SOIL SURVEY

VIRGIN ISLANDS of the United States

UNITED STATES DEPARTMENT AGRICULTURE
Soil Conservation Service

Issued August 1970

Major fieldwork for this soil survey was done in the period 1964-65. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions on the islands in 1965. This survey was made by the Soil Conservation Service. It is part of the technical assistance furnished to the Virgin Islands Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D. C. 20250.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in this publication. This guide lists all of the soils of the islands in alphabetic order by map symbol. It shows the page where each kind of soil is described and the page for the capability unit and the range site. It also shows the woodland group in which the soil has been placed.

Interpretations not included in this survey can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

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

Ranchers and others can find under "Use of the Soils for Range" groupings of the soils according to their suitability for range and descriptions of the vegetation on each range site.

Engineers and builders can find under "Use of the Soils in Engineering" tables that describe soil properties that affect engineering and show the relative suitability of the soils for specified engineering purposes.

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

Newcomers on the islands may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the Islands."

Cover picture: Coconut palm trees and pangolagrass on sandy coastal soil.

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SOIL SURVEY OF THE VIRGIN ISLANDS OF THE UNITED STATES

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

THE VIRGIN ISLANDS OF THE UNITED STATES consist of St. Croix, St. Thomas, St. John, and about 50 smaller islands that range in size from a cluster of small rocks to a square mile.

St. Croix, the largest island and the most easterly possession of the United States, is approximately 100 miles south-southeast of San Juan, Puerto Rico. It is a little more than 22 miles long, from east to west. The western half is rectangular in shape and is about 6 miles wide. The eastern half is about 5 miles wide at Christiansted and tapers to a point at the east end. The area is approximately 54,400 acres, or 85 square miles.

St. Thomas, the second largest island, is about 40 miles north of St. Croix and 40 miles east of Puerto Rico. It is about 12 miles long and 3 miles wide. The area is approximately 19,000 acres, or 30 square miles.

St. John is about 2 miles east of St. Thomas, just across Pillsbury Sound. It is about 7 miles long and 3 miles wide. The area is approximately 12,000 acres, or 19 square miles.

The island of St. Croix is characterized by a mountainous area in the north flanked by a rolling plain to the south. The mountains are broken by many narrow, steep-sided valleys through which intermittent streams discharge in southerly and southeasterly courses across the plain. Few deeply cut streams flow directly westward. Mount Eagle, the highest peak on St. Croix, is 1,165 feet above sea level. The eastern end of the island is mountainous also, but the elevation is not so high and the stream valleys are not so sharply incised.

St. Thomas and St. John are characterized by irregular coastlines, numerous bays, steep slopes, and small drainage areas. For the most part, the topography is mountainous. Coastal plains are almost completely absent. There are no permanent streams or rivers. Intermittent streams discharge into the sea, but on their way form narrow, nearly level alluvial fans and terraces. Crown Mountain, the highest peak on St. Thomas, is 1,500 feet above sea level. Bordeaux Mountain, the highest peak on St. John, is 1,277 feet above sea level.

HOW THIS SURVEY WAS MADE

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in areas nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this publication efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town, an estate, or other geographic feature near the place where a soil of that series was first observed and mapped. Cramer and Magens, for example, are the names of two soil series. All the soils on the islands having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in the texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in the texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Cramer gravelly clay loam and Cramer stony clay loam are two soil types in the Cramer series. The difference in the texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature that affects their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases (5).[1] The name of a soil phase indicates a feature that affects management. For example, Cramer gravelly clay loam, 12 to 40 percent slopes, is one of three phases of Cramer gravelly clay loam, a soil type that has a slope range of 5 to 60 percent.

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

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

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in such small individual tracts that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soils in it, for example, Cramer-Isaac gravelly clay loams, 12 to 40 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. Such an area is shown on the map like other mapping units, but it is given a descriptive name, such as Volcanic rock land or Tidal flats, and is called a land type.

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

But only part of a soil survey is done when the soils have been named, described, and delineated on the map and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. The soil scientists set up trial groups based on the yield and practice tables and other data. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

[1] Underscored numbers in parentheses refer to Literature Cited, page 76.

GENERAL SOIL MAP

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

A map showing soil associations is useful to people who want a general idea of the soils on the islands, who want to compare different parts of the islands, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The general soil map of the Virgin Islands and a table that shows limitations of the major soils and degrees of limitation for selected uses are in an envelope at the back of this survey.

The seven soil associations on the Virgin Islands are described in the following paragraphs.

1. Descalabrado-Jacana Association

Strongly sloping to steep, well-drained soils; clay loam to clay subsoil; shallow and moderately deep over volcanic rock; on mountainsides and foot slopes

This association is characterized by steep, rugged, forested or pastured mountain slopes slightly rounded at the top; strongly sloping, pastured or cultivated foot slopes; and valleys made up of thin alluvial fans and narrow flood plains. It occurs on the island of St. Croix. The largest acreage is in the northwestern part of the island. A smaller acreage occurs in the eastern part, on either side of Christiansted.

This association makes up 19 percent of the total land area of the Virgin Islands. It is 80 percent Descalabrado soils and 15 percent Jacana soils.

Descalabrado soils are on hillsides and mountainsides throughout the association. They are steep, shallow, neutral soils that formed in material weathered in place from volcanic rock.

Jacana soils are on foot slopes and alluvial fans below Descalabrado soils. They are moderately deep over volcanic rock and are slightly acid to mildly alkaline.

San Anton and Cramer soils are minor soils in this association. San Anton soils are on narrow alluvial fans below Descalabrado and Jacana soils. Cramer soils are on hillsides and mountainsides.

Descalabrado and Jacana soils are limited largely to use for pasture, woodland, wildlife, and recreation. Shallowness over rock and steep slopes generally preclude cultivation of these soils and cause them to have severe limitations for residential, commercial, and industrial development.

2. Aguilita-Fredensborg-Sion Association

Gently sloping to steep, well-drained soils; clay loam and silty clay loam material below the surface layer; shallow over soft, marly limestone; on hills, foot slopes, and terraces

This association is characterized by strongly sloping, low, rounded, forested or pastured limestone hills and gently sloping foot slopes and terraces. It takes in the southwestern tip of St. Croix and much of the coastal plain in the central part of the island.

This association makes up 22 percent of the total land area of the Virgin Islands. It is 50 percent Aguilita soils, 20 percent Fredensborg soils, and 20 percent Sion soils.

Aguilita soils are undulating to steep, shallow, gravelly, calcareous, well drained, and moderately permeable. They formed in material weathered in place from soft limestone.

Fredensborg soils are on foot slopes and in valleys below the limestone hills. They are well drained and are shallow over soft limestone or marl. They formed in calcareous clayey sediments.

Sion soils are on foot slopes and in valleys below Aguilita soils. They are well drained and moderately permeable and are shallow over soft limestone or marl. They formed in calcareous material.

Coamo, Diamond, and Hesselberg soils and Limestone rock land make up minor parts of this association. The soils are on stream terraces or alluvial fans on the coastal plains.

Aguilita soils have severe limitations, chiefly steep slopes and shallowness over rock, that make them generally unsuitable for cultivated crops. Their use is limited largely to pasture and woodland. Fredensborg and Sion soils have moderate limitations, chiefly slope, but they can be used for cultivated crops. Fredensborg and Sion soils have moderate limitations for most nonfarm uses, and Aguilita soils, moderate to severe limitations.

3. Fraternidad-Aguirre-Glynn Association

Nearly level to gently sloping, well-drained to poorly drained, deep, mainly clayey soils on alluvial fans

This association is characterized by broad alluvial fans that slope gently from the base of the volcanic mountains onto the coastal plain. It is dissected by many intermittent streams. It occurs on the island of St. Croix.

This association makes up 8 percent of the total land area of the Virgin Islands. It is 60 percent

Fraternidad soils, 15 percent Aguirre soils, and 15 percent Glynn soils.

Fraternidad soils are on slightly convex alluvial fans. They are nearly level to gently sloping, deep, moderately well drained, slowly permeable, plastic clays that swell when wet and shrink when dry. They formed in clay sediments.

Aguirre soils are on slightly concave alluvial fans. They are nearly level, deep, poorly drained, slowly permeable clays that swell when wet and shrink when dry. They formed in clay sediments.

Glynn soils are on foot slopes and fans below the volcanic hills and along the northern edge of the coastal plain in the southern and central parts of St. Croix. They are deep, well drained, and moderately slowly permeable. They formed in clay and clay loam sediments.

San Anton and Coamo soils are minor soils in this association. San Anton soils are on narrow alluvial fans, close to the volcanic hills. Coamo soils are on stream terraces or alluvial fans at the outlets of upland drains.

Fraternidad, Aguirre, and Glynn soils can be used for cultivated crops and pasture, but their heavy plastic clay texture is a moderate limitation that reduces the choice of crops. Because of slow permeability and the shrinking and swelling of the clay, Fraternidad and Aguirre soils have severe limitations for residential, commercial, and industrial development. Glynn soils have moderate limitations.

4. Southgate-Parasol Association

Steep to sloping, well-drained soils; gravelly loam to clay subsoil; shallow and deep over weathered granitic rock; on mountainsides, foot slopes, and alluvial fans

This association is characterized by steep, rugged, forested or pastured mountainsides; sloping, pastured or cultivated foot slopes; and valleys made up of thin alluvial fans and very narrow flood plains. It occurs as one small area on the island of St. Croix.

This association makes up 2 percent of the total land area of the Virgin Islands. It is 65 percent Southgate soils and 30 percent Parasol soils.

Southgate soils are on hills and mountains. They are steep, well drained, and moderately permeable and are shallow over hard granitic rock. They formed in material weathered in place from coarse-textured rock. The subsoil is 50 percent rock fragments.

Parasol soils are on foot slopes and alluvial fans below Southgate soils. They are deep and well drained. They are moderately permeable in the surface layer and moderately rapidly permeable in the subsoil. They formed in clayey sediments and material weathered from granitic rock.

San Anton and Descalabrado soils are minor soils in this association. San Anton soils are on narrow alluvial fans and flood plains below Southgate and Parasol soils. Descalabrado soils are on hillsides and mountainsides.

Southgate soils have severe limitations, chiefly shallowness over rock and steep slopes, that make them unsuitable for cultivation and for nonfarm uses. They are limited largely to use for pasture, woodland, wildlife habitat, and recreation. Parasol soils and the minor soils in this association, which occur on foot slopes, have moderate limitations for cultivation and for nonfarm uses.

5. Cramer-Isaac Association

Very steep to strongly sloping, well-drained soils; clayey in subsoil; shallow and moderately deep over volcanic rock; on mountainsides and foot slopes

This association is characterized by steep and very steep mountainsides, strongly sloping foot slopes, and narrow alluvial fans and flood plains. The soils are reddish. The surface layer is gravelly and stony. Between 50 and 70 percent of the surface is covered with rock outcrops, and boulders and stones are common. All of the island of St. John, all of the offshore islands, a large part of the island of St. Thomas, and three fairly large areas on the island of St. Croix are in this association.

This association makes up 41 percent of the total land area of the Virgin Islands. It is 60 percent Cramer soils and 30 percent Isaac soils.

Cramer soils are on mountainsides throughout the association. They are steep and very steep, shallow, red or reddish brown, well drained, and moderately permeable. Their surface layer is gravelly or stony. They formed in material weathered in place from volcanic rock.

Isaac soils are on foot slopes. They are strongly sloping, moderately deep, and well drained. They have many angular volcanic rock fragments on the surface. They formed in material weathered in place from volcanic rock.

Minor soils in this association are San Anton, Glynn, and Aguilita soils and Cobbly alluvial land. San Anton and Glynn soils are on narrow alluvial fans and flood plains below Cramer and Isaac soils. Aguilita soils are on low hills and foot slopes. Cobbly alluvial land is on narrow flood plains.

Cramer and Isaac soils have severe limitations, chiefly shallowness over rock and steep slopes, that make them unsuitable for cultivation and for most nonfarm uses. They are limited largely to use for pasture and range, woodland, wildlife habitat, and recreation.

6. Dorothea-Victory-Magens Association

Steep and very steep, well-drained, deep soils; clay to clay loam subsoil; on mountainsides

This association is characterized by steep and very steep, rugged, forested or pastured mountains that are slightly rounded at the top. It occurs only on the island of St. Thomas. The highest peaks

of the island--Hawk Hill, Crown Mountain, and Signal Hill--are on this association.

This association makes up 2 percent of the total land area of the Virgin Islands. It is 60 percent Dorothea soils, 25 percent Victory soils, and 10 percent Magens soils.

All of the major soils are on mountainsides. Victory and Magens soils are steep. Dorothea soils are steep and very steep. All are deep, well drained, and moderately permeable, and all formed in material derived in place from highly weathered volcanic rock. Dorothea and Victory soils are yellowish brown, and Magens soils are red in the subsoil.

Cramer and Isaac soils are minor soils in this association. Cramer soils are on hillsides and mountainsides. Isaac soils are on foot slopes.

Dorothea, Victory, and Magens soils have severe limitations, chiefly slope, that make them unsuitable for cultivation. Rock terraces that can be cultivated satisfactorily have been constructed on some areas of Dorothea soils. The deep soils in this association can be leveled and dug into with machinery, and thus the slope limitation for some nonfarm uses, such as homesites, can be overcome. For the most part, however, the use of these soils is limited to pasture, woodland, wildlife habitat, and recreation.

7. Cornhill-Coamo-San Anton Association

Nearly level to gently sloping, moderately well drained and well drained, deep soils; clay to clay loam subsoil; on alluvial fans and flood plains

This association occurs only on the island of St. Croix. It consists of a strip of gently sloping alluvial fans that extends from Southgate Pond on the north to Great Pond on the south and then extends west along the coastal plain.

This association makes up 6 percent of the total land area of the Virgin Islands. It is 35 percent Cornhill soils, 30 percent Coamo soils, and 30 percent San Anton soils.

Cornhill soils are in the southern part of the island. They are nearly level, deep, and moderately well drained. They have a moderately slowly permeable surface layer and slowly permeable underlying material that swells when wet and shrinks when dry. They formed in calcareous, clayey sediments mixed with varying amounts of gravel.

Coamo soils are on foot slopes and alluvial fans below the limestone and volcanic hills. They are deep, well drained, moderately permeable in the surface layer, and moderately slowly permeable in the subsoil. They formed in calcareous clayey sediments.

San Anton soils are on flood plains. They are deep, well drained, and moderately permeable. They formed in neutral to slightly alkaline material deposited on the flood plains.

Descalabrado and Jacana soils are minor soils in this association. Descalabrado soils are on hillsides and mountainsides. Jacana soils are on foot slopes below Descalabrado soils.

Cornhill, Coamo, and San Anton soils are not suitable for cultivation, because of the dry climate. Their use is limited largely to pasture and range, woodland, wildlife habitat, and recreation.

DESCRIPTIONS OF THE SOILS

This section describes the soil series and mapping units of the Virgin Islands. The approximate acreage and the proportionate extent of each mapping unit are given in table 1.

A general description of each soil series is given, and this is followed by brief descriptions of the mapping units in that series. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. Each series contains a short description of a typical soil profile and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations.

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

Many terms used in the soil descriptions and other sections of the survey are defined in the Glossary.

Aguilita Series

The Aguilita series consists of gently sloping to steep, well-drained soils that are shallow over soft limestone or marl. These soils formed in residuum derived from limestone. They occur in hilly and mountainous areas of St. Croix and in the northern part of St. Thomas. The slope gradient is 2 to 60 percent. The climate is semiarid. The average annual rainfall is between 30 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile (pl. I) the surface layer is very dark grayish-brown and light brownish-gray gravelly clay loam about 6 inches thick. Below this is mixed very dark grayish-brown and dark grayish-brown, firm, calcareous gravelly clay loam that is 50 to 70 percent limestone fragments. The substratum, at a depth of about 10 inches, is mostly soft limestone but contains hard limestone concretions. The soft limestone material can be penetrated with a spade.

Drainage is good, and permeability is moderate. The water table is low.

Most of the acreage is in grasses and brush. A small acreage has been cleared and is now in guineagrass and is used as pasture.

Representative profile of Aguilita gravelly clay loam, 20 to 40 percent slopes, in a brushy area on St. Croix, half a mile north and 125 feet west of an intersection three-fourths of a mile east of Insular Experiment Station:

A--0 to 6 inches, mixed very dark grayish-brown (10YR 3/2) and light brownish-gray (10YR 6/2) gravelly clay loam; moderate, fine, subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; approximately 50 percent limestone rock fragments; calcareous; common fine roots; clear, smooth boundary. 3 to 8 inches thick.

AC--6 to 10 inches, mixed very dark grayish-brown (10YR 3/2) and dark grayish-brown (10YR 4/2) gravelly clay loam; weak, fine, granular structure; firm; 50 to 70 percent limestone fragments; calcareous; few fine roots; gradual, smooth boundary. 1 to 6 inches thick.

C--10 to 60 inches +, white (10YR 8/1) soft limestone or marl; few to common hard limestone concretions.

The depth to soft limestone or marl ranges from 4 to 14 inches. The number of limestone fragments ranges from common to many. The color of the A horizon ranges from very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 3/4) or light brownish gray (10YR 6/2), and the texture ranges from gravelly clay loam to gravelly clay. The color of the AC horizon ranges from very dark grayish brown (10YR 3/2) to brown (10YR 5/3), and the texture from gravelly clay loam to gravelly clay. This horizon also contains pockets that have weak blocky structure. The color ranges from white to light gray.

Aguilita soils are shallower and more gravelly than Sion and Fredensborg soils. They lack the weakly expressed B horizon and the horizon of accumulated calcium carbonate that are typical of Pozo Blanco soils. They are not so red as Hesselberg and Diamond soils.

Aguilita gravelly clay loam, 2 to 5 percent slopes (AgB).--This soil is on ridges and knolls in the southern and southwestern parts of St. Croix. Included in mapping were spots of Diamond clay loam and Hesselberg clay.

The surface layer of this Aguilita soil is dominantly very dark grayish brown and is 4 to 6 inches thick. The texture is gravelly clay loam to a depth of 10 to 14 inches.

This soil can be used occasionally for cultivated crops. It has a moderate limitation as a site for picnic areas, trafficways, highways, and airports, for buildings for light industry, and for residences served by a community sewerage system. (Capability unit IVe-1; woodland group 2; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Aguilita gravelly clay loam, 5 to 12 percent slopes, eroded (AgC2).--This soil is on ridges and foot slopes in the southern and southwestern parts of St. Croix. Included in mapping were small areas of Fredensborg, Sion, and Diamond soils.

As a result of erosion, the surface layer of this Aguilita soil is now only 3 to 5 inches thick. It is lighter colored than that in the profile described as typical for the series because it has

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Soil	Area	Extent	Soil	Area	Extent
	Acres	Percent		Acres	Percent
Aguilita gravelly clay loam, 2 to 5 percent slopes	632	0.7	Hesselberg clay, 0 to 2 percent slopes	540	0.6
Aguilita gravelly clay loam, 5 to 12 percent slopes, eroded	2,086	2.4	Isaac clay loam, saprolitic substratum, 12 to 20 percent slopes, eroded	168	.2
Aguilita gravelly clay loam, 12 to 20 percent slopes	2,052	2.4	Isaac clay loam, saprolitic substratum, 20 to 40 percent slopes	525	.6
Aguilita gravelly clay loam, 20 to 40 percent slopes	2,101	2.5	Isaac gravelly clay loam, 5 to 20 percent slopes	735	.7
Aguilita gravelly clay loam, 40 to 60 percent slopes	388	.5	Jacana clay loam, 2 to 5 percent slopes	193	.2
Aguirre clay, 0 to 2 percent slopes	761	.9	Jacana clay loam, 5 to 12 percent slopes	1,663	1.9
Coamo clay loam, 2 to 5 percent slopes	2,161	2.5	Jacana clay loam, 12 to 20 percent slopes	86	.1
Cobbly alluvial land	96	.1	Jaucas sand, 0 to 5 percent slopes	1,387	1.6
Cornhill gravelly clay loam, 0 to 2 percent slopes	1,336	1.6	Lavallee gravelly clay loam, 2 to 5 percent slopes	227	.3
Cramer gravelly clay loam, 5 to 12 percent slopes	250	.3	Leveled clayey land	28	(1/)
Cramer gravelly clay loam, 12 to 40 percent slopes	10,921	12.8	Leveled marly land	307	.4
Cramer gravelly clay loam, 40 to 60 percent slopes	11,838	13.7	Leveled rocky land	84	.1
Cramer stony clay loam, 12 to 40 percent slopes, eroded	1,869	2.2	Limestone rock land	167	.2
Cramer stony clay loam, 40 to 60 percent slopes, eroded	4,154	4.9	Made land	225	.3
Cramer-Isaac gravelly clay loams, 12 to 40 percent slopes	2,035	2.4	Magens silty clay loam, 30 to 50 percent slopes	177	.2
Descalabrado clay loam, 12 to 20 percent slopes	1,156	1.4	Parasol clay loam, 2 to 5 percent slopes	96	.1
Descalabrado clay loam, 20 to 40 percent slopes	4,082	4.8	Parasol clay loam, 5 to 12 percent slopes	429	.5
Descalabrado clay loam, 40 to 60 percent slopes	8,244	9.7	Pozo Blanco clay loam, 5 to 12 percent slopes	174	.2
Diamond-Limestone rock land complex, 0 to 5 percent slopes	1,265	1.5	Pozo Blanco clay loam, 12 to 20 percent slopes	98	.1
Diamond-Limestone rock land complex, 5 to 12 percent slopes, eroded	91	.1	San Anton clay loam, 0 to 3 percent slopes	3,713	4.3
Dorothea clay loam, 20 to 40 percent slopes	962	1.1	San Anton clay loam, 5 to 12 percent slopes	741	.9
Dorothea clay loam, 40 to 60 percent slopes	591	.7	Sion clay loam, 0 to 5 percent slopes	2,221	2.6
Fraternidad clay, 0 to 3 percent slopes	2,549	3.0	Sion clay loam, 5 to 12 percent slopes	488	.6
Fraternidad clay. 3 to 12 percent slopes, eroded	585	.7	Southgate clay loam, 12 to 40 percent slopes	385	.5
Fredensborg clay, 0 to 2 percent slopes	264	.3	Southgate clay loam, 40 to 60 percent slopes	792	.9
Fredensborg clay, 2 to 5 percent slopes	2,229	2.6	Southgate-Rock land complex, 20 to 60 percent slopes	399	.5
Fredensborg clay, 5 to 12 percent slopes, eroded	414	.5	Tidal flats	407	.5
Glynn clay loam, 2 to 5 percent slopes	929	1.1	Tidal swamp	996	1.2
Glynn clay loam, 5 to 12 percent slopes, eroded	167	.2	Victory clay loam, 12 to 20 percent slopes	138	.2
			Victory clay loam, 20 to 40 percent slopes	389	.5
			Volcanic rock land	1,185	1.4
			Mines and pits	12	(1/)
			Total	85,383	100.0

[1]Less than 0.05 percent.

been mixed with material weathered from the underlying gray limestone. The texture is gravelly clay loam to a depth of 8 to 12 inches.

This soil is not suited to cultivated crops; it is shallow and is low in water-holding capacity. It has a moderate limitation as a site for highways, airports, and buildings for light industry, but only a slight limitation for trafficways and for residences served by a community sewerage system. (Capability unit VIe-3; woodland group 2; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Aguilita gravelly clay loam, 12 to 20 percent slopes (AgD).--This soil occurs on ridgetops and side slopes in the southern and southwestern parts of St. Croix and in the north-central part of St. Thomas. Included in mapping were small areas of Limestone rock land, bands of Sion clay loam, and, north of the Truman Airport in St. Thomas, small areas of soils that developed in calcareous volcanic rocks.

The surface layer of this Aguilita soil is dominantly dark grayish brown and is more than 5 inches thick. The texture is gravelly clay loam to a depth of 10 to 14 inches.

This soil has severe limitations, mainly shallowness and strong slopes, that preclude its use for cultivated crops, but it can be used safely for pasture or woodland. It has a moderate limitation as a site for picnic areas and trafficways and for residences served by a community sewerage system. It has a severe limitation as a site for highways, airports, and buildings for light industry. (Capability unit VIe-3; woodland group 2; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Aguilita gravelly clay loam, 20 to 40 percent slopes (AgE).--This soil is on side slopes in the southern and southwestern parts of St. Croix and in the north-central part of St. Thomas. Included in mapping were small areas of Limestone rock land.

This Aguilita soil has the profile described as representative for the series. The depth to soft limestone ranges from 8 to 12 inches.

This soil can be used for woodland or pasture. Shallowness, moderately steep slopes, and rapid runoff preclude cultivation, and shallowness and slope severely limit nonfarm uses. (Capability unit VIIe-1; woodland group 2; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Aguilita gravelly clay loam, 40 to 60 percent slopes (AgF).--This steep soil is in the central part of St. Croix and in the northern part of St. Thomas. Included in mapping, and making up 15 to 20 percent of some mapped areas, were tracts of Limestone rock land.

The surface layer of this Aguilita soil is 3 to 5 inches thick and is grayish brown to dark grayish brown in color. The texture is gravelly clay loam to a depth of 4 to 10 inches.

Shallowness, rapid runoff, and steep slopes severely limit almost all farm and nonfarm uses. Establishing and maintaining pasture is more difficult on this soil than on other soils in the Aguilita series. (Capability unit VIIe-1; woodland group 2; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Aguirre Series

The Aguirre series consists of nearly level to slightly depressed, poorly drained soils that are deep over limestone and volcanic rocks. These soils formed in clayey sediments derived from these rocks. They occur near coastal areas and on valley floors on the island of St. Croix. The slope gradient is 0 to 2 percent. The climate is semiarid. The average annual rainfall is between 30 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark gray clay about 13 inches thick. Below this is dark-gray and light olive-brown, firm and very firm, calcareous clay that shrinks when dry and swells when wet. The substratum, at a depth of about 36 inches, is olive-gray and light olive-brown clay.

Drainage is poor, and permeability is slow. Most of the acreage is cultivated.

Representative profile of Aguirre clay, 0 to 2 percent slopes, three-tenths of a mile north and 50 feet west of Bethlehem sugar factory, on St. Croix:

A11--0 to 10 inches, very dark gray (N 3/0) clay; massive when wet; moderate, fine, granular structure when dry; hard, very firm, sticky, plastic; common fine roots; calcareous; gradual, wavy boundary. 7 to 11 inches thick.

A12--10 to 13 inches, very dark gray (N 3/0) clay; massive; many pressure faces and slickensides; very hard, very firm, sticky, plastic; few fine roots; few black concretions; calcareous; clear, wavy boundary. 3 to 10 inches thick.

A13--13 to 26 inches, dark-gray (5Y 4/1) clay; medium and coarse, wedge-shaped peds and many pressure faces and slickensides; very hard, very firm, sticky, plastic; few fine roots; few fine fragments of volcanic rock; few, fine, black concretions; strongly calcareous; clear, irregular boundary. 6 to 13 inches thick.

AC--26 to 36 inches, mixed light olive-brown (2.5Y 5/4) and dark-gray (5Y 4/1) clay; massive; many, medium and coarse, wedge-shaped peds and common pressure faces and slickensides; very hard, firm, sticky, plastic; calcareous; clear, irregular boundary. 5 to 12 inches thick.

C1--36 to 45 inches, olive-gray (5Y 5/2) clay; massive; few, medium and coarse, wedge-

shaped peds and common pressure faces and slickensides; very hard, very firm, slightly sticky, plastic; few, fine, black concretions; calcareous; gradual, wavy boundary. 7 to 12 inches thick.

C2--45 to 60 inches, light olive-brown (2.5Y 5/4) clay; massive; pressure faces and small slickensides; very hard, very firm, slightly sticky, plastic; few, fine, black concretions; calcareous.

There are few to common black concretions and volcanic rock fragments throughout the profile. The color of the A horizon ranges from black (N 2/0) to very dark gray (N 3/0, 10YR 3/1, 5Y 3/1) and dark gray (5Y 4/1). This layer is massive when wet but has weak to moderate granular structure when dry. The color of the AC and C horizons ranges from very dark grayish brown (10YR 3/2) and light olive brown (2.5Y 5/4) to olive (5Y 5/4). There are few to common, low-chroma and yellowish-brown mottles.

Aguirre soils are associated with Fraternidad, Coamo, Glynn, Fredensborg, and Cornhill soils. They are more poorly drained, have a darker colored profile, and have a less friable surface layer than Fraternidad soils, and they occur on concave rather than convex slopes. They are more poorly drained than Coamo soils, which formed in stratified sediments of silt, clay, sand, and gravel. They are more poorly drained than Glynn soils, which have a well-developed subsoil and stratified underlying material. They are deeper than Fredensborg soils, which are shallow over soft limestone. They are more poorly drained than Cornhill soils, which are clay loam in the surface layer and upper part of the subsoil and are clayey and plastic in the lower part of the subsoil and in the substratum.

Aguirre clay, 0 to 2 percent slopes (AuA).--This soil is near the Bethlehem sugar factory. Included in mapping were areas that are slightly saline and small areas that are less than 30 inches deep over marl.

This Aguirre soil is used for sugarcane, but it is sticky and plastic and is difficult to keep in good tilth. Slow permeability, waterlogging, and poor workability limit all farm uses. High shrink-swell potential, slow permeability, high plasticity, and poor bearing strength severely limit nonfarm uses. (Capability unit IVw-1; no woodland classification; Deep range site 4, precipitation zone 35 to 45 inches)

Coamo Series

The Coamo series consists of gently sloping, well-drained soils that are deep over volcanic and limestone rocks. These soils occur on alluvial fans and terraces. They formed in sediments derived from these rocks. The sediments range in texture from clay to sand. The slope gradient is 2 to 5 percent. The climate is semiarid. The average annual rainfall is between 30 and 40 inches, and the average annual temperature is between 78° and 80°F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 8 inches thick. It contains a few rock fragments. The subsoil is very dark grayish-brown and yellowish-brown, firm clay. It also contains a few rock fragments. The substratum, beginning at a depth of about 24 inches, is yellowish-brown and dark yellowish-brown, friable, calcareous clay loam stratified with sand and gravel.

Most of the acreage is in grasses and brush. A small acreage has been cleared and is now in guineagrass and is used as pasture.

Representative profile of Coamo clay loam, 2 to 5 percent slopes, in a native pasture on St. Croix, 160 feet east and 200 feet north of a windmill that is three-tenths of a mile due north of the main entrance to Halfpenny Bay estate:

Ap--0 to 8 inches, very dark grayish-brown (10YR 3/2) clay loam, dark gray (10YR 4/1) when dry; weak, coarse, subangular blocky structure that breaks to weak, fine, subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine roots; few angular fragments of volcanic rock 1/4 to 1/2 inch in diameter; neutral; clear, smooth boundary. 5 to 10 inches thick.

B2t--8 to 14 inches, very dark grayish-brown (10YR 3/2) clay; weak, medium, subangular blocky structure; hard, firm, slightly sticky, plastic; thin, discontinuous clay films; few fine roots; many angular fragments of volcanic rock 1/4 to 1/2 inch in diameter; neutral; clear, smooth boundary. 6 to 12 inches thick.

B3ca--14 to 24 inches, yellowish-brown (10YR 5/4) clay; weak, medium, subangular blocky structure; hard, firm, slightly sticky, plastic; few fine roots; many fragments of volcanic rock 1/4 to 1/2 inch in diameter; common, fine, dark-colored nodules; common medium lime splotches; strongly calcareous; gradual, smooth boundary. 8 to 16 inches thick.

IIC1ca--24 to 40 inches, yellowish-brown (10YR 5/4) clay loam; massive; friable, slightly sticky, nonplastic; few, fine, dark-colored nodules; thin lenses 1/4 to 1/2 inch thick of fine and medium gravel; common medium lime splotches; strongly calcareous; gradual, wavy boundary. 10 to 20 inches thick.

IIIC2ca--40 to 50 inches, yellowish-brown (10YR 5/6) gravelly clay loam; massive; friable, slightly sticky, nonplastic; many, fine and medium, angular fragments of volcanic rock; few, fine, dark-colored nodules; common fine lime splotches; strongly calcareous; gradual, wavy boundary. 8 to 14 inches thick.

IVC3ca--50 to 56 inches, dark yellowish-brown (10YR 4/4) clay loam; massive; friable, slightly sticky, nonplastic; few, fine, dark-colored nodules; few fine lime splotches; calcareous; abrupt, smooth boundary. 4 to 10 inches thick.

VC4--56 to 60 inches +, gravel.

The thickness of the solum ranges from 24 to 38 inches. The texture of the Ap horizon is dominantly clay loam but ranges to silty clay loam. The color ranges from black (10YR 2/1) or dark gray (10YR 4/1) to very dark grayish brown (10YR 3/2). The reaction ranges from neutral to slightly acid. The texture of the B horizon is dominantly clay. The color ranges from 7.5YR to 10YR in hue, 3 to 5 in value, and 2 to 6 in chroma. The structure ranges from weak, medium, subangular blocky to moderate, medium, subangular blocky. Clay films range from few patchy to thin discontinuous. The underlying horizons are stratified gravel, gravelly clay loam, and loam. They contain varying amounts of secondary lime.

Coamo soils are associated with Cornhill, San Anton, Glynn, and Fraternidad soils. They are less clayey in the underlying material than Cornhill soils are, and they do not have the large slickensides that are typical of those soils. They are more calcareous in the underlying material than San Anton soils, which formed in stratified sediments derived from limestone and volcanic rocks. They differ from Glynn soils in having a more friable surface layer and a thinner subsoil. They are less clayey and less plastic than Fraternidad soils.

Coamo clay loam, 2 to 5 percent slopes (CaB).--This soil is on alluvial fans and terraces. Included in mapping were small areas of San Anton clay loam, Cornhill clay loam, and Fraternidad clay, and spots of Coamo clay loam where the gradient is 1 percent.

Adverse climate is the major limitation. The lack of sufficient rainfall and the high evaporation rate cause crop failures, even though all other soil characteristics are favorable. Pasture grasses grow well. There are few or no limitations for most nonfarm uses. (Capability unit IIIc-1; no woodland classification; Deep range sites 1, 4, and 7, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Cobbly Alluvial Land

Cobbly alluvial land (Cb) occurs as gently sloping to moderately sloping, narrow strips near streams. It consists of sediments of varying texture. The material is 60 to 75 percent subangular and subrounded, very hard cobblestones of volcanic origin. It ranges from very dark grayish brown to dark yellowish brown in color, and in spots where it is associated with Cramer soils, it is more red than is typical.

At present, the acreage is in native grasses and is used as pasture. Poor workability, an overflow hazard, rapid permeability, a low water-holding capacity, and stoniness severely limit all farm and nonfarm uses. (Capability unit VIIs-4; no woodland classification; no range site classification)

Cornhill Series

The Cornhill series consists of nearly level, moderately well drained soils that are deep over clayey, plastic sediments. These soils formed in a mantle of clay loam sediments. They occur near coastal areas, on terraces and alluvial fans in the southern part of St. Croix. The slope gradient is 0 to 2 percent. The climate is semiarid. The average annual rainfall is between 30 and 35 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark-brown gravelly clay loam about 9 inches thick. The upper part of the subsoil is very dark brown, firm, calcareous clay loam. The lower part is dark grayish-brown, firm clay. It extends to a depth of about 30 inches. The underlying layers are yellowish-brown, calcareous clay that shrinks when dry and swells when wet.

Most of the acreage is used as pasture. The vegetation consists of native grasses and shrubs. Guineagrass grows in well-managed areas.

Representative profile of Cornhill gravelly clay loam, 0 to 2 percent slopes, on St. Croix, 205 feet east and 85 feet north of the southwest corner of a pasture fence that is three-tenths of a mile south of a windmill at Longford, or a little less than five-tenths of a mile south of the farm entrance:

Ap--0 to 9 inches, dark-brown (10YR 3/3) gravelly clay loam, grayish brown (10YR 5/2) when dry; weak, medium, subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; common, fine and medium, angular and subrounded fragments of volcanic rock; common fine roots; few, fine, black concretions; calcareous; moderately alkaline; clear, wavy boundary. 8 to 14 inches thick.

B2--9 to 18 inches, very dark brown (10YR 2/2) heavy clay loam; weak, medium and coarse, subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few, fine, dark-colored oxide concretions; calcareous; moderately alkaline; gradual, wavy boundary. 8 to 16 inches thick.

IIB3--18 to 30 inches, dark grayish-brown (10YR 4/2) clay; weak, coarse, angular blocky structure, with slickensides and pressure faces when moist, that breaks to weak, coarse, granular structure or weak, fine, subangular blocky structure when dry; firm, sticky, plastic; common, fine, black concretions; calcareous; moderately alkaline; gradual, wavy boundary. 12 to 24 inches thick.

IIIC1--30 to 36 inches, yellowish-brown (10YR 5/4) gravelly clay; weak, medium and coarse, angular blocky structure, with slickensides and pressure faces when moist, that breaks to weak, medium, granular structure when dry; firm, slightly sticky, plastic; common, fine, black concretions; common, fine and medium, calcium carbonate concretions;

moderately alkaline; clear, wavy boundary. 6 to 12 inches thick.

IIIC2--36 to 48 inches +, yellowish-brown (10YR 5/4) gravelly clay; massive; firm, slightly sticky, slightly plastic; common, fine, dark-colored oxide concretions; calcareous.

The thickness of the Ap and B2 horizons combined ranges from 16 to 30 inches. The profile is calcareous throughout, and secondary lime is present in the lower horizons. In places sandy and gravelly lenses occur throughout the profile. The color of the A horizon ranges from very dark brown (10YR 2/2) to dark grayish brown (10YR 4/2), and the texture from gravelly clay loam to clay loam. The color of the B horizon ranges from very dark brown (10YR 2/2) and dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). The texture is dominantly clay loam in the upper part of the profile and clay in the lower part. The structure ranges from weak, medium, subangular blocky to weak, coarse, subangular blocky, and there are few to common pressure faces. The consistence of the B horizon ranges from firm to friable. The C horizon is typically stratified. The upper part is plastic, dark yellowish-brown (10YR 4/4) to light yellowish-brown (10YR 6/4) clay or gravelly clay and has many slickensides and pressure faces. The lower part grades to sand and gravel at a depth of 48 to 68 inches.

Cornhill soils are associated with Coamo, San Anton, and Fraternidad soils. They do not have the sandy and gravelly lenses in the lower part of the profile that are typical of Coamo soils. They have more free lime than San Anton soils. They are less clayey and less plastic throughout than Fraternidad soils.

Cornhill gravelly clay loam, 0 to 2 percent slopes (CoA).--This soil is on terraces and alluvial fans in the southern part of St. Croix. Included in mapping were very gravelly areas and spots of Coamo clay loam, San Anton clay loam, and Fraternidad clay, none of which exceed 10 percent of each mapped area. Also, along the southern coast and close to the sea are small areas of soils that contain varying amounts of soluble salts.

Adverse climate is the major limitation. The lack of sufficient rainfall and the high evaporation rate cause crop failures, even though all other soil characteristics are favorable. Pasture grasses grow well. The shrinking and swelling of the underlying plastic clay severely limit use of this soil as a site for residences and for buildings for light industry. Limitations are moderate to severe for recreational uses, as for campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit IVc-1; no woodland classification; Deep range sites 4 and 7, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer Series

The Cramer series consists of moderately sloping to steep, well-drained soils that are shallow over partly weathered, basic volcanic rocks. These soils occur on side slopes of dissected volcanic uplands throughout the Virgin Islands. The slope gradient is 5 to 60 percent. The climate is semiarid. The average annual rainfall is between 30 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile (pl. I) the surface layer is dark reddish-brown gravelly clay loam that is 30 percent volcanic rock fragments. This layer is 9 inches thick. The upper 4 inches of the subsoil is firm, dark-red gravelly clay that also is 30 percent volcanic rock fragments. The lower 6 inches is very firm, dark reddish-brown clay. Below a depth of about 19 inches is partly altered volcanic rock. This material is difficult to dig into with a spade.

Drainage is good. Runoff is medium to rapid, and permeability is moderate.

About four-fifths of the acreage is gravelly, and one-fifth is stony. Most of the acreage is in brush or brushy forest. Only a small part is cultivated or used as pasture.

Representative profile of Cramer gravelly clay loam, 40 to 60 percent slopes, on St. Croix, 1.8 miles northwest of junction of roads to Annaly and Scenic Drive, and 100 feet north of road or 1.3 miles northeast of rock quarry located in northwest corner of St. Croix, along Scenic Drive.

A1--0 to 9 inches, dark reddish-brown (5YR 3/3) gravelly clay loam; moderate, medium, granular structure; slightly hard, friable, nonsticky, slightly plastic; many fine roots; 30 percent angular volcanic rock fragments 1/4 to 1/2 inch in diameter; neutral; clear, smooth boundary. 5 to 10 inches thick.

B1--9 to 13 inches, dark-red (2.5YR 3/6) gravelly clay; weak, medium, subangular blocky structure that breaks to moderate, medium, granular; firm, slightly sticky, slightly plastic; common fine roots; 30 percent angular volcanic rock fragments 1/4 inch to 2 inches in diameter; slightly acid; clear, smooth boundary. 3 to 5 inches thick.

B2t--13 to 19 inches, dark reddish-brown (2.5YR 3/4) clay; moderate, fine and medium, subangular blocky structure; very firm, sticky, plastic; few pressure faces; many volcanic rock fragments 1/4 inch to 2 inches in diameter; medium acid; abrupt, wavy boundary. 2 to 8 inches thick.

R--19 inches +, greenish-gray, hard-bedded volcanic mudstone (very difficult to dig with spade); red and dark reddish-brown stains along fracture planes.

The depth to hard rock ranges from 10 to 20 inches. The percentage of gravel ranges from 25 to 60. The reaction ranges from medium acid to neutral. The color of the A horizon is 5YR and 2.5YR in hue, 3 in value, and 2 to 4 in chroma. The texture of the B2t horizon is dominantly clay. The

color is 5YR and 2.5YR in hue, 3 and 4 in value, and 4 to 8 in chroma. The structure is weak to moderate, coarse to fine, subangular blocky.

Cramer soils are associated with Descalabrado, Southgate, Victory, Magens, and Dorothea soils. They are redder and more plastic than Descalabrado soils, which are neutral to mildly alkaline. They are redder and more clayey in the subsoil than Southgate soils, which developed in material weathered from granitic rocks. They are less yellow than Victory soils. They have a more strongly developed subsoil than Southgate and Victory soils. They are less red, are shallower, and have a thinner subsoil than Magens soils. They are less yellow and are shallower than Dorothea soils, which are underlain by softer, more altered rock.

Cramer gravelly clay loam, 5 to 12 percent slopes (CrC).--This soil is on small hills near the northern coast of St. Croix, east of Christiansted, and also occurs as scattered areas on the islands of St. Thomas and St. John. Included in mapping, and making up 10 to 15 percent of each mapped area, were spots of Isaac gravelly clay loam.

The surface layer of this Cramer soil is 8 to 10 inches thick. Bedrock is at a depth of 12 to 20 inches.

This soil is suitable for pasture and woodland and is used for those purposes. Moderate slopes, susceptibility to erosion, shallowness over rock, a large amount of gravel throughout the profile, and a low water-holding capacity are severe limitations that preclude its use for cultivated crops. It has a moderate limitation as a site for picnic areas and trafficways, and a severe limitation as a site for residences, intensive play areas, camps, golf fairways, and buildings for light industry. (Capability unit VIs-3; woodland group 4; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer gravelly clay loam, 12 to 40 percent slopes (CrE).--This soil is on the ridges and side slopes of dissected volcanic uplands throughout the Virgin Islands. Included in mapping, and making up 10 to 15 percent of each mapped area, were spots of Isaac gravelly clay loam, Descalabrado clay loam, Dorothea clay loam, and Victory clay loam, and spots where the underlying volcanic rock contains secondary lime.

The surface layer of this Cramer soil is 7 to 9 inches thick. The depth to hard rock ranges from 10 to 20 inches.

This soil is suitable for pasture and woodland, and the entire acreage is used for those purposes. Shallowness over rock, moderately steep slopes, susceptibility to erosion, a large number of coarse fragments, and a low water-holding capacity preclude cultivation. Limitations are severe for nonfarm uses, as for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIs-3; woodland group 4; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer gravelly clay loam, 40 to 60 percent slopes (CrF).--This soil is on the side slopes of dissected volcanic uplands throughout the Virgin Islands. Included in mapping, and making up 10 to 15 percent of the total acreage, were spots of Cramer stony clay loam, Descalabrado clay loam, Dorothea clay loam, Isaac gravelly clay loam, and Volcanic rock land, and areas where the underlying rock is coated with secondary lime. Small pockets of gravelly colluvium occur on the lower slopes.

This Cramer soil has the profile described as representative for the series. The surface layer is 5 to 9 inches thick. The depth to hard rock ranges from 13 to 20 inches.

Steep slopes, shallowness over rock, rapid runoff, susceptibility to erosion, and the large number of coarse fragments throughout the profile preclude cultivation and make it difficult to establish and maintain pasture. These limitations also preclude nonfarm uses. (Capability unit VIIs-3; woodland group 4; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer stony clay loam, 12 to 40 percent slopes, eroded (CsE2).--This soil is on the ridges and side slopes of dissected volcanic uplands in the eastern part of St. Croix and throughout the islands of St. Thomas and St. John. Included in mapping were small areas of Volcanic rock land and of Cramer gravelly clay loam.

From 50 to 70 percent of the surface of this Cramer soil is covered with stones and cobblestones. The stones are 1 foot to 3 feet in diameter. The surface layer is 5 to 8 inches thick. The depth to hard rock ranges from 10 to 20 inches.

Most of the acreage is forest or brushy forest. Shallowness over rock, moderately steep slopes, stoniness, poor workability, and rapid runoff preclude cultivation. Stoniness makes it difficult to establish and maintain pasture. Limitations are severe for nonfarm purposes, as for residences, buildings for light industry, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIIs-1; no woodland classification; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer stony clay loam, 40 to 60 percent slopes (CsF).--This soil occurs on the side slopes of dissected volcanic uplands on the island of St. John, as small areas on St. Thomas, and as a very small acreage on south-facing slopes east of Christiansted, on the island of St. Croix. Included in mapping were small areas of Volcanic rock land and Cramer gravelly clay loam.

From 50 to 70 percent of the surface of this Cramer soil is covered with stones and cobblestones. The stones are 1 foot to 3 feet in diameter. The surface layer is 5 to 9 inches thick. The depth to hard rock ranges from 10 to 20 inches.

Almost all of the acreage is forest or brushy forest. Very steep slopes, shallowness over rock, a large number of stones on the surface, rapid runoff, and a limited water-holding capacity severely limit use of this soil for cultivated crops and

make it difficult to establish and maintain grasses for pasture. Limitations are also severe for nonfarm purposes, as for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIIs-1; no woodland classification; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Cramer-Isaac gravelly clay loams, 12 to 40 percent slopes (CvE).--These soils occupy side slopes, foot slopes, and concave colluvial-alluvial positions along drains. They occur throughout the islands of St. Thomas and St. John. Isaac soils make up 30 to 45 percent of each mapped area.

Cramer soils have a surface layer of gravelly clay loam and a subsoil of gravelly clay. Hard rock is at a depth of 10 to 20 inches. Isaac soils are thicker than Cramer soils and have hard rock at a depth of 20 to 40 inches. A description of Isaac soils is given under the heading "Isaac Series."

Moderately steep slopes, coarse fragments, and shallowness over rock are limitations that preclude the use of these soils for cultivated crops and make them unsatisfactory for residences, buildings for light industry, trafficways, campsites, intensive play areas, and golf fairways. Isaac soils are more productive of grasses than Cramer soils. (Capability unit VIe-1; woodland group 4; no range site classification)

Descalabrado Series

The Descalabrado series consists of strongly sloping to steep, well-drained soils that are shallow over consolidated, basic volcanic rocks. These soils formed in clay loam material derived from the rocks. They occur on mountainous terrain. The slope gradient is 12 to 60 percent. The climate is semiarid. The average annual rainfall is between 30 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 6 inches thick. The subsoil extends to a depth of about 14 inches. The upper part is brown, friable clay loam, and the lower part is dark-brown, firm silty clay. Below this is olive-brown, decomposed volcanic rock in which the original rock structure is still evident. This material can be penetrated easily with a spade. It is underlain, at a depth of less than 20 inches, by hard, greenish-gray volcanic rock.

Most of the acreage is in native grasses and is used as pasture.

Representative profile of Descalabrado clay loam, 20 to 40 percent slopes, in a native pasture on St. Croix, 1.6 miles west of the intersection of Scenic Drive and the road from La Vallee to River and 50 feet east of the road:

Ap--0 to 6 inches, very dark grayish-brown (10YR 3/2) clay loam; weak, fine, subangular blocky structure to moderate, medium, granular; friable, slightly sticky, slightly plastic; many fine roots; few fine volcanic fragments; neutral; clear, smooth boundary. 3 to 7 inches thick.

B1--6 to 10 inches, brown (10YR 4/3) clay loam; moderate, fine, subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; few fine volcanic fragments; neutral; clear, smooth boundary. 2 to 4 inches thick.

B2--10 to 14 inches, dark-brown (10YR 4/3) light silty clay; moderate, fine and medium, subangular blocky structure; firm, nonsticky, slightly plastic; thin, very dark grayish-brown (10YR 3/2) clay films; common fine roots; few fine volcanic fragments; few dark-colored worm casts; 10 to 15 percent saprolite; neutral; clear, smooth boundary. 3 to 5 inches thick.

C--14 to 19 inches, olive-brown (2.5Y 4/4) loam (saprolite); fracture planes of the original rock structure coated with dark-brown (10YR 3/3) clay and organic matter. 2 to 5 inches thick.

R--19 inches +, greenish-gray, slightly weathered volcanic rock.

The depth to consolidated rock ranges from 10 to 20 inches. Volcanic rock fragments range from few to common throughout the profile. The texture of the A horizon is dominantly clay loam but ranges from silty clay loam to loam. The color ranges from very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) to dark brown (10YR 3/3 or 7.5YR 3/2). The texture of the B horizon ranges from clay loam, silty clay loam, and silty clay to gravelly clay loam, and the color from dark brown (10YR 3/3) and brown (10YR 4/4) to strong brown (7.5YR 5/6). The structure ranges from weak, fine and medium, subangular blocky to moderate, fine and medium, subangular blocky. The reaction is neutral.

Descalabrado soils are associated with Victory, Cramer, Southgate, Jacana, Pozo Blanco, and Diamond soils and Volcanic rock land. They are slightly shallower, are less deeply altered, and have a thinner subsoil than Victory soils. They are less clayey, are less red, and have a less strongly developed subsoil than Cramer soils. They are less acid and less gravelly than Southgate soils. They are less clayey and are shallower over hard rock than Jacana soils. They are shallower than Pozo Blanco soils, which are calcareous in the lower part of the subsoil and formed in limy material. They are not so red as Diamond soils, which overlie hard limestone.

Descalabrado clay loam, 12 to 20 percent slopes (DeD).--This soil occurs on side slopes and ridgetops in the western part of St. Croix, north of Frederiksted, and in the eastern part, south and east of Christiansted. Included in mapping were spots of Jacana clay loam, San Anton clay loam, and Victory clay loam.

The surface layer of this Descalabrado soil is 5 to 7 inches thick. The depth to rock ranges from 16 to 20 inches.

This soil is suited to pasture and woodland but is used mostly for pasture. It has limitations, mainly shallowness over rock, strong slopes, and an erosion hazard, that preclude cultivation. It has moderate limitations for trafficways, campsites, and picnic areas, and severe limitations for residences, buildings for light industry, intensive play areas, and golf fairways. (Capability unit VIs-3; woodland group 4; Shallow range sites 3, 6, and 9, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Descalabrado clay loam, 20 to 40 percent slopes (DeE).--This soil is on side slopes of dissected uplands (pl. I) in the western and northern parts of St. Croix. Included in mapping were spots of Cramer gravelly clay loam and Victory clay loam on the steeper slopes, spots of Jacana clay loam and San Anton clay loam along the drains and on the lower foot slopes, and very small areas of Volcanic rock land.

This Descalabrado soil has the profile described as representative for the series. The surface layer is 4 to 7 inches thick. The depth to hard rock ranges from 10 to 20 inches.

This soil is suited to pasture and woodland. Most of the acreage is in grasses and is used as pasture. Steep slopes, shallowness over rock, the erosion hazard, and a low water-holding capacity preclude cultivation. The limitation is severe for most nonfarm uses, as for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIs-3; woodland group 4; Shallow range sites 3, 6, and 9, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Descalabrado clay loam, 40 to 60 percent slopes (DeF).--This soil is on side slopes of dissected volcanic uplands, mainly in the northern and northwestern parts of St. Croix. Included in mapping were small areas of Cramer gravelly clay loam and Southgate clay loam, narrow bands of San Anton clay loam along the drains, areas where the underlying volcanic rock contains secondary lime, and areas of Volcanic rock land.

The surface layer of this Descalabrado soil is 3 to 5 inches thick. The depth to rock ranges from 10 to 18 inches.

This soil is too steep and too shallow to be suited to cultivated crops. It can be used for pasture and woodland. Limitations are severe for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIIs-3; woodland group 4; Shallow range sites 3, 6, and 9, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Diamond Series

The Diamond series consists of nearly level to moderately sloping, well-drained soils that are shallow over semiconsolidated limestone. These soils formed in sediments derived from limestone. They occur near coastal areas in the southern and southwestern parts of St. Croix. The slope gradient is 0 to 12 percent. The climate is semiarid. The average annual rainfall is between 30 and 35 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dusky-red clay loam about 2 inches thick. The subsoil is dark reddish-brown, friable clay loam that is about 15 percent limestone fragments. Below this is dark-red, friable, calcareous loam. Hard limestone is at a depth of about 14 inches.

The Diamond soils in this survey area were mapped with Limestone rock land. Most of the acreage is in grasses and shrubs and is used as pasture and building sites.

Representative profile of Diamond clay loam, 0 to 5 percent slopes, on the southwestern tip of St. Croix, near White Ladys, east of Westend Saltpond:

A1--0 to 2 inches, dusky-red (2.5YR 3/2) clay loam; weak, fine, granular structure; very friable, slightly sticky; abrupt, smooth boundary. 2 to 5 inches thick.

B2--2 to 10 inches, dark reddish-brown (2.5YR 3/4) clay loam; moderate, coarse, granular structure; friable, slightly sticky, plastic; about 15 percent limestone fragments; common roots; mildly alkaline; clear, wavy boundary. 4 to 10 inches thick.

C--10 to 14 inches, dark-red (2.5YR 3/6) heavy loam; massive; friable, slightly sticky, nonplastic; few roots; calcareous; moderately alkaline; abrupt, irregular boundary. 2 to 5 inches thick.

R--14 inches +, semiconsolidated limestone.

The depth to limestone ranges from 8 to 16 inches. There are few to many limestone fragments throughout the profile. The reaction ranges from neutral to moderately alkaline. The color of the A horizon ranges from 5YR to 2.5YR in hue, 2 to 3 in value, and 2 to 3 in chroma. The texture of the A horizon is dominantly clay loam. The color of the B horizon ranges from dark reddish brown (2.5YR 3/4) to dark red (2.5YR 3/6). The texture is dominantly clay loam. The structure of the B2 horizon ranges from moderate, coarse, granular to moderate, fine, subangular blocky.

Diamond soils are associated with Hesselberg, Aguilita, Sion, and Fredensborg soils. They are shallower, less clayey, and redder than Hesselberg soils. They differ from Aguilita, Sion, and Fredensborg soils in that those soils are underlain by soft marl. They are redder and slightly deeper than Aguilita soils. They are redder and slightly shallower than Sion soils. They are redder, less clayey, and less calcareous than Fredensborg soils.

Diamond-Limestone rock land complex, 0 to 5 percent slopes (DlB).--This complex occurs as small, irregularly shaped, undulating areas. Diamond clay loam makes up 50 to 70 percent of each mapped area.

Included in mapping were spots of Hesselberg clay and Fredensborg clay.

The Diamond soil in this complex has the profile described as representative for the series. Limestone rock land is described under the heading "Limestone rock land."

This complex is suited to pasture and woodland. Shallowness and rock outcrops preclude cultivation and severely limit use of this complex for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIs-2; woodland group 2; Rough Stony Land range site 10, all precipitation zones)

Diamond-Limestone rock land complex, 5 to 12 percent slopes, eroded (DlC2).--This complex is on ridges and knolls. Diamond clay loam makes up 50 to 70 percent of each mapped area. Included in mapping were spots of Aguilita clay loam.

The Limestone rock land part of this complex consists of semiconsolidated limestone, softer than that of Diamond-Limestone rock land, 0 to 5 percent slopes. The fractured limestone has been mixed with the soil material through erosion and deep tillage. Thus, the Diamond soil in this complex is more gravelly than that in the Diamond-Limestone rock land complex previously described.

This complex is suited to pasture and woodland. Shallowness and rock outcrops preclude cultivation. Shallowness over limestone limits use of this complex for residences, buildings for light industry, and trafficways, but because of the softer nature of the limestone, the limitation is only moderate. Rockiness is a severe limitation for recreational purposes, as for campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIs-2; woodland group 2; Rough Stony Land range site 10, all precipitation zones)

Dorothea Series

The Dorothea series consists of moderately steep to steep, deep, well-drained soils over highly weathered, basic volcanic rocks mixed with unweathered volcanic boulders. These soils formed in material derived from these rocks. They occur on dissected volcanic uplands, mainly on the northern coast of St. Thomas. The slope gradient is 20 to 60 percent. The climate is tropical semiarid. The average annual rainfall is between 40 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark-brown clay loam about 6 inches thick. The subsoil is yellowish-brown, very firm clay to a depth of about 19 inches. Below this is strong-brown, friable clay loam. At a depth of about 30 inches is highly decomposed volcanic rock mixed with hard volcanic boulders.

Most of the acreage is used for cultivated crops or pasture. Part of it is being subdivided for housing developments.

Representative profile of Dorothea clay loam, 20 to 40 percent slopes, on St. Thomas, 1,000 feet west of Lilliendahl junction, which is 1,000 yards east of the Dorothea Experiment Station and 75 feet south of the road:

A1--0 to 6 inches, dark-brown (10YR 4/3) clay loam; weak, fine and medium, subangular blocky structure that breaks to moderate, medium, granular; friable, nonsticky, slightly plastic; many roots; slightly acid; clear, smooth boundary. 4 to 8 inches thick.

B21t--6 to 11 inches, yellowish-brown (10YR 5/6) clay; moderate, medium, subangular blocky structure; very firm, slightly sticky, plastic; thin, discontinuous, dark-brown (10YR 4/3) coatings on vertical and horizontal peds; few small pressure faces; common roots; few worm casts; slightly acid; clear, smooth boundary. 4 to 7 inches thick.

B22t--11 to 19 inches, yellowish-brown (10YR 5/6) clay; moderate, medium and coarse, subangular blocky structure; very firm, slightly sticky, plastic; thin, discontinuous, brown (10YR 4/3) coatings; few small pressure faces; few roots; few worm casts; slightly acid; clear, smooth boundary. 6 to 10 inches thick.

B3--19 to 30 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium and coarse, subangular blocky structure; friable, slightly sticky, slightly plastic; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; few roots; few black nodules; 25 to 35 percent saprolite; slightly acid; gradual, smooth boundary. 9 to 12 inches thick.

C--30 to 36 inches +, highly weathered, basic volcanic extrusive rock (saprolite) mixed with a few large, unweathered volcanic boulders.

The thickness of the solum ranges from 24 to 37 inches. The reaction ranges from medium acid to neutral. The texture is mainly clay loam. In spots it is silty clay loam. The color of the A horizon is 10YR and 7.5YR in hue, 4 in value, and 2 to 4 in chroma. The texture of the B2t horizon ranges from heavy clay loam to silty clay and clay. The color ranges from yellowish brown (10YR 5/4, 5/6, 5/8) to strong brown (7.5YR 5/6, 5/8). The structure of these horizons ranges from moderate, medium, subangular blocky to moderate, coarse, subangular blocky. There are thin discontinuous clay films. The percentage of saprolite in the B3 horizon ranges from 20 to 40. Laboratory determinations show high base saturation (80 percent) and a Ca/Mg ratio of 1:1 in the B2t horizon.

Dorothea soils are associated with Cramer, Isaac, Victory, and Magens soils. They are deeper over volcanic rock and are less red than Cramer soils. They are shallower over volcanic rock and are less red than Isaac soils. They are deeper over rock and have a more strongly developed subsoil than Victory soils. They are not so red nor so acid as Magens soils, and their underlying material is not so highly decomposed.

Dorothea clay loam, 20 to 40 percent slopes (DoE).--This soil is on side slopes of dissected

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volcanic uplands on the northern coast of St. Thomas. Included in mapping, and making up less than 15 percent of each mapped area, were spots of Victory, Magens, and Cramer soils.

This Dorothea soil has the profile described as representative for the series. The surface layer is 4 to 8 inches thick. The depth to weathered rock is 28 to 37 inches.

This soil is suited to pasture and woodland. The slope and the erosion hazard preclude cultivation. Truck crops can be grown if rock barriers are established (pl. I). Slope severely limits use of this soil for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, or golf fairways. (Capability unit VIe-1; woodland group 1; Hilly Clay range sites 2 and 5, precipitation zones 45 to 60 inches and 35 to 45 inches)

Dorothea clay loam, 40 to 60 percent slopes (DoF).--This soil is on side slopes of dissected volcanic uplands on the northern coast of St. Thomas. Included in mapping, and making up 10 to 15 percent of each mapped area, were spots of Victory, Magens, and Cramer soils.

The surface layer of this Dorothea soil is 4 to 7 inches thick. The depth to weathered rock is 24 to 37 inches.

This soil is suited to pasture and woodland. Establishing and maintaining grasses is more difficult than on Dorothea clay loam, 20 to 40 percent slopes. The slope and the erosion hazard preclude cultivation. The slope is a severe limitation for nonfarm purposes, as for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, or golf fairways. (Capability unit VIIe-2; woodland group 1; Hilly Clay range sites 2 and 5, precipitation zones 45 to 60 inches and 35 to 45 inches)

Fraternidad Series

The Fraternidad series consists of deep, nearly level to moderately sloping, moderately well drained soils that formed in clayey sediments derived from volcanic and limestone hills. These soils occur near coastal areas in the southern part of St. Croix. The slope gradient is 0 to 12 percent. The climate is semiarid. The average annual rainfall is between 30 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown and dark grayish-brown clay about 13 inches thick. Below this, to a depth of about 62 inches, is light olive-brown, calcareous, very firm clay.

Drainage is moderately good. Permeability is slow. Most of the acreage is cultivated. A small acreage is in grass and is used for pasture.

Representative profile of Fraternidad clay, 0 to 3 percent slopes, on St. Croix, three-tenths of a mile west on the farm road along the north side of Lower Love and 400 feet north:

Ap--0 to 6 inches, very dark grayish-brown (2.5Y 3/2) clay; moderate, medium, granular structure; friable, sticky, plastic; common roots; strongly effervescent; clear, smooth boundary.

A1--6 to 13 inches, dark grayish-brown (2.5Y 4/2) clay; weak, fine and medium, subangular blocky structure (few small angular peds); very firm, sticky, plastic; few, fine, angular volcanic rock fragments; few, fine, black nodules; few worm casts 1 to 2 millimeters in diameter; strongly effervescent; clear, wavy boundary. 4 to 12 inches thick.

A3--13 to 23 inches, light olive-brown (2.5Y 5/4) clay; weak, medium, subangular blocky structure with rhombic form and pressure faces; very firm, sticky, plastic; few angular volcanic fragments; few, fine, black nodules less than 2 millimeters in diameter; very few roots; strongly effervescent; clear, wavy boundary. 6 to 16 inches thick.

C1--23 to 31 inches, light olive-brown (2.5Y 5/4) clay; medium to coarse, intersecting, angular or wedge-shaped peds and numerous slickensides and pressure faces; very firm, sticky, plastic; few fine limestone fragments; few angular volcanic fragments; few, fine, black nodules; strongly effervescent; small blotches of secondary lime; clear, wavy boundary. 6 to 10 inches thick.

C2--31 to 43 inches, light olive-brown (2.5Y 5/4) clay; medium to coarse, intersecting, angular or wedge-shaped peds and numerous slickensides and pressure faces; very firm, sticky, and plastic; few fine limestone fragments; strongly effervescent; clear, wavy boundary. 8 to 14 inches thick.

C3ca--43 to 62 inches, light olive-brown (2.5Y 5/4) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; medium and coarse, angular and wedge-shaped peds and pressure faces and slickensides (less numerous than in C2 horizon); very firm, sticky, and plastic; few black nodules 1 millimeter in diameter; few limestone concretions; violently effervescent; numerous blotches of secondary lime; abrupt, wavy boundary. 10 to 22 inches thick.

IIB21b--62 to 76 inches, strong-brown (7.5YR 5/8) with seams of black (5Y 2/2) gravelly clay loam; very weak, subangular blocky structure; thin patchy clay films; firm, slightly plastic; few angular volcanic fragments; few black nodules 1 to 2 millimeters in diameter; slightly effervescent; clear, wavy boundary. 8 to 16 inches thick.

IIIB22tb--76 to 78 inches, strong-brown (7.5YR 5/8) clay loam; weak, medium, subangular blocky structure; thin, olive (5Y 3/3), discontinuous clay films, friable, nonsticky, and plastic; few black nodules; matrix noncalcareous; very few limestone blotches.

Limestone and volcanic fragments range from few to many and are scattered throughout the profile. The depth to gravelly sediments or marl ranges from 48 to 72 inches. The color of the A horizon ranges

from very dark brown (10YR 2/2) to brown (10YR 4/3) and very dark grayish brown (2.5Y 3/2) to dark grayish brown (2.5Y 4/2). The A horizon is massive when wet. The structure is either granular or fine subangular blocky when dry. The color of the C horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/6) and dark grayish brown (2.5Y 4/2) to light olive brown (2.5Y 5/4). The C horizon has few to many wedge-shaped peds and slickensides that range from 1 to 8 inches in diameter. The peds intersect, and the faces are commonly oriented approximately 60° from the surface. There are few to many peds or pockets of soil material from one horizon in adjoining horizons because of the churning action of the soil. The depth to strongly calcareous material ranges from 0 to 20 inches.

Fraternidad soils are associated with Aguirre, Coamo, Fredensborg, and Glynn soils. They are better drained and have a lighter colored profile than Aguirre soils. They are less friable, more clayey, and more poorly drained than Coamo soils. They are more poorly drained than Fredensborg soils, which are shallow over soft marl. They are more clayey and less brown than Glynn soils, which have a well-developed subsoil.

Fraternidad clay, 0 to 3 percent slopes (FcA).--This soil is in the southern and southwestern parts of St. Croix. A large area occurs near Lower Love. Included in mapping, and making up 5 to 15 percent of each mapped area, were spots of Coamo clay loam, Glynn clay loam in areas where sediments from volcanic rocks are dominant, Aguirre clay in depressional concave areas, and Fredensborg clay where this Fraternidad soil is near areas of soft limestone or marl.

This Fraternidad soil has the profile described as representative for the series.

Slow percolation, slow permeability, plastic and sticky consistence, and poor workability limit use of this soil for farming. Climate also is an adverse factor. Nevertheless, a large part of the acreage is in cultivated crops. Pasture grasses do well. Limitations are severe for trafficways, residences, buildings for light industry, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit IIIs-1; no woodland classification; Deep range site 4, precipitation zone 35 to 45 inches)

Fraternidad clay, 3 to 12 percent slopes, eroded (FcC2).--This soil occurs along small drainageways and on foot slopes in the southern and southwestern parts of St. Croix. Included in mapping were spots of Jacana and Descalabrado soils.

Erosion has removed much of the original granular surface layer from this Fraternidad soil. The present surface layer is only 4 to 6 inches thick. In spots the lighter colored, more plastic underlying material is exposed.

This soil takes in water slowly, expands when wet and shrinks when dry, and is difficult to till. If tilled, it is subject to further erosion. Limitations are severe for trafficways, residences, buildings for light industry, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit IVe-2; no woodland classification; Deep range site 4, precipitation zone 35 to 45 inches)

Fredensborg Series

The Fredensborg series consists of nearly level to moderately sloping, well-drained soils that formed in clayey, calcareous sediments over soft limestone or marl. These soils occur near coastal areas on St. Croix, in valleys and on foot slopes below the limestone hills. The slope gradient is 0 to 12 percent. The climate is semiarid. The average annual rainfall is between 35 and 40 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown, calcareous clay about 16 inches thick. The next layer is very pale brown, very friable, calcareous silty clay loam. At a depth of about 20 inches is very pale brown, soft marl or limestone.

These soils are used for crops and pasture, mainly row crops and guineagrass.

Representative profile of Fredensborg clay, 2 to 5 percent slopes, on St. Croix, 150 feet west and 75 feet north of an intersection a quarter of a mile west of Kingshill:

Ap--0 to 10 inches, very dark grayish-brown (10YR 3/2) clay; weak, medium, subangular blocky structure that breaks to moderate, fine, granular; hard, firm, slightly sticky, plastic; many small pressure faces; calcareous; many small shell and limestone fragments; moderately alkaline; clear, smooth boundary. 6 to 10 inches thick.

A1--10 to 16 inches, very dark grayish-brown (10YR 3/2) clay; moderate, fine, granular structure; hard, firm, slightly sticky, plastic; many light-colored worm casts; calcareous; many small shell and limestone fragments; moderately alkaline, abrupt, smooth boundary. 2 to 10 inches thick.

AC--16 to 20 inches, very pale brown (10YR 7/3) silty clay loam; very weak, fine and medium, granular structure; very friable, soft, nonsticky, slightly plastic; many worm casts filled with dark-colored material; calcareous; strongly alkaline; clear, smooth boundary. 2 to 8 inches thick.

C1--20 to 36 inches, very pale brown (10YR 7/3), silty, soft marl or limestone and a few small, soft lime concretions. 10 to 20 inches thick.

C2--36 to 50 inches, pale-brown (10YR 6/3), silty, soft marl or limestone and many small, soft lime concretions. Material is easily penetrated with a spade or an auger.

The thickness of the solum ranges from 10 to 20 inches. Few to common limestone fragments are

scattered throughout the profile. The color of the A horizon is dominantly 10YR in hue, 2 to 3 in value, and 2 to 4 in chroma. The structure ranges from weak, medium, subangular blocky to weak and moderate granular. The AC horizon is a mixture of material from the A horizon and the underlying soft limestone. This mixture is the result of worm activity.

Fredensborg soils are associated with Sion, Hesselberg, Aguilita, Fraternidad, Coamo, and Pozo Blanco soils. They are more clayey than Sion soils. They are less friable and less red than Hesselberg soils, which have a moderately well developed subsoil and are underlain by hard limestone. They are deeper and more clayey than Aguilita soils. They are shallower and less sticky than Fraternidad soils, in which the underlying material is stratified with sand and gravel. They are shallower and more clayey than Coamo soils. They are more clayey than Pozo Blanco soils, which have a weakly developed subsoil.

Fredensborg clay, 0 to 2 percent slopes (FrA).--This soil is on St. Croix, in valleys between the limestone hills. Included in mapping were spots of Fraternidad clay and, in the southern and eastern parts of the island, spots of Sion clay loam.

The surface layer of this Fredensborg soil is very dark brown to very dark grayish brown and is 7 to 10 inches thick. The depth to soft limestone or marl is 12 to 20 inches.

Moderately slow permeability and less than optimum workability are slight limitations for all farm uses. There is no erosion hazard. The plastic surface layer is a moderate limitation for use of this soil for residences, buildings for light industry, trafficways, and golf fairways, and a severe limitation for campsites, picnic areas, and intensive play areas. (Capability unit IIs-1; woodland group 2; Deep range site 4, precipitation zone 35 to 45 inches)

Fredensborg clay, 2 to 5 percent slopes (FrB).--This soil is in the southern and southwestern parts of St. Croix. Included in mapping were spots of Sion clay loam and, in undulating areas, spots of Fredensborg clay, 0 to 2 percent slopes.

This Fredensborg soil has the profile described as representative for the series.

This soil is suited to cultivated crops, pasture grasses, and trees. Much of the acreage is in row crops (pl. II). The plastic and sticky nature of the clay when wet and the resulting poor workability are moderate limitations for all farm uses. The erosion hazard is moderate. This soil has a moderate limitation for residences, buildings for light industry, trafficways, and golf fairways, and a severe limitation for campsites, picnic areas, and intensive play areas. (Capability unit IIIs-2; woodland group 2; Deep range site 4, precipitation zone 35 to 45 inches)

Fredensborg clay, 5 to 12 percent slopes, eroded (FrC2).--This soil is in the southern and southwestern parts of St. Croix, on foot slopes below the limestone hills. Included in mapping were small areas of Aguilita gravelly clay loam.

The surface layer of this Fredensborg soil is 6 to 8 inches thick. The depth to soft limestone or marl is 10 to 18 inches.

The plastic and sticky nature of the clay when wet and the resulting poor workability limit the use of this soil for farming. The erosion hazard is severe. This soil has a moderate limitation for residences, buildings for light industry, and golf fairways, and a severe limitation for campsites, picnic areas, intensive play areas, and trafficways. (Capability unit IVe-4; woodland group 2; Deep range site 4, precipitation zone 35 to 45 inches)

Glynn Series

The Glynn series consists of deep, gently sloping to moderately sloping, well-drained soils that formed in clay loam and clayey sediments over stratified sandy loam, clay loam, and clay. These soils are on alluvial fans. The slope is convex, and the gradient is 2 to 12 percent. The climate is semiarid. The average annual rainfall is between 35 and 40 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark-brown clay loam about 12 inches thick. The upper part of the subsoil is dark yellowish-brown, firm clay. The lower part is dark yellowish-brown and yellowish-brown, friable and very friable clay loam. The underlying material, at a depth of about 50 inches, is yellowish-red and strong-brown, stratified sandy loam, clay loam, and clay.

Some areas are in row crops and guineagrass, some are in native grasses and shrubs, and others are used as building sites.

Representative profile of Glynn clay loam, 2 to 5 percent slopes, on St. Croix, one-eighth of a mile south and 150 feet west of Grove Place, which is approximately one-tenth of a mile north of St. Lukes Church:

A1--0 to 12 inches, dark-brown (10YR 3/3) clay loam, light brownish gray (10YR 6/2) when dry; moderate, medium, granular structure; very hard, firm, slightly sticky, slightly plastic; few subrounded fragments of volcanic rock; neutral; clear, smooth boundary. 8 to 15 inches thick.

B2t--12 to 23 inches, dark yellowish-brown (10YR 4/4) clay; moderate, medium, prismatic structure that breaks to moderate, fine and medium, subangular blocky; very hard, firm, slightly sticky, slightly plastic; thin, patchy, brown (10YR 4/3) clay films on vertical and horizontal ped surfaces; common, fine, subrounded volcanic fragments; many worm casts; many roots; mildly alkaline; clear, smooth boundary. 10 to 18 inches thick.

B31--23 to 30 inches, dark yellowish-brown (10YR 4/4) clay loam; weak, medium, subangular

blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few, thin, patchy clay films on vertical ped surfaces; few subrounded fragments of volcanic rock; mildly alkaline; clear, smooth boundary. 6 to 16 inches thick.

IIB32--30 to 50 inches, yellowish-brown (10YR 5/6) clay loam; weak, coarse, subangular blocky structure; very friable, slightly sticky, nonplastic; few patchy clay films; few, fine, rounded volcanic fragments; mildly alkaline; clear, smooth boundary. 10 to 20 inches thick.

IIIC--50 inches +, yellowish-red (5YR 5/8) and strong-brown (7.5YR 5/8), stratified sandy loam, clay loam, and clay; pockets and lenses of secondary lime; small to large amount of gravel; few patchy clay films and clay-coated sand grains.

The depth to the IIB horizon ranges from 30 to 49 inches. Gravel occurs throughout the profile. The depth to the IIIC horizon ranges from 48 to 60 inches. The color of the A horizon is dark brown (10YR 3/3). The texture is dominantly clay loam but ranges to loam. The color of the B2t horizon ranges from 10YR to 5YR in hue, and from 3 to 4 in chroma and value. The texture is dominantly clay but ranges to clay loam. The structure of the B2t horizon ranges from moderate, medium, prismatic to strong, medium, subangular blocky. The color of the B3 horizon ranges from dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4). The texture ranges from clay to clay loam. The underlying finer textured layer that has weak structure and patchy clay films is a buried B horizon. Below the B3 horizon is stratified sandy loam, clay loam, and clay and varying amounts of gravel. Any or all of these layers may contain secondary lime.

Glynn soils are associated with Isaac, Parasol, Lavallee, Coamo, Fraternidad, San Anton, and Jacana soils. They are deeper over rock and are less red than Isaac soils. They are less friable, are lighter colored, and have a slightly thinner surface layer than Parasol soils. They are deeper and are less gravelly than Lavallee soils. They have a less friable surface layer and have brighter colors in the subsoil than Coamo soils. They are less clayey, less plastic, and better drained than Fraternidad soils. They have a more strongly developed subsoil than San Anton soils, which formed in more recent sediments along the inland streams. They are deeper and have a more strongly developed subsoil than Jacana soils, which occupy positions just above Glynn soils, on lower foot slopes of the volcanic uplands.

Glynn clay loam, 2 to 5 percent slopes (GyB).--This soil occurs as fairly large areas on foot slopes and alluvial fans in the western half of St. Croix and as small areas throughout the other islands. Included in mapping were narrow bands of San Anton clay loam, and small areas of Coamo clay loam.

This Glynn soil has the profile described as representative for the series.

This soil has only a slight erosion hazard and a slight limitation for most farm uses. Its surface layer is friable when moist but becomes hard and difficult to dig into when dry. It has a slight limitation for trafficways, golf fairways, and buildings for light industry, and a moderate limitation for residences, campsites, picnic areas, and intensive play areas. (Capability unit IIe-2; woodland group 3; Deep range sites 1, 4, and 7, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Glynn clay loam, 5 to 12 percent slopes, eroded (GyC2).--This soil is mainly in the western part of St. Croix, on alluvial fans and breaks along upland drains. Included in mapping were spots of San Anton clay loam and Coamo clay loam.

Erosion has removed much of the original surface layer of this Glynn soil, and the present surface layer is only 8 to 10 inches thick. The depth to the underlying material (IIB horizon) is 30 to 40 inches.

This soil is friable when moist but becomes hard and difficult to dig into when dry. Because of the slope and the erosion hazard, it is moderately limited for all farm uses. It has little or no limitation for picnic areas and trafficways. The slope and the slow percolation rate are moderate limitations for residences, buildings for light industry, campsites, and golf fairways. The slope severely limits its use for intensive play areas. (Capability unit IIIe-1; woodland group 3; Deep range sites 1, 4, and 7, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Hesselberg Series

The Hesselberg series consists of nearly level to gently undulating, well-drained soils that are shallow over hard limestone. These soils formed in clayey material weathered in place from limestone. They occur near coastal areas in the southern and southwestern parts of St. Croix. The slope gradient is 0 to 2 percent. The climate is semiarid. The average annual rainfall is between 30 and 40 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark reddish-brown, calcareous clay about 7 inches thick. The upper part of the subsoil is dark reddish-brown, friable, calcareous clay. The lower part is dark-red, friable, calcareous clay. Hard, white limestone is at a depth of about 18 inches.

The acreage is about equally divided between range and cropland. Range vegetation consists of guineagrass, native grasses, and shrubs. Cultivated areas are mainly in row crops.

Representative profile of Hesselberg clay, 0 to 2 percent slopes, on St. Croix, seven-tenths of a mile west of the south entrance to the airport, 400 feet south on a secondary road, and 50 feet west of the road:

Ap--0 to 7 inches, dark reddish-brown (5YR 3/3) clay; moderate, medium, subangular blocky

structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; few limestone fragments; calcareous; mildly alkaline; clear, smooth boundary. 4 to 8 inches thick.

B1--7 to 12 inches, dark reddish-brown (5YR 3/3) clay; moderate, fine, subangular blocky structure; friable, slightly sticky, plastic; many fine roots; calcareous; few limestone fragments; mildly alkaline; clear, smooth boundary. 4 to 6 inches thick.

B2--12 to 17 inches, dark-red (2.5YR 3/6) clay; weak, medium, prismatic structure that breaks to moderate, fine and medium, subangular blocky; friable, slightly sticky, plastic; common fine roots; few limestone fragments; few dark reddish-brown (5YR 3/3) worm casts; calcareous; mycelial lime; mildly alkaline; abrupt, wavy boundary. 2 to 6 inches thick.

C1cam--17 to 18 inches, hard white limestone; light-red (2.5YR 6/6) lamins.

C2cam--18 to 24 inches +, white, partly silicified limestone.

The depth to silicified limestone ranges from 10 to 20 inches but is dominantly 16 to 20 inches. The profile is weakly to strongly calcareous and has few to common limestone fragments throughout. The color of the A horizon ranges from 7.5YR to 5YR in hue and from 2 to 3 in chroma and value. The texture is dominantly clay but ranges to silty clay. The color of the B horizon ranges from 5YR to 2.5YR in hue, 3 to 6 in chroma, and 3 to 4 in value. The texture ranges from silty clay to clay. The structure of the B horizon ranges from moderate, fine, subangular blocky to weak, medium, prismatic and moderate, fine and medium, subangular blocky. There are few to no visible clay films.

Hesselberg soils are associated with Diamond, Fredensborg, Sion, and Aguilita soils. They are more clayey and more strongly developed than Diamond soils. They are not so brown as Fredensborg and Sion soils, both of which are underlain by soft limestone. They are deeper than Aguilita soils, which are gravelly, are very dark grayish brown, and overlie soft limestone.

Hesselberg clay, 0 to 2 percent slopes (HeA).--This soil is in the southern and southwestern parts of St. Croix. Included in mapping were small areas of Diamond clay loam.

This soil is used for cultivated crops, mainly row crops, and for grassland. Shallowness over rock, a small amount of available water for plants, and adverse climate are limitations for all farm uses. The limitation is moderate for golf fairways and trafficways, and severe for residences, buildings for light industry, campsites, picnic areas, and intensive play areas. (Capability unit IIIsc-1; no woodland classification; Shallow range site 6, precipitation zone 35 to 45 inches)

Isaac Series

The Isaac series consists of moderately sloping to steep, acid, well-drained soils that are moderately deep over basic volcanic rocks. These soils formed in material derived in place from these rocks. They occur throughout the islands, on side slopes and foot slopes of dissected volcanic uplands. The slope gradient is 5 to 40 percent. The climate is semiarid. The average annual rainfall is between 35 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark reddish-brown gravelly clay loam about 8 inches thick. The uppermost part of the subsoil is dark reddish-brown, friable gravelly clay loam about 3 inches thick. The middle part is red, firm clay. The lowermost part is yellowish-red, friable clay loam. At a depth of about 24 inches is yellowish-red, very friable clay loam. This material, about 12 inches thick, is decomposed volcanic rock. Below this is bedded volcanic rock.

Most areas are in brush or brushy forest. Some are subdivided for housing developments. Very few are used for pasture or cultivated crops.

Representative profile of Isaac gravelly clay loam, 5 to 20 percent slopes, 1,000 feet northeast of St. Croix Beach Hotel:

Ap--0 to 8 inches, dark reddish-brown (5YR 3/3) gravelly clay loam; weak, fine, granular structure; friable, slightly sticky, slightly plastic; many fine roots; about 30 percent hard angular volcanic gravel; slightly acid; clear, smooth boundary. 6 to 14 inches thick.

B1--8 to 11 inches, dark reddish-brown (5YR 3/4) gravelly heavy clay loam; weak, fine, subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; about 30 percent hard volcanic gravel; slightly acid; clear, smooth boundary. 3 to 6 inches thick.

B2t--11 to 19 inches, red (2.5YR 4/6) clay; moderate, medium, subangular blocky structure; firm, slightly sticky, plastic; few, fine, angular volcanic fragments; thin patchy clay films on ped surfaces; few fine roots; neutral; gradual, smooth boundary. 6 to 10 inches thick.

B3--19 to 24 inches, yellowish-red (5YR 4/6) clay loam; weak, medium, subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium volcanic fragments; very few patchy clay films on ped surfaces; very few fine roots; neutral; gradual, smooth boundary. 3 to 7 inches thick.

C--24 to 36 inches, yellowish-red (5YR 4/6) light clay loam; massive; very friable, nonsticky, slightly plastic; original rock structure is visible; neutral; clear, smooth boundary. 8 to 14 inches thick.

R--36 inches +, semiconsolidated, bedded, extrusive volcanic rock.

The thickness of the solum ranges from 18 to 33 inches. The depth to hard rock ranges from 20 to 72 inches or more. The reaction ranges from medium acid to neutral (pH 5.5 to 7.3). The texture of the A horizon ranges from clay loam to gravelly clay

loam. Gravel makes up 5 to 50 percent of the soil mass. The color of the A horizon ranges from very dark brown (10YR 2/2) and dark brown (7.5YR 3/2) to dark reddish brown (5YR 3/4). The B2t horizon is dominantly clay. The color ranges from 5YR to 2.5YR in hue, 3 to 4 in value, and 4 to 8 in chroma. The structure of the B2t horizon ranges from weak, medium, subangular blocky to moderate, coarse, subangular blocky. Strong vertical cleavage and pressure faces are evident when the soil is dry.

Isaac soils are associated with Coamo, Parasol, Cramer, Dorothea, and Victory soils. They are not so brown as Coamo soils, which have a layer of accumulated calcium carbonate within a depth of 40 inches and stratified, gravelly underlying material. They are not so brown as Parasol soils, which are underlain by highly decomposed and fractured granitic rock. They have a darker colored surface layer and are redder than Dorothea soils. They are less yellow and have a more strongly developed subsoil than Victory soils.

Isaac clay loam, saprolitic substratum, 12 to 20 percent slopes, eroded (IsD2).--This soil is on side slopes and foot slopes of dissected volcanic uplands on the islands of St. Thomas and St. John. Included in mapping were small areas of Dorothea clay loam, Cramer gravelly clay loam, and Victory clay loam.

This Isaac soil has a slightly thinner surface layer, a slightly thicker subsoil, and looser, more decomposed underlying material than the soil described as representative for the series. The present surface layer is 6 to 8 inches thick. The underlying rock can be excavated easily with a spade.

This soil is suited to pasture or woodland. The entire acreage is in brushy forest. The strong slopes and the erosion hazard preclude cultivation. The limitation is moderate for picnic areas, campsites, and trafficways, and severe for residences, buildings for light industry, intensive play areas, and golf fairways. (Capability unit VIe-1; woodland group 1; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Isaac clay loam, saprolitic substratum, 20 to 40 percent slopes (IsE).--This soil is on side slopes of dissected volcanic uplands on the islands of St. Thomas and St. John. Included in mapping were spots where the surface layer is gravelly and spots of Cramer, Victory, and Dorothea soils.

This Isaac soil has a dark-colored, granular surface layer 8 to 14 inches thick. Its subsoil is thicker than that in the profile described as representative for the series, and the underlying material is looser and more decomposed. This underlying material can be excavated easily with a spade.

This soil is suited to pasture or woodland. The entire acreage is in brushy forest. The moderately steep slopes and the erosion hazard preclude cultivation. The limitation is severe for nonfarm purposes, as for residences, buildings for light industry, trafficways, campsites, picnic areas, intensive play areas, and golf fairways. (Capability unit VIe-1; woodland group 1; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Isaac gravelly clay loam, 5 to 20 percent slopes (IvD).--This soil occurs on side slopes and foot slopes of dissected volcanic uplands throughout the Virgin Islands. Included in mapping were spots of San Anton clay loam along the lower slopes near drains and spots of Cramer gravelly clay loam along the steeper slopes.

This soil has the profile described as representative for the series. The surface layer is 6 to 10 inches thick. The depth to decomposed volcanic rock is 18 to 33 inches. The depth to hard rock is 20 to 72 inches.

This soil is suited to pasture or woodland. It has a moderately high water-holding capacity, but the slope, the erosion hazard, and the coarse fragments severely limit its use for cultivated crops. It has a moderate limitation for picnic areas, campsites, and trafficways, and a severe limitation for residences, buildings for light industry, intensive play areas, and golf fairways. (Capability unit VIe-1; woodland group 4; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Jacana Series

The Jacana series consists of gently sloping to strongly sloping, well-drained soils that are moderately deep over basic volcanic rocks. These soils formed on clayey sediments in material derived in place from these rocks. They occur on foot slopes and low rolling hills, mainly on the island of St. Croix. The slope gradient is 2 to 20 percent. The average annual rainfall is between 30 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 9 inches thick. The upper part of the subsoil is dark-brown, firm clay loam. The lower part is very dark grayish-brown and yellowish-brown, firm gravelly clay. This layer is a mixture of soil material and decomposed volcanic rock fragments. At a depth of about 26 inches is yellowish-brown, partly weathered volcanic rock. Below this, at a depth of about 29 inches, is hard fractured rock.

Generally these soils are used for pasture. A limited acreage is in cultivated crops, mainly row crops.

Representative profile of Jacana clay loam, 2 to 5 percent slopes, on St. Croix, a little more than a tenth of a mile west of the headquarters building at Fountain on the Canady farm, or 140 feet east from the side drain and 350 feet north of the major west to east drain:

Ap--0 to 9 inches, very dark grayish-brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) when dry; weak, fine, subangular blocky structure; hard, friable, slightly sticky, plastic; common fine roots; common, fine, angular fragments of volcanic rock; neutral;

gradual, smooth boundary. 7 to 11 inches thick.

B2--9 to 17 inches, dark-brown (10YR 3/3) heavy clay loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky; hard, firm, slightly sticky, plastic; 20 percent fine angular fragments of volcanic rock; common, fine, faint, very dark grayish-brown (10YR 3/2) krotovinas; few fine roots; neutral; gradual, smooth boundary. 6 to 10 inches thick.

B3--17 to 26 inches, mixed very dark grayish-brown (10YR 3/2) and yellowish-brown (10YR 5/4) gravelly clay; weak, coarse, subangular blocky structure that breaks to moderate, fine, subangular blocky; hard, firm, slightly sticky, slightly plastic; 50 percent weathered volcanic rock fragments; few fine roots; neutral; clear, wavy boundary. 7 to 11 inches thick.

C--26 to 29 inches, yellowish-brown (10YR 5/4), partly weathered volcanic rock; neutral; many volcanic rock fragments; abrupt, broken boundary. 0 to 6 inches thick.

R--29 inches +, hard, fractured volcanic rock.

The thickness of the solum ranges from 20 to 28 inches. The depth to consolidated rock ranges from 20 to 36 inches. The texture of the A horizon is dominantly clay loam but ranges to clay. The color of the A horizon ranges from very dark grayish brown (10YR 3/2) and dark brown (7.5YR 3/2) to dark grayish brown (10YR 4/2). The texture of the B2 horizon ranges from heavy clay loam to silty clay and clay. The color ranges from dark brown (10YR 3/3, 7.5YR 3/3) to yellowish brown (10YR 5/4) and from dark reddish brown (5YR 3/4) to reddish brown (5YR 4/3). The structure of the B horizon ranges from weak to moderate subangular blocky.

Jacana soils are associated with Descalabrado, Coamo, Glynn, Cornhill, and Fraternidad soils. They are deeper than Descalabrado soils, which are 20 inches or less deep over hard rock. They are shallower than Coamo and Glynn soils, both of which have a well-developed subsoil and occupy lower topographic positions on alluvial fans and terraces. They are shallower and are less plastic in the underlying material than Cornhill soils. They are shallower, better drained, and less clayey than Fraternidad soils.

Jacana clay loam, 2 to 5 percent slopes (JaB).--This soil occurs on foot slopes in the western part of St. Croix. Included in mapping were small areas of Coamo clay loam on the nearly level parts of the landscape and small areas of San Anton clay loam that occur as narrow bands along drains.

This Jacana soil has the profile described as representative for the series. The surface layer is 9 to 11 inches thick. The depth to the partly weathered volcanic rock is 20 to 28 inches.

This soil is suited to pasture and woodland. Its use for cultivated crops is limited by adverse climatic conditions. It has only a slight limitation as a site for golf fairways. The slope and the clayey texture are moderate limitations for campsites, picnic areas, intensive play areas, and buildings for light industry. Coarse fragments and shallowness over rock are severe limitations for use as a site for residences. (Capability unit IVe-3; woodland group 4; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Jacana clay loam, 5 to 12 percent slopes (JaC).--This soil is on foot slopes and low rolling hills throughout volcanic areas, mainly on the island of St. Croix. Included in mapping were spots of Descalabrado clay loam and small areas of a deeper soil that has a thin subsoil horizon (Bt) in which there is a significant accumulation of clay.

The surface layer of this Jacana soil is 7 to 11 inches thick. The depth to partly weathered volcanic rock is 18 to 28 inches.

This soil is suited to pasture and woodland. Its use for cultivated crops is limited by the slope, the erosion hazard, the depth to hard rock, and adverse climate. It has a moderate limitation for campsites, picnic areas, golf fairways, trafficways, and buildings for light industry, and a severe limitation for residences and intensive play areas. (Capability unit IVe-3; woodland group 4; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Jacana clay loam, 12 to 20 percent slopes (JaD).--This soil is on foot slopes and low rolling hills throughout the volcanic areas of St. Croix. Included in mapping were spots of Descalabrado clay loam.

The surface layer of this Jacana soil is 6 to 9 inches thick. The depth to partly weathered volcanic rock is 16 to 26 inches. The depth to hard rock is 20 to 30 inches.

This soil is suited to grassland and woodland. Its use for cultivated crops is limited by the slope, the erosion hazard, the depth to hard rock, and adverse climate. It has a moderate limitation for campsites, picnic areas, and trafficways, and a severe limitation for residences, buildings for light industry, intensive play areas, and golf fairways. (Capability unit VIe-1; woodland group 4; Hilly Clay range sites 2, 5, and 8, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Jaucas Series

The Jaucas series consists of excessively drained soils that formed in marine deposits of sand-sized particles of coral and seashells. These soils occur as hummocky areas along the coast, above high tide. The slope gradient is 0 to 5 percent. The climate is semiarid. The average annual rainfall is between 30 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is grayish-brown, calcareous sand about 6 inches thick. It

contains many seashells. The underlying layers consist of light brownish-gray and pale-brown calcareous sand and many fragments of coral and seashells.

The acreage is largely in seagrapes, coconuts, cocoplum (Icaco), and other drought-resistant plants. Scattered small areas are used for recreational purposes.

Representative profile of Jaucas sand, 0 to 5 percent slopes, on Sandy Point, St. Croix, 200 feet north of the sea:

A--0 to 6 inches, grayish-brown (10YR 5/2) sand; single grain; loose; strongly calcareous; gradual, smooth boundary. 2 to 10 inches thick.
C1--6 to 16 inches, light brownish-gray (10YR 6/2) sand; single grain; loose; strongly calcareous; gradual, smooth boundary. 8 to 12 inches thick.
C2--16 to 26 inches, pale-brown (10YR 6/3) sand; single grain; loose; strongly calcareous; gradual, smooth boundary. 8 to 20 inches thick.
C3--26 to 60 inches +, very pale brown (10YR 7/3) sand; single grain; loose; strongly calcareous. Many seashell and coral fragments the size of sand grains and a few large shell fragments mixed throughout profile.

The texture is dominantly sand. The color of the A horizon ranges from dark grayish brown (10YR 4/2) to very pale brown (10YR 7/3) or white (10YR 8/2).

Jaucas soils are associated with Diamond soils and with Tidal flats. They are deeper than Diamond soils, which are red clay loams and are only about 14 inches deep over limestone. They are unlike Tidal flats in that this land type occurs right on the coast, is covered with sea water during high tide, and is strongly saline.

Jaucas sand, 0 to 5 percent slopes (JuB).--This soil occurs as low, hummocky, sandy coastal areas on all three islands and on some small islands offshore (pl. II). Included in mapping were small areas of coral, Tidal flats, and Limestone rock land.

Low fertility, a low water-holding capacity, and very rapid permeability are severe limitations for most farm purposes, and the deep sand and high tide are severe limitations for most nonfarm purposes. (Capability unit VIIs-2; no woodland classification; Coastal Sand range site 11, all precipitation zones)

Lavallee Series

The Lavallee series consists of gently sloping, well-drained soils that are deep over volcanic rocks. These soils formed in gravelly clay loam sediments derived from these rocks. They occur on alluvial fans. The slope gradient is 2 to 5 percent. The climate is semiarid. The average annual rainfall is between 40 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark-brown gravelly clay loam about 8 inches thick. The subsoil is dark-brown or reddish-brown, friable gravelly clay loam. At a depth of about 18 inches is dark-brown very gravelly loam that is about 50 percent volcanic rock fragments.

Most of the acreage is cultivated and planted to subsistence crops.

Representative profile of Lavallee gravelly clay loam, 2 to 5 percent slopes, on St. Croix, 300 feet west and 75 feet south of the road intersection to Cane Bay in the town of La Vallee:

Ap--0 to 8 inches, dark-brown (10YR 3/3) gravelly clay loam; moderate, medium, granular structure; very hard, friable, slightly sticky, nonplastic; common, fine, angular and subrounded fragments of volcanic rock; neutral; clear, smooth boundary. 6 to 12 inches thick.
B21t--8 to 12 inches, dark-brown (7.5YR 3/2) gravelly clay loam; moderate, fine and medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few, thin, patchy clay films; common, fine and medium, subrounded fragments of volcanic rock; neutral; clear, smooth boundary. 4 to 6 inches thick.
B22t--12 to 18 inches, reddish-brown (5YR 4/4) gravelly clay loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky; hard, friable, slightly sticky, slightly plastic; few, thin, patchy clay films; many, fine and medium, subrounded and angular fragments of volcanic rock; many fragments the size of sand grains; few worm channels filled with soil material from B21t horizon; calcareous; mildly alkaline; gradual, smooth boundary. 8 to 12 inches thick.
IIC--18 to 48 inches +, dark-brown (7.5YR 4/4) very gravelly loam; 50 percent volcanic rock fragments.

The thickness of the solum ranges from 18 to 30 inches. Common to many fragments are scattered throughout the profile. The color of the A horizon ranges from 10YR to 7.5YR in hue and 2 to 3 in chroma and value. The texture is dominantly gravelly clay loam but ranges to clay loam and loam. The texture of the B2t horizon is dominantly gravelly clay loam but ranges to gravelly loam, clay loam, and gravelly clay. The structure of the B2t horizon ranges from weak to moderate subangular blocky. Patchy clay films are few to common. Below the B2t horizon are stratified lenses of gravelly loam, gravelly clay loam, loam, and gravel and thin lenses or pockets of secondary lime. In places there is a B3 horizon that has coated sand grains and a few patchy clay films. The color of the B3 horizon ranges from 7.5YR to 5YR in hue, and from 4 to 6 in value and chroma. The texture ranges from gravelly clay loam to gravelly loam.

Lavallee soils are associated with San Anton, Glynn, and Parasol soils. They have a more strongly developed subsoil and are more gravelly than San Anton soils. They are less clayey and more gravelly

than Glynn soils. They are less yellow, are more gravelly, and have a lighter colored surface layer than Parasol soils.

Lavallee gravelly clay loam, 2 to 5 percent slopes (LaB).--This soil is on terraces and alluvial fans near La Vallee and Christiansted on the island of St. Croix. Included in mapping were small areas of San Anton soils along drains, spots of Isaac gravelly clay loam, and steeper areas of Lavallee gravelly clay loam.

This soil has only a slight erosion hazard and a slight limitation for most farm uses. The slope and the gravelly surface layer are moderate limitations for residences, buildings for light industry, trafficways, campsites, and picnic areas, and severe limitations for intensive play areas and golf fairways. (Capability unit IIe-2; woodland group 3; Deep range sites 1 and 4, precipitation zones 45 to 60 inches and 35 to 45 inches)

Leveled Clayey Land

Leveled clayey land (Lc) occurs east and south of the Alexander Hamilton Airport on St. Croix. The soil material in these areas was originally Aguirre clay, 0 to 2 percent slopes. Cutting, filling, and leveling have removed much of the upper part of this soil and replaced it with a layer of marl. The material now is a mixture of marl and Aguirre clay.

The shrinking and swelling of the clay, the plasticity and stickiness, and the slow percolation rate are severe limitations for all farm and nonfarm uses. (Capability unit VIIIs-1; no woodland or range classification)

Leveled Marly Land

Leveled marly land (Lm) is near the aluminum plant and the Alexander Hamilton Airport on St. Croix. It consists of leveled and reworked Aguilita and Sion soils. Originally both soils had a thin surface layer. Consequently, the reworked surface layer is largely marl or soft limestone.

This land type has no value for farming. It has a moderate limitation for trafficways, because of moderate traffic-supporting capacity, and a severe limitation for residences and for buildings for light industry, because of low bearing strength. Stoniness and coarse fragments are moderate to severe limitations for all recreational uses. (Capability unit VIIIs-1; no woodland or range classification)

Leveled Rocky Land

Leveled rocky land (Lr) consists of areas where soils that are shallow and very shallow over volcanic rock have been blasted off or bulldozed. These areas occur at the western end of the Truman Airport on St. Thomas, where the ridge that extended from the Caribbean Hotel to the Virgin Islands College was blasted and leveled and the surrounding areas were filled with rocky debris. Included in mapping were spots where the swamps or the tidal flats are filled with stones, cobblestones, and other rocky material.

This land type has no value for farming. The hard rock at the surface is a severe to very severe limitation for all nonfarm purposes. (Capability unit VIIIs-1; no woodland or range classification)

Limestone Rock Land

Limestone rock land (Ls) consists of nearly level to steep areas where 70 to 90 percent of the surface is covered with outcrops of hard limestone or where erosion has removed the surface layer of soil material and exposed the underlying soft limestone, marl, or thin-bedded limestone. The slope gradient is 0 to 40 percent. Included in mapping were areas along the seacoast where coral outcrops are covered with as much as 6 inches of clayey sediments.

The lack of soil material precludes all farm uses. The rockiness and the coarse fragments are severe to very severe limitations for all nonfarm uses. (Capability unit VIIIs-1; no woodland or range classification)

Made Land

Made land (Ma) consists of areas along the coast where sand has been dredged from the sea and used to fill the tidal flats and the tidal mangrove swamps to an elevation above sea level and above high tide. One large area is east of Christiansted, on St. Croix, near the radio tower. Another is west of Frenchtown in Charlotte Amalie, on St. Thomas. This land type is high in percentage of shell fragments and low in organic-matter content.

This land type has severe limitations for all farm and nonfarm uses. (Capability unit VIIIs-1; no woodland or range classification)

Magens Series

The Magens series consists of moderately steep to steep, acid, well-drained soils that are deep over very highly decomposed basic volcanic rocks mixed with stones and boulders. These soils formed in material derived in place from these rocks. They occur on side slopes of dissected volcanic uplands in the north-central part of St. Thomas. The slope gradient is 30 to 50 percent. The climate is semiarid. The average annual precipitation is between 40 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is reddish-brown and yellowish-red silty clay loam about 10 inches thick. The subsoil is red, friable gravelly clay and clay. At a depth of about 49 inches is very highly decomposed volcanic rock that is variegated red, brown, gray, and white. This material shows the original rock structure but can be crushed between the fingers.

Most areas are in brush or brushy forest. Some

are subdivided for housing developments. Only a few are used for crops or pasture.

Representative profile of Magens silty clay loam, 30 to 50 percent slopes, on St. Thomas, 200 feet east on Jasmine road from the main entrance to the North Star Village housing development and 990 feet north of Mountain Top:

A11--0 to 7 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, granular structure; friable, slightly sticky, slightly plastic; many fine roots; medium acid; clear, smooth boundary. 6 to 8 inches thick.

A12--7 to 10 inches, yellowish-red (5YR 4/6) silty clay loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular; friable, slightly sticky, plastic; common fine roots; strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B1--10 to 17 inches, red (2.5YR 4/6) gravelly clay; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky; friable, slightly sticky, slightly plastic; few fine roots; strongly acid; clear, smooth boundary. 5 to 9 inches thick.

B21--17 to 26 inches, red (10R 4/6) clay; weak, coarse, subangular blocky structure that breaks to weak, medium, subangular blocky; friable, slightly sticky, slightly plastic; thin discontinuous clay films; few roots; strongly acid; gradual, smooth boundary. 8 to 10 inches thick.

B22--26 to 42 inches, red (10R 4/6) clay; weak, coarse, subangular blocky structure that breaks to weak, fine and medium, subangular blocky; friable, slightly sticky, slightly plastic; thin discontinuous clay films; few roots; strongly acid; gradual, smooth boundary. 10 to 18 inches thick.

B3--42 to 49 inches, red (10R 4/6) silty clay loam; weak, medium and coarse, subangular blocky structure; friable, slightly sticky, slightly plastic; thin discontinuous coatings; few fine pores; approximately 30 percent saprolite; strongly acid; gradual, wavy boundary. 5 to 9 inches thick.

C--49 to 84 inches, saprolite; variegated red, yellowish brown, gray, and white and appears to have a rubbed color of red (10R 4/6); massive; few clay coatings on fracture planes.

The thickness of the solum ranges from 35 to 60 inches. The reaction ranges from strongly acid to medium acid (pH 5.1 to 6.0). The texture is dominantly silty clay loam but ranges to clay loam and silty clay. The color of the A horizon ranges from dark reddish gray (5YR 4/2) to yellowish red (5YR 4/6). The color of the B2 horizon is red (2.5YR 4/6 or 10R 4/8). The texture of this horizon is dominantly clay. The structure ranges from weak, coarse, subangular blocky to weak, fine, subangular blocky. The B3 horizon is 25 to 50 percent saprolite. A few subrounded stones, 12 to 24 inches in diameter, of more resistant volcanic material are scattered throughout the profile. At a depth of about 16 inches is a weak stone line that consists of small angular volcanic fragments and a few cobblestones 3 to 6 inches in diameter.

Magens soils are associated with Cramer, Isaac, Dorothea, and Victory soils. All are on steep volcanic uplands. Magens soils are deeper than Cramer soils, which are less than 20 inches over hard volcanic rock. They are deeper and have a lighter colored surface layer than Isaac soils. They differ from Dorothea soils in being red instead of yellow and in having a more weakly developed subsoil. They differ from Victory soils in being red instead of yellow and in having a more strongly developed subsoil.

Magens silty clay loam, 30 to 50 percent slopes (MgF).--This soil is on side slopes of dissected volcanic uplands in north-central St. Thomas. Included in mapping were spots of Cramer, Dorothea, and Victory soils; spots where the subsoil is yellowish red; and spots where there are angular rock fragments on the surface.

This soil is suited to pasture and woodland. It is deep and easy to work, but the slope and the erosion hazard preclude its use for cultivated crops. The slope and the hazard of slides severely limit all nonfarm uses. (Capability unit VIe-2; woodland group 1; Hilly Clay range sites 2 and 5, precipitation zones 45 to 60 inches and 35 to 45 inches)

Parasol Series

The Parasol series consists of gently sloping to moderately sloping, well-drained soils that are deep over granitic rock (gabbro). These soils formed in clay loam and clayey sediments derived from this material. They occur on foot slopes and alluvial fans, mainly in the Fountain area on St. Croix. The slope gradient is 2 to 12 percent. The climate is semiarid. The average annual rainfall is between 45 and 50 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark brown clay loam about 13 inches thick. The upper part of the subsoil is brown, firm clay. The lower part is dark yellowish-brown, friable clay loam. At a depth of about 40 inches is brown, friable loam, sandy loam, and loamy sand, all derived from granitic rock.

Most of the acreage is used for sugarcane. The rest is in guineagrass and native grasses.

Representative profile of Parasol clay loam, 5 to 12 percent slopes, on St. Croix, 1.3 miles north of an oil road on the road to River and 100 feet south and 75 feet west of Gate:

Ap--0 to 7 inches, very dark brown (10YR 2/2) clay loam; moderate, medium, granular structure; friable, slightly sticky, slightly plastic; many sand grains; few roots; neutral; clear, smooth boundary. 4 to 8 inches thick.

A1--7 to 13 inches, very dark brown (10YR 2/2) clay

loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular; friable, slightly sticky, slightly plastic; many sand grains; few roots; neutral; clear, smooth boundary. 4 to 8 inches thick.

B2t--13 to 24 inches, brown (10YR 4/3) clay; moderate, medium, subangular blocky structure; hard, firm, slightly sticky, slightly plastic; thin, discontinuous, dark-brown (10YR 3/3) clay films on peds and in root channels; many dark-brown worm casts 1 to 2 millimeters in diameter; few roots; numerous sand grains; neutral; gradual, smooth boundary. 8 to 12 inches thick.

B3--24 to 40 inches, dark yellowish-brown (10YR 4/4) clay loam; weak, coarse, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; thin, discontinuous, very dark grayish-brown (10YR 3/2) coatings on vertical ped surfaces and in root channels; very few roots; numerous sand grains; numerous old root channels that have very dark brown organic coatings; neutral; gradual, smooth boundary. 8 to 18 inches thick.

C1--40 to 52 inches, brown (10YR 4/3) loam (saprolite); massive; friable, nonsticky, nonplastic; few, thin, patchy clay films along fracture planes; few calcareous feldspar crystals; neutral; gradual, smooth boundary. 8 to 20 inches thick.

C2--52 to 62 inches, brown (10YR 4/3) sandy loam (saprolite); massive; very friable, nonsticky, nonplastic; few calcareous feldspar crystals, partly weathered; neutral; gradual, smooth boundary.

C3--62 to 80 inches, brown (10YR 5/3) coarse loamy sand (saprolite); massive.

The thickness of the solum ranges from 24 to 46 inches. The color of the A horizon ranges from very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2). The texture is dominantly clay loam. The color of the B2t horizon ranges from brown (10YR 4/3) to dark yellowish brown (10YR 3/4). The texture is dominantly clay but ranges to silty clay. The structure is moderate, medium, subangular blocky. There are a few thin, patchy to discontinuous clay films. The color of the B3 horizon ranges from dark yellowish brown (10YR 4/4) to brown (10YR 4/3), and the texture from clay loam to loam. The structure is dominantly weak, coarse, subangular blocky. Clay films range from few thin patchy to thin discontinuous on the vertical cleavage planes and in root channels.

Parasol soils are associated with Coamo, Lavallee, Glynn, Southgate, and Jacana soils. They do not have the horizon of accumulated calcium carbonate that is typical of Coamo soils. They do not have the red colors that are typical of Lavallee soils and they are not gravelly. They have a more friable surface layer than Glynn soils and are neutral throughout instead of alkaline. They are deeper over rock and occur in lower topographic positions than Southgate soils. They are deeper than Jacana soils, which are only 20 to 36 inches deep over hard volcanic rock.

Parasol clay loam, 2 to 5 percent slopes (PaB).--This soil is on St. Croix, on foot slopes and alluvial fans near Fountain and River. Included in mapping were spots of Jacana clay loam, Southgate clay loam, and San Anton clay loam.

The surface layer of this Parasol soil is very dark brown clay loam 10 to 16 inches thick. The upper part of the subsoil is clay 8 to 12 inches thick. Below this is highly decomposed rock.

This soil is suited to cultivated crops, pasture, and woodland. It has no limitation or only a slight limitation for residences, buildings for light industry, trafficways, and golf fairways, and a moderate limitation for campsites, picnic areas, and intensive play areas. (Capability unit IIe-2; woodland group 3; Hilly Clay range sites 2 and 5, precipitation zones 45 to 60 inches and 35 to 45 inches)

Parasol clay loam, 5 to 12 percent slopes (PaC).--This soil is on St. Croix, on foot slopes and alluvial fans near Fountain and River and just south of Christiansted. Included in mapping, and making up 5 to 10 percent of each mapped area, were spots of Jacana clay loam, spots of Southgate clay loam, and spots of steeper Parasol clay loam.

This Parasol soil has the profile described as representative for the series.

This soil is suited to pasture and woodland. It is moderately limited for cultivation because of the slope and the erosion hazard. It has no limitation or only a slight limitation for residences and trafficways, a moderate limitation for campsites, picnic areas, golf fairways, and buildings for light industry, and a severe limitation, because of slope, as a site for intensive play areas. (Capability unit IIIe-1; woodland group 3; Hilly Clay range sites 2 and 5, precipitation zones 45 to 60 inches and 35 to 45 inches)

Pozo Blanco Series

The Pozo Blanco series consists of gently sloping to moderately sloping, well-drained, calcareous soils that are moderately deep over thin-bedded soft limestone. These soils formed in clay loam sediments derived from limestone and basic volcanic rocks. They occur on foot slopes in the northern part of St. Thomas and in the western and central parts of St. John. The slope gradient is 5 to 20 percent. The climate is semiarid. The average annual rainfall is between 35 and 45 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 6 inches thick. The upper part of the subsoil is dark grayish-brown, firm clay loam. The lower part is brown, friable, calcareous silty clay loam. At a depth of about 18 inches is light-gray, very friable, calcareous loam thin-bedded with soft limestone.

Almost all the acreage is in guineagrass and native grasses and is used as pasture.

Representative profile of Pozo Blanco clay loam, 5 to 12 percent slopes, in a guineagrass pasture on St. Thomas, 2,200 feet east of Lovenlund, 1,000 feet west of Mandal, and 200 feet north of the road:

Ap--0 to 6 inches, very dark grayish-brown (10YR 3/2) clay loam; moderate, medium, granular structure; firm, slightly sticky, slightly plastic; many fine roots; few fine fragments; neutral; clear, smooth boundary. 4 to 8 inches thick.

B2--6 to 13 inches, dark grayish-brown (10YR 4/2) clay loam; weak, fine, subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; mildly alkaline; clear, smooth boundary. 6 to 8 inches thick.

B3ca--13 to 18 inches, brown (10YR 5/3) silty clay loam; weak, fine and medium, subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; calcareous; lime coatings on ped surfaces; abrupt, smooth boundary. 4 to 6 inches thick.

C--18 to 48 inches, light-gray (10YR 7/2) loam; massive; very friable, nonsticky, slightly plastic; calcareous. This horizon is thin-bedded, soft limestone.

The thickness of the solum ranges from 14 to 20 inches. Limestone and volcanic fragments range from none to many. The texture of the A horizon ranges from gravelly clay loam or clay loam to loam. The color of the A horizon is 10YR in hue, 2 and 3 in value, and 1 to 4 in chroma. The color of the B2 horizon ranges from dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4). The texture ranges from gravelly clay loam to clay loam. The structure of the B2 horizon ranges from weak, medium, prismatic to weak, fine and medium, subangular blocky. The color of the B3ca ranges from dark yellowish brown (10YR 4/4) to brown (10YR 5/3, 10YR 4/3), and the texture ranges from clay loam to silty clay loam. The structure of this horizon is dominantly weak subangular blocky. The material in the C horizon ranges from soft limestone to highly weathered calcareous volcanic rock. The color ranges from pale yellow (2.5Y 8/4) or yellow (10YR 7/6) to white and light gray (5Y 7/1) and greenish gray (5BG 6/1).

Pozo Blanco soils are associated with Aguilita, Fredensborg, and Sion soils. They differ from all of these soils in having a layer of accumulated calcium carbonate. They are deeper and less gravelly than Aguilita soils.

Pozo Blanco clay loam, 5 to 12 percent slopes (PbC).--This soil occurs on foot slopes in the northern part of St. Thomas and in the central and western parts of St. John. Included in mapping were spots of Aguilita gravelly clay loam and Isaac clay loam.

This Pozo Blanco soil has the profile described as representative for the series. The surface layer is 4 to 8 inches thick. The depth to soft limestone is 14 to 20 inches.

This soil is suited to grassland and woodland but is not generally suited to cultivated crops. The slope is a severe limitation, and the erosion hazard is severe in cultivated areas that are not protected by a vegetative cover. The limitation is none to slight for dwellings and trafficways, moderate for campsites, picnic areas, golf fairways, paths and trails, and buildings for light industry, and severe for intensive play areas. (Capability unit IVe-1; woodland group 2; Hilly Clay range sites 5 and 8, precipitation zones 35 to 45 inches and 25 to 35 inches)

Pozo Blanco clay loam, 12 to 20 percent slopes (PbD).--This soil occurs on foot slopes in the northern part of St. Thomas and in the central and western parts of St. John. Included in mapping were spots of Aguilita gravelly clay loam and Isaac clay loam.

This Pozo Blanco soil has been affected by geologic erosion. The surface layer is 4 to 7 inches thick. The depth to soft limestone is 14 to 18 inches.

This soil is suited to pasture and woodland but is not generally suited to cultivated crops. The slope is a severe limitation, and the erosion hazard is severe in cultivated areas that are not protected by a vegetative cover. The limitation is moderate for dwellings, trafficways, campsites, picnic areas, and paths and trails, and severe for golf fairways, intensive play areas, and buildings for light industry. (Capability unit VIe-3; woodland group 2; Hilly Clay range sites 5 and 8, precipitation zones 35 to 45 inches and 25 to 35 inches)

San Anton Series

The San Anton series consists of nearly level to moderately sloping, well-drained soils that are deep over limestone and volcanic rocks. These soils formed in stratified sediments derived from these rocks. They occur on flood plains and alluvial fans on the three main islands. The slope gradient is 0 to 12 percent. The climate is semiarid. The average annual rainfall is between 35 and 50 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 9 inches thick. The subsoil is brown, friable gravelly clay loam. At a depth of about 21 inches is brown, friable, calcareous gravelly clay loam that grades to yellowish-brown, firm, calcareous clay loam. This material contains some rock fragments.

Most of the acreage is in grasses and is used as pasture. Part of it is used for cultivated crops.

Representative profile of San Anton clay loam, 0 to 3 percent slopes, in a guineagrass pasture on St. Croix, five-tenths of a mile east of the coast road, which is north of Fredericksted, on the road to Orangegrove, and 50 feet south of the road:

Ap--0 to 9 inches, very dark grayish-brown (10YR 3/2) clay loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; few, fine, black minerals; common, fine and medium, angular volcanic fragments; common fine roots; neutral; clear, smooth boundary. 6 to 12 inches thick.

B--9 to 21 inches, brown (10YR 4/3) gravelly clay loam; weak, medium, subangular blocky structure that breaks to weak, fine, subangular blocky; friable when moist, slightly sticky and slightly plastic when wet; common, fine and medium, angular volcanic fragments; few, fine, black minerals; few fine limestone fragments; common fine roots; neutral; clear, smooth boundary. 8 to 14 inches thick.

C1--21 to 32 inches, brown (10YR 4/3) gravelly clay loam; massive; friable when moist, slightly sticky and slightly plastic when wet; few fine roots; few, fine, black concretions; calcareous; abrupt, smooth boundary. 8 to 14 inches thick.

IIC2--32 to 50 inches, yellowish-brown (10YR 5/4) clay loam; massive; firm when moist, slightly sticky and slightly plastic when wet; few fine roots; common, fine, black minerals; calcareous.

Thickness of the solum ranges from 14 to 26 inches. The texture of the A horizon ranges from clay loam and silty clay loam to silty clay. The color is 10YR to 5YR in hue, 2 to 4 in value, and 2 to 3 in chroma. The texture of the B horizon ranges from gravelly clay loam to silty clay loam and loam. The color is 10YR to 5YR in hue, 2 to 4 in value, and 2 to 4 in chroma. The structure ranges from weak, fine, subangular blocky to weak, medium, subangular blocky. The C horizon is stratified. The texture ranges from silty clay loam to loamy sand, and there are varying amounts of gravel. The color of the C horizon is 10YR to 5YR in hue, 4 to 5 in value, and 2 to 4 in chroma. Below a depth of 40 inches, the color ranges from yellowish brown (10YR 5/4) to olive (5Y 4/4) and olive brown (2.5Y 4/4). The reaction ranges from slightly acid to alkaline.

San Anton soils are associated with Glynn, Coamo, Lavallee, and Cornhill soils. They have a thinner, less clayey, more weakly developed subsoil than Glynn soils. They are less red, have a thinner subsoil, and are less gravelly than Lavallee soils. They are less clayey in the subsoil than Coamo soils, which have calcareous, stratified underlying layers. They are less plastic and clayey in the underlying material than Cornhill soils.

San Anton clay loam, 0 to 3 percent slopes (SaA).--This soil is on alluvial fans and narrow flood plains along drains on all three of the main islands. Included in mapping, and making up less than 10 percent of each mapped area, were spots of Coamo clay loam and Glynn clay loam, and in some areas, spots of gravelly soils that formed in recent alluvium.

This San Anton soil has the profile described as representative for the series.

This soil is suited to cultivated crops, pasture, and woodland. Lack of effective rainfall limits the choice of crops. In areas not subject to flooding, the limitation is none to slight for all nonfarm uses. (Capability unit IIc-1; woodland group 3; Deep range sites 1, 4, and 7, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

San Anton clay loam, 5 to 12 percent slopes (SaC).--This soil is on alluvial fans and dissected, narrow flood plains along drains on all three of the main islands. Included in mapping were spots of Descalabrado clay loam and Cramer gravelly clay loam.

The surface layer of this San Anton soil is 6 to 9 inches thick, and the solum is 14 to 22 inches thick.

This soil is suited to cultivated crops, pasture, and woodland. The slope limits the choice of crops, and the erosion hazard is severe in cultivated areas that are not protected by a vegetative cover. The limitation is none to slight for dwellings and trafficways, moderate for buildings for light industry, golf fairways, campsites, picnic areas, and paths and trails, and severe for intensive play areas. (Capability unit IIIe-1; woodland group 3; Deep range sites 1, 4, and 7, precipitation zones 45 to 60 inches, 35 to 45 inches, and 25 to 35 inches)

Sion Series

The Sion series consists of nearly level to moderately sloping, well-drained soils that are shallow over soft limestone or marl. These soils formed in calcareous clay loam sediments derived from this material. They occur near coastal areas, in valleys and on foot slopes in the southern part of St. Croix. The slope gradient is 0 to 12 percent. The climate is semiarid. The average annual rainfall is between 30 and 35 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 12 inches thick. The subsoil is grayish-brown, friable, calcareous clay loam. At a depth of about 17 inches is very pale brown and white, soft limestone or marl.

Most of the acreage is cultivated to row crops. Uncultivated areas are in guineagrass and are used as pasture.

Representative profile of Sion clay loam, 0 to 5 percent slopes, in a cultivated field on St. Croix, half a mile west and 50 feet south of the entrance to the Experiment Station near Annas Hope:

Ap--0 to 12 inches, very dark grayish-brown (10YR 3/2) clay loam, brown (10YR 5/3) when dry; weak, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many, fine and medium, limestone fragments; calcareous; moderately alkaline;

Profile of Aguilita gravelly clay loam.

Profile of Cramer gravelly clay loam.

Descalabrado clay loam, 20 to 40 percent slopes.

Rock terraces on Dorothea clay loam, 20 to 40 percent slopes.

Plate II

Sugarcane on Fredensborg clay, 2 to 5 percent slopes. Steep wooded area in background is Aguilita gravelly clay loam, 20 to 40 percent slopes.

Jaucas sand.

Honduras mahogany underplanted in heavy brush. The soil is Fredensborg clay, 2 to 5 percent slopes.

Farm pond under construction in Dorothea clay loam, 20 to 40 percent slopes. Slope reduces potential storage capacity.

clear, smooth boundary. 8 to 12 inches thick.

B--12 to 17 inches, grayish-brown (10YR 5/2) clay loam, light brownish gray (10YR 6/2) when dry; weak, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; calcareous; many, fine and medium limestone fragments; moderately alkaline; abrupt, smooth boundary. 2 to 8 inches thick.

C--17 to 50 inches, soft, very pale brown (10YR 7/3) limestone or marl. This material is easily penetrated with a spade or an auger.

The thickness of the solum ranges from 10 to 20 inches. Few to common limestone fragments are mixed throughout the profile. The color of the A horizon is dominantly 10YR in hue, 2 or 3 in value, and 2 to 5 in chroma. The texture ranges from clay loam to silty clay loam, and the structure ranges from weak, fine, granular to moderate, medium, granular. The color of the B horizon ranges from brown (10YR 5/3) to grayish brown (10YR 5/2), and the texture ranges from silty clay loam and clay loam to silt loam.

Sion soils are associated with Aguilita, Fredensborg, Hesselberg, and Diamond soils. They are deeper and are less gravelly than Aguilita soils. They are less clayey in the surface layer than Fredensborg soils. They are not so red as Hesselberg and Diamond soils, both of which overlie limestone.

Sion clay loam, 0 to 5 percent slopes (ScB).--This soil occurs in valleys and on foot slopes in the southern and southwestern parts of St. Croix. Included in mapping were spots of Fredensborg clay, Hesselberg clay, and Diamond clay loam.

This Sion soil has the profile described as representative for the series. The surface layer is 10 to 12 inches thick. The texture is clay loam to a depth of 16 to 20 inches.

This soil can be used for cultivated crops, pasture, and woodland. Shallowness over rock and insufficient effective rainfall limit the choice of crops. The limitation is none to slight for dwellings and golf fairways, and moderate for trafficways, buildings for light industry, campsites, and picnic areas. (Capability unit IIIsc-1; woodland group 2; Shallow range site 6, precipitation zone 35 to 45 inches)

Sion clay loam, 5 to 12 percent slopes (ScC).--This soil is on foot slopes in the southern and southwestern parts of St. Croix. Included in mapping were spots of Aguilita gravelly clay loam and Fredensborg clay and spots where the slope is more than 12 percent.

The surface layer of this Sion soil is 8 to 10 inches thick. The texture is clay loam to a depth of 10 to 16 inches.

This soil is suited to pasture and woodland. It can be used occasionally for cultivated crops, but the erosion hazard is very severe in cultivated areas that are not protected by a cover of vegetation. The limitation is slight for residences, moderate for campsites, picnic areas, golf fairways, trafficways, and buildings for light industry, and severe for intensive play areas. (Capability unit IVe-1; woodland group 2; Shallow range site 6, precipitation zone 35 to 45 inches)

Southgate Series

The Southgate series consists of strongly sloping to steep, well-drained soils that are shallow over granitic rocks. These soils formed in gravelly clay loam material derived in place from these rocks. They occur on mountain slopes, mainly in the north-central part of St. Croix. The climate is semiarid. The average annual rainfall is between 30 and 50 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is very dark grayish-brown clay loam about 7 inches thick. It contains angular rock fragments. The subsoil is dark-brown, friable gravelly loam and is 50 percent gravel-sized rock fragments. At a depth of about 12 inches is partly decomposed granitic rock. Below this, at a depth of about 18 inches, is harder granitic rock.

Most of the acreage is in native grasses, guineagrass, and brush and is used as pasture.

Representative profile of Southgate clay loam, 12 to 40 percent slopes, at an elevation of approximately 300 feet on the south slope of Maria Hill, on St. Croix, four-tenths of a mile east of Lowrys Hill ruins:

Ap--0 to 7 inches, very dark grayish-brown (10YR 3/2) clay loam; moderate, medium, granular structure; friable, slightly sticky, slightly plastic; common fine roots; few sand grains; common angular rock fragments; medium acid; clear, smooth boundary. 5 to 10 inches thick.

B--7 to 12 inches, dark-brown (10YR 3/3 rubbed color) gravelly loam; weak, fine, subangular blocky structure; friable, nonsticky, nonplastic; 50 to 60 percent volcanic rock fragments the size of pebbles; few fine roots; medium acid; clear, smooth boundary. 4 to 8 inches thick.

C--12 to 18 inches, partly weathered, intrusive volcanic rock; reddish-brown (2.5YR 4/4) staining on fracture planes; few fine roots along fracture planes; slightly acid; gradual, wavy boundary. 4 to 10 inches thick.

R--18 inches, semiconsolidated, intrusive volcanic rock.

The depth to semiconsolidated volcanic rock ranges from 9 to 20 inches. Common to many volcanic fragments are mixed throughout the profile. The reaction ranges from medium acid to slightly acid. The color of the A horizon ranges from very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) to dark yellowish brown (10YR 3/4). The texture ranges from clay loam to gravelly clay loam. The color of the B horizon is 7.5YR and 10YR in hue, 3 to 5 in value, and 3 to 4 in chroma. The texture ranges from gravelly loam to gravelly clay loam.

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The structure of the B horizon ranges from weak, fine, subangular blocky to weak, medium, subangular blocky.

Southgate soils are associated with Descalabrado, Cramer, and Parasol soils and Volcanic rock land. They are more gravelly in the subsoil than Descalabrado soils. In comparison with Cramer soils, their subsoil is thinner and is dark-brown gravelly loam instead of dark-red and dark reddish-brown gravelly clay. They are shallower over granitic rock than Parasol soils, which occur on foot slopes below Southgate soils.

Southgate clay loam, 12 to 40 percent slopes (SgE).--This soil is on side slopes and ridgetops on St. Croix, mainly near Fountain and River. It also occurs as a small area southeast of Christiansted. Included in mapping were spots of Descalabrado clay loam and Parasol clay loam.

This Southgate soil has the profile described as representative for the series. The surface layer is 7 to 10 inches thick. The depth to rock ranges from 12 to 20 inches.

This soil is suited to pasture and woodland. Most of the acreage is used for pasture. Shallowness over rock, the slope, and the erosion hazard preclude cultivation. The limitation is severe for all nonfarm uses. (Capability unit VIs-3; woodland group 4; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Southgate clay loam, 40 to 60 percent slopes (SgF).--This soil occurs on side slopes of dissected granitic uplands in the Fountain area on St. Croix and on some of the offshore islands. Included in mapping were spots of Descalabrado clay loam, and, making up 10 to 15 percent of each mapped area, spots of Volcanic rock land where the soil is less than 6 inches thick over rock.

The surface layer of this Southgate soil is 5 to 8 inches thick. The depth to rock ranges from 9 to 18 inches.

This soil is suited to pasture and woodland. The very steep slopes, the shallowness over rock, and the coarse fragments preclude cultivation. The limitation is severe for all nonfarm uses. (Capability unit VIIs-3; woodland group 4; Shallow range sites 6 and 9, precipitation zones 35 to 45 inches and 25 to 35 inches)

Southgate-Rock land complex, 20 to 60 percent slopes (SrF).--This complex consists of Southgate soils and areas that are 50 to 70 percent rock outcrops and have soil material less than 5 inches thick. Loose stones and boulders are common on the surface. This complex occurs on all three Virgin Islands and on some of the offshore islands.

Southgate soils occur between the rock outcrops. They are dark grayish-brown, dark-brown, and yellowish-brown clay loams 6 to 20 inches thick. The rocks are fresh exposures of lava, breccia, and tuff.

This complex has no value for farming. Most of the acreage is brushy forest or brushy pasture. The shallowness over rock, the steep slopes, and the coarse fragments preclude cultivation and make it difficult to establish and maintain pasture and woodland. The limitation is severe for all nonfarm uses. (Capability unit VIIs-3; no woodland classification; Rough Stony Land range site 10, all precipitation zones)

Tidal Flats

Tidal flats (Tf) occurs as nearly level, essentially barren areas that are periodically covered with tidal water. Some of the lower parts are covered daily. The higher parts are covered during high tide and during periods when they receive excessive runoff from the surrounding mountains. The soil material is silty and clayey and in places contains a considerable amount of very fine sand. Generally it is high in soluble salts. This material cracks when dry.

This land type can be used only for wildlife habitat or esthetic purposes. Extreme wetness precludes its use for commercial production of crops, forage, and trees. The limitation is severe to very severe for most engineering and recreational uses. (Capability unit VIIIw-1; no woodland classification; no range classification)

Tidal Swamp

Tidal swamp (Ts) occurs along inlets and along the seacoast. It is usually covered with salt water. The vegetation is a thick growth of mangrove trees. The soil material is light colored, saline, and sandy or clayey. It contains a considerable amount of mucky and peaty organic material derived from the decaying mangrove trees. The underlying material consists of coral, shells, limestone, marl, or clay.

This land type can be used as habitat for birds and as feeding and breeding areas for oysters and crabs. It has no agricultural value. Flooding precludes its use for most engineering and recreational uses. Some of the mangrove wood is used in making charcoal. (Capability unit VIIIw-1; no woodland classification; no range classification)

Victory Series

The Victory series consists of strongly sloping to steep, well-drained soils that are deep over highly decomposed, basic volcanic rocks mixed with a few less highly decomposed boulders. These soils formed in clay loam material derived in place from these rocks. They are on side slopes and ridgetops of maturely dissected volcanic uplands. Most of the acreage is on St. Thomas. It occurs as a ridge that includes Crown Mountain, Signal Hill, and some of the other higher peaks. The slope gradient is 12 to 40 percent. The climate is semiarid. The average annual rainfall is between 40 and 55 inches, and the average annual temperature is between 78° and 80° F.

In a typical profile the surface layer is dark yellowish-brown clay loam, is about 9 inches thick, and contains a few volcanic rock fragments. The subsoil is strong-brown clay loam. The upper part

is firm; the lower part is friable. At a depth of about 30 inches is strong-brown, friable, highly decomposed volcanic rock.

Most areas are used for pasture and cultivated crops. Some are subdivided for housing developments.

Representative profile of Victory clay loam, 12 to 20 percent slopes, on St. Thomas, 200 feet west of the Lilliendahl road junction and 1,400 yards east of the Dorothea Experiment Station:

A1--0 to 9 inches, dark yellowish-brown (10YR 3/4) clay loam; moderate, medium, granular structure; slightly hard, friable, slightly sticky, slightly plastic; few, fine, volcanic rock fragments; slightly acid; clear, smooth boundary. 7 to 11 inches thick.

B2--9 to 17 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; very few, thin, patchy clay films; few, fine, volcanic rock fragments; slightly acid; gradual, smooth boundary. 6 to 10 inches thick.

B3--17 to 22 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, angular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine volcanic fragments; 40 percent saprolite; slightly acid; gradual, wavy boundary. 4 to 7 inches thick.

C--22 to 60 inches +, strong-brown (7.5YR 5/6) saprolite; massive; hard, friable, slightly sticky, nonplastic; slightly acid.

The thickness of the solum ranges from 17 to 28 inches. The texture is dominantly clay loam but ranges to silty clay loam. The reaction ranges from medium acid to neutral (pH 5.6 to 7.3). The color of the A horizon ranges from dark brown (7.5YR 3/2 or 10YR 3/3) to brown (7.5YR 4/2 or 10YR 4/3) and dark yellowish brown (10YR 3/4 or 4/4). The texture of the B horizon ranges from clay loam to gravelly clay loam. The color of the B horizon ranges from yellowish brown (10YR 5/4, 5/6, or 5/8) to strong brown (7.5YR 5/6 or 5/8). The structure ranges from weak, medium, subangular blocky to weak, coarse, subangular blocky. Angular volcanic fragments range from few to common in the B horizon. The B3 horizon is 30 to 50 percent saprolite.

Victory soils are associated with Descalabrado, Dorothea, Cramer, Isaac, and Magens soils. They are deeper, browner, and more acid than Descalabrado soils, and they are underlain by more highly decomposed material. They have a more weakly developed subsoil than Dorothea soils. In comparison with Cramer soils, they are deeper, have a more weakly developed subsoil, have softer underlying material, and are yellowish brown instead of reddish brown. They are less clayey and have a more weakly developed subsoil than Isaac soils and are yellowish brown instead of reddish brown. They are shallower than Magens soils and are yellowish brown instead of reddish brown.

Victory clay loam, 12 to 20 percent slopes (VcD).--This soil is on side slopes and ridgetops, mainly in the central part of St. Thomas. It also occurs as a small acreage in the northwestern part of St. Croix. Included in mapping were spots of Dorothea clay loam, Descalabrado clay loam, and Cramer gravelly clay loam.

This Victory soil has the profile described as representative for the series. The surface layer is 8 to 11 inches thick. The subsoil extends to a depth of 20 to 28 inches.

This soil is limited to use as pasture, woodland, and wildlife habitat. The strong slope makes it unsuitable for cultivation, and the erosion hazard is severe in cultivated areas that do not have a protective cover of vegetation. The limitation is moderate for dwellings, trafficways, campsites, picnic areas, paths, and trails, and severe for buildings for light industry or other commercial purposes, intensive play areas, and golf fairways. (Capability unit VIe-1; woodland group 1; Hilly Clay range site 2, precipitation zone 45 to 60 inches)

Victory clay loam, 20 to 40 percent slopes (VcE).--This soil is on side slopes, mainly in the northern part of St. Thomas. It also occurs as a small acreage in the northwestern part of St. Croix. Included in mapping were spots of Dorothea clay loam, Descalabrado clay loam, and Cramer gravelly clay loam.

The surface layer of this Victory soil is 7 to 10 inches thick. The subsoil extends to a depth of 17 to 25 inches.

This soil is limited to use as pasture, woodland, and wildlife habitat. The steep slope makes it unsuitable for cultivation, and the erosion hazard is severe in cultivated areas that do not have a protective cover of vegetation. The limitation is severe for most engineering and recreational uses. (Capability unit VIe-1; woodland group 1; Hilly Clay range site 2, precipitation zone 45 to 60 inches)

Volcanic Rock Land

Volcanic rock land (Vr) is made up of areas where volcanic rock outcrops cover 50 to 70 percent of the surface. Between the outcrops is very shallow, dark yellowish-brown, gravelly loam soil material. Loose stones and boulders are common. The slope gradient is 60 to 70 percent. The vegetation is brushy forest or brushy pasture. This land type occurs on the three larger islands and on some offshore smaller islands.

This land type is restricted to wildlife habitat and esthetic purposes. The very steep slopes, exposed rock, and shallow soil material preclude its use for commercial production of crops, forage, or trees and severely limit all engineering and recreational uses. (Capability unit VIIIs-1; no woodland classification; Rough Stony Land range site 10, all precipitation zones)

Grain sorghum, sorghum for silage, sweetpotatoes, tomatoes, sugarcane, and guineagrass are the principal crops on the Virgin Islands. None are irrigated. Crop response depends on adequate rainfall during the growing season.

Complete fertilizer is generally needed. The amount to be applied is best determined through soil tests. Crop residue management and applications of manure increase the supply of organic matter and help in controlling erosion.

The capability grouping used by the Soil Conservation Service, in which the soils are grouped according to their suitability for crops, is explained in the pages that follow, and suggested use and management of the soils are described by capability unit. At the end of this section is a table that shows estimated yields of specified crops on the soils now under cultivation.

The soils in capability units IIe-2, IIs-1, IIc-1, IIIs-1, IIIs-2, IIIsc-1, IIIc-1, IVe-2, and IVc-1 would be well suited to irrigation if water were available.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

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

Class I soils have few limitations that restrict their use. (There are no class I soils in the survey area.)

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. (There are no class V soils in the survey area.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry. For some soils on the Virgin Islands, shallowness and climate are limitations of about equal importance, and the subclass symbol indicates both, for example, IIIsc-1.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by w, s, and c, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIe-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small

letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units on the Virgin Islands are described, and suggestions for the use and management of the soils are given. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all the soils of a given series are in the unit. The capability unit designation for each soil in the survey area can be found in the "Guide to Mapping Units."

Capability Unit IIe-2

This unit consists of soils of the Glynn, Lavallee, and Parasol series. These soils are on foot slopes, alluvial fans, and stream terraces. They are gently sloping, deep, well drained, neutral to slightly alkaline, and friable. The subsoil is clayey to loamy. Some areas are gravelly. The supply of plant nutrients and organic matter is high. Permeability is moderate, and the water-holding capacity is moderate to high.

Suitable crops are sugarcane, tomatoes, and grain sorghum. Contour furrowing is needed if row crops are grown. The erosion hazard is moderate. Practices that control erosion and provide additional organic matter are needed to preserve tilth. Droughtiness is a limitation during extended dry periods. No water is available for irrigation.

Capability Unit IIs-1

The one soil in this unit, Fredensborg clay, 0 to 2 percent slopes, is a calcareous soil that is shallow over porous marl or soft limestone. The surface layer is well supplied with plant nutrients and organic matter. Runoff is slow, permeability is moderately slow, and the water-holding capacity is high.

This soil is suited to sugarcane, tomatoes, sweetpotatoes, and grain sorghum. It can be cultivated within only a narrow range of moisture content. When wet, it is sticky and plastic and is difficult to till. Preserving tilth and maintaining good structure are difficult. Droughtiness is likely to be a limitation during prolonged dry periods. No water is available for irrigation.

Capability Unit IIc-1

The one soil in this unit, San Anton clay loam, 0 to 3 percent slopes, is a deep, well-drained, friable, neutral to calcareous soil on flood plains and alluvial fans. Some areas are gravelly and sandy. Infiltration and permeability are moderate, and the water-holding capacity is moderate to high. The response to fertilization is good.

This soil is suited to tomatoes, sweetpotatoes, and grain sorghum. Generally it is in good tilth and is easy to work. Machinery can be used without difficulty. Artificial drainage is not required. There is no hazard of erosion. Lack of effective rainfall is the only limitation. No water is available for irrigation.

Capability Unit IIIe-1

This unit consists of soils of the Glynn, Parasol, and San Anton series. These soils are on foot slopes, alluvial fans, and stream terraces. They are deep, well drained, neutral to slightly alkaline, friable, and moderately sloping. They are dominantly clayey in the subsoil. Small areas are sandy and gravelly. Infiltration is moderate, permeability is moderate to moderately slow, and the water-holding capacity is moderate to high. The response to fertilization is good.

These soils are fairly well suited to sugarcane, tomatoes, grain sorghum, and guineagrass. Generally they are in good tilth and are easy to work. They should be farmed on the contour. The erosion hazard is severe. Close-growing plants are needed to protect natural drainageways, and diversion ditches are needed to intercept and remove water that runs down from the steeper hillsides. Droughtiness is a limitation during prolonged dry periods. No water is available for irrigation.

Capability Unit IIIs-1

The one soil in this unit, Fraternidad clay, 0 to 3 percent slopes, is a deep, moderately well drained, neutral to slightly alkaline soil on alluvial fans. The surface layer is friable to firm clay. It is underlain by firm clay. Fertility is high. Infiltration and permeability are slow.

This soil is suited to tomatoes, grain sorghum, sorghum for silage, and guineagrass. It is difficult to work and can be tilled within only a narrow range of moisture content. It shrinks and cracks when dry and swells when wet. Machinery skids and sticks if the soil is wet. Shallow ditches are needed for good surface drainage.

Capability Unit IIIs-2

The one soil in this unit, Fredensborg clay, 2 to 5 percent slopes, is calcareous and is shallow over soft limestone. It is well supplied with nutrients and organic matter. The response to fertilization is good. Runoff is medium, permeability is moderately slow, and the water-holding capacity is high.

This soil is suited to tomatoes, sweetpotatoes, grain sorghum, and sorghum for silage. It is difficult to work and can be tilled within only a narrow range of moisture content. The surface layer is sticky and plastic when wet. Preserving tilth and maintaining good structure are difficult. Furrows should be on the contour if row crops are grown. The erosion hazard is moderate. Close-growing plants are needed to protect natural drainageways,

and diversion ditches are needed to intercept and remove water that runs down from steeper hillsides. Droughtiness is a limitation during prolonged dry periods. No water is available for irrigation.

Capability Unit IIIsc-1

This unit consists of soils of the Hesselberg and Sion series. These are nearly level to gently sloping, calcareous, friable clays and clay loams that are 10 to 20 inches deep over soft or hard limestone. They are well supplied with plant nutrients and organic matter. Generally the response to fertilization is good. Infiltration and permeability are moderate, and the water-holding capacity is low.

Suitable crops are sugarcane, tomatoes, grain sorghum, sorghum for silage, and guineagrass. All plowing and furrowing should be on the contour if row crops are grown. There is no erosion hazard. The chief limitation is lack of effective rainfall. No water is available for irrigation.

Capability Unit IIIc-1

The one soil in this unit, Coamo clay loam, 2 to 5 percent slopes, is a deep, well-drained, neutral to calcareous, friable soil on alluvial fans. Small areas are gravelly and sandy. Infiltration and permeability are moderate, and the water-holding capacity is moderately high. The response to fertilization is good.

Suitable crops are tomatoes, sweetpotatoes, grain sorghum, and guineagrass. All cultivation and furrowing should be done on the contour if row crops are grown. The erosion hazard is moderate. Lack of effective rainfall is the chief limitation. No water is available for irrigation.

Capability Unit IVe-1

This unit consists of soils of the Aguilita, Pozo Blanco, and Sion series. These are gently sloping to moderately sloping, friable clay loams that are shallow over marl or soft limestone. Some areas have limestone outcrops, and some have limestone fragments on the surface. Fertility is moderate. Permeability and infiltration are moderately rapid, and the water-holding capacity is low.

These soils are generally in fairly good tilth and are fairly easy to work, but they are not suited to cultivated crops. Sugarcane, for example, is damaged by chlorosis. Pasture of guineagrass and native grasses is probably the best use. Good pasture management is needed. The erosion hazard is severe unless the surface is protected. Generally, drainage is not needed. Droughtiness is a limitation during prolonged dry periods. Irrigation should not be considered.

Capability Unit IVe-2

The one soil in this unit, Fraternidad clay, 3 to 12 percent slopes, eroded, is deep, moderately well drained, gently sloping to moderately sloping, plastic, and calcareous. Sheet erosion has removed a large part of the surface layer. This soil takes in water slowly and releases it slowly to plants. Permeability is slow. Fertility is high.

Generally this soil is in poor tilth and is difficult to work. It is difficult to till when wet, and it shrinks and cracks when dry. It can be cultivated within only a narrow range of moisture content. Machinery skids and sticks if the soil is wet. Furrowing should be done on the contour if cultivated crops are grown. Irrigation is beneficial.

Capability Unit IVe-3

This unit consists of soils of the Jacana series. These are gently sloping to moderately sloping, well-drained, neutral to slightly alkaline soils on foot slopes. They are moderately deep over volcanic rocks. The surface layer is friable clay loam. Infiltration and permeability are moderately slow, and the water-holding capacity is moderately high. Fertility is high. The response to fertilization is good.

These soils are well suited to guineagrass and native grasses and are fairly well suited to sugarcane. Generally they are in poor tilth and are difficult to work. Any cultivation should be shallow. It should be done on the contour and at optimum moisture content. If areas in pasture are to be used for cultivated crops, natural drainageways should be left in grass and used as protected outlets. The erosion hazard is severe unless the surface is protected by a grass cover or erosion is controlled by some other conservation practice. Good pasture management is needed, especially during dry periods when grass is semidormant. Crop response depends on adequate rainfall during the growing season. Stands of planted crops are likely to be poor.

Capability Unit IVe-4

The one soil in this unit, Fredensborg clay, 5 to 12 percent slopes, eroded, is on foot slopes. It is calcareous and is moderately deep over soft limestone. Runoff is moderately rapid, infiltration and permeability are moderately slow, and the water-holding capacity is high. Fertility is high. The response to fertilization is good.

Generally this soil is in poor tilth. It can be worked within only a narrow range of moisture content. The surface layer is sticky and plastic when wet, and tillage is difficult. Preserving tilth and maintaining good structure are difficult. All cultivation should be on the contour. If areas in pasture are to be used for cultivated crops, natural drainageways should be left in grass and used as protected outlets. The erosion hazard is severe unless the surface is protected by close-growing plants or erosion is controlled by some other conservation practice. Good pasture management is

needed, especially during dry periods when grass is semidormant. Crop response depends on adequate rainfall during the growing season. No water is available for irrigation.

Capability Unit IVw-1

The one soil in this unit, Aguirre clay, 0 to 2 percent slopes, is on the coastal plain. It is deep, poorly drained, and calcareous. The surface layer is friable to very firm clay. It is underlain by firm, sticky, plastic clay. Infiltration and permeability are slow. Natural fertility is moderate to high.

This soil is well suited to malojillograss or paragrass but is poorly suited to sugarcane and other cultivated crops. Generally it is in poor tilth and is difficult to work. It can be cultivated within only a narrow range of moisture content. The clay shrinks and cracks when dry and swells when wet. Machinery skids, slips, and sticks easily if the soil is wet. Poor drainage, the high clay content, and in some areas, the alkali make tillage and crop production difficult. Grazing animals should be kept off wet pasture because they destroy the grass by trampling. Open ditches are needed for surface drainage. Installing subsurface drainage is difficult because of the position of this soil on the landscape, the slow permeability, and an intermittently high water table.

Capability Unit IVc-1

The one soil in this unit, Cornhill gravelly clay loam, 0 to 2 percent slopes, is a deep soil on alluvial fans. The surface layer is gravelly clay loam that is friable when moist and brittle and hard when dry. The subsoil is heavy, plastic, sticky, calcareous clay that shrinks and cracks when dry. Infiltration and permeability are moderate in the surface layer and slow in the subsoil. Natural fertility is moderately high.

This soil contains much gravel. It is generally in poor tilth and is difficult to work. Stands of planted crops are likely to be poor. Most of the acreage is pasture. Good pasture management is needed. Grazing should be deferred to permit grasses to reseed. Lack of effective rainfall is a severe limitation. Drainage is no problem. No water is available for irrigation.

Capability Unit VIe-1

This unit consists of soils of the Cramer, Dorothea, Isaac, Jacana, and Victory series. These soils are moderately sloping to steep and are moderately deep to deep over volcanic rocks. The soil material is friable. Some areas have scattered rock fragments at or near the surface. Infiltration and permeability are moderate to moderately slow. Natural fertility is moderate.

These soils are well suited to guineagrass and native grasses. They are difficult to work because of the gravelly surface layer, and they should not be cultivated because of the slope and the risk of erosion. If areas in pasture are to be used for cultivated crops, they should be cultivated on the contour and natural drainageways should be left in grass. The erosion hazard is severe unless the surface is protected by permanent vegetation. Pasture management is needed, especially during dry periods when the grass is semidormant. Grazing should be controlled or deferred to permit grasses to reseed. Irrigation should not be considered.

Capability Unit VIe-2

The one soil in this unit, Magens silty clay loam, 30 to 50 percent slopes, is on mountainsides. This is a red, friable, acid, clayey soil that is deep over very highly altered material mixed with a few volcanic boulders. Infiltration and permeability are moderate, and the water-holding capacity is high. Fertility is moderately low. The response to fertilization is good.

This soil is easy to work, but the slope and the risk of erosion severely limit its use for cultivated crops. If areas in pasture are cultivated, they should be planted on the contour and natural drainageways should be kept in grass and used as protected outlets. The erosion hazard is very severe unless the surface is protected by a grass cover or erosion is controlled by some other conservation practice. Pasture management is needed, especially during dry periods when grass is semidormant. Grazing should be controlled or deferred to permit grasses to reseed. Irrigation should not be considered.

Capability Unit VIe-3

This unit consists of soils of the Aguilita and Pozo Blanco series. These are alkaline, sloping and strongly sloping, well-drained soils on uplands. They are shallow over soft limestone or other limy material. The surface layer is gravelly clay loam. Infiltration and permeability are moderate to rapid, and the water-holding capacity is low. Natural fertility is moderate.

These soils are well suited to guineagrass and native grasses. They are generally in fairly good tilth, but they are difficult to work and are susceptible to erosion. Stoniness and shallowness preclude cultivation. Most of the acreage is in pasture. Pasture management that promotes maximum growth of the best grasses is needed. Much of the acreage in brush could be cleared and seeded to suitable grasses. Irrigation should not be considered.

Capability Unit VIs-2

This unit consists of Diamond soils and Limestone rock land. The soils are nearly level to moderately

sloping, well-drained, friable, red clay loams that are very shallow over hard limestone. Limestone outcrops make up about 50 percent of the acreage. Infiltration and permeability are moderate to rapid, and the water-holding capacity is low. Natural fertility is medium.

These soils are well suited to guineagrass and native grasses. They are generally in fairly good tilth, but they are difficult to work. The shallowness and the outcrops preclude cultivation. Pasture management that promotes maximum growth of the best grasses is needed. Much of the acreage in brush could be cleared and seeded to suitable grasses. Irrigation should not be considered.

Capability unit VIs-3

This unit consists of soils of the Cramer, Descalabrado, and Southgate series. These soils are on mountainsides. They are moderately sloping to moderately steep, are well drained, and are less than 20 inches deep over volcanic rocks. Rock outcrops are common. The surface layer is friable clay loam or gravelly clay loam. Runoff is excessive, infiltration and permeability are moderate to moderately slow, and the water-holding capacity is low. Natural fertility is moderate.

These soils are fairly well suited to guineagrass and native grasses. They are not suited to cultivated crops. They are difficult to work because they are steep, shallow, and in places gravelly. Any cultivation should be done on the contour. Most of the acreage is in pasture and brush. Only a small part is cultivated. Many areas now in brush could be cleared and used for pasture. Pasture management is needed. The number of animals grazed should be reduced during dry periods. Droughtiness is a severe limitation. Irrigation should not be considered.

Capability Unit VIIe-1

This unit consists of soils of the Aguilita series. These are steep and very steep, well-drained, alkaline gravelly clay loams that are very shallow over soft limestone. They hold only a small amount of water that is available to plants. There are rock outcrops and many limestone fragments on the surface. Infiltration and permeability are moderate to rapid. Natural fertility is moderate.

These soils are generally in fairly good tilth but are difficult to work because they are steep, stony, and shallow. They are well suited to guineagrass and fairly well suited to native grasses. Most of the acreage is in pasture and brush. Pasture management should promote growth of the best plants, prevent loss of stands, and permit plants to reseed. The acreage in brush could be cleared and seeded to grass. Much of it would make good pasture. Erosion is a hazard unless a permanent grass cover is maintained. Irrigation should not be considered.

Capability Unit VIIe-2

The one soil in this unit, Dorothea clay loam, 40 to 60 percent slopes, is on mountainsides. It is a friable, neutral to slightly acid soil that is moderately deep to deep over altered volcanic rocks. Runoff is rapid, infiltration and permeability are moderate, and the water-holding capacity is high. Natural fertility is moderate.

This soil is well suited to guineagrass and native grasses. It is difficult to work because of the slope and consequently is not suited to cultivated crops. The erosion hazard is very severe unless the surface is protected by permanent vegetation. Pasture management is needed, especially during dry periods when the grass is semidormant. Grazing should be controlled and deferred to allow grasses to reseed. Irrigation should not be considered.

Capability Unit VIIs-1

This unit consists of soils of the Cramer series. These are steep, friable soils that are less than 20 inches deep over volcanic rocks. From 50 to 70 percent of the surface is covered with stones 1 to 3 feet in diameter. Runoff is excessive, infiltration and permeability are moderate, and the water-holding capacity is low. Natural fertility is moderate.

These soils are suited to guineagrass and native grasses. The slope, stoniness, and shallowness preclude cultivation. The erosion hazard is severe unless the surface is protected by permanent vegetation. Pasture management is needed, especially during periods when the grass is semidormant. Grazing should be controlled and deferred to allow grasses to reseed. Droughtiness is a limitation. Irrigation should not be considered.

Capability Unit VIIs-2

The one soil in this unit, Jaucas sand, 0 to 5 percent slopes, is adjacent to the sea and just above high tide. It is a deep, light-colored, calcareous, loose sand that contains many fragments of coral and seashells. It holds only a small amount of water available to plants. Drainage is excessive, and infiltration and permeability are very rapid. Natural fertility is low.

This soil is generally in good tilth and is easy to work at any moisture content. It is well suited to coconuts and seagrapes. It is somewhat poorly suited to guineagrass and native grasses. It is not suited to cultivated crops. Some areas are planted to coconuts, some are in brush, and those sprayed by sea water are barren. Irrigation should not be considered.

Capability Unit VIIs-3

This unit consists of soils of the Cramer, Descalabrado, and Southgate series and areas of rock land. The soils are very steep, friable, and clayey

and are very shallow over igneous rocks. Rock outcrops are common, and there are many rock fragments on the surface. Runoff is excessive, infiltration and permeability are moderate, and the water-holding capacity is low. Natural fertility is moderate.

If well managed, these soils are fairly well suited to guineagrass and native grasses. The slope, shallowness, and rockiness preclude cultivation. The erosion hazard is very severe unless the surface is protected by permanent vegetation. Most of the acreage is in pasture and brush. Pasture management is needed. The number of animals grazed should be reduced during dry periods when the grass is semidormant, and grazing should be deferred to permit grasses to reseed. Many areas now in brush could be cleared and used for pasture. Droughtiness is a limitation. Irrigation should not be considered.

Capability Unit VIIs-4

This unit consists only of Cobbly alluvial land. This land type is on the islands of St. John and St. Thomas. It occurs as gently sloping to moderately sloping, narrow strips close to intermittent streams, and it is subject to flooding. The texture varies. Subangular and subrounded, very hard volcanic cobblestones make up 59 to 75 percent of the soil mass. Infiltration and permeability are rapid, and the water-holding capacity is low.

Poor workability, the overflow hazard, rapid permeability, and stoniness preclude cultivation. Most of the acreage is in pasture and brush. Guineagrass and native grasses grow fairly well if pasture is well managed. The number of animals grazed should be reduced during dry periods when the grass is semidormant, and grazing should be deferred to allow plants to reseed. Many areas now in brush could be cleared and used as pasture. Irrigation should not be considered.

Capability Unit VIIIw-1

This unit consists of inundated swamps and flats in the coastal lowlands near the sea. These land types either are under sea water or are flooded during high tide. When the flats are not inundated by high tide, the water table is near the surface. In most places the surface is covered with a thin salt crust. The soil material consists of light-colored, saline, strongly alkaline sand and clay. Natural fertility is low.

These land types are of no value for farming. The swamps support mangrove trees. They are fished for oysters and are used as recreational areas. The flats support only salt-tolerant weeds and grasses. Much of the acreage is barren. None of it is grazed by livestock.

Capability Unit VIIIs-1

This unit consists of land types that have no potential for cultivated crops, grasses, or trees. These land types range from nearly level to steep. All are rocky and shallow. There is very little soil material. Some areas have been reworked and leveled in cut and fill operations. Others have been filled with sandy material dredged from the bottom of the sea.

Estimated Yields

Estimated yields of the principal crops grown on the Virgin Islands, under two levels of management, are shown in table 2. The estimates are for the soils now under cultivation. They are based on records kept at experiment stations, on information obtained from farmers, and on records compiled by agronomists who have had experience with crops and soils on the islands. The yields are those obtained during periods of average rainfall. During wet periods, yields are likely to be higher than those shown in table 2, and during unusually dry periods, they are likely to be much lower.

The A columns in table 2 show the yields that can be expected under average management. The B columns show the yields that can be expected under improved management.

Improved management provides--

1. Complete fertilization according to the results of soil tests.
2. Adequate seedbed preparation.
3. Drainage and water control if needed.
4. Planting of proven varieties.
5. Cultivation at proper range of moisture content and to the proper depth.
6. Control of weeds, pests, and plant diseases.
7. Harvesting of crops at the proper time.
8. Management of crop residue. No burning of residue.
9. Protection from overgrazing.
10. Establishment of erosion control practices.

None of the crops grown on the islands are irrigated. Crop response varies according to the amount of effective rainfall during the growing season. September or October is the most favorable time for planting.

Some crops that are not produced commercially were planted at the Agricultural Research Service Experiment Station on Fredensborg clay, 2 to 5 percent slopes. The yields obtained under improved management were--

Corn for silage: 20 tons per acre, green weight, in two crops.
Elephantgrass: 40 tons per acre, in three cuttings, using 250 pounds of nitrogen per acre.
Corn for grain, St. Croix Long Ear variety: 1,800 pounds per acre.
Yams, Sealtop variety (Discorea): 12 tons per acre.
Cassava: 15 tons per acre, in a 9-month period.
Bananas: 50 hundredweights per acre. Planted 4 feet apart both ways.
String beans: 12,000 pounds per acre.

TABLE 2.--ESTIMATED AVERAGE YIELDS PER ACRE OF PRINCIPAL CROPS UNDER TWO LEVELS OF MANAGEMENT

[Figures in columns A indicate yields under average management; figures in columns B indicate yields under improved management]

Soil	Tomatoes		Sweetpotatoes		Grain sorghum		Sorghum for silage		Guineagrass	
	A	B	A	B	A	B	A	B	A	B
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Tons	Tons	Tons	Tons
Aguilita gravelly clay loam, 2 to 5 percent slopes	6,000	7,500	-----	------	3,500	4,500	15	18	7	9
Aguirre clay, 0 to 2 percent slopes	6,000	7,500	-----	------	4,000	5,000	17	20	8	10
Coamo clay loam, 2 to 5 percent slopes	7,000	8,500	7,000	9,000	4,000	5,000	19	22	9	11
Cornhill gravelly clay loam, 0 to 2 percent slopes	5,500	7,000	6,500	8,500	3,500	4,500	18	21	8	10
Fraternidad clay, 0 to 3 percent slopes	6,500	8,000	-----	------	4,000	5,000	17	20	8	10
Fraternidad clay, 3 to 12 percent slopes, eroded	5,500	7,000	-----	------	3,500	4,500	14	17	6	8
Fredensborg clay, 0 to 2 percent slopes	7,500	9,000	8,000	10,000	5,000	6,000	22	25	12	14
Fredensborg clay, 2 to 5 percent slopes	7,000	8,500	7,000	9,000	4,300	5,300	20	23	10	12
Fredensborg clay, 5 to 12 percent slopes, eroded	6,500	8,000	6,000	8,000	4,000	5,000	15	18	7	9
Glynn clay loam, 2 to 5 percent slopes	8,000	9,500	8,000	10,000	5,000	6,000	22	25	12	14
Glynn clay loam, 5 to 12 percent slopes, eroded	6,500	8,000	7,000	9,000	4,300	5,300	20	23	9	11
Hesselberg clay, 0 to 2 percent slopes	6,500	8,000	6,500	8,500	4,000	5,000	17	20	9	11
Jacana clay loam, 2 to 5 percent slopes	5,000	6,500	-----	------	3,500	4,500	14	17	6	8
Jacana clay loam, 5 to 12 percent slopes	5,000	6,500	-----	------	3,500	4,500	14	17	6	8
Lavallee gravelly clay loam, 2 to 5 percent slopes	8,000	9,500	8,000	10,000	5,000	6,000	22	25	12	14
Parasol clay loam, 2 to 5 percent slopes	8,000	9,500	8,000	10,000	5,000	6,000	22	25	12	14
Parasol clay loam, 5 to 12 percent slopes	6,500	8,000	7,000	9,000	4,300	5,300	20	23	9	11
Pozo Blanco clay loam, 5 to 12 percent slopes	6,000	7,500	-----	------	3,500	4,500	15	18	7	9
San Anton clay loam, 0 to 3 percent slopes	8,000	9,500	8,000	10,000	5,000	6,000	22	25	12	14
San Anton clay loam, 5 to 12 percent slopes	6,500	8,000	7,000	9,000	4,300	5,300	20	23	9	11
Sion clay loam, 0 to 5 percent slopes	6,500	8,000	6,500	8,500	4,000	5,000	17	20	9	11
Sion clay loam, 5 to 12 percent slopes	6,000	7,500	-----	------	3,500	4,500	15	18	7	9

Cucumbers: 6,000 pounds per acre.
Pineapple, Red Spanish variety: 21,500 pounds per acre. Fruits were 3 to 4 pounds each.
Papaya: 10 tons of marketable fruit, 15 tons total fruit, per acre.

USE OF THE SOILS FOR SHADE AND FRUIT TREES, SHRUBS, AND ORNAMENTALS[2]

Tables 3 and 4 show the suitability of many plants for specified soils on the islands. Among these plants are shade trees, fruit trees, and trees and shrubs that are decorative and are used as ornamentals. None are produced commercially. Table 3 is for St. Croix, and table 4 is for St. Thomas and St. John.

Many of these plants are well suited. Some can be establihhed under special management. Others, particularly ornamentals, can be established in holes, trenches, and garden beds that are filled with suitable soil material.

USE OF THE SOILS FOR RANGE

Grassland on the Virgin Islands amounts to almost 25,000 acres. Most likely, much of the acreage formerly in sugarcane will revert or be converted to grassland. Production of beef cattle, predominantly the Senapol breed, is the chief source of farm income.

The soils used as range are mainly the deep clays and clay loams on the coastal plain and on flood plains, foot slopes, and low hills, and the shallow clays on side slopes. Most of these soils are fertile. Their suitability for rangeland is limited mainly by lack of sufficient rainfall.

Range Sites and Condition Classes

Different kinds of soils produce different kinds of grass and other vegetation. The soils that have similar climatic and physiographic features and that produce about the same kinds of plants and about equal yields of forage are grouped together for range management purposes. These groups are called range sites. Each range site has its own distinctive potential for producing native plants and retains its ability to reproduce this plant community unless the soils are materially altered or have deteriorated.

Range condition is determined mainly by comparing the kinds and numbers of plants that make up the vegetative cover with those in the potential native plant cover, or climax vegetation, for the same site.

Climax vegetation, or potential native plant cover, is the stabilized plant community on a particular site. It reproduces itself and does not change so long as the environment remains unchanged. Decreasers are plants in the climax vegetation that tend to decrease if heavily grazed. These plants generally are the tallest, most productive, and most palatable perennials. Increasers are plants in the climax vegetation that normally increase as the decreasers decrease. These plants commonly are the shorter, less productive, less palatable plants.

Invaders are plants that are not part of the climax vegetation but that become established after the climax vegetation has been heavily grazed. Many invaders are woody plants. They may originate nearby or at a great distance.

Range condition indicates the degree to which the composition of the existing plant community differs from the climax vegetation. Four classes are recognized. A range is in excellent condition if 76 to 100 percent of the vegetation is the same kind as that in the original stand; it is in good condition if the percentage is between 51 and 75; in fair condition if the percentage is between 26 and 50; and in poor condition if the percentage is 25 or less.

The changes in the plant cover may be of a permanent or temporary nature. If management is good and there has been no soil deterioration, rapid recovery to the original climax cover can be expected. If the soil has deteriorated, from trampling or from erosion, recovery is much slower.

Descriptions of Range Sites

The 11 range sites recognized on the islands are described in the following pages. Each site description gives estimates of the total annual yield of air-dried forage, per acre, on a site in excellent condition. The soil series represented are named in the description of each site, but this does not mean that all the soils of a given series are in the site.

1. Deep Range Site
(45 to 60 inches precipitation)

This site occurs mostly at the base of hills, along stream terraces, and on alluvial fans. It consists of soils of the Coamo, Glynn, Lavallee, and San Anton series. These are clay loams that are more than 20 inches deep.

This site is very well suited to guineagrass and pangolagrass. If overgrazed, these grasses are replaced by hurricanegrass and Barbados sourgrass. Brush invades as range condition becomes poorer.

[2] By Richard M. Bond and Axel Fredericksen, Agricultural Research Service, Agricultural Experiment Station, Kingshill, St. Croix.

TABLE 3.--SUITABILITY OF FRUIT TREES, SHADE TREES, EXOTICS, AND ORNAMENTALS FOR SPECIFIED SOILS ON ST. CROIX

[Figure 1 indicates that the plant is suited to the soil; figure 2 indicates that it is suited under special management; figure 3 indicates that the plant is not suited]

Plants	Soils																				
	Aguilita gravelly clay loam	Aguirre clay	Coamo clay loam	Cornhill gravelly clay loam	Cramer gravelly clay loam	Cramer stony clay loam	Descalabrado clay loam	Diamond clay loam	Fratermidad clay	Fredensborg clay	Glynn clay loam	Hesselberg clay	Isaac gravelly clay loam	Jacana clay loam	Jaucas sand	Lavallee gravelly clay loam	Limestone rock land	Parasol clay loam	San Anton clay loam	Sion clay loam	Southgate clay loam	Victory clay loam
African tulip	3	2	2	2	2	2	2	3	2	2	2	3	2	1	3	2	3	2	1	2	2	2
Alamanda	3	2	1	1	1	1	1	3	2	2	2	3	2	1	2	1	3	1	1	2	2	1
Almond	2	2	2	2	1	1	1	3	2	2	2	3	1	1	1	1	3	1	1	2	1	1
Australian pine	2	2	1	1	1	1	1	3	2	1	1	2	1	1	2	1	2	1	1	1	1	1
Avocado	2	3	2	2	2	2	2	3	3	1	3	3	2	1	3	1	3	1	2	1	2	2
Bamboo	2	2	2	2	2	2	1	3	2	2	2	3	2	2	2	2	3	1	1	1	2	2
Banana, plantain	2	2	1	2	1	2	2	3	2	1	2	3	1	1	3	1	3	1	1	1	2	1
Bougainvillea	1	2	1	1	1	1	1	2	1	1	2	2	1	1	2	1	3	1	1	1	1	1
Breadfruit	3	3	3	3	2	2	2	3	2	3	3	3	3	2	3	2	3	2	2	2	3	2
Cashew	3	2	1	2	1	2	1	3	2	2	2	3	1	1	1	1	3	1	1	2	2	1
Cedar (tabebuia)	1	2	2	2	1	1	1	2	2	1	2	2	1	1	2	1	2	1	1	1	1	1
Coconut palm	2	2	2	2	1	1	1	3	2	1	2	2	1	1	1	1	3	1	1	1	1	1
Cocoplum	3	3	1	3	2	3	2	3	2	2	2	3	2	1	1	1	3	1	1	2	2	2
Croton	2	2	1	1	1	1	1	3	2	2	2	3	2	1	2	1	3	1	1	1	2	1
Custardapple	3	3	3	3	2	2	2	3	2	3	3	3	2	1	3	2	3	2	1	2	2	2
Date	2	2	2	2	2	3	2	3	2	2	2	3	2	1	2	1	3	1	1	2	2	2
Flamboyanttree	1	2	1	1	1	1	1	2	1	2	1	2	1	1	1	1	3	1	1	1	1	1
Frangipani	1	2	1	1	1	1	1	2	2	1	1	2	1	1	2	1	3	1	1	1	1	1
Genip	2	2	1	2	1	1	1	2	2	1	1	2	1	1	2	1	3	1	1	1	1	1
Ginger Thomas	1	2	1	1	1	1	1	2	2	1	2	2	1	1	2	1	2	1	1	1	1	1
Gooseberry	2	2	1	2	1	1	1	3	1	1	1	2	2	1	2	1	3	1	1	1	1	1
Governorsplum	2	2	2	2	1	1	1	3	2	1	2	3	2	1	3	1	3	1	1	1	2	1
Guava	2	2	1	2	1	1	1	2	1	2	1	2	1	1	2	1	2	1	1	2	1	1
Guavaberrytree	3	2	2	2	1	1	1	3	3	3	2	3	2	1	3	1	3	1	2	2	3	1
Hibiscus	2	2	2	2	1	1	1	3	2	1	2	2	1	1	2	1	3	1	1	2	2	1
Hogplum	3	2	1	2	1	1	1	3	1	1	1	2	1	1	3	1	3	1	1	1	1	1
Jerusalemthorn	3	3	1	1	2	2	2	3	2	2	1	2	2	2	3	2	3	2	2	2	2	2
Jujube	2	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1	3	1	1	1	1	1
Lime	1	2	1	1	1	1	1	2	2	1	2	2	2	1	3	1	2	1	1	1	1	1
Mahogany	1	2	1	1	1	1	1	2	1	1	1	2	1	1	2	1	2	1	1	1	1	1
Mamey	2	2	1	1	1	1	1	3	1	1	1	3	1	1	2	1	3	1	1	1	1	1
Mango	3	2	1	2	1	1	1	3	2	2	2	3	1	1	3	2	3	1	1	3	2	1
Mesple	1	2	1	2	1	1	1	2	1	1	2	2	1	1	2	1	1	1	1	1	1	1
Oleander	2	2	1	2	1	1	1	2	1	1	1	3	1	1	2	1	3	1	1	1	1	1
Orange, grapefruit	3	3	2	2	2	2	2	3	3	2	2	3	2	2	3	2	3	2	3	2	3	2
Ota Haiti	3	1	1	3	2	2	2	3	2	2	2	3	1	1	1	1	3	1	1	2	1	2
Papaya	2	2	1	2	1	2	1	3	2	1	2	2	1	1	2	1	3	1	1	1	1	1
Pineapple	3	3	1	3	1	1	1	3	3	2	2	3	2	2	3	2	3	1	2	2	3	2
Pomegranate	3	2	2	2	1	1	1	3	3	2	2	3	2	1	3	2	3	1	1	2	2	2
Plums de Terre	3	3	2	3	1	1	1	3	2	2	2	3	2	1	3	1	3	1	1	2	2	1

TABLE 3.--SUITABILITY OF FRUIT TREES, SHADE TREES, EXOTICS, AND ORNAMENTALS FOR SPECIFIED SOILS ON ST. CROIX--CONTINUED

Plants	Soils																			
	Aguilita gravelly clay loam	Aguirre clay	Coamo clay loam	Cornhill gravelly clay loam	Cramer gravelly clay loam	Cramer stony clay loam	Descalabrado clay loam	Diamond clay loam	Fraternidad clay	Fredensborg clay	Glynn clay loam	Hesselberg clay	Isaac gravelly clay loam	Jacana clay loam	Jaucas sand	Lavallee gravelly clay loam	Limestone rock land	Parasol clay loam	San Anton clay loam	Sion clay loam	Southgate clay loam	Victory clay loam
Royal palm	3	2	1	3	1	1	1	3	2	1	1	3	2	1	2	1	3	1	1	2	1	1
Seagrape	2	3	2	2	2	2	2	3	2	2	2	2	2	1	1	2	3	1	1	2	2	2
Soursop	2	3	1	3	1	1	1	3	2	2	2	3	2	1	3	2	3	1	1	2	2	1
Sugarapple	2	2	1	1	1	1	1	3	2	2	2	3	1	1	3	1	3	1	1	1	2	1
Tamarind	1	2	1	1	1	1	1	2	1	1	1	2	1	1	2	1	3	1	1	1	1	1
Tanya	2	3	2	2	2	2	2	3	2	2	2	3	3	1	3	1	3	1	1	1	2	2
Teak	-	3	2	2	3	3	3	3	2	1	1	1	2	1	3	1	3	1	1	1	3	1
Turpentine-myrtle	1	2	1	2	1	1	1	2	1	1	1	2	1	1	2	1	3	1	1	1	1	1
West Indian cherry	2	2	1	2	1	1	1	3	2	1	1	3	1	1	3	1	3	1	1	1	1	1
Yam	3	3	2	2	2	3	2	3	2	1	3	3	2	1	2	1	3	1	2	1	1	1

TABLE 4.--SUITABILITY OF FRUIT TREES, SHADE TREES, EXOTICS, AND ORNAMENTALS FOR SPECIFIED SOILS ON ST. THOMAS AND ST. JOHN

[Figure 1 indicates that the plant is suited to the soil; figure 2 indicates that it is suited under special management; figure 3 indicates that the plant is not suited]

Plants	Soils															
	Aguilita gravelly clay loam	Cramer gravelly clay loam	Cramer stony clay loam	Descalabrado clay loam	Dorothea clay loam	Glynn clay loam	Isaac gravelly clay loam	Jacana clay loam	Jaucas sand	Lavallee gravelly clay loam	Limestone rock land	Magens silty clay loam	Pozo Blanco clay loam	San Anton clay loam	Southgate clay loam	Victory clay loam
African tulip	3	2	2	2	2	2	2	1	3	2	3	1	2	1	2	2
Alamanda	3	1	1	1	1	2	2	1	2	1	3	1	3	1	2	1
Almond	2	1	1	1	1	2	1	1	1	1	3	1	1	1	1	1
Australian pine	2	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1
Avocado	2	2	2	2	2	3	2	1	3	1	3	2	1	2	2	2
Bamboo	2	2	2	1	2	2	2	2	2	2	3	1	2	1	2	2
Banana, plantain	2	1	2	2	1	2	1	1	3	1	3	1	2	1	2	1
Bougainvillea	1	1	1	1	1	2	1	1	2	1	3	1	1	1	1	1
Breadfruit	3	2	2	2	2	3	3	2	3	2	3	1	2	2	3	2
Cashew	3	1	2	1	1	2	1	1	1	1	3	1	2	1	2	1
Cedar (tabebuia)	1	1	1	1	1	2	1	1	2	1	2	1	1	1	1	1
Coconut palm	2	1	1	1	1	2	1	1	1	1	3	2	1	1	1	1
Cocoplum	3	2	3	2	2	2	2	1	1	1	3	2	3	1	2	2
Croton	2	1	1	1	1	2	2	1	2	1	3	1	2	1	2	1
Custardapple	3	2	2	2	2	3	2	1	3	2	3	1	3	1	2	2
Date	2	2	3	2	2	2	2	1	2	1	3	2	2	1	2	2
Flamboyanttree	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1
Frangipani	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1	1
Genip	2	1	1	1	1	1	1	1	2	1	3	1	1	1	1	1
Ginger Thomas	1	1	1	1	1	2	1	1	2	1	2	1	1	1	1	1
Gooseberry	2	1	1	1	1	1	2	1	2	1	3	1	2	1	1	1
Governorsplum	2	1	1	1	1	2	2	1	3	1	3	1	2	1	2	1
Guava	2	1	1	1	1	1	1	1	2	1	2	1	2	1	1	1
Guavaberrytree	3	1	1	1	1	2	2	1	3	1	3	1	3	2	3	1
Hibiscus	2	1	1	1	1	2	1	1	2	1	3	1	2	1	2	1
Hogplum	3	1	1	1	1	1	1	1	3	1	3	1	2	1	1	1
Jerusalemthorn	3	2	2	2	2	1	2	2	3	2	3	2	2	2	2	2
Jujube	2	1	1	1	1	1	1	1	1	1	3	2	2	1	1	1
Lime	1	1	1	1	1	2	2	1	3	1	2	1	1	1	1	1
Mahogany	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1
Mamey	2	1	1	1	1	1	1	1	2	1	3	1	2	1	1	1
Mango	3	1	1	1	1	2	1	1	3	2	3	1	2	1	2	1
Mesple	1	1	1	1	1	2	1	1	2	1	1	2	1	1	1	1
Oleander	2	1	1	1	1	1	1	1	2	1	3	1	2	1	1	1
Orange, grapefruit	3	2	2	2	2	2	2	2	3	2	3	1	2	3	3	2
Ota Haiti	3	2	2	2	2	2	1	1	1	1	3	2	2	1	1	2
Papaya	2	1	2	1	1	2	1	1	2	1	3	1	1	1	1	1
Pineapple	3	1	1	1	2	2	2	2	3	2	3	1	3	2	3	2
Pomegranate	3	1	1	1	2	2	2	1	3	2	3	2	2	1	2	2
Plums de Terre	3	1	1	1	1	2	2	1	3	1	3	1	3	1	2	1

TABLE 4.--SUITABILITY OF FRUIT TREES, SHADE TREES, EXOTICS, AND ORNAMENTALS FOR SPECIFIED SOILS ON ST. THOMAS AND ST. JOHN--CONTINUED

Plants	Soils															
	Aguilita gravelly clay loam	Cramer gravelly clay loam	Cramer stony clay loam	Descalabrado clay loam	Dorothea clay loam	Glynn clay loam	Isaac gravelly clay loam	Jacana clay loam	Jaucas sand	Lavallee gravelly clay loam	Limestone rock land	Magens silty clay loam	Pozo Blanco clay loam	San Anton clay loam	Southgate clay loam	Victory clay loam
Royal palm	3	1	1	1	1	1	2	1	2	1	3	1	2	1	1	1
Seagrape	2	2	2	2	2	2	2	1	1	2	3	2	2	1	2	2
Soursop	2	1	1	1	1	2	2	1	3	2	3	1	2	1	2	1
Sugarapple	2	1	1	1	1	2	1	1	3	1	3	2	2	1	2	1
Tamarind	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1	1
Tanya	2	2	2	2	2	2	3	1	3	1	3	2	2	1	2	2
Teak	-	3	3	3	1	1	2	1	3	1	3	1	2	1	3	1
Turpentine-myrtle	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1	1
West Indian cherry	2	1	1	1	1	1	1	1	3	1	3	1	1	1	1	1
Yam	3	2	3	2	1	3	2	1	2	1	3	2	2	2	1	1

Controlling brush is a serious problem; roots must be killed or removed. Guineagrass recovers naturally if brush is removed.

The total annual yield of forage is about 24,000 pounds per acre.

2. Hilly Clay Range Site (45 to 60 inches precipitation)

This site consists of soils of the Dorothea, Isaac, Jacana, Parasol, and Victory series. These are clays and clay loams. The stratum below a depth of 20 inches does not restrict grass roots.

This site is very well suited to guineagrass and pangolagrass. If it is overused, hurricanegrass becomes abundant and brush invades. Controlling the invasion of brush, particularly of Guava brush, is a serious problem.

The total annual yield of forage is about 16,000 pounds per acre.

3. Shallow Range Site (45 to 60 inches precipitation)

This site occurs mostly in steep mountainous areas. It consists of soils of the Descalabrado series. These are clay loams that are less than 20 inches deep over bedrock.

Guineagrass and pangolagrass make up the climax vegetation. If overgrazed, they are replaced by hurricanegrass and Barbados sourgrass. Mexican bluegrass (Chloris inflata) and brush invade as range condition becomes poorer.

Controlling brush is a serious problem. Guineagrass recovers naturally if brush is removed. The erosion hazard is severe in limestone areas denuded of vegetation.

The total annual yield of forage is about 12,000 pounds per acre.

4. Deep Range Site (35 to 45 inches precipitation)

This site occurs along streams, on alluvial fans, and at the base of the volcanic and limestone hills. It consists of soils of the Aguirre, Coamo, Cornhill, Fraternidad, Fredensborg, Glynn, Lavallee, and San Anton series. These are clays and clay loams. Most are deeper than 20 inches.

Guineagrass and pangolagrass make up the climax vegetation. If overgrazed, they are replaced by hurricanegrass, Mexican bluegrass, and Barbados sourgrass. Brush invades as range condition becomes poorer.

Controlling brush is a serious problem. Removal of all roots by mechanical means or by the use of herbicides and good grass management keep invasion at a minimum. Guineagrass recovers naturally if brush is removed.

The total annual yield of forage is about 16,000 pounds per acre.

5. Hilly Clay Range Site (35 to 45 inches precipitation)

This site consists of soils of the Dorothea, Isaac, Jacana, Parasol, and Pozo Blanco series. These are clay loams. The stratum below a depth of 20 inches does not restrict grass roots.

This site is well suited to guineagrass but is only fairly well suited to pangolagrass. If these grasses are overgrazed, hurricanegrass and Barbados sourgrass become abundant. Brush and poor grass species, such as Mexican bluegrass, invade after continuous overuse of this site.

Erratic rainfall and brush invasion are the two most critical limitations.

The total annual yield of forage is about 12,000 pounds per acre.

6. Shallow Range Site (35 to 45 inches precipitation)

This site occurs in mountainous areas and on foot slopes. It consists of soils of the Aguilita, Cramer, Descalabrado, Hesselberg, Sion, and Southgate series.

The climax vegetation is guineagrass. Pangolagrass grows only on the well-managed, deeper parts of the site. Hurricanegrass and Mexican bluegrass are the principal increasers if the site is heavily grazed. Acacia, moran, and numerous other undesirable species also become abundant.

Brush invasion is the most serious limitation.

The total annual yield of forage is about 8,000 pounds per acre.

7. Deep Range Site (25 to 35 inches precipitation)

This site occurs along streams, on alluvial fans, and at the base of the volcanic hills. It consists of soils of the Coamo, Cornhill, Glynn, and San Anton series. These are clay loams that are more than 20 inches deep.

The climax vegetation is guineagrass. If overgrazed, it is replaced by hurricanegrass and Barbados sourgrass. Brush and cactus invade as range condition becomes poorer.

Erratic rainfall and brush invasion are the two major limitations. Guineagrass recovers naturally if brush is removed.

The total annual yield of forage is about 12,000 pounds per acre.

8. Hilly Clay Range Site (25 to 35 inches precipitation)

This site consists of soils of the Isaac, Jacana, and Pozo Blanco series. These are clay loams. The stratum below a depth of 20 inches does not restrict grass roots.

The climax vegetation is guineagrass. If overgrazed, it is replaced by hurricanegrass and Barbados sourgrass. Continuous overuse of the site results in complete invasion of brush and Mexican bluegrass.

Erratic rainfall and brush invasion are the two most critical limitations. Guineagrass recovers naturally if brush is removed.

The total annual yield of forage is about 9,600 pounds per acre.

9. Shallow Range Site
(25 to 35 inches precipitation)

This site occurs in mountainous areas and on foot slopes. It consists of soils of the Aguilita, Cramer, Descalabrado, and Southgate series. These soils are clay loams.

Guineagrass is the climax vegetation. If overgrazed, it is replaced by hurricanegrass and Barbados sourgrass. Continuous overgrazing results in invasion of Mexican bluegrass and numerous species of brush.

Erratic rainfall and brush invasion are the two most critical limitations. Brush should be removed by mechanical means or by burning. Guineagrass recovers naturally if brush is removed.

The total annual yield of forage is about 6,000 pounds per acre.

10. Rough Stony Land Range Site
(25 to 60 inches precipitation)

This site occurs in volcanic and limestone areas throughout the islands. It consists of Diamond and Southgate soils, Limestone rock land, and rock land. The soils are clay loams that are shallow over rock.

Guineagrass is the potential plant cover in areas where the soil is deep enough for grass roots. Production is limited because there is little soil material and little or no available moisture.

11. Coastal Sand Range Site
(25 to 60 inches precipitation)

The one soil in this site, Jaucas sand, 0 to 5 percent slopes, is a deep, loose sand that contains many fragments of coral and seashells. It occurs along the seashore. It is very low in moisture-holding capacity and is very droughty.

The potential native plant cover is seashore dropseed (Sporobolus virginicus).

USE OF THE SOILS FOR WOODLAND[3]

Approximately 34,000 acres on the Virgin Islands is woodland. Of this acreage, 20,000 acres has potential for timber production. About 15,000 acres of this potential timberland is in mountainous areas in the northwestern part of St. Croix and on hills in the central and southwestern parts. It is estimated that there is 500,000 board feet of natural mahogany of commercial quality on the islands, most of which is standing on a 300-acre tract in the central part of St. Croix. A large part of the acreage used for timber production, in fact, about 13,500 acres, is under private, generally absentee, ownership.

The principal species on the islands are West Indies mahogany, which grows on all but the steepest slopes, and thibet, or woman's tongue, which is a common pasture shade tree. Teak has been introduced recently. The desirability of these high-grade woods makes salvage of the logs practical despite the small volume involved. Nearly all wood products are utilized on the islands as craftwood, cabinet wood, fence posts, and marine items.

Woodland Suitability Groups

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect growth of trees and management of the stands. The soils of the Virgin Islands have been assigned to four woodland suitability groups. Each group consists of soils that are about the same in suitability for wood crops, potential productivity, and management requirements. The factors considered in assigning each soil to a woodland group include potential productivity, species to be favored in management of existing stands and to be preferred for planting, and soil-related hazards and limitations to be considered in management.

Estimates of potential productivity are given in annual growth in board feet for West Indies mahogany, in plantations under intensive management, using a 75-year rotation.

Plant competition refers to invasion by unwanted shrubs and vines when openings are made in the canopy. Competition is slight if invaders do not prevent adequate regeneration and early growth and do not interfere with the development of planted seedlings. It is moderate if the invaders delay but do not prevent the establishment of a normal, fully stocked stand. Competition is severe if invaders prevent adequate regeneration or if intensive site preparation and maintenance are needed. Mahogany occurs naturally in nearly pure stands on the islands. In plantations, plant competition is severe.

Seedling mortality refers to the expected loss of naturally occurring or planted seedlings, as a result of unfavorable soil characteristics. Mortality is slight if the expected loss is less than 25 percent; it is moderate if the expected loss is between 25 and 50 percent; and it is severe if the expected loss is more than 50 percent. Seedling mortality is not a limitation in woodland management on the islands; mortality is seldom more than slight.

Equipment limitation refers to soil characteristics and topographic features that restrict or prohibit the use of conventional equipment for planting, harvesting of wood crops, road construction,

[3]By Robert W. Nobles, Institute of Tropical Forestry, United States Forest Service.

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and control of unwanted vegetation. The limitation is slight if there is little or no restriction on the type of equipment or the time of year that the equipment can be used. The limitation is moderate if the use of equipment is restricted by one or more unfavorable characteristics, such as slope, stones or other obstructions, seasonal wetness, instability, or risk of injury to roots of trees. The limitation is severe if conventional equipment cannot be used.

The hazards of drought, exposure, and a high transpiration rate make most east-facing slopes on the islands unsuitable for timber production.

The woodland groups on the islands are described in the following paragraphs. The soil series represented are named in the description of each site, but this does not mean that all the soils of a given series are in the site. The woodland group designation for each soil on the islands can be found in the "Guide to Mapping Units."

Woodland Group 1

This group consists of soils of the Dorothea, Isaac, Magens, and Victory series. These soils are moderately fine textured, are well drained, and are deep over highly weathered volcanic rocks (saprolite). They occur on side slopes of dissected volcanic uplands. The slope gradient is 12 to 60 percent. Drainage is good. Runoff is medium to rapid, permeability is moderate, and the available water capacity is high. These soils are used mostly for terraced, cultivated crops and for pasture.

Annual growth is estimated at 150 to 250 board feet per acre each year. Mahogany should be selected for planting and favored in existing stands. The amount of moisture available causes moderate competition from unwanted trees, shrubs, and vines but normally insures only slight seedling mortality. The equipment limitation is slight if the slope is less than 20 percent, moderate if it is between 20 and 40 percent, and severe if it is more than 40 percent.

Woodland Group 2

This group consists of soils of the Aguilita, Fredensborg, Pozo Blanco, Sion, and Diamond series, and Limestone rock land. The soils are moderately fine textured to fine textured, are well drained, and are shallow and moderately deep over soft marly limestone. They occur on alluvial fans, foot slopes, and low hills, mostly on St. Croix. The slope gradient is 0 to 60 percent. Drainage is good. Runoff is medium to rapid, permeability is moderate, and the available water capacity is moderate.

About 90 percent of the acreage in natural mahogany forest on St. Croix is on these soils. Mahogany should be favored in existing stands. Both mahogany and teak are suitable for planting (pl. II). The amount of available moisture causes severe competition from unwanted trees and shrubs in natural areas and from shrubs, grasses, and weeds in plantations. Seedling mortality is slight. The equipment limitation is slight.

Woodland Group 3

This group consists of soils of the Glynn, Lavallee, Parasol, and San Anton series. These are moderately fine textured, well-drained soils that are deep over stratified sediments of varying textures. All are on alluvial fans and flood plains. Drainage is good. Runoff is medium, permeability is moderate, and the available water capacity is moderate to high.

These soils are generally not used for timber production, but if they are, excellent mahogany and teak plantations can be expected. Annual growth is estimated at 250 to 350 board feet per acre each year. The supply of moisture is good to poor. If rainfall is plentiful, plant competition is very severe. Generally, seedling mortality is slight. The equipment limitation is slight.

Woodland Group 4

This group consists of soils of the Cramer, Isaac, Descalabrado, Jacana, and Southgate series. These are moderately fine textured, well-drained soils that are moderately deep and shallow over hard volcanic rock. They are on side slopes of dissected volcanic uplands. The slope gradient is 2 to 60 percent. Drainage is good. Runoff is medium to rapid, permeability is moderate, and the available water capacity is low to medium.

Annual growth is estimated at 150 board feet per acre on the upper slopes and 300 board feet per acre on the lower slopes. Mahogany is the preferred species for planting, but teak may be planted on the deep soils on lower slopes. The degree of slope and the availability of moisture vary greatly. Plant competition is moderate on the upper slopes and severe on the lower slopes. Seedling mortality ranges from slight to moderate. The equipment limitation is slight if the slope is less than 20 percent, moderate if it is between 20 and 40 percent, and severe if it is more than 40 percent.

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, building foundations, water storage facilities, erosion control structures, and sewage disposal systems. Among the properties most important to engineers are permeability, shear strength, density, shrink-swell potential, water-holding capacity, grain-size distribution, plasticity, and reaction. Depth to the water table, depth to bedrock, and topography also are important.

Information concerning these and related soil properties is furnished in tables 5, 6, and 7. The estimates and interpretations in these tables can be used in--

1. Planning and designing farm ponds and other structures for controlling water and conserving soil.
2. Selecting locations for highways, airports, pipelines, and underground cables.
3. Locating sources of sand, gravel, or rock suitable as construction material.
4. Selecting areas suitable for industrial, commercial, residential, and recreational development.

The engineering interpretations reported here do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, however, the soil map is useful in planning more detailed field investigations and in indicating the kinds of problems that may be expected.

Some of the terms used by soil scientists have special meanings in soil science that may not be familiar to engineers. These terms are defined in the Glossary.

Engineering Classifications

The two systems most commonly used in classifying soils for engineering are the systems approved by the American Association of State Highway Officials (AASHO) and the Unified system.

The AASHO system (1) is used to classify soils according to those properties that affect use in highway construction. In this system all soil material is classified in seven principal groups, on the basis of grain-size distribution, liquid limit, and plasticity index. The groups range from A-1, which consists of soils that have the highest bearing strength and are the best soils for subgrade (foundation), to A-7, which consists of soils that have the lowest strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0, for the best material, to 20, for the poorest. The group index number is shown in parentheses following the soil group symbol.

In the Unified system (7) soils are classified according to their texture and plasticity and their performance as engineering construction material. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, MH-CH.

The textural classification system used by the U.S. Department of Agriculture is primarily for agricultural use but is also important in engineering. In this system the texture of the soil depends on the proportional amount of the different sized mineral particles. The sizes are designated as cobblestones, gravel, sand, silt, and clay. The textural classes range from the fine-textured clays, silty clays, and sandy clays to the coarse-textured loamy fine sands, loamy sands, sands, and coarse sands.

Table 7 shows the AASHO and Unified classifications of specified soils on the islands, as determined by laboratory tests. Table 5 shows the estimated classification of all the soils in the survey area according to all three systems of classification.

Estimated Properties of the Soils

Estimates of soil properties that are significant in engineering are given in table 5. The estimates are based on data shown in table 7, on tests of similar soils in the survey area, and on past experience in engineering construction.

Permeability indicates the rate at which water moves downward through undisturbed and uncompacted soil material. The rate depends largely on the texture, structure, and porosity of the soil. Plowpans, surface crusts, and other properties resulting from the use of the soils are not considered.

Available water capacity is the amount of capillary water in the soil and available to plants, after all free water has been drained away.

Reaction, the degree of acidity or alkalinity, is expressed as pH value. The pH value and relative terms used to describe soil reaction are explained in the Glossary.

The shrink-swell potential indicates the volume change to be expected with a change in moisture content. The estimates are based primarily on the amount and type of clay in the soil. The shrinking and swelling of soils damages building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to the maintenance of structures constructed in, on, or with such material.

Interpretations of Engineering Properties

Estimates of the suitability of the soils for various engineering uses are given in table 6. Features or characteristics that are likely to affect

TABLE 5.--ESTIMATED

Soil and map symbol	Depth to--		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	In.	Ft.	In.			
Aguilita: AgB, AgC2, AgD, AgE, AgF.	4-14	10+	0-10	Gravelly clay loam	GC	A-2 or A-4
			10-60	Soft limestone	CL	A-6
Aguirre: AuA	60+	10+	0-60	Clay	CH	A-7
Coamo: CaB	60+	10+	0-8	Clay loam	CH or MH	A-7
			8-24	Clay	CH	A-7
			24-40	Clay loam	CH or MH	A-7
			40-60	Gravelly clay loam, clay loam, and gravel.		
Cobbly alluvial land: Cb[1,2]	60+	10+				
Cornhill: CoA	60+	10+	0-9	Gravelly clay loam	CL or ML	A-4
			9-18	Clay loam	CH	A-7
			18-30	Clay	CH	A-7
			30-48	Gravelly clay	CL or ML	A-6
Cramer: CrC, CrE, CrF, CsE2, CsF, CvE.	10-20	10+	0-9	Gravelly clay loam	GM or ML	A-7
			9-19	Clay and gravelly clay	CL	A-7
			19	Volcanic mudstone.		
Descalabrado: DeD, DeE, DeF.	10-20	10+	0-10	Clay loam	MH or CH	A-7
			10-19	Silty clay loam	ML or CL	A-7
			19	Volcanic rock.		
Diamond: D1B, D1C2--- For Limestone rock land part, see Limestone rock land.	8-16	10+	0-10	Clay loam	ML or CL	A-6
			10-14	Loam	ML or CL	A-4
			14	Limestone.		
Dorothea: DoE, DoF	24-37	10+	0-6	Clay loam	MH or CH	A-7
			6-19	Clay	MH or CH	A-7
			19-36	Clay loam	MH or CH	A-7
Fraternidad: FcA, FcC2.	60+	10+	0-23	Clay	CH	A-7
			23-43	Clay	CH	A-7
			43-62	Clay	CH	A-7
Fredensborg: FrA, FrB, FrC2.	10-20	10+	0-20	Clay, silty clay loam	MH or CH	A-7
			20-50	Silt loam, soft marl, and limestone	CL	A-6
Glynn: GyB, GyC2	60+	10+	0-12	Clay loam	CL	A-7
			12-30	Clay, clay loam	CH	A-7
			30-59	Clay loam, sandy loam, and clay	CH	A-7
Hesselberg: HeA	10-20	10+	0-12	Clay	MH	A-7
			12-17	Clay	MH	A-7
			17-18	Limestone	GM	A-1
			18	Limestone.		
Isaac: IsD2, IsE, IvD--	20-72	10+	0-11	Gravelly clay loam	GM or ML	A-7
			11-19	Clay	CL	A-7
			19-36	Clay loam	CL	A-7
			36	Volcanic rock.		

See footnotes at end of table.

PROPERTIES OF THE SOILS

Percentage passing sieve--				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 40	No. 200				
				In./hr.	In./in. of soil	pH	
55-65	45-55	45-55	30-40	0.63-2.00	0.15-0.20	7.9-8.4	Moderate.
99	97	82	56	0.63-2.00	0.10-0.15	7.9-8.4	Moderate.
100	100	90-100	75-95	0.06-0.20	0.10-0.15	7.4-8.4	Very high.
80-90	75-85	70-80	65-75	0.63-2.00	0.15-0.20	6.6-7.3	Moderate.
85-95	80-90	75-85	70-80	0.20-0.63	0.15-0.20	7.4-8.4	Moderate.
80-90	75-85	70-80	65-75	0.63-2.00	0.15-0.20	7.4-8.4	Moderate.
75-85	70-80	65-75	70-80	0.20-0.63	0.15-0.20	7.4-8.4	Moderate.
100	100	90-100	70-80	0.20-0.63	0.15-0.20	7.4-8.4	Moderate.
100	100	90-100	75-95	0.06-0.20	0.15-0.20	7.4-8.4	Very high.
75-85	70-80	70-80	75-85	0.20-0.63	0.15-0.20	7.4-8.4	Moderate.
65-75	60-70	55-65	45-55	2.00-6.30	0.15-0.20	6.1-7.3	Moderate.
90-100	80-90	65-75	55-65	0.63-2.00	0.15-0.20	6.1-7.3	Moderate.
85-95	85-90	80-90	70-80	0.20-0.63	0.15-0.20	6.1-7.3	Moderate.
100	100	90-95	65-75	0.63-2.00	0.10-0.15	6.1-7.3	Moderate.
100	100	90-100	70-80	0.63-2.00	0.15-0.20	6.6-7.3	Low.
100	100	85-95	60-75	2.00-6.30	0.10-0.15	7.4-8.4	Low.
100	100	90-100	65-75	0.63-2.00	0.15-0.20	5.6-6.5	Moderate.
100	100	90-100	70-80	0.20-0.63	0.15-0.20	5.6-6.5	Moderate.
100	100	90-100	65-75	0.63-2.00	0.15-0.20	5.6-6.5	Moderate.
95-100	90-100	80-90	75-85	0.06-0.20	0.15-0.20	7.4-8.4	High.
100	100	90-100	85-95	0.06-0.20	0.15-0.20	7.4-8.4	Very high.
100	100	90-100	80-90	0.06-0.20	0.15-0.20	7.4-8.4	Very high.
99	90-100	85-95	75-85	0.20-0.63	0.15-0.20	7.4-8.4	High.
99	95-100	80-90	56-70	0.63-2.00	0.10-0.15	7.9-8.4	Moderate.
96	90-100	80-90	65-75	0.20-0.63	0.15-0.20	6.6-7.8	Moderate.
99	99	95-100	85-95	0.20-0.63	0.15-0.20	6.6-7.8	High.
99	95-100	90-100	80-90	0.63-2.00	0.15-0.20	7.4-8.4	High.
98	95-100	85-95	80-90	0.63-2.00	0.10-0.15	6.6-7.8	High.
99	99	90-100	90-100	0.63-2.00	0.10-0.15	6.6-7.8	High.
50-60	40-50	25-35	15-25	---	---	---	
65-75	60-70	55-65	45-55	2.00-6.30	0.15-0.20	6.1-7.3	Moderate.
90-100	80-90	65-75	55-65	0.63-2.00	0.15-0.20	6.1-7.3	Moderate.
85-95	70-80	65-75	55-65	0.63-2.00	0.15-0.20	6.1-7.3	Moderate.

TABLE 5.--ESTIMATED PROPERTIES

Soil and map symbol	Depth to--		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	In.	Ft.	In.			
Jacana: JaB, JaC, JaD--	20-36	10+	0-9	Clay loam	MH or CH	A-7
			9-17	Clay loam	MH or CH	A-7
			17-26	Gravelly clay	ML or CL	A-7
			26-29	Volcanic rock.		
Jaucas: JuB[1]	60+	1-4	0-60	Sand	SM or SP	A-2
Lavallee: LaB	60+	10+	0-18	Gravelly clay loam	CL or ML	A-4
			18-48	Very gravelly loam	GC	A-2 or A-4
Leveled clayey land: Lc[2].	60+	10+				
Leveled marly land: Lm[2].	60+	10+				
Leveled rocky land: Lr[2].	At surface.	10+				
Limestone rock land: Ls[2].	0-10	10+				
Made land: Ma[1,2]	60+	5+				
Magens: MgF	60+	10+	0-10	Silty clay loam	MH	A-7
			10-42	Clay	MH	A-7
			42-84	Clay loam	ML or CL	A-6
Parasol: PaB, PaC	60+	10+	0-13	Clay loam	ML or CL	A-7
			13-24	Clay	MH or CH	A-7
			24-40	Clay loam	ML or CL	A-7
			40-80	Saprolite.		
Pozo Blanco: PbC, PbD--	60+	10+	0-13	Clay loam	CH	A-7
			13-18	Silty clay loam	CH	A-7
			18-48	Loam	CL	A-6
Rock land. No estimates.						
San Anton: SaA, SaC[1]	60+	5+	0-9	Clay loam	MH	A-7
			9-32	Gravelly clay loam	CL or ML	A-6
			32-50	Clay loam	MH	A-7
Sion: ScB, ScC	10-20	10+	0-17	Clay loam	MH or CH	A-7
			17-50	Soft limestone and marl	CL	A-6
Southgate: SgE, SgF, SrF.	10-20	10+	0-7	Clay loam	MH	A-7
			7-18	Gravelly loam	GC	A-2 or A-4
			18	Volcanic rock.		
Tidal flats: Tf[1,2]	60+	0-3				
Tidal swamp: Ts[1,2]	60+	0-1				

See footnotes at end of table.

OF THE SOILS--CONTINUED

Percentage passing sieve--				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 40	No. 200				
				In./hr.	In./in. of soil	pH	
85-95	85-90	80-90	70-80	0.20-0.63	0.15-0.20	6.1-7.3	High.
85-95	85-90	80-90	70-80	0.20-0.63	0.15-0.20	6.1-7.3	Moderate.
100	100	90-95	65-75	0.63-2.00	0.10-0.15	6.1-7.3	Moderate.
100	100	85-95	5-15	6.30-20.0	0.05-0.10	7.4-8.4	Very low.
75-85	70-80	65-75	70-80	0.20-0.63	0.15-0.20	6.1-7.3	Moderate.
55-65	45-55	45-55	30-40	0.63-2.00	0.10-0.15	6.6-7.8	Low.
100	100	95-100	85-95	0.63-2.00	0.10-0.15	5.1-6.0	Low.
100	100	90-100	75-95	0.63-2.00	0.15-0.20	4.5-5.5	Low.
100	100	90-100	70-80	0.63-2.00	0.10-0.15	4.5-5.5	Low.
90-100	90-100	80-90	60-70	0.63-2.00	0.10-0.15	5.1-5.5	Moderate.
100	100	80-90	58-70	0.20-0.63	0.15-0.20	6.6-7.3	High.
100	100	70-80	51-60	0.63-2.00	0.10-0.15	6.6-7.8	Moderate.
100	100	90-100	70-80	0.63-2.00	0.10-0.15	6.6-7.8	Moderate.
100	100	95-100	85-95	0.63-2.00	0.15-0.20	7.4-8.4	Moderate.
100	100	85-95	60-75	0.63-2.00	0.10-0.15	7.4-8.4	Moderate.
85-95	85-95	80-90	70-80	0.63-2.00	0.15-0.20	6.1-7.3	Moderate.
75-85	70-90	65-75	70-80	0.63-2.00	0.10-0.15	6.6-8.4	Low.
100	100	90-100	70-80	0.63-2.00	0.15-0.20	7.4-8.4	Moderate.
99	90-100	85-95	75-85	0.20-0.63	0.15-0.20	7.4-8.4	Moderate.
99	97	75-85	56-65	0.63-2.00	0.10-0.15	7.9-8.4	Moderate.
85-95	85-95	80-90	70-80	0.63-2.00	0.15-0.20	5.1-6.0	Moderate.
55-65	45-55	45-55	30-40	2.00-6.30	0.10-0.15	5.6-6.5	Low.

TABLE 5.--ESTIMATED PROPERTIES

Soil and map symbol	Depth to--		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	In.	Ft.	In.			
Victory: VcD, VcE------	60+	10+	0-22	Clay loam----------	MH or CH	A-7
Volcanic rock land: Vr[1].	0-6	10+				

[1]Subject to flooding.

OF THE SOILS--CONTINUED

Percentage passing sieve--				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 40	No. 200				
				In./hr.	In./in. of soil	pH	
100	100	90-100	65-75	0.63-2.00	0.15-0.20	5.6-6.5	Moderate.

[2]Material variable. Onsite determination is necessary.

TABLE 6.--INTERPRETATION OF ENGINEERING PROPERTIES OF THE SOILS

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Aguilita: AgB, AgC2, AgD, AgE, AgF.	Poor: gravel and cobblestones.	Fair: cobblestones and stones.	Erodible if exposed on embankments; need for cuts and fills; stones in places.	Slope reduces storage potential.	Fair stability; fair compaction; high compressibility.	Fair stability; fair compaction; high compressibility.	Severe if slope is more than 10 percent; moderate if 5 to 10 percent.	Severe if slope is more than 7 percent; moderate if 2 to 7 percent.
Aguirre: AuA---	Poor: plastic clay.	Poor: very high shrink-swell potential.	Unstable: plastic clay.	All features favorable.	Very high shrink-swell potential; poor compaction.	Very high shrink-swell potential.	Severe: slow permeability.	Moderate: unstable material for embankments.
Coamo: CaB-----	Good---------	Fair: moderate shrink-swell potential.	All features favorable.	Pervious material and layers.	Fair stability; fair compaction; high compressibility.	Fair stability; fair compaction; high compressibility.	Slight-------	Moderate: slope is more than 2 percent; fair stability for embankments.
Cobbly alluvial land: Cb.	Poor: stones and cobblestones.	Poor: stones and cobblestones.	Stones hinder hauling and grading.	Pervious layers.	Stones and cobblestones.	Flood hazard; stones and cobblestones.	Severe: flood hazard.	Severe: flood hazard; cobblestones and stones.
Cornhill: CoA--	Good---------	Fair in uppermost 18 inches; poor at a depth of 18 to 30 inches; very high shrink-swell potential.	Plasticity of underlying layers.	Gravelly layers; seepage.	Very high shrink-swell potential; poor compaction.	Poor stability and very high shrink-swell potential at a depth of 18 to 30 inches.	Severe: slow permeability at a depth of 18 to 36 inches.	Slight.

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds: Reservoir area	Farm ponds: Embankment	Foundations for low buildings	Septic tank filter fields	Sewage lagoons
Cramer: CrC, CrE, CrF, CsE2, CsF, CvE.	Poor: gravel and stones; difficult to obtain because of topography.	Poor: shallow over bedrock; poor accessibility because of slope.	Bedrock at a depth of 10 to 20 inches; need for cuts and fills.	Fractured rock; high seepage potential; slope.	Fair stability; fair compaction; limited volume of material; shallow.	Shallow over bedrock.	Severe: shallow over bedrock.	Severe: slope more than 7 percent; less than 20 inches over bedrock.
Descalabrado: DeD, DeE, DeF.	Fair to poor, depending on accessibility.	Poor: shallow over rock; poor accessibility because of slope.	Shallow over bedrock; need for cuts and fills.	Fractured rock; high seepage potential; slope.	Limited volume of material; poor stability.	Shallow over bedrock.	Severe: shallow over bedrock; steep slope.	Severe: slope more than 7 percent; less than 20 inches over bedrock.
Diamond: D1B, D1C2. For limestone rock land part, see Limestone rock land.	Poor: shallow over hard limestone; stones; limestone outcrops.	Poor: shallow over hard limestone.	Shallow over hard limestone.	Hard limestone; high seepage potential.	Limited volume of material; stones; limestone outcrops.	Shallow over hard limestone.	Severe: shallow over hard limestone.	Severe: less than 20 inches over hard limestone.
Dorothea: DoE, DoF.	Fair to poor, depending on accessibility.	Fair: poor accessibility because of slope.	Erodible if exposed on embankments; need for cuts and fills.	Slope reduces storage potential.	Poor stability; poor compaction; high compressibility.	Poor stability; high compressibility in subsoil.	Severe: steep slope.	Severe: steep slope.
Fraternidad: FcA, FcC2.	Poor: plastic clay.	Poor: high shrink-swell potential.	Unstable, plastic clay.	All features favorable.	High volume change; poor compaction.	High shrink-swell potential.	Severe: slow permeability.	Moderate: high volume change; unstable material for embankments.

TABLE 6.--INTERPRETATION OF ENGINEERING PROPERTIES OF THE SOILS--Continued

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Fredensborg: FrA, FrB, FrC2.	Fair: plastic clay.	Poor in soil material; high shrink-swell potential; fair in underlying soft limestone.	Plastic clay in surface layer; underlying soft limestone easy to haul and excavate.	All features favorable.	Poor stability; poor compaction; high compressibility.	Poor stability and poor compaction in surface layer; fair in underlying soft limestone.	Slight: moderately slow permeability in surface layer; slight limitation below.	Moderate: poor stability for embankments; severe if slope is more than 7 percent.
Glynn: GyB, GyC2.	Good--------	Fair: moderate to high shrink-swell potential.	Plastic subsoil; moderate to high shrink-swell potential.	Seepage through gravelly layers.	Poor stability; poor compaction.	Poor stability; poor compaction.	Moderate: moderately slow permeability in upper 30 inches.	Moderate: poor stability for embankments; severe if slope is more than 7 percent.
Hesselberg: HeA.	Fair: shallow over hard limestone.	Poor: shallow over hard limestone; high shrink-swell potential.	Hard limestone at a depth of 10 to 20 inches.	Shallow over hard limestone that has high seepage potential.	Limited volume of material; poor stability and compaction.	Shallow over hard limestone.	Severe: shallow over hard limestone.	Severe: less than 20 inches over hard limestone.
Isaac: IsD2, IsE, IvD.	Fair to poor, depending on amount of gravel and accessibility.	Fair to poor, depending on depth to bedrock; moderate shrink-swell potential.	Bedrock at a depth of 20 to 72 inches; need for cuts and fills.	20 to 72 inches to fractured rock; seepage potential; slope reduces storage potential.	Fair stability; fair compaction; limited volume of material at source.	Fair stability; fair compaction; fair compressibility.	Severe if slope is more than 10 percent; less than 4 feet to bedrock.	Severe if slope is more than 7 percent; moderately deep over bedrock.
Jacana: JaB, JaC, JaD.	Fair: moderately deep over bedrock; accessibility of slope.	Poor: moderately deep over bedrock; high to moderate shrink-swell potential.	Bedrock at a depth of 20 to 36 inches; need for cuts and fills.	Fractured rock; high seepage; slope reduces storage potential.	Poor stability and compaction; limited volume of material at source.	20 to 36 inches to bedrock.	Severe: less than 4 feet to bedrock.	Severe: less than 4 feet to bedrock.

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Jaucas: JuB-----	Poor: low productivity; low available moisture capacity.	Good if confined.	Subject to flooding during high tide.	Very pervious material.	Poor stability; piping; rapid permeability.	Poor stability unless confined; low shear strength.	Severe: flood hazard; high water table; polution hazard.	Severe: very rapid permeability; poor stability for embankments.
Lavallee: LaB---	Fair: gravel-	Good----------	All features favorable.	Gravelly layers; seepage.	Fair stability. good compaction; slight to medium compressibility.	Fair stability; good compaction; medium compressibility.	Slight-------	Moderate: 20 to 50 percent gravel.
Leveled clayey land: Lc.	Poor: plastic clay.	Poor: plastic clay.	Unstable, plastic clay.	All features favorable.	Poor stability; poor compaction; high compressibility.	High shrink-swell potential.	Severe: slow permeability.	Moderate: poor stability for embankments.
Leveled marly land: Lm.	Poor: low productivity.	Fair----------	All features favorable.	All features favorable.	Fair stability; fair compaction; medium compressibility.	Fair stability; fair compaction; fair compressibility.	Moderate: moderate permeability.	Practice not applicable.
Leveled rocky land: Lr.	Poor: exposed bedrock.	Poor: exposed bedrock.	Bedrock at or near surface.	Practice not applicable.	Practice not applicable.	Hard rock at or near surface.	Severe: hard rock at or near surface.	Severe: bedrock at or near surface.

TABLE 6.--INTERPRETATION OF ENGINEERING PROPERTIES OF THE SOILS--Continued

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Limestone rock land: Ls.	Poor: exposed limestone.	Poor: exposed limestone.	Limestone at or near surface.	Practice not applicable.	Practice not applicable.	Limestone at or near surface.	Severe: limestone rock at or near surface.	Severe: limestone at or near surface.
Made land: Ma---	Poor: no soil material available.	Good----------	May be flooded during high tide.	Very pervious material.	Poor stability; fair compaction; rapid permeability; piping.	Poor stability; fair compaction; subject to piping; rapid permeability.	Slight-------	Severe: very rapid permeability.
Magens: MgF-----	Fair: difficult to obtain because of slope.	Fair: poor accessibility because of slope.	Erodible if exposed on roadbanks; need for cuts and fills; easy to haul and excavate.	Slope reduces storage potential.	Fair to poor stability; fair to poor compaction; high compressibility.	Fair stability; fair compaction; high compressibility.	Severe: steep slope.	Severe: steep slope.
Parasol: PaB, PaC.	Good---------	Fair: plastic clay subsoil.	Plastic, unstable subsoil.	Seepage in underlying layers.	Fair to poor stability; medium to high compressibility.	High compressibility; fair to poor stability.	Moderate: moderate permeability.	Moderate: unstable material for embankments; severe if slope is more than 7 percent.
Pozo Blanco: PbC, PbD.	Good to fair, depending on accessibility.	Fair: moderate shrink-swell potential.	Erodible if exposed on roadbanks; need for cuts and fills.	Pervious underlying layers; slope reduces storage potential.	Poor stability in uppermost 18 inches; fair to good below.	High compressibility and poor stability in uppermost 18 inches; fair to good below.	Moderate: moderate permeability; severe if slope is more than 10 percent.	Moderate: unstable material for embankments; severe if slope is more than 7 percent.

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Rock land. No interpretations.								
San Anton: SaA, SaC.	Good--------	Fair: moderate shrink-swell potential.	Need for cuts and fills on steeper slopes.	Gravelly layers; seepage.	Poor stability; poor compaction.	High compressibility; poor compaction.	Moderate to severe: flood hazard; moderate permeability.	Moderate: 9- to 38-inch layer more than 20 percent gravel; moderate permeability; severe if slope is more than 7 percent.
Sion: ScB, ScC--	Fair: shallow over soft limestone.	Fair: moderate shrink-swell potential.	Moderately plastic surface layer.	All features favorable.	Poor compaction in surface layer; fair to good below.	Poor compaction and poor stability in surface layer; fair in underlying layers.	Severe in surface layer; moderate below; moderate permeability.	Moderate: surface layer unstable for embankments; severe if slope is more than 7 percent.
Southgate: SgE, SgF, SrF.	Fair to poor, depending on accessibility.	Poor: shallow over rock.	Bedrock at a depth of 10 to 20 inches; erodible if exposed on roadbanks; need for cuts and fills.	Fractured rock; seepage; slope reduces storage potential.	Shallow over rock; limited volume of material at source.	Shallow over bedrock.	Severe: bedrock at a depth of 10 to 20 inches; steep slope.	Severe: steep slope; bedrock at a depth of less than 20 inches.
Tidal flats: Tf.	Poor: toxic salts.	Poor: shallow over water table.	High water table; subject to frequent flooding.	High water table.	Variable--	High water table.	Severe: high water table.	Severe: high water table.
Tidal swamp: Ts-	Poor: toxic salts.	Poor: poorly drained; usually flooded.	Usually flooded--	Inundated------	Organic material; variable.	High water table; usually flooded.	Severe: high water table; flooding.	Severe: high water table.

TABLE 6.--INTERPRETATION OF ENGINEERING PROPERTIES OF THE SOILS--Continued

Soil and map symbols	Suitability as source of--		Soil features affecting--				Soil limitations for sewage disposal	
	Topsoil	Road fill	Highway location	Farm ponds		Foundations for low buildings	Septic tank filter fields	Sewage lagoons
				Reservoir area	Embankment			
Victory: VcD, VcE.	Fair to poor, depending on accessibility.	Fair: poor accessibility because of slope.	Need for cuts and fills; erodible if exposed on embankments.	Slope reduces storage potential.	Poor stability; poor compaction.	Poor compaction; poor stability; medium to high compressibility.	Severe: steep slope.	Severe: slope more than 7 percent.
Volcanic rock land: Vr.	Poor: exposed volcanic rock.	Poor: exposed bedrock.	Bedrock at or near surface.	Practice not applicable.	Practice not applicable.	Hard rock at or near surface.	Bedrock at or near surface.	Severe: bedrock at or near surface.

various engineering practices were considered, and evaluations were based on test data and field performance. The estimates apply to the depth indicated in table 5.

Topsoil is a term used to designate a fertile soil or soil material, ordinarily rich in organic matter, that is used as a topdressing for lawns, gardens, and roadbanks. The information in table 6 indicates suitability for such use.

Road fill is material used to build embankments. The estimates in table 6 indicate the suitability of soil material moved from borrow areas for this purpose.

Among the features considered for highway location are the flood hazard and the depth, stability, and erodibility of the soil material.

Farm pond reservoir areas are affected mainly by slope (pl. II) and loss of water through seepage. The soil features mentioned in table 6 are those that influence seepage and potential storage capacity.

Farm pond embankments serve as dams. The soil features considered in constructing pond embankments include depth, permeability, stability, compaction characteristics, and shrink-swell potential.

Foundations for low buildings are affected chiefly by features of the undisturbed soil that influence its capacity to support the normal foundation loads. Among the features considered are stability, shrink-swell potential, compaction characteristics, depth, and susceptibility to flooding. Specific values of bearing strength are not given in the table, and none should be inferred.

Septic tank filter fields are affected mainly by permeability, depth to the water table, slope, depth to bedrock, and susceptibility to flooding. Both the degree and the kind of limitation are given in table 6.

Sewage lagoons are influenced chiefly by such features as permeability, slope, depth to bedrock, and number of coarse fragments. The degree and the kind of limitation are given.

Cramer gravelly clay loam, Descalabrado clay loam, and Southgate clay loam make up a large percentage of the total acreage of the Virgin Islands. These soils are steep and are shallow over bedrock. They have severe limitations for most engineering uses.

Aguilita gravelly clay loam, Fredensborg clay, and Sion clay loam are shallow and moderately deep over soft limestone. Limitations resulting from the slope and the plastic surface layer are readily overcome by land forming.

Aguirre and Fraternidad clays have slow permeability and a very high shrink-swell potential. The limitations are severe for most engineering uses.

Diamond clay loam and Hesselberg clay are shallow over hard limestone. They have severe limitations for most engineering uses.

Dorothea clay loam, Victory clay loam, and Magens silty clay loam are steep, but they are deep over very highly altered volcanic rocks. Limitations resulting from slope are readily overcome by land forming.

Jaucas sand is the only soil suitable as a source of sand for structural purposes. There are some gravelly soils, but the gravel is not clean and is not suitable for construction purposes.

Engineering Test Data for Soils

Soil samples taken from eight profiles on the island of St. Croix were tested in accordance with standard procedures to help evaluate the soils for engineering purposes. The tests were performed by the Bureau of Public Roads. Table 7 shows the results of tests to determine particle-size distribution and other properties significant in soil engineering.

Mechanical analysis shows the percentages, by weight, of soil particles that pass sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve. Silt is the material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is the material smaller than 0.002 millimeter in diameter that passes the No. 200 sieve. The clay fraction was determined by the hydrometer method.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from solid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

The AASHO and Unified classifications are explained under the heading "Engineering Classifications."

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TABLE 7.--ENGINEERING

[Tests made by Bureau of Public Roads (BPR) in accordance with standard

Soil name and location	Parent material	Depth	Mechanical analysis[1]			
			Percentage passing sieve--			
			1-in.	3/4-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
		In.				
Cramer gravelly clay loam:						
1.8 miles NW. of Annaly and 100 feet to the right of Scenic Drive. (Ortho)	Volcanic rocks (Caledonia formation).	0-14	100	91	72	67
		14-20	98	98	93	83
		20-32	92	85	60	52
0.15 mile S. of Centerline Rd. and 50 feet E. of main entrance to Cotton Valley. (Thick B2t horizon)	Sediments derived from basic volcanic rocks and local residuum.	0-8	98	97	86	77
		8-21	---	---	---	100
		21-27	100	99	88	74
Descalabrado clay loam:						
1.75 miles W. of Fountain-LaVallee and 50 feet NE. of Scenic Drive. (Ortho)	Basic volcanic rocks.	0-10	95	93	89	87
		14-30	---	---	---	100
Fraternidad clay:						
0.3 mile W. along N. side of Lower Love and 400 feet N. of farm road. (Ortho)	Sediments derived from residuum of volcanic and limestone rocks.	0-6	---	---	98	94
		23-31	---	---	---	100
		43-62	---	---	---	100
Fredensborg clay:						
0.25 mile W. of Kingshill Police Station and 150 feet W. and 75 feet N. of road intersection. (Ortho)	Alluvium derived from limestone.	0-16	---	100	99	94
		22-50	---	---	99	97
Glynn clay loam:						
300 feet S. of church in SW. corner of Grove Place and 60 feet W. and 30 feet N. of light pole. (Ortho)	Alluvium derived from volcanic rocks.	0-10	---	100	96	94
		15-26	---	---	99	99
		50-59	---	---	99	97
Hesselberg clay:						
0.7 mile W. of S. entrance to airport and 470 feet S. on secondary road and 50 feet W. of road. (Ortho)	Residuum from limestone.	0-7	99	99	98	97
		12-17	---	---	99	99
		17-18	97	92	55	46
Parasol clay loam:						
1.3 miles N. of oil road and 100 feet S. and 75 feet W. of gate on road to River. (Ortho)	Sediments derived from intrusive igneous rocks (Gabbro).	0-7	95	95	95	94
		13-24	---	---	---	100
		24-40	---	---	---	100

[1]According to AASHO Designation: T 88-57, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 2, Ed. 8 (1961), published by AASHO. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method,

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis[1]--con.						Liquid limit	Plasticity index	Classification	
Percentage passing sieve--con.		Percentage smaller than--						AASHO	Unified[2]
No. 40 (0.042 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
						Pct.			
58	49	48	44	32	23	60	20	A-7-5(8)	GM
69	60	58	55	44	38	44	21	A-7-6(10)	CL
40	35	34	32	27	23	46	22	A-2-7(2)	GC
62	48	46	43	36	28	46	20	A-7-6(6)	SM or SC
87	68	66	63	54	47	56	30	A-7-6(17)	CH
47	30	28	24	19	16	38	17	A-2-6(1)	SC
84	76	73	63	44	32	58	26	A-7-5(18)	MH or CH
92	69	63	51	30	23	42	15	A-7-6(9)	ML or CL
87	75	71	57	42	35	52	28	A-7-6(18)	CH
98	91	89	81	66	56	85	57	A-7-6(20)	CH
94	86	83	75	61	51	79	54	A-7-6(20)	CH
89	81	78	72	63	56	75	39	A-7-5(20)	MH or CH
82	56	53	48	40	31	36	15	A-6(6)	CL
86	70	66	56	38	30	41	19	A-7-6(11)	CL
97	89	86	77	63	56	76	44	A-7-5(20)	CH
94	83	80	70	53	45	60	37	A-7-6(20)	CH
91	85	83	72	59	50	92	46	A-7-5(20)	MH
97	94	92	86	79	75	106	58	A-7-5(20)	MH
30	17	16	15	14	12	36	6	A-1-b(0)	GM
83	60	56	48	37	34	50	22	A-7-6(11)	ML or CL
81	58	55	48	39	34	56	25	A-7-5(12)	MH or CH
76	51	49	42	30	25	50	23	A-7-6(9)	ML or CL

and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[2]SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are SM or SC, MH or CH, and ML or CL.

USE OF THE SOILS FOR RECREATIONAL DEVELOPMENT

The information in the following paragraphs and in table 8 can be used as a guide in determining the suitability of sites on the Virgin Islands for recreational development.

The degree and kind of limitation of the soils for specified recreational uses are given in table 8. The degrees of limitation are expressed as slight, moderate, and severe.

Golf fairways.--Soils used as golf fairways should be suitable for foot traffic and vehicular traffic. Soils that have only a slight limitation are nearly level, productive, and free of coarse fragments. The suitability of the soils for the rough or for hazards was not considered because of the extremely wide variety of soils that are suitable for these parts of the golf course. Not considered also was the suitability of the soils for greens, because most greens are man made.

Campsites.--The areas used frequently as campsites, including tent and trailer sites, should require little preparation. They should be suitable for unsurfaced parking lots for cars and camp trailers and for heavy traffic. The most suitable sites are nearly level to gently sloping, have a firm surface, are free of coarse fragments and rock outcrops, are permeable and have good drainage, and are not subject to flooding. The suitability of the soil for supporting vegetation should also be considered in selecting a campsite.

Picnic areas.--The limitations of the soils for use as picnic areas are based on soil characteristics. Other factors, such as the number of trees or lakes in the area, that affect the desirability of the site were not considered. The most suitable sites are nearly level to gently sloping, have a firm surface, and have good drainage. They should be free of stones and rocks and should not be subject to flooding. The suitability of the soils for supporting vegetation should also be considered.

Intensive play areas.--Areas used for playgrounds and for organized games, including baseball, football, and badminton, are subject to heavy foot traffic. The soils selected should be nearly level, have a firm surface, and have good drainage. The most desirable soils are also free of coarse fragments and rock outcrops. It is assumed that a good vegetative cover can be established and maintained where needed.

Paths and trails.--The limitations of the soils for use as bridle paths and trails for hiking, and for other nonintensive uses that involve random movement of people are based on the slope, the soil texture, the degree of wetness, and the hazard of flooding. Other factors that affect the desirability of a site were not considered. Some soils that have severe limitations and would require considerable preparation and maintenance would nevertheless be desirable because they are in a scenic location.

TABLE 8.--DEGREE AND KIND OF LIMITATION FOR SPECIFIED RECREATIONAL USE

Soil	Golf fairways	Campsites	Picnic areas	Intensive play areas	Paths and trails
Aguilita:					
AgB	Severe: coarse fragments.	Moderate: coarse fragments.	Moderate: soil texture.	Severe: coarse fragments; slope.	Moderate: soil texture.
AgC2	Severe: coarse fragments.	Moderate: slope; coarse fragments.	Moderate: slope; soil texture.	Severe: coarse fragments; slope.	Moderate: soil texture.
AgD	Severe: coarse fragments; slope.	Moderate: coarse fragments; slope.	Moderate: slope; soil texture.	Severe: coarse fragments; slope.	Moderate: slope; soil texture.
AgE	Severe: coarse fragments; slope.	Severe: slope---	Severe: slope----	Severe: coarse fragments; slope.	Moderate: slope; soil texture.
AgF	Severe: coarse fragments; slope.	Severe: slope---	Severe: slope----	Severe: coarse fragments; slope.	Severe: slope.
Aguirre: AuA	Severe: poor trafficability.	Severe: wetness; flooding.	Severe: wetness; soil texture.	Severe: wetness; soil texture.	Severe: wetness; soil texture.
Coamo: CaB	Slight----------	Moderate: soil texture.	Moderate: soil texture.	Moderate: slope.	Moderate: soil texture.
Cobbly alluvial land: Cb.	Severe: coarse fragments.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: stoniness.
Cornhill: CoA	Severe: coarse fragments.	Moderate: coarse fragments.	Moderate: soil texture.	Severe: coarse fragments.	Moderate: soil texture.
Cramer:					
CrC	Severe: coarse fragments.	Severe: coarse fragments.	Moderate: slope; soil texture.	Severe: coarse fragments; slope.	Moderate: soil texture.
CrE	Severe: coarse fragments; slope.	Severe: coarse fragments; slope.	Severe: slope----	Severe: coarse fragments; slope.	Moderate: slope; soil texture.
CrF	Severe: coarse fragments; slope.	Severe: coarse fragments; slope.	Severe: slope----	Severe: coarse fragments; slope.	Severe: slope.
CsE2	Severe: coarse fragments; slope.	Severe: stoniness; slope.	Severe: slope----	Severe: stoniness; slope.	Severe: stoniness.
CsF	Severe: coarse fragments; slope.	Severe: stoniness; slope.	Severe: slope----	Severe: stoniness; slope.	Severe: stoniness; slope.
CvE	Severe: coarse fragments; slope.	Severe: coarse fragments: slope.	Severe: slope----	Severe: coarse fragments; slope.	Moderate: soil texture.

TABLE 8.--DEGREE AND KIND OF LIMITATION FOR SPECIFIED RECREATIONAL USE--CONTINUED

Soil	Golf fairways	Campsites	Picnic areas	Intensive play areas	Paths and trails
Descalabrado:					
DeD	Severe: slope	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope	Moderate: soil texture.
DeE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: soil texture.
DeF	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Diamond:					
DlB	Severe: coarse fragments.	Severe: rockiness.	Severe: rockiness.	Severe: rockiness.	Severe: rockiness.
DlC2	Severe: coarse fragments.	Severe: rockiness.	Severe: rockiness.	Severe: rockiness; slope.	Severe: rockiness.
Dorothea:					
DoE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope; soil texture.
DoF	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Fraternidad: FcA, FcC2.	Severe: poor trafficability.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Fredensborg:					
FrA, FrB	Moderate: fair trafficability.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
FrC2	Moderate: fair trafficability; slope.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Glynn:					
GyB	Slight	Moderate: soil texture.	Moderate: soil texture.	Moderate: slope; soil texture.	Moderate: soil texture.
GyC2	Moderate: slope	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope	Moderate: soil texture.
Hesselberg: HeA	Moderate: fair trafficability.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Isaac:					
IsD2	Severe: slope	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope	Moderate: slope; soil texture.
IsE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope; soil texture.
IvD	Severe: coarse fragments.	Moderate: slope; coarse fragments.	Moderate: slope; soil texture.	Severe: slope	Moderate: slope; soil texture.
Jacana:					
JaB	Slight	Moderate: soil texture.	Moderate: soil texture.	Moderate: slope; soil texture.	Moderate: soil texture.
JaC	Moderate: slope	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope	Moderate: soil texture.
JaD	Severe: slope	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope	Moderate: slope; soil texture.

TABLE 8.--DEGREE AND KIND OF LIMITATION FOR SPECIFIED RECREATIONAL USE--CONTINUED

Soil	Golf fairways	Campsites	Picnic areas	Intensive play areas	Paths and trails
Jaucas: JuB--------	Severe: poor trafficability; low productivity.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Lavallee: LaB------	Severe: coarse fragments.	Moderate: coarse fragments.	Moderate: soil texture.	Severe: coarse fragments.	Moderate: soil texture.
Leveled clayey land: Lc.	Severe: low productivity.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Leveled marly land: Lm.	Severe: low productivity.	Moderate: soil texture.	Moderate: soil texture.	Moderate: soil texture.	Moderate: soil texture.
Leveled rocky land: Lr.	Severe: low productivity.	Very severe: rockiness.	Severe: rockiness.	Very severe: rockiness.	Severe: rockiness.
Limestone rock land: Ls.	Severe: low productivity; slope.	Very severe: rockiness.	Severe: rockiness.	Very severe: rockiness.	Severe: rockiness.
Made land: Ma------	Severe: low productivity.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.	Severe: soil texture.
Magens: MgF--------	Severe: slope----	Severe: slope---	Severe: slope----	Severe: slope---	Severe: slope.
Parasol:					
PaB----------	Slight----------	Moderate: soil texture.	Moderate: soil texture.	Moderate: slope; soil texture.	Moderate: soil texture.
PaC----------	Moderate: slope--	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope---	Moderate: soil texture.
Pozo Blanco:					
PbC----------	Moderate: slope--	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope---	Moderate: soil texture.
PbD----------	Severe: slope----	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope---	Moderate: slope; soil texture.
Rock land. No interpretations.					
San Anton:					
SaA----------	Slight----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
SaC----------	Moderate: slope--	Moderate: slope.	Moderate: slope--	Severe: slope---	Moderate: soil texture.
Sion:					
ScB----------	Slight----------	Moderate: soil texture.	Moderate: soil texture.	Moderate: slope; soil texture.	Moderate: soil texture.
ScC----------	Moderate: slope--	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope---	Moderate: soil texture.
Southgate:					
SgE----------	Severe: slope----	Severe: slope---	Severe: slope----	Severe: slope---	Moderate: slope; soil texture.
SgF----------	Severe: slope----	Severe: slope---	Severe: slope----	Severe: slope---	Severe: slope.

TABLE 8.--DEGREE AND KIND OF LIMITATION FOR SPECIFIED RECREATIONAL USE--CONTINUED

Soil	Golf fairways	Campsites	Picnic areas	Intensive play areas	Paths and trails
Southgate: cont.					
SrF---------- For Rock land part of SrF, see Rock land.	Severe: slope; coarse fragments.	Severe: slope; rockiness.	Severe: slope; rockiness.	Severe: slope; rockiness.	Severe: rockiness.
Tidal flats: Tf----	Severe: poor trafficability.	Very severe: flooding.	Severe: flooding.	Very severe: flooding.	Very severe: flooding.
Tidal swamp: Ts----	Severe: poor trafficability.	Very severe: flooding.	Severe: flooding.	Very severe: flooding.	Very severe: flooding.
Victory:					
VcD----------	Severe: slope----	Moderate: slope; soil texture.	Moderate: slope; soil texture.	Severe: slope---	Moderate: slope; soil texture.
VcE----------	Severe: slope----	Severe: slope---	Severe: slope----	Severe: slope---	Moderate: slope; soil texture.
Volcanic rock land: Vr.	Severe: coarse fragments; slope.	Very severe: rockiness.	Severe: rockiness.	Very severe: rockiness.	Severe: rockiness.

FORMATION AND CLASSIFICATION OF THE SOILS

Earth, the fifth largest planet in the solar system, may be compared with a huge ball of rock and water surrounded by air. The earth is very old, perhaps 5 billion years. During its existence, it has been visited by cataclysmic storms, earthquakes, and volcanic eruptions.

By what may have been a series of volcanic actions in a part of earth's water area--the Atlantic Ocean--basal rocks of the Virgin Islands were deposited. These rocks have been altered by additional intrusions of igneous rocks, by faulting, folding, and uplifting, and by the formation of wavecut terraces. In places, mainly on the island of St. Croix, limestone has formed through the accumulation of shells and coral.

Throughout the time that the surface of the islands has been exposed, the rocks have been subjected to breakdown by physical and chemical processes. Along with these processes, called weathering, soil formation began.

Through physical weathering, rocks were broken into smaller particles and additional surfaces were exposed. Plants, mostly lichens and mosses, grew on rock surfaces. Later they were joined by higher plants, the roots of which pried into crevices of the rocks and contributed further to physical weathering. Earthworms and larger burrowing animals mixed and exposed additional rock material.

Chemical weathering of the rocks took place concurrently with physical weathering. As weathering continued, plant and animal growth accelerated and a variable mixture of unconsolidated mineral matter and plant and animal tissues in different stages of decomposition accumulated on the rocks. This collection of material is known as soil.

The properties of soil are determined by the interaction of the five soil-forming factors--parent material, climate, living matter, relief, and time. Differences among soils are the result of differences in the effects of the various soil-forming factors.

Each body of soil has thickness, breadth, and length. A single unit of this three-dimensional body is called an individual soil. It ranges in size from a few square yards to several hundred acres. Individual soils that have similar characteristics within defined ranges make up a soil series. In the Cramer series, for example, the allowable range in depth to hard rock is 10 to 20 inches. Thus, an individual soil that is more than 20 inches deep over hard rock is excluded from the Cramer series.

A phase is a subdivision of a soil series that is important for interpretation. Sometimes the allowable range of a characteristic for a series is too wide to meet the need of the person using the soil map. For example, a slope range of gently sloping to steep is too wide a range for a farmer, for he needs to manage steep areas differently from gently sloping areas. The Cramer series is separated into phases on the basis of slope and on the basis of coarse fragments on the surface.

A soil type is a kind of phase of a series. It is based on the textural class name, or on the relative amounts of sand, silt, and clay in the uppermost 7 or 8 inches. Cramer clay loam, for example, is a soil type.

In making the soil map of the Virgin Islands, significant phases of the different soil series were classified and mapped. Each area on the map was given a name. This name is that of the principal soil in the unit, but other soils can be present. Because of limitations in the map scale and degree of accessibility, one cannot always map out separately these tiny areas of different soils.

Factors of Soil Formation

The five major factors that affect soil formation are plants and animals, climate, parent material, relief, and age of landform. These factors are described in the following paragraphs.

Plants and Animals

Gains in organic matter, gains or losses in plant nutrients, and changes in structure and porosity are among the changes brought about by plants and animals.

Plants help in the formation of soils by sending their roots into the earthy parent material. Plant roots, even though small, are strong. They tend to break up the soil, rearrange the soil particles, force openings into the lower parts of the soil, and modify porosity. Animals burrow beneath the surface and mix the soil. Earthworms, ants, and many other animals and insects are active in the soils of the Virgin Islands. In a warm tropical climate, the biological activity is continuous. When plants and animals die, their remains decay and form humus in the soil.

The natural vegetation on the islands varies according to the location. The mountainous region in the northwestern part of St. Croix supports fairly dense tropical forest, some parts of which have never been cleared. The trees are not large, but the undergrowth consists of thorny bushes and shrubs. In other mountainous areas there is a dense growth of thorny bushes and cactus, which is the type of vegetation typical of semiarid regions that have low rainfall and high evaporation. The soils that formed under forest vegetation have a moderate to large supply of organic matter. Grass vegetation has influenced several areas on the islands, particularly on the coastal plain. The soils that formed under grass have a large supply of organic matter and are dark colored.

Climate

The climate is warm and dry. The amount or rainfall differs in different locations on the islands but alone does not account for differences among

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soils. There are only small variations in temperature, no more than 5° or 7° between the coldest and the warmest months. The average annual temperature is 79.7° F. The average temperature in January is 76.9°, and that in July is 82.6°. This warm climate promotes rapid soil development. The warm temperature encourages chemical reaction. Plant and animal remains decompose rapidly. Soil development is hastened further because this activity goes on throughout the year. Rainfall is limited. The amount is not enough to dissolve and remove bases and nutrients from the soil profile.

Parent Material

Most soils on the Virgin Islands formed in material derived in place from basic volcanic rocks. These rocks are fine grained and are high in bases, such as calcium, magnesium, sodium, and potassium. Thus, the soils are fine textured, generally clays and clay loams, and are well supplied with bases and nutrients. Cramer, Descalabrado, Victory, and Dorothea soils are examples of soils that formed in this kind of parent material.

Some soils on the islands formed in sediments derived in place from soft limestone. These soils, for example, Aguilita, Fredensborg, and Sion soils, are fine textured, mainly clays and clay loams. They have a dark-colored surface layer, are weakly developed, and are shallow over soft, marly limestone.

Still other soils formed in sediments derived from volcanic or limestone rocks. These soils are strongly influenced by the physical, chemical, and mineralogical nature of the earthy parent material. Fraternidad and Aguirre soils, for example, which formed in clayey sediments high in montmorillonite, have a high shrink-swell potential.

Basic volcanic rocks decompose and form soil material more rapidly than limestone rocks do. All other factors of soil formation being equal, soils that formed in material derived from volcanic rocks are better developed than those that formed in material derived from limestone.

Relief

The shape of the landscape influences soil formation because it affects drainage, erosion, plant cover, and soil temperature. Many soils of the Virgin Islands are on steep slopes and therefore are subject to rapid runoff during tropical storms. They do not absorb much of the rainfall that falls on them, nor do they receive extra runoff from surrounding areas. The soils on foot slopes and alluvial fans, in contrast, receive their share of rainfall in addition to excess runoff from the surrounding hills. Accordingly, the soils on steep slopes, even those not under cultivation, are influenced by geologic erosion. Soil material is moved downslope and is deposited on foot slopes and alluvial fans. The soils on steep side slopes of the mountains and hills, Descalabrado and Cramer soils, for example, are shallow over bedrock. The soils on foot slopes, Jacana and Isaac soils, for example, are moderately deep over rock. The soils on alluvial fans, Fraternidad, Aguirre, and Glynn, as examples, formed in sediments transported from the hills and mountains and are very deep.

Age of Landform

Time is required for soil formation--usually long periods. The length of time that soil-forming forces have been able to act on parent material is commonly reflected in the characteristics of the soil.

The soils of the Virgin Islands range from young soils that have little or no development to old soils that have pronounced development.

San Anton clay loam is an example of a young soil. It retains most of the characteristics of its parent material, except for a darkening of the surface layer and a weakly developed subsoil. The earthy sediments have been transported recently and deposited on the flood plains. Glynn clay loam is an example of an older soil that formed in the same kind of parent material. It has a clayey, well-developed subsoil that bears little resemblance to the original parent material. Glynn soils formed on alluvial fans. Magens soils are the oldest soils on the islands. They are acid and are low in extractable bases. Their thick, red subsoil indicates that they have been exposed to the soil-forming processes for a long period.

The age of a landform is influenced by the topography. Steep side slopes are usually youthful. Geologic and accelerated erosion remove soil material and offset the soil-forming processes. The soils are therefore young and are shallow over rock. Descalabrado, Southgate, and Victory soils are examples of soils that formed on steep side slopes.

Representative Soil Horizons

The action of the soil-forming factors is reflected in the soil profile, which is a succession of horizons, or layers, that extends from the surface down to the unaltered parent material. The horizons differ in one or more properties, such as color, texture, thickness, structure, consistence, porosity, and reaction.

The main layers used in classifying the soils of the Virgin Islands are mollic epipedons, ochric epipedons, cambic horizons, and argillic horizons.

A mollic epipedon is a thick, dark-colored layer at the surface that is much like the surface layer of soils that formed under grass. This layer may have moderate to strong structure, a base saturation of 50 percent or more, and calcium as the dominant metallic cation. Aguilita, Sion, Fredensborg, Coamo, Cramer, and Pozo Blanco soils have a mollic epipedon.

An ochric epipedon is a layer at the surface that contains some organic matter, but is too light colored or too thin to meet the requirements of other kinds of epipedons. Dorothea and Victory soils have an ochric epipedon.

A cambic horizon is a subsurface horizon that has been altered but that shows no evidence of accumulated iron or aluminum. Victory, Southgate, Descalabrado, and San Anton soils have a cambic horizon.

An argillic horizon is one in which silicate clay has accumulated. Glynn, Coamo, Isaac, Parasol, Cramer, and Dorothea soils have an argillic horizon.

Some soils on the islands, Sion, Fredensborg, and Fraternidad soils, for example, have neither a cambic nor an argillic horizon.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (2) and revised later (4). The system currently used by the National Cooperative Soil Survey was adopted in 1965 (6). It is under continual study. Readers interested in the development of the system should refer to the latest literature available (3).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of each soil series represented on the islands by family, subgroup, and order, according to the current system.

Following are brief descriptions of each of the categories in the current system.

Order.--Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions are Entisols and Histosols, which occur in many different climates.

Suborder.--Each order is divided into suborders, primarily on the basis of soil characteristics that produce classes having genetic similarity. A suborder has a narrower climatic range than an order has. The criteria for suborders reflect either the presence or absence of waterlogging or differences in climate or vegetation.

Great group.--Each suborder is divided into great groups on the basis of uniformity in the kind and sequence of genetic horizons.

Subgroup.--Each great group is divided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, made up of soils that have mostly properties of one great group but also one or more properties of another great group.

Family.--Families are established within each subgroup, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

Series.--The series has the narrowest range of characteristics of the categories in the classification system. It is explained in the section "How This Survey Was Made."

A detailed description of each soil series represented on the islands is given in the section "Descriptions of the Soils."

TABLE 9.--SOIL SERIES CLASSIFIED ACCORDING TO THE CURRENT SYSTEM OF CLASSIFICATION

Series	Family	Subgroup	Order
Aguilita	Loamy-skeletal, carbonatic, isohyperthermic	Typic Rendolls	Mollisols.
Aguirre	Fine, mixed, isohyperthermic	Udic Pellusterts	Vertisols.
Coamo	Fine, mixed, isohyperthermic	Udic Argiustolls	Mollisols.
Cornhill	Fine-loamy, mixed, isohyperthermic	Fluventic Ustropepts	Inceptisols.
Cramer	Clayey, mixed, isohyperthermic	Lithic Argiustolls	Mollisols.
Descalabrado	Clayey, mixed, isohyperthermic	Lithic Vertic Ustropepts	Inceptisols.
Diamond	Fine-loamy, mixed, isohyperthermic	Lithic Ustropepts	Inceptisols.
Dorothea	Fine, mixed, isohyperthermic	Udic Haplustalfs	Alfisols.
Fraternidad	Very fine, montmorillonitic, isohyperthermic	Udic Chromusterts	Vertisols.
Fredensborg	Fine, carbonatic, isohyperthermic	Typic Rendolls	Mollisols.
Glynn	Fine, mixed, isohyperthermic	Typic Haplustalfs	Alfisols.
Hesselberg	Clayey, mixed, isohyperthermic, shallow	Petrocalcic Paleustolls	Mollisols.
Isaac	Fine, mixed, isohyperthermic	Udic Argiustolls	Mollisols.
Jacana	Fine, mixed, isohyperthermic	Vertic Ustropepts	Inceptisols.
Jaucas	Carbonatic, isohyperthermic	Typic Ustipsamments	Entisols.
Lavallee	Fine-loamy, mixed, isohyperthermic	Udic Haplustalfs	Alfisols.
Magens	Clayey, oxidic, isohyperthermic	Oxic Tropustults	Ultisols.
Parasol	Fine-loamy, mixed, isohyperthermic	Udic Argiustolls	Mollisols.
Pozo Blanco	Fine-loamy, carbonatic, isohyperthermic	Typic Calciustolls	Mollisols.
San Anton	Fine-loamy, mixed, isohyperthermic	Cumulic Haplustolls	Mollisols.
Sion	Fine-loamy, carbonatic, isohyperthermic	Typic Rendolls	Mollisols.
Southgate	Loamy-skeletal, mixed, isohyperthermic	Lithic Ustropepts	Inceptisols.
Victory	Fine-loamy, mixed, isohyperthermic	Typic Ustropepts	Inceptisols.

The acreage on the Virgin Islands that was once typically rural is rapidly decreasing with increasing development of residential, recreational, transportational, commercial, and industrial facilities. This change, particularly in residential development, began soon after the end of World War II and is likely to continue for many years. People from the States are migrating to the islands, and local residents whose standard of living is now somewhat higher are building new homes.

Rapid urban expansion has increased the need for new roads, new schools, and new recreational developments and has intensified the limitations that already existed, among them, a limited water supply and an inadequate system for sewage disposal.

For many years the sugarcane grown on St. Croix was an important part of the economy, but since the major sugar mill has ceased operations, sugarcane is no longer the most important crop. Finding a suitable cash crop to replace sugarcane is difficult because there is no water for irrigation.

Climate [4]

The Virgin Islands of the United States extend eastward from Puerto Rico, along the path of the Lesser Antilles, directly in the belt of subtropical, easterly trade winds. The climate is maritime tropical, one of the most equable in the world. It is characterized by generally fair weather, steady winds, and slight but regular annual, seasonal, and diurnal ranges of temperature. A significant feature of the rainfall pattern is the marked variation within short distances with change in terrain and elevation.

Minor seasonal contrasts are generated by outbreaks of cold air from the higher latitudes in winter and by tropical disturbances late in summer and in fall. Of greater significance is the diurnal tempering effect of the islands on the surrounding ocean climate. Since the land area is small, the Virgin Islands exert less modification on the surrounding ocean climate than do the islands of the Greater Antilles, which lie to the west.

Table 10 shows, by months, the average daily maximum temperature, the average daily minimum temperature, and the average precipitation on St. Croix.

Rainfall.--Lifting of moist air over hilly terrain is the most common cause of rainfall on the islands. The amount of rainfall increases with increasing elevation. The average annual total at the higher elevations is between 50 and 60 inches, and at the lower elevations, between 20 and 30 inches. Whether an exposure is on the windward or the leeward side of a slope is a significant factor in the amount of rainfall received. In general, there is a much higher occurrence of rainfall by day than by night.

There is no sharply defined wet season or dry season on the islands. Records indicate seasons much like those along the southern coast of Puerto Rico. The rainfall is lightest during the period December through June. On St. Thomas and St. John, it is generally lightest in February and March and heaviest in September and October. On St. Croix, it is heaviest in September, October, and November. The number of days with rainfall equal to or more than one-tenth of an inch ranges from about 75 to 110, depending on location.

Temperature.--Variations in temperature between the coolest and the warmest months are 5 to 7 degrees at the most. The highest temperatures are in August, and the lowest in January or February. During the warmest months, the highest average daytime temperature is about 87° F. During hot spells, which occur nearly every year, the temperature exceeds 88° or 90° for several days in succession. The average lowest nighttime temperature during the warmest months is between 74° and 78°. Nighttime temperatures are somewhat lower at the higher elevations. During the coldest months, the highest temperature is generally in the low 80's, and the lowest in the high 60's or low 70's. At the higher elevations, outbreaks of cold air into the Caribbean bring nighttime temperatures down to the low 60's or high 50's.

Wind.--Regularity in direction of the trade winds is one of the most dependable weather phenomena on the islands. Almost without exception the trade winds blow from an easterly direction. The velocity varies daily; one day it averages 5 miles per hour, and the next day 15 miles per hour. A velocity of more than 15 miles per hour occurs more frequently in winter than in other seasons. Leeward slopes are protected against the full force of the trade winds, but the flow is strong enough to pass over the higher terrain without diminishing in velocity. Most locations have a good flow of air movement most of the day. On the nearly level parts of St. Croix, windbreaks are needed to protect garden crops and young fruit trees. The nighttime offshore land breeze and the daytime onshore sea breeze that are typical of Puerto Rico are lacking on the Virgin Islands because of the small total land area, but the diurnal variation in windspeed, that is, the calms and low speeds at night and the increase in velocity at daybreak, provides somewhat the same effect in physical comfort.

Hurricanes and tropical storms.--The islands are affected occasionally by tropical storms and hurricanes. They lie outside the main paths of severe tropical disturbances except those that occur from August through the first half of October. The storms that develop over the South Atlantic east of the Antilles chain usually move toward the north or northwest and pass north or south of the islands; rarely do they pass directly over them. There is risk of hurricane force winds about once every 9 or 10 years.

[4] By Robert J. Calvesbert, climatologist, Weather Bureau, ESSA.

TABLE 10.--TEMPERATURE AND PRECIPITATION

[Data from Alexander Hamilton Field, St. Croix]

Month	Temperature				Precipitation			Average number of days with more than one-tenth of an inch of rainfall
	Average daily maximum	Average daily minimum	Average maximum	Average minimum	Average total	One year in 10 will have--		
						Less than--	More than--	
	°F.	°F.	°F.	°F.	In.	In.	In.	
January----	83	70	86	65	2.23	0.50	7.2	5
February---	83	70	86	66	2.19	.44	5.8	6
March------	84	71	86	66	1.73	.40	4.6	4
April------	86	73	88	68	2.83	.55	7.6	6
May--------	86	74	89	70	4.31	.60	8.2	8
June-------	88	76	90	71	3.10	.58	6.0	9
July-------	88	76	90	71	3.51	.80	6.6	8
August-----	89	76	91	72	4.58	1.20	8.8	9
September--	88	75	91	71	6.65	2.20	11.0	10
October----	88	75	90	70	5.45	1.60	10.2	8
November---	86	73	89	68	4.65	1.20	9.0	9
December---	84	72	[1]87	[2]67	3.34	1.00	8.6	9
Year----	86	73	[1]92	[2]64	44.57	34.00	53.8	91

[1]Average annual highest temperature.

[2]Average annual lowest temperature.

Evaporation.--The steady flow of trade winds and the warm temperature result in high evaporation rates. Open-pan measurements taken at Annas Hope indicate rates that exceed the average annual rainfall. Following is the potential evapotranspiration, that is, the amount of moisture lost through evaporation and transpiration, as estimated by the Thornthwaite formula, in inches of water each month.

Month:	Inches
January	3.89
February	3.67
March	4.45
April	4.96
May	5.94
June	6.27
July	6.55
August	6.40
September	5.85
October	5.69
November	4.90
December	4.27
Annual	62.78

Drought.--Periods of deficient rainfall occur almost every year in some parts of the Virgin Islands. Although some of these periods are of short duration, they have a serious impact on farming and dairying activities, on the urban water supply, and on the general economy. The islands have no large rivers and no large storage reservoirs. Consequently, even a few months of drought can be damaging. Droughts are most prevalent late in fall, in winter, and early in spring.

The severity of drought on the islands has been computed by the Palmer Index, developed by the Environmental Data Service. This computation is based on the difference between the amount of rainfall received and the amount needed to maintain an average for the area. It indicates that mild to extreme droughts can be expected about half the time, severe to extreme droughts about 15 percent of the time, and mild to moderate droughts about a third of the time. Since 1931, there have been 14 droughts indexed by the Palmer system. The longest was for 48 months, from February 1945 to February 1949. The drought of 1964-65 was the most recent and the most severe.

Relative humidity.--The average relative humidity, over a 6-year period, at Alexander Hamilton Field on St. Croix is summarized, by months, in the following tabulation. The values shown are also representative of Truman Field on St. Thomas.

Average relative humidity
Atlantic standard time

Month:	2:30 a.m.	2:30 p.m.
January	81	66
February	84	63
March	83	63
April	85	66
May	87	70
June	84	69
July	86	70
August	87	69
September	88	73
October	90	72
November	90	72
December	86	69
Annual	86	69

The relative humidity at these two locations is somewhat lower than that at San Juan, Puerto Rico, but it is sufficiently high, along with the salt content of the air, to cause corrosion and deterioration of buildings and metal equipment.

Water Supply

The greatest problem confronting farmers on the islands is that of retaining sufficient soil moisture to produce crops that are otherwise suited to the soils and the climate. Drought is more serious now than ever before in history. Many springs and wells have gone dry. Subterranean reservoirs have become more and more depleted, even though, according to records, the islands receive about the same amount of rainfall as at any time in the past.

Depletion of the underground water supply is the result of poor soil management. Large areas have been cleared of the original forest cover, subsequently cultivated, and then abandoned. Consequently, most of the moisture is lost through runoff and evaporation. Only a small amount is absorbed.

Natural Vegetation

The vegetation now growing on the islands differs from the original vegetation and differs somewhat in different parts. Uncleared mountainous areas support a fairly dense growth of tropical forest, including a few large trees and a dense undergrowth of brush and vines, but the cleared mountainous areas are covered with thorny brush, which is of little or no value.

Much of the cultivated acreage on the coastal plain has been converted to rangeland. The vegetation is mainly cactus and small thorny brush. There is very little pasture grass. Hurricanegrass, which is considered to be an inferior pasture grass, has spread rapidly over the southern part of the coastal plain and into adjacent mountainous areas.

Hilly areas between the coastal plain and the mountains are covered with thorny brush and poor-quality pasture grass. There are only a few trees. The eastern ends of the islands, which are usually drier than other parts, are covered with a dense growth of cactus and thorny brush.

The abundance of cactus and thorny brush is the result of overgrazing and improper use of the soils. Guineagrass could be established if the areas formerly cleared and cultivated were cleared of brush and brought under good management.

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Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, mineral soil particles that are 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. (See also Texture, soil.)

Concretions. Grains, pellets, or nodules that consist of concentrations of compounds or of soil grains cemented together. They are of various sizes, shapes, and colors. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found 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; will not hold together in a mass.

Friable.--When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.--When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.--When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.--When wet, adheres to other material, and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.--When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.--When dry, breaks into powder or individual grains under very slight pressure.

Cemented.--Hard and brittle; little affected by moistening.

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.--The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.--The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, or sesquioxides (iron and aluminum oxides).

B horizon.--The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.--The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.--Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Mottling, soil. Irregular marking with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct, and prominent. The size measurements are these: fine, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and coarse, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Permeability. The capacity of the soil to transmit air or water. Terms used to describe permeability are as follows: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value alkalinity; and a lower value, acidity. (See also Reaction, soil.)

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values or words as follows:

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

Sand. As a soil separate, individual rock or mineral fragments 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay. (See also Texture, soil.)

Saprolite. Thoroughly decomposed, soft, earthy, untransported rock.

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 textural class, soil that is 80 percent or more silt and less than 12 percent clay. (See also Texture, soil.)

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are--platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are (1) single grain (each grain by itself, as in dune sand) or (2) massive (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by adding the words "coarse," "fine," or "very fine" to the name of the textural class.

Tilth, soil. The condition of the soil, especially as to soil structure, in relation to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. For complete information about a capability unit, read the introduction "Use of the Soils for Crops and Pasture," which gives general information about management. All woodland groups are described on page 46. Other information is given in tables as follows:

Acreage and extent, table 1, page 7; estimated yields, table 2, page 38.

Use of the soils in engineering, table 5, page 48, table 6, page 54, table 7, page 62.

Use of the soils for recreational development, table 8, page 65.

Map symbol	Mapping unit	Described on page	Capability unit		Range site		Woodland group
			Symbol	Page	Name	Page	
AgB	Aguilita gravelly clay loam, 2 to 5 percent slopes	6	IVe-1	34	Shallow (6,9)	44,45	2
AgC2	Aguilita gravelly clay loam, 5 to 12 percent slopes, eroded	6	VIe-3	35	Shallow (6,9)	44,45	2
AgD	Aguilita gravelly clay loam, 12 to 20 percent slopes	8	VIe-3	35	Shallow (6,9)	44,45	2
AgE	Aguilita gravelly clay loam, 20 to 40 percent slopes	8	VIIe-1	36	Shallow (6,9)	44,45	2
AgF	Aguilita gravelly clay loam, 40 to 60 percent slopes	8	VIIe-1	36	Shallow (6,9)	44,45	2
AuA	Aguirre clay, 0 to 2 percent slopes	9	IVw-1	35	Deep (4)	44	-
CaB	Coamo clay loam, 2 to 5 percent slopes	10	IIIc-1	34	Deep (1,4,7)	39,44	-
Cb	Cobbly alluvial land	10	VIIs-4	37	----------	-----	-
CoA	Cornhill gravelly clay loam, 0 to 2 percent slopes	11	IVc-1	35	Deep (4,7)	44	-
CrC	Cramer gravelly clay loam, 5 to 12 percent slopes	12	VIs-3	36	Shallow (6,9)	44,45	4
CrE	Cramer gravelly clay loam, 12 to 40 percent slopes	12	VIs-3	36	Shallow (6,9)	44,45	4
CrF	Cramer gravelly clay loam, 40 to 60 percent slopes	12	VIIs-3	36	Shallow (6,9)	44,45	4
CsE2	Cramer stony clay loam, 12 to 40 percent slopes, eroded	12	VIIs-1	36	Shallow (6,9)	44,45	-
CsF	Cramer stony clay loam, 40 to 60 percent slopes	12	VIIs-1	36	Shallow (6,9)	44,45	-
CvE	Cramer-Isaac gravelly clay loams, 12 to 40 percent slopes	13	VIe-1	35	----------	-----	4
DeD	Descalabrado clay loam, 12 to 20 percent slopes	13	VIs-3	36	Shallow (3,6,9)	44,45	4
DeE	Descalabrado clay loam, 20 to 40 percent slopes	14	VIs-3	36	Shallow (3,6,9)	44,45	4
DeF	Descalabrado clay loam, 40 to 60 percent slopes	14	VIIs-3	36	Shallow (3,6,9)	44,45	4
D1B	Diamond-Limestone rock land complex, 0 to 5 percent slopes	14	VIs-2	35	Rough Stony Land (10)	45	2
D1C2	Diamond-Limestone rock land complex, 5 to 12 percent slopes, eroded	15	VIs-2	35	Rough Stony Land (10)	45	2
DoE	Dorothea clay loam, 20 to 40 percent slopes	15	VIe-1	35	Hilly Clay (2,5)	44	1
DoF	Dorothea clay loam, 40 to 60 percent slopes	16	VIIe-2	36	Hilly Clay (2,5)	44	1
FcA	Fraternidad clay, 0 to 3 percent slopes	17	IIIs-1	33	Deep (4)	44	-
FcC2	Fraternidad clay, 3 to 12 percent slopes, eroded	17	IVe-2	34	Deep (4)	44	-
FrA	Fredensborg clay, 0 to 2 percent slopes	18	IIs-1	33	Deep (4)	44	2
FrB	Fredensborg clay, 2 to 5 percent slopes	18	IIIs-2	33	Deep (4)	44	2
FrC2	Fredensborg clay, 5 to 12 percent slopes, eroded	18	IVe-4	34	Deep (4)	44	2
GyB	Glynn clay loam, 2 to 5 percent slopes	19	IIe-2	33	Deep (1,4,7)	39,44	3
GyC2	Glynn clay loam, 5 to 12 percent slopes, eroded	19	IIIe-1	33	Deep (1,4,7)	39,44	3
HeA	Hesselberg clay, 0 to 2 percent slopes	20	IIIsc-1	34	Shallow (6)	44	-
IsD2	Isaac clay loam, saprolitic substratum, 12 to 20 percent slopes, eroded	21	VIe-1	35	Hilly Clay (2,5,8)	44	1
IsE	Isaac clay loam, saprolitic substratum, 20 to 40 percent slopes	21	VIe-1	35	Hilly Clay (2,5,8)	44	1
IvD	Isaac gravelly clay loam, 5 to 20 percent slopes	21	VIe-1	35	Hilly Clay (2,5,8)	44	4
JaB	Jacana clay loam, 2 to 5 percent slopes	22	IVe-3	34	Hilly Clay (2,5,8)	44	4

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GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Range site		Woodland group
			Symbol	Page	Name	Page	
JaC	Jacana clay loam, 5 to 12 percent slopes	22	IVe-3	34	Hilly Clay (2,5,8)	44	4
JaD	Jacana clay loam, 12 to 20 percent slopes	22	VIe-1	35	Hilly Clay (2,5,8)	44	4
JuB	Jaucas sand, 0 to 5 percent slopes	23	VIIs-2	36	Coastal Sand (11)	45	-
LaB	Lavallee gravelly clay loam, 2 to 5 percent slopes	24	IIe-2	33	Deep (1,4)	39,44	3
Lc	Leveled clayey land	24	VIIIs-1	37	----------	-----	-
Lm	Leveled marly land	24	VIIIs-1	37	----------	-----	-
Lr	Leveled rocky land	24	VIIIs-1	37	----------	-----	-
Ls	Limestone rock land	24	VIIIs-1	37	----------	-----	-
Ma	Made land	24	VIIIs-1	37	----------	-----	-
MgF	Magens silty clay loam, 30 to 50 percent slopes	25	VIe-2	35	Hilly Clay (2,5)	44	1
PaB	Parasol clay loam, 2 to 5 percent slopes	26	IIe-2	33	Hilly Clay (2,5)	44	3
PaC	Parasol clay loam, 5 to 12 percent slopes	26	IIIe-1	33	Hilly Clay (2,5)	44	3
PbC	Pozo Blanco clay loam, 5 to 12 percent slopes	27	IVe-1	34	Hilly Clay (5,8)	44	2
PbD	Pozo Blanco clay loam, 12 to 20 percent slopes	27	VIe-3	35	Hilly Clay (5,8)	44	2
SaA	San Anton clay loam, 0 to 3 percent slopes	28	IIc-1	33	Deep (1,4,7)	39,44	3
SaC	San Anton clay loam, 5 to 12 percent slopes	28	IIIe-1	33	Deep (1,4,7)	39,44	3
ScB	Sion clay loam, 0 to 5 percent slopes	29	IIIsc-1	34	Shallow (6)	44	2
ScC	Sion clay loam, 5 to 12 percent slopes	29	IVe-1	34	Shallow (6)	44	2
SgE	Southgate clay loam, 12 to 40 percent slopes	30	VIs-3	36	Shallow (6,9)	44,45	4
SgF	Southgate clay loam, 40 to 60 percent slopes	30	VIIs-3	36	Shallow (6,9)	44,45	4
SrF	Southgate-Rock land complex, 20 to 60 percent slopes	30	VIIs-3	36	Rough Stony Land (10)	45	-
Tf	Tidal flats	30	VIIIw-1	37	----------	-----	-
Ts	Tidal swamp	30	VIIIw-1	37	----------	-----	-
VcD	Victory clay loam, 12 to 20 percent slopes	31	VIe-1	35	Hilly Clay (2)	44	1
VcE	Victory clay loam, 20 to 40 percent slopes	31	VIe-1	35	Hilly Clay (2)	44	1
Vr	Volcanic rock land	31	VIIIs-1	37	Rough Stony Land (10)	45	-

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