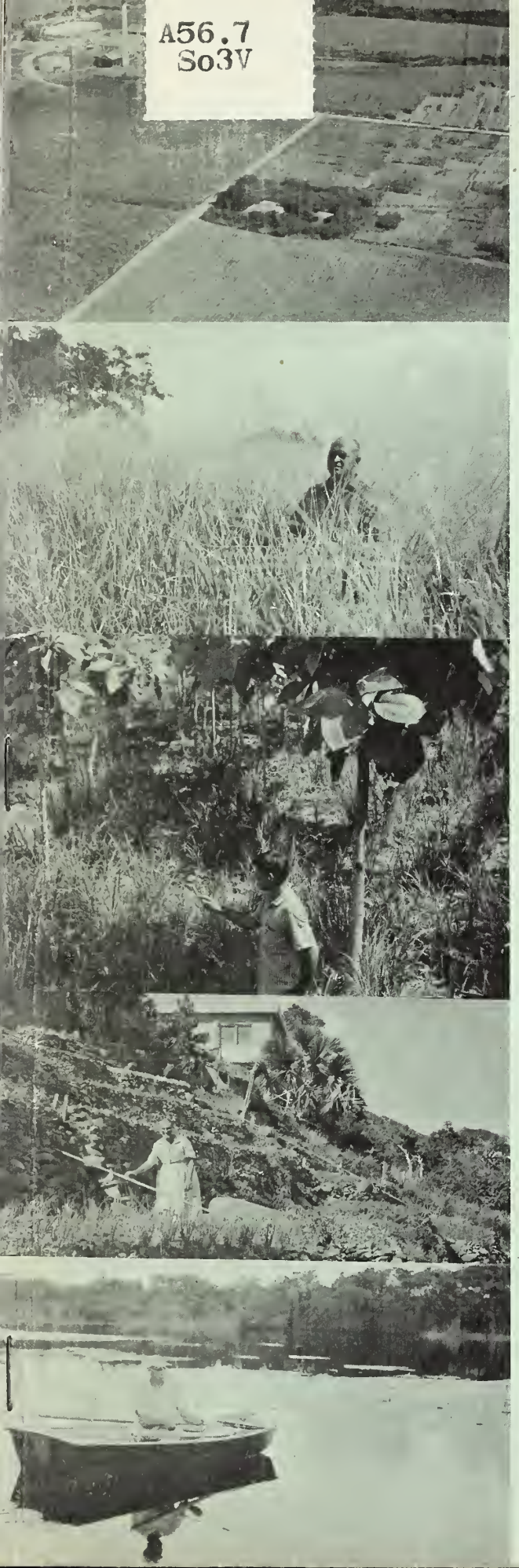
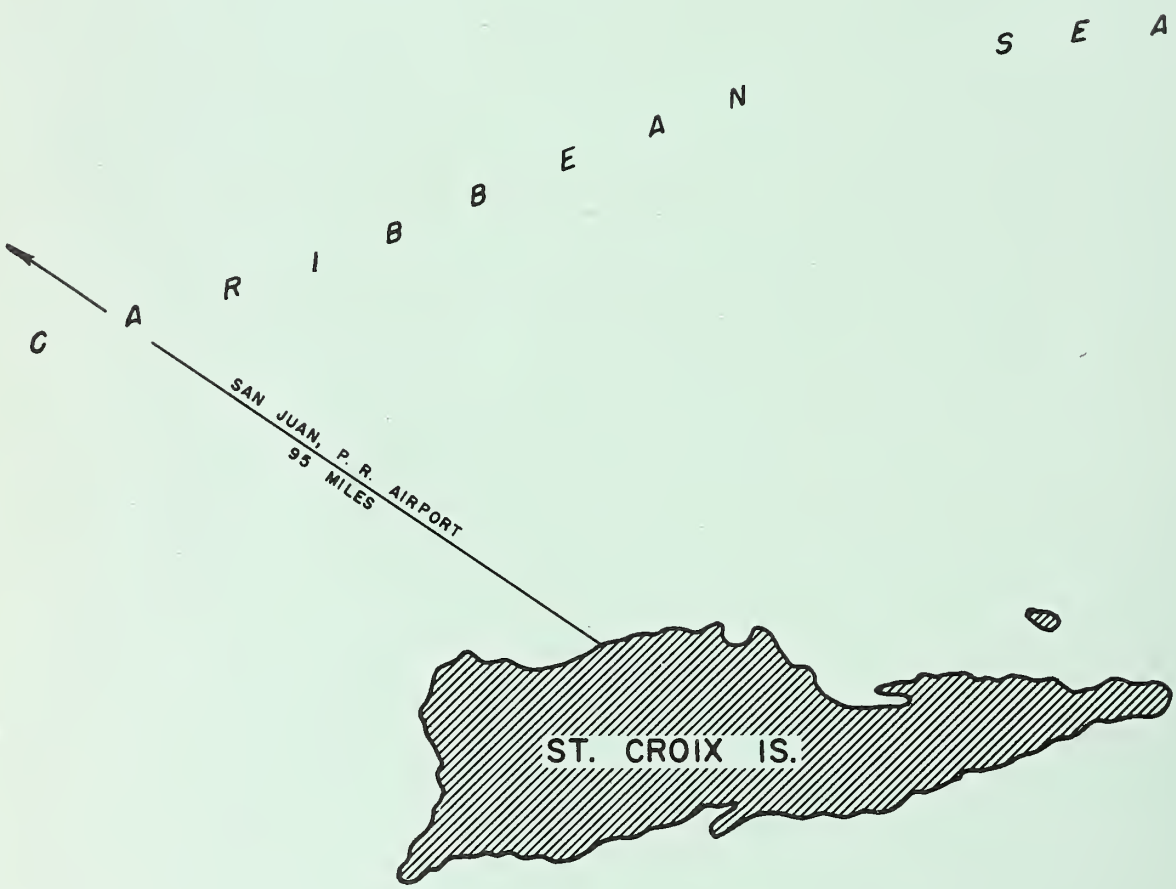


VIRGIN ISLANDS

SOIL AND WATER CONSERVATION NEEDS INVENTORY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CARIBBEAN AREA



VIRGIN ISLANDS SOIL CONSERVATION DISTRICT

VIRGIN ISLANDS SOIL AND WATER CONSERVATION NEEDS INVENTORY

The Inventory was prepared under the supervision of the Virgin Islands Soil and Water Conservation Needs Committee, representing agencies and organizations with conservation responsibilities and interests. The chairmanship was assigned to the Soil Conservation Service, Santurce, Puerto Rico.

Membership

Soil Conservation Service, Puerto Rico . . T. W. Yager, Chairman

Agricultural Research Service . . . . . R. M. Bond

Farmers Home Administration . . . . . D. A. Peterson

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INTRODUCTION

The U. S. Department of Agriculture, other federal agencies, insular agencies, and other organizations have constant need for current information on conservation needs that will aid in carrying out the responsibilities of providing for adequate conservation of the nation's plant, soil and water resources. The purpose of this inventory was to assemble such facts for the American Virgin Islands. The inventory was designed to provide reasonable estimates of the magnitude and urgency of the various conservation measures needed to maintain and improve the country's productive capacity for all the people. The Soil and Water Conservation Inventory for the Virgin Islands was developed as a part of the National Inventory of Soil and Water Conservation Needs established by the Secretary of Agriculture. (Appendix 1)

In this inventory the conservation needs estimates are expressed in terms of acres that require treatment in order to maintain production in line with the National interest, as interpreted from the economic framework. In the Virgin Islands the long term needs must take into consideration the possibility of the Islands being isolated due to international disaster because of war.

The Virgin Islands stand at the cross roads of agricultural development. The 200-year old sugar cane industry, which has existed on shaky economic feet for several years, may be abolished before 1975. Population increase and growth of tourism continue to exert more pressure on the Islands for production of more food locally. Industrial development, urban development, and other changes in land use pose a serious threat to the proper development of our natural resources. Proper agricultural zoning is a must to protect our very valuable and limited plant, soil and water resources, if the Virgin Islands are to continue to have a healthy and long lasting development. The ratio of imported food stuffs to locally produced food has continued to rise. By proper conservation treatment and management the Virgin Islands can increase the production of beef, vegetables and other foods for local consumption and for exportation.

Major trends in conservation management by individual land owners have been evidenced during the period 1960-64. Increased participation by the Insular Government in furnishing cost sharing money in cooperation with the Federal Agricultural Conservation Program has been instrumental, during 1963 and 1964, in bringing about an accelerated program of brush control and pasture management, along with several other important conservation practices. This program of conservation development being carried out in cooperation with the Virgin Islands Soil Conservation District, has been helped by additional funds from the Insular Government in the sum of approximately $30,000.00 annually during 1963 and 1964. These funds are in addition to the usual $13,000.00 available each year on the Federal ACP.

LAND PATTERN - VIRGIN ISLANDS SOIL CONSERVATION DISTRICT

Size of Farms	Number
Under 3 acres	56
3-9 "	199
10-19 acres	87
20-49 "	57
50-99 "	42
100-174 "	18
175-259 "	10
260-499 "	13
500-999 "	10
1,000 or more acres	9
Total Farms ----	501

Farms by Economic Class - Value of Farm Products Sold

	Number	Percent of Total
Commercial farms	182	36.3
Others (residential, part-time, etc.)	319	63.7
Total ---------	501	100.0

Commercial Farms	Number	Percent
Income $10,000 and over	18	3.6
7,500 to $9,999	7	1.4
5,000 to 7,499	12	2.4
2,500 to 4,999	13	2.6
1,200 to 2,499	26	5.2
500 to 1,199	44	8.8
100 to 499	62	12.3
	182	36.3

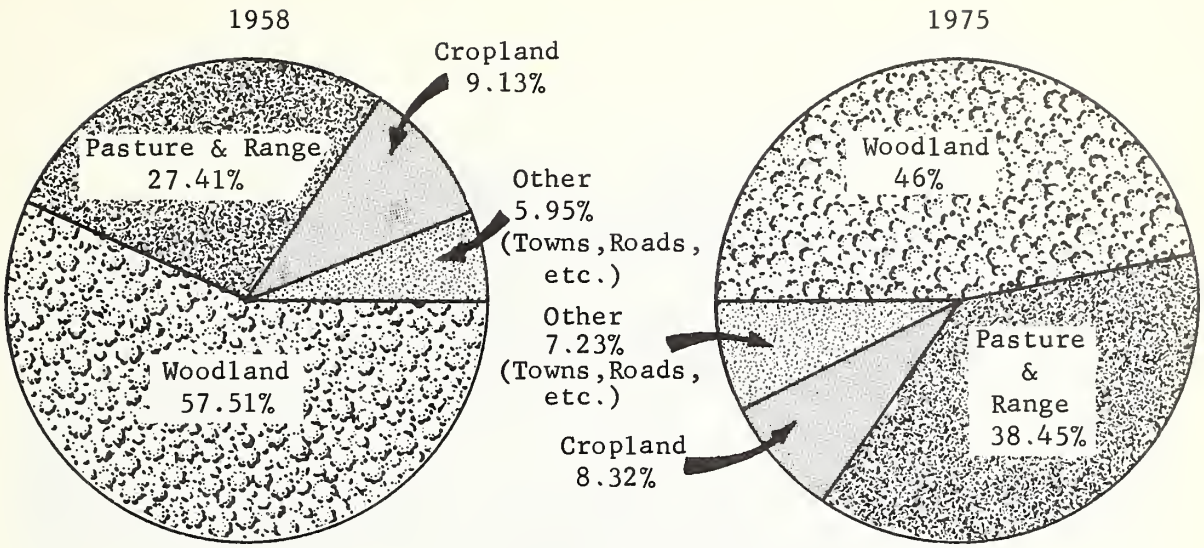
Trends in several major conservation practices such as brush control, stock ponds, irrigation pipe lines, proper use of range and pasture land, wells for livestock water, and fencing for grazing control, have experienced a steady increase for 3 years.

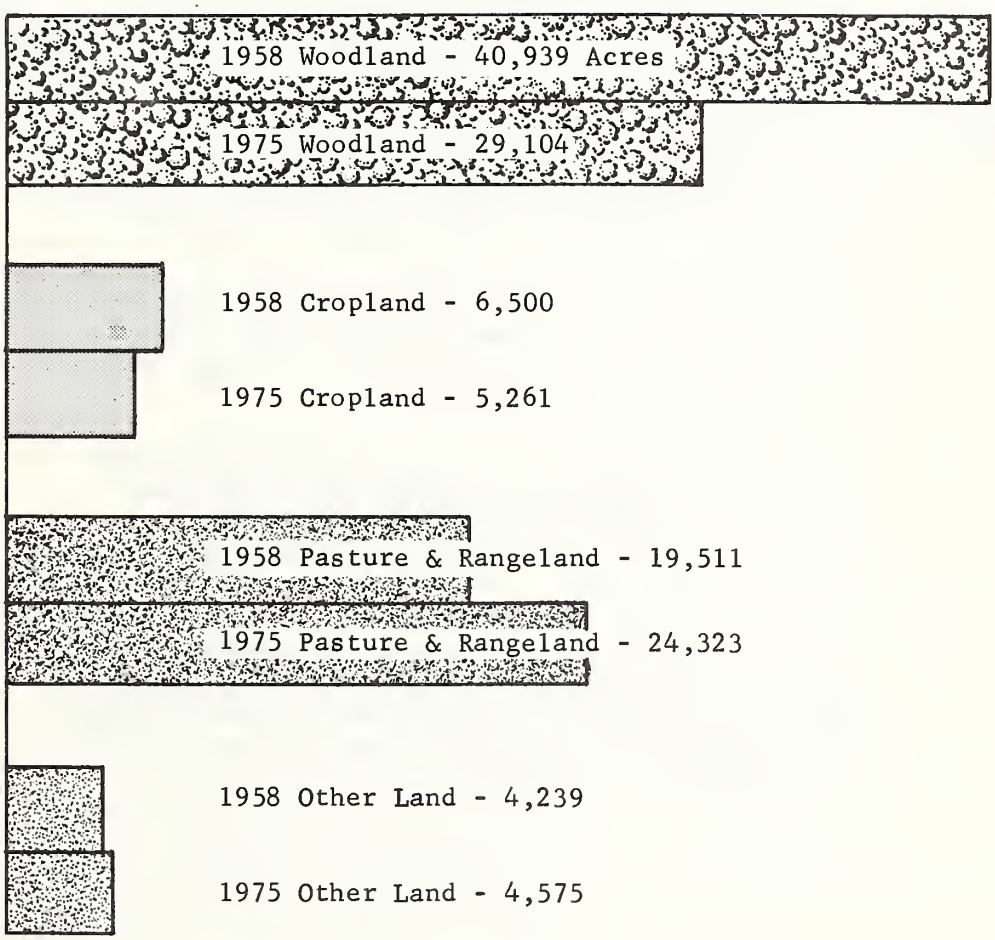
Table 1. Land area of the American Virgin Islands and use of inventory acreage, Virgin Islands, 1958 and expected 1975

Item	1958 acreage 1/	1975 acreage
	acres	acres
Inventory acreage:		
Cropland 2/	6,500	5,261
Pasture and range	19,511	24,323
Forest and woodland	40,939	29,104
Other land	4,239	4,575
Total inventory acreage	71,189	63,263
Non-Inventory Acreage:		
Federal land 2/	6,777	xxx 4/
Urban and built-up areas	5,544	xxx 4/
Water areas 3/	970	xxx 4/
Total land area	84,480	xxx 4/

1/ The Conservation Needs Inventory was begun in April 1958 and completed in December 1960 in the Virgin Islands.
2/ Federal land leased or used by permit for cropland is included.
3/ Of less than 40 acres in size and streams less than 1/8 mile in width. Water areas of 40 acres in size or streams 1/8 mile in width and over are not included in total land area.
4/ Not available.

LAND USE - UNITED STATES VIRGIN ISLANDS





Note: 7,926 going into St. John National Park and other non agricultural uses.

LAND CAPABILITY CLASSES AND ACREAGE IN EACH CLASS

Class I - Soils in Class I require good soil management practices only - 282 Acres.

Class II - Soils in Class II have some limitations that reduce the choice of plants or require moderate conservation practices - 5,703 Acres.

Class III - Soils in Class III have severe limitations that reduce the choice of plants or require special conservation practices such as terracing in the hill areas or drainage in bottomland, or both - 8,143 Acres.

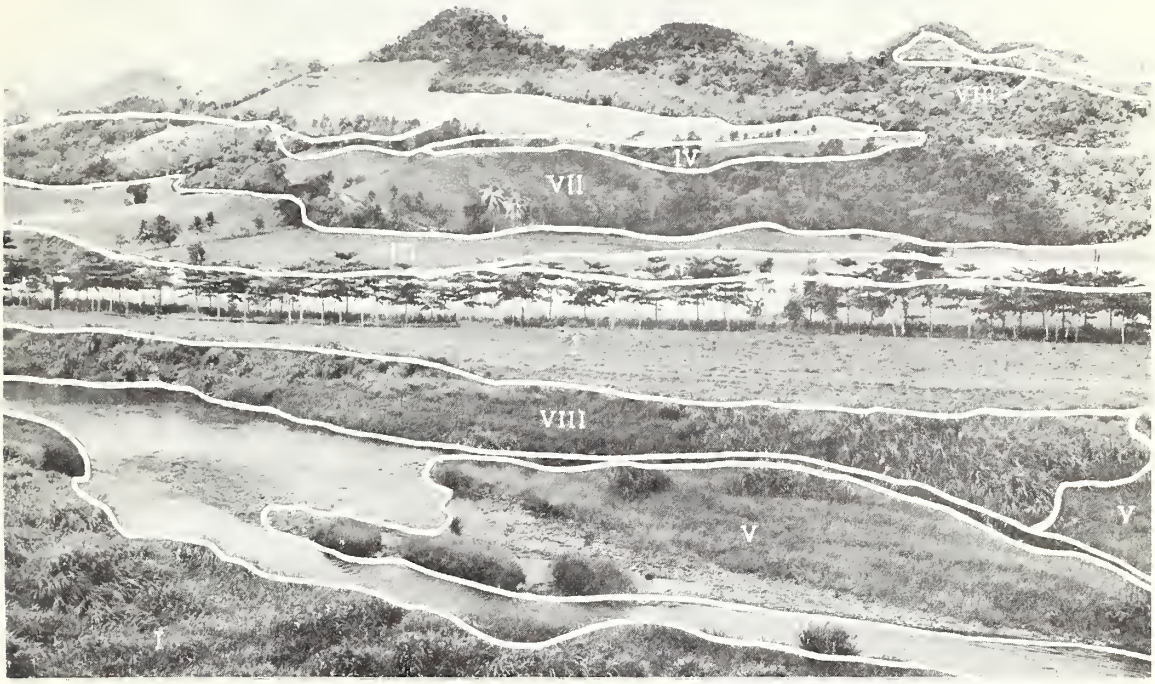
Class IV - Soils in Class IV have very severe limitations that restrict the choice of plants, require careful management, or both - 15,920 Acres.

Class V - Soils in Class V have little or no erosion but have drainage problems due to inadequate outlets that limit their use largely to pasture, range, woodland or wildlife - 968 Acres.

Class VI - Soils in this class have severe limitations that make them generally unsuited for cultivation and limit their use largely to pasture, range, woodland or wildlife - 14,429 Acres.

Class VII - Soils in this class have very severe limitations due to steep slope and erosion that make them unsuited for cultivation and restrict their use largely to grazing, woodland or wildlife. 21,301 Acres.

Class VIII - Land in this class has limitations that prevent its use for commercial plant production and restrict its use to recreation, wildlife, or water supply. This land consists largely of rock outcrops and rock quarries - 4,443 Acres.



Landscape representing the eight land capability classes.

NEEDS FOR CONSERVATION TREATMENT

Conservation needs for cropland, pasture and range, forest and woodland, and other land, were estimated in acreages having conservation problems and acreages needing treatment.

The problems for cropland and other land are related primarily to the conservation of the soil resources; therefore, land capability units, singly or in groups, were the basis for these estimates. The problems on pasture and range, and forest and woodland are related to the conservation of the plant cover as well as to the conservation of the soil resource; therefore, the estimates for these land uses were based on the actual condition of the vegetative cover and were made with no direct reference to land capability units.

Table 2 Acreage of Capability Classes and Subclasses [1]

Classes	Acres	Subclasses	Acres
I	282		
II	5,703		
		II E	5,462
		II C	241
III	8,143		
		III E	4,188
		III S	3,604
		III C	351
IV	15,920		
		IV E	15,168
		IV S	752
V	968		
		V W	968
VI	14,429		
		VI E	10,530
		VI S	3,899
VII	21,301		
		VII E	1,395
		VII W	105
		VII S	19,801
VIII	4,443		
	71,189		

1/ See Appendix 2.

Table 3 Estimated needs for conservation treatment on expected acreage by 1975

Cropland	
Total Cropland	5,261 Acres
Land with no problems that limit use	37 Acres
Cropland with conservation problems	5,224 Acres
Cropland with a major problem of erosion	4,267 Acres
Cropland with a major problem caused by climatic conditions	92 Acres
Cropland with a major problem of unfavorable soil conditions	865 Acres
Pasture and Range	
Total Pasture	24,323 Acres
Area needing treatment	13,146 Acres
Establishment or reestablishment of vegetation	7,000 Acres
Improvement of vegetative cover	3,500 Acres
Protection of vegetative cover from overgrazing	1,500 Acres
Protection of vegetative cover from encroachment of plants	1,000 Acres
Woodland	
Acreage needing treatment	29,104 Acres
Tree Planting (Open, interplanting and under planting	5,067 Acres
Improvement of timber stand	400 Acres
Protection of timber stand (fire, insects, animals, etc.)	12,842 Acres
Other Land	
Total other land	4,575 Acres
Acres adequately treated	446 Acres
Acres needing treatment	4,129 Acres

CROPLAND

These pictures represent land use and possible land use on 6,500 acres of land, or 9% of the total. This is expected to be about 5,261 acres in 1975, or 8% of the total agricultural land.

Sugar cane - 200-year old industry, still represents the major cash crop in the Virgin Islands. It is an excellent conservation crop and adapted to many soil conditions. 4,148 acres of the total 6,500 acres of cropland are in sugar cane.

Erosion in a clean tilled field. If sugar cane goes out and is replaced by clean tilled crops, more intensive measures, such as terracing, will be required to control erosion. Additional measures will be needed on an additional 4,000 acres if cane is replaced by clean tilled crops.

A grass waterway through a clean tilled field.

An irrigated field of citrus root stock. This is one crop being considered for expansion in St. Croix.

About 15,000 papaya trees have been planted on 15 acres by growers of the St. Croix Growers Association for export to New York.

Cassava is another crop under trial for possibility of being grown on St. Croix. One of the uses of cassava would be for starch to be used in alumina processing.

Lettuce beds. On St. Thomas, intensive truck crops represent the major agricultural enterprise.

To grow truck crops on steep slopes, rock barriers built to form bench terraces, are necessary. 22 miles of rock barriers have been constructed on St. Thomas. This represents approximately 27 acres of highly intensive truck crops.

A newly completed irrigation pond got this farmer started back in business. Water for supplemental irrigation continues to be a critical need. Eleven of these structures have been built for irrigation purposes.

Research trials on various crops are being conducted to determine suitable crops for cultivated areas. Production trials for pineapple on alkaline soil are being tried at the Federal Research Station.

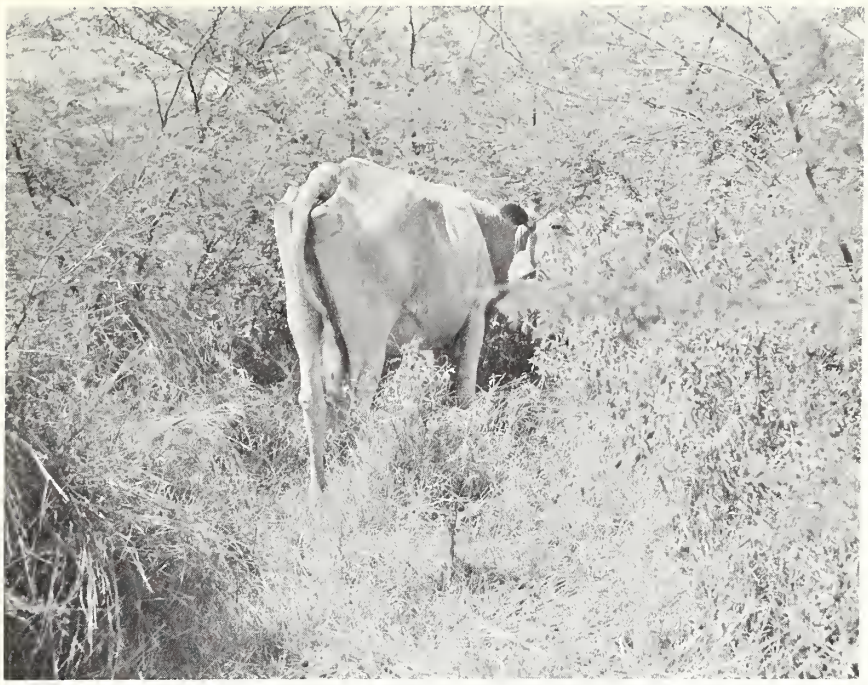
The second largest agricultural crop in the Virgin Islands is the produce of pasture and rangeland, in the form of sheep, cattle and goats.

Typical Senepol cow on well managed Guinea grass. Proper use must be practiced on all pasture to maintain good condition of grass.

Senepol cattle on improved pangola grass pasture.

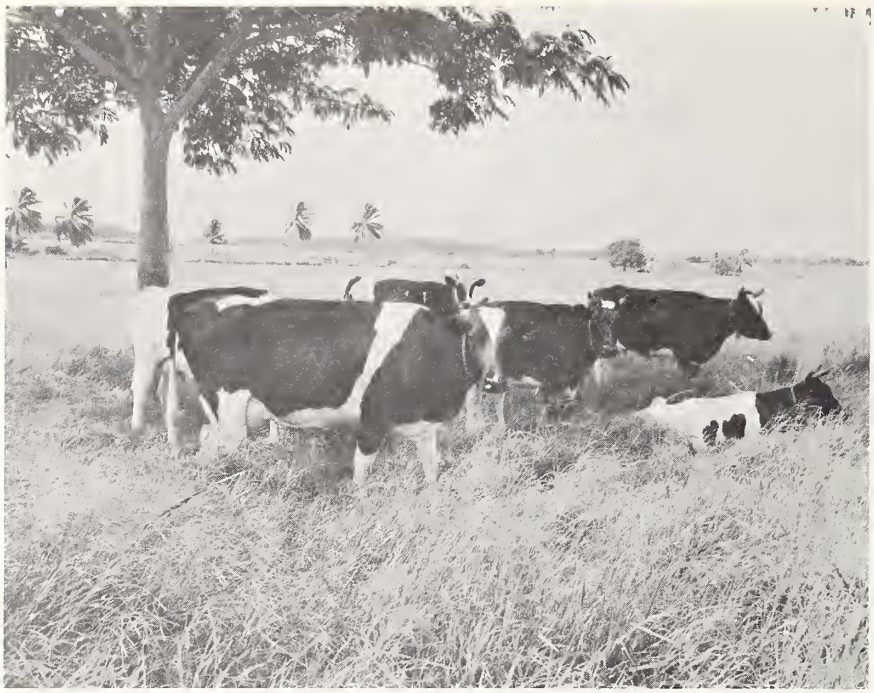
Good grass and good livestock condition go hand in hand.

Proper use of grass has resulted in an increase of stocking rate to about 10 grown goats per acre on these pastures.



Poor grass - poor cattle. A major problem in pasture management is control of casha (Acacia spp.) Neglect and overgrazing of a pasture will result in a stand of casha such as this. Over 10,000 acres need brush control.

Most of the casha in this pasture has been eliminated by use of hormone spray. Controlled grazing - taking half and leaving half of the grass - will maintain the excellent stand of Guinea grass indefinitely. Proper use of pasture and range needed on over 10,000 acres.



Herd of well managed Holstein cows on a dairy farm. Better herd management, improved milking techniques, and better pasture management brought about a 50% increase in milk production and an increase of 33% in milk consumption during 1963.

Artificial insemination has been a part of the dairy improvement program. This is the first producing Holstein cow resulting from artificial insemination on St. Croix.

This area had been completely dominated by brush for over 15 years. After bulldozing, and 9 months rest, this spontaneous stand of Guinea grass was obtained.

This pasture consisted of close to 100% hurricane grass for 15 years. Nine months deferment caused plant succession and an increase of the Guinea grass to over 50%.

Before Scene - A pasture just bulldozed and rested.

After Scene - A spontaneous stand of Guinea grass was obtained by 90 days of complete rest.

Another important land use is recreation. Over 200 dams for livestock and irrigation, such as this, have been built. At least 100 could be stocked with fish.

Angling for bass in the Chimney Bush reservoir.

WOODLAND

Woodlands represent 57% of the total agricultural land in the Virgin Islands. This acreage is expected to be 29,000 acres by 1975, or 46% of the agricultural land. It is estimated that 20,000 of these acres are suitable for commercial timber production.

Approximately 20,000 potted forest tree seedlings are produced each year in the Forest Service nursery.

Mahogany underplanted in heavy brush in 1953. There have been 106,000 mahogany trees successfully planted on 33 plantations, covering 200 acres. 40,000 trees should be planted each year.

Teak plantation, Estate Thomas - 38,000 teak trees have been successfully planted on 6 sites on 32 acres. 900 acres of woodland sites could support teak in the Virgin Islands.

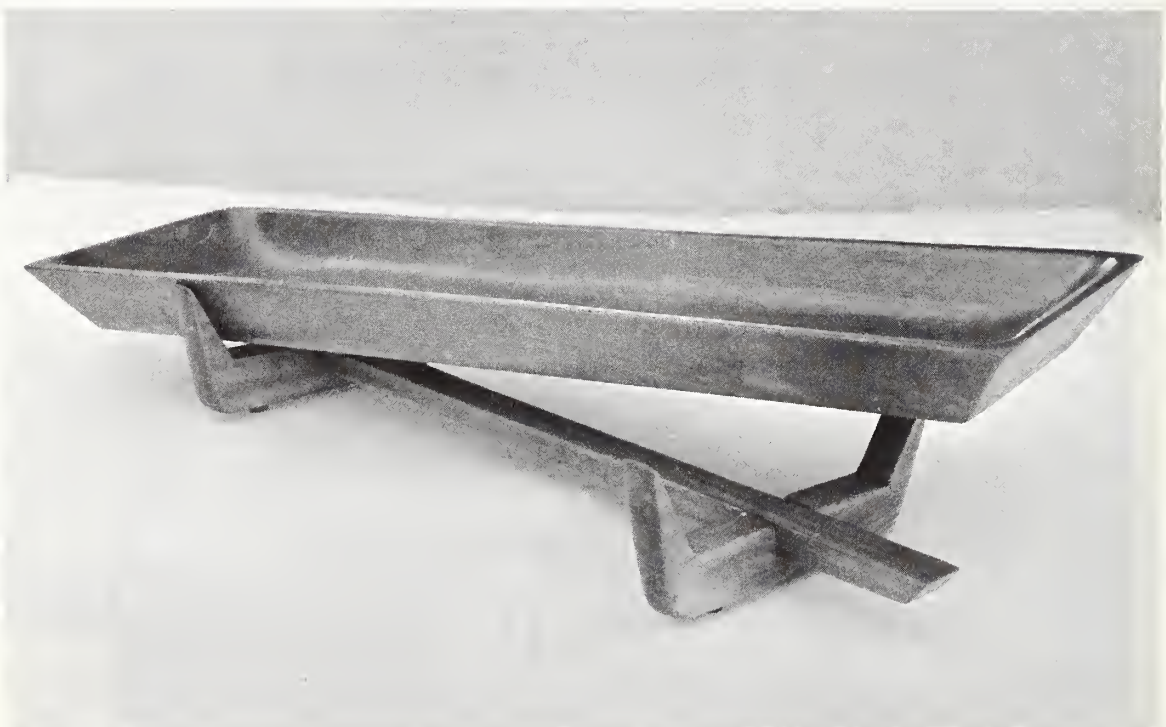
Other exotic forest tree species, such as cigar box, cedar (shown above) are being propagated and planted on some sites. Other species being planted are cadam, lignum vitae, primavera, Australian pine, and true pine.

Natural mahogany stand at Estate Thomas, after improvement cutting. These trees are from 15 to 25 years old. Subsequent release removed 4 of the 6 large trees in the picture. Timber stand improvement has been carried out on 30 acres of the approximately 500 acres of mature natural mahogany woodland. Forest Service Photo

West Indies mahogany logs ready for milling at the Sion Farm sawmill. About 50,000 board feet of lumber and craft wood have been processed at the mill. The potential should be about 11,000 board feet of choice mahogany wood per year. Forest Service Photo

An important by-product of stand improvement is treated fence posts. This product is badly needed for the expanding livestock industry. Non-treated fence posts rot in 3 years. Treated posts will last 15 years and up. 50,000 posts have already been processed.

Forest Service Photo



Another important product is choice wood for the growing craft industries for which a tremendous potential exists. Forest Service Photos

APPENDIX 1

UNITED STATES DEPARTMENT OF AGRICULTURE
Office of the Secretary
Washington 25, D. C.

MEMORANDUM NO. 1396

April 10, 1956

National Inventory of Soil and Water Conservation Needs

The Department has constant need and use for information that can be gained only through a national inventory of soil and water conservation needs. This inventory would equip the Department to more effectively plan and carry out its responsibility in soil and water conservation. From it the Department could arrive at reasonable estimates of the magnitude and urgency of the various conservation measures needed to maintain and improve the country's productive capacity for all the people. The following policies, therefore, are hereby established:

1. A National Inventory of Soil and Water Conservation Needs will be made and kept current by the Department of Agriculture. This Inventory will be developed for each county in the United States and for appropriate subdivisions of the Territories. The goal for initial completion will be three years. The Forest Service has recently completed an intensive survey of the Nation's timber resources. County estimates for forestry, insofar as is possible, will be developed from this timber survey and other available forest resource information.

2. The Department agencies concerned with land use, soil and water conservation and the management of land resources which are to cooperate in this endeavor are: Agricultural Conservation Program Service, Agricultural Research Service, Commodity Stabilization Service, Federal Extension Service, Farmers Home Administration, Forest Service and Soil Conservation Service. Other agencies of the Department will be called upon where they can make a contribution. The Soil Conservation Service is hereby assigned responsibility for leadership.

3. A Department Soil and Water Conservation Needs Committee, comprised of one representative from each of the agencies named in paragraph 2, will be established. This committee, under leadership of a chairman from the Soil Conservation Service, will aid in the development and review of proposed procedures, furnish guidance in the cooperative effort, and make periodic reviews of progress for the information of the participating agencies.

4. A Soil and Water Conservation Needs Committee will be established in each State or Territory. Its membership will consist of representatives who work within the State or Territory for the Department agencies named in paragraph 2. The Soil Conservation Service representative will serve as chairman. The State Conservationist of the Soil Conservation Service will invite representation on the committee from the Land-Grant College, the State Forester, and other appropriate State agencies and groups who may be able to provide assistance and useful data. The State or Territorial committee will develop a plan for making the Inventory, and will submit it to the Administrator of the Soil Conservation Service for review and consideration of the Department Committee and the Assistant Secretary, Federal-States Relations.

5. Data will be developed separately for privately owned and publicly owned land. The Soil Conservation Service will be responsible for collecting basic physical data on soil and water on non-federally owned lands. The Forest Service will be responsible for the adequacy of the physical data on forestry on non-federally owned lands. The Forest Service and other land management agencies will be responsible for making the Inventory on lands under their jurisdiction.

6. Cooperation of State and local agencies, organizations, and groups concerned with soil, water, forest, range and wildlife conservation, utilization, and management will be actively solicited in the development and review of the Inventory. The Department of Agriculture will also seek and encourage the cooperation of other Federal agencies, responsible for land management activities, in the development of data which can be utilized in the National Inventory of Soil and Water Conservation Needs.

Secretary

APPENDIX 2

THE LAND-CAPABILITY CLASSIFICATION

The standard soil-survey map shows the different kinds of soil that are significant and their location in relation to other features of the landscape. These maps are intended to meet the needs of users with widely different problems and, therefore, contain considerable detail to show important basic soil differences.

The information on the soil map must be explained in a way that has meaning to the user. These explanations are called interpretations. The capability classification is one of a number of interpretive groupings made primarily for agricultural purposes. As with all interpretive groupings the capability classification begins with the individual soil-mapping units, which are building stones of the system. In this classification the arable soils are grouped according to their potentialities and limitations for sustained production of the common cultivated crops that do not require specialized site conditioning or site treatment. Nonarable soils (soils unsuitable for longtime sustained use for cultivated crops) are grouped according to their potentialities and limitations for the production of permanent vegetation and according to their risks of soil damage if mismanaged.

The individual mapping units on soil maps show the location and extent of the different kinds of soil. Mapping units permit making the greatest number of precise statements about the individual soils and predictions about their use and management. The capability grouping of soils is designed to (1) help landowners and others use and interpret the soil maps, (2) introduce users to the detail of the soil map itself, and (3) make possible broad generalizations based on soil potentialities, limitations in use, and management problems.

The capability classification provides three major categories: (1) Capability unit, (2) capability subclass, and (3) capability class. The first category is the capability unit, which is a grouping of soils that have about the same influence on production and responses to systems of management of common cultivated crops and pasture plants. Soils in any one capability unit are adapted to the same kinds of common cultivated and pasture plants and require similar alternative systems of management for these crops. Longtime estimated yields of adapted crops for individual soils within the unit under comparable management do not vary more than about 25 percent.

The second category in the classification is the subclass. This is a grouping of capability units having similar kinds of limitations and hazards. Four kinds of limitations or hazards are recognized: (1) Erosion hazard, (2) wetness, (3) root zone limitations, and (4) climate.

The third and broadest category in the capability classification places all the soils in eight capability classes. The risks of soil damage or limitations in use become progressively greater from class I to class VIII. Soils in the first four classes are capable under good management of producing adapted plants, such as forest trees or range plants, and the common cultivated field crops and pasture plants. Soils in classes V, VI, and VII

are suited to the use of adapted native plants. Some soils in classes V and VI are also capable of producing specialized crops, such as certain fruits and ornamentals, and even field and vegetable crops under highly intensive management involving elaborate practices for soil and water conservation. Soils in class VIII do not return onsite benefits for inputs of management for crops, grasses, or trees.

The grouping of soils into capability units, subclasses, and classes is done primarily on the basis of their capability to produce common cultivated crops and pasture plants without deterioration over a long period. To express suitability of the soils for range and woodland use the soil-mapping units are grouped into range sites and woodland sites.

Capability Classes

Land suited for cultivation and other uses

Class I.--Soils in class I have few limitations that restrict their use.

Soils in this class are suited to a wide range of plants and may be used safely for cultivated crops, pasture, range, woodland, and wildlife. The soils are nearly level,[1] and erosion hazard (wind or water) is low. They are deep, generally well drained, and easily worked. They hold water well and are either fairly well supplied with plant nutrients or highly responsive to inputs of fertilizer.

The soils in class I are not subject to damaging overflow. They are productive and suited for intensive cropping. The local climate must be favorable for growing many of the common field crops.

In irrigated areas, soils may be placed in class I if the limitation of the arid climate has been removed by relatively permanent irrigation works. Such irrigated soils (or soils potentially useful under irrigation) are nearly level, have deep rooting zones, have favorable permeability and water-holding capacity, and are easily maintained in good tilth. Some of the soils may require initial conditioning including leveling to the desired grade, the leaching of a slight accumulation of soluble salts, or the lowering of the seasonal water table. Where limitations due to salts, water table, overflow, or erosion are likely to recur, the soils are regarded as subject to permanent natural limitations and are not included in class I.

Soils that are wet and have slowly or very slowly permeable subsoils are not placed in class I. Some kinds of soil in class I may be drained as an improvement measure for increased production and ease of operation.

Soils in class I that are used for crops need ordinary management practices to maintain productivity--both soil fertility and soil structure. Such practices may include the use of one or more of the following: Fertilizers and lime, cover and green-manure crops, conservation of crop residues and animal manures, and sequences of adapted crops.

[1] Some rapidly permeable soils in class I may have gentle slopes.

Class II.--Soils in class II have some limitations that reduce the choice of plants or require moderate conservation practices.

Soils in this class require careful soil management, including conservation practices, to prevent deterioration or to improve air and water relations when the soils are cultivated. The limitations are few and the practices are easy to apply. The soils may be used for cultivated crops, pasture, range, woodland, or for wildlife food and cover.

Limitations of soils in class II may include singly or in combination the effects of (1) gentle slopes; (2) moderate susceptibility to wind or water erosion, or moderate adverse effects of past erosion; (3) less than ideal soil depth; (4) somewhat unfavorable soil structure and workability; (5) slight to moderate salinity or alkalinity, easily corrected but likely to recur; (6) occasional damaging overflow; (7) wetness correctible by drainage but existing permanently as a moderate limitation; and (8) slight climatic limitations on soil use and management.

The soils in this class provide the farm operator less latitude in the choice of either crops or management practices than soils in class I. They may also require special soil-conserving cropping systems, soil conservation practices, water-control devices, or tillage methods when used for cultivated crops. For example, deep soils of this class with gentle slopes that are subject to moderate erosion when cultivated may need one of the following practices or some combination of two or more: Terracing, stripcropping, contour tillage, crop rotations that include grasses and legumes, vegetated water-disposal areas, cover on green-manure crops, stubble mulching, fertilizers, manure, and lime. The exact combinations of practices vary from place to place, depending on the characteristics of the soil, the local climate, and the farming system.

Class III.--Soils in class III have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Soils in class III have more restrictions than those in class II, and when used for cultivated crops, the conservation practices are usually more difficult to apply and to maintain. They may be used for cultivated crops, pasture, woodland, range, or for wildlife food and cover.

Limitations of soils in class III restrict the amount of clean cultivation; timing of planting, tillage, and harvesting; choice of crops; or a combination of these items. The limitations may result from the effects of one or more of the following: (1) Moderately steep slopes; (2) high susceptibility to water or wind erosion or severe adverse effects of past erosion; (3) frequent overflow accompanied by some crop damage; (4) very slow permeability of the subsoil; (5) wetness or some continuing waterlogging after drainage; (6) shallow depths to bedrock, hardpan, fragipan, or claypan that limits the rooting zone and the water storage; (7) low moisture-holding capacity; (8) low fertility not easily corrected; (9) moderate salinity or alkalinity, or (10) moderate climatic limitations.

When cultivated, many of the wet, slowly permeable but nearly level soils in class III require a drainage system and a cropping system that maintains or improves the structure and tilth of the soil. To prevent puddling and to improve permeability it is commonly necessary to supply organic material to such soils and to avoid working them when they are wet. In some irrigated areas, part of the soils in class III have limited use because of high water table, slow permeability, and the hazard of salt or alkali accumulation. Each distinctive kind of soil in class III has one or more alternative combinations of use and practices required for safe use, but the number of practical alternatives for average farmers is less than for soils in class II.

Class IV.--Soils in class IV have very severe limitations that restrict the choice of plants, require very careful management, or both.

The restrictions in use for these soils are greater than those in class III, and the choice of plants is more limited. When these soils are cultivated, more careful management is required and conservation practices are more difficult to apply and maintain. Soils in class IV may be used for crops, pasture, woodland, range, or for wildlife food and cover.

Soils in class IV may be well suited to only two or three of the common crops or the amount of harvest produced may be low in relation to inputs over a long period. Use for cultivated crops is limited as a result of the effects of one or more permanent features such as (1) steep slopes, (2) severe susceptibility to water or wind erosion, (3) severe effects of past erosion, (4) shallow soils, (5) low moisture-holding capacity, (6) frequent overflows accompanied by severe crop damage, (7) excessive wetness with continuing hazard of waterlogging after drainage, (8) severe salinity or alkalinity, or (9) moderately adverse climate.

Many sloping soils in class IV in humid regions are suited for occasional but not regular cultivation. Some of the poorly drained, nearly level soils placed in class IV are not subject to erosion but are poorly suited to intertilled crops because of the time required for the soil to dry out in the spring and because of low productivity for cultivated crops. Some soils in class IV are well suited to one or more of the special crops, such as fruits and ornamental trees and shrubs, but this suitability itself is not sufficient to place a soil in class IV.

In subhumid and semiarid regions soils in class IV may produce good yields of adapted cultivated crops during years of above average rainfall; low yields during years of average rainfall; and failures during years of below average rainfall. During the low rainfall years the land must be protected even though there can be little or no expectancy of a marketable crop. Special treatments and practices to prevent soil blowing, conserve moisture, and maintain soil productivity are required. Sometimes crops must be planted or emergency tillage used for the primary purpose of maintaining the soil during years of low rainfall. These treatments must be applied more frequently or more intensively than on soils in class III.

Land limited in use--generally not suited for cultivation

Class V.--Soils in class V have little or no erosion hazard but have other limitations that are impractical to remove that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Soils in this class have limitations that restrict the kind of plants that can be grown and that prevent normal tillage of cultivated crops. They are nearly level but some are wet, are frequently overflowed by streams, are stony, have climatic limitations, or have some combination of these limitations. Examples of class V are (1) soils of the bottom lands subject to frequent overflow that prevents the normal production of cultivated crops, (2) nearly level soils with a growing season that prevents the normal production of cultivated crops, (3) level or nearly level stony or rocky soils, and (4) ponded areas where drainage for cultivated crops is not feasible but where soils are suitable for grasses or trees. Because of these limitations cultivation of the common crops is not feasible but pastures can be improved and benefits from proper management can be expected.

Class VI.--Soils in class VI have severe limitations that make them generally unsuited for cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Physical conditions of soils placed in class VI are such that it is practical to apply range or pasture improvements, if needed, such as seeding, liming, fertilizing, and water control with contour furrows, drainage, ditches, diversions, or water spreaders. Soils in class VI have continuing limitations that cannot be corrected, such as (1) steep slope, (2) severe erosion hazard, (3) effects of past erosion, (4) stoniness, (5) shallow rooting zone, (6) excessive wetness or overflow, (7) low-moisture capacity, (8) salinity or alkalinity, or (9) severe climate. Due to one or more of these limitations these soils are not generally suited for cultivated crops. But they may be used for pasture, range, woodland, or wildlife cover or some combination of these.

Some soils in class VI can be safely used for the common crops provided unusually intensive management is used. Some of the soils in this class are also adapted to special crops such as coffee, tomatoes, peppers, pigeonpeas, etc., requiring soil conditions unlike those demanded by the common crops. Depending upon soil features and local climate the soils may be well or poorly suited to woodlands.

Class VII.--Soils in class VII have very severe limitations that make them unsuited for cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Physical conditions of soils in class VII are such that it is impractical to apply such pasture or range improvements as seeding, liming, fertilizing, and water-control measures such as contour furrows, ditches, diversions, or water spreaders. Soil restrictions are more severe than those in class VI because of one or more continuing limitations that cannot be corrected, such as very steep slopes, erosion, shallow soil,

stones, wet soil, salts or alkali, unfavorable climate, or other limitations that make them unsuited for common cultivated crops. They can be used safely for grazing or woodland or wildlife food and cover, or some combination of these under proper management.

Depending upon the soil characteristics and local climate, soils in this class may be well or poorly suited to woodland. They are not suited to any of the common cultivated crops; in unusual instances, some soils in this class may be used for special crops under unusual management practices. Some areas of class VII may need seeding or planting to protect the soil and to prevent damage to adjoining areas.

Class VIII.--Soils and landforms in class VIII have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes.

Soils and landforms in class VIII cannot be expected to return significant onsite benefits from management for crops, grasses, or trees, although benefits from wildlife use, watershed protection, or recreation may be possible.

Limitations that cannot be corrected may result from the effects of one or more of the following: (1) Erosion or erosion hazard, (2) severe climate, (3) wet soil, (4) stones, (5) low moisture capacity, and (6) salinity or alkalinity.

Badlands, rock outcrop, sandy beaches, river wash, mine tailings, and other nearly barren lands are included in class VIII. It may be necessary to give protection and management for plant growth to soils and landforms in class VIII in order to protect other more valuable soils, to control water, or for wildlife or aesthetic reasons.

Capability Subclasses

Subclasses are groups of capability units within classes that have the same kinds of dominant limitations for agricultural use as a result of soil and climate. Some soils are subject to erosion if they are not protected, while others are naturally wet and must be drained if crops are to be grown. Some soils are shallow or droughty, or have other soil deficiencies. Still other soils occur in areas where climate limits their use. The four kinds of limitations recognized at the subclass level are: Risks of erosion, designated by the symbol (e); wetness, drainage, or overflow (w); root-zone limitations (s); and climatic limitations (c). The class and subclass provide the map user information about both the degree and kind of limitation. Subclasses are not recognized in capability class I.

Subclass (e) erosion is made up of soils where the susceptibility to erosion is the dominant problem or hazard in their use. Erosion susceptibility and past erosion damage are the major soil factors for placing soils in this subclass.

Subclass (w) excess water is made up of soils where excess water is the dominant hazard or limitation in their use. Poor soil drainage, wetness, high water table, and overflow are the criteria for determining which soils belong in this subclass.

Subclass (s) soil limitations in the root zone is made up of soils where root-zone limitations are the dominant hazard or limitation in their use. These limitations are the results of such factors as shallow soils, stoniness, low moisture-holding capacity, low fertility difficult to correct, and salinity or alkalinity.

Subclass (c) climatic limitation is made up of soils where the climate (temperature and lack of moisture) is the only major hazard or limitation in their use.

Limitations imposed by erosion, excess water, shallow soils, stones, low moisture-holding capacity, salinity or alkalinity can be modified or partially overcome and take precedence over climate in determining subclasses. The dominant kind of limitation or hazard to the use of the land determines the assignment of capability units to the (e), (w), and (s) subclasses. Capability units that have no limitation other than climate are assigned to the (c) subclass.

Where two kinds of limitation which can be modified or corrected are essentially equal, the subclasses have the following priority: e, w, and s. For example, we need to group a few soils in humid regions that have both an erosion hazard and an excess water hazard; with them the e takes precedence over the w; with soils having both an excess water limitation and a root-zone limitation the w takes precedence over the s. In grouping soils of subhumid and semiarid regions that have both an erosion hazard and a climatic limitation the e takes precedence over the c, and in grouping soils with both root-zone limitations and climatic limitations the s takes precedence over the c.

Capability Units

The capability units provide more specific and detailed information than the subclass for application to specific fields on a farm or ranch. A capability unit is a grouping of soils that are nearly alike in suitability for plant growth and responses to the same kinds of soil management. That is, a reasonably uniform set of alternatives can be presented for the soil, water, and plant management of the soils in a capability unit, assuming that effects of past management are properly considered. Soils grouped into capability units respond in a similar way and require similar management although they may have soil characteristics that put them in different soil series.

Soils grouped into a capability unit should be sufficiently uniform in the combinations of soil characteristics that influence their qualities to have similar potentialities and continuing limitations or hazards. Thus the soils in a capability unit should be sufficiently uniform to (a) produce similar kinds of cultivated crops and pasture plants with similar management practices, (b) require similar conservation treatment and management under the same kind and condition of vegetative cover, and (c) have comparable potential productivity. (Estimated average yields under similar management systems should not vary more than about 25 percent among the kinds of soil included within the unit.)

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