

VIRGIN ISLANDS RESOURCE MANAGEMENT COOPERATIVE

Biosphere Reserve Research Reports

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AND HAWKSNEST BAY WATERSHEDS
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Virgin Islands National Park

August, 1987

HISTORIC LAND USE IN THE
REEF BAY, FISH BAY AND HAWKSNEST BAY WATERSHEDS
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1718-1950

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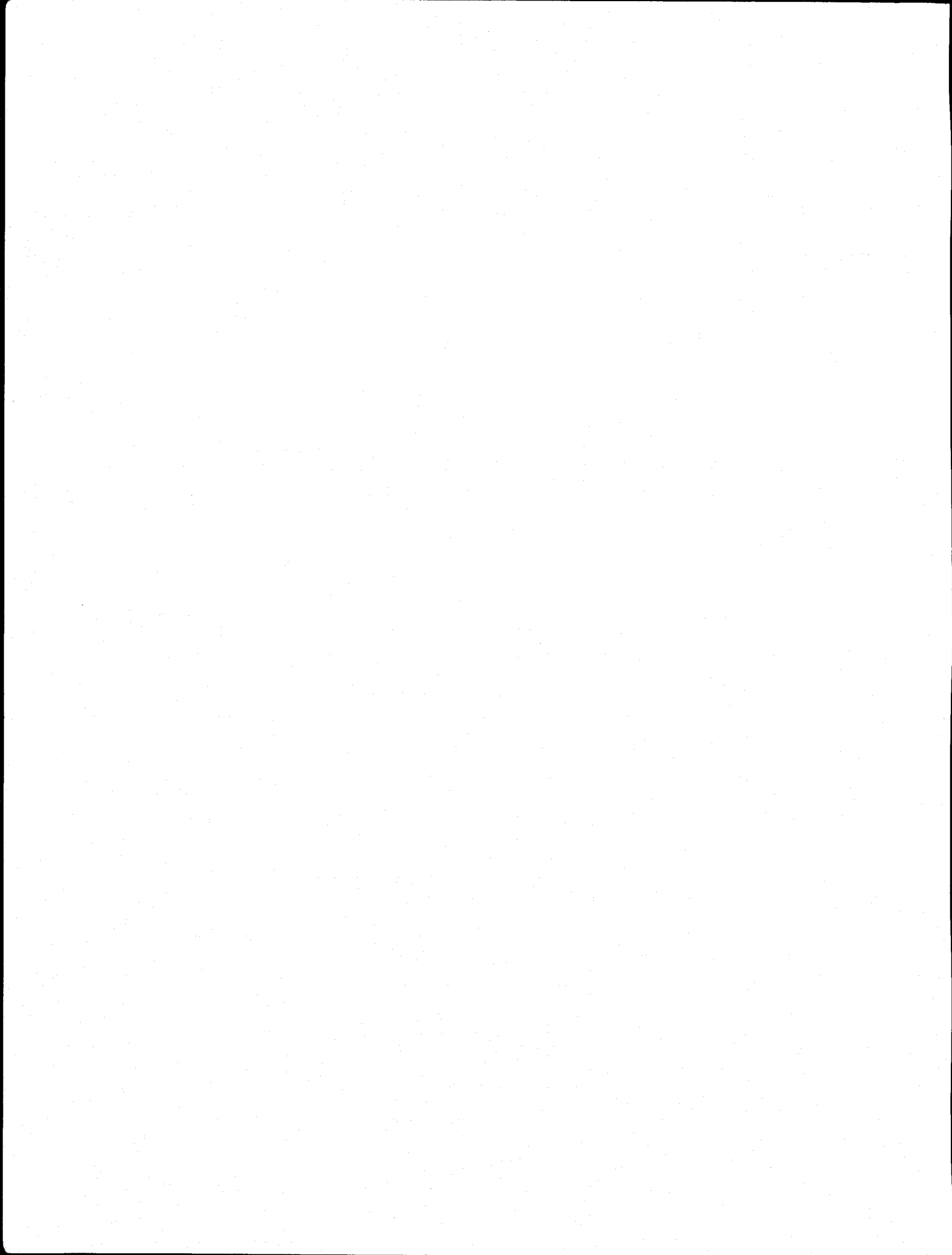
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ABSTRACT

Historic land use and settlement patterns within the Reef Bay, Fish Bay and Hawksnest Bay watersheds were associated almost exclusively with export-oriented plantation agriculture introduced by European and African colonists after 1717. Aboriginal and post-emancipation peasant subsistence farming was not widely practiced in these study areas.

Energized by imported slave labor the plantations spread throughout the watersheds between 1718 and 1740. Field operations and population densities peaked in the 1770's, but continued at relatively high levels until about 1820. Thereafter, agricultural activities contracted steadily, permitting progressive reforestation of the watersheds. During the first half of the twentieth century no more than 5 percent of total watershed land remained in use.

Analysis of the historical record indicates that plantation agriculture had a profound, yet variable, impact on watershed environments. Plantation fuel, lumber and land requirements resulted in the initial loss of most, if not all, of the indigenous forest cover and its partial replacement with introduced vegetation. On the other hand, truncated plantation development and plantation land management strategies, such as terracing, watercourse controls and selective reforestation, allowed for the persistence of many native plant species and probably moderated soil erosion and sedimentation discharges associated with widespread land clearance and intensive use.

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INTRODUCTION

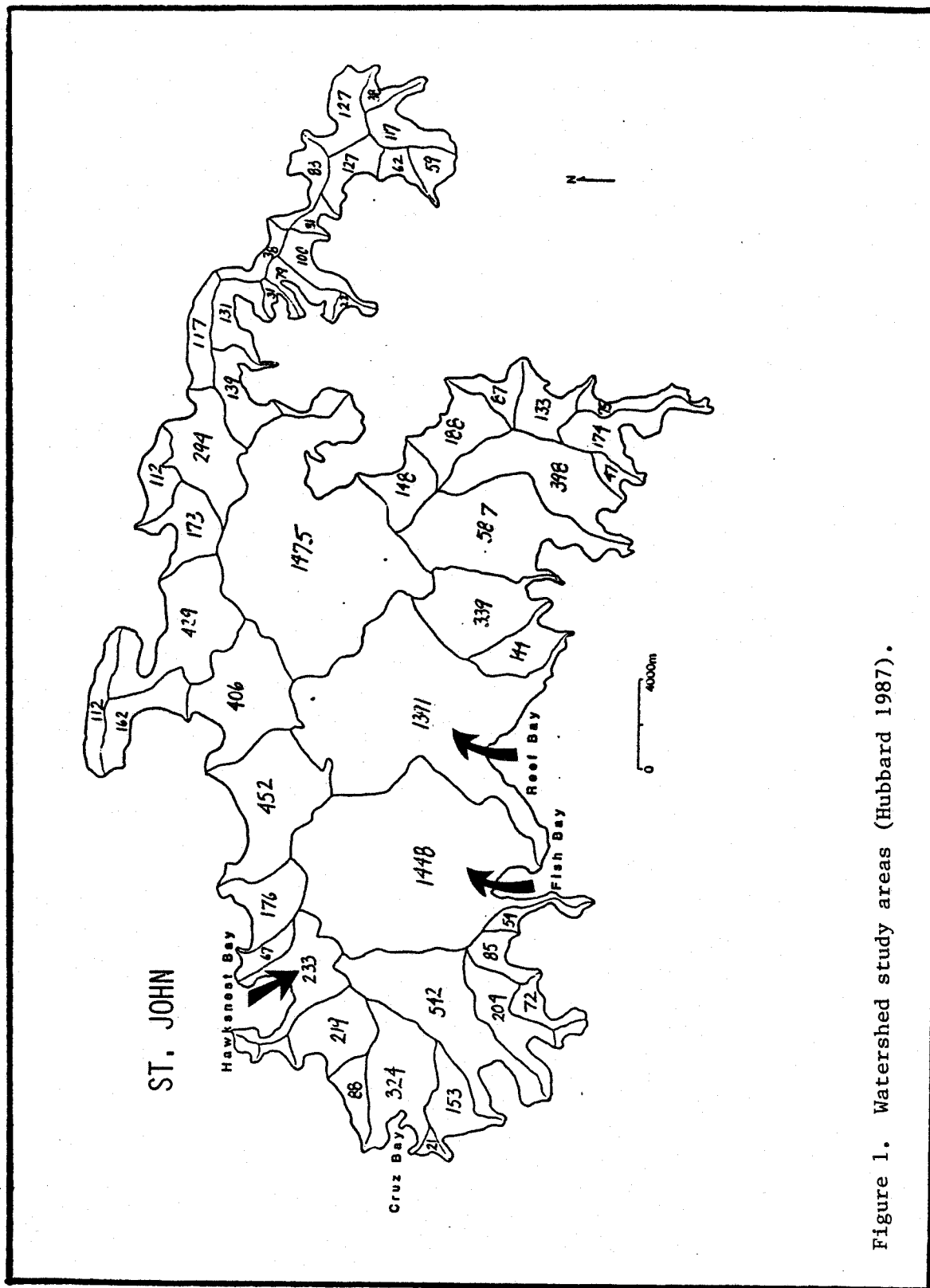
Human manipulation of the St. John landscape began some 2000 years ago with the arrival of seafaring aboriginal migrants. Since that time the limited terrestrial and marine resources of the 19 square mile island have been subject to almost continuous exploitation by successive waves of immigrant groups. Although the scope and intensity of land utilization varied considerably in accordance with the size and adaptive resource management strategies of each settlement culture, the cumulative impact has been the complete alteration of the pristine insular environment.

Today's landscape, despite its wilderness appearance, is largely a cultural landscape, in that it has been shaped as much by human activity as by natural processes and events. This intrinsic cultural dimension derives from two human systems: an export oriented plantation system and, to a lesser degree, a subsistence system practiced by a post-emancipation peasantry. The plantation system dominated the landscape for over a century (roughly 1718-1850). Thereafter, it shared St. John's natural resources with a small, but energetic peasantry until the advent in the 1950's of the contemporary systemic mode based on tourism and welfare state economics.

This study focuses on the land use patterns and practices of the plantation and peasant modes of production in three St. John watersheds - Reef Bay, Fish Bay and Hawksnest Bay - between 1718 and 1950. Its primary objective is to assess the extent and nature of human activity in these critical ecosystems in order to delineate the cultural and historical processes that have brought them to their present state of development.

The study is based primarily on archival research in hitherto untapped documentary sources found in the national archives of Denmark and the United States. Informant interviews, field surveys, cartographic analysis and secondary sources have been used to supplement the documentary material.

The most important historical documents consulted were the land tax registers (matriculs) maintained by the Danish Government. These records, which cover the years 1728-1733, 1736-1739 and 1755-1915, provide invaluable statistical information about ownership, size, land use and population for each unit of production on the island. While they pose certain problems for the researcher (Tyson 1984), their use, in conjunction with supplementary material, such as plantation inventories and special plantation censuses, makes it possible to reconstruct land use patterns and population densities during the era of Danish sovereignty with a high degree of accuracy.



For the period between 1917 and 1950, the record collections of various United States Government agencies involved in island administration were consulted. Information from these sources has been augmented by recollections of people who lived on St. John during the period.

The study will provide historical baseline information that will be integrated into scientific studies of vegetation, sedimentation rates, reef systems, and fisheries being conducted within the Virgin Islands Biosphere Reserve. It is further intended to contribute to our understanding of human ecology in Caribbean insular systems.

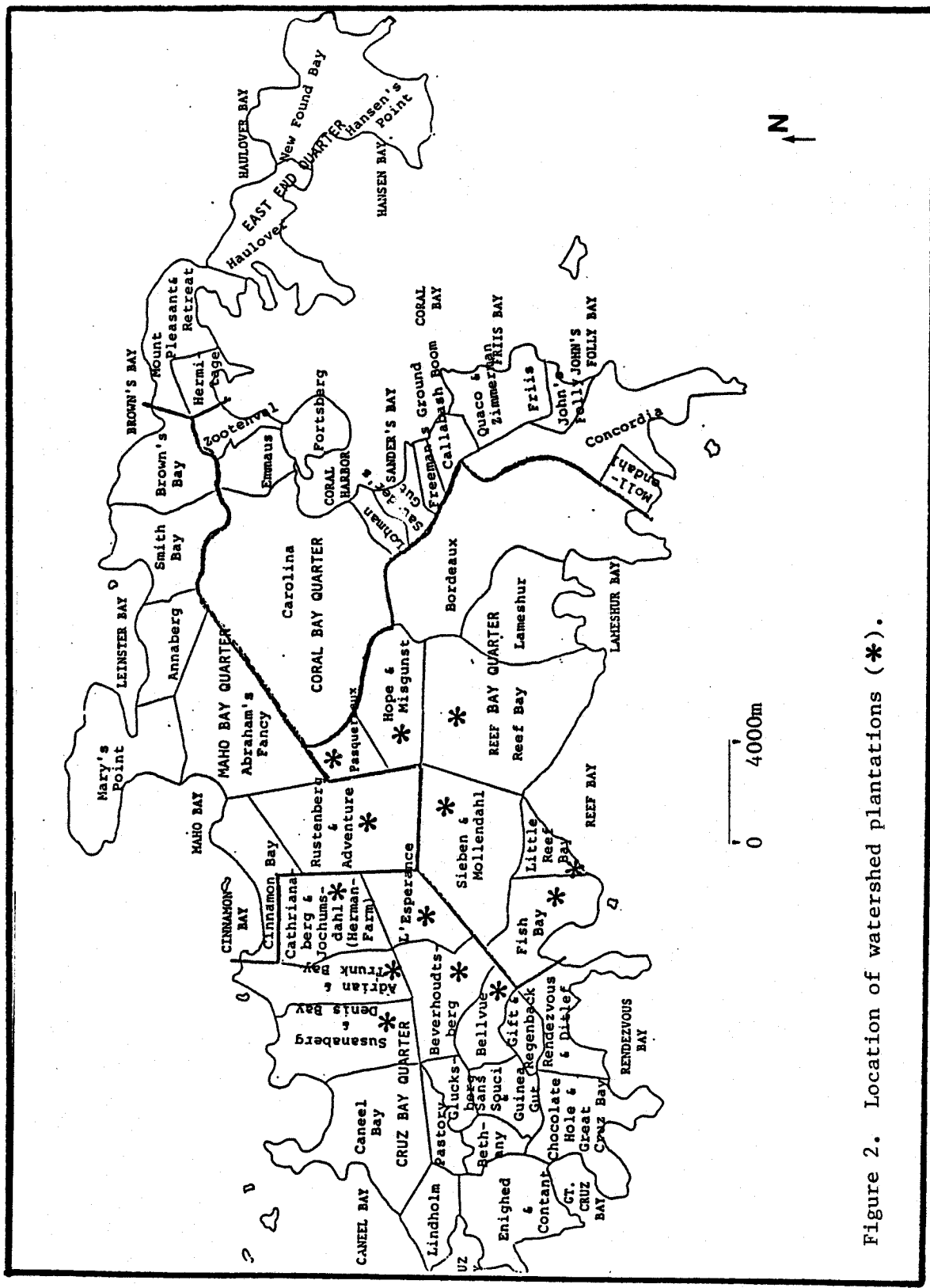


Figure 2. Location of watershed plantations (*).

HISTORIC OVERVIEW

Prehistoric Era

According to the archaeological record, human occupation of St. John began around A.D. 100-200, when seafaring aborigines belonging to the Arawak family of South America established a settlement at Coral Bay.¹ Here they practiced a mixed subsistence economy that involved the exploitation of marine resources as a source of protein, but relied primarily upon the agricultural production of foodstuffs, such as potatoes, peppers, maize, beans and, above all, manioc. The cultivation technique of these early horticulturalists most likely consisted of "swidden" or "slash and burn" agriculture, rather than the establishment of permanent field systems characteristic of later Indian cultures found in the Greater Antilles (Bullen 1962; Bradstreet 1975; Figueredo 1982).

For reasons that remain unclear, sometime around 500 B.C. the locus of aboriginal settlement shifted from the southern to the northern side of St. John. The Coral Bay site was abandoned, while several contemporaneous settlements were established along the north shore between Cruz Bay and Francis Bay.

Archaeologists differ as to why this shift occurred. Bullen (1962) attributes it to population change. Sleight (1962) stresses environmental factors, chiefly the desire to find more hospitable meteorological and agricultural conditions. Bradstreet (1975) also emphasizes environmental factors, but believes that Coral Bay was abandoned because of recurring drought induced by increased land clearance. Johnston and Lunberg (1983) suggest that northside sites may also have been preferred because of growing inter-island trade networks.

All are agreed that the new settlement orientation reflected an adaptive shift in aboriginal subsistence pattern from primary emphasis on horticulture to primary reliance on the exploitation of marine resources, especially shellfish.

The impact of aboriginal subsistence economy on the terrestrial and marine resources of St. John during more than 1000 years of occupation is difficult to estimate. Available archaeological evidence indicates small populations and limited site distribution. To date a total of 23 prehistoric sites have been reported on St. John (Sleight 1962; Prokopetz and Hamilton 1977; Johnston 1981; Reeves 1987), but most seem to be special use sites and/or temporary camps rather than major settlements. All known sites are located at coastal bays or valleys, and there is little evidence that Indian settlement or agriculture extended far into the interior.

1. A 1986 archaeological survey conducted at Lameshur Bay by the Southeast Archaeological Center found evidence of a pre-ceramic midden that radio carbon tested to B. C. 770 (+/- 70) (Reeves 1987).

On the other hand, there must have been considerable land clearance and shellfish harvesting around the main coastal occupation sites at Coral Bay, Cruz Bay, Turtle Bay, Cinnamon Bay, Francis Bay and possibly Fish Bay. One local archaeologist (Figueredo 1986) believes that despite small populations, a millennium of shifting, slash and burn agriculture probably destroyed most, if not all, of the climax forest of St. John.

Proto-Historic Era (1493-1717)

St. John was among those Caribbean islands that Christopher Columbus encountered and claimed for Spain during his second voyage to the New World in 1493. His captains, who apparently did not make landfall, reported it as uninhabited. There is some evidence (Figueredo 1978) that Carib and Arawak refugees temporarily reoccupied St. John during the wars associated with the Spanish conquest of Puerto Rico and the pacification of the Caribs of St. Croix (1511-1530). However, it appears that aboriginal occupation ceased prior to 1550, leaving St. John uninhabited for over a century.

Between 1671 and 1717 small bands of mariners, woodcutters and agriculturalists from St. Thomas and surrounding British islands intermittently occupied St. John for short periods (Westergaard 1917; Larsen 1986). But, competing claims to the island by European powers prevented permanent colonization. Little is known about these early colonists, and no documentary or physical evidence respecting the location or nature of their settlements has yet surfaced. Their impact on the landscape must have been slight, for on the eve of Danish colonization a visiting English governor reported St. John as being heavily wooded and without evidence of human occupation (Public Record Office 1717).

The Plantation Era (1718-1850)

Immediately upon colonizing St. John in March 1718, Danish authorities began parcelling out the land for plantation development with the intention of producing profitable tropical crops for export into the emerging world market economy. Consequently, there was no development of subsistence agriculture, such as occurred in colonial Puerto Rico, or of small-scale yeoman farming, such as occurred on neighboring British and French islands.

By 1728 the entire island, except for some rocky headlands, had been subdivided into 91 plantation holdings (Larsen 1986). During the next decade some of these original tracts were subdivided by their owners, and headlands were parcelled out by the government so that by 1739 there were 110 plantations, averaging 110 acres and 15 residents each (Table 1).

TABLE 1. St. John land use indices: 1739, 1760, 1800

St. John	1739	1760	1800
Total Plantations	110	83	65
Total Plantation Acreage	12046	12497	12497
Total Plantation Slaves	1455	1991	2359
Total Plantation Population	1620	2169	2616
Estimated Cropland (acres) ^a	2182	2987	3539
Population Density ^b	86	111	134
Av. Plantation Acreage	110	151	192
Av. Plantation Population	15	26	40
Av. Plantation Cropland Acres	20	36	54
Sugar Sector			
Number of Plantations	27	22	20
Plantation Acreage	4636	5993	7465
Plantation Slaves	734	1288	2167
Plantation Population	782	1471	2209
Estimated Cropland (acres) ^a	1101	1932	3251
Population Density ^b	108	157	189
Av. Plantation Acreage	172	272	373
Av. Plantation Population	29	67	110
Av. Plantation Cropland Acres	43	88	163
% Total Plantations	24.5	26.5	30.7
% Total Acreage	38.5	48.0	59.7
% Total Population	48.3	67.8	82.8
% Total Cropland	50.5	64.7	91.9
Non-Sugar Sector			
Number of Plantations	65	59	22
Plantation Acreage	5801	6219	3022
Plantation Slaves	721	703	192
Plantation Population	838	816	407
Estimated Cropland (acres) ^a	1081	1055	288
Population Density ^b	92	84	86
Av. Plantation Acreage	89	105	137
Av. Plantation Population	14	14	19
Av. Acres Cropland	17	18	13
% of Total Plantations	59.1	71.1	33.8
% of Total Acreage	48.2	49.8	24.2
% of Total Population	51.7	37.6	15.6
% of Total Cropland	49.5	35.3	08.1
Uncultivated Plantations			
Number of Plantations	18	2	23
Acreage	1609	285	2010
% of Total Plantations	16.4	02.4	35.4
% of Total Acreage	13.3	02.4	16.1

Source: Rigsarkivet 1728-1915

^aEstimated at 1.5 acres per slave. ^bPersons per square mile

Like other West Indian plantations, those on St. John imported slave labor from Africa and other Caribbean colonies to clear the forest, build terraces, plant, harvest and process cash crops for export into the world market. The first island-wide census, taken in 1728, showed 806 slaves (Larsen 1986). In 1739 the slave population stood at 1455; in 1760 at 1991; in 1800 at 2359 (Table 1). Slave labor was essential to plantation enterprise, and it was universally acknowledged by the St. John plantocracy that the size of the slave population, more than any other factor, determined the extent of land clearance and cultivation (Rigsarkivet 1804a).

Given the absence of other types of relevant statistical information, the slave population curve provides the best index of agrarian land use activity on St. John prior to 1804. Slave population figures can also be used to estimate the amount of cropland before 1804. Information derived from St. John plantation inventories dating between 1767 and 1793, and from an island-wide plantation census of 1797 (Table 2), establish a ratio of at least 1.5 cultivated acres per slave during the 18th century, which compares to 1 acre per slave elsewhere in the Caribbean (Barrett, 1965).

In addition to importing labor, the plantations introduced a host of new plant species, including export crops like sugar cane, cotton, coffee, indigo, cocoa and tobacco; food crops such as bananas, plantains, coconuts, vegetables and a variety of citrus fruits; and forage crops such as guinea grass. They also imported domestic animals, most particularly horses, cattle, burros, sheep, goats and swine.

Like its Caribbean counterparts (Sheridan 1973), the St. John plantation system was not static. Rather it evolved through a development cycle consisting of four phases: foundation (1718-1740); consolidation (1740-1765); sugar monoculture (1765-1850) and decline (1850-1950). Data respecting the character of the plantation system in the first three of these phases is presented in Table 1.

During its first half century the plantation system practiced a diversified agricultural economy, closely adapted to prevailing environmental conditions. Sugar cane was cultivated on coastal plains, alluvial valleys, mountain spurs and the central upland plateau. Cotton was grown in the drier southwestern and eastern portions of the island. A few coffee estates were established along the cool mountain ridgelines between Bordeaux, Mamey and Camelberg peaks. Smaller properties on steep terrane concentrated on raising livestock or harvesting foodstuffs for sale to the sugar plantations (Tyson 1984). Some estates around Coral Bay produced indigo, but this fledgling industry was permanently destroyed by the great slave rebellion of 1733-1734 (Marfeldt 1765).

By 1740 the foundations of St. John's plantation economy had been firmly set in place. During this pioneer phase of development the plantation system spread throughout the entire island by a process of land distribution, in-migration, land clearance, terracing, cultivation and

construction. A large percentage of forest was cleared and transformed into cropland. Additional areas of native vegetation were partially modified by African slaves cultivating foodstuffs on a shifting basis (Olwig 1986) and by herds of foraging livestock (mules, horses, cattle, sheep and swine) introduced by the plantation owners (Tyson 1984).

Between 1740 and 1765 the system of diversified plantation agriculture that had emerged in the 1730's matured into a fully developed economic order. During this period the number of plantations declined from 110 to 83, as landholdings were consolidated by enterprising planters into larger units of production. Non-sugar plantations prospered, with cotton and coffee competing with sugar as the leading crops. In 1760 the non-sugar plantations comprised 71% of all plantations and occupied 50% of the land (Table 1).

During this period the plantations achieved maximum internal and external expansion through increased inputs of capital, labor and technology. Most, if not all, of the remaining native forest was cut down, either because of its commercial value, or to make way for plantation agriculture and settlement. Stone terraces extended sugar cultivation to the mountain peaks in many areas.

In 1760 (Table 1) eighty-one operational plantations occupied 98% of the land surface. Much of the remaining area had been exposed to some level of cultivation before being allowed to revert to bush by its owners. Probably at no other time has the St. John landscape been subject to such extensive exploitation. In consequence of this agrarian enterprise, the pristine, tropical wilderness gave way to a cultural landscape whose features reflected the adaptive resource management strategies and syncretic cultural traditions of the new European and African inhabitants.

After 1765 the St. John plantation system underwent a major structural transformation, as its diversified agricultural economy gave way to one specializing in the production of a single staple: sugar. Between 1760 and 1800, as shown by Table 1, the sugar plantations progressively enlarged themselves and their control over the St. John landscape at the expense of the non-sugar sector. By 1800 the sugar plantations engrossed 60% of the land, 91% of all cropland and 83% of the population (Table 1).

Estates engaged in cotton and coffee cultivation virtually disappeared from the scene. Non-sugar properties that were not directly incorporated into the sugar sector functioned essentially as its economic satellites, producing ground provisions, livestock and possibly even slave laborers for sugar plantation consumption (Tyson 1984). Several estates were abandoned altogether. In 1800 (Table 1) there were 23 uncultivated plantations, aggregating 2010 acres. Most of these unproductive properties were located in the dry southwestern section of the island.

It should be noted that by 1800 most St. John sugar planters owned uncultivated plantation grounds outside the bounds of their sugar estates, which they utilized for wood, water, marine resources and pasture. For example, in 1800 the respective owners of Susanaberg, Adrian and Herman Farm, three sugar plantation in the central upland plateau, also owned a 350 acre plantation at Fish Bay, a 75 acre plantation near the village of Cruz Bay, and two plantations aggregating 375 acres at Chocolate Hole and Great Cruz Bay, all of which were classified as uncultivated in the tax records (Rigsarkivet 1728-1915).

Enlargement and consolidation of landholdings enabled sugar planters to practice economies of scale and to manage limited land, water and labor resources more efficiently. In practice this meant that cane cultivation was expanded to wherever soils, slope and precipitation could sustain it. Drier, rockier, steeper, less productive land was set aside for specialized purposes, such as slave provision grounds, pasture or wood harvesting. To concentrate labor on sugar production many planters scaled down or phased out these secondary activities, relying instead on imported food and lumber (Tyson 1984). The end result of this land management regime was intensive use of arable acreage, while marginal land was allowed to lapse into secondary growth.

The actual land use pattern prevailing on the sugar plantations at the end of the eighteenth century is shown in Table 2.

TABLE 2. Land use on St. John sugar plantations, 1797

Total Acreage	8355	(100%)
Cropland	2636	(31.5%)
Sugar Cane	1969	
Cotton	40	
Coffee	2	
Provisions	625	
Pasture	1678 a	(20.1%)
Woodland	4041	(48.4%)
Slaves	1805	
Cultivated Acres per Slave	1.5	

Source: Rigsarkivet 1797.

a. Reliable data could be obtained for 14 estates. It yielded an average of 84 acres per estate, which was the figure assigned to each of the six remaining estates.

According to these figures, derived from a special plantation census of 1797, just over half the total land area of the sugar plantations (4314 acres) was actually in agricultural use. The remaining 48.4% was classified as woodland. Of the land-in-use, cropland accounted for 61% and pasture for 39%. Caneland comprised 75% of all cropland, while provisions for plantation use took up 24% of the cultivated area. Not all of the caneland was planted. According to another census of 1804 (Rigsarkivet 1804b), 16% of the cane fields lay fallow. The woodland category included some cleared land, such as roads, trails, shoreline and the settlement site. Plantation settlement areas consisted of three activity zones:

1. Great House Complex: Owner's and/or manager's residence, kitchen and other service buildings, servants' quarters, wells, cisterns, privy, garden, cemetery.
2. Factory Complex: Grinding mill, boiling, curing and still houses(s), storerooms, stables, pens, shops, magoss house, hospital, overseer's rooms.
3. Workers' Village: Small houses, garden plots, burial grounds.

These three complexes were typically concentrated together on high ground near the center of the property. It is not possible to accurately determine the size of the settlement area from available information. However, the 1804 census shows that the 20 St. John sugar plantations allocated a total of 117 acres, or about 6 acres each, to their slave villages. It can be estimated that an equivalent amount of land was assigned to the remaining settlement structures. The settlement area on the typical St. John sugar plantation, therefore, aggregated about 12 acres, with perhaps an additional 3 acres in trails, paths and roads.

The Mixed Economy (1850-1950)

The period between 1780 and 1850 constituted the golden age of King Sugar, an era characterized by intensive, specialized land use, relatively high population densities, and island-wide land management by and for the great sugar complexes.

After 1840 several factors combined to undermine the St. John sugar economy and vitiate the plantation system. These impairments included declining soil fertility, mounting production costs, falling prices and scarcity of investment capital (Tyson 1984). Slave emancipation in 1848 accelerated the decline, as many laborers evaded the oppressive contract Labor Act of 1849 by leaving St. John for greater economic opportunities and personal freedom on the neighboring islands of St. Thomas and Tortola (Olwig 1986). Overall population on St. John plunged from 2450 residents in 1846 to just 944 in 1880. During the same period the

UNITS OF PRODUCTION												
50 ACRES OR MORE				UNDER 50 ACRES			TOTAL UNITS		LAND USES (ACRES)			
YEAR	SUGAR		NON-CULTIVATED	TOTAL	CULTIVATED	UNCULTIVATED	TOTAL	SUGAR CANE	OTHER IMPROVED	WOODLAND	TOTAL	RURAL POPULATION
	21	22	20	63	1	1	2					
1805	21	22	20	63	1	1	2	1788	730 ^a	9988	12506	2577
1810	21	19	21	61	1	0	1	1690	805 ^a	10337	12832	2386
1815	18	15	19	52	0	3	3	1561	433 ^{h a}	10477 ^h	12472	2306
1820	18	15	20	53	0	3	3	1455	280 ^{h a}	11164 3/4	12900 ^h	2257
1825	17	18	18	53	2	4	6	1211	241 ^{h a}	11457 3/4	12910 ^h	2224
1830	16	21	15	52	20	4	24	1116	270 ^a	11530 ^h	12916 ^h	2319
1835	16	21	15	52	21	8	29	995	327 ^a	11583 ^h	12910 ^h	2435
1840	16	21	16	53	22	4	26	950	851	11109 ^h	12910 ^h	2161 (1841)
1845	15	19	17	51	16	9	25	839	780	11291 ^h	12910 ^h	2113
1850	16	18	17	51	25	6	31	976	1022 ^h	10900	12898 ^h	1325
1855	13	11	28	52	na	na	39	635	893 ^h	11457 ^h	12898 ^h	1633
1860	13	14	24	51	na	na	47	562	1327 3/4	11096	12985 3/4	1427
1865	11	17	21	49	22	60	82	559	1192 1/3	11242 5/8	12993 3/4	na
1870	4	22	24	50	19	63	82	136	1078	11779 3/4	12993 3/4	955
1875	6	17	29	52	14	79	93	88	599	12306 3/4	12993 3/4	na
1880	1	24	26	51	20	72	92	78	564	12421 3/4	12933 3/4	854
1885	5 ^b	20	28	53	70	69	139	106	500	12387 3/4	12993 3/4	na
1890	4	27	22	53	83	78	161	82	631 ^h	12355 3/4	13069 ^h	924
1895	5	21	25	51	102	66	168	26	499 3/4	12543 ^h	13069 ^h	na
1900	3	26	22	51	125	64	189	10 ^h	824 3/4	12237 ^h	13069 ^h	872 (1901)
1905	2	25	25	52	117	74	191	7 ^h	726	12335 3/4	13069 ^h	na
1910	1	29	20	50	125	81	206	14	807	12248 ^h	13069 ^h	914 (1911)
1915	1	30	23	54	172	72	244	10	1044	12208 ^h	13262 ^h	na

Sources: Rigsarkivet 1728-1915; Rigsarkivet 1835-1911. ^aExcludes pasture. ^bIncludes Adrian 1886

Table 3. St. John land use data, 1805-1915.

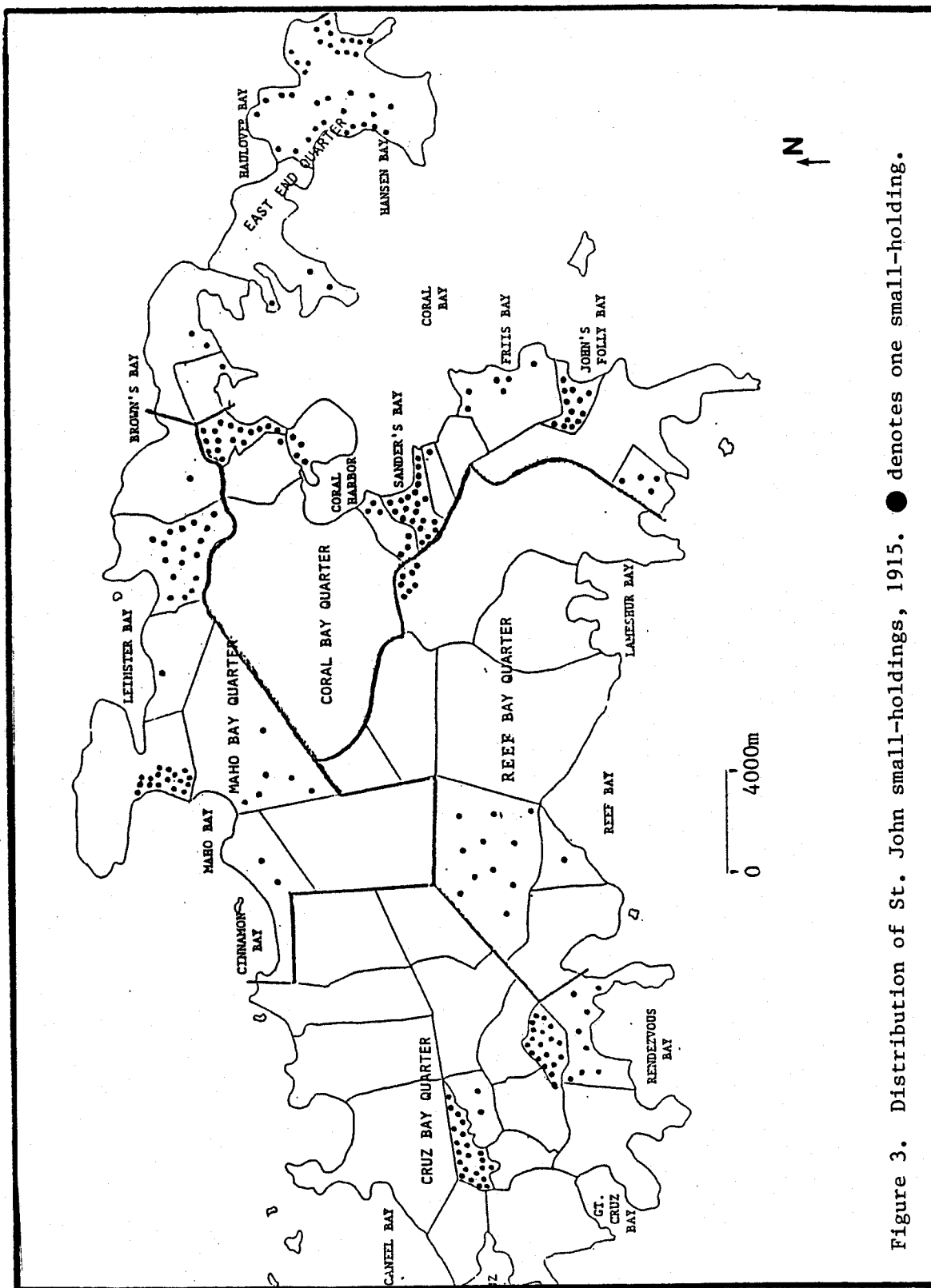


Figure 3. Distribution of St. John small-holdings, 1915. ● denotes one small-holding.

amount of caneland shrunk from 839 to 8 acres (Table 3). By 1915 only Par Force plantation in Reef Bay Quarter still cultivated sugar cane commercially.

The St. John plantation system buckled under the impact of slave emancipation and the demise of the sugar industry, but it did not collapse. It adapted to changing conditions by converting to small-scale, labor extensive, diversified agricultural pursuits, such as provision farming, fruit growing (limes, mangoes, guava, bananas), bay leaf harvesting/processing, and, most importantly, livestock (cattle and sheep) raising (Tyson 1984). In 1915 there were still 31 operational plantations with combined landholdings of 12,114 acres. However, only 729 acres were actually being farmed, chiefly as pasture. Much of the remainder had reverted to secondary forest.

Although the plantations controlled 91% of the land in 1915, most of the rural population lived outside their boundaries. The plantations survived into the twentieth century largely because their owners began sharing land resources with the newly emancipated labor force, thus laying the foundations of a freeholding peasantry unique in the Danish West Indies. Much of the impetus toward agricultural diversification after 1850 came from the mixed subsistence economy practiced by these resourceful peasant cultivators.

Data presented in Tables 3 and 4 shows that between 1805 and 1915 the number of small-holdings (50 acres or less) on St. John rose from 2 to 244. In the latter year 75% of the population lived on these plots, which engrossed 9% of the land, and accounted for 31% of all land-in-use. Figure 3 shows the distribution of small-holdings in 1915.

TABLE 4. Acreage and Land Use on St. John Small-holdings, 1805-1915

Year	Units	Sugar Acres	Pasture & Provisions	Unused	Totals
1805	4	0	1	31	32
1830	24	0	28	153	181
1860	47	0	43	312	355
1885	139	1	158	676	835
1915	244	0	325	823	1148

Source: Rigsarkivet 1728-1915

The impact of the peasant sector on the landscape exceeded actual land ownership, because in addition to parcelling out land, the planters frequently entered into rental or sharecropping arrangements, allowing peasants access to unused estate land (Olwig 1986).

The St. John peasantry practiced a subsistence economy involving a combination of occupational activities, including shifting provision cultivation, rearing small numbers of livestock, charcoal production, boat building, fishing, sailing, sand and ballast rock harvesting, basketry and part-time plantation labor. A discrete Afro-Caribbean culture, based on traditions of cooperation, sharing and reciprocity, crystallized around these diverse economic pursuits (Olwig 1986).

Within fifty years after Emancipation a distinctive socio-economic order based on small-scale, diversified agriculture, synergistically practiced by a relatively small population of plantation owners and peasants had evolved on St. John. In this system of integrated resource management people's energies were directed not toward rearranging the environment, but to making the most effective use of microhabitat and natural phenomena. A balance had been reached between production for the market and production for domestic use, which ensured the inhabitants a modest livelihood and a high degree of cultural autonomy. The development of this mixed economy significantly altered the land use situation, as can be seen from a review of the data presented in Table 3.

Between 1805 and 1915 the amount of land-in-use on St. John decreased by 58%, from 2158 to 1054 acres. Whereas in 1800 about 34% of the island was subject to intense exploitation, by 1915 only 8% remained in agricultural use. During this period the cultivation of sugarcane virtually ceased and there was a fundamental shift in land use from cropland to pasture. Population pressure on land resources eased considerably as the number of inhabitants fell from 2577 to 905, a net loss of 65%. Overall population density dropped from 134 to 47 persons per square mile.

In 1917 the United States took possession of St. John along with the other Danish West Indian colonies. Although American rule did not significantly alter the prevailing system of land tenure before 1950, it did disrupt post-emancipation patterns of land distribution and land use.

The basic contours of the plantation system remained intact, primarily because large landowners held on to their properties for speculative, rather than agricultural, purposes. Land distribution to smallholders was curtailed, and landholdings were concentrated into fewer hands, so that in 1950 just 14 owners held 10,480 acres, or 82% of St. John (Tyson 1984). Between 1930 and 1950 most plantations ceased commercial farming and fell into ruin. The once promising forestry industry collapsed. Livestock farming also suffered a downturn, although it persisted on a few estates.

After 1930 peasant subsistence activities also contracted, and many settlement sites were abandoned by their owners. Between 1917 and 1950, the rural population, which had been fairly stable since 1880, dropped from 900 to around 700. By 1950 smallholders probably had no more than 100 acres under cultivation. Charcoal production continued to be the chief source of peasant income during this period, but by 1950 it too had almost ceased (Tyson 1984).

The post-emancipation productive system, which began disintegrating during the 1930's, has been totally transformed by the establishment of an open tourist economy and the St. John National Park in the 1950's and 1960's. During the past 35 years, most of the old plantation land has been incorporated into the National Park system, which has shut it off to traditional agricultural and forest uses. Concurrently, small cultivators have abandoned the land as a source of livelihood, although some St. Johnians continue to engage in ground provision cultivation and artisanal fishing in order to supplement their government or tourist related incomes (Olwig 1986; Koester 1986). A way of life has disappeared, while much of the landscape has been deliberately managed to a wilderness state that obscures its cultural dynamic.

LAND USE IN REEF BAY WATERSHED

Geographical Setting

The Reef Bay watershed, located on the south side of St. John (Figure 1), drains 1391 acres (Hubbard, *et al.* 1987). The watershed is characterized by steep slopes rising to heights of 1000 to 1200 feet on three sides of a narrow, alluvial valley that opens broadly to the sea at Reef Bay on the south. The northern boundary is defined by the island's central east-west oriented mountain ridgeline, culminating at Mamey Peak (1147 feet). The eastern border is defined at its upper elevation by the Bordeaux mountain spur stretching north-south toward Bordeaux Peak (1277 feet), thence meandering along a subsidiary spur toward White Point on the eastern side of Reef Bay. The western border is defined by another north-south trending mountain spur that incorporates Camelberg Peak (1193 feet) before arcing in an ENE-WSW direction toward a shallow headland (Oyens or Owens Hill) that separates Reef and Fish Bays.

Reef Bay Gut, the second longest drainage basin on St. John, completely bisects the watershed, running 1.7 miles from Mamey Peak to Reef Bay. It is paralleled on the west by Rustenburg Gut, which extends 1.1 miles before joining it on the valley floor. Water flows in these two guts are intermittent.

Most of the watershed has slopes of 40-60 degrees. Cramer variety soils predominate in the uplands, San Anton varieties on the valley floor (Rivera, *et al.* 1970).

Prehistoric Land Use

There is little evidence of significant land use in the Reef Bay watershed prior to the historic epoch. Two prehistoric sites have been found in the Reef Bay valley by surface surveys, but only limited cultural remains have been encountered, leading archaeologists to speculate that Reef Bay was not heavily populated or utilized by aborigines (Sleight 1962; Prokopetz and Hamilton 1977; Johnston 1981). It is entirely possible, however, that other evidence of prehistoric settlement may have been destroyed/buried by the dynamic of upland erosion and lowland sedimentation generated by historic agricultural activities.

Historic Land Use

Whatever the level of prehistoric activity, there can be no doubt that the greatest human impact on the Reef Bay watershed occurred during the historic era, through the medium of the plantation system. All of the land within the Reef Bay watershed was parcelled out for plantation development during the first decade of Danish occupation. A total of 12 plantation grounds, comprising approximately 1455 Danish acres, were distributed by Danish authorities between 1718 and 1726 (Table 5).

TABLE 5. Plantation development in Reef Bay watershed, 1718-1728

Plantation	1728 Owner	Year Laid Out	Acres (Danish)
Adventure A	Jan Vlack	1718	150
Rustenburg A	Jacob Magens	1718	150
Rustenburg B	Jacob Magens	1718	150
Pasquereaux	Pasquereaux heirs	1721	158
Hope A	Adrian v. Beverhoudt	1721	150
Hope B	Adrian v. Beverhoudt	1721	75
Misgunst	Reis David	1724	112
Par Force A	Andreas Tortensen	1721	150
Par Force B	Jochim Stolley	1721	150
Par Force C	Bertel Swennings	1721	113
Par Force D	Anthony Kambeck	1724	97
Little Reef Bay	Phillip Diedrich	1726	75

Source: Rigsarkivet 1728-1915

Between 1725 and 1800, 11 of these original plantation grounds were progressively consolidated into 4 large units: Rustenburg/Adventure (450 acres), Pasquereaux (175 acres), Hope/Misgunst (275 acres), Par Force (500 acres). Little Reef Bay (75 acres) was the only plantation unaffected by the consolidation process. Thereafter, the plantations retained these acreages until their acquisition by the National Park Service in the 1950's.

It should be noted that plantation boundaries do not coincide exactly with watershed boundaries. Three upland plantations - Sieben, Maria's Hope (Vessup), and Bordeaux - each having some land within the watershed, have been excluded from this study because the majority of their property was outside the watershed. Sieben plantation, with considerable acreage on the ridgelines and slopes in the southwestern quadrant of the watershed, has been excluded because after 1755 land use and population data relating to it was combined with that of Mollendal plantation in the land tax records. The Sieben/Mollendal plantation has been included in the Fish Bay watershed, which is discussed in the next section, since most of its land lies within those boundaries. The reader should bear in mind, therefore, that the Reef Bay watershed experienced somewhat greater human manipulation than is statistically indicated in this discussion.

The statistical distortion is offset somewhat by the fact that Adventure, a 150 acre plantation located outside of the watershed, has been incorporated into it by this study. This inclusion became necessary because after 1772 Adventure was combined with Rustenburg and so lost its independent listing in the tax records.

TABLE 6. Reef Bay land use indices: 1739, 1760, 1800

	1739	1760	1800
Total Plantations	11	8	5
Total Plantation Acreage	1475	1475	1475
Total Plantation Slaves	242	383	267
Total Plantation Population	253	387	275
Estimated Cropland (acres) ^a	363	575	401
Population Density ^b	110	168	119
Av. Plantation Acreage	134	184	295
Av. Plantation Population	23	48	55
Av. Acres Cropland	33	92	80
Sugar Sector			
Number of Plantations	4	5	4
Plantation Acreage	600	1100	1400
Plantation Slaves	130	349	267
Plantation Population	133	352	275
Estimated Cropland (acres) ^a	195	524	413
Population Density ^b	142	205	126
Av. Plantation Acreage	150	220	350
Av. Plantation Population	33	70	69
Av. Acres Cropland	49	105	103
% Total Plantations	36.3	62.5	80.0
% of Total Acreage	40.7	74.6	94.9
% of Total Population	52.0	91.0	100.0
% of Total Cropland	53.7	91.1	100.0
Non-Sugar Sector			
Number of Plantations	6	3	0
Plantation Acreage	725	375	0
Plantation Slaves	112	34	0
Plantation Population	120	35	0
Estimated Cropland (acres) ^a	168	51	0
Population Density ^b	106	60	0
Av. Plantation Acreage	121	125	0
Av. Plantation Population	20	12	0
Av. Acres Cropland	28	17	0
% of Total Plantations	54.5	37.5	0
% of Total Acreage	49.1	25.4	0
% of Total Population	48.0	0.09	0
% of Total Cropland	46.3	0.09	0
Uncultivated Plantations			
Number of Plantations	1	0	1
Acreage	150	0	75
% of Total Plantations	.09	0	20
% of Total Acreage	10.1	0	0.05

Source: Rigsarkivet 1728-1915

^aEstimated at 1.5 acres per slave. ^bPersons per square mile

Data summarizing land use and population trends in the Reef Bay watershed during the eighteenth century is presented in Table 6. Comparison with similar data in Table 1 demonstrates that watershed plantations were generally larger, more densely populated and more extensively cultivated than most St. John plantations. For example, in 1739 they contained 18% more acreage, were 22% more densely populated and had 39% more cropland than the island-wide average. By 1760 these figures stood at 18%, 34% and 61% respectively.

Prior to 1740 watershed plantations practiced a diversified agricultural economy centering around the cultivation of sugarcane and cotton, but also involving provision farming, stock grazing and coffee growing. Jacob Magens, owner of Rustenburg, reportedly introduced the latter crop to St. John (Marfeldt n. d.).

Comparison of Table 6 with Table 1 shows that the statistical deviations from island-wide norms in 1739 and 1760 were largely attributable to the relative strength of the sugar plantations. Cane was being grown on Rustenburg, Adventure and Hope plantations from the 1720's. Misgunst shifted from cotton to sugar around 1735. However, before 1740 land use features within the watershed were also strongly determined by the non-sugar plantations, nearly all of which cultivated cotton. In 1739 the non-sugar plantations contained 24% more land and 30% more residents than those outside the watershed.

Between 1740 and 1760 sugarcane cultivation expanded significantly within the watershed, while non-sugar acreage contracted. By 1760, and probably earlier, five large sugar plantations occupied 75% of the watershed and held 92% of the population. Cane was also being grown on watershed uplands belonging to Sieben, Maria's Hope and Bordeaux.

Watershed sugar plantations - Rustenburg/Adventure in the northwest corner, Par Force on the valley floor and Hope/Misgunst on the western slopes of Bordeaux Mountain - were about the same size as their counterparts elsewhere on the island; but, in 1760 they had larger than average populations and population densities. And, because of their higher number of slaves, they undoubtedly had more land under cultivation than the norm. For example, in 1767 all 150 acres of Rustenburg plantation were being exploited: one hundred acres were planted in cane, 20 acres were planted in provisions and the remainder was in "negro plantation" (Rigsarkivet 1763-1775). Evidence survives of considerable terracing around Rustenburg and along the watershed's eastern slopes between Misgunst and Pasquereaux.

The three non-sugar properties in 1760 were Pasquereaux, in the upper northeastern corner, which concentrated on coffee cultivation until shifting to sugar at the end of the eighteenth century; Par Force B in the southeastern corner, which cultivated cotton until 1765, when it was absorbed into the Par Force sugar plantation; and Little Reef Bay in the southwestern corner, which grew some cotton, but emphasized the production of foodstuffs and livestock for sale to the surrounding sugar

plantations. Coffee was also cultivated along with sugar on Rustenburg and Hope plantations during the second half of the eighteenth century (Tyson 1984), while some cocoa was cultivated on Rustenburg, Maria's Hope and possibly Pasquereaux along the watershed's upper northern slopes (Rigsarkivet 1763-1775).

Figure 4, which depicts the size of the watershed slave population between 1730 and 1800, shows that the highest slave densities, and, by correlation, the most intense agricultural land use, occurred during the two decades between 1755 and 1775. During this period the slaves were more or less equally distributed among watershed sugar plantations (Table 7), indicating roughly the same degree of environmental modification. While agricultural activity, along with the slave population, fell off somewhat after 1775, it remained at a relatively high level into the first decade of the nineteenth century.

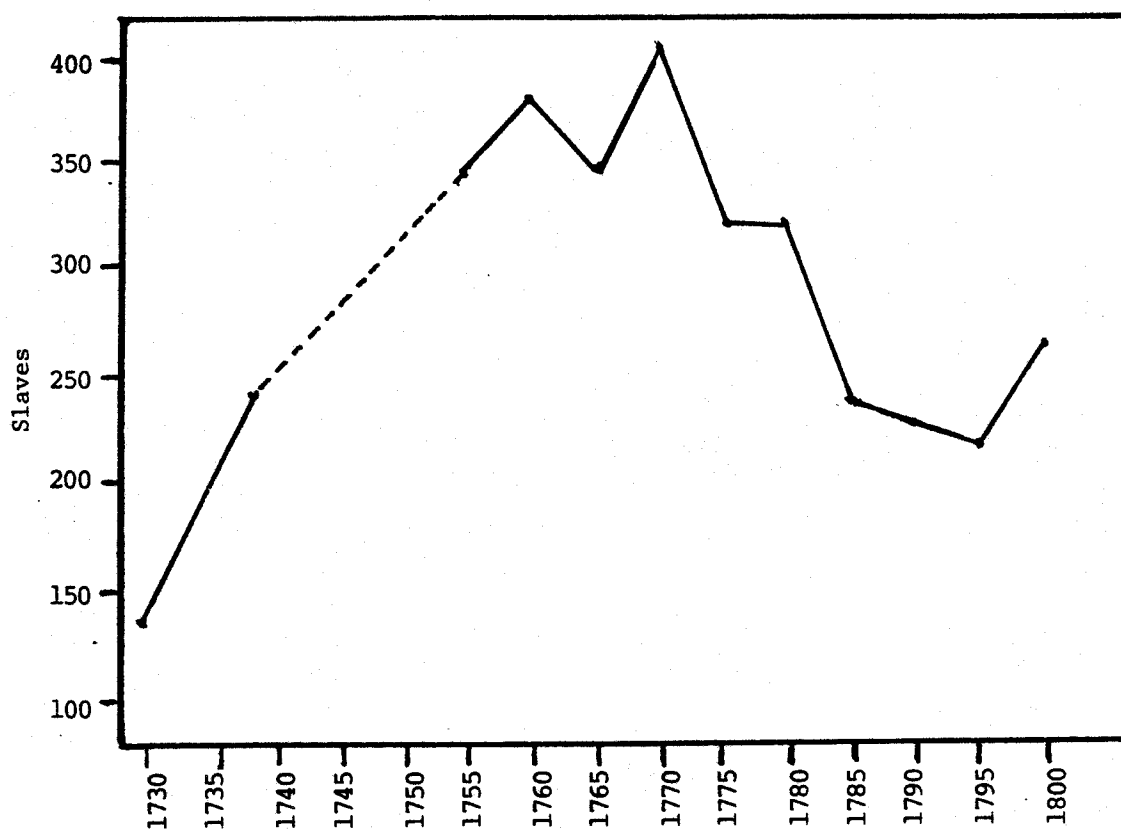


Figure 4. Reef Bay slave population trends, 1730-1800.

The nature of plantation land use and extent of land clearance in the Reef Bay watershed around 1800 can be rather precisely established from data presented in Table 7, and examination of Peter L. Oxholm's 1800 map of St. John (Figure 5).

TABLE 7. Plantation land use in Reef Bay watershed, 1797

Plantation	Cane Land	Other Crops	Pas- ture	Wood- land	% Im- proved	Popula- tion	Live- stock
Rustenburg/Adv.	70	30	84	266	41%	112	98
Par Force	90	40	40	330	34%	70	44
Hope/Misgunst	40	5	60	195	35%	55	33
Pasquereaux	50 ^a	40 ^a	2	58	61%	53	14
Little Reef Bay	0	3	72	0	100%	10	39
Totals	250	118	258	849	42%	300	228

Sources: Rigsarkivet 1728-1915; 1797

^a1804 figures

According to the data presented in Table 7, 42% of watershed land was improved in 1800, compared to an island-wide figure of 35%. Cropland accounted for 59% of the improved land, with pasture making up the remainder. Caneland comprised over two-thirds of the cropland. Most other cropland was planted in provisions, except for a few acres of coffee still being grown at Pasquereaux. Comparison with island-wide statistics presented in Table 2 reveals that despite greater than normal land clearance within the watershed, all forms of agricultural activity on watershed sugar plantations were less extensive than on sugar properties elsewhere.

Oxholm's map (Figure 5), which shows roughly half of the watershed in vegetation, confirms and particularizes the statistical data. It shows extensive clearance around all plantations, except Pasquereaux, which was just being opened up for sugar cultivation in 1800. According to Oxholm there were two large concentrations of woodland: one covered the long, dissected mountain spur abutting the western side of the Reef Bay Gut; the other extended along a mountain spur stretching between White Point and Bordeaux Peak in the southeastern corner of the watershed.

It is likely that some part of both of these woodland areas had previously been under cultivation. The old Par Force D plantation was located somewhere in the first woodland cluster, while Par Force B occupied the second. In all probability Rustenburg/Adventure cultivation once extended into some of the woodland area in the north-central part of the watershed.

TABLE 8. Reef Bay plantation land use trends, 1797-1915

	1797	1836	1875	1915
<u>Caneland</u>				
Rustenburg/Adventure	70	40	0	0
Pasquereaux	50 ^a	0	0	0
Par Force	90	60	10	10
Hope/Misgunst	40	50	0	0
Little Reef Bay	0	0	0	0
Total (Danish acres):	250	150	10	10
<u>Other Improved Land</u>				
Rustenburg/Adventure	114	30	30	0
Pasquereaux	40 ^a	0	0	0
Par Force	80	60	47	24
Hope/Misgunst	65	50	20	4
Little Reef Bay	75	10	0	4
Total (Danish acres):	374	150	97	32
<u>Woodland</u>				
Rustenburg/Adventure	266	380	420	450
Pasquereaux	60 ^a	175	175	175
Par Force	330	380	443	466
Hope/Misgunst	195	175	255	271
Little Reef Bay	0	65	75	71
Total (Danish acres):	851	1175	1368	1433
<u>Population</u>				
Rustenburg/Adventure	112	62	16	0 (1911)
Pasquereaux	53	0	0	0 (1911)
Par Force	70	83	15	27 (1911)
Hope/Misgunst	55	117	0	0 (1911)
Little Reef Bay	10	18	0	0 (1911)
Total:	300	280	31	27 (1911)
Source: Rigsarkivet 1728-1915; 1797. ^a 1804				

Data presented in Table 8, summarized in Figure 6, shows that Reef Bay experienced a significant decline in agricultural land use between 1797 and 1915. During this period sugar production and other kinds of agricultural activity ceased on all plantations except for Par Force and Little Reef Bay. Despite the failure of commercial agriculture, plantation owners held on to their properties, so smallholders never established themselves in the watershed.

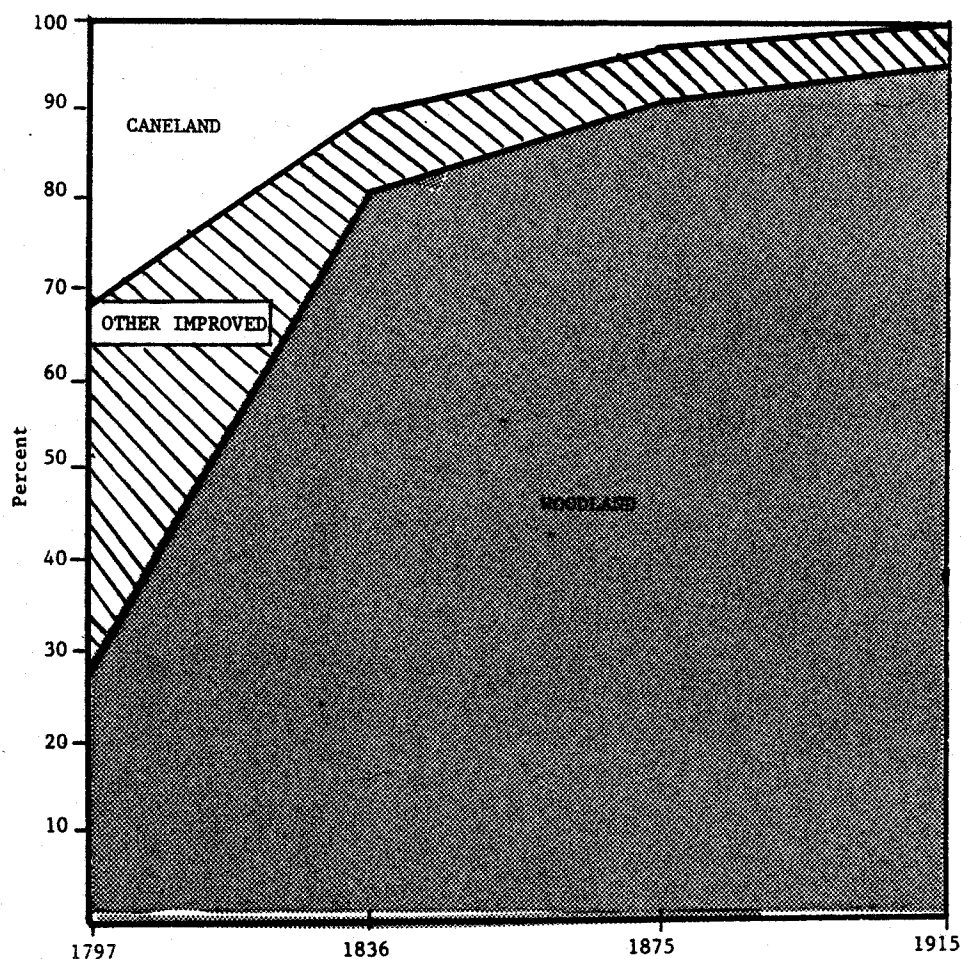


Figure 6. Land Use trends in Reef Bay watershed, 1797-1915.

Sugarcane cultivation ceased on Pasquereaux in 1813, on Hope/Misgunst in 1849 and on Rustenburg/Adventure after the hurricane of 1867. The latter plantation had an average of 60 acres planted in cane between 1845 and 1865, but apparently its owner could not raise sufficient capital to repair the hurricane damage to his sugar works.

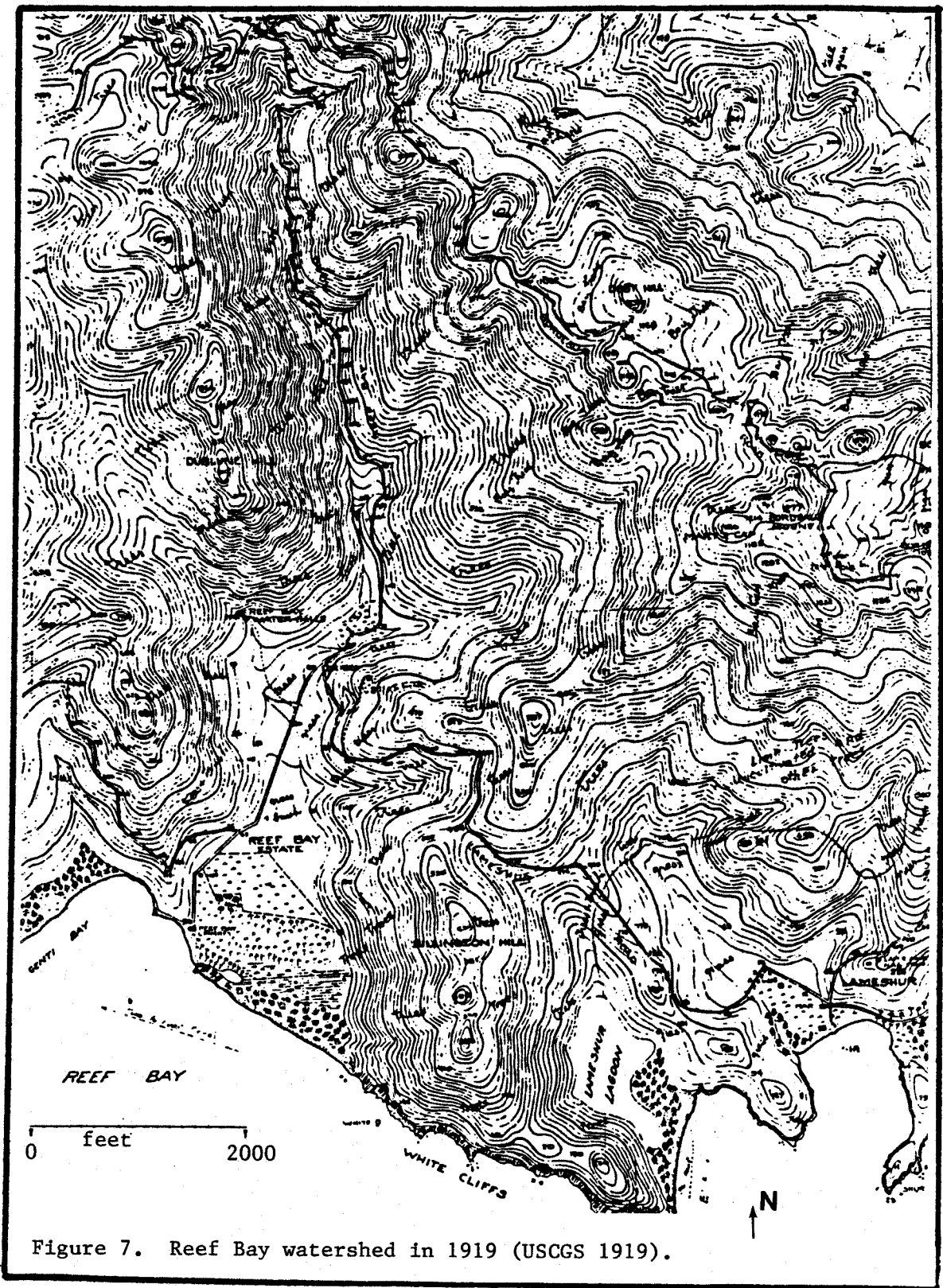


Figure 7. Reef Bay watershed in 1919 (USCGS 1919).

As sugar production proved increasingly unprofitable, watershed planters shifted to other agricultural pursuits, particularly stock farming. But these new ventures enjoyed little success, and within a few decades operations ceased altogether, except on Par Force. Pasquereaux was abandoned in 1826, Hope/Misgunst in 1887, Rustenburg Adventure in 1898. Little Reef Bay, without the sugar plantations to cater to, also fell on hard times, going unoccupied for 40 years (1869-1909) before being reactivated as a stock estate by William Henry Marsh, owner of Par Force.

Post-sugar era livestock herds were rather small. In 1860, for example, the watershed contained a total of 112 adult cattle, 31 sheep and 32 goats. By 1877 there were only 57 cattle and 6 goats, but the sheep population had grown to 68 (Rigsarkivet 1728-1915). Rustenburg and Par Force were the leading stock estates, even while they cultivated sugar. Although some grass pastures were planted and fenced, open range grazing was commonplace.

After 1900 only Par Force and Little Reef Bay remained operational. They supported a population of some 25 residents, who cultivated from 7 to 10 acres of sugar cane, grazed small herds of cattle, and harvested some fruit, coconuts and vegetables (Rigsarkivet 1728-1915).

According to an informant (Pickwood 1986) who lived on Par Force between 1895 and 1905, plantation operations extended over the entire valley floor. Sugarcane was planted just behind the marshy area north-east of the factory; fruit and coconut trees, used solely for domestic consumption, abounded; provision grounds for the plantation household and the estate laborers were located around the worker village and great house at the northern end of the valley floor. Although three or four enclosed grass pieces were set aside for sheep and cattle, most of the time plantation livestock roamed freely in the thickly wooded hills surrounding the settlement.

A detailed fieldmap of the Reef Bay watershed, prepared by the United States Coast and Geodetic Survey in 1919 (Figure 7), confirms the informant's memory. It shows watershed slopes covered with trees and a cleared valley floor planted in grass and cane, with a banana patch and coconut grove behind the Reef Bay shoreline. Sugar and rum were still being processed at the estate factory (Swainson 1919).

Little information respecting land use in the Reef Bay watershed between 1920 and 1950 has been located. It has been established through local informants and fragmentary documentation that Par Force and Little Reef Bay plantations remained occupied and marginally operational into the 1940's. During this period the locus of agricultural activity shifted somewhat from the Reef Bay valley to the slopes around Little Reef Bay. But, the overall amount of land in use appears to have remained fairly constant at 30 to 40 acres.

In 1930 five persons lived on Par Force (Shaw 1940). An agricultural census return of that year (U.S. Bureau of the Census 1930) showed that cane cultivation had ended, and that only 2 acres of improved land remained. A herd of 44 cattle grazed the property. The owner (Anna Marsh) sold small amounts of milk and fruit (limes, mangoes, guava and oranges). Little Reef Bay contained 30 improved acres, and a herd of 25 cattle in 1930. Its owner (A. A. Richardson, the island Administrator) sold small amounts of milk, fruit (mangoes, bananas, limes) and coconuts (U.S. Bureau of the Census 1930).

No returns were submitted in 1930 for the other watershed properties, indicating that they remained unimproved. However, some forest industry did occur there. In 1904 Baron de Castenskjold, a Danish nobleman who owned Lameshur and Bordeaux plantations, acquired Misgunst, Hope and Pasquereaux from the Marsh family. The Baron allowed a few families to settle on Bordeaux Mountain so that they could harvest leaves from bay tree groves. A number of these bay trees were located in the upper reaches of the watershed around Hope and Misgunst plantations (Figure 7). Herman O. Creque, who purchased Castenskjold's holdings in 1922, continued this practice, at least into the 1930's (NARS 1933). Bay leaf harvesting also occurred around Rustenburg during the same period. Field surveys confirmed extensive bay tree orchards in all these upland areas, as well as several old charcoal pits, indicating that the pickers also cut and burnt estate wood.

This pattern of limited occupation and land use continued through the 1940's. Aerial photographs of 1947 (U.S. Air Force 1947) show the watershed covered with vegetation, except for a few small patches of clearance along the upper slopes of Bordeaux Mountain, at Rustenburg and near the Par Force factory. Sizable areas on the hillsides above the Little Reef Bay settlement and along the crest of Billington Ridge, south of the Par Force great house, seem to have been partially cleared, probably for use as pasture. Of the vegetated area only about 20%, located primarily along the western slope of Bordeaux Mountain, could be classified as forest. The remainder appears to be scrub, indicating intensive prior land use.

By the mid-1950's, according to aerial photographs (U. S. Geological Survey 1954) and a USGS topographic map (U. S. Geological Survey 1958), most of the cleared or partially cleared patches had reverted to bush, while the forested area had expanded. Par Force seems to have been abandoned, and residential usage was restricted to three buildings at Little Reef Bay.

LAND USE IN FISH BAY WATERSHED

Geographical Setting

The Fish Bay watershed, draining a total of 1448 acres (Hubbard, et. al., 1987), features several diverse terrains. In the north is a gently sloping upland plateau, roughly 2000 feet wide and 7000 feet in length. Cramer soils, in association with Isaac and San Anton varieties, predominate here. The eastern part of the watershed consists principally of a long mountain spur, with relatively gentle upper slopes, slanting southward from Camelberg Peak Ridge toward the sea. The watershed's southern portion is characterized by steep, rocky terrain, except for some small alluvial fans with San Anton soils in the narrow lowland valleys immediately behind Fish Bay (Rivera 1970).

Two major watercourses drain the central uplands into Fish Bay: Battery Gut, originating at Herman Farm, and Fish Bay Gut, beginning at L'Esperance. They converge at the northern end of the Fish Bay valley before emptying into a mangrove swamp behind Fish Bay. A shorter gut, originating in the hills between Sieben and Mollendal and entering Fish Bay from the east, drains the southeastern quadrant of the watershed. The three guts flow intermittently, but there are standing pools of water year-round in Fish Bay and Battery guts. Reportedly, the gut between L'Esperance and Fish Bay was never dry during the second half of the eighteenth century (Rigsarkivet 1804).

Prehistoric Land Use

Four prehistoric sites have been found by surface surveys in the Fish Bay watershed. All of these sites are located around Fish Bay. One is on the west side of Ditlef Point. Another is on Owens Hill. Two sites are in the central Fish Bay valley, on either side of Fish Bay Gut. No sites have been reported in the upper part of the watershed (Sleight 1962; Prokopetz and Hamilton 1977; Johnston 1981).

None of the sites appear to be extensive; but collectively they suggest a relatively high level of prehistoric activity. From the number of shells present it can be conjectured that aboriginal inhabitants selected the area more for its marine resources than its agricultural potentials.

Historic Land Use

Land in the upper parts of the Fish Bay watershed was completely taken up by aspiring planters within three years after Danish colonization commenced. Plantation development came somewhat later to the lower section around Fish Bay, indicating the poor agricultural value of this area. By 1729, however, as shown by Table 9, the entire watershed had been organized into 20 plantations.

TABLE 9. Plantation development in Fish Bay watershed, 1718-1729

Plantation	1728 Owner	Year Laid Out	Acres (Danish)
Jochumsdahl A	J. Delicat Jr. heirs	1718	75
Jochumsdahl B	Jacob Delicat	1718	75
Catharinaberg	Judith Ann Delicat	1718	150
L'Esperance A	Eric Bredal	1721	150
L'Esperance B	Christian Crabbe	1725	150
Adrian A	Adrian Runnels	1718	150
Adrian B	Adrian Runnels	1725	37
Susanaberg A	Isaac Runnels	1721	200
Susanaberg B	Abraham Runnels	1721	113
Beverhoudtsberg A	Johannes v. Beverhoudt	1721	150
Beverhoudtsberg B	Johannes Runnels	1718	75
Bellvue	Anna Maria v. Hoeten	1721	150
Fish Bay A	William Carstensens	1729	44
Fish Bay B	Ditlef Madden	1727	22
Fish Bay C	Volkers & v. Hermall	1721	150
Fish Bay D	Diedrich v. Stell	1726	70
Mollendal A	Adrian Charles	1727	113
Mollendal B	Gerard Moll	1721	112
Sieben A	Elizabeth Friis	1727	75
Sieben B	Johan v. Sieben	1721	150

Source: Rigsarkivet 1728-1915

Between 1730 and 1800 all but one of these original plantation grounds were progressively consolidated into 7 large units: L'Esperance (225 acres), Jochumsdahl/Catharinaberg, called Herman Farm (300 acres), Adrian (225 acres), Susanaberg/Denis Bay (300 acres), Beverhoudtsberg (225 acres); Fish Bay (350 acres); Sieben/Mollendal (400 acres). Bellvue (150 acres) was the only plantation unaffected by the consolidation process, although it was often affiliated with neighboring Beverhoudtsberg. Most plantations retained these acreages into the 1950's. A 25 acre tract called Grunwald was permanently separated from Bellvue in 1871. Susanaberg had a 75 acre tract (Denis Bay) split from it in 1877. Sieben/Mollendal transferred 49 acres to smallholders between 1879 and 1913. For statistical purposes, however, these smaller tracts have been grouped with their parent plantation throughout this study.

Plantation boundaries do not coincide exactly with watershed boundaries. As noted in the preceding section, some Sieben land actually lay within the Reef Bay watershed. About one-third of the land belonging to Herman Farm, Susanaberg and Adrian also fell outside the watershed. Given the organization of the land tax records, it was not possible to

TABLE 10. Fish Bay land use indices: 1739, 1760, 1800

	1739	1760	1800
Total Plantations	18	12	10
Total Plantation Acreage	2225	2225	2225
Total Plantation Slaves	400	622	649
Total Plantation Population	435	656	664
Estimated Cropland (acres) ^a	600	933	996
Population Density ^b	125	189	191
Av. Plantation Acreage	124	185	223
Av. Plantation Population	24	55	66
Av. Acres Cropland	33	78	100
Sugar Sector			
Number of Plantations	9	7	6
Plantation Acreage	1525	1750	1750
Plantation Slaves	318	514	649
Plantation Population	340	533	664
Estimated Cropland (acres) ^a	477	771	996
Population Density ^b	143	195	243
Av. Plantation Acreage	169	250	292
Av. Plantation Population	38	76	111
Av. Acres Cropland	53	110	166
% Total Plantations	50.0	58.3	60.0
% of Total Acreage	68.5	78.7	78.7
% of Total Population	78.2	81.2	100.0
% of Total Cropland	79.5	82.6	100.0
Non-Sugar Sector			
Number of Plantations	8	5	0
Plantation Acreage	625	475	0
Plantation Slaves	82	108	0
Plantation Population	95	123	0
Estimated Cropland (acres) ^a	123	162	0
Population Density ^b	97	166	0
Av. Plantation Acreage	78	95	0
Av. Plantation Population	12	25	0
Av. Acres Cropland	15	32	0
% of Total Plantations	44.4	41.7	0
% of Total Acreage	28.1	21.3	0
% of Total Population	21.8	18.8	0
% of Total Cropland	20.5	17.4	0
Uncultivated Plantations			
Number of Plantations	1	0	4
Acreage	75	0	475
% of Total Plantations	05.6	0	40.0
% of Total Acreage	03.4	0	21.3

Source: Rigsarkivet 1728-1915

^aEstimated at 1.5 acres per slave. ^bPersons per square mile

eliminate this acreage statistically from watershed holdings. On the other hand, nearly all arable land belonging to these properties fell within the watershed, so data respecting land use has not been badly distorted.

Data summarizing land use and population trends in Fish Bay watershed during the eighteenth century is presented in Table 10. Comparison with similar data in Table 1 demonstrates that from the outset watershed plantations, were larger and more densely populated than most on St. John. As illustration, in 1739 they contained 11% more acreage, were 31% more densely populated, and had 39% more cropland than the island-wide norm. In 1760 these figures had increased to 18%, 41% and 54% respectively. It can be inferred from this data that the watershed experienced far greater human modification and use than other parts of the island during the eighteenth century.

The deviations from island-wide norms are largely attributable to the early predominance of sugar plantations within the watershed. Due to its gently sloping terrain, relatively deep, rich soils and high rainfall, the central upland plateau constituted the premier sugar producing area on St. John. Peter Oxholm declared that its soil was "excellent and produces much better and finer sugar than either of the other two Danish islands" (Oxholm 1780). Area plantation owners seconded this assessment (Rigsarkivet 1804a).

Sugarcane cultivation started in the upland region almost immediately after Danish occupation. Catharinaberg was harvesting cane as early as 1721, and had a sugar factory a year later (Larsen 1986). In 1739 nine watershed plantations accounted for 33% of the land and 44% of the population within the entire sugar sector.

By 1760 cane was being grown on all upland watershed properties, except Bellvue. Although watershed sugar plantations - Herman Farm, Adrian, Sieben/Mollendal, Susanaberg, Beverhoudtsberg, L'Esperance - tended to be of average size, they were more densely populated and extensively cultivated than the norm. Indeed, it appears that by the second half of the eighteenth century, if not earlier, sugarcane blanketed virtually the entire central plateau. Plantation inventories dating between 1767 and 1780 show that cane cultivation extended over all of Catharinaberg, nearly all of Beverhoudtsberg, three-quarters of Adrian and two-thirds of Jochumsdahl. Most of the remaining land was planted in provisions (Rigsarkivet 1765-1786; 1775-1796).

Non-sugar plantations within the watershed were concentrated in the southern portion around Fish Bay. Like their counterparts elsewhere on the island they had small populations and limited amounts of land in use. It is difficult to determine from available documentation exactly what types of agricultural activity they engaged in. Bellvue cultivated cotton for a while, as did Fish Bay D. Both estates also pastured live-

earlier, raised cattle (Rigsarkivet 1763-1775). Fish were also harvested by dragnets in the bay, hence its name (Marfeldt 1765).

Commercial agriculture lasted for less than sixty years on the non-sugar properties. Between 1750 and 1765 the four Fish Bay plantations and Sieben A were acquired by upland sugar planters, who apparently discontinued cultivation and used them to support the grazing and lumber needs of their sugar plantations. The land tax records show Fish Bay as being unoccupied and uncultivated between 1788 and 1914, although other evidence suggests that it may not have been wholly abandoned. Bellvue ceased agricultural operations between 1792 and 1908 according to the tax records. Presumably, the area belonging to Sieben A, which had been absorbed into the Mollendal/Sieben sugar plantation, suffered the same fate (Rigsarkivet 1728-1915).

Field surveys by the author around Fish Bay located little evidence of terracing on surrounding slopes, which tends to confirm statistical data suggesting that this area experienced relatively limited agricultural development.

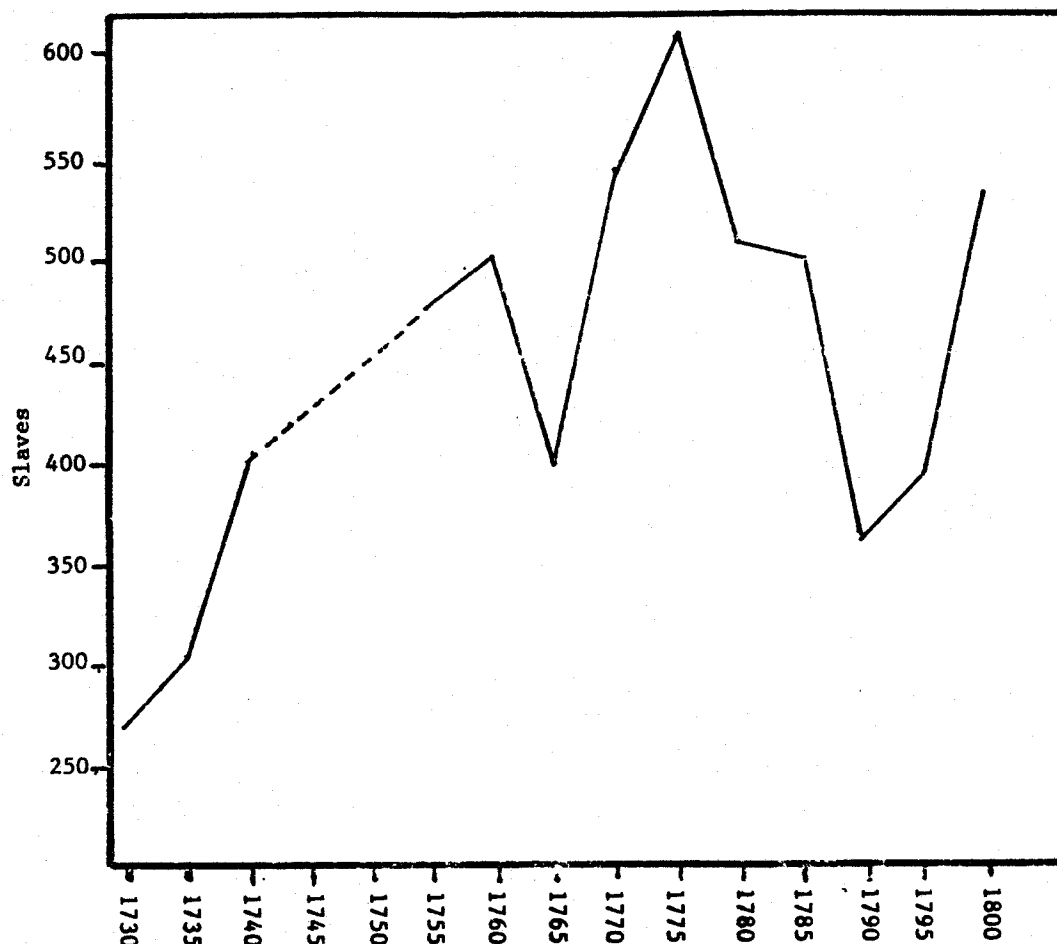


Figure 8. Fish Bay slave population trends, 1730-1800.



The watershed slave population curve (Figure 8), which indicates the trend of agricultural activity, reflects an irregular development pattern during the eighteenth century, with highest population densities occurring between 1765 and 1780. A sharp decline took place between 1775 and 1790, followed by an upswing that pushed population and land exploitation up to previously high levels by 1800.

The nature of plantation land use and extent of land clearance in the Fish Bay watershed around 1800 can be rather precisely established from data presented in Table 11 and by examination of Oxholm's map (Figure 9).

TABLE 11. Land use on Fish Bay plantations, 1797 (Danish Acres)

Plantation	Cane Land	Other Crops	Pas- ture	Wood land	% Im- proved	Popu- lation	Live- stock
Susanaberg/Fish Bay	100	25	200	175	65%	120	97
Beverhoudtsberg	90	10	84	41	82%	55	93
Adrian	150	30	170	0	100%	124	59
L'Esperance	156	25	25	19	92%	71	38
Herman Farm	150	40	110	0	100%	107	44
Sieben/Mollendal	80	60	150	261	53%	107	141
Bellvue	0	0	0	137	0%	0	0
Totals:	726	190	739	633	72%	584	472

Sources: Rigsarkivet 1728-1915; 1797

According to the data presented in Table 11, a total of 1655 acres, or 72% of watershed land, was improved in 1800. Nearly all of this improved land was located in the upland portion of the watershed. Two properties, Adrian and Herman Farm, were 100% improved, while almost all of L'Esperance, and 82% of Beverhoudtsberg had been cleared. Cropland accounted for 55% of the improved land, with pasture making up the remainder. Caneland comprised 72% of all cropland. The remaining cropland was planted in provisions.

Comparison with island-wide statistics of the period shows that the Fish Bay watershed, particularly its upland plateau, was one of the most extensively developed and intensively farmed areas on the island. Oxholm's map (Figure 9) confirms this impression. It shows a wide arc of cleared land stretching from Beverhoudtsberg northeastward to Herman Farm, and a somewhat narrower area of clearance between Herman Farm and the Sieben/Mollendal bluffs.

Conversely, almost the entire lower part of the watershed was wooded. There were only two thinly cleared areas in this section, both in Fish Bay valley. One was a narrow strip around the settlement site of plantation #8 (Fish Bay C) on the east side of the gut. The cleared area extended northward up the slope to the Mollendal settlement site. The other was associated with plantation #10, which was located on a small bluff near the southeastern base of Gift Hill.

It is likely, however, that a greater amount of the land around Fish Bay had once been cleared and occupied. Fish Bay D plantation was located somewhere around Owens Hill east of the Bay, while Fish Bay B was probably situated somewhere along Ditlef Point. Mollendal A may have occupied the narrow, north-south trending ridgeline just east of the plantation #8 settlement.

Data presented in Table 12 and charted in Figure 10, shows that agrarian land use fell off dramatically between 1797 and 1915. In the

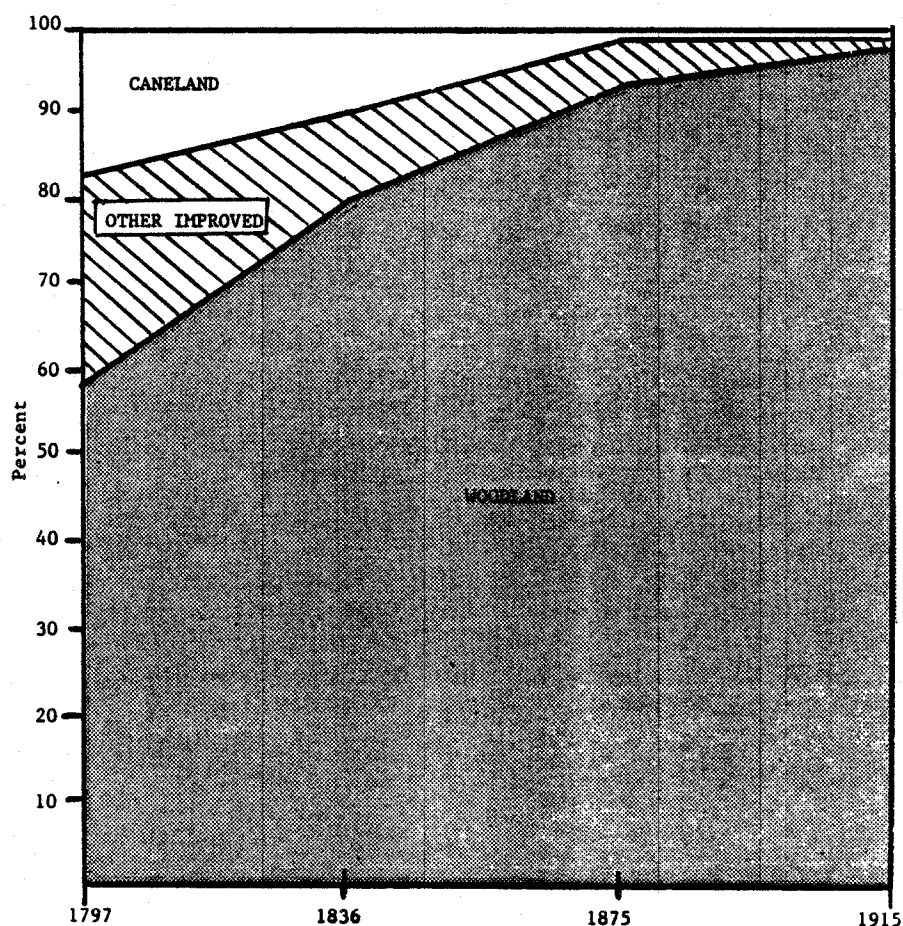


Figure 10. Land use trends in Fish Bay watershed, 1797-1915.

TABLE 12. Fish Bay plantation land use trends, 1797-1915

	1797	1836	1875	1915
<u>Caneland</u>				
Susanaberg	100	55	1	0
Beverhoudtsberg	90	30	0	0
Adrian	150	85	30	0
L'Esperance	156	0	0	0
Herman Farm	150	55	40	0
Sieben/Mollendal	80	0	0	0
Bellvue	0	0	0	0
Fish Bay	0	0	0	0
Total (Danish acres):	726	225	71	0
<u>Other Improved Land</u>				
Susanaberg	225 ^a	50	37	70
Beverhoudtsberg	94	20	0	0
Adrian	200	40	44	0
L'Esperance	50	10	0	0
Herman Farm	150	40	33	0
Sieben/Mollendal	210	35	16	18
Bellvue	0	0	4	15
Fish Bay	-	0	0	3
Total (Danish acres):	929	195	134	106
<u>Woodland</u>				
Susanaberg	175 ^a	195	262	230
Beverhoudtsberg	41	175	225	225
Adrian	0	100	151	225
L'Esperance	19	215	225	225
Herman Farm	0	205	227	300
Sieben/Mollendal	261	365	384	382
Bellvue	137	150	146	135
Fish Bay	-	350	350	347
Total (Danish acres):	633	1755	1970	2069
<u>Population</u>				
Susanaberg	120 ^a	93	15	10 (1911)
Beverhoudtsberg	55	43	0	0 (1911)
Adrian	124	96	42	11 (1911)
L'Esperance	71	13	0	0 (1911)
Herman Farm	107	100	39 (1874)	0 (1911)
Sieben/Mollendahl	107	18	9	26 (1911)
Bellvue	0	0	6	18 (1911)
Fish Bay	-	0	0	0 (1911)
Total:	584	363	111	65 (1911)
Source: Rigsarkivet 1728-1915; 1797. ^a includes Fish Bay				

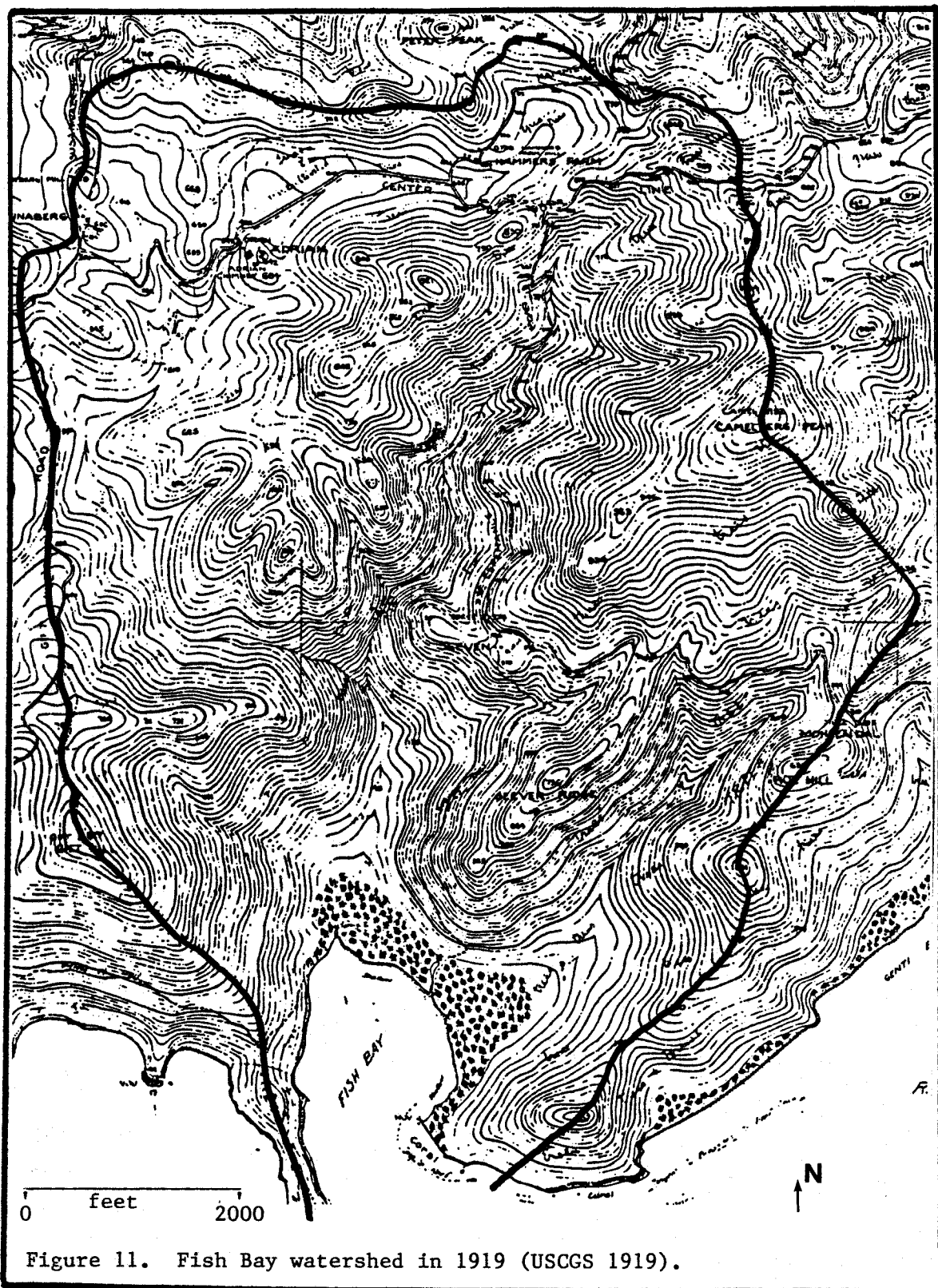


Figure 11. Fish Bay watershed in 1919 (USCGS 1919).

latter year only 5% of the watershed was still improved. During this period sugar production ceased altogether, while other kinds of agricultural pursuits contracted sharply. Population density plunged from 159 to 18 persons per square mile.

In 1808 the owner of Sieben/Mollendal discontinued cane cultivation in favor of stock farming. L'Esperance, which had the most caneland in 1797, abandoned the crop in 1830. Other plantations stuck with sugar until the end of the century. Beverhoudtsberg stopped production and was permanently abandoned in 1872. Susanaberg cultivated cane until 1879, but only in small amounts after the hurricane of 1867. Herman Farm and Adrian produced their last crop in 1896.

As the sugar industry atrophied, watershed planters turned to provision farming, fruit growing and livestock raising as a source of income. Louis Delinois, a St. Thomas merchant who owned all the properties in the upper watershed between 1883 and 1919, experimented with a variety of commercial crops, including coffee, cocoa, cotton, and fruits (guavas and mangoes). But his efforts to find an alternative cash crop proved unavailing (Tyson 1984). Stock raising seems to have been only moderately successful and herds tended to be small. In 1875, for example, the watershed supported a total of just 66 cattle, 120 sheep and 8 goats, 90% of which were pastured on Susanaberg, Adrian and Herman Farm (Rigsarkivet 1728-1915).

By 1915 the watershed contained only 106 improved acres, nearly all grass pasture. The remaining landscape had reverted to woodland and bush (Figure 11). Susanaberg, which functioned largely as a stock farm, was the only operational upland plantation, and 60% of its improved land was actually at Denis Bay. It did, however, have a small cultivation patch at its settlement site (Figure 11). Herman Farm had been shut down. Adrian was also uncultivated, but inhabited by 11 persons.

Smallholders rather than planters were responsible for the little agriculture that survived within the watershed during the last decades of Danish sovereignty. Only a handful of peasant cultivators managed to secure watershed land. All but two of these subsistence farmers were located on Sieben/Mollendal, whose owners parcelled out 49 acres between 1879 and 1913. By 1915 a total of 26 people lived on 11 smallholdings (ranging from 2 to 9 acres) at Sieben/Mollendal. Collectively, they had 18 improved acres, on which they grew fruit and ground provisions (Rigsarkivet 1728-1915).

The two other peasant farmers in the watershed owned and operated plots of land at Grunwald, a 25 acre parcel that had been separated from Bellvue in 1871. Collectively they kept between 3 and 12 acres in use up to 1915. In 1911 a total of 18 persons lived on Grunwald, and it is likely that this small community was responsible for the improved acreage at Bellvue and Fish Bay in 1915.

Little information could be found respecting land use trends in the Fish Bay watershed after St. John passed under American rule. A modest upswing in agricultural activity seems to have occurred between 1917 and 1930. In the latter year a total of 65 people lived in the watershed (Shaw 1940), while agricultural census returns (U.S. Bureau of the Census 1930) showed over 200 acres in improved land.

Adrian had 46 improved acres. The 25 people who lived there raised some goats and hogs and grew small amounts of cocoa, coconuts and fruit (limes, bananas, mangoes, guavas, soursop). Ten people lived on Susanaberg. This property was leased by Neptune Richards, who raised ground provisions and grazed a variety of livestock on 69 improved acres. There were 5 acres of improved land on Grunwald, where peasant cultivators grazed 10 head of cattle and harvested ground provisions and fruit (mangoes and sugar apples).

In 1930 agricultural land use was greatest on Sieben/Mollendal. Here Julius Sprauve, who leased the main plantation, maintained 82 improved acres, on which he raised provisions (beans, sweet potatoes, tanyas, yams), pastured 10 head of cattle and harvested 250 banana and 64 mango trees. Three peasant farmers also had an additional 9 acres in unspecified use.

No returns were submitted for Beverhoudtsberg, L'Esperance, Bellvue and Herman Farm, indicating that they were uncultivated. Fish Bay also seems to have been unoccupied and unimproved, although a small herd of 22 cattle grazed there in 1934 (NARS 1934).

This small-scale agricultural revival seems to have sustained itself through World War II. It is documented that during the 1940's Neptune Richards maintained his modest operation at Susanaberg, while Corey Bishop, an American entrepreneur, ran a sizable truck farm at Herman Farm (Johnson 1950). Aerial photographs of 1947 (U. S. Navy 1947) show an irregular, but broad, band of clearance along Centerline Road between Susanaberg and Herman Farm. There were also cleared patches along the southern slope of Peter Peak and at Sieben/Mollendal.

Nonetheless, agricultural land use occupied a relatively small area in 1947. Aerial photographs show over 90% of the watershed as sylvan. Of this vegetation, roughly 75% appears to be scrub, indicating intensive prior land use, while only 25%, located primarily in the southern and eastern sections (land belonging to Fish Bay, Sieben/Mollendal and L'Esperance), could be classified as forested.

The same configuration of clearance and vegetation is depicted on aerial photographs of 1954 (U. S. Geological Survey 1954) and the USGS topographic map of 1958 (U. S. Geological Survey 1958), although the aeriels do show some expansion of the forested area. Residential usage was limited to just eight buildings, according to the 1958 map.

LAND USE IN HAWKSNEST BAY

Geographical Setting

The Hawksnest Bay watershed, located on the north coast of St. John (Figure 1), drains 233 acres (Hubbard, et al. 1987). It is defined on the east and west by two mountain spurs that extend northward from St. John's central mountain ridgeline before culminating in headlands on either side of Hawksnest Bay. The western spur stretches for slightly more than a mile from Margaret Hill (840') to Hawksnest Point. The shorter eastern spur runs from the ridgeline near Susanaberg plantation ruins to an unnamed headland separating Hawksnest and Denis bays. The southern boundary is formed by the central mountain ridgeline, 600 to 700 feet above the Bay. The watershed is traversed by two small drainage guts with intermittent flows. Slopes are steep, and Cramer variety soils predominate (Rivera 1970).

Prehistoric Land Use

One of the largest prehistoric settlement sites on the northside of St. John is located at Hawksnest Point (Sleight 1962). This site, which was badly disturbed by resort development in the 1960's, supported a relatively large Indian population around 800 A.D. Aboriginal exploitation of land and marine resources in the area must have been intense. However, horticulture was undoubtedly concentrated on the flat, fertile land around Caneel Bay, rather than on steep watershed slopes. No evidence of Indian occupation has been found in the southern or western portions of the watershed.

Historic Land Use

Land use during the historic era is difficult to reconstruct precisely because the watershed falls within the boundaries of two plantations - Susanaberg and Caneel Bay - whose main agricultural areas were located outside of the watershed.

Field systems associated with Caneel Bay plantation were concentrated in the flatland directly behind Caneel Bay. However, as shown by Oxholm's map of 1800 (Figure 9), they did extend to the top of the Hawksnest Point ridgeline. Oxholm also shows one section of the plantation's settlement complex on this ridgeline, as well as a road running from Hawksnest Point up to Margaret Hill. Overall, however, operations of this plantation probably had a negligible impact on the Hawksnest Bay watershed, hence they have not been considered in this study.

Most of the Hawksnest Bay drainage area falls within the historical boundaries of Susanaberg plantation. Data respecting land use and population density on Susanaberg has been included in the section dealing

with the Fish Bay watershed because the main Susanaberg settlement complex and its best agricultural land was located in the central upland plateau.

However, as shown by Oxholm's map of 1800 (Figure 9), Susanaberg's field systems also extended downslope through the Hawksnest Bay watershed to an associated settlement complex at Denis Bay, which was linked to it by a serrated trail. A road, running along the main drainage gut through the middle of the watershed, connected Susanaberg and other upland plantations with Hawksnest Bay, where sugar could be conveniently transported aboard securely anchored sailing ships.

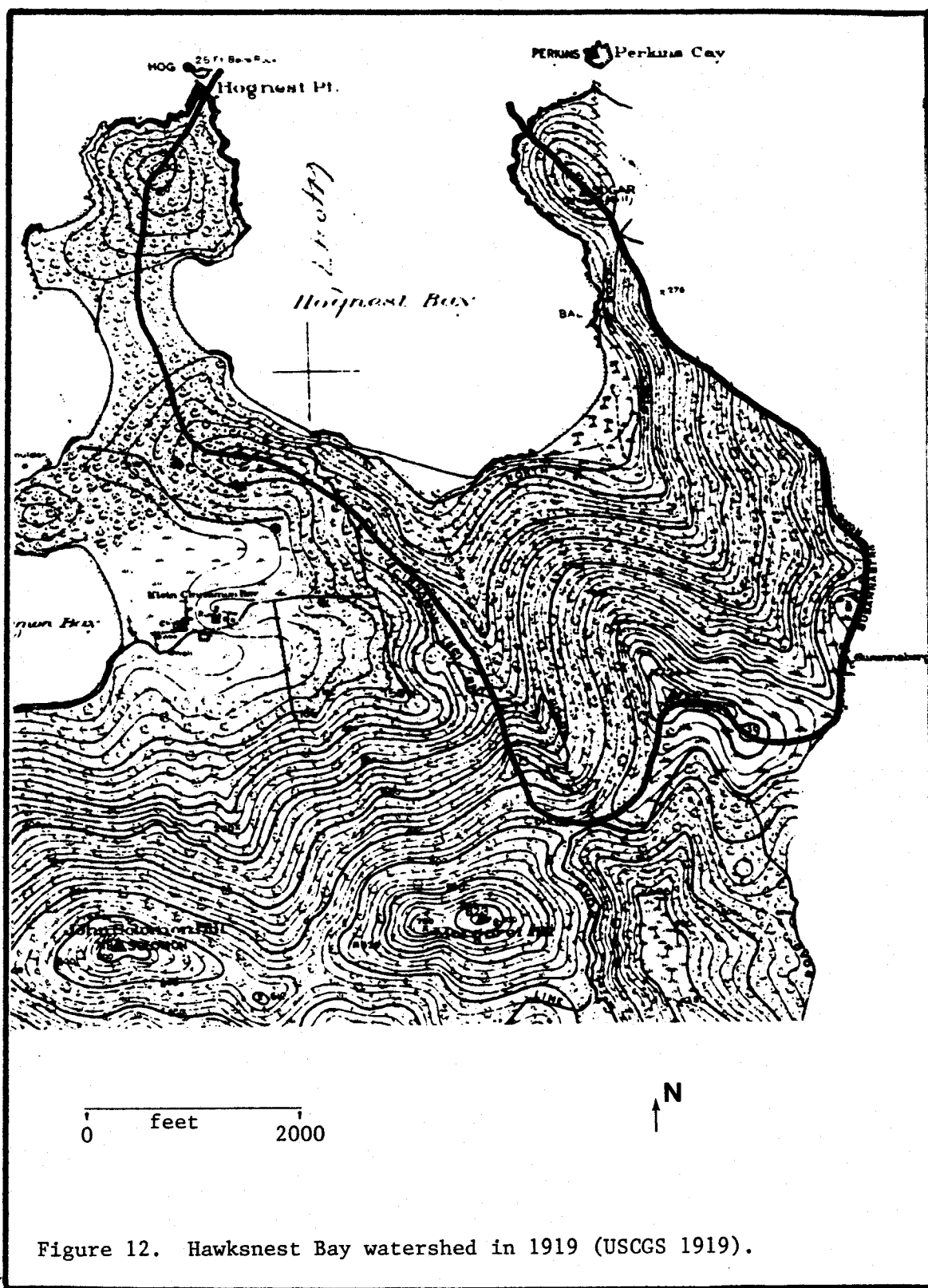
The Denis Bay plantation was probably always associated with Susanaberg. Both were laid out in 1721, and, although they had independent settlement sites, they were being operated by members of the same family in 1728 (Table 9). Between 1740 and 1754 they were consolidated under the same ownership, and remained together until 1877, when Denis Bay was split off with 75 acres (Rigsarkivet 1728-1915).

Plantation agriculture at Susanaberg/Denis Bay clearly had a major impact on the watershed environment. Both plantations were cultivating sugarcane by 1729, and continued to do so into the second half of the nineteenth century (Rigsarkivet 1728-1915). An inventory of 1844 showed the entire property as improved, with 125 acres in canes, 40 acres in provisions and the rest pasture (Rigsarkivet 1832-1845). Field surveys by the author found evidence of extensive terracing on the watershed's eastern slopes. Indeed, human activity around Hawksnest Bay had become so intense by 1765 that the turtles the bay had been named after no longer nested there (Marfeldt 1765). Thus, it can be assumed that the level of land clearance shown by Oxholm in 1800 (Figure 9) characterized the watershed for much of the eighteenth and early nineteenth centuries.

By the 1840's, and probably earlier, agricultural activities and population were being concentrated around Denis Bay. Inventories of 1844 and 1846 show more caneland and pasture at Denis Bay than at Susanaberg. Denis Bay had the only slave village, as well as the only operative windmill and sugar factory (Rigsarkivet 1832-1845).

Agricultural activity and population pressure on Susanaberg/Denis Bay began to diminish after 1850. Cane cultivation ceased around 1880. But, the owners continued to maintain some pasture for livestock until the early part of the twentieth century. Throughout the nineteenth century Susanaberg/Denis Bay supported relatively large herds of cattle and sheep. In 1850, for example, 101 sheep and 34 cattle grazed the property. In 1873 there were 31 cattle and 60 sheep (Rigsarkivet 1728-1915).

A modest agricultural revival began on Denis Bay after it was sold to J. E. Lindqvist in 1905. Lindqvist not only raised cattle and maintained a guest house (McGuire 1926), but planted some 2000 pineapples,



1000 banana trees and 500 coconut palms. He also tried growing cotton and cocoa among the pineapples and beneath existing natural vegetation (Borgesen 1906).

Despite these undertakings, the contraction of overall agricultural activity on Susanaberg/Denis Bay after 1850 probably resulted in the reforestation of much of the watershed. Seventy-seven percent of the total acreage was in bush in 1915 (Table 12). The 1919 USG&GS fieldmap (Figure 12) shows the slopes covered with trees. Even the old road between Susanaberg and Hawksnest Bay had disappeared into the vegetation. The fieldmap also shows Lindqvist's cultivated land around Denis Bay lying outside the watershed.

While agricultural operations continued on both Susanaberg and Denis Bay at a considerably reduced scale into the 1940's, according to local informants and aerial photographs, they did not extend into the watershed. The 1947 aerials (U. S. Navy 1947) show that forested woodland prevailed almost everywhere, except for a small strip of clearance along the upper ridgeline near the Susanaberg settlement.

Aerial photographs of 1954 (U. S. Geological Survey 1954) and the 1958 topographical map (U. S. Geological Survey 1958) show the watershed entirely vegetated, except for a small area around the recently built Caneel Bay catchment basin. Residential usage was confined to two houses on the Caneel Bay ridgeline, and two others just behind the beach.

SUMMARY

Land use within the Reef Bay, Fish Bay and Hawksnest Bay watersheds has been associated almost exclusively with plantation agriculture and settlement that commenced with European occupation in 1718. Aboriginal land use seems to have been limited in these study areas.

The plantations spread throughout the watersheds between 1718 and 1740, resulting in the loss of most, if not all, of their natural vegetation. Extensive deforestation during this pioneer period induced soil erosion, sedimentation and changes in water quality and quantity. However, the slow pace of plantation development and associated vegetation removal facilitated the persistence of native species and probably moderated runoff.

Plantation operations and population densities in all watersheds were most intense in the second half of the eighteenth century, peaking between 1755 and 1780, but continuing at relatively high levels until about 1820. During this period approximately one-half of total watershed acreage was being intensively utilized for agricultural purposes. Much of the remainder was subject to periodic exploitation.

Extensive terracing was necessary to support this level of agricultural activity on steep watershed slopes. Field surveys conducted by the author found evidence that terraces extended from valley floors to the uppermost ridgelines in the Reef Bay and Hawksnest watersheds. Some terracing also occurred in the Fish Bay watershed, primarily in the uplands. There is also evidence in all three watersheds that watercourses were being systematically managed through damming and channeling. Terracing, watercourse controls and other plantation management strategies, mitigated soil and water runoff associated with land clearance and intensive land use.

Plantation agriculture contracted steadily in all three watersheds during the nineteenth century, leading to their progressive reforestation. This process accelerated after 1848 due to population decline and the demise of sugar production. By 1900 ninety-five percent of all watershed acreage was classified as woodland. Thereafter, agricultural land use never exceeded five percent of the total. Abandonment of plantation lands, however, also produced initial increases in erosion and sedimentation due to the breakdown of the terrace system and slow succession rates on severely cut over and degraded areas.

Post-emancipation subsistence farming had limited impact on the watersheds. Relatively few peasant smallholders managed to gain a foothold. Swidden farming and charcoal burning appear to have been confined to small areas along Bordeaux Mountain ridge and on Bellvue, Sieben/Mollendahl and Rustenburg plantation grounds.

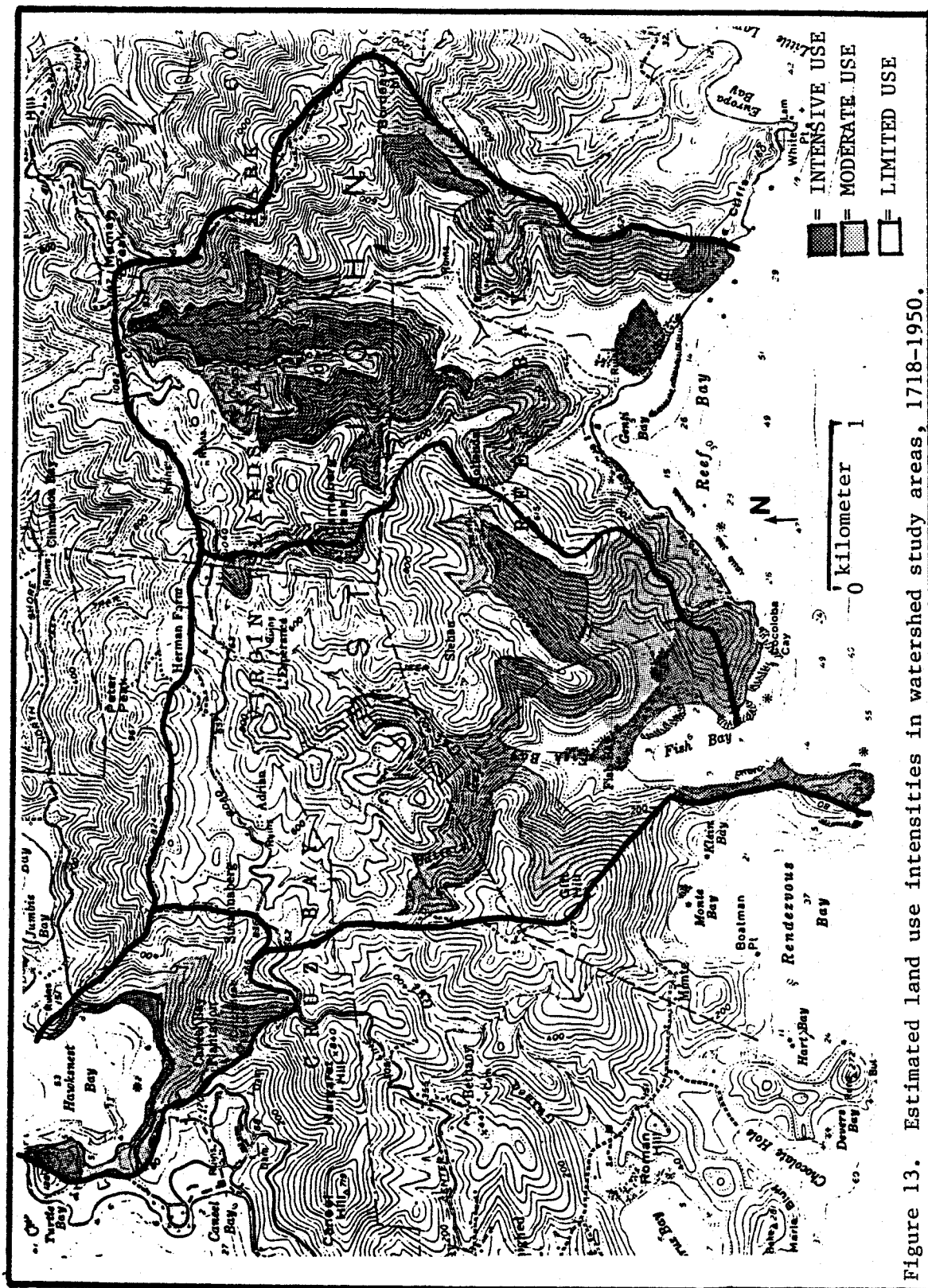


Figure 13. Estimated land use intensities in watershed study areas, 1718-1950.

Between 1718 and 1950 plantation land use activities were most pronounced in the upland plateau region between Beverhoudtsberg and Rustenburg plantations, in the Reef Bay valley between Little Reef Bay and Hope/Misgunst plantations and on the eastern slopes above Hawksnest Bay. Here extensive vegetation removal occurred. Moderately effected areas were the steep, rocky slopes and ravines located in the lower part of the Fish Bay watershed, the rugged middle section and precipitous northeast corner of Reef Bay watershed and the western portion of Hawksnest Bay watershed. Mangrove stands in Reef and Fish Bays, rocky headlands on the western sides of Hawksnest and Fish Bays, and all shorelines, also experienced limited human impacts.

Figure 13 presents an estimate of areal land use intensities within the three watersheds during the historic era (1718-1950), based on analysis of statistical data in the land tax records, soil types, historical documentation and maps. The area of most "intensive use" (white) was depicted as cleared on the Oxholm map of 1800. Much of it continued in use until after 1850. Overall, this zone experienced almost continuous cultivation for about 150 years. The "moderate use" area (lightly shaded) was shown as woodland by Oxholm, but can be documented or reliably estimated as having been cleared either before or after his map. The "limited use" area (dark shading) designates land where it is possible that little or no direct human modifications occurred.

It is unlikely, however, that the forest cover currently found in the "limited use" area contains any relics of the original climax forest, or even eighteenth century secondary growth. The historical record strongly suggests that most, if not all, indigenous vegetation was removed for fuel, lumber or land needs of the colonial population. What escaped the attention of man, undoubtedly fell victim to natural disruptions - periodic fires, droughts and, above all, hurricanes.

Though there can be little doubt that the present distribution and composition of watershed vegetation has been greatly influenced by past human environmental manipulations, the effect of pre-1950 cultural activity on watershed sedimentation discharge may have been far less profound.

Analysis of prehistoric and historic evidence (Table 13) suggests that the overall impact of human activity on sedimentation rates within the watersheds has been variable during the past two millennia, with significant stresses confined to relatively brief periods, and overall effects being relatively mild. This inference from historical documentation gains substantiation from recent studies of sedimentation impacts on watershed salt ponds (Nichols 1987) and reef systems (Hubbard, *et al.* 1987) that found little measurable evidence of man-induced impacts during the historic era.

TABLE 13. Estimated impact by human activities on sedimentation in Fish Bay, Reef Bay and Hawksnest Bay watersheds, A.D. 100 - 1950

Era	Impact	Primary casual factors
A.D. 100 - 1200	Low	Limited occupation levels
1200 - 1717	Non-Existent	No human occupation
1718 - 1750	Heavy to moderate	Land clearance for plantation development
1750 - 1850	Moderate to low	Intensive monoculture; mitigation by plantation management strategies
1850 - 1900	Moderate to low	Reforestation; breakdown of terrace system and slow succession process
1900 - 1950	Low	Reforestation

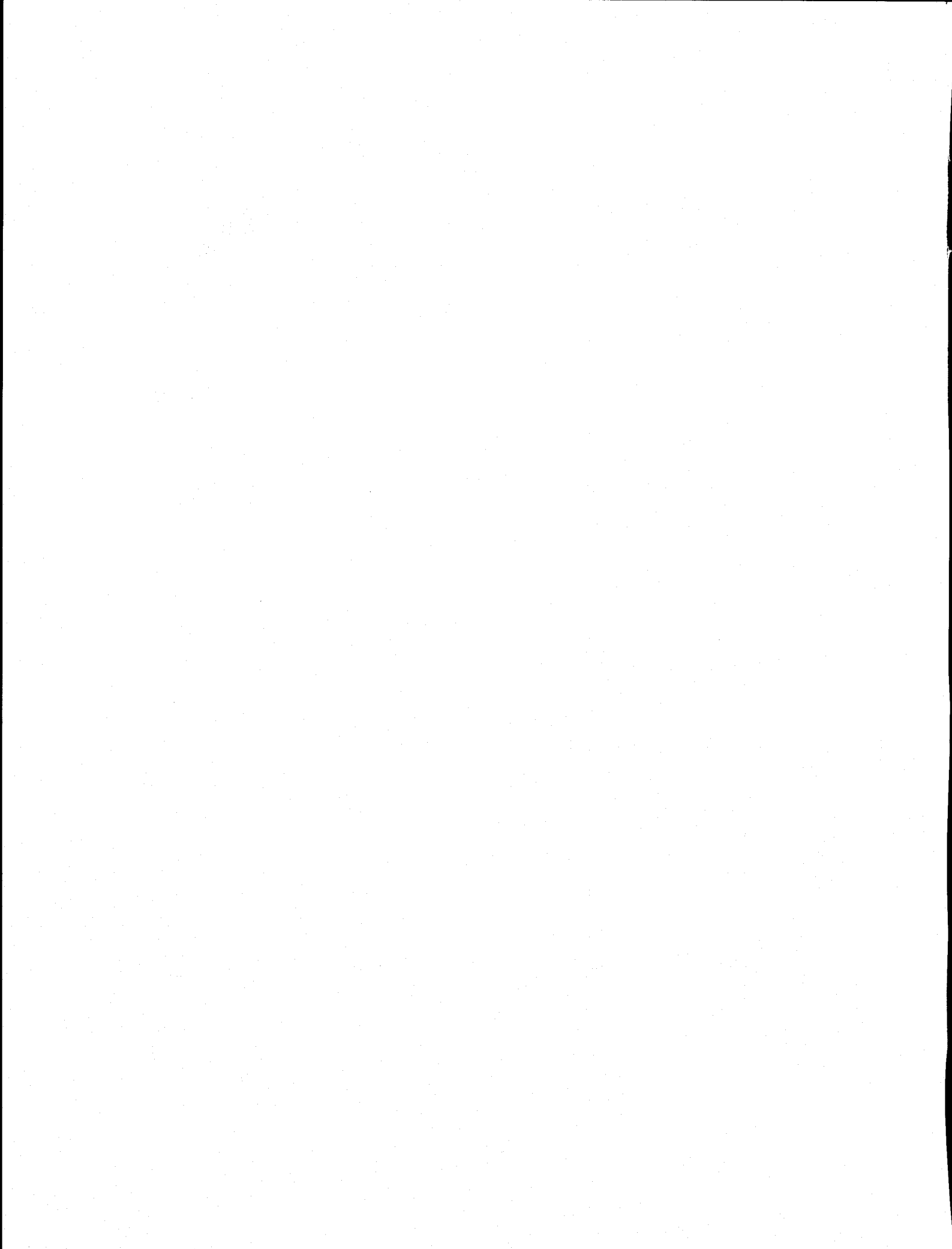
While man's role in shaping past and present watershed ecosystems cannot be denied, care must be taken not to overestimate the human imprint. On St. John the plantation system certainly did not overwhelm and transform the landscape to the same degree it did on more amenable Caribbean islands, such as St. Croix. Rather, due to chronic shortages of capital, manpower and technology, it made many accommodations with, and adaptations to, constraining environmental conditions. And, to a considerable extent, St. John planters and peasants strove to mitigate adverse environmental impacts in order to sustain the productive capabilities of the limited resources available to them.

Conversely, strong evidence exists that periodic natural disruptions, particularly hurricanes, were as destructive to terrestrial and marine ecosystems as man during the historic era. Photographic evidence showing the virtual annihilation of the re-emergent St. John forest by the severe hurricane of 1916 makes it clear that the current St. John wilderness is probably as much a product of this violent storm, and, to a lesser extent, that of 1924 as of two centuries of prior land use activities. Moreover, in addition to their devastating effect on vegetation cover, recurrent hurricanes (at least 40 struck St. John between 1718 and 1950), generate massive sedimentation discharges, and their associated ground seas can wipe out entire coral reef systems, as appears to have happened in Hawksnest Bay in 1916 (Hubbard, *et al.* 1987).

Although man's long-term impact on the landscape might sometimes pale in comparison with the destruction wrought by a single cataclysmic event, it must also be borne in mind that extensive human environmental re-arrangements can enhance storm destruction and significantly effect the inherent ability of tropical ecosystems to adapt to and recover from such disasters.

In sum, the conclusion remains inescapable that man and nature, in tandem, have brought St. John to its current state of development. Too much emphasis on one dimension or the other can only distort our understanding of the past and undermine our ability to shape a reasonable future. St. John is neither a pristine wilderness nor a ravaged victim of human over-exploitation. To imagine that it is either would be a case of historical ignorance. To try to manage it into one or the other would be equally misguided.

Despite some recent excesses, the essence of the place resides in the precarious balance achieved there by the complex interaction of man and nature - from man's creative adaptations to the insular environment and nature's adjustments to human endeavor. Understanding, maintaining and celebrating that delicate equilibrium, that mutual accomplishment, ought to be the focal point of the Virgin Islands National Park, as well as the St. John Biosphere Reserve.



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