

U.S. VIRGIN ISLANDS

ST. THOMAS

**BOTANY BAY
AREA OF PARTICULAR CONCERN
(APC)**

AND

**AREA FOR PRESERVATION AND RESTORATION
(APR)**

A COMPREHENSIVE ANALYTIC STUDY

September 21, 1993

**VIRGIN ISLANDS DEPARTMENT OF
PLANNING AND NATURAL RESOURCES**
Coastal Zone Management Program

Roy E. Adams
Commissioner

**BOTANY BAY
AREA OF PARTICULAR CONCERN
(APC)**

AND

**AREA FOR PRESERVATION AND RESTORATION
(APR)**

A COMPREHENSIVE ANALYTIC STUDY

V.I. DEPARTMENT OF PLANNING AND NATURAL RESOURCES
Coastal Zone Management Program

September 21, 1993

Draft Prepared By:
Island Resources Foundation
Under Contract PC PNR-330-92

With assistance from:
The University of the
Virgin Islands

This publication is financed in part through a federal grant from the Office of Coastal Zone Management, NOAA under the provision of Section 305 of the Coastal Zone Management Act of 1972 (Public Law 92-583).

Copies of this document may be obtained from the Department of Planning and Natural Resources, (Coastal Zone Management Program), Nisky Center, Charlotte Amalie, St. Thomas, United States Virgin Islands 00802.

BOTANY BAY
APC/APR COMPREHENSIVE ANALYTIC STUDY
TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1	General	1
1.2	Relationship to Other Plans and Regulations	2
1.3	Historical Perspective	2
1.4	Other Classifications	3
2.	DESCRIPTION OF THE SITE	6
2.1	APC Boundary	6
2.2	Ownership Summary	6
2.3	Physical Environment	7
2.3.1	Climate	7
2.3.2	Geological Setting	7
2.3.3	Hydrological Setting	8
2.3.4	Coastal Environment	8
2.4	Biological Environment	8
2.4.1	Terrestrial	8
2.4.2	Marine	11
2.4.3	Endangered Species	12
2.5	Cultural Resources	13
2.5.1	Prehistoric	13
2.5.2	Historic	14
2.6	Built Environment	14
2.6.1	Roads and Ports	14
2.6.2	Water Systems	15
2.6.3	Wastewater Systems	15
2.6.4	Energy Systems	15
2.6.5	Solid Waste Disposal Systems	15
3.	RESOURCE USE, USE CONFLICTS, AND ADVERSE IMPACTS	15
3.1	Resource Use	15
3.2	Use Conflicts	15
3.3	Adverse Impacts	16
3.3.1	Water Quality	16
3.3.2	Air Quality	16
3.3.3	Noise Pollution	16
3.3.4	Impacts to Biological Resources	16
3.3.5	Impacts to Cultural Resources	16
4.	MANAGEMENT RECOMMENDATIONS	17
4.1	Policy Framework	17
4.2	Planning and Permitting	17
4.3	Legislative Change	20
4.4	Institutional Development	20
5.	CONCLUSION	20

LIST OF KEY ACRONYMS

Area of Particular Concern	APC
Area of Preservation and Restoration	APR
Base Flood Elevation	BFE
Coastal Zone Management Act	CZMA
Department of Housing, Parks, and Recreation	DHPR
Department of Planning and Natural Resources	DPNR
Department of Public Works	DPW
Division of Archeology and Historic Preservation	DAHP
Division of Coastal Zone Management	DCZM
Division of Environmental Enforcement	DEE
Division of Environmental Protection	DEP
Division of Fish and Wildlife	DFW
Federal Emergency Management Agency	FEMA
Mean High Water	MHW
National Flood Insurance Program	NFIP
National Natural Landmark	NNL
National Park Service	NPS
Significant Natural Area	SNA
U.S. Geological Survey	USGS

LIST OF FIGURES

1. Regional APC Map
2. APC Boundary Map
3. 100-year Floodplain
4. Other Classifications
5. Physical and Biological Resources
6. Land and Water Use
7. Existing Zoning
8. Major Drainage Basins

1. INTRODUCTION

1.1 General

Botany Bay is one of 18 Areas of Particular Concern (APC's) designated by the Planning Office in 1979 after public nominations and comment had been received (Figure 1). The Botany Bay APC is located on the westernmost end of St. Thomas and includes Botany Bay, Sandy Bay, the isthmus of Little St. Thomas; Savana and Cockroach Islands; Salt, West, Kalkun, Sula, and Dutchcap Cays; and Saltwater Money, Drum, and Cricket Rocks (Figure 2). The APC also includes Botany Bay Estate, one of the largest, undeveloped, and privately owned estates on St. Thomas, comprised of approximately 800 acres.

The APC includes mountains, forests, beaches, ocean cliffs, and open grazing lands, many areas of which are of natural, cultural, geological, recreational and scenic importance. Owing to the unusual combination of resources within the APC, the area has received other significant classifications as well. For example, two sites within the APC are listed on the National Register of Historic Places, four sites have been nominated as Significant Natural Areas (SNA's), and the entire Estate Botany Bay has been designated as the "foundation" of the proposed Virgin Islands Territorial Park System (USVI Govt/DCCA, 1976a).

On July 26th, 1991, the CZM Commission adopted the 18 APC's recommended in the Final Environmental Impact Statement (USDOC, 1979), which accompanies the Virgin Islands CZM Act. The Final Environmental Impact Statement notes "the importance of the entire coastal zone", but declares that "certain areas are of yet greater significance." It also establishes the criteria for the designation of Areas of Particular Concern which are as follows:

- Significant Natural Areas
- Culturally Important Areas
- Recreation Areas
- Prime Industrial or Commercial Areas
- Developed Areas
- Hazard Areas
- Mineral Resource Areas

In September of 1991, the Coastal Zone Management (CZM) Commission met and held public hearings on all three islands on the boundaries for all 18 APC's. The Commission met again on October 1, 1991 and, based upon public input and staff recommendations, approved the boundaries of the APC's.

APC management requires knowledge of an area's historical development and traditional uses, and an action-oriented plan for the area's future utilization. This Comprehensive Analytic Study and proposed management plan is intended to serve as an overall planning and management framework within which the various regulatory entities carry out their decision-making authorities.

The APC planning effort recognizes that permit decision-making is most often reactive; that is, the decision to approve or disapprove a proposed development is made in response to a specific permit request and its content, rather than in response to previously established guidelines of what is or is not acceptable for the area. The goal of developing an APC management framework is to be able to make *a priori* decisions about the allowable extent to which an entire landscape unit may be modified. In other words, the planning goal is to raise the level of decision-making from

the site-specific to that of natural landscape units and the maintenance of a wide array of interactive resource uses.

1.2 Relationship to Other Plans and Regulations

The Botany Bay APC was prepared under the authority of the Coastal Zone Management Commission. The Study and proposed plan is intended to serve as the overall planning and management framework within which the various planning and regulatory entities carry out their respective authorities. It is intended that the policy framework contained herein be incorporated into the policies and review criteria of those entities, including, but not limited to, the Department of Planning and Natural Resources (DPNR), the Department of Housing, Parks and Recreation (DHPR), the Port Authority, the Water and Power Authority (WAPA), the Department of Public Works (DPW), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACOE), the U.S. Environmental Protection Agency (USEPA), and the Department of Property and Procurement. This Study and proposed management plan will serve as a guide for future decisions concerning the area. Future development activity should be consistent with Study and proposed plan.

The intent of this Comprehensive Analytic Study and proposed management plan is for all participating territorial and federal agencies to utilize the broad policy framework to guide planning and permit decisions with respect to their own authorities. For those agencies that issue permits or review and comment on permit applications, the Study and proposed plan does not eliminate the authority of those agencies, but increases the predictability and timeliness of the permitting process since many of the issues that must be addressed in a specific permit application are already addressed and mandated in the Plan.

The issues surrounding any proposed use or activity within the coastal environment are complex. A proposed use immediately outside the boundary of the APC planning area may result in significant adverse impacts on the APC and impair the goals of the APC management framework described herein. This Plan contains several different forms of guidance, all of which should be considered in evaluating impact on an APC. Both the individual property owner who is considering a specific proposal and the decision-maker who is evaluating the proposal should follow the guidance of this Plan.

1.3 Historical Perspective

The earliest known inhabitants of St. Thomas were preceramic people who settled at Krum Bay about 1500 B.C. following migrations through the Lesser Antillean archipelago. Evidence of human habitation of the Botany Bay APC can be found dating as far back as 700 A.D. Artifacts and ruins in the area have suggested to some researchers that it may have been the site of a ceremonial, cultural, or trading center for the Amerindians (Berry, *et al.*, 1989). Preceramic peoples most likely inhabited the APC at two different times; first, between 700 and 900 A.D., and again between 1300 and 1500 A.D., possibly until as late as 1600 A.D. (USVI Govt/DPNR, 1981a).

Europeans first arrived in the Virgin Islands in the late 1400's, but it was not until 1672 that the Danish established a settlement on St. Thomas. The initial intent of the Danes was to develop a plantation-based agricultural economy. Sugar became the primary product and production reached its peak in 1725 (USVI Govt/DCCA, 1976b). The growing importance of Charlotte Amalie as a maritime commerce center served to decrease the importance of agriculture to the island's economy after about 1754. Still, at least 66 plantations were known to exist on St.

Thomas in or around 1835 (USVI Govt/DPNR, 1981b). Estate Botany Bay contains one of the few remaining ruins of a sugar plantation on St. Thomas. These are located on the largest, privately owned parcel within Estate Botany Bay, comprising most of the watersheds of Botany Bay and Sandy Bay, as well as the isthmus of Little St. Thomas (section 2.2).

Records indicate that the sugar (and possibly banana) plantation was operating in 1810 -- the date of the estate's first recorded land transaction. The plantation was sold, transferred, or auctioned a number of times between 1810 and 1827. It was sold for \$36,000 in 1827. The 1878 sale price of \$900 attests to the considerable deterioration of both the estate and the economy in the interim years. The same records show that by 1878, sugar production had been replaced by animal husbandry as the plantation's primary interest. A record of sale dated 1878 details the use of the estate for "livestock range" (Berry, *et al.*, 1989).

The majority of Estate Botany Bay was purchased in 1959 by Warren H. Corning, and today remains the property of that family. Soon after purchasing the estate, the Cornings erected several buildings near the shore in Botany Bay, including a main house, a caretaker's house, three caretaker shacks, a beach house, a guest house, a pool, and storage shacks for a generator, the pool pump system, and general storage. This is the only development that has taken place on the estate in recent years.

Other than the incorporation of the old sugar mill ruins into caretakers quarters, the plantation ruins remain essentially undisturbed. The relatively small-scale development in the area has disturbed some of the prehistoric sites, but the full extent and impact of this activity has not been fully evaluated (pers. comm., E. Righter, DPNR/DAHP).

1.4 Other Classifications

National Register of Historic Places

Within the Botany Bay APC are two sites listed on the National Register of Historic Places. These sites are (1) the Botany Bay Archaeological District, listed in August of 1976, and (2) the Botany Bay Historic Site, listed in September 1976. The National Register of Historic Places is the official listing of the nation's cultural resources most worthy of preservation. Inclusion in the Register provides protection from projects receiving federal funding, but has no effect as a development control mechanism when other than federal funding is involved.

Territorial Park System Plan

Two sites within the APC -- Savana Island Reserve and Salt Cay/West Cay Reserve -- are listed as existing "wilderness" areas in a 1960 park and recreation plan for the U.S. Virgin Islands (USDOI, 1960). The following descriptions are paraphrased from that plan:

Savana Island Reserve - The island is located ten miles west of Charlotte Amalie. The 250-acre volcanic island is V.I. Government-owned, with no special use being prescribed therefor. The surrounding waters are good for fishing and, at times, provide interesting surf displays. There are no developments on the island and it should remain undeveloped. The highly scenic area is most valuable as a wilderness area and bird refuge and should be so protected by policy and enforcement.

Salt Cay/West Cay Reserve - The cay is located seven and one-half miles west of Charlotte Amalie. The two publicly owned cays, totaling 125 acres, are undisturbed, highly scenic volcanic islands. There are two small rocky beaches on West Cay, on the east and west sides. Only

'passive' recreational uses should be allowed. There is no present use and apparently no policy for protection. There should be no development, and the area should be protected for conservation purposes. The removal of sand and gravel from the beaches should be expressly prohibited.

Botany Bay is also listed as a proposed public park and natural area in the same 1960 park and recreation area plan. The following is a description of the area and recommendations from that document (USDOI, 1960):

Botany Bay Estate Preserve - The proposed site is located six miles westward from Charlotte Amalie. The 500-acre area, with elevations to 700 feet, would take in Bordeaux Hill, Klok Hill, and westward to the end of the island, including Botany Bay Beach, Sandy Beach, and Little St. Thomas and Mermaid's Chair. The area has mountains, beaches, forests, grazing lands, areas of unusual botanical interest and wildlife values. It would be multi-purpose and could serve such purposes without conflicts. Botany Bay Beach is rough, not very good for swimming, but of interest for other uses such as snorkeling. Sandy Bay Beach is proposed for day-use development, including facilities for boating, swimming, and picnicking with essential attendant facilities. Bordeaux Hill, the site of a (communications) tower, should be developed as a parking overlook with benches and rest shelters. Little St. Thomas should be protected and preserved in its natural scenic state. The entire area should be protected for nature study purposes with development limited to nature trails, information signs and parking overlooks at strategic locations.

Botany Bay is listed in an early Virgin Islands Park System plan (Alexander, 1981) as a high priority beach area and an area of scenic value. Further description of Botany Bay as a potential Territorial Park site can be found in Island Resources Foundation (1991) as site T9, which was surveyed for damage assessment subsequent to the 1989 Hurricane Hugo.

National Natural Landmark

In 1975, the Botany Bay area was included in a list of potential National Natural Landmark sites developed for the U.S. Virgin Islands (Adams, *et al.*, 1975). In 1980, ten islets and cays throughout the Territory, including Savana Island, West Cay, Salt Cay, and Little St. Thomas within the Botany Bay APC, were designated as National Natural Landmarks, and are now included in the National Registry of Natural Landmarks (*Daily News*, March 31, 1980). National Natural Landmarks (NNLs) are areas that represent the best examples of the ecological and geological features composing the natural history of the United States and Territories. More than 600 of these areas, showing the great diversity of the natural environment, have been designated by the Secretary of the Interior since 1962 (USVI Govt/DHPR, 1991).

The National Park Service (NPS) regularly reviews the condition of NNLs and, upon request by landowners, provides advice on conservation practices. The NPS also prepares an annual report on those NNLs that are damaged or threatened by development activity or natural phenomenon. The Secretary of the Interior sends this report to the U.S. Congress (USVI Govt/DHPR, 1991).

Floodplain

The entire shoreline and some upland areas of the APC are situated within a designated 100-year floodplain (section 2.3.3). Virtually the entire coastal area of the APC is comprised of designated A-zones, some areas for which Base Flood Elevations (BFEs) have been determined (Figure 3). The most significant riverine floodplain within the APC exists in the watershed which discharges into Botany Bay.

Significant Natural Area

With the adoption of the territorial Coastal Zone Management Program in 1979, approximately 60 sites in the Territory were identified as potential Significant Natural Areas (SNA's), including four sites within the Botany Bay APC: Kalkun Cay, Dutchcap Cay, Cockroach Island/Sula Cay, and Cricket Rock (Teytaud, 1980) [Figure 4].

Kalkun Cay is a nesting area for Brown Boobies, Red-billed Tropicbirds, Bridled Terns, Roseate Terns, Noddy Terns, and Zenaida Doves (Dammann and Nellis, 1992). Dutchcap Cay is host to approximately 200 pairs of Brown Pelicans, 100 pairs of Red-footed Boobies, and 500 pairs of Brown Boobies. Red-billed and White-tailed Tropicbirds and Noddy and Bridled Terns also nest on the Cay (Dammann and Nellis, 1992). According to Dammann and Nellis, introduced goats have been eliminated, and the Cay should be managed as a "no-entry" wildlife sanctuary.

Cockroach Island and Sula Cay are host to the only known breeding colony of the Masked Booby in U.S. territory, aside from Monito Island, Puerto Rico. Brown Booby, Red-billed and White-tailed Tropicbird, Audubon's Shearwater, Bridled Tern, Laughing Gull, and Noddy Tern also nest here (Dammann and Nellis, 1992). The Island and Cay should be managed as an important seabird breeding area. Cricket Rock is largely (although not entirely) devoid of vegetation, and is host to a similar assemblage of seabirds as found on the other cays in the area.

Significant Natural Areas are defined as areas of unique, scarce, or fragile natural habitat or physical features; areas of high natural productivity; or essential habitat for living resources, including endangered species and the various levels of the food chain critical to their well being. Examples of significant areas are those which harbor unique or remnant plant and animal species of special interest; natural areas that provide scientific and educational value; and areas necessary for nesting, spawning, rearing of young, or resting during migration. Also included are areas needed to protect, maintain, or replenish coastal lands and resources (USVI Govt/DPNR, 1991). An effort to survey and describe the major biological attributes of SNA's was initiated in 1989 by the DPNR/CZMP. However, the project was terminated prior to completion, and as of yet no official designation of SNA sites has occurred.

Proposed Marine Reserve System

The entire APC, including the waters of Botany Bay and Sandy Bay and the waters surrounding the line of cays extending westward, has been designated as part of the proposed Virgin Islands Marine Reserve System. Type II and Type III activities are indicated. Type II activities specify that no anchoring may occur of vessels greater than 40-feet in length, and no fishing of reef species. Type III activities specify that any size vessel may anchor, but no fishing of reef species. The proposed Marine Reserve System for St. Thomas and St. John was submitted to the Governor for signature in the early 1990's, however, no action has been taken pending completion of a similar effort and submittal covering proposed sites on St. Croix.

2. DESCRIPTION OF THE SITE

2.1 APC Boundary

The boundary for the Botany Bay APC, established by the Coastal Zone Management Commission in October 1991, is described as follows (Figure 2):

The boundary extends north from Botany Point to the edge of the outer shelf or the three mile limit (whichever is closer); then follows the shelf edge or three mile limit west approximately four (4) miles; then south to a point southwest of Savana Cay (a distance approximately two thousand (2000) feet south southwest of Virgin Point); then northeast to Mermaids Chair; then southeast along the shoreline to the start of the rocky shoreline at the western end of Barents Bay; and then northeasterly along the ridge line to Bordeaux Hill; and then northwest to Botany Point, the point of origin, enclosing the drainage area of Botany Bay.

2.2 Ownership Summary

Estate Botany Bay is mostly privately owned. Within the APC, three parcels totalling approximately 360 acres are owned by the Corning family. Two other private entities, the Chen family and Casa Grande, also own land within the APC, principally on land adjacent to the road which leads to Little St. Thomas. None of these parcels are known to be presently on the market.

The Nature Conservancy (TNC) holds two parcels of land within the APC -- the isthmus of Little St. Thomas and the adjacent small cay. This total of six acres is intended to remain undeveloped as a conservation area. A one acre sand spit which joins the isthmus of Little St. Thomas with St. Thomas is subject to tidal influence and falls under V.I. Government ownership.

East of the APC, the Virgin Islands Government owns approximately 89 acres of land along either side of the public road which leads to Botany Bay. Within this land is a 1.3 acre parcel owned by the U.S. Government. Other V.I. Government owned property includes the offshore cays and rocks; these are managed by DPNR/DFW as part of the Territory's wildlife reserve system. The islands, cays, and rocks that fall within the APC boundary are: Savana Island, Salt, West, Sula, and Kalkun Cays, and Saltwater Money and Drum Rocks.

2.3 Physical Environment

2.3.1 Climate

Rainfall in the Virgin Islands generally increases with increasing elevation and exhibits a trend on each island of a dry-to-wet cline from east to west. Average rainfall data, compiled from several years of records at various stations can be misleading in that it probably poorly represents the available precipitation at a particular area in any given year. The U.S. Virgin Islands receive an average of 41 inches of rain per year (Bowden, 1970). The wettest months are September to December; the dry season is February to July (Island Resources Foundation, 1977). Botany Bay receives an average of 35 inches of rain per year, about half of that usually falling between August and November (Berry, *et al.*, 1989).

Temperatures average an annual 79° degrees Fahrenheit, with the winter low averaging 76° degrees F and the summer high reaching an average of 84° degrees F. The temperature and climate are moderated by near constant on-shore breezes.

The island lies within the "easterlies" or "tradewinds" which are predominantly out of the east-northeast and east (Island Resources Foundation, 1977). Trade winds average about 15 to 20 knots and vary seasonally, but most significantly during the late summer months when tropical depressions may form resulting in storms and/or hurricanes. Hurricane season is from June to November, with peak activity occurring in September. The annual probability of a hurricane event in the Territory is once every 16 years (Bowden, 1974).

2.3.2 Geological Setting

The steep slopes within the Botany Bay APC average approximately 30 percent (Spatial Information Analysis, Inc., 1987) and rise 565 feet from the sea (Berry, *et al.*, 1989). The dramatic coastline was formed by volcanic sedimentary rock. The most common soil type in Botany Bay is the Cramer series; stony, shallow, rapidly draining soils with a surface that is rich in organic matter (Berry, *et al.*, 1989). Alluvial deposits provide a thin, fertile cover on the lower slopes.

Information on the geological features of the offshore cays and islets can be found in Dammann and Nellis (1992).

Historical seismicity in the USVI

As a result of convergence between the Caribbean and North American tectonic plates, the Virgin Islands are located in one of the most earthquake prone regions of the world. During the past 450 years, damage has occurred from earthquakes and associated tsunamis. Strong seismic shocks were recorded for the Virgin Islands in 1777, 1843, 1867, and 1918. Destructive tsunamis occurred in the U.S. Virgin Islands in 1867 and in 1918; the latter resulted in 116 deaths and economic losses estimated at \$4 million (in 1918 dollars) [USGS, 1984]. The 1867 tsunami was reported to have a wave height of 27-feet above sea level (Geoscience Associates, 1984b).

Potential human and economic losses for a similar event occurring today would be several orders of magnitude higher. Scientists report high seismic potential for a major fault rupture in the Puerto Rico Trench north of Puerto Rico and the Virgin Islands (USGS, 1984). The Virgin Islands are classified as "Zone 4" for earthquake vulnerability, the highest damage zone and the same classification given to many parts of California (Brower and Beatley, 1988).

Studies prepared in 1984 estimated that an earthquake of MMVIII intensity (Modified Mercalli Scale) has a recurrence period of between 110 and 200 years for the St. Thomas/St. John area. The probability of such an earthquake occurring in the next twenty years is between 50 and 70 percent, and between 60 and 80 percent during the next 50 years (Geoscience Associates, 1984a and 1984b). The waterfront areas of Charlotte Amalie and Christiansted are especially vulnerable to impacts from earthquakes due to substantial construction on recently filled (reclaimed) land. It is these areas where liquefaction and ground settling are likely to be the greatest. Buildings constructed on loose alluvial or man-made fill soils along the waterfront are at risk of destruction should an earthquake occur (Geosciences Associates, 1984b).

2.3.3 Hydrological Setting

The steeply sloped hillsides surrounding Botany Bay form a rectangular watershed that drains to the Atlantic Ocean in a northwesterly direction through a number of guts (Figure 8). The relatively undeveloped hillsides in the Botany Bay watershed have allowed the guts to maintain a stable, well-vegetated environment that buffers the lowland drainage area from the tremendous flow rates that can be achieved within the guts during intense rains.

A-Zone and C-Zone floodplains exist within the APC (Figure 3). A-Zones are, in general, comprised of 100-year riverine floodplains, for which Base Flood Elevations have been determined for some areas and not others. C-Zones are areas of minimal flooding (FEMA, 1987).

2.3.4 Coastal Environment

The mean tidal range within the Botany Bay APC is 0.89 feet (Nichols and Kuo, 1979). The northwest orientation of the bay somewhat protects it from the normal southeasterly winds and currents of that direction, although it is seasonally vulnerable to northern swells and strong currents. Heavy swells break on the shores of both Botany Bay and Sandy Bay in the winter, stirring up sand and limiting the growth of branching corals (section 2.4.2). Strong currents have been reported in these two bays (Berry, *et al.*, 1989).

Botany Bay's exposure to the wind and currents results in a high rate of flushing, and thus low pollution susceptibility (Nichols and Kuo 1979). Water quality is excellent and pollution minimal, at least partly attributable to the minimal human development of the watershed (USVI Govt/DCCA, c. 1980).

2.4 Biological Environment

The physical and biological resources of the APC are depicted in Figure 5.

2.4.1 Terrestrial

Vegetation

The vegetation zones in the Botany Bay APC watershed are: semi-evergreen; dry deciduous forest; thorn and cactus scrub; and, coastal lowland forest and scrub (Berry, *et al.*, 1989). Boundaries between these communities are generally not distinct, and transitional, mixed-type areas are common. Also common are introduced exotics and ornamental species.

The semi-evergreen forest is found along the north and west slopes, and extends down the guts. The higher slopes receive slightly more rain than the lower areas; about 45 inches per year on average. Representative tree species in this zone include: Kapok (*Ceiba pentandra*), West Indian Locust (*Hymenaea courbaril*), Mahogany (*Swietenia mahagoni*), Raintree (*Pithecellobium saman*), Monkey Pistol (*Hura crepitans*), Genip (*Melicoccus bijugatus*), and Wild-mammee (*Clusia rosea*). The understory contains a wide variety of species that include sweet lime (*Triphasia infolia*), wild coffee (*Psychotria spp.*), painkiller (*Morinda citrifolia*), and teyer palm (*Coccothrinax alba*). Ground cover in this zone consists primarily of ferns, aroids, and bromeliads. The dominant species in the semi-evergreen forest zone is the genip (*Melicoccus bijugatus*), an introduced species (USVI Govt/DCCA, c. 1980).

The dry deciduous forest zone is found at elevations below the semi-evergreen forest, and is the dominant vegetation zone in the APC. The zone has a higher diversity and a greater number of woody species than in any other terrestrial, tropical ecosystem (Adams, *et al.*, 1975). This zone receives an average of 30-45 inches of highly seasonal rain each year. The zone is characterized by a low, open canopy; succulents dominate the ground cover. Within the APC the following trees can be found in this zone: gumbo-limbo (*Bursera simaruba*), fiddlewood (*Cytharexylum fruticosum*), frangipani (*Plumeria rubra*), mampoo (*Pisonia subcordata* and *P. fragrans*), tamarind (*Tamarindus indica*), tan-tan (*Leucaena glauca*), manjack (*Cordia spp.*), casha (*Acacia sp.*), and caper (*Capparis cynophallophora*). Wild pineapple (*Bromelia pinguin*), a highly competitive bromeliad, dominates the understory. Genip, another highly competitive species, is also found in this zone (Berry, *et al.*, 1989).

The next zone of vegetation proceeding down-slope is the cactus and thorn scrub area. This zone is generally rocky and exposed to the elements, including salt-laden breezes. The thin soil and high evapotranspiration rates limit vegetation in the zone to xerophytic succulents or small leaved species. The zone contains pipe organ (*Cephalocereus royenii*), prickly pear (*Opuntia dillenii*), and Turk's cap cacti (*Cactus intortus*), guinea grass (*Panicum maximum*) and hurricane grass (*Bothriochloa pertusa*), maran (*Croton spp.*), agave (*Agave missionum*), catch-and-keep (*Acacia riparia*), gri-gri (*Bucida buceras*), and sea purslane (*Sesuvium portulacastrum*) [Berry, et al., 1989].

The final vegetation zone proceeding downhill into the flatlands is the low coastal forest. Genip, heiti-heiti (*Thespesia populnea*), and coconut palms (*Cocos nucifera*) dominate this low-lying, sand-flat area of Botany Bay.

The area surrounding the former plantation and the present estate grounds has been extensively landscaped. Both native species, such as the starvation apple (*Morinda citrifolia*), lignum vitae (*Guaiacum officinale*), philodendron (*Monstera* and *Philodendron sp.*), and orchids (*Epidendron* and *Oncidium spp.*) have been used in the creation of the Corning family's Arboretum. Species from throughout the tropics have also been introduced into the gardens (USVI Govt/DCCA, 1976a).

Little St. Thomas, which was once a pasture land, has a late successional mangrove community, as well as thorn scrub and various cacti species. The other cays within the APC have varied vegetational and floral features. Savana Island, the largest of the offshore cays, shows signs of the classic vegetational pattern of more dry-tolerant species on the windward south and eastern sides, such as acacia and maran; and teyer palm and frangipani on the western side. Once used as a goat farm, secondary growth of catch-n-keep, and underbrush are abundant. Savana's shoreline is fringed with seagrape, grasses, and sedges (Dammann and Nellis, 1992).

Salt Cay, containing the only salt pond within the APC, is primarily covered with guinea grass. The low lying areas around the salt pond are covered with dry forest type growth (Dammann and Nellis, 1992). This cay was previously used to pasture livestock.

West Cay has a dry forest zone located on the uplands of the island. The cay's coastal area contains beach peas, seagrape, and a small coconut palm grove (Dammann and Nellis, 1992).

Ground observations after Hurricane Hugo found that only some 10 percent of the trees in the APC were damaged, although many of the cacti were greatly damaged. Aerial observations showed that less than 20 percent of the coastal and backshore vegetation was damaged by the hurricane (Island Resources Foundation, 1991).

Fauna

Warren H. Corning was fascinated with the ecology of Botany Bay and so declared the area a "wildlife sanctuary", and managed the property with the idea of conserving its diverse faunal communities (USVI Govt/DCCA, 1976a). Today the estate is home to a wide variety of birds, mammals, and marine organisms.

Reptiles known to exist in the Botany Bay APC include a wide variety of lizards (anoles, ground lizards, geckos, worm lizards, and skinks), as well as the common iguana (*Iguana iguana*), and the Puerto Rican racer (found on Savana Island and Salt Cay). The Antillean frog

(*Eleutherodactylus spp.*) is also present in Botany Bay. The St. Thomas worm lizard and the Blind Snake have been seen on Savana Island (Dammann and Nellis, 1992).

Both land and sea birds are abundant in Botany Bay. Warblers (*Dendroica spp.*), bananaquits (*Coereba flaveola*), grassquits (*Tiaris spp.*), bridled quail doves (*Geotrygon mystacea*), ground doves (*Columbina passerina*), pearly-eyed thrashers (*Margarops fuscatus*), gray kingbirds (*Tyrannus dominicensis*), Antillean crested hummingbirds (*Orthorhynchus cristatus*), mockingbirds (*Mimus polygottos*), Caribbean parakeets (*Aratinga pertinax*), and Red-tailed hawks (*Buteo jamaicensis*) are among the land-based birds that are abundant in the Botany Bay APC. Brown pelicans (*Pelecanus occidentalis*), brown boobies (*Sula leucogaster*), red-billed tropicbirds (*Phaethon aethereus*), frigate birds (*Fregata magnificens*), little blue herons (*Florida caerulea*), and a number of tern species (*Sterna spp.*) are some of the bird species known to live, feed, and/or nest in the APC (Berry, *et al.*, 1989; and, Dammann and Nellis, 1992). Zenaida doves (*Zenaida aurita*) nest on Salt and West Cays, and white-crowned pigeons (*Columba leucocephala*) and scaly-neck pigeons (*Columba squamosa*) nest on Savana Island. Tropicbirds nest on West Cay (Dammann and Nellis, 1992). Many migratory birds winter in the Virgin Islands, especially in and around Botany Bay due to its very limited development and lush vegetation.

Mammals that are found within the APC include a large population of fruit bats, and possibly other kinds of bats as well (i.e., cave, roof, and/or fish-eating bats). Bats are the only mammal endemic to the Virgin Islands, and are an important component of the forest ecosystem. Fruit bats are reported to feed and roost in the lowland areas where West Indian almonds and palms are common (Berry, *et al.*, 1989). Other mammals include rats (*Rattus rattus*), mongoose (*Herpestes javanicus auropunctatus*), feral cats, and a herd of approximately twenty white-tailed deer (*Odocoileus virginianus*), which were introduced to the Virgin Islands in the 1700's (Berry, *et al.*, 1989). Goats are found on Savana Island and on West Cay. Roof bats are commonly seen feeding near Salt Cay (Dammann and Nellis, 1992).

Reports of green monkeys in the Botany Bay APC have been made as recently as 1986. Land transfer records at DPNR/DAHP make reference to "8 apes" and "14 apes" included in the estate's transfer of ownership in 1827. Sightings of green monkeys on the north and northwest sides of St. Thomas have been reported during the past several years to DPNR/DFW, although as yet no confirmed reports have been made by a qualified biologist. The monkeys are believed to be the same species that is found on St. Kitts (pers. comm., R. Boulon, DPNR/DFW).

2.4.2 Marine

The marine resources in and around the Botany Bay APC have been extensively studied (see for example, Clark, 1965; Kumpf and Randall, 1965; Kumpf, 1965; Adams, *et al.*, 1975; Spatial Information Analysis, Inc., 1987; Berry, *et al.*, 1989; Island Resources Foundation, 1991; and, Dammann and Nellis, 1992). Comparisons of survey transects from 1964 and 1988 show only minimal changes (Berry, *et al.*, 1989). The limited development of the watershed has resulted in only minor disturbances and negative impacts to the area's marine resources.

The relatively undisturbed nearshore marine habitats contain coral reefs, mangroves, sandy bottoms, rocky shores, and seagrass beds. Botany Bay has "one of the more pristine marine environments left in the U.S. Virgin Islands" (Berry, *et al.*, 1989). A post-Hugo damage assessment of the area's marine resources found broken blades of *Acropora palmata* lying on the bottom, but indicated that the area seemed otherwise healthy (Island Resources Foundation,

1991). This study also found abundant fish life, little terrigenous debris, and only minor beach and coastal vegetation damage, beach-rock exposure, and soft-coral damage.

A general characterization of the marine environment of the area is offered by Clark (1965). He indicates that the two bays exposed to the north (Botany Bay and Sandy Bay) are not "protected by shallow offshore reefs or prominences, and waves approach the shore with little modification". The effect, in the nearshore areas of the two bays, "is to scour the bottom and restrict the growth of most branching corals. This also acts to prevent the growth of large branching coral masses, and to restrict the larger bottom-type fishes to the deeper areas immediately offshore".

Sandy Bay is comprised of a continuous sloping sandy bottom. The benthic environment was found to have few species and low numbers of species in a 1964 survey (as described by Clark, 1965), probably due to the scouring action of frequent storm swells originating in the Atlantic Ocean. Schools of small fish, however, were abundant and provide excellent feeding for the Brown Pelicans in the area. Squid were also observed to spawn in the area.

Clark (1965) characterizes the marine environment of the south shore as one that is relatively well protected from strong surf at all times of the year, and thus affords "a rich and varied flora and fauna compressed into small areas, thus easily accessible and convenient for study".

West Cay Bay is reported to be well protected from surf action and a good nature study location with rich marine fauna and flora (Clark, 1965). Corals appear in good variety, and many reef fishes and larger pelagics are in good abundance. There is a heavy current (tidal flow) between West Cay and Little St. Thomas.

Clark reports that Mermaid's Chair provides the "best all-around variety of habitats in the area". The bay is also easily accessible, and reef fishes, corals, and invertebrates are abundant. The principal investigator during the 1964 survey, Dr. John Storr, reported that more coral and sponge species were found here (at Mermaids Chair) than anywhere else (that he has seen) in the tropics. The area has an exceptional variety of sea bushes and fan worms, and virtually all species found elsewhere in the Botany Bay area were found here, plus an additional 20-30 percent (Clark, 1965).

Additional information on the faunal and floral features of each of the offshore cays and islets can be found in Dammann and Nellis (1992).

2.4.3 Endangered Species

The U.S. Endangered Species Act defines "endangered species" to mean a species or subspecies that is in imminent danger of extinction throughout all or a significant portion of its range. "Threatened species" are those likely to become endangered in the foreseeable future unless current trends are reversed. Such species are protected by Federal law which states that neither the whole animal nor any products from it may be taken, sold, or possessed. Alteration of the habitat in which any of these species occur may be prohibited or constrained.

The V.I. Legislature has also passed endangered species legislation. Known as the Indigenous and Endangered Species Act of 1990, the bill (Act 5665), signed into law in December 1990, authorizes the Commissioner of DPNR to promulgate a list of endangered and threatened species in the Virgin Islands. The V.I. Government, Department of Planning and Natural Resources, Division of Fish and Wildlife maintains a list of locally endangered or threatened species.

The following species, found within the APC, are either endangered (E) or threatened (T), and appear on either the Federal (F) or Virgin Islands (V) list:

Humpback whale (<i>Megaptera novaengliae</i>)		E F
Green Sea Turtle (<i>Chelonia mydas</i>)		E F
Hawksbill Sea Turtle (<i>Eretmochelys imbricata</i>)	E F	
Brown Pelican (<i>Pelecanus occidentalis</i>)	E F	
Red Fruit Bat (<i>Stenoderma rufum</i>)		E V
Iguana (<i>Iguana iguana</i>)	E V	
White-tailed Tropicbird (<i>Phaethon lepturus</i>)		E V
Least Tern (<i>Sterna antillarum</i>)		E V
Royal Tern (<i>Sterna maxima</i>)		E V
White-crowned Pigeon (<i>Columba leucocephala</i>)	T V	
Red-billed Tropicbird (<i>Phaethon aethereus</i>)		E V
White-tailed Tropicbird (<i>Phaethon lepturus</i>)		E V
Bridled Quail Dove (<i>Geotrygon mystacea</i>)		T V

2.5 Cultural Resources

2.5.1 Prehistoric Resources

There are two archaeological sites at Botany Bay: the remains of a preceramic, Amerindian village and a site containing petroglyphs (symbols of undetermined meaning carved on rocks by ancient inhabitants of the area). These sites are listed on the National Register of Historic Places as the Botany Bay Archaeological District.

The Amerindian village site may date back as far as 700 A.D. and possibly served as a cultural, ceremonial, or trade center. The village was occupied by the preceramic Amerindians in two separate periods; first, between 700 and 900 A.D. during the 'Magens Bay Period', and again between 1300 and 1500 A.D. (and possibly later) during the 'Chicoid Period', also referred to as the 'Botany Bay Stage'.

Archaeologists have found a number of hand-carved coral slabs, and a fragment of a stone collar in the area. At least one of the coral slabs was found in association with an Amerindian burial, causing the archaeologists to interpret the coral slabs as a grave marker (pers. comm., E. Righter, DPNR/DAHP). Other researchers believe that the coral slabs and stone collar may be articles associated with an Amerindian ball game similar to both soccer and basketball. The game was played throughout the Greater Antilles and Mexico, and it is thought that a highly developed system of inter-island competition took place and "courts" were built at the sites of regular "international" meets (USVI Govt/DCCA, 1976a). However, other researchers believe that the presence of a ceremonial center at Botany Bay and a system of inter-island competitions between Amerindian groups in the Caribbean is a matter of speculation that has yet to be proved (pers. comm., E. Righter, DPNR/DAHP).

The coral slabs may also have been used in burial ceremonies, and the existence of petroglyphs in the area may indicate that this was a burial or ceremonial site. There is some discrepancy regarding the authenticity of the petroglyphs. At least one person has claimed to have "faked" them in the early 20th century. But according to A.E. Figueredo, an archaeologist who has studied them extensively, "it would have been almost impossible for fakers to turn out such a set of carvings at that time ..." due to their obvious Chicoid style and their similarity to authentic petroglyphs found elsewhere in the West Indies, most of which had "not even been reported,

much less illustrated at the time the forgeries were alleged to have taken place" (USVI Govt/DCCA, 1976b). Upper levels of the dig site also revealed Chicoid ceramics, artifacts, and remnants of the second Amerindian occupation. Beads located on the site were in association with ceramics of the Chicoid style, indicating that the site at Botany Bay was occupied by Amerindians during the time of European contact in the Caribbean (pers. comm., E. Righter, DPNR/DAHP).

Despite the unresolved controversy concerning their authenticity, the presence and potential importance of the petroglyphs (the only ones known to exist on St. Thomas), and the many associated Chicoid style artifacts, makes this site archaeologically important and sensitive.

2.5.2 Historic Resources

Botany Bay is one of the few remaining, relatively intact former sugar plantation estates on St. Thomas. Estate Botany Bay's ruins include a sugar mill/factory complex with slave quarters and associated buildings. The sugar mill complex on the estate is listed as the Botany Bay Historic Site in the National Register of Historic Places.

Historical deed records indicate that the estate changed ownership frequently. While it is true that remains of a so-called "Great House" have not been found at Botany Bay, it is possible that a Supervisor's house or an Estate House existed somewhere on the property, and that the remains have either been destroyed when the area was developed or that the undiscovered remains may still exist somewhere on the property (pers. comm., E. Righter, DPNR/DAHP). Since a comprehensive archaeological survey has not been conducted on the property, it is not possible to ascertain the presence or absence of certain resources.

The Botany Bay "L"-shaped sugar factory is an uncommon form in the Virgin Islands where most mills were laid out in a "T"-formation. Other ruins are from a boiling house and stone houses, most likely slave quarters. The ruins also include a horse mill that has been incorporated into a small house for estate staff. Three wells are located on the property as well as a two-compartment cistern that dates back to the early 1800's (USVI Govt/DCCA, 1976b).

The historic and cultural resources of the APC can provide Virgin Islanders with a much needed and valuable link with their past. The importance of the Botany Bay plantation ruins is well documented, although further archaeological research is needed to provide a more detailed picture of life in the Virgin Islands at that time.

2.6 Built Environment

2.6.1 Roads and Ports

A single semi-improved (concrete) access road runs from the gatehouse for Estate Botany Bay to the Corning family residence near the Botany Bay shoreline (Figure 6). It does not traverse the main gut, and contributes little sediment runoff to the marine environment. The same road branches off halfway down to the shoreline and leads to the parcels along the southwest coast, Mermaids Chair, and the isthmus of Little St. Thomas. There are no improved boat access points within the APC.

2.6.2 Water Systems

Rain water is collected and stored in cisterns in association with the various dwelling units within the APC. There is no public supply of water to the APC.

2.6.3 Wastewater Systems

Wastewater is disposed of by means of individual septic tank systems and leach fields. There is no "community-type" septic system or sewage treatment system within the APC.

2.6.4 Energy Systems

Electrical energy is supplied to areas within the APC by the V.I. Water and Power Authority.

2.6.5 Solid Waste Disposal Systems

It is presumed that residents within the APC dispose of solid waste at the public roadside dumpsters provided by the Department of Public Works.

3. RESOURCE USE, USE CONFLICTS, AND ADVERSE IMPACTS

3.1 Resource Use

Presently, resource use in the Botany Bay APC is relatively minimal. The majority of the APC is owned by a single family that has kept development on their land to personal-use facilities for the family. Other holdings within the APC belong to two other private entities, and The Nature Conservancy, a non-profit organization dedicated to the preservation of important habitats and ecosystems. Low-density housing is the only significant human use found within the APC.

3.2 Use Conflicts

Presently, resource use in the Botany Bay APC is minimal. The majority of the APC is owned by a single family that has kept development on their land to personal-use facilities for the family. Other holdings within the APC belong to two other private entities, and The Nature Conservancy, a non-profit organization dedicated to the preservation of important habitats and ecosystems. Low-density housing is the only significant human use found within the APC. There are no significant use conflicts presently known to exist within the APC. As discussed in greater detail in Section 3.2 of the Study, certain types of future development might be in conflict with the goal of establishing the area as part of the Territorial Park System.

There has been only limited adverse impact on water and air quality and to the natural and cultural resources of the Botany Bay APC. The general good health and biological diversity of the area's terrestrial and marine resources is in part the result of its relatively undeveloped state. The minimal development that has taken place has allowed the coral reefs, seagrass beds, and other natural resources to remain among the healthiest in the Territory. Nevertheless, the potential for adverse impacts to the area's marine resources should be considered as high where sedimentation effects associated with watershed development are not properly mitigated.

3.3 Adverse Impacts

3.3.1 Water

There has been only limited adverse impact on water quality within the Botany Bay APC. The minimal terrestrial development that has taken place, along with the rapid rate of flushing within bays and embayments, has allowed the coral reefs, seagrass beds, and other marine resources to remain among the healthiest in the Territory. Nevertheless, the *potential* for adverse impacts to coral reefs, seagrass beds, and other benthic resources should be considered as high where sedimentation effects associated with watershed development are not properly mitigated. Such adverse impacts to living marine biological resources have been well documented within the Territory (Rogers, 1990).

3.3.2 Air

There are no known adverse impacts to air quality within the APC.

3.3.3 Noise

There are no known adverse impacts resulting from excessive noise levels within the APC.

3.3.4 Biological Resources

Section 2.4 describes the abundant and diverse biological resources that exist within the APC. The general good health and biological diversity of the area is in part the result of the area's relatively undeveloped state. It should be understood that significant impact to the area's terrestrial resources (and ecosystems) did occur, however, during the island's plantation agriculture era which dates back to more than 200 years ago. Since reaching its peak around 1725, however, the decline of the plantation era has allowed substantial recovery of biological communities throughout the APC.

No significant adverse impacts to biological resources are presently identified, other than what is in evidence throughout the Territory where non-native species (i.e., rats, mongooses, goats, cats, etc.) have been introduced or are now feral. Such impacts have not been quantified.

3.3.5 Cultural Resources

Section 2.5 describes the prehistoric and historic resources found within the APC. While the known artifacts have been clearly recorded, further studies of the archaeological and historical resources within the APC need to be conducted (section 4.2). There are presently no known adverse impacts to cultural resources within the APC except as indicated in Section 2.5.

4. MANAGEMENT RECOMMENDATIONS

4.1 Policy Framework

The Botany Bay APC is an extraordinary example of relatively undisturbed ecosystems and habitats that, coupled with the other cultural, recreational, educational, and scenic features of the area, is worthy of immediate attempts at preservation and planning for appropriate conservation, recreational, and educational purposes. This has been documented by many natural and cultural resource scientists both in the private and public sectors.

Many management recommendations have been advanced by these scientists with the common thread being that the Botany Bay APC would be an ideal and appropriate area to be included in the Territorial Park System. As discussed previously and as noted in previous studies (USDOI, 1960; Island Resources Foundation, 1991), Botany Bay is privately owned and the property must be acquired to accomplish this goal.

This Study supports the thesis that a feasibility study should be carried out to determine the possibility of acquiring Botany Bay and establishing it within the Territorial Park System. A public/private collaboration should be viewed as the most feasible mechanism for ownership and management. Private agencies, such as The Nature Conservancy, and other private owners on the APC should be invited to join a working partnership and to contribute to the TPS.

The several special designations (section 1.4) that have been given to the various features of the APC underscore the importance of these resources to the Territory. The offshore cays and islets are critical breeding grounds for a variety of seabirds. As a policy objective, these areas (most of which have been nominated as Significant Natural Areas) should all remain "no entry" sanctuaries for the protection of breeding colonies. The Botany Bay Archaeological District and the Botany Bay Historic Site (section 2.5) are likewise of considerable significance, as evidenced by their inclusion on the National Register of Historic Places.

If Botany Bay cannot be acquired by Government for a Territorial Park, other alternatives must be explored to control the type, scale, intensity, and location of future developments within the APC. Negotiation with private landowners' development rights should be explored. Certain development control mechanisms can be employed, including the transfer or purchase of development rights, land swaps, tax donations, and/or the establishment of conservation easements.

4.2 Planning and Permitting

The Botany Bay APC is currently comprised of two zoning designations (Figure 7). The entire western end of St. Thomas is zoned R-1 (residential low density). Salt Cay and West Cay are zoned P (public). Permitted uses for these zones can be found in the V.I. Code, Title 29, Chapter 3, Section 228.

In the late 1970's, the Legislature adopted the Coastal Land and Water Use Plan (CLWUP), which designated all coastal areas of the Territory as one of ten (10) classifications. The CLWUP designations were, at some locations, in conflict with existing zoning designations. For the Botany Bay APC, however, the CLWUP basically supported the earlier zoning designations, and provided new refinement of allowable water uses. Section 907 of the CZM Act prohibited, however, the use of this plan in the review of permit applications, and thus rendered it a nearly useless policy.

Since the late 1980's, DPNR/Comprehensive Planning staff have worked to prepare a Comprehensive Land and Water Use Plan that will re-designate all land and water in the Territory as one of ten (10) new designations, known as "Intensity Districts". The goal of the Comprehensive Plans is to ensure that the quality of life for island residents is maximized.

Permitted development should be required to maintain an adequate distance from critical landscape features (such as guts, salt ponds, beaches, etc.). The setback distance (or buffer zone) should be determined through consideration of slope, aspect, vegetative cover, and other relevant factors. Teytaud (1981) provides specific guidelines for steep slope development which should be consulted prior to any future permit decision-making for the area.

In this regard, flooding mitigation will be an ongoing concern for new developments in many locations in the APC and its watershed. As mentioned above (2.3.3), FEMA/NFIP A-Zone and C-Zone floodplains exist throughout the area. Strict adherence to National Flood Insurance Program policies and regulations is recommended, and new developments should be restricted where the hydrology and flooding potential of an area may adversely affect important wildlife habitat or other natural features.

Channelization for flood control should be avoided wherever possible, and new developments directed away from floodplain hazard areas. Cumulative impacts from the increased use of non-porous surface materials should be assessed, and guidelines established for the use of "grassphalt" and other porous surface materials on access roads, parking lots, and other suitable areas. Regular maintenance of all drainage systems, and an assessment of proper sizing of culverts, should be integral to a program of stormwater management for the APC.

Biological Resources

The following is a list of management measures and/or suggestions for future research with respect to biological resources and the unique research potential that the relatively pristine Botany Bay APC offers.

1. A thorough survey should be made to quantify the winter and summer migratory bird populations in the APC and the Territory.
2. There is a need to conduct field investigations to determine if the endangered St. John Red Fruit Bat (*Stenoderma rufum*) is found within the APC.
3. Because of the relatively undisturbed condition of many of its biological resources, the APC offers a good opportunity to establish long-term ecosystem profiling and monitoring projects to provide the foundation for restoration/conservation efforts; permanent transects should be established on both land and in the marine environment as part of efforts to monitor ecological change, including studies on the effects of loss of open land and habitat and/or on the minimum habitat needs of various populations.
4. As part of the above research (which will have Territory-wide applications), the APC may provide a good opportunity to carry out original research or to validate other research on: (1) the hydrological characteristics and erosion potential of undisturbed soils; (2) the effects of vegetation removal on localized rainfall patterns; (3) nutrient cycling in each of the various biological communities; (4) the ecosystem relationships between biological

communities; and (5) the effects of human introductions of plant and animal species into these communities -- for example, the spread of genip (*Melicoccus bijugatus*) to the exclusion of native species.

5. Where sea turtles are known to nest on sand beaches, these sites should be closely monitored to ensure that human and other predator impacts are avoided. Where development is permitted within the proximity of a turtle nesting beach, the use of artificial lighting should be "turtle sensitive": that is, only low-pressure, long-wavelength, sodium-vapor lamps (of either high or low intensity) should be allowed, and they should always be shielded to direct illumination away from turtle nesting areas. Signs should be posted which instruct the public as to applicable regulations.

Cultural Resources

The first step in adequate protection of cultural resources in the Botany Bay APC should be to conduct a comprehensive cultural resource survey. Such a survey should aim to identify, delimit, and assess the nature and condition of presently known and as yet undiscovered cultural resources. Following this survey, a site-specific management plan should be prepared and enforced for both existing and proposed activities. The protection of both natural and cultural resources, as well as the elimination of user conflicts, should be given appropriate attention in such site-specific management plans. Archaeological resources should be viewed as the non-renewable, irreplaceable resources that they are. Moreover, provision for proper treatment, stabilization, and restoration of historic buildings should be a component of any future site development and management plans. If sites eligible for inclusion in the National Register of Historic Places are present on the Botany Bay Estate, then 'removal' of these historic resources should be expressly prohibited.

Under an adequate management plan, archaeological resources should not be disturbed, and archaeological research should not be permitted unless preservation in place can be enforced. Archaeological research or data recovery should be permitted only after a comprehensive research design, based on extensive testing and careful planning has been submitted to and approved by DPNR/DAHP. Archaeological research should be performed only by qualified archaeologists certified by the Society of Professional Archaeologists (SOPA). In the permit review process, reference should be made to DPNR/DAHP's 'Guidelines for the Conduct of Cultural Resource Surveys' and the Advisory Council's 'Guidelines for the Protection of Historic and Cultural Properties' (36 CFR, Part 800).

If the Botany Bay area is established as a public park, then a plan for the control of visitor-related impacts should be prepared and implemented. There are many different types of park-related activities that can adversely affect cultural resources, and lessons can be drawn in this regard from experience gained at the National Park on St. John. The establishment of picnic and camping areas on or near archaeological sites is one such example. In addition, inappropriate restorations and uses of historic buildings can adversely affect the historic integrity of an entire area.

4.3 Legislative Change

Legislation is needed to establish the Territorial Park System, including the necessary funding allocations and, where appropriate, provisions for creative, cooperative management with groups and agencies outside of the V.I. Government. DPNR and the Legislature together should explore

the range of options available to acquire, through either fee simple or other terms, the Botany Bay APC as a priority site within the Territorial Park System.

Early passage of the Antiquities Legislation Bill is recommended. With the antiquities protection that the bill provides, there will be a greater chance that important prehistoric and historic resources found with the APC are given proper protection for the benefit of present and future generations of Virgin Islanders.

4.4 Institutional Development

DPNR and DHPR have been working closely on the establishment of a Territorial Park System. DPNR has dedicated a senior planner under the CZM Program to this task.

Successful management of the Botany Bay APC will come about more quickly and with more lasting results if the local community, including the landowners in the area, are drawn into the planning process. This was the hope during drafting of the APC Comprehensive Analytic Study and proposed management plan, and to this end DPNR solicited input from all user groups in the area. Hopefully, the various environmental and cultural organizations, and other commercial and philanthropic organizations will work together and in conjunction with DPNR to address certain specific components of the overall management framework, and even to finance certain elements (including fundraising for land acquisition) that will have obvious payback benefits to the entire community.

5. CONCLUSION

Effective management of the many important resources found within the Botany Bay APC will require a comprehensive, proactive strategy, on the part of both the V.I. Government and non-governmental organizations, to ensure that the area receives the protection and long-term planning it deserves. Given the uncertainties of future ownership and potential development of privately owned lands within the APC, the V.I. Government must have a clear plan in advance of future development proposals that will determine the exact type, scale, location, and timing of activities that will be acceptable in this environmentally and historically valuable area.

This APC Comprehensive Analytic Study recognizes the need to balance the interests of growth and development with those of resource conservation in order to provide the foundation for sustainable development in the Virgin Islands. As the Territory's human population expands, so too will the need to accommodate people with new residential and employment opportunities. If not properly planned for, however, new growth can lead to the further piecemeal degradation of the island's natural environment, resulting in the loss of habitat and the many free "ecological services" that healthy, intact ecosystems provide.

Virgin Islanders can ill afford to stand by and watch their natural and cultural resources disappear. A territorial conservation strategy -- one that is established upon a Territorial Park System which provides for a wide range of needs, from reserves to recreational and multiple-use areas -- is needed to demonstrate the Territory's commitment to maintaining biological diversity and representative ecosystems in their natural states. It is not within the scope of this Plan to discuss the ecological and economic importance of preserving biological diversity, but certainly an appreciation of the topic is necessary if the recommendations contained herein will have meaning.

The importance of maintaining natural areas for research, education, environmental quality, and recreation cannot be overstated. The Botany Bay APC is one of the few remaining areas on St. Thomas where the potential still exists to preserve a significant representation of the island's natural environment, along with some important elements of the area's cultural heritage, while developing recreational and educational opportunities for residents and visitors alike. The establishment of the Botany Bay APC as a Territorial Park would be an important step towards serious commitment to the sustainable use of the island's resources.

REFERENCES CITED

- Adams, J.B., L.C. Gerhard, J.C. Ogden, and J. Bowman, 1975. Potential national natural landmarks, U.S. Virgin Islands. Prepared for the National Park Service, by the West Indies Laboratory, Fairleigh Dickinson University. St. Croix, USVI.
- Alexander, 1981. Virgin Islands Park System. Prepared for USVI Govt/Department of Conservation and Cultural Affairs. St. Thomas, USVI.
- BC&E/CH₂M Hill, 1979. A sediment reduction program. Prepared for the Government of the U.S. Virgin Islands. Gainesville, FL.
- Berry, J.K., Aley, J., Moore, J., Wilson, M., and A. Letourneau, 1989. Natural and cultural resources in the United States Virgin Islands; Research, education, and management needs. With special reference to St. Thomas, USVI and Estate Botany Bay. Yale University, School of Forestry and Environmental Studies, New Haven, CT.
- Bowden, M.J., 1970. Climate, water balance, and climatic change in the northwest Virgin Islands. Published under the auspices of the Caribbean Research Institute, College of the Virgin Islands. St. Thomas, USVI.
- Bowden, M.J., 1974. Hurricanes in paradise: Perception and reality of the hurricane hazard in the Virgin Islands. Published by Island Resources Foundation. St. Thomas, USVI.
- Brower, D.J. and T. Beatley, 1988. Natural hazard mitigation plan for the U.S. Virgin Islands. Prepared for the Virgin Islands Territorial Emergency Management Agency (VITEMA). St. Thomas, USVI.
- Clark, J., 1965. The littoral resources of Greater Botany Bay, St. Thomas, Virgin Islands. The Underwater Naturalist; Bulletin of the American Littoral Society, 3(2):6-17. Sandy Hook Marine Laboratory, Highlands, N.J.
- Daily News*, 1980. Five natural landmarks approved. The Daily News Publishing Company, March 31, 1980. St. Thomas, USVI.
- Dammann, A.E. and D.W. Nellis, 1992. A natural history atlas to the cays of the U.S. Virgin Islands. Pineapple Press, Inc., Sarasota, FL.
- Federal Emergency Management Agency, 1987. Flood insurance rate map, U.S. Virgin Islands, Island of St. Thomas. Community Panel Number 780000 0005 D. Revised March 18, 1987.

Geoscience Associates, 1984a. Phase 1 report; Vulnerability analysis, earthquake hazards of the U.S. Virgin Islands. Prepared for the USVI Government, Office of the Governor, Disaster Programs Office. St. Thomas, USVI.

Geoscience Associates, 1984b. Phase 2 report; Vulnerability analysis, earthquake hazards of the U.S. Virgin Islands. Prepared for the USVI Government, Office of the Governor, Disaster Programs Office. St. Thomas, USVI.

Island Resources Foundation, 1977. Marine environments of the Virgin Islands, Technical supplement No. 1. Prepared for the USVI Government, Office of the Governor, Virgin Islands Planning Office, Coastal Zone Management Program. St. Thomas, USVI.

Island Resources Foundation, 1991. Hugo's coastal impacts: Damage, recovery, and revival of the Territorial Park System. Prepared for the Department of Planning and Natural Resources. St. Thomas, USVI.

Kumpf, H.E. and H.A. Randall, 1965. Charting the littoral habitats of the Greater Botany Bay area. *The Underwater Naturalist; Bulletin of the American Littoral Society*, 3(2):6-17. Sandy Hook Marine Laboratory, Highlands, N.J.

Kumpf, H.E., 1965. Fishes observed in the Greater Botany Bay area, St. Thomas Island. *The Underwater Naturalist; Bulletin of the American Littoral Society*, 3(2):6-17. Sandy Hook Marine Laboratory, Highlands, N.J.

Nichols, M. and A. Kuo, 1979. Virgin Island Bays: Modeling of water quality and pollution susceptibility. Technical Report No. 3. Prepared for the Department of Conservation and Cultural Affairs. St. Thomas, USVI.

Real Estate Data, Inc., 1987. Real estate atlas of the Virgin Islands. Miami, FL.

Rogers, C., 1990. Responses of coral reefs and reef organisms to sedimentation. *Marine Ecology Progress Series*, 62:185-202. Inter-Research publications, F.R. Germany.

Spatial Information Analysis, Inc., 1987. Demonstration of a concept; Development and analysis of a spatial database for the Botany Bay vicinity. St. Thomas, USVI. Final Report of Contract 787B-48-87811 to Tropical Resources Institute, Yale University. New Haven, CT.

Strategic Planning Group, 1991. U.S. Virgin Islands comprehensive land and water use plan. Prepared for USVI Government, Department of Planning and Natural Resources. Jacksonville, FL.

Tetra Tech, Inc., 1991. Options to prevent degradation of pristine distinctive habitats in Puerto Rico and the U.S. Virgin Islands. Prepared for the U.S. Environmental Protection Agency. Bellevue, WA.

Teytaud, A.R., 1980. Preliminary report on potential significant natural area (SNA) sites. USVI Government, Department of Conservation and Cultural Affairs. St. Thomas, USVI.

Teytaud, A.R., 1981. Development on steep slopes: Recommendations for development suitability, erosion control, and septic tank systems in the U.S. Virgin Islands. Prepared for the

Department of Conservation and Cultural Affairs, Division of Coastal Zone Management. CZMP Technical Circular No. 3. St. Thomas, USVI.

U.S. Department of Commerce, 1979. Final environmental impact statement, proposed Coastal Zone Management Program for the Virgin Islands. Prepared by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration. Washington, D.C.

U.S. Department of the Interior, 1960. Park and recreation plan for the U.S. Virgin Islands.

U.S. Geological Survey, 1982. Map of Western St. Thomas, V.I. 1955 and photorevised 1982. DMA 1522 1 SE-Series E836.

U.S. Geological Survey, 1984. A workshop on earthquake hazards in the Virgin Islands region. Open-file report 84-762. U.S. Department of the Interior, USGS. Reston, VA.

USVI Government/Department of Conservation and Cultural Affairs, 1976a. "Estate Botany Bay". In What's News Under the Sun, 1(3) October 1976.

USVI Government/Department of Conservation and Cultural Affairs, 1976b. Nomination of Estate Botany Bay to the National Register of Historic Places. Filed 30 July 1976 by the USVI Government/DCCA to the U.S. Secretary of the Interior. St. Thomas, USVI.

USVI Government/Department of Conservation and Cultural Affairs, c. 1980. Draft Botany Bay SNA/APC Report. St. Thomas, USVI.

USVI Government/Department of Housing, Parks and Recreation, 1991. Territorial Comprehensive Outdoor Recreation Plan for the Virgin Islands 1990-1994. St. Thomas, USVI.

USVI Government/Department of Planning and Natural Resources, 1981a. St. Thomas Prehistoric Resources Inventory: Final Report. Prepared by B.R. Johnston for the DPNR/Division of Archaeology and Historic Preservation, St. Thomas, USVI.

USVI Government/Department of Planning and Natural Resources, 1981b. Historic Archaeological Sites of St. Thomas. Prepared by B.R. Johnston for the DPNR/Division of Archaeology and Historic Preservation. St. Thomas, USVI.

USVI Government/Department of Planning and Natural Resources, 1991. Descriptions of Areas of Particular Concern. Memorandum from Coastal Zone Management Division to Island Resources Foundation. St. Thomas, USVI.

BOTANY BAY
APC/APR COMPREHENSIVE ANALYTIC STUDY
EXECUTIVE SUMMARY

INTRODUCTION

Botany Bay is one of the 18 Areas of Particular Concern (APC's) designated by the Planning office in 1979 after public nominations and comments had been received.

The Botany Bay APC is located on the westernmost end of St. Thomas and includes Botany Bay, Sandy Bay, the isthmus of Little St. Thomas; Savana and Cockroach Islands; Salt, West, Kalkun, Sula, and Dutchcap Cays; and Saltwater Money, Drum, and Cricket Rocks (Figure 1). The APC also includes Botany Bay Estate, one of the largest, undeveloped, and privately owned estates on St. Thomas, comprised of approximately 800 acres. The APC includes areas which are of natural, cultural, geological, recreational and scenic importance. Owing to the unusual combination of resources within the APC, the area has received other significant classifications, including:

- **National Register of Historic Places**
- **Territorial Park System Plan**
- **National Natural Landmark**
- **Floodplain**
- **Significant Natural Area**
- **Proposed Marine Reserve System**

For a detailed account of what each of these designations entails, refer to Section 1.4 of the Study.

BOUNDARY DESCRIPTION

The boundary for the Botany Bay APC, established by the Coastal Zone Management Commission in October 1991, is described as follows:

The boundary extends north from Botany Point to the edge of the outer shelf or the three mile limit (whichever is closer); then follows the shelf edge or three mile limit west approximately four (4) miles; then south to a point southwest of Savana Cay (a distance approximately two thousand (2000) feet south southwest of Virgin Point); then northeast to Mermaids Chair; then southeast along the shoreline to the start of the rocky shoreline at the western end of Barents Bay; and then northeasterly along the ridge line to Bordeaux Hill; and then northwest to Botany Point, the point of origin, enclosing the drainage area of Botany Bay.

OWNERSHIP SUMMARY

Estate Botany Bay is mostly privately owned. Within the APC, three parcels totalling approximately 360 acres are owned by the Corning family. Two other private entities also own land within the APC. The Nature Conservancy (TNC) holds two parcels of land within the APC - the isthmus of Little St. Thomas and the adjacent small cay. A one acre sand spit which joins the isthmus of Little St. Thomas with St. Thomas is of unknown ownership, although it is subject to tidal influence and conceivably falls under V.I. Government ownership. Other V.I. Government owned property includes the offshore cays and rocks; these are managed by DPNR/DFW as part of the Territory's wildlife reserve system. The islands, cays, and rocks that

fall within the APC boundary are: Savana Island, Salt, West, Sula, and Kalkun Cays, and Saltwater Money and Drum Rocks.

HYDROLOGICAL SETTING

The steeply sloped hillsides surrounding Botany Bay form a rectangular watershed that drains to the Atlantic Ocean in a northwesterly direction through a number of guts. The relatively undeveloped hillsides in the Botany Bay watershed have allowed the guts to maintain a stable, well-vegetated environment that buffers the lowland drainage area from the tremendous flow rates that can be achieved within the guts during intense rains.

A-Zone and C-Zone floodplains exist within the APC (Figure 3). A-Zones are, in general, comprised of 100-year riverine floodplains, for which Base Flood Elevations have been determined for some areas and not others. C-Zones are areas of minimal flooding (FEMA, 1987).

USE CONFLICTS

Presently, resource use in the Botany Bay APC is minimal. The majority of the APC is owned by a single family that has kept development on their land to personal-use facilities for the family. Other holdings within the APC belong to two other private entities, and The Nature Conservancy, a non-profit organization dedicated to the preservation of important habitats and ecosystems. Low-density housing is the only significant human use found within the APC. There are no significant use conflicts presently known to exist within the APC. As discussed in greater detail in Section 3.2 of the Study, certain types of future development might be in conflict with the goal of establishing the area as part of the Territorial Park System.

There has been only limited adverse impact on water and air quality and to the natural and cultural resources of the Botany Bay APC. The general good health and biological diversity of the area's terrestrial and marine resources is in part the result of its relatively undeveloped state. The minimal development that has taken place has allowed the coral reefs, seagrass beds, and other natural resources to remain among the healthiest in the Territory. Nevertheless, the potential for adverse impacts to the area's marine resources should be considered as high where sedimentation effects associated with watershed development are not properly mitigated.

MANAGEMENT RECOMMENDATIONS

The following is an abbreviated listing of Management Recommendations that should be adopted in order to manage the resources of the Botany Bay APC effectively. For further details on the rationale for these recommendations and specific information for their implementation can be found in Section 4 of the full document.

- The Botany Bay APC should be included in the Territorial Park System.
- A feasibility study should be carried out to determine the possibility of acquiring Botany Bay and establishing it within the Territorial Park System.
- The offshore cays and islets within the APC should all remain "no entry" sanctuaries for the protection of sea bird breeding colonies.
- The proposed Comprehensive Land and Water Use Plan (CLWUP), including the Botany Bay APC's designation as Intensity District 1

(Conservation/Agriculture) should be established, through the appropriate legislative process as soon as possible.

- If Botany Bay cannot be acquired by Government for a Territorial Park, other alternatives must be explored to control the type, scale, intensity, and location of future developments within the APC.

CONCLUSION

Effective management of the many important resources found within the Botany Bay APC will require a comprehensive, proactive strategy, on the part of both the V.I. Government and non-governmental organizations, to ensure that the area receives the protection and long-term planning it deserves. Given the uncertainties of future ownership and potential development of privately owned lands within the APC, the V.I. Government must have a clear plan in advance of future development proposals that will determine the exact type, scale, location, and timing of activities that will be acceptable in this environmentally and historically valuable area.

This draft APC Comprehensive Analytic Study recognizes the need to balance the interests of growth and development with those of resource conservation in order to provide the foundation for sustainable development in the Virgin Islands. As the Territory's human population expands, so too will the need to accommodate people with new residential and employment opportunities. If not properly planned for, however, new growth can lead to the further piecemeal degradation of the island's natural environment, resulting in the loss of habitat and the many free "ecological services" that healthy, intact ecosystems provide. The establishment of the Botany Bay APC as a Territorial Park would be an important step towards serious commitment to the sustainable use of the island's resources.