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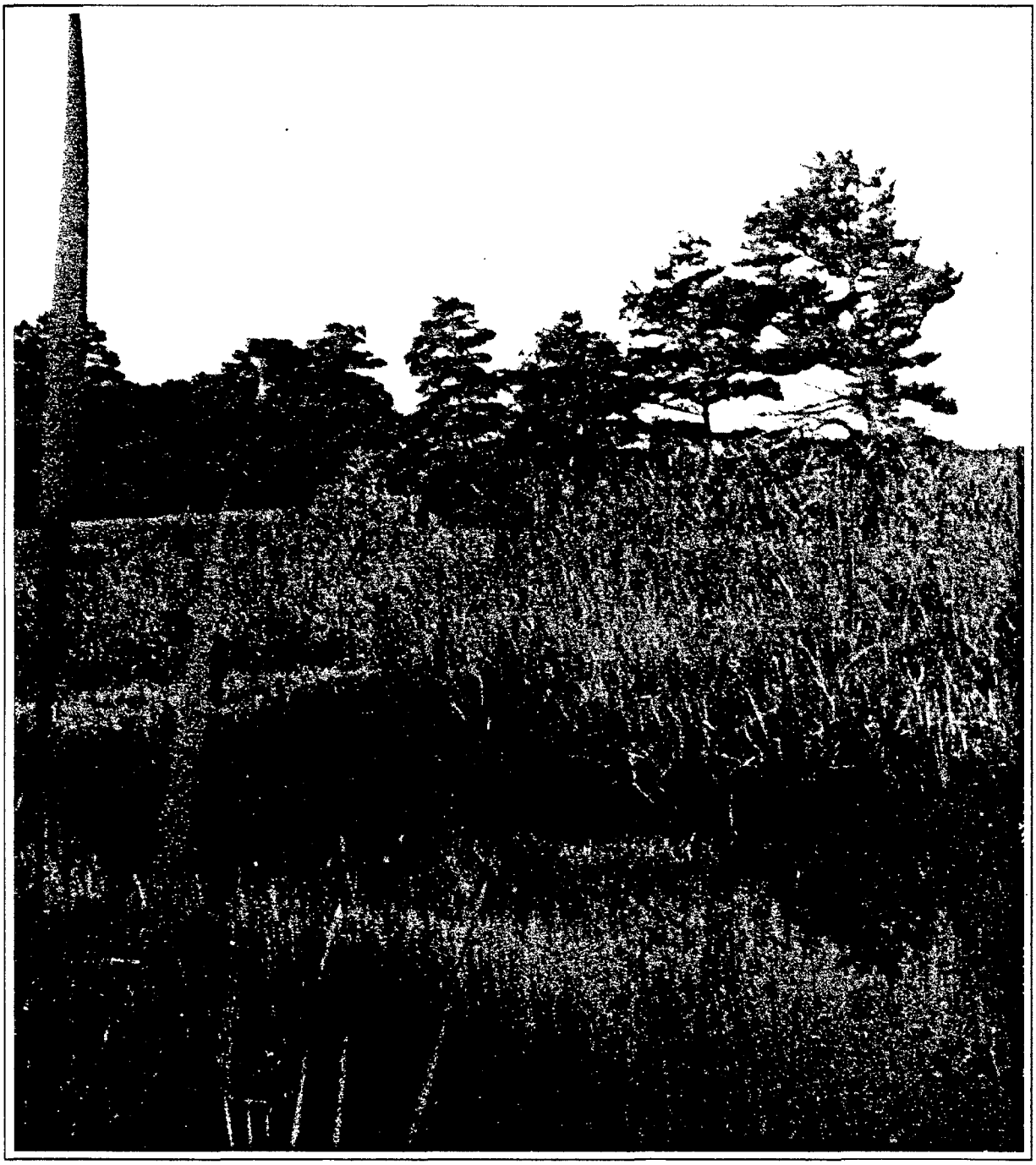
A NATURAL AREAS INVENTORY OF THE CITY OF VIRGINIA BEACH, VIRGINIA

FINAL REPORT



Department of Conservation & Recreation
Division of Natural Heritage

Natural Heritage Technical Report '93 14

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A NATURAL AREAS INVENTORY OF THE CITY OF VIRGINIA BEACH, VIRGINIA

FINAL REPORT

Prepared for
City of Virginia Beach

by
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VIRGINIA BEACH NATURAL AREAS INVENTORY

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VIRGINIA BEACH NATURAL AREAS INVENTORY

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VIRGINIA BEACH NATURAL AREAS INVENTORY

EXECUTIVE SUMMARY

In 1989, the Virginia Department of Conservation and Recreation's Division of Natural Heritage was contracted by the City of Virginia Beach to conduct a three-year natural areas inventory. The goal of this inventory was to systematically identify the City's natural heritage resources: "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest" (Virginia Natural Area Preserves Act, §10.1-209 et seq. of the Code of Virginia).

The natural areas inventory was conducted in six steps:

1) Review aerial photographs;
2) Gather existing information;
3) Conduct aerial reconnaissance of potential natural areas (PNAs);
4) Perform an initial ground survey;
5) Complete a thorough inventory of priority PNAs;
6) Compile the results and prepare a final report.

At the completion of the inventory, the Division of Natural Heritage had records of 20 rare vertebrate species, 39 rare invertebrate species, and 76 rare plant species from the City. Nineteen types of natural communities of statewide significance were also identified. Many of these resources are sensitive to disturbance or may be sought out by collectors. For this reason, there is a limited exemption to Virginia's Freedom of Information Act for natural heritage resources and the precise locations of these species are not included in this report. Requests for additional information on these resources should be addressed to the Department of Conservation and Recreation, Division of Natural Heritage, through the Virginia Beach Department of Planning, Environmental Management Center.

Thirty-four potential natural areas were identified during the initial phases of the inventory. Of these, 23 were found to support natural heritage resources. Based on a review of data obtained in the field, maps, and aerial photographs, Natural Heritage staff scientists developed conservation planning boundaries for these natural heritage resources. During this stage, a number of factors were considered, including the extent of high-quality natural communities, current and potential habitat for rare species, and threats to these resources. The result of this process is contained in Appendix B of this report: descriptions and maps of 18 natural areas that warrant protection because of the natural heritage resources they contain and over which the City has some control through ownership or zoning. In addition, Appendix B contains brief descriptions of 14 natural areas that have been identified previously by the Division of Natural Heritage during inventories of publicly-owned tracts (e.g. parks and military bases). These 42 natural areas range from ca. 10 acres to over 4000 acres.

VIRGINIA BEACH NATURAL AREAS INVENTORY

Some of the natural resources within these natural areas have been afforded protection under federal, state, and local law. Among these laws are the U.S. Endangered Species Act, Virginia Endangered Species Act, Virginia Endangered Plant and Insect Species Act, the Clean Water Act, Chesapeake Bay Preservation Act, Southern Watersheds Management Ordinance and City Zoning Ordinance. The delineation of conservation planning boundaries in this report does not confer any additional regulatory protection on the natural areas. These boundaries are intended to be used to support wise planning and decision-making for the conservation of the natural areas within the City. The Department of Conservation and Recreation encourages the City to take appropriate actions to protect these sites.

The report includes five recommendations for the City:

1. Participate fully in the development of local protection tools.

2. Include the Department of Conservation and Recreation's Division of Natural Heritage in the review of projects in or near natural areas.

3. Expand public awareness of the need for protecting and managing natural areas.

4. Increase cooperation among pertinent organizations.

5. Properly manage natural areas within the City of Virginia Beach.

To assist in protecting these natural areas, the Department of Conservation and Recreation is working with the Council on the Environment and the City to evaluate and apply existing local mechanisms for the protection of natural areas. Where appropriate, recommendations for new natural area protection tools will be developed. At the same time, the conservation planning boundaries identified here will be refined.

VIRGINIA BEACH NATURAL AREAS INVENTORY

Representative Natural Heritage Resources of Virginia Beach

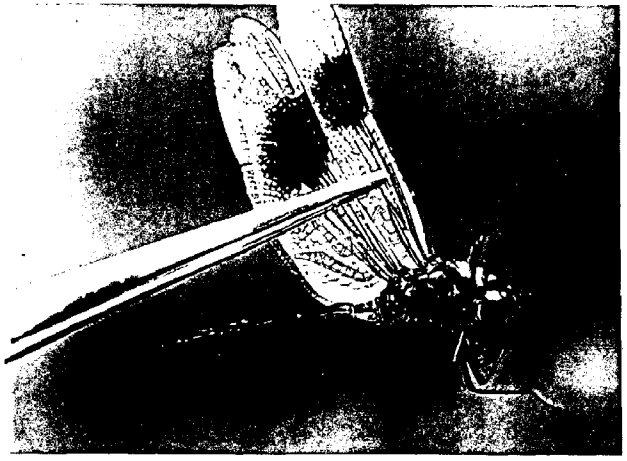
Upper Left: Spreading pogonia (Cleistes divaricata), known in Virginia Beach only from the North Pocosin Natural Area. Photo by Hal Horowitz.

Lower Left: Four-spotted pennant (Brachymesia gravida), known in Virginia Beach from Seashore and False Cape State Parks. Photo by Kurt Buhlmann.

Center: Great blue heron (Ardea herodias), which nests in a large colony in Gum Swamp Natural Area. Photo by Guy Bonnivier.

Lower Right: Slender-leaved dragon-head (Physostegia leptophylla), common along the North Landing River, typically with purple flowers, but occasionally with white flowers. Photo by Christopher Clampitt.

Upper Right: Three-square bulrush--cattail oligohaline marsh along Muddy Creek, Muddy Creek Natural Area. Photo by Christopher Clampitt.



VIRGINIA BEACH NATURAL AREAS INVENTORY

INTRODUCTION

In October 1989 the Virginia Department of Conservation and Recreation, through its Division of Natural Heritage, was contracted by the City of Virginia Beach to begin a three-year natural areas inventory. The goal of this inventory was to systematically identify the City's natural heritage resources: "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest" (Virginia Natural Area Preserves Act, §10.1-209 et seq. of the Code of Virginia). Subsequent contracts in 1990 and 1991 provided for completion of the inventory. Although this report covers the earlier work, it emphasizes the third year of the inventory. In addition to the inventory presented here, the City of Virginia Beach has secured funding for an additional project that will address the protection and management of the natural areas identified here.

OVERVIEW OF THE STUDY AREA

The City of Virginia Beach lies in the southeastern corner of Virginia. It is bordered on the north by the Chesapeake Bay, on the east by the Atlantic Ocean, and the south by Currituck County, North Carolina and on the west by the cities of Chesapeake and Norfolk. The northern portion of Virginia Beach is heavily urbanized, but the southern portion retains a rural character.

Geology. Virginia Beach lies entirely within Virginia's Coastal Plain physiographic province. Here, bedrock is buried by deep layers of unconsolidated materials that eroded from the mountainous western portions of the Commonwealth and were transported to the ocean by large rivers (Calver and Hobbs, 1963). Although now lying above sea level, these sands and gravels were deposited on the sea floor and reworked as sea level moved alternately west and east during the Quaternary. In general, the topography of Virginia Beach is level to rolling. The highest points in the City are the crests of some of the coastal dunes, which can exceed 50' above sea level. However, most of the City lies below 15'.

Major Watersheds. The City of Virginia Beach encompasses parts of four large watersheds. The northern third of the City drains into Chesapeake Bay or the Atlantic Ocean by way of small, steep-walled, tidal creeks and bays (e.g., Broad Bay, Linkhorn Bay, Rudee Inlet, and the Lynnhaven River). The southeastern third of the City drains into Albemarle Sound by way of Back Bay, which is fed by many marsh-lined creeks (e.g., Muddy Creek, Nawney Creek). The southwestern third of the City is drained by the North Landing and Northwest Rivers, broad blackwater rivers that also drain south into Albemarle Sound. Of these two rivers, the North Landing drains much more of Virginia Beach. It is bordered by extensive forested wetlands north of the Pungo Ferry bridge

and by extensive herbaceous wetlands south of the bridge. The North Landing River is now part of the Intracoastal Waterway, connecting Albemarle Sound to the south with the Southern Branch of the Elizabeth River.

Unlike the streams in the northern part of Virginia Beach, the tributaries of Albemarle Sound are not influenced by regular lunar tides. However, prolonged winds from the northwest can push water out of the Sound, dropping the water level in Back Bay and the North Landing River by a foot or more. Similarly, a "wind tide" brought on by strong easterly winds can push saltwater into the Sound, raising the water level (and salinity) in its tributaries.

Soils. The U.S. Soil Conservation Service divides the naturally-occurring soils of Virginia Beach into seven general groups (map units). Three of these occur in uplands, two occur in marshes and swamps, and two are confined to coastal dune systems (Soil Conservation Service, 1985; Table 1).

Current Vegetation. Most of the upland areas of Virginia Beach are either developed or in agriculture. Many seasonal wetlands have been drained and cleared in the past and now support vegetation more typical of uplands. In recent years, some agricultural lands have been abandoned and others have been converted to residential areas. Thus the few upland forests are relatively young stands of loblolly pine, Virginia pine, and/or early-successional hardwoods such as red maple. Upland forests that have not been logged or grazed for several decades are composed of hardwoods, including black gum, American beech, tulip poplar, sourwood, white oak, southern red oak, water oak, and hickories.

In coastal areas, wind and salt spray from the ocean can create conditions that are too harsh for many species. Under these conditions can be found a distinctive series of maritime forests, scrublands and grasslands. These are particularly abundant at Cape Henry and False Cape, where public ownership has prevented the construction of human communities with the consequent destruction of the natural communities. The characteristic species of maritime forests is live oak. Growing with it are bluejack oak, water oak, and loblolly pine. Along the inland edge of the maritime forest community, the pines typically tower over the oaks. Nearer the ocean, the pines drop out and the oaks get shorter and shorter until they form a low scrub. From here to the primary dune, grasses dominate the landscape. Chief among these are American beachgrass, sea oats, and broomsedge.

Forested wetlands (swamps) cover a substantial portion of Virginia Beach. Dominant species in the swamps include bald cypress, swamp tupelo, red maple, sweetgum, loblolly pine and Atlantic white cedar. Most of these swamps have been logged since Europeans first settled the area, with Atlantic white cedar and bald cypress being the most valued species. Red maple and black gum typically dominate second growth forested wetlands.

Table 1. Naturally-occuring[1] soils of Virginia Beach. (Based on Soil Conservation Service, 1985).

Soil Group	Description	Distribution in Virginia Beach	Percent of the City
Swamp and Marsh Soils			
Dorovan-Pocaty-Nawney	Very poorly drained soils that consist of organic or loamy material; formed in organic material or fluvial sediments.	Level floodplains of the larger rivers and their tributaries in the southwestern portion.	10
Backbay-Nawney	Very poorly drained soils that have a thin organic surface layer over a loamy sub-stratum; formed in fluvial sediments.	Floodplains of Back Bay and its tributaries.	7
Sandy Coastal Soils			
Newhan-Duckston-Corolla	Excessively drained to poorly drained soils that have a sandy sub-stratum; formed in marine and eolian sediments.	Sand dunes, flats and other sandy, coastal areas along Chesapeake Bay and the Atlantic Ocean.	5
Pamlico-Fripp-Lakehurst Variant	Very poorly drained, excessively drained, and moderately well drained soils that are organic or sandy; formed in organic material or in marine or eolian sediments.	Stabilized and forested dunes in and near Seashore State Park.	3
Upland Soils			
Acredale-Tomotley-Nimmo	Poorly-drained soils that have a loamy subsoil; formed in marine and fluvial sediments.	Widespread on broad, flat areas in the uplands, central and southern portions.	41
State-Tetotum-Augusta	Well-drained, moderately well-drained, and somewhat poorly-drained soils that have a loamy subsoil; formed in marine and fluvial sediments.	Broad ridges and side slopes, mainly in the northern portions.	15
Dragston-Munden-Bojac	Somewhat poorly-drained, moderately well-drained, and well-drained soils that have a loamy subsoil; formed in marine and fluvial sediments.	Narrow ridges and side slopes, throughout.	11

1) Udorthents (soils affected by grading and filling) and urban lands with impervious surfaces cover roughly 8% of the City.

Within some of the largest forested wetlands occur nutrient-poor, naturally-burned communities known as pocosins. In these communities, stunted pond pine and loblolly pine form a broken canopy over a dense tangle of shrubs and vines.

The remainder of the wetlands in Virginia Beach are fresh to somewhat salty (brackish) marshes. The largest of these are associated with the North Landing River and Back Bay. Dominating these marshes are big cordgrass, narrow-leaf cattail, southern cattail, twig rush, black needlerush and (in disturbed areas such as disposal sites for dredged material and ditches) common reed.

VIRGINIA'S NATURAL HERITAGE PROGRAM

The Department of Conservation and Recreation (DCR) is the Commonwealth's principal manager of data on rare plants and animals, unique and exemplary natural communities, and other significant natural features such as caves. Through its Division of Natural Heritage, DCR is part of a natural heritage data center network covering all 50 states in the U.S., three Canadian provinces, and 13 countries in Latin America and the Caribbean. A consistent methodology is utilized throughout this network, ensuring that information collected by the various state, provincial and national programs can be readily shared, compared and updated. The Division of Natural Heritage continually refines its data through biological surveys and compilation of data from other sources. This keeps the information base current and increasingly accurate. The Division of Natural Heritage also continues to look for new and better ways to provide information on natural heritage resources, their legal and biological status, and ways to protect and manage their habitats. For example, the Division is currently investigating the use of geographical information systems to produce regional maps of natural heritage resources.

Each significant natural features (species, community type, and category of geological feature) monitored by the Division of Natural Heritage is an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 2). The primary criterion for ranking elements is the number of occurrences, i.e. the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences such that ranks are an index of known biological rarity. These ranks are assigned both in terms of the element's rarity within Virginia (its State or S-rank) and the element's rarity over its entire range (its Global or G-rank). Global ranks are based upon the collective knowledge of the natural heritage data network. Taken together the G- and

Table 2. Definition of Natural Heritage state rarity ranks. Global ranks are similar, but refer to a species' rarity throughout its range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means extinct. A question mark following a rank indicates that the actual rarity is uncertain. These ranks should not be interpreted as legal designations.

S1 Extremely rare: usually 5 or fewer occurrences in the state, or there may be a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare: usually between 5 and 20 occurrences, or there may be many individuals in fewer occurrences; often susceptible to becoming endangered.

S3 Rare to uncommon: usually between 20 and 100 occurrences, there may be fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

S4 Common: usually more than 100 occurrences, but there may be fewer with many large populations, which may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common: demonstrably secure under present conditions.

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SN Regularly occurring migrants; transients; seasonal, non-breeding residents. Usually no specific site can be identified with its range in the state. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from the state.

S-ranks give an instant picture of the rarity of an element based upon the best available information of the natural heritage network. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species are protected. Therefore, Natural Heritage rarity ranks should not be interpreted as legal designations.

The spot on the landscape that supports a particular population of a specific rare species or stand of a given community type is an **element occurrence.** There are now more than 7000 mapped element occurrences in Virginia. Information on the location and quality of these element occurrences is also entered into the computerized databases that comprise the Biological and Conservation Data System (BCD).

In addition to ranking each element in terms of rarity, Natural Heritage staff scientists rank each element occurrence so that protection efforts can be aimed not only at the rarest elements, but at the best examples of each. In the case of species, an element occurrence is ranked in terms of the **quality** (size, vigor, etc.) of the population, the **condition** or naturalness of the habitat, the long-term **viability** of the population, and the **defensibility** of the occurrence. Given the intimate relationship between a natural community and its environment, communities are ranked in terms of their quality and their size. Element occurrence ranks run from A (excellent) through D (poor) where the population and habitat are well known. In other cases element occurrences are given a rank of U (unknown) or H (historical).

One of the many ways that the Division of Natural Heritage uses these element and element occurrence ranks is to assess the overall significance of a site, which may include one or many element occurrences. Based on these ranks, each site is assigned a biodiversity (or B-) rank:

B1 Outstanding Significance: only site known for an element or an excellent occurrence of a G1 species.

B2 Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type, good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type, excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

Many rare species are sensitive to disturbance, especially during the breeding season. Others may sought out by individuals interested in capturing, photographing or even destroying them for a variety of reasons.

For these reasons, the Virginia Freedom of Information Act (§2.1-342 of the Code of Virginia) grants a limited exemption to the release of information on natural heritage resources, as well as significant historic and archaeological sites, if "disclosure of the information would jeopardize the continued existence or the integrity of the resource."

VIRGINIA BEACH NATURAL AREAS INVENTORY

METHODS

The Natural Heritage staff conducts natural area inventories in six stages:

1) Review of aerial photographs. Aerial photographs of the entire survey area are reviewed in detail to identify potential natural areas (PNAs) to be studied in the following stages. Where possible, recent and historical aerial photographs are studied. Comparing these sets of photographs with each other helps determine how long forests and other vegetation have been in their current condition. To aid in their interpretation, the photographs are compared with topographic, wetlands, and soils maps.

2) Gathering existing information. Natural Heritage staff examine museum collections and record label information for rare species. Published and unpublished information on natural areas in the inventory area is collected and assimilated in conjunction with the review of aerial photographs. This includes gathering maps of public lands (federal, state and local) within the survey area, reviewing Natural Heritage data, consulting experts such as local naturalists, soil conservationists, foresters, and college faculty. During this stage, some PNAs are eliminated from further consideration while others are added. The state and federal governments own a substantial portion of Virginia Beach. The Department of Conservation and Recreation's Division of Natural Heritage has conducted or will be conducting inventories on many of these tracts, including Camp Pendleton, Little Creek Naval Amphibious Base, Naval Air Station Oceana, and Seashore State Park. For this reason, the Virginia Beach natural areas inventory has focused on private and city lands (see citations in the References section of this report). Significant sites identified during these collateral studies are included in Appendix B of this report.

3) Aerial reconnaissance. Selected PNAs are studied in more detail by flying over them in a small airplane or helicopter. Typically, this is done in the early spring or late fall, when the ground is visible through the trees. This is especially useful where no recent photographs are available or there have been recent major changes in the landscape due to development, conversion of natural forests to managed plantations, etc. Flying allows the quick review of many tracts that would take days to visit by boat, car and on foot. Making a videotape of the flight allows the flight to be replayed and reanalyzed. The goal of this stage is to eliminate from consideration the sites that are no longer in a natural state and to begin prioritizing the remaining PNAs for on-the-ground survey.

4) Initial ground survey. There are several purposes of this stage. One is to identify and contact the landowner. A second purpose is to screen the PNAs to eliminate those that show signs of substantial disturbance that are not visible in aerial photographs or from the air. A third is to plan for the main survey of PNAs that still show potential as natural areas. Among the decisions to be made are when the survey can best be conducted, which staff scientist(s) should be involved (i.e. what is the potential for rare plants, rare animals or exemplary communities), and how much time should be budgeted for completing the survey. Where there is a need to verify the accuracy of the photo interpretation conducted during stage 1, these stages may overlap.

5) Thorough inventory of priority PNAs. At this time, detailed information is collected on the presence and status of rare species and unique or exemplary natural communities that are present, the extent of the feature(s) that make the PNA significant, and the area that needs to be protected to preserve those features. Threats and past or present disturbances are also noted. For sites found to be of statewide significance, these data are transcribed onto Natural Heritage maps and entered into the BCD databases.

6) Compilation of results and preparation of final report. As field work is completed, Natural Heritage staff scientists review the information gathered. Based on a review of all natural heritage resources present at a PNA, the staff prioritizes the sites in terms of their significance and the threats facing them, develops and maps preliminary conservation planning boundaries, and drafts protection and management recommendations. This information is then combined into a report to the contracting locality.

Although a natural areas inventory can logically be broken into these steps, in actuality the work proceeds in multiple directions simultaneously and is often iterative.

RESULTS

During the Virginia Beach Natural Areas Inventory, Natural Heritage staff scientists identified 34 potential natural areas (PNAs; Table 3; Figure 1). These areas included the most promising sites for natural heritage resources in Virginia Beach. Twenty-three of the PNAs were found to support natural heritage resources. Eight of the PNAs have been altered or are heavily disturbed and are unlikely to support any rare, threatened or endangered species or significant natural habitats. The remaining three PNAs were of low priority and were omitted from the inventory because of difficulty of access. While these last 11 PNAs have an extremely low potential for supporting natural heritage resources, they may be important to the city for other reasons, e.g., buffering water courses from upland developments or as open space.

During the course of the inventory, the Natural Heritage staff has accumulated a wealth of data. Eighty species of rare vascular ("higher") plants are now known from the city, as are two rare mosses, seven rare birds, five rare mammals, four rare reptiles, two rare amphibians, and two rare fish (Table 4). In addition, 39 rare invertebrates have been documented from the city. Also identified during this inventory are 19 classes of significant natural communities (Table 5).

1) Review of aerial photographs. Black and white aerial photographs taken by the Virginia Department of Transportation (VDOT) and false color, infra-red photos taken by the USGS under the National High Altitude Photography (NHAP) program were reviewed. The VDOT photographs were taken in 1980 and 1985 while the NHAP photographs date from 1982. The infra-red photographs were particularly useful in locating wetlands. Coupled with staff experience in Virginia Beach, these photographs provided the basis for delineating most of the PNAs identified to date. They were also used extensively in delineating the natural areas discussed in Appendix B.

2) Interviews. Formal interviews were conducted with members of the wetlands unit at the College of William and Mary, School of Marine Science, Virginia Institute of Marine Sciences (VIMS). Informal discussions have also taken place with Natural Heritage staff, contractors and colleagues who are working on collateral studies on various military bases and State-owned lands in Virginia Beach. Additional discussions have been held with students and faculty of Old Dominion University, city staff, several state and federal employees and with other knowledgeable individuals. Interviewees have provided useful information on the ecology of various wetland systems in Virginia Beach, and on the status of several rare species.

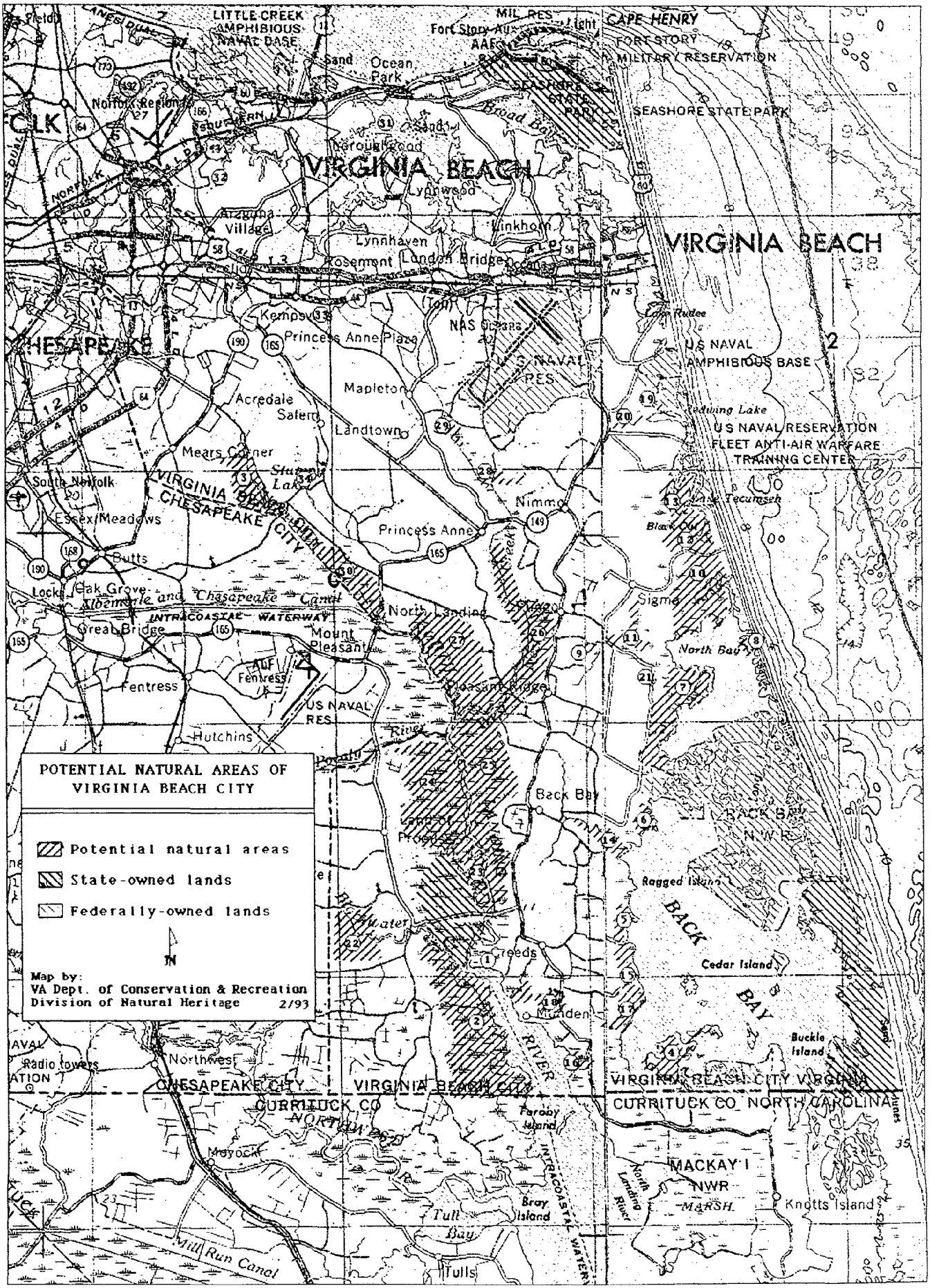
Table 3. Status of Potential Natural Areas in Virginia Beach as of September 1992. PNA numbers correspond with Figure 1.

PNA Num	PNA Name	USGS Quadrangle	Status*
1	Pleasant Ridge South	PLEASANT RIDGE	P
2	Milldam Creek Wetlands	CREEDS	P
3	Stumpy Lake	KEMPSVILLE	P
4	Pocahontas WMA	KNOTTS ISLAND	P
5	Campbell Landing	KNOTTS ISLAND	P
6	Moose Island Point	NORTH BAY	P
7	Bridge Cove	NORTH BAY	P
8	Sandbridge South	NORTH BAY	P
9	Pungo Forest	PLEASANT RIDGE	N
10	North Bay North	NORTH BAY	P
11	Muddy Creek	NORTH BAY	P
12	Black Gut	VIRGINIA BEACH,NORTH BAY	P
13	Lake Tecumseh	VIRGINIA BEACH	N
14	Nawney Creek	PLEASANT RIDGE,NORTH BAY	P
15	Pellitory Point	KNOTTS ISLAND	P
16	Seneca Marsh	CREEDS	P
17	Trojan WMA South	KNOTTS ISLAND,CREEDS	P
18	Oakum Creek & Uplands	CREEDS	P
19	Golf Course Woods	VIRGINIA BEACH	N
20	Jones Swamp	VIRGINIA BEACH	N
21	Horn Point Pond	NORTH BAY	N
22	Upper Blackwater Creek	CREEDS	N
23	Middle Marsh	PLEASANT RIDGE,CREEDS	P
24	North Pocosin	PLEASANT RIDGE	P
25	North Landing East	PLEASANT RIDGE	P
26	West Neck Creek	PLEASANT RIDGE	P
27	West Landing	PLEASANT RIDGE	N
28	Seaboard Road	PRINCESS ANNE	P
29	Mundens Corner	PRINCESS ANNE	P
30	South Gum Swamp	PLEASANT RIDGE	P
31	Lynnhaven Inlet	CAPE HENRY	O
32	Lake Lawson South	LITTLE CREEK	O
33	Gallops Corner	PRINCESS ANNE,KEMPSVILLE	N
34	Elbow Road Elbow	KEMPSVILLE	O

*PNA Status:

- N No natural heritage resources known and little likelihood that any actually are present
- O Low-priority site omitted from inventory
- P Natural heritage resources documented as present

FIGURE 1


POTENTIAL NATURAL AREAS OF VIRGINIA BEACH CITY
Potential natural areas
State-owned lands
Federally-owned lands
N
Map by:
VA Dept. of Conservation & Recreation
Division of Natural Heritage 2/93
VIRGINIA BEACH
VIRGINIA BEACH
CHESAPEAKE
CHESAPEAKE CITY
VIRGINIA BEACH CITY
CURRITUCK CO
CURRITUCK CO NORTH CAROLINA
LITTLE CREEK AMPHIBIOUS NAVAL BASE
CAPE HENRY
FORT STORY MILITARY RESERVATION
SEASHORE STATE PARK
Ocean Park
Norfolk Regional
Lynnwood
Lynnhaven
Rosemont
London Bridge
Kempsville
Princess Anne Plaza
Mapleton
Acredale
Salem
Landtown
Mears Corner
South Norfolk
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Butts
Oak Grove
Great Bridge
Fentress
Hutchins
Mount Pleasant
North Landing
Princess Anne
Nimmo
Pleasant Ridge
Back Bay
Creeds
Munden
Northwest
Moyock
Tulls
Knotts Island
MACKAY I NWR
MARSH
Ragged Island
Cedar Island
Buckle Island
Faraby Island
Bray Island
Tull Bay
Mill Run Canal
Albemarle and Chesapeake Canal
INTRACOASTAL WATERWAY
US NAVAL AMPHIBIOUS BASE
US NAVAL RESERVATION FLEET ANTI-AIR WARFARE TRAINING CENTER
US NAVAL RES
BACK BAY
BACK BAY N.W.R.
North Bay
Sigma
Lake Tecumseh
Redwing Lake
Lake Rudee
Broad Bay
Norfolk Region
Araguna Village
Linkhorn
Sand
Norfolk Region
Fort Story Aux
Light
Pleasant Ridge
Creek
Radio towers

Table 4. Natural Heritage resources documented from the City of Virginia Beach.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK[1]	STATE RARITY RANK[2]	USFWS LEGAL STATUS[3]	VA LEGAL STATUS[4]
** INVERTEBRATES					
AGELENOPSIS KASTONI	A FUNNEL-WEB SPIDER	G4?	S1		
ANODONTA IMBECILLIS	PAPER PONDSHELL	G5	S2		
ATLIDES HALESUS	GREAT PURPLE HAIRSTREAK	G5	S3		
BARRONOPSIS JEFFERSI	A FUNNEL-WEB SPIDER	G3	S1		
BOTHYNOTUS JOHNSTONI	A MIRID BUG	GU	SU		
BRACHYMESIA GRAVIDA	FOUR-SPOTTED PENNANT	G5	S1		
CALEPHELIS VIRGINIENSIS	LITTLE METALMARK	G4	S3		
CASTIANEIRA TRILINEATA	A TWO-CLAWED HUNTING SPIDER	G4?	S1		
CICINDELA DORSALIS MEDIA	A TIGER BEETLE	G4T4	S3		
CICINDELA TRIFASCIATA	A TIGER BEETLE	G5	S1		
CTENOTRACHELUS SHERMANI	A TRUE BUG	GU	SU		
DELTOCHILUM GIBBOSUM	A SCARAB BEETLE	G4?	S1		
DRASSYLUS LOUSIANUS	A GNAPHOSID SPIDER	G4?	S1		
ENALLAGMA DURUM	BIG BLUET	G5	S2		
EPITHECA COSTALIS	STRIPE-WINGED BASKETTAIL	G4	S1		
EUPHYES DUKESI	SCARCE SWAMP SKIPPER	G3G4	S2		C
EUPHYES PILATKA	SAWGRASS SKIPPER	G3G4	S1		
GOMPHAESCHNA FURCILLATA	HARLEQUIN DARNER	G5	S2		
HELLUOMORPHOIDES NIGRIPENNIS	A FLAT-HORNED GROUND BEETLE	G4?	S1		
LESTES DISJUNCTUS AUSTRALIS	COMMON SPREADWING	G5T5	S2		
LIBELLULA AXILENA	BAR-WINGED SKIMMER	G5	S1		
LIBELLULA FLAVIDA	YELLOW-SIDED SKIMMER	G5	S2		
LYTTA POLITA	A BLISTER BEETLE	G4?	S1S2		
NASIAESCHNA PENTACANTHA	CYRANO DARNER	G5	S1		
NICROPHORUS MARGINATUS	A BURYING BEETLE	G5	S1		
PISAURINA DUBIA	A NURSERY WEB SPIDER	G4?	S1		
PLOIARIA CAROLINA	THREAD-LEGGED BUG	G4?	S1		
PLOIARIA HIRTICORNIS	AN ASSASSIN BUG	G3?	S1		
POANES AARONI AARONI	SAFFRON SKIPPER	G4T4	S3		
PSEUDAPTINUS TENUICORNIS	A CARABID BEETLE	GU	SU		
PSEUDOPOLYDESMUS PALUDICOLOUS	A MILLIPEDE	G1	S1		SSC
RANATRA AUSTRALIS	SOUTHERN WATER SCORPION	G5	S1S3		
RANATRA DRAKEI	DRAKE'S WATER SCORPION	G4	S1S3		
RYBAXIS SPECIES 1	A PSELAPHID BEETLE	GU	SU		
SATYRIUM KINGI	KING'S HAIRSTREAK	G3G4	S2S3		
SPHODROS COYLEI	COYLE'S PURSE-WEB SPIDER	G2	S2		
TOMINOTUS COMMUNIS	A BURROWER BUG	G5	S1		
TRAMEA ONUSTA	RED-MANTLED GLIDER	G5	S1		
TRIODOPSIS OBSOLETA	SMOOTH-LIPPED SAND THREE-TOOTH	G4	S3		

VIRGINIA BEACH NATURAL AREAS INVENTORY

Table 4., continued.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK[1]	STATE RARITY RANK[2]	USFWS LEGAL STATUS[3]	VA LEGAL STATUS[4]
** AMPHIBIANS					
RANA VIRGATIPES	CARPENTER FROG	G5	S3		SSC
SIREN LACERTINA	GREATER SIREN	G5	S2		
** BIRDS					
ARDEA HERODIAS	GREAT BLUE HERON	G5	S3		
CASMERODIUS ALBUS	GREAT EGRET	G5	S2		
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G3	S2S3	LE	LE
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S2		
RALLUS ELEGANS	KING RAIL	G4Q	S2		
RALLUS LIMICOLA	VIRGINIA RAIL	G5	S2		
STERNA ANTILLARUM	LEAST TERN	G4	S2		SSC
** FISH					
ACANTHARCHUS POMOTIS	MUD SUNFISH	G5	S3		
CHOLOGASTER CORNUTA	SWAMPFISH	G5	S3		
** MAMMALS					
CONDYLURA CRISTATA PARVA	STAR-NOSED MOLE	G5T4	S2		SSC
PEROMYSCUS LEUCOPUS EASTI	PUNGO MOUSE	G5T1	S1	C2	
SOREX LONGIROSTRIS FISHERI	DISMAL SWAMP SOUTHEASTERN SHREW	G5T2Q	S2	LT	LT
SYLVILAGUS PALUSTRIS	MARSH RABBIT	G5	S2S3		SSC
SYNAPTOMYS COOPERI HELALETES	DISMAL SWAMP BOG LEMMING	G5T3	S3		
** REPTILES					
CARETTA CARETTA	LOGGERHEAD SEA TURTLE	G3	S1S2	LT	LT
CROTALUS HORRIDUS ATRICAUDATUS	CANEBRAKE RATTLESNAKE	G5TUQ	S1		LE
DEIROCHELYS RETICULARIA RETICULARIA	EASTERN CHICKEN TURTLE	G5T5	S1		LE
OPHISAURUS VENTRALIS	EASTERN GLASS LIZARD	G5	S1		LT
** NON-VASCULAR PLANTS					
SPHAGNUM PERICHAETIALE	BRACT PEATMOSS	G5	S2S3		
SPHAGNUM TRINITENSE	TRINIDAD PEATMOSS	G4	S2S3		

VIRGINIA BEACH NATURAL AREAS INVENTORY

Table 4., continued.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK[1]	STATE RARITY RANK[2]	USFWS LEGAL STATUS[3]	VA LEGAL STATUS[4]
** VASCULAR PLANTS					
ARENARIA LANUGINOSA	A SANDWORT	G5	SH		
ASTER PUNICEUS VAR ELLIOTTII	ELLIOTT'S ASTER	G5T3T4	S1		
ASTER RACEMOSUS	COASTAL-PLAIN ASTER	G3?Q	S1		
BOLTONIA ASTEROIDES	ASTER-LIKE BOLTONIA	G5	S2		
BOLTONIA CAROLINIANA	CAROLINA BOLTONIA	G2Q	S1		
CALOPOGON PALLIDUS	PALE GRASS-PINK	G4G5	SH		
CAREX DECOMPOSITA	EPIPHYTIC SEDGE	G3G4	S1		C
CAREX RENIFORMIS	RENIFORM SEDGE	G4?	S1		
CAREX STRIATA	A SEDGE	G4	S1S2		
CASSIA FASCICULATA VAR MACROSPERMA	PRAIRIE SENNA	G5T2Q	S2	C2	
CHAMAECYPARIS THYOIDES	ATLANTIC WHITE CEDAR	G4	S2		
CHAMAESYCE BOMBENSIS	A SPURGE	G3G4	S2		
CHRYSOPSIS GOSSYPINA	COTTONY GOLDEN-ASTER	G5	S1		
CIRSIUM REPANDUM	COASTAL-PLAIN THISTLE	G5	SH		
CLADIUM MARISCUS SSP JAMAICENSE	SAWGRASS	G5T5	S1		
CLEISTES DIVARICATA	SPREADING POGONIA	G4	S1		
CRATAEGUS AESTIVALIS	MAY HAWTHORN	G5	S1		
CUSCUTA CEPHALANTHI	BUTTON-BUSH DODDER	G5	S1?		
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?		
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL	G3G4	S2		
ELEOCHARIS BALDWINII	BALDWIN SPIKERUSH	G4G5	S1		
ELEOCHARIS HALOPHILA	SALT-MARSH SPIKERUSH	G4	S1		
ELEOCHARIS RADICANS	ROOTED SPIKERUSH	G5	SH		
ELEOCHARIS VIVIPARA	VIVIPAROUS SPIKERUSH	G5	S1		
ERIGERON VERNUS	WHITE-TOP FLEABANE	G5	S2		
ERIOCAULON AQUATICUM	WHITE BUTTONS	G5	S1		C
FIMBRISTYLIS CAROLINIANA	CAROLINA FIMBRISTYLIS	G4	S1		
GALIUM HISPIDULUM	COAST BEDSTRAW	G5	S2		
GYMNOPOGON BREVIFOLIUS	BROAD-LEAVED BEARDGRASS	G5	SH		
HELIOTROPIUM CURASSAVICUM	SEASIDE HELIOTROPE	G5	S1		
HONKENYA PEPLOIDES	SEA-BEACH SANDWORT	G5	S1		
HYDROCOTYLE BONARIENSIS	COASTAL-PLAIN PENNY-WORT	G5	S1?		
HYPOXIS SESSILIS	LONG'S YELLOW STAR-GRASS	G4	SH		
IRESINE RHIZOMATOSA	EASTERN BLOODLEAF	G5	S1S2		
IVA IMBRICATA	SEA-COAST MARSH-ELDER	G5?	S1S2		
JUNCUS ELLIOTTII	BOG RUSH	G4G5	S1S2		
JUNCUS GRISCOMII	GRISCOM'S RUSH	GHQ	SH		
JUNCUS MEGACEPHALUS	BIG-HEAD RUSH	G4G5	S2		
KALMIA ANGUSTIFOLIA	SHEEP-LAUREL	G5	S2S3		
LILAEOPSIS ATTENUATA	CAROLINA LILAEOPSIS	G3	S1S2		C
LOBELIA ELONGATA	ELONGATED LOBELIA	G3G5	S1		
LUDWIGIA ALATA	WINGED SEEDBOX	G3G4	S1		
LUDWIGIA BREVIPES	LONG BEACH SEEDBOX	G4G5	S2S3		
LUDWIGIA REPENS	CREEPING SEEDBOX	G5	S1		
NOTHOSCORDUM BIVALVE	CROW-POISON	G4	S2		
NYMPHOIDES AQUATICA	BIG FLOATING-HEART	G5	S1		
OSMANTHUS AMERICANUS	WILD OLIVE	G5	S1		
PASPALUM DISTICHUM	JOINT PASPALUM	G5	S1		
PHYLA NODIFLORA	COMMON FROG-FRUIT	G5	S1		
PHYSALIS WALTERI	STICKY GROUND-CHERRY	G4G5T4	S2		
PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON-HEAD	G4G5	S2	C2	
PINUS PALUSTRIS	LONG-LEAF PINE	G4G5	S1		
QUERCUS HEMISPHAERICA	DARLINGTON'S OAK	G5	S2		

Table 4., continued.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK[1]	STATE RARITY RANK[2]	USFWS LEGAL STATUS[3]	VA LEGAL STATUS[4]
VASCULAR PLANTS, CONTINUED					
QUERCUS INCANA	BLUE JACK OAK	G5	S2		
QUERCUS LAEVIS	TURKEY OAK	G5	S2		
QUERCUS MARGARETTAE	SAND POST OAK	G5	S2S3		
RANUNCULUS HEDERACEUS	LONG-STALKED CROWFOOT	G5	SH		
RHYNCHOSPORA COLORATA	WHITE-TOPPED SEDGE	G4G5	S1		
RHYNCHOSPORA DEBILIS	SAVANNAH BEAKRUSH	G4?	S1		
RHYNCHOSPORA FASCICULARIS	FASCICULATE BEAKRUSH	G5	S2		
RHYNCHOSPORA SCIRPOIDES	LONG-BEAKED BALDRUSH	G4	S1		
SCIRPUS ETUBERCULATUS	CANBY'S BULRUSH	G3G4	S1		
SOLIDAGO TORTIFOLIA	A GOLDENROD	G3G5	S1		
SPARGANIUM ANDROCLADUM	BRANCHING BURREED	G4G5	S1		
SPARTINA PECTINATA	FRESH WATER CORDGRASS	G5	S2		
SPIRANTHES ODORATA	SWEETSCENT LADIES'-TRESSES	G5	S2		
STEWARTIA MALACHODENDRON	SILKY CAMELLIA	G4	S2		
STIPULICIDA SETACEA	PINELAND SCALY-PINK	G5	S1		
TILLANDSIA USNEOIDES	SPANISH MOSS	G5	S2		
UTRICULARIA FIBROSA	FIBROUS BLADDERWORT	G4G5	S1		
UTRICULARIA GEMINISCAPA	HIDDEN-FRUITED BLADDERWORT	G4G5	S2		
UTRICULARIA PURPUREA	PURPLE BLADDERWORT	G5	S2		
VACCINIUM MACROCARPON	LARGE CRANBERRY	G4	S2		
VERBENA SCABRA	SANDPAPER VERVAIN	G5	S2		
WISTERIA FRUTESCENS	AMERICAN WISTERIA	G5	S2		
XYRIS CAROLINIANA	CAROLINA YELLOW-EYED-GRASS	G4G5	S1		

Footnotes:

1 Global rarity ranks are determined in exactly the same way that state rarity ranks (Table 2) are, however, they may be qualified in the following ways:
- ? the actual rarity of the element is uncertain
- Q the taxonomic status of the element is uncertain
- T_ describes the rarity of the subspecies or variety that is being ranked, e.g., a rank of G5T1 means that the element is an extremely rare subspecies of an extremely common species

2 See Table 2

3 The status of the element under the US Endangered Species Act, as determined by the US Fish and Wildlife Service:
- C2 category 2 candidate for future listing
- LE listed as endangered
- LT listed as threatened

4 The status of the element under the Virginia Endangered Species Act, as determined by the Department of Game and Inland Fisheries, or under the Endangered Plant and Insect Species Act, as determined by the Department of Agriculture and Consumer Services:
- C candidate for future listing (plants and insects only)
- LE listed as endangered
- LT listed as threatened
- SSC state special concern (wildlife excluding insects only)

VIRGINIA BEACH NATURAL AREAS INVENTORY

Table 5. Significant natural communities of Virginia Beach. The upper levels of this classification are outlined in Rawinski (1990) and Rawinski (1992).

SYSTEM Major Community Type COMMUNITY CLASS Plant Community	State Rarity Rank
TERRESTRIAL	
Forest	
OLIGOTROPHIC FOREST	
Loblolly Pine/Live Oak maritime forest	S2
Woodland	
OLIGOTROPHIC WOODLAND	
Water Oak/Sassafras dune woodland	S2
Scrub	
OLIGOTROPHIC SCRUB	
Live Oak--Bluejack Oak dune scrub	S1
Sand Heather dwarf scrub	S2
Herbaceous	
MID-HEIGHT HERBACEOUS	
Sea Oats--American Beachgrass maritime grassland	S4
PALUSTRINE	
Forest	
OLIGOTROPHIC SATURATED PALUSTRINE FOREST	
Atlantic White Cedar swamp	S1
OLIGOTROPHIC SEMIPERMANENTLY-FLOODED PALUSTRINE FOREST	
Bald Cypress/heath swamp	S2
EUTROPHIC SEMIPERMANENTLY-FLOODED PALUSTRINE FOREST	
Water Tupelo--Bald Cypress/Carolina Ash swamp	S4
Woodland	
OLIGOTROPHIC SATURATED PALUSTRINE WOODLAND	
Pond Pine/Fetter-bush tall pocosin	S1
Scrub	
OLIGOTROPHIC SATURATED PALUSTRINE SCRUB	
Fetter-bush--Sheep-laurel low pocosin	S1
Sweet Bay--Red Bay shrub swamp	S2
OLIGOTROPHIC SEMIPERMANENTLY-FLOODED PALUSTRINE SCRUB	
Buttonbush pond	S2
EUTROPHIC SEASONALLY-FLOODED PALUSTRINE SCRUB	
Black Willow/Cattail maritime shrub swamp	S1
Herbaceous	
OLIGOTROPHIC SEMI-PERMANENTLY FLOODED	
Cattail--Spikerush tall freshwater marsh	S4
Spikerush short freshwater marsh	S2
OLIGOTROPHIC SEASONALLY-FLOODED	
Salt-meadow Cordgrass--Tiny-headed Goldenrod swale	S3
ESTUARINE	
Herbaceous	
HERBACEOUS ESTUARINE WETLAND	
Spikerush short oligohaline marsh	S1
Three-square Bulrush--Cattail oligohaline marsh	S3
Salt Reed-grass oligohaline marsh	S5

3) Collection of existing information. The major herbaria (Table 6) in Virginia have been searched by Natural Heritage staff scientists for records of rare plants. Records for the City of Virginia Beach have been mapped and entered in the Natural Heritage databases. This work provided leads on rare plant locations not previously known to the Natural Heritage staff. Major collections of Virginia specimens of amphibians and reptiles, have been canvassed and the records entered into the database. The Virginia Society of Ornithology's Breeding Bird Atlas data have also been reviewed. Invertebrate data have been gleaned from multiple sources including the scientific literature, private collections of local experts, and Dr. R. L Hoffman of the Virginia Museum of Natural History. The identification of many invertebrates requires the close attention of a specialist, and many of the specimens collected during invent ories in Virginia Beach still await identification. However, Dr. Hoffman is currently assisting the Natural Heritage staff in the identification of specimens collected during rare species surveys in Seashore State Park and on several Department of Defense facilities in Virginia Beach. For vertebrates and some invertebrates, the Virginia Department of Game and Inland Fisheries has been queried for their information on rare species that may occur in Virginia Beach.

4) Aerial reconnaissance. Natural Heritage staff conducted three flights as part of this inventory. Two of these concentrated on the North Landing River and Gum Swamp, while the third was focused on Back Bay. These flights provided Natural Heritage staff with good information on the current state of the southern two-thirds of Virginia Beach, where most of the PNAs are located. The most productive of the three flights was conducted from one of the city's police helicopters. The capabilities of the aircraft coupled with the pilot's skill and knowledge of the city gave our staff an excellent view of some of the most significant areas in Virginia Beach.

5) Field Surveys. Although nearly all of the PNAs were field checked during this inventory, field survey efforts by Natural Heritage scientists have focused on the PNAs most likely to harbor natural heritage resources. Zoological inventory has concentrated on birds, mammals, and selected insect groups. From these surveys, natural heritage resources have been documented in 23 of the PNAs. Natural Heritage staff have spent much time along the North Landing River. At least 42 rare species and 19 significant natural communities have been documented in this watershed, which is of national importance. The north and west shores of Back Bay have also been investigated in detail. These wetlands support at least 13 species of rare plants and animals, but common reed now dominates large expanses, reducing the quality of the natural marsh communities. Some specific highlights of the field surveys are noted below:

Table 6. Herbaria searched for records of plants monitored by the Division of Natural Heritage in the City of Virginia Beach.

Institution	Number of Records
College of William and Mary	10
George Mason University	2
Longwood College	29
Lynchburg College	5
National Arboretum	13
Old Dominion University	16
University of Richmond	17
Virginia Commonwealth University	2
VPI & SU	46
US National Herbarium	49

VIRGINIA BEACH NATURAL AREAS INVENTORY

* The City of Virginia Beach supports more rare species than any other Virginia locality east of the Blue Ridge.

* Twenty rare vertebrate species have been documented from Virginia Beach, five of which were reported for the first time during this inventory. Twelve of these 20 species were observed during the inventory and 6 more have been documented within the past 10 years.

* Thirty-nine rare species of invertebrates are known from the City, with 25 of these documented within the decade. Given the relative lack of collections of many invertebrate groups and the extensive, high-quality wetlands in the City, there are undoubtedly many more rare invertebrates waiting to be found.

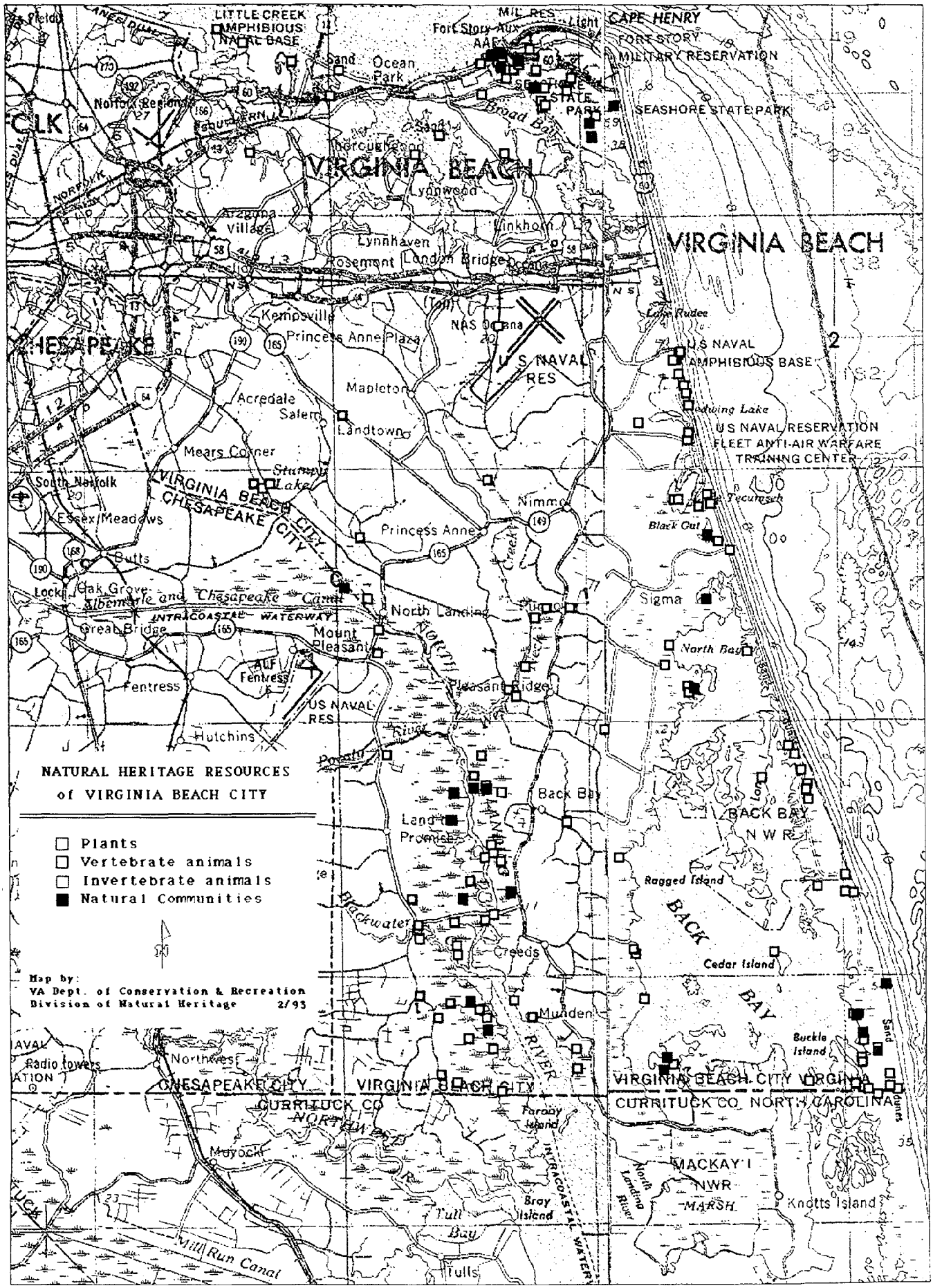
* Eighty-two rare species of vascular plants are known from Virginia Beach, 36 of these were observed during the inventory and 14 more have been observed since 1982. In addition, two rare species of peatmoss were documented during the inventory, but these were incidental collections and there may be many rare non-vascular plants within the City.

* In general, Virginia Beach has extensive herbaceous wetlands (marshes) that are clearly of statewide or national significance. However, it is also clear that dredging and other disturbances such as stormwater runoff have lead to the invasion of common reed, a pernicious weed that is difficult to control. This is particularly true in Back Bay, where observations by VIMS staff suggest that common reed has increased its coverage in Back Bay ten-fold since the late 1970s.

* Two highly significant forested wetland communities are present in Virginia Beach: pocosins and Atlantic white cedar swamps. Both of these are rare in Virginia and are highly threatened throughout their ranges in the United States.

* The Department of Conservation and Recreation currently has some 320 distinct records (element occurrences; Figure 2) of rare species and significant natural communities in its databases for the City of Virginia Beach. Of these, over 120 are extant, with 97 documented for the first time during this inventory. Many of the other records are old, dating from the 1930s or before. While efforts were made to reverify as many of these as possible, most have either general locational information or were collected in what are now urban areas that are unlikely to support these species.

FIGURE 2


NATURAL HERITAGE RESOURCES
of VIRGINIA BEACH CITY
Plants
Vertebrate animals
Invertebrate animals
Natural Communities
Map by:
VA Dept. of Conservation & Recreation
Division of Natural Heritage 2/93
VIRGINIA BEACH
CAPE HENRY
FORT STORY MILITARY RESERVATION
SEASHORE STATE PARK
LITTLE CREEK AMPHIBIOUS NAVAL BASE
Ocean Park
Norfolk Regional
Lynnhaven
Rosemont
London Bridge
Kempsville
Princess Anne Plaza
NAS Oceana
U S NAVAL RES
U S NAVAL AMPHIBIOUS BASE
Mapleton
Acredale
Salem
Landtown
Mears Corner
U S NAVAL RESERVATION FLEET ANTI-AIR WARFARE TRAINING CENTER
South Norfolk
Essex Meadows
VIRGINIA BEACH CITY
CHESAPEAKE CITY
Princess Anne
Nimmo
Butts
Oak Grove
Albemarle and Chesapeake Canal
INTRACOASTAL WATERWAY
North Landing
Sigma
Great Bridge
Mount Pleasant
North Bay
Fentress
Pleasant Ridge
US NAVAL RES
Hutchins
Back Bay
Land of Promise
BACK BAY N W R
Ragged Island
BACK BAY
Creeds
Cedar Island
Munden
Buckle Island
Northwest
CHESAPEAKE CITY
VIRGINIA BEACH CITY
CURRITUCK CO
VIRGINIA BEACH CITY VIRGINIA
CURRITUCK CO NORTH CAROLINA
Moyock
MACKAY I NWR
Knotts Island
Tull Bay
Tulls
Mill Run Canal
Bray Island
Radio towers

6) Collateral studies. In addition to the work being conducted as part of the Virginia Beach Natural Areas Inventory, Natural Heritage staff have undertaken inventories on several large, public lands in Virginia Beach. Among these are the North Landing River Natural Area Preserve, Seashore State Park, False Cape State Park, Dam Neck Naval Station, Oceana Naval Air Station, and Little Creek Naval Amphibious Base. These studies have documented the presence of numerous rare species and significant natural communities.

PROTECTION OF NATURAL AREAS

Of the 34 potential natural areas (PNAs) identified during the inventory, eight were found to be heavily disturbed and three low priority sites were not visited because of access or other problems. The remaining 23 PNAs were found to support natural heritage resources, and therefore meet the definition of a natural area that is contained in the Virginia Natural Area Preserves Act:

> "any area of land [and/or] water ... that retains or has reestablished its natural character ... or which is important in preserving rare or vanishing flora, fauna, native ecological systems, geological, natural historical, scenic or similar features of scientific or educational value...." (§10.1-209 of the Code of Virginia).

Once a natural area has been identified, the first step in protecting the natural heritage resources is to delineate a conservation planning boundary for the site. In developing these boundaries, Natural Heritage staff scientists consider a number of factors. These include, but are not limited to:

* the extent of current and potential habitat for rare plant and animal species;
* the current extent of significant natural communities and the area in which they could be restored;
* species movement and migration corridors;
* exclusion or control of invasive exotic species; and
* land necessary for direct management or monitoring activities.

As the preliminary conservation planning boundaries were developed, several of the PNAs supporting natural heritage resources were merged. Thus, the 23 PNAs found to support natural heritage resources have been consolidated into 18 natural areas (Table 7; Appendix B); which range in size from ca. 50 acres to over 4000 acres. All of these natural areas are located within the major southern watersheds: Back Bay (6 natural areas) and the North landing River (12 natural areas). An additional 14 natural areas have been identified during collateral studies on state and federal lands, 9 in the Back Bay watershed and 5 in the Atlantic Ocean/ Chesapeake Bay watershed.

Figure 3 shows the locations of the 34 natural areas identified in this report. While many of the natural areas are known to support only one or two rare species, others support several. North Pocosin Natural Area alone supports 12 rare species and 4 significant community types. The natural areas also range greatly in their significance (Appendix B, Table 1). The North Landing River Watershed and the Back Bay Watershed are among the top 10% of all natural areas identified statewide by the Division of Natural Heritage.

VIRGINIA BEACH NATURAL AREAS INVENTORY

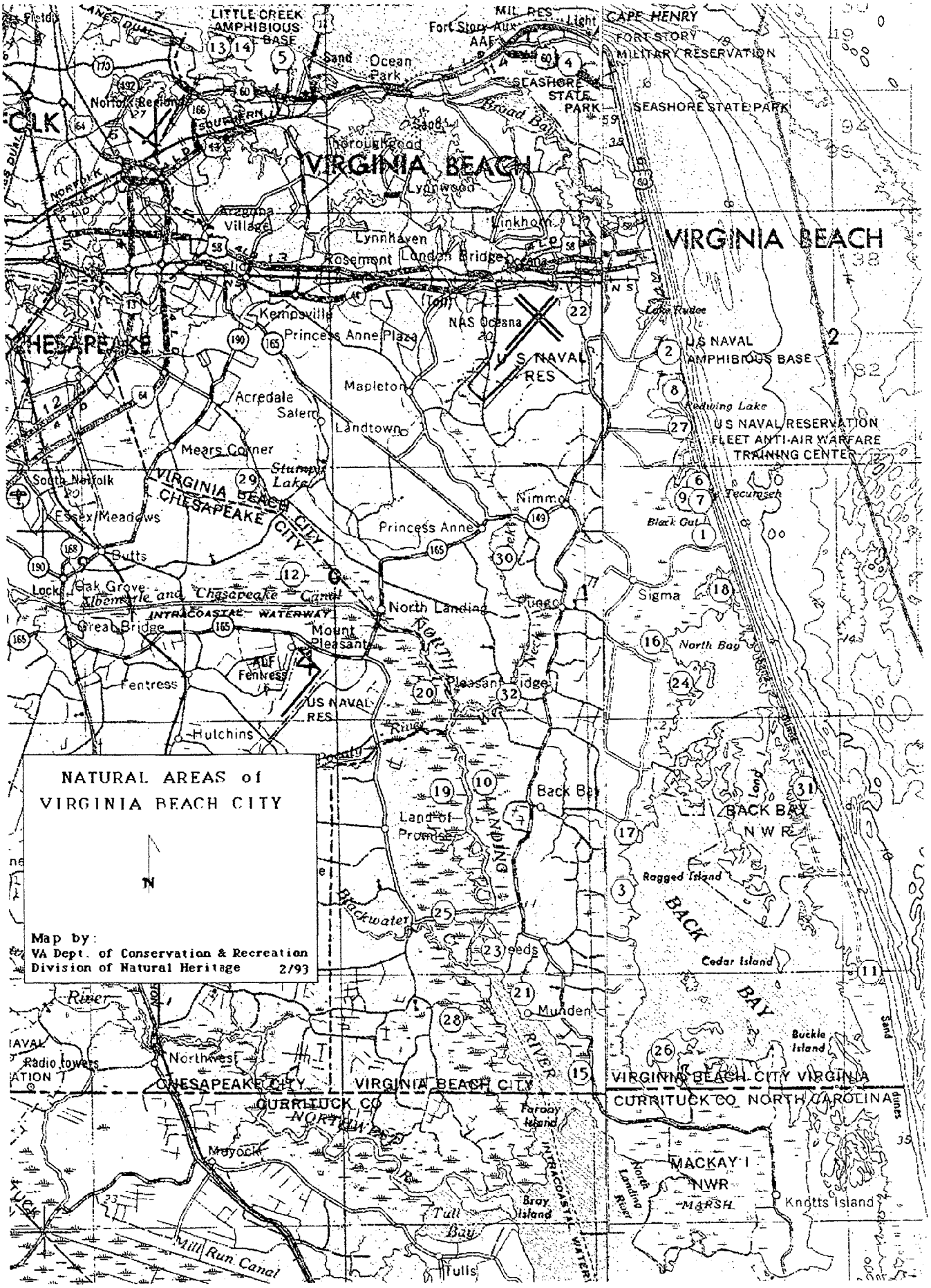
Table 7. Natural areas of Virginia beach City and their biodiversity scores.

Back Bay Watershed	B2
Black Gut Natural Area	B4
Camp Pendleton Dune & Swale Natural Area	B5
Dam Neck Helicopter Pad Wetlands Natural Area	B5
Dam Neck Interdunal Swale Natural Area	B5
Dam Neck Middle Beach Dunes Natural Area	B4
Dam Neck Northern Dune & Swale Natural Area	B5
False Cape Natural Area	B2
Muddy Creek Natural Area	B4
Nawney Creek Natural Area	B4
North Bay Marshes Natural Area	B4
Porpoise Point Natural Area	B5
Sedge Island Natural Area	B5
Southeast Redwing Lake Natural Area	B5
Wash Flats Natural Area	B4
North Landing River Watershed	B2
Eastern Wetlands Natural Area	B3
Gum Swamp Natural Area	B4
Morse Point Natural Area	B5
North Pocaty Natural Area	B5
North Pocosin Natural Area	B3
Oakum Creek Natural Area	B3
Pungo Ferry Pocosin Natural Area	B2
Southern Marshes Natural Area	B3
Stumpy Lake Natural Area	B5
Upper West Neck Creek Natural Area	B5
West Neck Creek Natural Area	B3
Cape Henry Natural Area	B2
Chub Lake Natural Area	B5
Little Creek Channel Natural Area	B5
Little Creek Dunes Natural Area	B5
Oceana Sandpits Natural Area	B5

Figure 3. The location of the 32 natural areas identified during this inventory.

1. Black Gut Natural Area
2. Camp Pendleton Dune & Swale Natural Area
3. Campbell Landing
4. Cape Henry Natural Area
5. Chub Lake Natural Area
6. Dam Neck Middle Beach Dunes Natural Area
7. Dam Neck Interdunal Swale Natural Area
8. Dam Neck Northern Dune & Swale Natural Area
9. Dam Neck Helicopter Pad Wetlands Natural Area
10. Eastern Wetlands Natural Area
11. False Cape Natural Area
12. Gum Swamp Natural Area
13. Little Creek Channel Natural Area
14. Little Creek Dunes Natural Area
15. Morse Point Natural Area
16. Muddy Creek Natural Area
17. Nawney Creek Natural Area
18. North Bay Marshes Natural Area
19. North Pocosin Natural Area
20. North Pocaty Natural Area
21. Oakum Creek Natural Area
22. Oceana Sandpits Natural Area
23. Piney Grove Church Natural Area
24. Porpoise Point Natural Area
25. Pungo Ferry Pocosin Natural Area
26. Sedge Island Natural Area
27. Southeast Redwing Lake Natural Area
28. Southern Marshes Natural Area
29. Stumpy Lake Natural Area
30. Upper West Neck Creek Natural Area
31. Wash Flats Natural Area
32. West Neck Creek Natural Area

FIGURE 3


NATURAL AREAS of
VIRGINIA BEACH CITY
N
Map by:
VA Dept. of Conservation & Recreation
Division of Natural Heritage 2/93
VIRGINIA BEACH
VIRGINIA BEACH
CHESAPEAKE
CHESAPEAKE CITY
VIRGINIA BEACH CITY
CURRITUCK CO
VIRGINIA BEACH CITY VIRGINIA
CURRITUCK CO NORTH CAROLINA
LITTLE CREEK AMPHIBIOUS BASE
CAPE HENRY
FORT STORY MILITARY RESERVATION
SEASHORE STATE PARK
Ocean Park
Norfolk Regional
Lynnwood
Lynnhaven
Rosemont
London Bridge
Kempsville
Princess Anne Plaza
NAS Oceana
U S NAVAL RES
U S NAVAL AMPHIBIOUS BASE
Mapleton
Acredale
Salem
Landtown
Mears Corner
Stumpy Lake
U S NAVAL RESERVATION FLEET ANTI-AIR WARFARE TRAINING CENTER
South Norfolk
Essex Meadows
Butts
Oak Grove
Albemarle and Chesapeake Canal
INTRACOASTAL WATERWAY
Great Bridge
Mount Pleasant
North Landing
Princess Anne
Nimmo
Sigma
North Bay
Fentress
Pleasant Ridge
Hutchins
Back Bay
Land of Promise
BACK BAY N W R
Ragged Island
BACK BAY
Cedar Island
Munden
Buckle Island
Northwest
Radio towers
Mayock
Faraby Island
MACKAY I NWR
Knotts Island
Bray Island
Tull Bay
Mill Run Canal
Tulls

VIRGINIA BEACH NATURAL AREAS INVENTORY

It is important to note that the wetland ecosystems of the North Landing River and Back Bay watersheds are tremendously significant because of the quality of these wetlands, the number of rare species that inhabit them, the diversity of habitats that are present, and the sheer extent of continuous natural habitat. For this reason, the natural areas in these two watersheds are grouped in Appendix B. Protecting this largely continuous, high-quality habitat is essential to maintaining the natural biodiversity of Virginia Beach.

Three of the natural areas in Virginia Beach are of very high significance on a national scale (i.e., they have a Biodiversity rank of B2): False Cape Natural Area, Pungo ferry Pocosin Natural Area, and Cape Henry Natural Area. At least a large portion of each of these is owned by the Commonwealth of Virginia and managed as a state park and/or state natural area. However, each of these natural areas is directly affected by the management of adjacent and nearby lands. Two particular concerns are maintenance of the natural surface- and ground-water regimes and control of invasive exotic species, especially common reed.

In addition to these three natural areas, seven natural areas have a Biodiversity rank of B3 and are thus of high significance on a national scale. Two of these are in the Back Bay watershed (where additional inventory of federal lands might locate additional sites of comparable quality), and five are in the North Landing River watershed. Again, the quality of these sites is directly linked to the quality of others within the larger watersheds.

Some of the natural resources within these natural areas have been afforded protection under federal, state, and local law. Among the relevant laws are the federal Endangered Species Act, Virginia Endangered Species Act, Virginia Endangered Plant and Insect Species Act, Clean Water Act, Chesapeake Bay Preservation Act, and local land use and environmental protection ordinances. The delineation of conservation planning boundaries in this report does not confer any additional regulatory protection on the 18 natural areas. These boundaries are intended to be used to support wise planning and decision-making for the conservation of the 18 natural areas. The Department of Conservation and Recreation encourages the City to take appropriate actions to protect these sites.

As the label "conservation planning" indicates, the boundaries presented here are for planning purposes; they delineate ecologically sensitive areas where land-use practices should be carefully planned to ensure that they are compatible with protection goals for natural heritage resources. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels of government and the private sector. Based on the available information, preliminary conservation planning boundaries have been drafted for the known natural areas of Virginia Beach. Maps showing these boundaries are included in Appendix B.

Natural Area Protection Tools

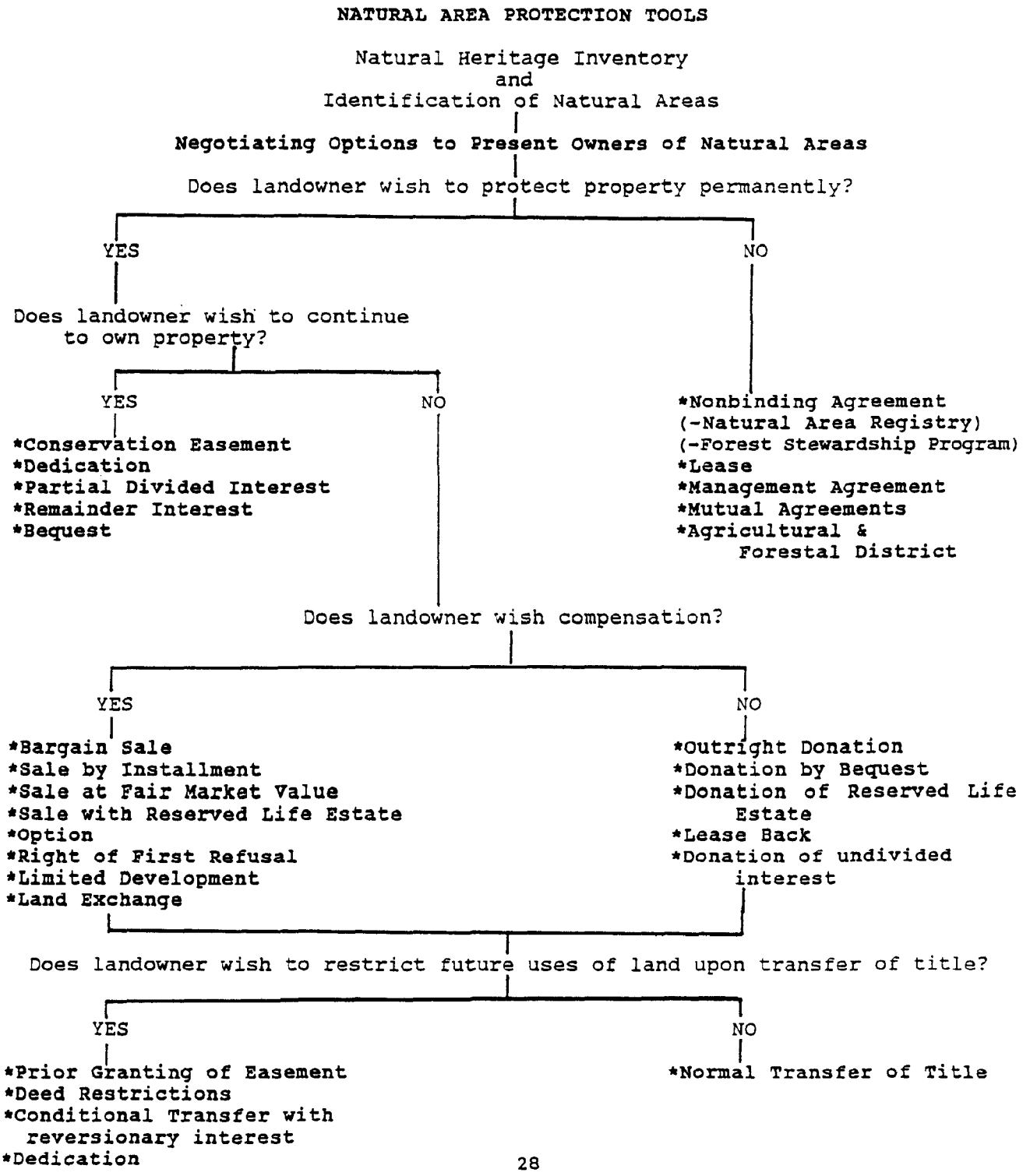
Figure 4 presents some of the options or "tools" available to build a strong program for the preservation of the City's natural ecological diversity. Each tool can be presented separately as a protection option or used collectively as a system of incentives. This system of protection tools is designed to provide an expanded set of options for landowners that addresses the widely varying needs and desires of individual, group, corporate and public landowners. They offer landowners six kinds of incentives: information, recognition, cash, tax savings, property tax relief, and management assistance to protect the natural heritage resources occurring on their land. Several of the approaches do not involve money or interests in real estate but encourage voluntary protection of significant areas.

Since funds for natural area acquisition are limited and the needs are great, it is necessary to develop a large portfolio of protection strategies to use those limited funds most effectively. The City of Virginia Beach should work closely with other public agencies and private land conservation organizations to develop innovative techniques for preserving natural areas at minimal cost, seek new sources and higher levels of funding, and develop new programs or enhance existing programs that will give long-term legal protection to Virginia's natural areas.

Intensive land use in Virginia contributes to the continual destruction of natural communities, endangered species habitat, and other types of natural areas. Siltation and pollution are additional problems resulting from intensive land use. Urban and agricultural best management practices can help protect critical natural areas. Promoting federal and state cost-share programs to assist landowners with these practices will provide added incentives and increased protection. Increasing property taxes and inheritance taxes coupled with increasing land values often force landowners to sell the land and its resources even though they would prefer to keep them intact. For this reason, financial incentives such as tax relief programs can help to prevent landowners from destroying natural areas for economic reasons.

Within the City of Virginia Beach there are numerous public lands that contribute to the protection of local natural habitats and biodiversity. Among those with a specific mission to manage native species or habitats are a Natural Area Preserve, two State Parks, two National Wildlife Refuges, and two Wildlife Management Areas. Of particular note is Back Bay National Wildlife Refuge, which is currently acquiring land on the western shore of Back Bay, an area that includes five of the natural areas identified in this report. The Nature Conservancy and other private organizations also own or manage lands within the city for their natural values. In addition, several city properties and Department of Defense installations also have protected natural lands within their boundaries. The limited access to and uses of these lands may provide limited, short-term protection for the natural

Figure 4. Flowchart for selecting natural area protection tools.



heritage resources that are present on them. However, strategies promoting the long-term protection of these resources are required, and should be actively pursued in the coming years.

The natural heritage resources on many of the privately-owned tracts have also received some level of protection. Some landowners have an obvious concern for the natural qualities of their land, and have voluntarily left areas in their natural state. In addition, many of the natural areas are in or adjacent to wetlands afforded protection under provisions of the City's Southern Watersheds Management Ordinance and Wetlands Zoning Ordinance.

Landowners and localities are often in the best position to protect natural areas within their jurisdiction. In 1992, the Division of Natural Heritage initiated discussions with the City and the Council on the Environment to identify and evaluate local land protection tools. As a result of these discussions, funding for a follow-up project was obtained through the Coastal Zone Management Program (CZMP) of the National Oceanographic and Atmospheric Administration (NOAA). Under the terms of the grant, five tasks will be completed during 1993:

* Design primary and secondary conservation planning boundaries for natural areas identified in this inventory. Primary boundaries include the immediate habitat for the rare species and extent of the significant communities. Secondary boundaries include lands needed for maintaining surface water quality within the site, maintaining the hydrologic integrity of the groundwater, e.g., by protecting recharge zones, land intended to buffer the site against future changes in the use of surrounding lands, and lands necessary for the safe and effective management of the site (e.g. fire breaks, access for educational activities).

* Prepare protection and management plans for each natural area.

* Prepare a digital GIS coverage of the natural area boundaries and site attributes that will be compatible with local and state geographic information systems. These data will be particularly valuable in the City's development review process.

* Develop and assist in the implementation of local tools for protecting natural areas.

* Develop a landowner contact program designed to provide landowners information on significant natural areas and voluntary protection options.

The goal of this project is to work with the City of Virginia Beach to assist in implementing appropriate and effective measures to protect and properly manage natural heritage resources. This project is a logical extension of the work carried out under the Virginia Beach natural areas

inventory. It is also the critical next step in developing comprehensive protection and management strategies for these significant natural areas.

VIRGINIA BEACH NATURAL AREAS INVENTORY

RECOMMENDATIONS FOR THE CITY OF VIRGINIA BEACH

1. **Participate fully in the development of local protection tools.** This inventory has documented the existence of thirty two natural areas in the City. By continuing to work with the Department of Conservation and Recreation and the Council on the Environment in evaluating local protection options, the City will help ensure that it has a solid array of tools for protecting its natural areas that are practical, feasible, and effective. The City can directly assist the Natural Heritage staff by making copies of relevant local ordinances, the comprehensive plan and other documents, and parcel maps accessible. In addition, the Natural Heritage staff will seek the expertise of, and work closely with, city staff and local conservation planning agencies and organizations in developing local protection measures for natural resources.

2. **Properly manage natural areas within the City of Virginia Beach.** The first step in doing this would be to develop management programs for public and private conservation lands. The Department of Conservation and Recreation can assist local agencies in developing management plans. The Department of Conservation and Recreation's Division of Natural Heritage is interested in working with other agencies and organizations to research and develop techniques for maintaining or restoring natural areas to aid in the preservation of rare, threatened or endangered species.

3. **Include the Division of Natural Heritage in the review of projects in or near natural areas.** The natural areas identified in this study are known to support unique or exemplary natural communities and rare species. As proposed developments come before the City, they should be compared with the natural area maps provided in this report (Appendix B). The Natural Heritage staff offers their knowledge and expertise in reviewing project proposals that may affect a natural area. Since the early stages of the planning process typically offer the greatest flexibility, it is important to contact the Natural Heritage staff as soon as the locality is aware of a project that may affect a natural area.

4. **Promote strategies for increasing tourism that utilizes the City's natural areas in a compatible manner.** Raise local awareness of the economic potential that the City of Virginia Beach could derive from attracting birdwatchers, nature photographers, wildflower and wildlife enthusiasts and canoeists. Promote special events and festivals to draw nature tourists to the area. These tourists would utilize local hotels, motels and resturaunts and purchase other local goods and supplies.

5. **Expand public awareness of the need for protecting and managing natural areas.** Given the rapid rate of growth in the City, natural lands are becoming scarce. Increasing the public's knowledge of the few remaining natural areas will build support for natural area protection programs. This could be done through interpretive facilities at parks or natural areas, conferences or meetings to stimulate public involvement, information bulletins, and the like.

6. **Increase cooperation among pertinent organizations.** Among the many groups and individuals that could be involved are those that own, manage, or have the authority to acquire natural areas. One goal could be to develop stronger ties among federal, state, local and private interests involved in the protection or management of natural lands.

REFERENCES

Buhlmann, K. A., J. C. Ludwig, and C. A Pague. 1992. A Natural Heritage Resources Inventory and Biological Assessment of the Fleet Combat Training Center, Department of the Navy, Virginia Beach, Virginia. Natural Heritage Technical Report #92-2. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, VA. 6 March 1992. 60 pp.

Calver, J.L. and C.R.B. Hobbs, Jr. 1963. Geologic Map of Virginia. Department of Conservation and Economic Development, Division of Mineral Resources (now Department of Mines, Minerals, and Energy). Charlottesville, VA.

Clampitt, C. A., C. A Pague, J. C. Ludwig, M. L. Lipford. C. A. Caljouw, and K. A. Buhlmann. 1990. An Inventory of the Natural Communities, and Rare, Threatened & Endangered Species of Seashore State Park and Natural Area, Virginia Beach, VA. Natural Heritage Technical Report #90-2. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, VA. 1 July 1990. 97 pp. + appendices.

Code of the City of Virginia Beach, Virginia. Appendix A. City Zoning Ordinance, Appendix D. Stormwater Management Ordinance, Appendix F. Chesapeake Bay Preservation Area Ordinance, Appendix G. Southern Watersheds Management Ordinance.

Code of Virginia. Virginia Natural Area Preserves Act, sections 10.1-209 et seq.

Conservation and Recreation. 1990a. An Inventory of the Rare, Threatened & Endangered Species of the Little Creek Naval Amphibious Base, Virginia Beach, VA. Natural Heritage Technical Report #90-3. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, VA. 1 September 1990. 70 pp.

Conservation and Recreation. 1990b. An Inventory of the Rare, Threatened & Endangered Species of the Naval Air Station Oceana, Virginia Beach, VA. Natural Heritage Technical Report #90-6. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, VA. 1 September 1990. 63 pp.

Conservation and Recreation. 1990c. An Inventory of the Rare, Threatened & Endangered Species of Camp Pendleton, Virginia Beach, VA. Natural Heritage Technical Report #90-7. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, VA. 1 September 1990. 75 pp.

Frost, C.C. 1989. History and status of remnant pocosin, canebrake and white cedar wetlands in Virginia. Unpublished report to the Virginia Natural Heritage Program, Richmond. 130 pp.

Hoose, P. M. 1981. Building an Ark: Tools for the preservation of natural diversity through land protection. Island Press, Covelo, CA.

McDonald, J. N. and T. Skware, editors. Virginia's Endangered Species: Proceedings of a Symposium / Coordinated by Karen Terwilliger. The McDonald and Woodward Publishing Co., Blacksburg, VA.

Rawinski, T. J. 1990. A classification of Virginia's indigenous biotic communities: Phase 1. Upper levels of the hierarchy. Unpubl. Report. Virginia Department of Conservation & Recreation, Division of Natural Heritage, Richmond, VA. 11 pp.

Rawinski, T. J. 1992. A classification of Virginia's indigenous biotic communities: Vegetated Terrestrial, Palustrine and Estuarine Community Classes. Natural Heritage Technical Report #92-21. Virginia Department of Conservation & Recreation, Richmond, VA. 25 pp.

Rawinski, T. J. and G. P. Fleming. 1992. An Inventory and protection plan for southeast Virginia's critical natural areas, exemplary wetlands, and endangered species habitats. Natural Heritage Technical Report #92-28. Virginia Department of Conservation & Recreation, Richmond, VA. 197 pp.

Soil Conservation Service. 1985. Soil Survey of City of Virginia Beach, Virginia. USDA.

ACKNOWLEDGEMENTS

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This inventory could not have been completed without the assistance of many people. Over the course of the project, every member of the Natural Heritage staff contributed to its completion. Others who were instrumental in initiating this inventory include Clay Bernick, Michael Lipford, Laura McKay, Christopher Pague, and Collin Powers. For providing access to their collections and other assistance in the initial stages we thank Ted Bradley (George Mason University), John Haydn (University of Richmond), Alton Harvill and David Breil (Longwood College), Richard Hoffman (Virginia Museum of Natural History), Miles Johnson (Virginia Commonwealth University), Peter Mazzeo (National Arboretum), Gwynn Ramsey (Lynchburg College), Rusty Russell (US National Herbarium), Donna Ware (College of William and Mary), and Tom Wieboldt (VPI & SU). We appreciate access to the North Landing River and Back Bay provided by the City of Virginia Beach, US Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, and Virginia Department of Transportation. Access was also provided by many private landowners.

For their efforts in the field and their knowledge of the local landscape and biota we thank Ruth Beck, Kurt Buhlmann, Richard Hoffman, David Knepper, Barry Knisley, Tony Leger, Joseph Mitchell, Christopher Pague, Alan Plochner, Alan Savitsky, Doug Stannard, Tim Vogt, Joan Wright, and David Young.

Finally, we thank Clay Bernick, Environmental Planner for the City of Virginia Beach, Mary Morris, other members of the planning staff, and the various elected officials who made this effort possible.

APPENDIX A.

Potential Natural Areas
of Virginia Beach City

VIRGINIA BEACH NATURAL AREAS INVENTORY

PNA Num	PNA Name	USGS Quadrangle
1	Pleasant Ridge South	PLEASANT RIDGE
2	Milldam Creek Wetlands	CREEDS
3	Stumpy Lake	KEMPSVILLE
4	Pocahontas WMA	KNOTTS ISLAND
5	Campbell Landing	KNOTTS ISLAND
6	Moose Island Point	NORTH BAY
7	Bridge Cove	NORTH BAY
8	Sandbridge South	NORTH BAY
9	Pungo Forest	PLEASANT RIDGE
10	North Bay North	NORTH BAY
11	Muddy Creek	NORTH BAY
12	Black Gut	VIRGINIA BEACH, NORTH BAY
13	Lake Tecumseh	VIRGINIA BEACH
14	Nawney Creek	PLEASANT RIDGE, NORTH BAY
15	Pellitory Point	KNOTTS ISLAND
16	Seneca Marsh	CREEDS
17	Trojan WMA South	KNOTTS ISLAND, CREEDS
18	Oakum Creek & Uplands	CREEDS
19	Golf Course Woods	VIRGINIA BEACH
20	Jones Swamp	VIRGINIA BEACH
21	Horn Point Pond	NORTH BAY
22	Upper Blackwater Creek	CREEDS
23	Middle Marsh	PLEASANT RIDGE, CREEDS
24	North Pocosin	PLEASANT RIDGE
25	North Landing East	PLEASANT RIDGE
26	West Neck Creek	PLEASANT RIDGE
27	West Landing	PLEASANT RIDGE
28	Seaboard Road	PRINCESS ANNE
29	Mundens Corner	PRINCESS ANNE
30	South Gum Swamp	PLEASANT RIDGE
31	Lynnhaven Inlet	CAPE HENRY
32	Lake Lawson South	LITTLE CREEK
33	Gallops Corner	PRINCESS ANNE, KEMPSVILLE
34	Elbow Road Elbow	KEMPSVILLE

APPENDIX B:

Natural Areas Identified During the Inventory

VIRGINIA BEACH NATURAL AREAS INVENTORY

The natural areas identified during this natural areas inventory (Table 1) are described in the following pages on standard natural area reports. The sections of these reports, and their content, are outlined below.

SIZE: The approximate acreage included within the conservation planning boundary for the natural area.

BIODIVERSITY RANK: The overall (global) significance of the natural area in terms of the rarity of the natural heritage resources and the quality (health, abundance, etc.) of their occurrences. As discussed on page 6 of the report, these ranks range from B1 (Outstanding significance) to B5 (General Biodiversity Significance).

LOCALITY: The cities and counties in which each natural area is located.

QUADRANGLE and **QUADRANGLE CODE:** The name and Natural Heritage code for the USGS 7.5' quadrangle(s) on which each natural area occurs. For example, 3607651 is the Creeds quadrangle.

LOCATION: A brief description of where the natural area is located and, for large natural areas, what its approximate boundaries are.

NATURAL HERITAGE RESOURCE SUMMARY TABLE: A list of the rare species and significant natural communities that have been documented from the natural area. In addition to the information contained in Tables 4 and 5 of the report, these tables list the element occurrence rank (page 4). Many rare species and some natural communities are sensitive to disturbance or may be sought out by collectors. For this reason, Virginia law provides a limited exemption to the requirements of the Freedom of Information Act for natural heritage resources and the names of the species and their precise locations are not included in this report. Requests for additional information on these natural areas should be addressed to:

Department of Conservation and Recreation
Division of Natural Heritage
Main Street Station
1500 East Main Street, Suite 312
Richmond, VA 23219
(804) 786-7951

SITE DESCRIPTION: A brief narrative picture of the topography, hydrology, vegetation, and current use of the natural area. Scientific names for all species not mentioned in Tables 4 or 5 are included in Appendix C.

BOUNDARY JUSTIFICATION: A summary of the most important factors considered in delineating the conservation planning boundary for the natural area. In general, the conservation planning boundary includes all known occurrences of natural heritage resources and the adjacent lands required for their immediate survival. A discussion of the major factors that were considered can be found on page 23.

THREATS: A summary of the most prominent threats that are believed to be facing the natural area given current data. Additional threats that were not obvious in the field to DCR-DNH staff may also be present.

CURRENT STATUS: A summary of the ownership (private or public) and degree of protection currently afforded the natural area, as determined to date.

PROTECTION RECOMMENDATIONS: Actions that should be considered or attempted to ensure that the land within the conservation planning boundary is available for the natural heritage resources.

MANAGEMENT RECOMMENDATIONS: Actions that should be considered or attempted to ensure that the habitat within the conservation planning boundary is suitable for the natural heritage resources.

VIRGINIA BEACH NATURAL AREAS INVENTORY

Table 1. Natural Areas identified during the Virginia Beach natural areas inventory and the page on which the site report begins.

Back Bay Watershed . . . . . B 4
- Black Gut Natural Area . . . . . B 5
- Camp Pendleton Dune & Swale Natural Area . . . . . B 8
- Campbell Landing . . . . . B 9
- Dam Neck Helicopter Pad Wetlands Natural Area . . . . B 12
- Dam Neck Interdunal Swale Natural Area . . . . . B 13
- Dam Neck Middle Beach Dunes Natural Area . . . . . B 14
- Dam Neck Norther Dune & Swale Natural Area . . . . . B 15
- False Cape Natural Area . . . . . B 16
- Muddy Creek Natural Area . . . . . B 17
- Nawney Creek Natural Area . . . . . B 20
- North Bay Marshes Natural Area . . . . . B 23
- Porpoise Point Natural Area . . . . . B 26
- Sedge Island Natural Area . . . . . B 29
- Southeast Redwing Lake Natural Area . . . . . B 30
- Wash Flats Natural Area . . . . . B 31

North Landing River Watershed . . . . . B 32
- Eastern Wetlands Natural Area . . . . . B 33
- Gum Swamp Natural Area . . . . . B 36
- Morse Point Natural Area . . . . . B 39
- North Pocaty Natural Area . . . . . B 41
- North Pocosin Natural Area . . . . . B 44
- Oakum Creek Natural Area . . . . . B 47
- Piney Grove Church Natural Area . . . . . B 49
- Pungo Ferry Pocosin Natural Area . . . . . B 52
- Southern Marshes Natural Area . . . . . B 55
- Stumpy Lake Natural Area . . . . . B 58
- Upper West Neck Creek Natural Area . . . . . B 61
- West Neck Creek Natural Area . . . . . B 63

Cape Henry Natural Area . . . . . B 66
Chub Lake Natural Area . . . . . B 67
Little Creek Channel Natural Area . . . . . B 68
Little Creek Dunes Natural Area . . . . . B 69
Oceana Sandpits Natural Area . . . . . B 70

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B2

LOCATION: For the purpose of this report, the Back Bay Watershed includes only the Virginia portion of the Back Bay watershed. The boundaries of this watershed are approximated by the Atlantic Ocean on the east, the North Carolina state line on the south, Princess Anne Road on the west and Birdneck Road on the north.

SITE DESCRIPTION: The Back Bay Watershed includes Back Bay, several smaller waterbodies (e.g. Redwing Lake), and extensive agricultural fields. Back Bay is a large body of open, brackish water lined by marshes, shrubby wetlands, and swamps. While a large portion of the marshes is dominated by common reed, an aggressive, invasive, exotic grass that grows to be more than 10' tall, other areas are in their natural state and support a diverse mosaic of vegetation types. Redwing Lake, Brinsons Inlet Lake (Lake Tecumseh), Black Gut and other, smaller water bodies are similar to Back Bay, but tend to have fresher water. For the most part, the uplands are in agricultural fields.

CURRENT STATUS: This watershed is currently in a mix of both public and private ownership. Large public tracts include Back Bay National Wildlife Refuge (which is currently acquiring more land), MacKay Island National Wildlife Refuge, False Cape State Park, Trojan Wildlife Management Area, and Pocahontas Wildlife Management Area.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- BLACK GUT NATURAL AREA

SIZE: ca. 660 acres **BIODIVERSITY RANK:** B4

LOCALITY: City of Virginia Beach

QUADRANGLE: Virginia Beach **QUADRANGLE CODE:** 3607578
North Bay 3607568

LOCATION: This site is located roughly 1 mile NW of the town of Sandbridge on the north side of Sandbridge Road.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
CATTAIL--SPIKERUSH TALL FRESHWATER MARSH	OLIGOTROPHIC SEMI-PERMANENTLY FLOODED HERBACEOUS WETLAND		S2			AB
SPIKERUSH SHORT FRESHWATER MARSH	OLIGOTROPHIC SEMI-PERMANENTLY FLOODED MARSH		S2			B
* PLANTS						
CAROLINA FIMBRISTYLIS	FIMBRISTYLIS CAROLINIANA	G4	S1			H
LONG BEACH SEEDBOX	LUDWIGIA BREVIPES	G4G5	S2S3			AB
VIVIPAROUS SPIKERUSH	ELEOCHARIS VIVIPARA	G5	S1			H
* VERTEBRATES						
KING RAIL	RALLUS ELEGANS	G4Q	S2			B
LEAST BITTERN	IXOBRYCHUS EXILIS	G5	S2			U
* INVERTEBRATES						
A DAMSELFLY	ENALLAGMA DURUM	G5	S2			C
SAFFRON SKIPPER	POANES AARONI AARONI	G4T4	S3			U
STRIPE-WINGED BASKETTAIL	EPITHECA COSTALIS	G4	S1			C

SITE DESCRIPTION: Black Gut is a small freshwater pond behind the dunes at Sandbridge. It is connected to Back Bay by two ditches and to Brinsons Inlet Lake (Lake Tecumseh) by a third ditch, which appears to be mostly overgrown. These ditches allow water (and aquatic organisms) to move between Black Gut and Back Bay when wind tides change the water level in Back Bay. The open water in Black Gut supports submerged and floating vegetation, including American lotus. Surrounding the open water are marshes supporting a high diversity of freshwater plants. Farther away from the water's edge are swamps dominated by young red maples, black gum, bald cypress and loblolly pine.

BOUNDARY JUSTIFICATION: The conservation planning boundary for this site encompasses Black Gut proper and the surrounding marshes and wooded

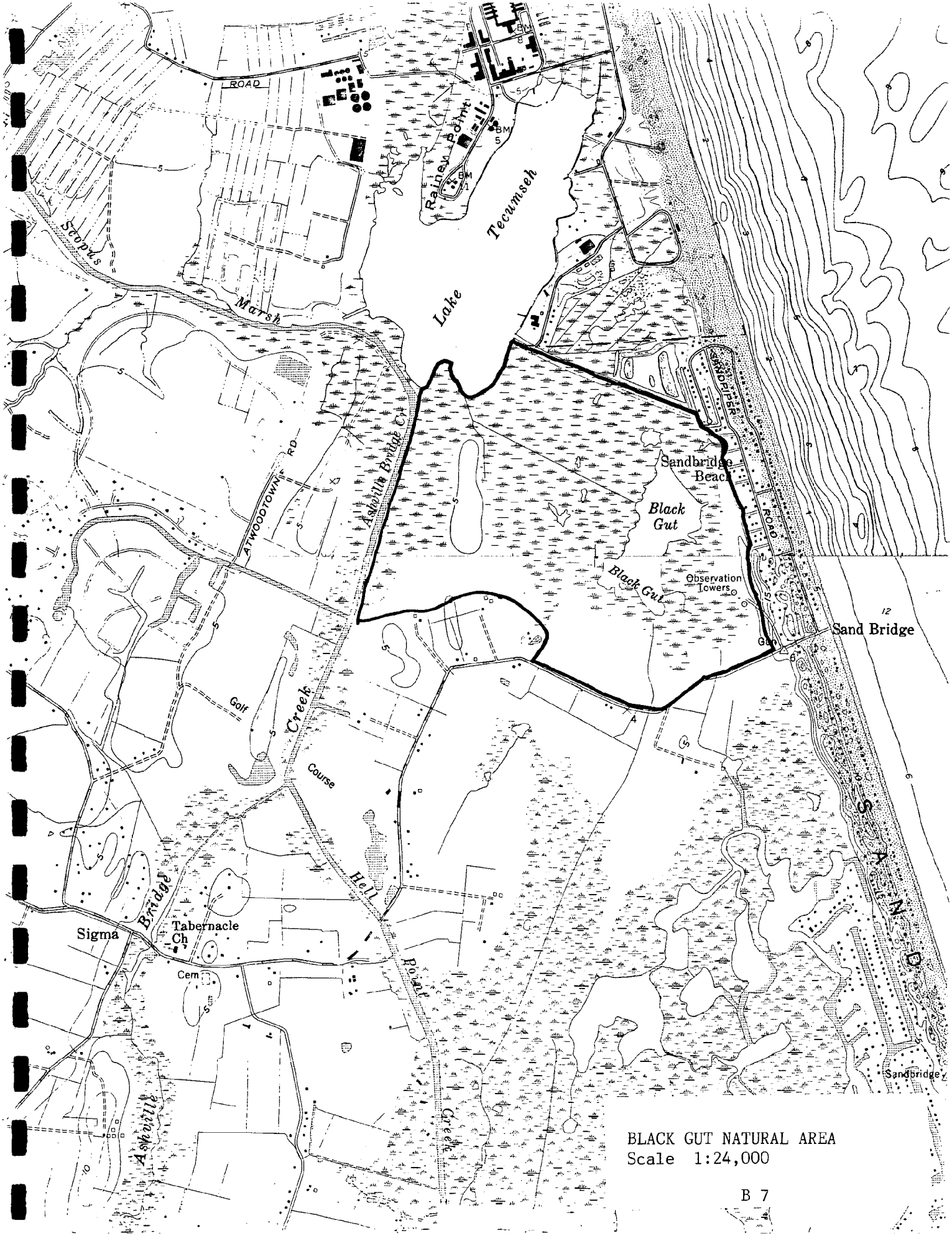
wetlands that help maintain the hydrologic integrity of Black Gut. These include the lands north of Sandbridge Road east of Scopus Marsh Creek, south of Dam Neck Naval Reservation and west of Sandbridge.

THREATS: Black Gut is threatened by the invasion of exotic species (e.g., common reed, carp) that disrupt or displace native species, by degradation of the water by nutrient-rich runoff from adjacent developments or faulty septic systems, and by conversion of the freshwater system to a brackish water system by ditches.

CURRENT STATUS: The site lies within the approved boundary of Back Bay National Wildlife Refuge, which has recently acquired land within the natural area. The remaining land is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the private landowners about the significance of the site and work with them to obtain voluntary protection. Determine the amount of upland buffer that is needed to protect the wetlands on this site. Acquisition and proper management by the Refuge could help protect the significant resources of this natural area.

MANAGEMENT RECOMMENDATIONS: Maintain water quality and evaluate effects of existing ditches on salinity and nutrient content of the water. Control exotic species that are adversely affecting the rare species.



BLACK GUT NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- CAMP PENDLETON DUNE AND SWALE NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: This site lies on the Atlantic coast southeast of Lake Christine on Camp Pendleton.

SITE DESCRIPTION: This site contains significant remnants of interdunal swale and dune communities from the beach and open foredunes to the maritime forest in the back dunes. These habitats are increasingly rare and also support ten rare plant species and at least one rare animal.

CURRENT STATUS: This site is contained within Camp Pendleton. A report on the rare, threatened and endangered species of Camp Pendleton was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- CAMPBELL LANDING NATURAL AREA

SIZE: ca. 770 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Knotts Island **QUADRANGLE CODE:** 3607558
North Bay 3607568

LOCATION: Campbell Landing Natural Area lies on the western shore of Back Bay. It is bounded on the north by Mill Landing Road and on the south by the main boat canal of Trojan Wildlife Management Area.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	AB
LONG BEACH SEEDBOX	LUDWIGIA BREVIPES	G4G5	S2S3			H
SEASIDE HELIOTROPE	HELIOTROPIUM CURASSAVICUM	G5	S1			H
* VERTEBRATES						
DISMAL SWAMP BOG LEMMING	SYNAPTOMYS COOPERI HELALETES	G5T3	S3			U

SITE DESCRIPTION: This site includes a band of herbaceous wetlands (marshes) along the west shore of Back Bay. Within the marshes are low spots of open water or short sedges on soupy muck. These marshes are crossed in places by ditches or canals, which have served as a point of invasion for common reed. Elsewhere the native vegetation is reasonably intact and the marshes are dominated by cattails, three-square bulrush black needlerush, or big cordgrass with a variety of subordinant species.

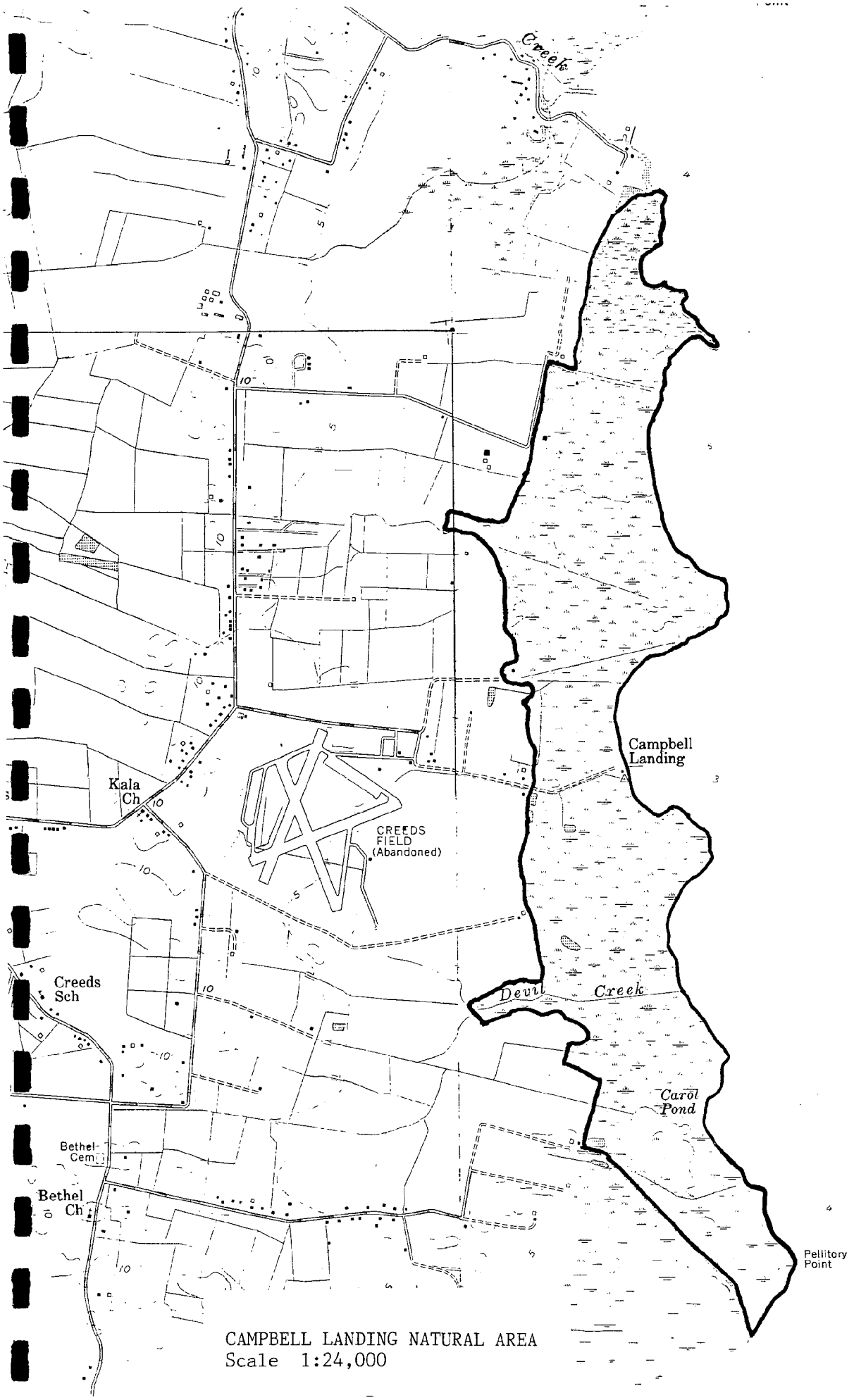
BOUNDARY JUSTIFICATION: The conservation planning boundary includes the wetland habitat of the rare species known from this site.

THREATS: The presence of common reed, an aggressive invasive exotic species, is the most serious threat to this site. The construction of additional canals or ditches, which alters the hydrology and nutrient regime, is another threat.

CURRENT STATUS: The southern part of the site is within Trojan Wildlife Management Area and the rest of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the landowners about the significance of their lands and work with them to voluntarily protect them.

MANAGEMENT RECOMMENDATIONS: Control common reed and unnatural input of nutrients and sediments.



CAMPBELL LANDING NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- DAM NECK HELICOPTER PAD WETLANDS NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: East of Brinsons Inlet Lake (Lake Tecumseh) on Fleet Combat Training Center Dam Neck.

SITE DESCRIPTION: This site encompasses a small wetland that is inhabited by a rare amphibian and an uncommon plant.

CURRENT STATUS: This site is entirely within Fleet Combat Training Center Dam Neck. A report on the rare, threatened and endangered species of Dam Neck was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- DAM NECK INTERDUNAL SWALE NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: At the south end of Fleet Combat Training Center Dam Neck, on the Atlantic coast.

SITE DESCRIPTION: This site includes significant interdunal swales that support large populations of three rare plants, a rare mammal and a rare bird. Several uncommon plant species also occur here.

CURRENT STATUS: This site is entirely within Fleet Combat Training Center Dam Neck. A report on the rare, threatened and endangered species of Dam Neck was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- DAM NECK MIDDLE BEACH DUNES NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B4

LOCATION: On the Atlantic coast, northeast of Brinsons Inlet Lake (Lake Tecumseh) on Fleet Combat Training Center Dam Neck.

SITE DESCRIPTION: This site contains a relatively natural coastal dune habitat, which has become rare in southeastern Virginia. It supports a rare small mammal and a globally rare invertebrate.

CURRENT STATUS: This site is entirely within Fleet Combat Training Center Dam Neck. A report on the rare, threatened and endangered species of Dam Neck was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- DAM NECK NORTHERN DUNE & SWALE NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: On the Atlantic Coast east of Redwing Lake on Fleet Combat Training Center Dam Neck.

SITE DESCRIPTION: This site includes a small interdunal swale as well as the most significant maritime forest on Dam Neck. This areas supports five plant species that are rare in Virginia as well as two that are uncommon.

CURRENT STATUS: This site is entirely within Fleet Combat Training Center Dam Neck. A report on the rare, threatened and endangered species of Dam Neck was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- FALSE CAPE NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B2

LOCATION: The site includes all of False Cape State Park, which is located north of the North Carolina state line and south of Back Bay National Wildlife Refuge.

SITE DESCRIPTION: False Cape is an ecological treasure, and represents one of the most significant undisturbed barrier beach systems along the Atlantic coast. The vegetation forms complex patterns of interdigitating zones, including an unvegetated sandy beach, a primary dune dominated by sea oats, a maritime grassland, dune-and-swale topography with alternating uplands and wetlands, and large, active dunes. Seasonally-inundated pools, known as interdunal swales, contain a very rich assemblage of plant life. Dune scrub thickets with live oak, wax myrtle, and bayberry are common between the high dunes and low swales. A large and somewhat interrupted maritime forest dominated by loblolly pine and live oak is interspersed with dune thicket vegetation. The maritime forest is one of the region's finest. Swamp forests with diverse woody vegetation grade into the marshes of Back Bay. The marsh vegetation indicates somewhat brackish conditions. The large number of rare plant species recorded from the Park indicates the site's significance; very few areas of similar size in Virginia can boast such a richness of rare plants (29 species). Furthermore, most of the rare plant populations at False Cape are thriving. Several rare animals also occur here, including Virginia's only known breeding site for the loggerhead sea turtle, one of four sites in the world for the Pungo mouse, and the only known Virginia population of eastern glass lizards.

CURRENT STATUS: False Cape State Park is managed by the Virginia Department of Conservation and Recreation's Division of State Parks for nature study and low-impact recreation. A small number of buildings including a contact station, park staff dwellings, and an environmental education center are located within the park. The northern portion of the site has been somewhat disturbed to enhance waterfowl habitat. The remainder of the site is remarkably pristine, except for a few sand roads, trails, and a powerline right-of-way.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- MUDDY CREEK NATURAL AREA

SIZE: ca. 400 acres **BIODIVERSITY RANK:** B4

LOCALITY: City of Virginia Beach

QUADRANGLE: North Bay **QUADRANGLE CODE:** 3607568

LOCATION: Muddy Creek Natural Area is located along the western shore of Back Bay roughly 2.5 miles southeast of Pungo.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	BC
CROW-POISON	NOTHOSCORDUM BIVALVE	G4	S2			H

SITE DESCRIPTION: Muddy Creek Natural Area encompasses two small tributaries of Back Bay: Muddy Creek and Ashville Bridge Creek. Near their mouths, the creeks are lined by marshes dominated by cattails, three-square bulrush and black needlerush. The upstream sections are lined by bald cypress and red maple, most of which are young replacements for larger trees that were logged earlier this century. Scattered creek-front homes and boat landings disturb the otherwise remote feel of the creeks, but do not appear to be significantly degrading these blackwater creeks.

BOUNDARY JUSTIFICATION: The conservation planning boundary for this site includes the least disturbed wetlands along Muddy Creek and Ashville Bridge Creek, which are bounded by Sandbridge Road on the north, New Bridge Road on the west, North Muddy Creek Road on the south, and Back Bay on the east.

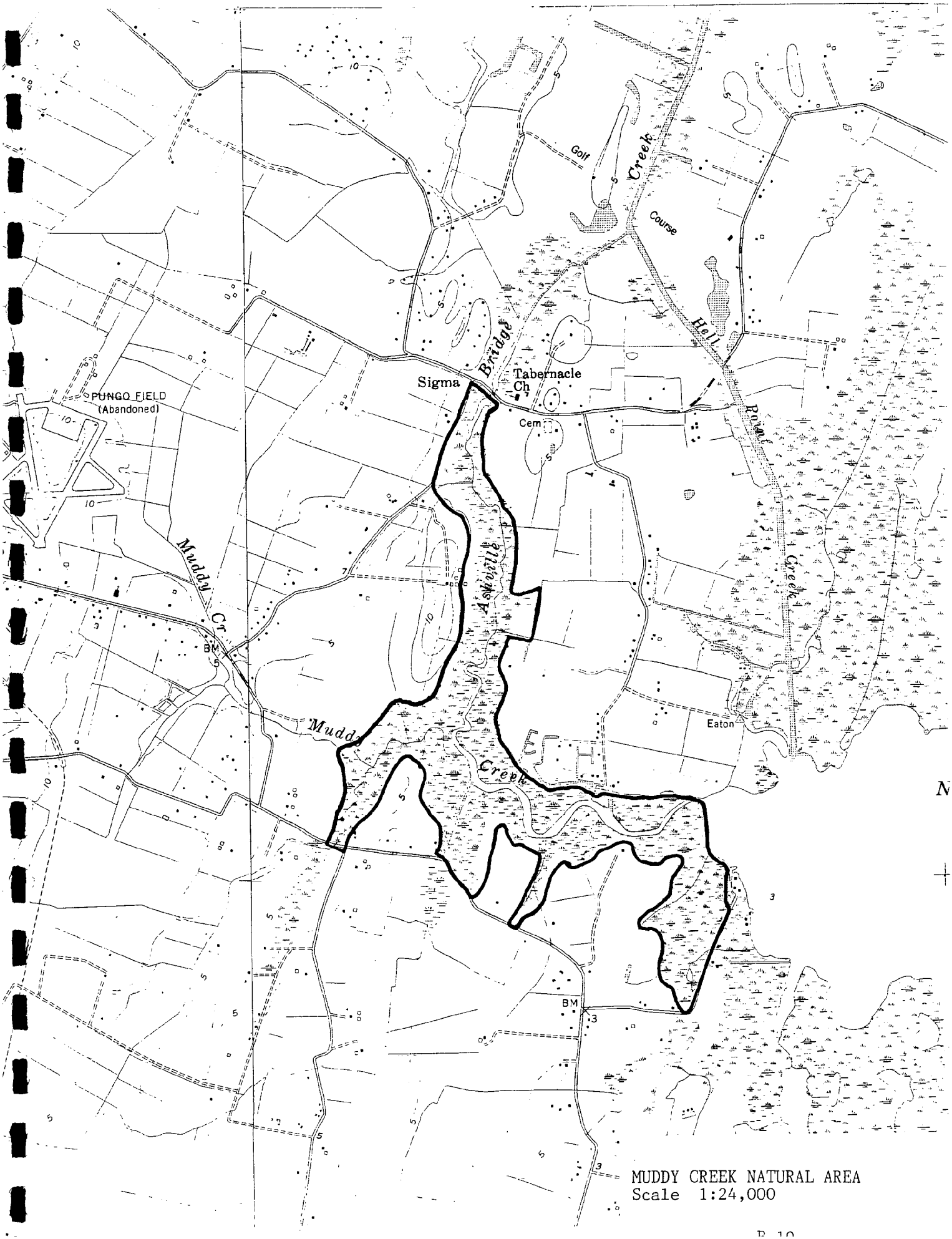
THREATS: The major threats to this site are increasing development of the adjacent uplands, clearing of the wetland forests, and the expansion of common reed.

CURRENT STATUS: The site is largely within the approved boundary of Back Bay National Wildlife Refuge, but the majority of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the private landowners about the significance of their lands and work with them to voluntarily protect them. Determine the extent of upland buffer that is required to protect

the significant wetland habitat. Acquisition and proper management by the Refuge could help protect the significant resources of this natural area.

MANAGEMENT RECOMMENDATIONS: Control invasive exotic species that are damaging the significant natural resources of the site. Identify the minimum upland buffer necessary to maintain the wetlands and work with adjacent landowners to maintain appropriate vegetation within the buffers.



MUDDY CREEK NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- NAWNEY CREEK NATURAL AREA

SIZE: ca. 610 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: North Bay **QUADRANGLE CODE:** 3607568
Pleasant Ridge 3607661

LOCATION: Nawney Creek Natural Area lies in the center of the western shore of Back Bay. It is bounded on the north by Hill Landing and on the south by Mill Landing Road.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	AB

SITE DESCRIPTION: This site includes Nawney (or Nanney) Creek, a small tributary to Back Bay. Portions of the creek have been dredged, while others remain in the natural channel. Most of the creek is lined by a broad band of cattail marshes with patches dominated by three-square bulrush or common reed. Similar marshes occur north of the mouth on the west shore of Back Bay. The upper reaches of the creek flow through swamps of bald cypress and red maple. Runoff from pig farms on the uplands appears to be increasing the nutrient and sediment loads of what probably once was a blackwater creek.

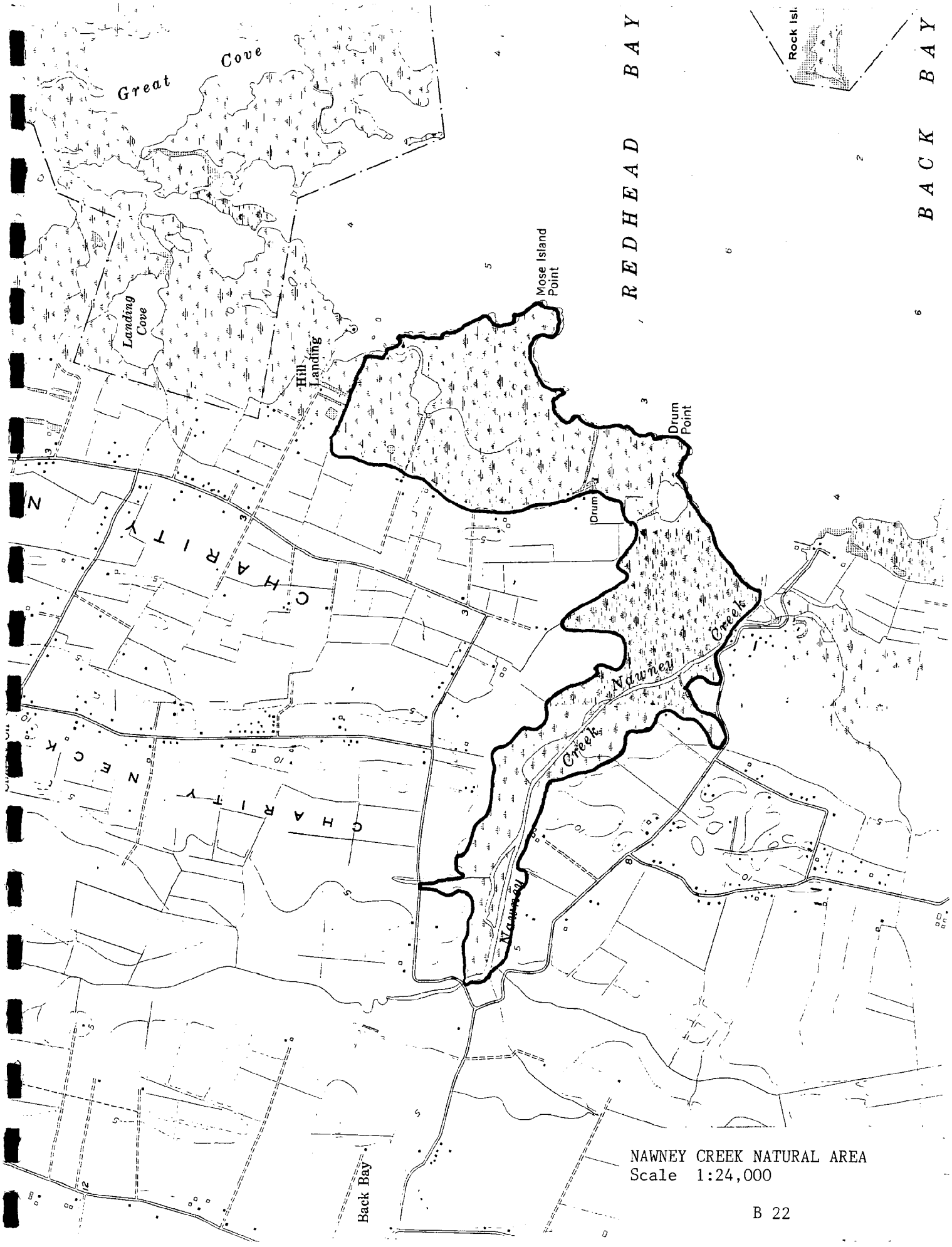
BOUNDARY JUSTIFICATION: The conservation planning boundary includes the significant wetland habitat of the rare plant that inhabits this site.

THREATS: Water pollution and the spread of common reed, an aggressive invasive exotic species, are the most notable threats to this site.

CURRENT STATUS: The majority of the site is within the approved boundary of Back Bay National Wildlife Refuge. While several tracts have been acquired recently by the Refuge, the rest of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the private landowners about the significance of their lands and work with them to voluntarily protect them. Determine the extent of upland buffer that is required to protect the significant wetland habitat. Acquisition and proper management by the Refuge could help protect the significant resources of this natural area.

MANAGEMENT RECOMMENDATIONS: Control common reed and unnatural input of nutrients and sediments.



NAWNEY CREEK NATURAL AREA
Scale 1:24,000

B 22

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- NORTH BAY MARSHES NATURAL AREA

SIZE: ca. 1360 acres **BIODIVERSITY RANK:** B4

LOCALITY: City of Virginia Beach

QUADRANGLE: North Bay **QUADRANGLE CODE:** 3607568

LOCATION: The North Bay Marshes Natural Area is located at the north end of Back Bay, roughly 2 miles southwest of Sandbridge.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			B
* PLANTS						
WINGED SEEDBOX	LUDWIGIA ALATA	G3G4	S1			BC

SITE DESCRIPTION: This site lies at the north end of Back Bay and includes a series of open-water channels and ponds surrounded by marshes. Extensive areas of the marshes are dominated by black needlerush or common reed. Elsewhere are patches variously composed of three-square bulrush, big cordgrass, saltmarsh cordgrass, cattails and other grass-like plants. Some of the channels have been dredged to allow boats to enter the ponds. The resulting dredge spoil has been placed alongside the channels, allowing woody plants such as wax myrtle, loblolly pine, and red bay to take hold. Dredging appears to have allowed common reed to get established within the marshes, and this aggressive exotic has displaced many acres of native species.

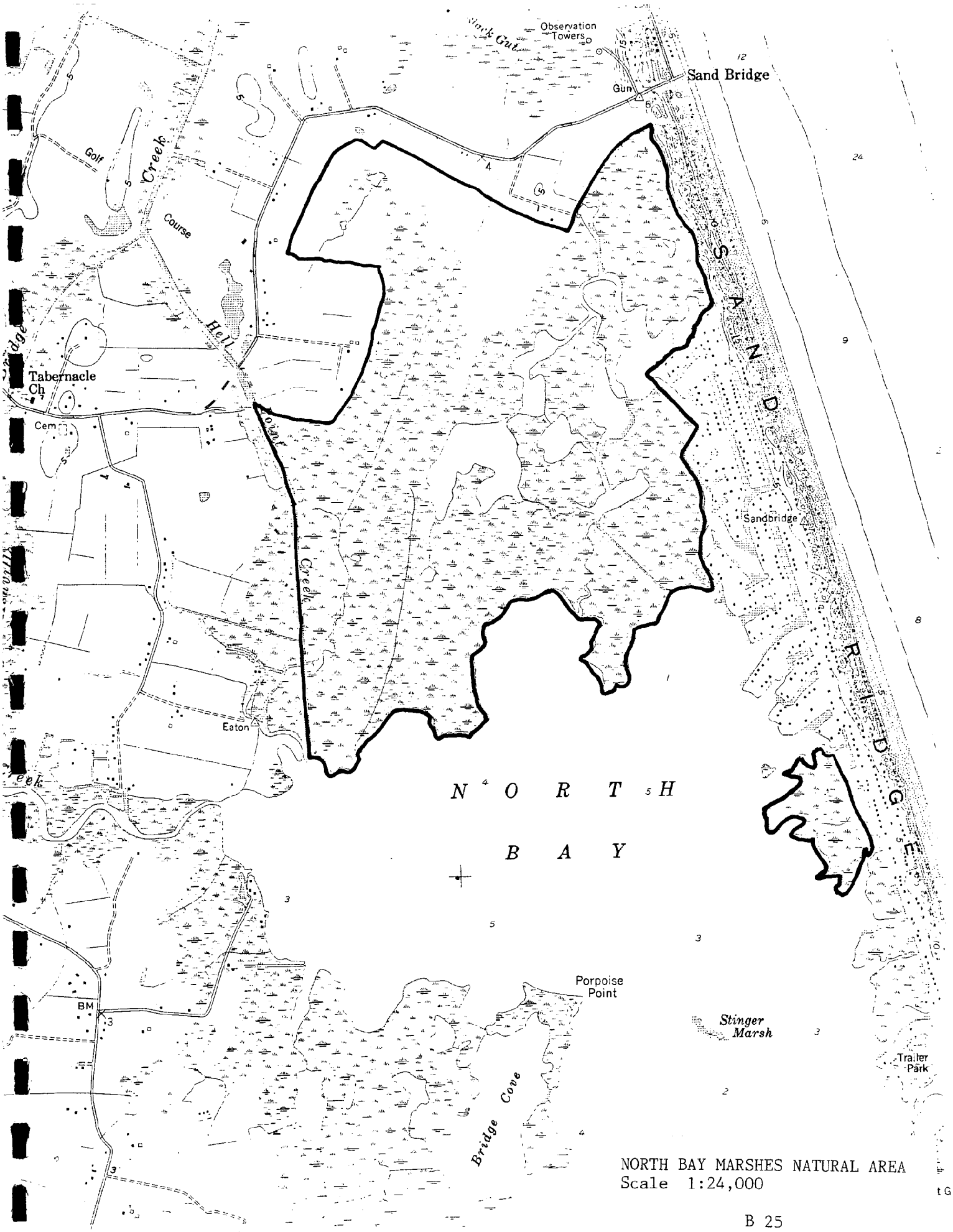
BOUNDARY JUSTIFICATION: The conservation planning boundary for this site includes the marsh habitat of the rare plant that is known from the site. The site is bounded on the north by Sandbridge Road, on the west by Colchester Road, on the south by Back Bay, and on the east by Sandbridge.

THREATS: The major threat to the rare species inhabiting this site is the expansion of common reed. Also threatening the site is development along the upland edges, which often increases nutrient and sediment loads.

CURRENT STATUS: The site is entirely within the approved boundary of Back Bay National Wildlife Refuge, which has recently acquired several small parcels within the natural area. The majority of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the private landowners about the significance of their lands and work with them to voluntarily protect them. Acquisition and proper management by the Refuge could help protect the significant resources of this natural area.

MANAGEMENT RECOMMENDATIONS: Work to control or eradicate common reed. Seek ways to maintain or improve water quality.



NORTH BAY MARSHES NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- PORPOISE POINT NATURAL AREA

SIZE: ca. 780 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Virginia Beach

QUADRANGLE: North Bay **QUADRANGLE CODE:** 3607568

LOCATION: Porpoise Point Natural Area is located on the northwest shore of Back Bay between Ashville Bridge Creek and Beggar's Bridge Creek. It is roughly five miles southeast of Pungo.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			C
* PLANTS						
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			BC
WINGED SEEDBOX	LUDWIGIA ALATA	G3G4	S1			BC
* VERTEBRATES						
KING RAIL	RALLUS ELEGANS	G4Q	S2			U

SITE DESCRIPTION: This site lies at the northwest end of Back Bay and includes a series of open-water channels and ponds surrounded by marshes. Extensive areas of the marshes are dominated by black needlerush or common reed. Elsewhere are patches variously composed of big cordgrass, saltmarsh cordgrass, cattails and other grass-like plants. Some of the channels have been dredged to allow boats to enter the ponds. This appears to have allowed common reed to get established within the marshes, and this aggressive exotic has displaced many acres of native species. The site includes upland pine forests, some of which have been logged in recent years. Nestled within the forest is a small freshwater pond.

BOUNDARY JUSTIFICATION: The conservation planning boundary for this site includes the marsh habitat of the rare species that are known from the site. The site is bounded on the north by Back Bay and Horn Point Road, on the west by Muddy Creek Road, on the south by Back Bay and Beggar's Bridge Creek, and on the east by Back Bay.

THREATS: The major threat to the rare species inhabiting this site is the expansion of common reed.

CURRENT STATUS: The site is in private ownership, but lies entirely within the approved boundaries of Back Bay National Wildlife Refuge.

PROTECTION RECOMMENDATIONS: Educate the landowners about the significance of their lands and work with them to voluntarily protect them. Determine the amount of upland buffer needed to protect the significant wetlands. Acquisition of the marshes by the Refuge could help ensure that these wetlands are protected and managed so that the rare species continue to inhabit them.

MANAGEMENT RECOMMENDATIONS: Work to control or eradicate common reed.

PORPOISE POINT NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- SOUTHEAST REDWING LAKE WETLANDS NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: Southeast of Redwing Lake on Fleet Combat Training Center Dam Neck.

SITE DESCRIPTION: This site encompasses two small freshwater marshes that support a rare amphibian.

CURRENT STATUS: This site is entirely within Fleet Combat Training Center Dam Neck. A report on the rare, threatened and endangered species of Dam Neck was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

BACK BAY WATERSHED -- WASH FLATS NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B4

LOCATION: Wash Flats Natural Area lies on the Atlantic coast between False Cape State Park and Sandbridge.

SITE DESCRIPTION: This site consists of coastal dunes and interdunal swales, which have historically supported many rare plant and animal species. Recent surveys have failed to relocate some of these species, possibly because much of this area has been converted to managed impoundments.

CURRENT STATUS: Most of this natural area is within Back Bay National Wildlife Refuge.

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B2
City of Chesapeake

LOCATION: This large site covers much of the southwestern quarter of the City of Virginia Beach, plus portions of Chesapeake City.

SITE DESCRIPTION: The North Landing River Watershed encompasses extensive forested, scrub and herbaceous wetlands that line the North Landing River, its two major tributaries (West Neck Creek and the Intracoastal Waterway) and several small tributaries. The uplands are predominantly agricultural or rural residential, but there are scattered woodlots, campgrounds and other natural or semi-natural areas. Many rare species are known to inhabit this ecosystem, which is one of the most diverse and extensive in southeastern Virginia.

CURRENT STATUS: The land in this area is primarily in private ownership, including roughly 4000 acres in private conservation lands. Smaller areas are owned by the Commonwealth of Virginia and the localities.

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- EASTERN WETLANDS NATURAL AREA

SIZE: ca. 2,040 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Pleasant Ridge **QUADRANGLE CODE:** 3607661
Creeds 3607651

LOCATION: The Eastern Wetlands Natural Area is located along the eastern shore of the North Landing River south of West Neck Creek and north of the Pungo Ferry causeway.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
ATLANTIC WHITE CEDAR SWAMP	OLIGOTROPHIC SATURATED FOREST		S1			C
ATLANTIC WHITE CEDAR SWAMP	OLIGOTROPHIC SATURATED FOREST		S1			D
BIG CORDGRASS OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S5			AB
SWEET BAY--RED BAY SHRUB SWAMP	OLIGOTROPHIC SATURATED SCRUB		S2			A
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			A
* PLANTS						
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			D
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			AB
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			U
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			B
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	AB
SAWGRASS	CLADIUM MARISCUS SSP JAMAICENSE	G5T5	S1			A
SILKY CAMELLIA	STEWARTIA MALACHODENDRON	G4	S2			A
SLENDER-LEAVED DRAGON-HEAD	PHYSOSTEGIA LEPTOPHYLLA	G4G5	S2	C2		A
WINGED SEEDBOX	LUDWIGIA ALATA	G3G4	S1			B
* VERTEBRATES						
LEAST BITTERN	IXOBRYCHUS EXILIS	G5	S2			CD
* INVERTEBRATES						
GREAT PURPLE HAIRSTREAK	ATLIDES HALESUS	G5	S3			C

SITE DESCRIPTION: This site encompasses extensive forested wetlands and low uplands, with small pocket marshes along the North Landing River. The forested wetlands include one relatively large stand of Atlantic white cedar and several smaller ones. The Atlantic white cedar swamps are particularly significant because they represent a regionally rare vegetation type much reduced from its former extent. They are surrounded by a larger hardwood swamp dominated by swamp tupelo, red maple, bald cypress, and loblolly pine with patches of shrub-dominated wetlands.

Within the swamp are slightly raised sandy islands dominated by American beech, sweetgum, loblolly pine, white oak and red maple. These islands provide habitat for silky camellia and may also be inhabited by canebrake rattlesnakes. Several rare plants and a rare bird inhabit the marshes.

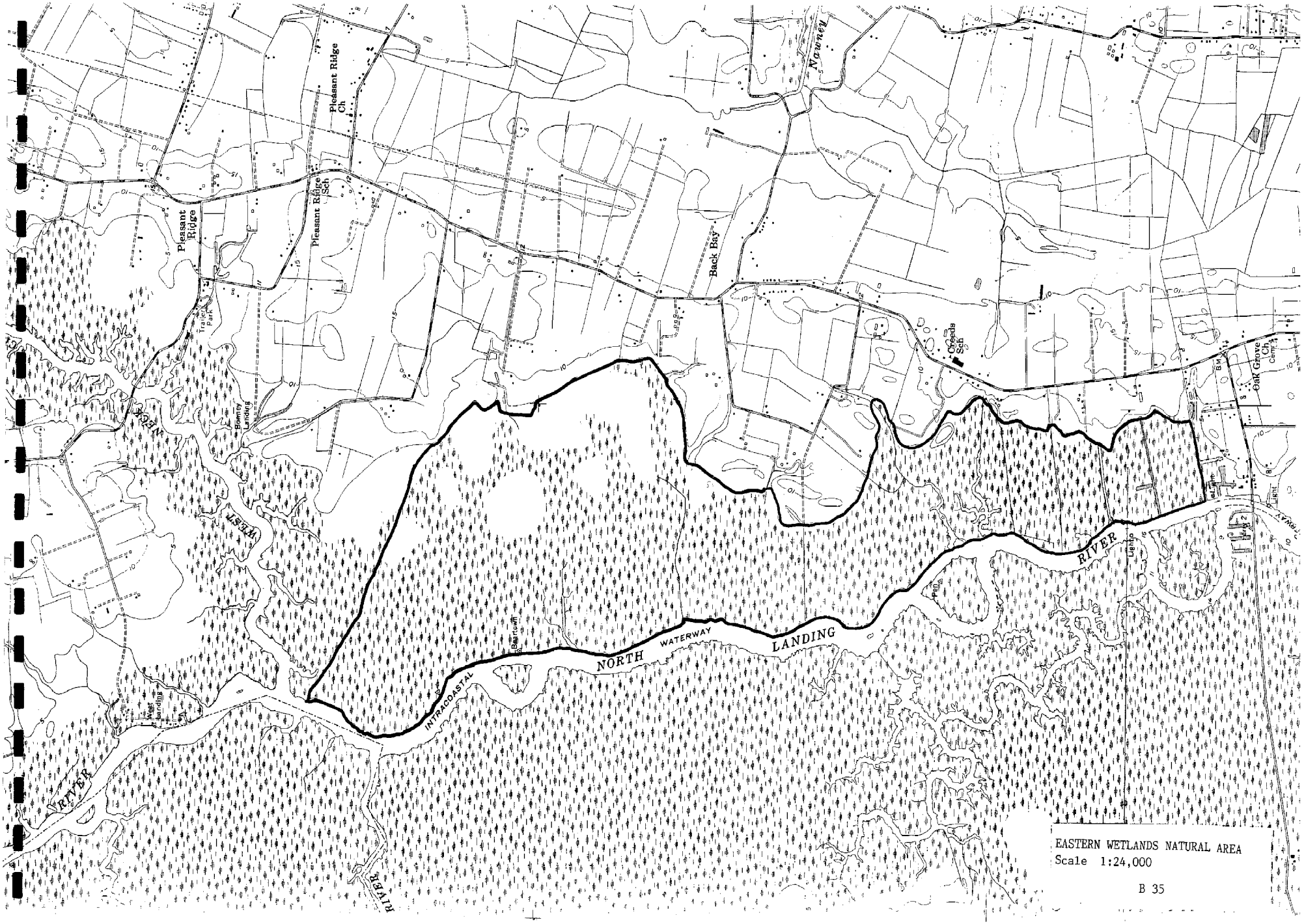
BOUNDARY JUSTIFICATION: The conservation planning boundary for this site encompasses the forested wetlands and the included or adjacent forested uplands that harbor the rare species. It is bounded on the north by West Neck Creek natural area, to which it is ecologically connected.

THREATS: The major threat to this site is logging, which can destroy rare organisms and their habitat both directly and through removal of the canopy and alteration of the wetland hydrology.

CURRENT STATUS: The site is in private ownership.

PROTECTION RECOMMENDATIONS: Educate the landowners about the significance of the resources on their land and work towards voluntary or permanent protection of the site. Determine how much upland buffer is required for the protection and management of the significant wetland communities and rare species. Along with several others, this site is integral to the protection of the North Landing River ecosystem.

MANAGEMENT RECOMMENDATIONS: The marshes and Atlantic white cedar swamp communities require periodic fire for their long-term maintenance. Develop and implement a prescribed burning management plan. Monitor rare species populations.



EASTERN WETLANDS NATURAL AREA
Scale 1:24,000

B 35

VIRGINIA BEACH NATURAL AREAS INVENTORY

SEDGE ISLAND NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: Sedge Island natural area is located in the southwestern corner of Back Bay.

SITE DESCRIPTION: This site is an irregularly-shaped marsh island, dominated by waist-high grasses. The edge of the island is lined by switchgrass and big cordgrass. In the interior are shallow ponds and marshes covered by low-growing sedges. Three rare plants and a rare bird inhabit these high-quality marshes. Similar wetlands appear to occur on the adjacent MacKay Island National Wildlife Refuge. Future inventories of this refuge are likely to reveal additional natural heritage resources.

CURRENT STATUS: Sedge Island is a part of Trojan-Pocahontas Wildlife Management Area, owned by the Virginia Department of Game and Inland Fisheries.

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED - GUM SWAMP NATURAL AREA

SIZE: ca. 4,150 acres **BIODIVERSITY RANK:** B4

LOCALITY: City of Chesapeake and City of Virginia Beach

QUADRANGLE:	Pleasant Ridge	**QUADRANGLE CODE:**	3607661
	Fentress		3607662
	Princess Anne		3607671
	Kempsville		3607672

LOCATION: The Gum Swamp Natural Area covers a large area along the North Landing River, north of the Intracoastal Waterway and south of Elbow Road.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
WATER TUPELO--BALD CYPRESS/CAROLINA ASH SWAMP	EUTROPHIC SEMIPERMANENTLY FLOODED FOREST		S4			B
* PLANTS						
SPANISH MOSS	TILLANDSIA USNEOIDES	G5	S2			BC
VIRGINIA LEAST TRILLIUM	TRILLIUM PUSILLUM VAR VIRGINIANUM	G3T2	S2	C2		BC
* VERTEBRATES						
DISMAL SWAMP BOG LEMMING	SYNAPTOMYS COOPERI HELALETES	G5T3	S3			U
DISMAL SWAMP SOUTHEASTERN SHREW	SOREX LONGIROSTRIS FISHERI	G5T2Q	S2	LT	LT	C
GREAT BLUE HERON	ARDEA HERODIAS	G5	S3			U
GREAT EGRET	CASMERODIUS ALBUS	G5	S2			U
* INVERTEBRATES						
SAFFRON SKIPPER	POANES AARONI AARONI	G4T4	S3			U
SCARCE SWAMP SKIPPER	EUPHYES DUKESI	G3G4	S2		C	U
SOOTY AZURE	CELASTRINA EBENINA	G4	S3S4			U

SITE DESCRIPTION: The site contains an extensive swamp above Indian River Road. The swamp is dominated by bald cypress, water tupelo, swamp tupelo and red maple. Nesting colonies of great blue herons and great egrets occur here. The canal dug for the Intracoastal Waterway is a prominent disturbance of this wetland.

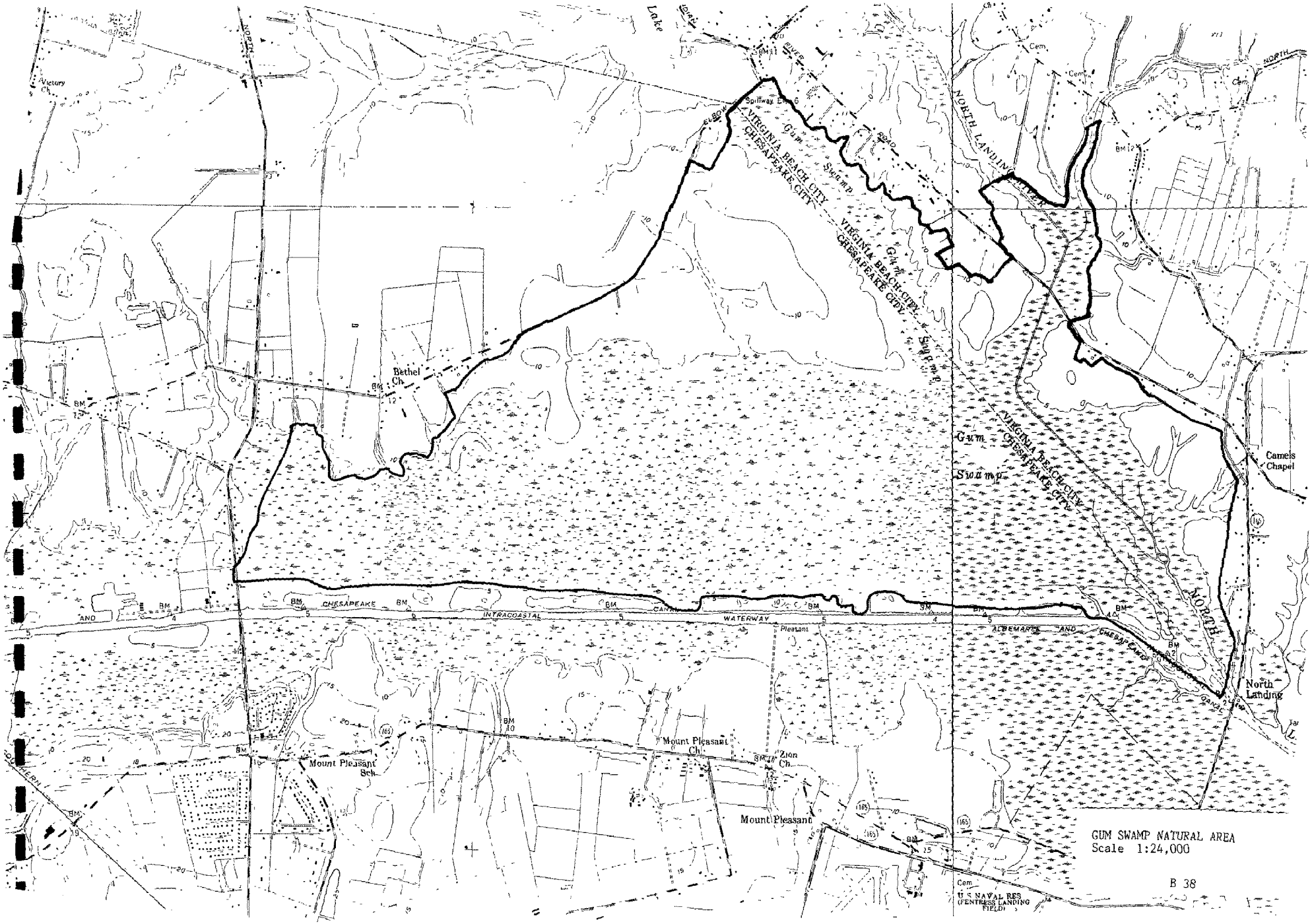
BOUNDARY JUSTIFICATION: The conservation planning boundary includes the natural heritage resources. Given the large amount of land involved and the limited on-the-ground field survey conducted, the boundaries for this site will need future refinements.

THREATS: The Southeastern Expressway is proposed to cross the North Landing River in or near this site. Construction of this highway or ditches and other hydrologic disruptions or increasing development of surrounding upland habitat could substantially alter this site. In particular, the nesting colonies of herons and egrets would most certainly suffer from increased human disturbance.

CURRENT STATUS: The Nature Conservancy owns more than 1000 acres of this site. The rest of the site is in private ownership.

PROTECTION RECOMMENDATIONS: The site, and adjacent upland buffer, is part of the significant North Landing River wetland ecosystem and should receive strong protection.

MANAGEMENT RECOMMENDATIONS: The forested portions of this site should remain in their natural state. Such conditions would benefit most rare species currently known from the area.



GUM SWAMP NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- MORSE POINT NATURAL AREA

SIZE: ca. 140 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Virginia Beach

QUADRANGLE: Creeds **QUADRANGLE CODE:** 3607651

LOCATION: Morse Point Natural Area lies on the eastern shore of the North Landing River just north of the North Carolina state line.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	CD
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			AB
SAWGRASS	CLADIUM MARISCUS SSP JAMAICENSE	G5T5	S1			A

SITE DESCRIPTION: Morse Point is a small marsh along the North Landing River. It is dominated by black needlerush, with forested wetlands towards the uplands. Scattered bald cypress and wax myrtle line the river. The marsh has been reduced by dredging and filling to create a campground and boat ramp.

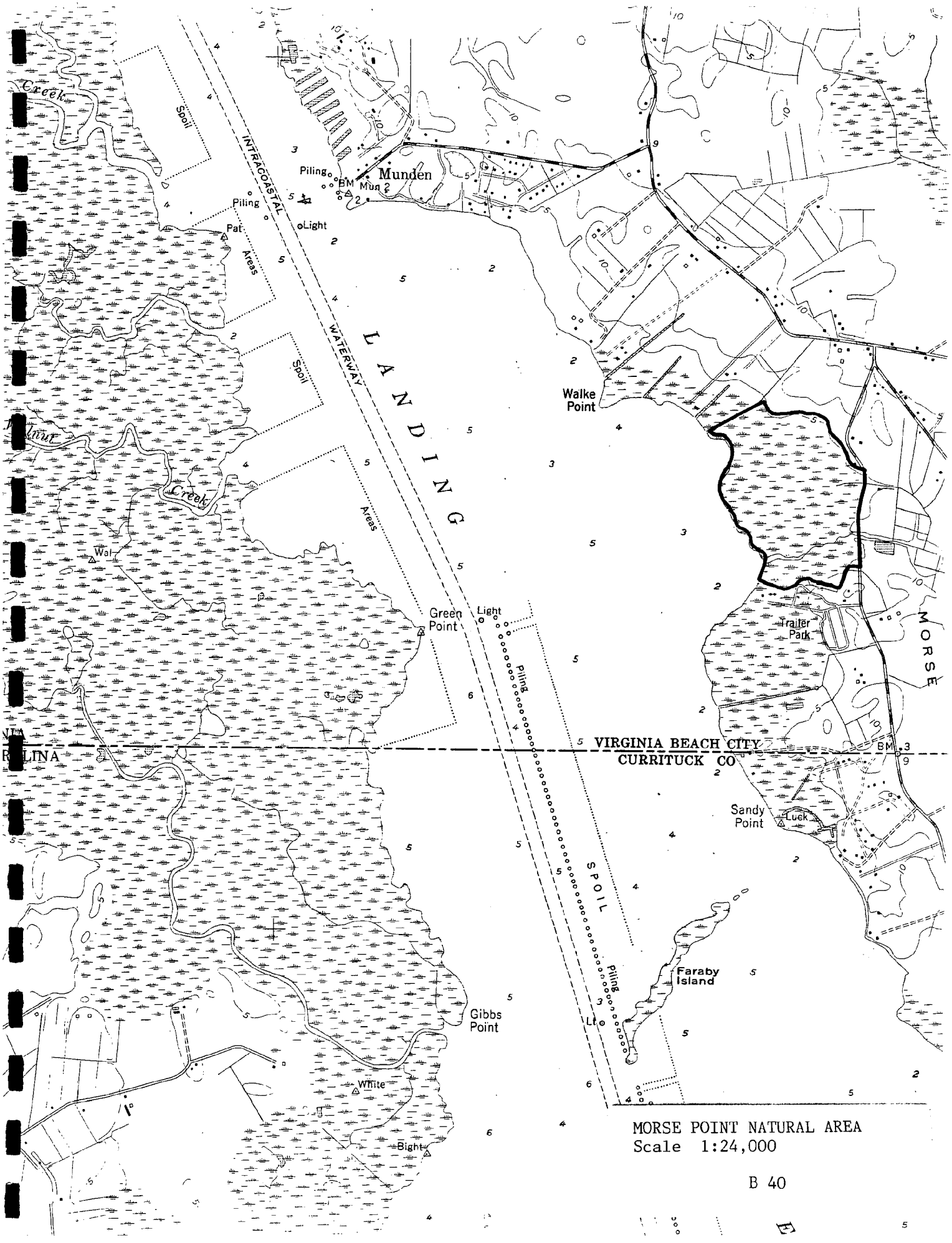
BOUNDARY JUSTIFICATION: The conservation planning boundary presented here includes the wetlands surrounding the known rare plant populations.

THREATS: Continued dredging could eliminate the rare plants from this small marsh. Wakes from large boats may be degrading the shoreline habitat for the rare plants at this site.

CURRENT STATUS: This site is in private ownership.

PROTECTION RECOMMENDATIONS: Notify landowners of the presence of rare species and work with them to protect their habitat.

MANAGEMENT RECOMMENDATIONS: Work to prevent the spread of common reed into this site and monitor the effects of boat wakes on the rare plants.



MORSE POINT NATURAL AREA
Scale 1:24,000

B 40

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- NORTH POCATY NATURAL AREA

SIZE: ca. 3,290 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Chesapeake
City of Virginia Beach

QUADRANGLE: Pleasant Ridge **QUADRANGLE CODE:** 3607661

LOCATION: The site encompasses a large forested wetland situated north of the Pocaty River. While the majority of the site lies south and west of the North Landing River in Chesapeake City, the northern boundary includes several hundred acres on the north shore of the river, in Virginia Beach. The western boundary coincides with the wetland bordering Route 165 and extends southward along the edge of the upland vegetation.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			AB
SLENDER-LEAVED DRAGON-HEAD	PHYSOSTEGIA LEPTOPHYLLA	G4G5	S2	C2		A
* VERTEBRATES						
GREAT BLUE HERON	ARDEA HERODIAS	G5	S3			U
GREAT EGRET	CASMERODIUS ALBUS	G5	S2			U

SITE DESCRIPTION: This site is an extensive, unfragmented deciduous swamp forest with small marshes along the North Landing and Pocaty Rivers. Field work at this site was largely restricted to the marshes bordering creek channels, where the rare plants occur. Much of the thickly vegetated swamp interior remains unexplored, but several reconnaissance flights over the area showed the vegetation to be in excellent condition.

BOUNDARY JUSTIFICATION: The conservation planning boundary includes the extensive forested wetlands and the rare plant habitat. Along with several other sites this site is integral to the protection of the North Landing River ecosystem.

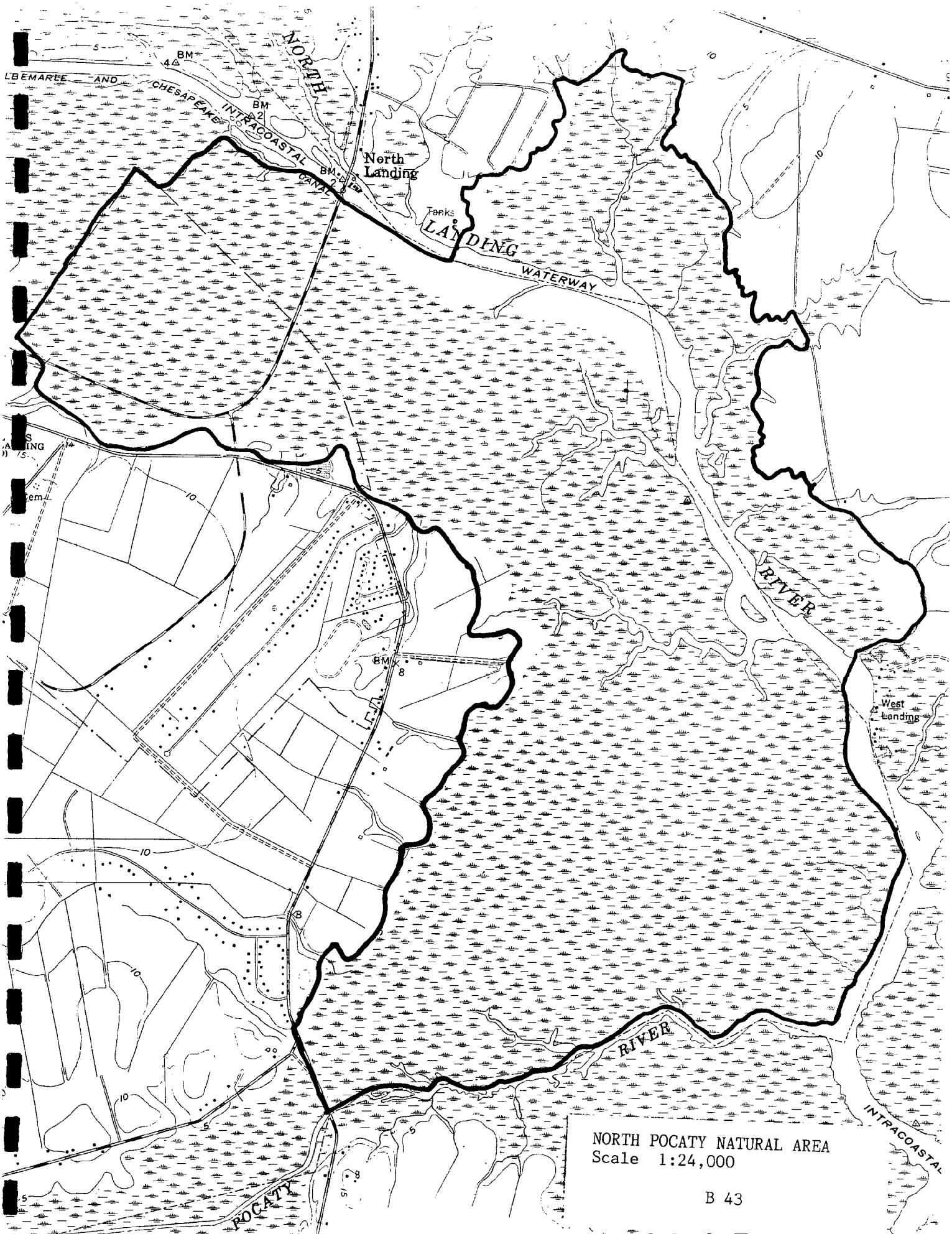
THREATS: There are no apparent, direct threats to the natural heritage resources of this site. However, disruption of the hydrology or nutrient regime by ditches, increased runoff from the uplands, and the like could substantially alter the wetland communities over the long term.

VIRGINIA BEACH NATURAL AREAS INVENTORY

CURRENT STATUS: Two large tracts, covering more than 1000 acres, within this site are owned by The Nature Conservancy. A small area near North Landing Road is managed by the U.S. Navy as part of the Fentress Landing Area. The remainder of the site is privately owned. The North Landing River (and associated bottomlands) downstream from North Landing Road is designated as a state scenic river.

PROTECTION RECOMMENDATIONS: Protection of this site and adjacent upland buffer would help form a larger, more viable and defensible preserve along the North Landing River.

MANAGEMENT RECOMMENDATIONS: Impacts from surrounding agricultural lands and residential development should be mitigated by encouraging sound soil and water management practices and maintaining vegetated upland buffers.



NORTH POCATY NATURAL AREA
Scale 1:24,000

B 43

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED - NORTH POCOSIN NATURAL AREA

SIZE: ca. 2,630 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Pleasant Ridge **QUADRANGLE CODE:** 3607661
Creeds 3607651

LOCATION: The site embraces a large forested wetland west of the North Landing River, south of the Pocaty River, and north of the North Landing River Natural Area Preserve. The western boundary roughly coincides with the edge of the upland vegetation.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
FETTER-BUSH--SHEEP LAUREL LOW POCOSIN	OLIGOTROPHIC SATURATED SCRUB		S1			BC
POND PINE/FETTER-BUSH TALL POCOSIN	OLIGOTROPHIC SATURATED WOODLAND		S1			A
BIG CORDGRASS OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S5			AB
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			A
* PLANTS						
A SEDGE	CAREX STRIATA	G4	S1S2			AB
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			A
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	D
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			AB
SAWGRASS	CLADIUM MARISCUS SSP JAMAICENSE	G5T5	S1			A
SHEEP-LAUREL	KALMIA ANGUSTIFOLIA	G5	S2S3			A
SLENDER-LEAVED DRAGON-HEAD	PHYSOSTEGIA LEPTOPHYLLA	G4G5	S2	C2		A
SPREADING POGONIA	CLEISTES DIVARICATA	G4	S1			D
SWEETSCENT LADIES'-TRESSES	SPIRANTHES ODORATA	G5	S2			A
WINGED SEEDBOX	LUDWIGIA ALATA	G3G4	S1			B
* VERTEBRATES						
CANEBRAKE RATTLESNAKE	CROTALUS HORRIDUS ATRICAUDATUS	G5TUQ	S1		LE	U
LEAST BITTERN	IXOBRYCHUS EXILIS	G5	S2			D

SITE DESCRIPTION: This site is noteworthy for its low pocosin, a peatland community locally referred to as juniper bog. This community is extremely rare in Virginia. It is characterized by rare orchids and sedges, knee-high heaths, and young Atlantic white cedar trees. Surrounding the low pocosin is an extensive area of tall pocosin dominated by pond pine, highbush blueberry, laurel-leaf greenbriar, and Virginia chain-fern.

Frequent fires have played an important ecological role in maintaining these pocosin communities, and regular prescribed burning will be required in the future. Elsewhere on the site, robust emergent marsh, shrub swamp, and deciduous swamp forest vegetation exist. Much of the area has not been explored due to the extremely thick vegetation.

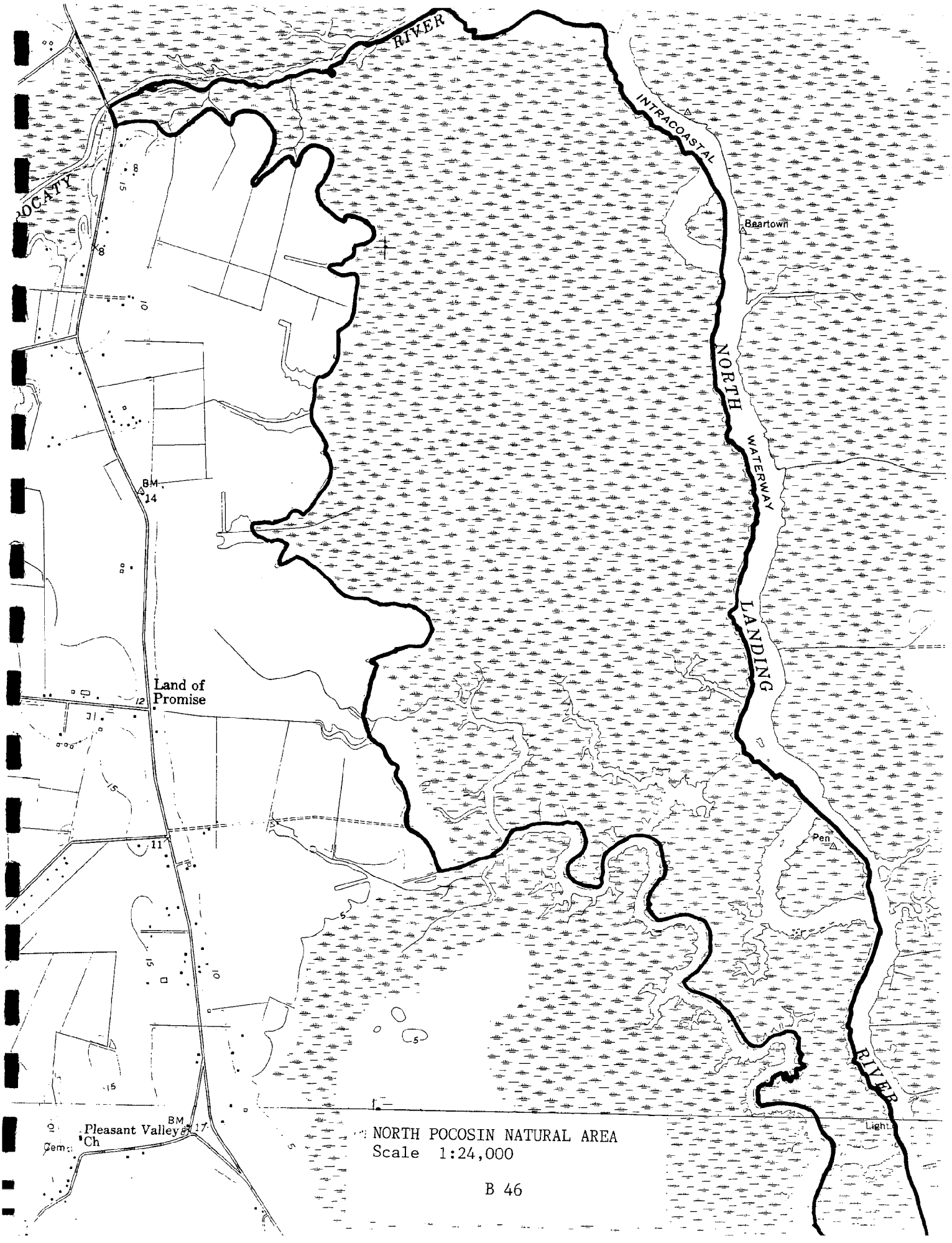
BOUNDARY JUSTIFICATION: The conservation planning boundary includes all known element occurrences and their habitat. Large units of wetland immediately to the north and south of this site are described as separate natural areas: North Pocaty and Pungo Ferry Pocosin.

THREATS: Lack of fire is the major threat to the rare pocosin vegetation. Additional threats include ditching, which alters the natural hydrology and introduces invasive exotic species such as common reed.

CURRENT STATUS: The site is in private ownership.

PROTECTION RECOMMENDATIONS: Protection of this site and adjacent upland buffer would contribute significantly to forming a larger, more viable and defensible, natural area preserve along the North Landing River.

MANAGEMENT RECOMMENDATIONS: Develop and implement a prescribed burning management plan to maintain the distinctive pocosin vegetation and its rare species. Monitor rare species populations and the spread of common reed. Impacts from surrounding agricultural lands can be mitigated by encouraging sound soil and water management practices and maintaining vegetated upland buffers.



NORTH POCOSIN NATURAL AREA
Scale 1:24,000

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- OAKUM CREEK NATURAL AREA

SIZE: ca. 440 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Creeds **QUADRANGLE CODE:** 3607651

LOCATION: Oakum Creek natural area lies north and east of Munden Point Park on the eastern shore of the North Landing River.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
CAROLINA LILAEOPSIS	LILAEOPSIS ATTENUATA	G3	S1S2		C	B
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			AB
SAWGRASS	CLADIUM MARISCUS SSP JAMAICENSE	G5T5	S1			A

SITE DESCRIPTION: Oakum Creek is a small, slow-moving, tightly-meandering tributary to the North Landing River. Several small ponds have been dredged within the marshes that border the creek. Over most of its length, the creek flows through nutrient-rich marshes, but a bald cypress swamp has formed near its mouth. The marshes are dominated by cattails and big cordgrass with common reed near dredged areas. The rare plants are found near the mouth of the creek, especially where sheltered from storm waves and boat wakes by bald cypress knees. The uplands north and east of Munden Point Park (not surveyed) support a surprisingly species-rich forest, which may provide habitat for rare plants or butterflies.

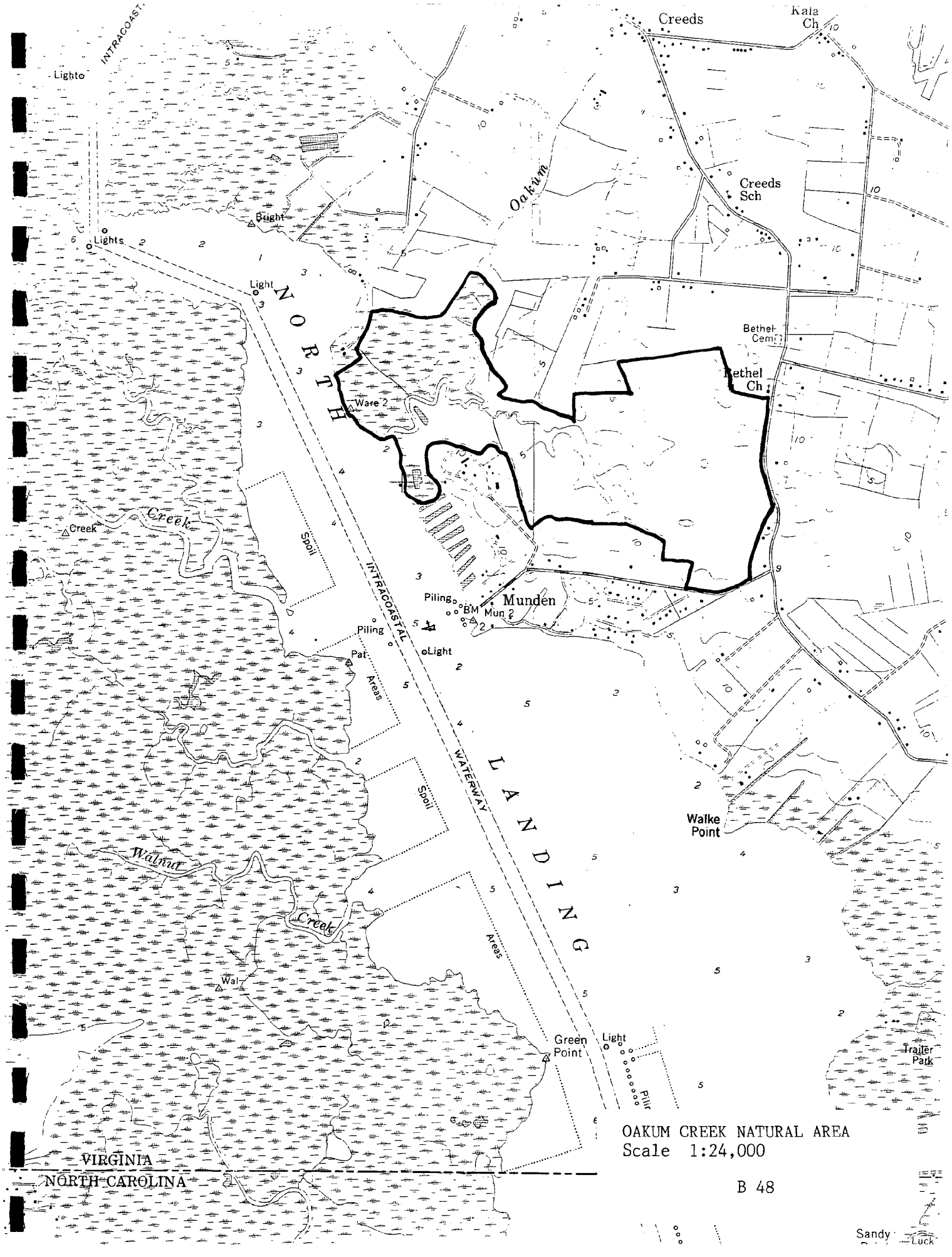
BOUNDARY JUSTIFICATION: The conservation planning boundary presented here includes the wetlands along Oakum Creek plus the adjacent forested uplands.

THREATS: Wakes from large boats may be degrading the shoreline habitat for the rare plants at this site.

CURRENT STATUS: A portion of the natural area lies within Munden Point Park, with the remainder of the site in private ownership.

PROTECTION RECOMMENDATIONS: Expansion of Munden Point Park could help protect the rare species that occur here.

MANAGEMENT RECOMMENDATIONS: Work to control the spread of common reed and monitor the effects of boat wakes on the rare plants.



OAKUM CREEK NATURAL AREA
Scale 1:24,000

B 48

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- PINEY GROVE CHURCH NATURAL AREA

SIZE: ca. 510 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Virginia Beach

QUADRANGLE: Creeds **QUADRANGLE CODE:** 3607651

LOCATION: Piney Creek Church natural area lies on the eastern shore of the North landing River upstream of the mouth of Blackwater Creek and downstream of the new Pungo Ferry bridge.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
BIG CORDGRASS OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S5			AB
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			A
* PLANTS						
SLENDER-LEAVED DRAGON-HEAD	PHYSOSTEGIA LEPTOPHYLLA	G4G5	S2	C2		A

SITE DESCRIPTION: The water level in the marshes at this site is relatively high, and coastal arrowhead is a common subordinant under the big cordgrass and cattails. In the northern section and along the western edge of the island, common reed is abundant, dominating hundreds of square yards.

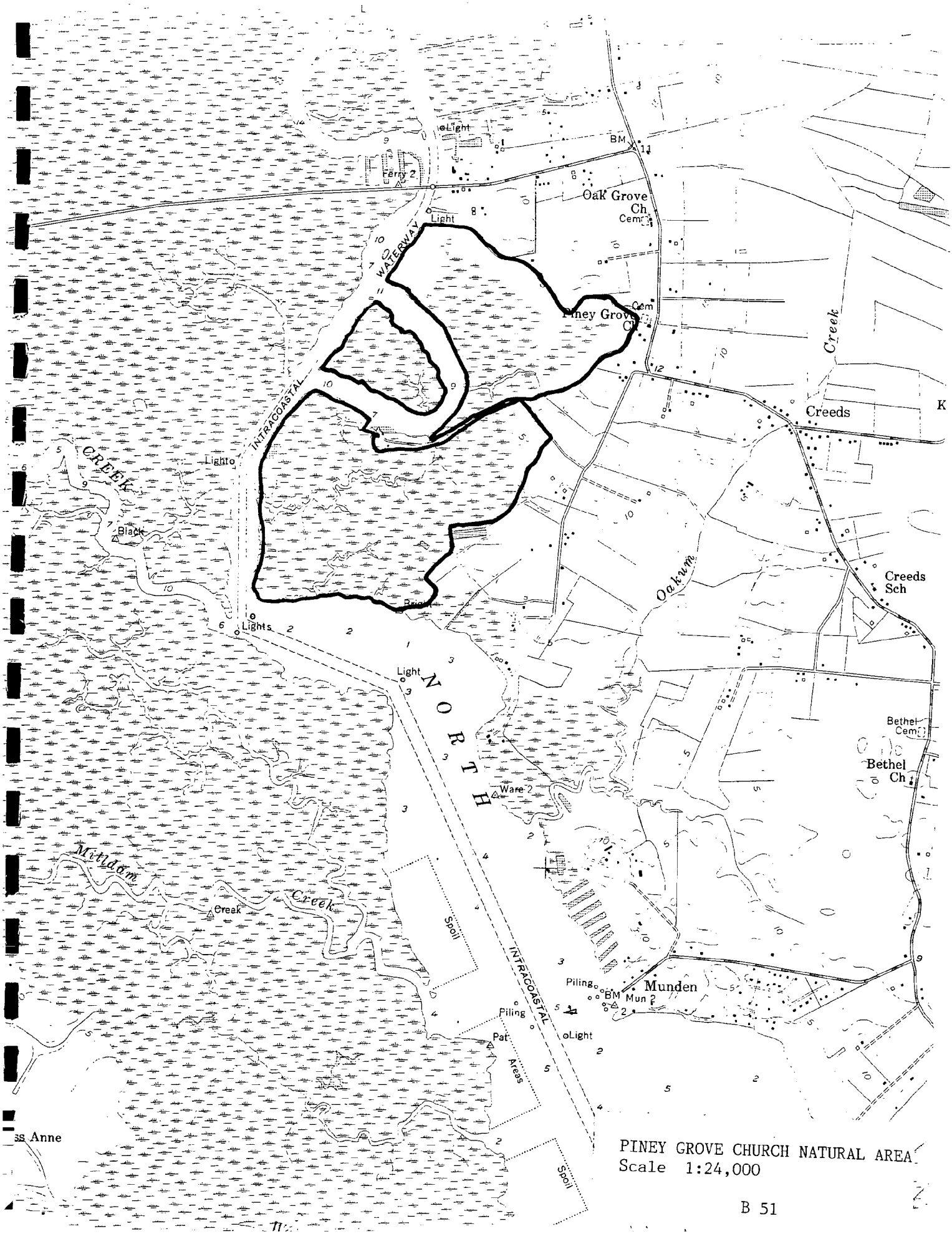
BOUNDARY JUSTIFICATION: The conservation planning boundary presented here includes the wetlands adjacent to the North Landing River and several small tributaries.

THREATS: Wakes from large boats may be degrading the shoreline habitat for the rare plants at this site. Dredging of the Intracoastal Waterway and construction of the new bridge have disturbed the wetlands and allowed common reed to proliferate.

CURRENT STATUS: A portion of the natural area is owned by the US Army Corps of Engineers, with the remainder of the site in private ownership.

PROTECTION RECOMMENDATIONS: Notify landowners of the presence of significant wetlands and rare species and work with them to protect their habitat.

MANAGEMENT RECOMMENDATIONS: Work to control the spread of common reed and monitor the effects of boat wakes on the rare plants.



PINEY GROVE CHURCH NATURAL AREA
Scale 1:24,000

B 51

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- PUNGO FERRY POCOSIN NATURAL AREA

SIZE: ca. 2200 acres **BIODIVERSITY RANK:** B2

LOCALITY: City of Virginia Beach

QUADRANGLE: Creeds **QUADRANGLE CODE:** 3607651
Pleasant Ridge 3607661

LOCATION: The site lies to the north and south of Pungo Ferry Road, west of the North Landing River. It is bordered to the north by a large creek, locally known to as Alton's Creek. The western boundary generally follows the edge of upland vegetation. The southern border is Blackwater Creek, and the eastern border is the North Landing River.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
POND PINE/FETTER-BUSH TALL POCOSIN	OLIGOTROPHIC SATURATED WOODLAND		S1			A
* PLANTS						
ASTER-LIKE BOLTONIA	BOLTONIA ASTEROIDES	G5	S2			H
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			A
BIG-HEAD RUSH	JUNCUS MEGACEPHALUS	G4G5	S2			H
ELLIOTT'S ASTER	ASTER PUNICEUS VAR ELLIOTTII	G5T3T4	S1			U
LARGE CRANBERRY	VACCINIUM MACROCARPON	G4	S2			H
SHEEP-LAUREL	KALMIA ANGUSTIFOLIA	G5	S2S3			A
* VERTEBRATES						
CANEBRAKE RATTLESNAKE	CROTALUS HORRIDUS ATRICAUDATUS	G5TUQ	S1		LE	U
* INVERTEBRATES						
GREAT PURPLE HAIRSTREAK	ATLIDES HALESUS	G5	S3			U
SAFFRON SKIPPER	POANES AARONI AARONI	G4T4	S3			U
SCARCE SWAMP SKIPPER	EUPHYES DUKESI	G3G4	S2		C	A

SITE DESCRIPTION: Pungo Ferry Road bisects the site and affords a marvelous opportunity to observe the gradient of wetland vegetation. Dense, nearly impenetrable pocosin gives way to shrub swamp, and then to robust emergent marsh bordering the North Landing River. The pocosin is one of Virginia's finest examples of this community type. It has burned frequently in the past and currently supports a woodland dominated by pond pine, tall ericaceous shrubs, and Virginia chain-fern. The marshes are exposed to wind tides, and the water is fresh to very-slightly brackish.

The upland forest within the forested wetlands at this site appears to be unusual and is worthy of further study.

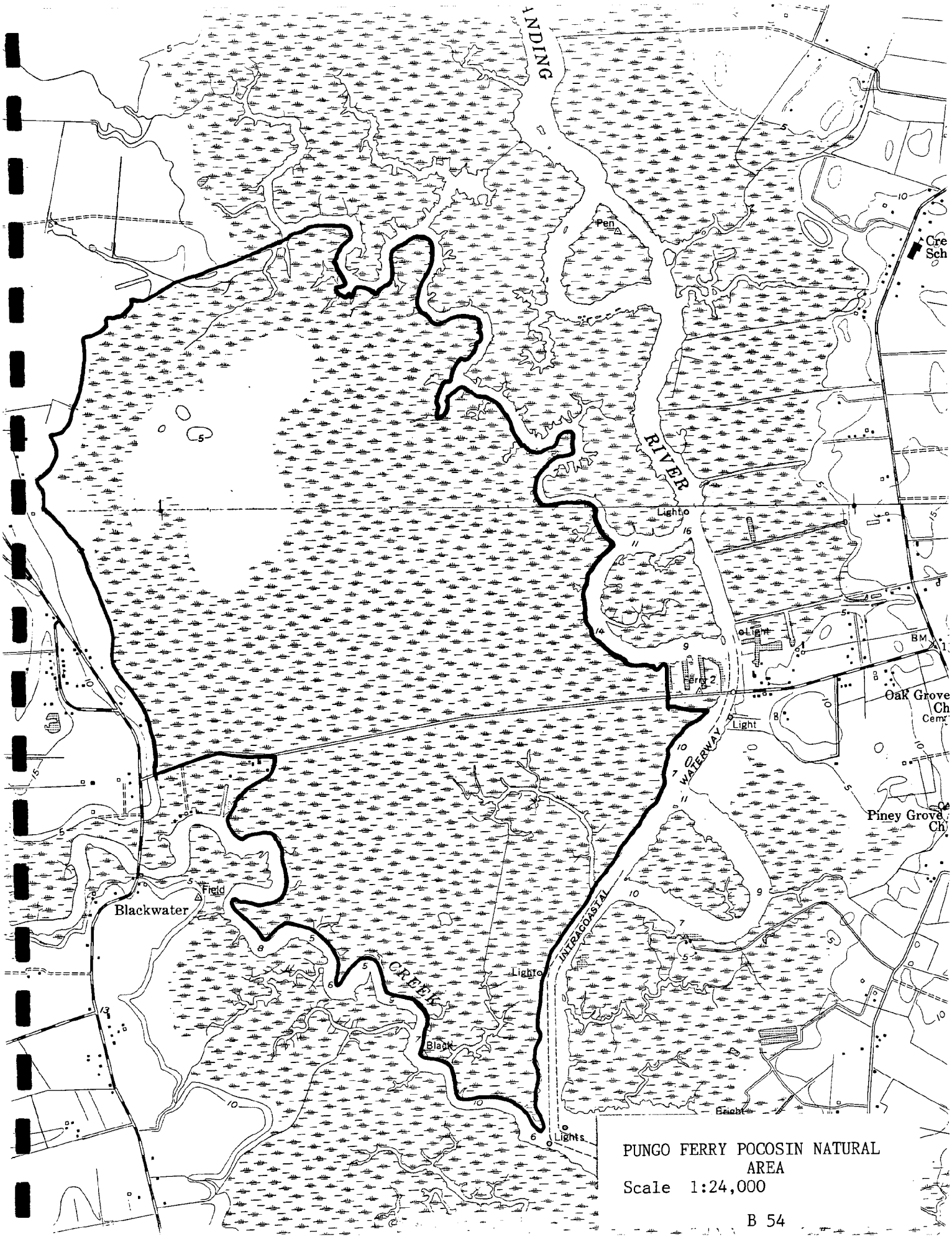
BOUNDARY JUSTIFICATION: The conservation planning boundary includes the significant natural community and habitat for the rare species.

THREATS: The primary threat facing this site is the lack of fire, which is necessary to maintain the pocosin community. Common reed, an invasive, exotic species may be threatening the natural vegetation of the marshes.

CURRENT STATUS: Most of the site is owned and managed by the Virginia Department of Conservation and Recreation as the North landing River Natural Area Preserve. The preserve is a dedicated natural area, which provides the strongest level of protection to natural heritage resources through formal recognition and stringent legal safeguards against conversion to inappropriate uses. Additional lands are privately owned.

PROTECTION RECOMMENDATIONS: To ensure that the natural heritage resources on this site persist, and to allow for safe management, the remainder of the site, including upland buffers, needs to be given permanent legal protection.

MANAGEMENT RECOMMENDATIONS: Develop and implement a management plan that includes prescribed burning. Monitor the health of the pocosin, the associated rare species and common reed in the marsh.



PUNGO FERRY POCOSIN NATURAL AREA

Scale 1:24,000

B 54

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- SOUTHERN MARSHES NATURAL AREA

SIZE: ca. 4,170 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Creeds **QUADRANGLE CODE:** 3607651

LOCATION: The site includes the wetland on the west side of the North Landing River, mostly east of Blackwater Road; north of the North Carolina state border, and south of Blackwater Creek.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
BIG CORDGRASS OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S5			AB
SPIKERUSH SHORT OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S1			AB
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			A
* PLANTS						
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	G4	S2			BC
CAROLINA BOLTONIA	BOLTONIA CAROLINIANA	G2Q	S1			U
EPIPHYTIC SEDGE	CAREX DECOMPOSITA	G3G4	S1		C	D
SAWGRASS	CLADIUM MARISCUS SSP JAMAICENSE	G5T5	S1			A
SILKY CAMELLIA	STEWARTIA MALACHODENDRON	G4	S2			B
SLENDER-LEAVED DRAGON-HEAD	PHYSOSTEGIA LEPTOPHYLLA	G4G5	S2	C2		A
SWEETSCENT LADIES'-TRESSES	SPIRANTHES ODORATA	G5	S2			A
WINGED SEEDBOX	LUDWIGIA ALATA	G3G4	S1			B
* VERTEBRATES						
CANEBRAKE RATTLESNAKE	CROTALUS HORRIDUS ATRICAUDATUS	G5TUQ	S1		LE	U
DISMAL SWAMP BOG LEMMING	SYNAPTOMYS COOPERI HELALETES	G5T3	S3			U
KING RAIL	RALLUS ELEGANS	G4Q	S2			U
LEAST BITTERN	IXOBRYCHUS EXILIS	G5	S2			U
VIRGINIA RAIL	RALLUS LIMICOLA	G5	S2			U

SITE DESCRIPTION: The site experiences regular water level fluctuations resulting from wind tides and is part of the large wetland ecosystem along the North Landing River. The water is fresh to slightly brackish. Plant species diversity is very high, and wetland communities form a complex mosaic. The marshes are dominated by robust emergents such as big cordgrass, common reed, southern cattail, narrow-leaf cattail, black needlerush, and the rare sawgrass. Areas of low marsh contain a diverse mix of plants, including several rare species. Many of the marshes are being invaded by woody species such as red maple, swamp rose, and wax

myrtle. The lack of frequent fire in the marshes is a major reason for the increase in woody plants. The swamp forests are characterized by bald cypress, swamp tupelo, loblolly pine, sweetgum, and red maple. Some upland forest is included in this site, providing habitat for the rare shrub, silky camellia.

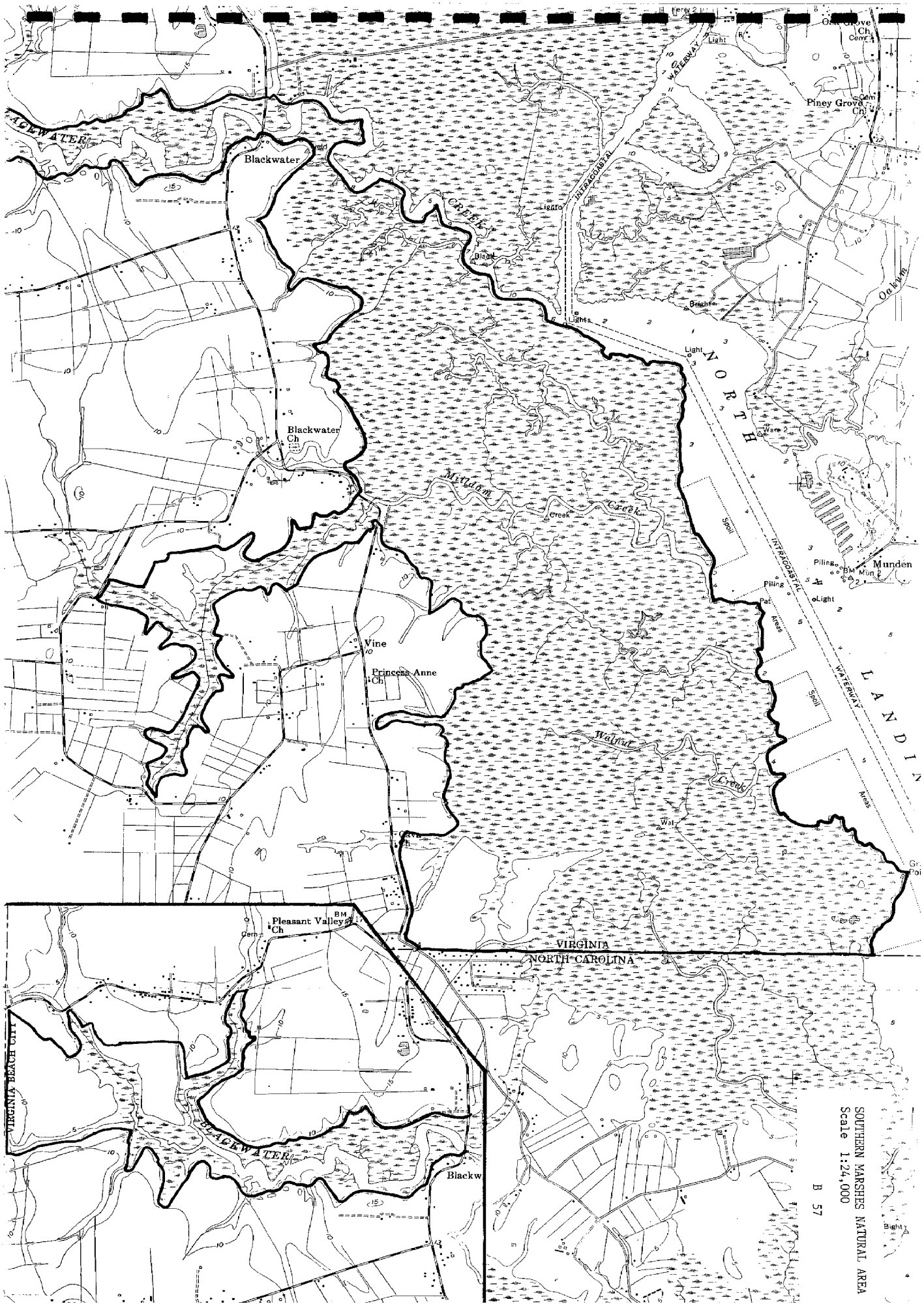
BOUNDARY JUSTIFICATION: The conservation planning boundary includes the upland and wetland habitat for the rare species.

THREATS: Common reed, an invasive, exotic species may be threatening the natural vegetation of the marshes. Logging threatens the forest vegetation. The encroachment of woody species into the marsh, possibly resulting from a reduced fire frequency, is cause for concern.

CURRENT STATUS: The Nature Conservancy has recently acquired two tracts, totalling more than 1000 acres, within this site. The rest of the site is in private ownership.

PROTECTION RECOMMENDATIONS: This site and adjacent upland buffers are part of the significant North Landing River ecosystem, and protection actions here will have direct bearing on the larger landscape unit.

MANAGEMENT RECOMMENDATIONS: Monitor woody species and common reed in the marsh. Work with the landowners to develop a management plan that includes prescribed burning.



SOUTHERN MARSHES NATURAL AREA
Scale 1:24,000

B 57

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- STUMPY LAKE NATURAL AREA

SIZE: ca. 2,530 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Virginia Beach
City of Chesapeake

QUADRANGLE: Kempsville **QUADRANGLE CODE:** 3607672
Fentress 3607662

LOCATION: Stumpy Lake lies at the head of Gum Swamp, north of Elbow Road, which crosses below the southern dam creating the lake.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* PLANTS						
SPANISH MOSS	TILLANDSIA USNEOIDES	G5	S2			H
* VERTEBRATES						
CANEBRAKE RATTLESNAKE	CROTALUS HORRIDUS ATRICAUDATUS	G5TUQ	S1		LE	C
* INVERTEBRATES						
A MILLIPEDE	PSEUDOPOLYDESMUS PALUDICOLIS	G1	S1		SSC	H
PAPER PONDSHELL	ANODONTA IMBECILLIS	G5	S2			U

SITE DESCRIPTION: Stumpy Lake is a Norfolk City reservoir created at the head of Gum Swamp. It is lined by bald cypress, which is joined in the west arm of the lake by water tupelo to form an open-canopy, deep-water swamp. A golf course has been built on part of the adjacent uplands, but a seasonally-wet forest has been left to the west of the golf course. The north end of Stumpy Lake is a very eutrophic, mucky shrub swamp dominated by Carolina willow with a dense mat of duckweed and water fern. Stumpy Lake is inhabited by a rare mussel and there are recent reports of canebrake rattlesnakes and several rare plants near the lake.

BOUNDARY JUSTIFICATION: The conservation planning boundary for this site includes Stumpy Lake proper as well as the adjacent forested areas that provide habitat for the rare species.

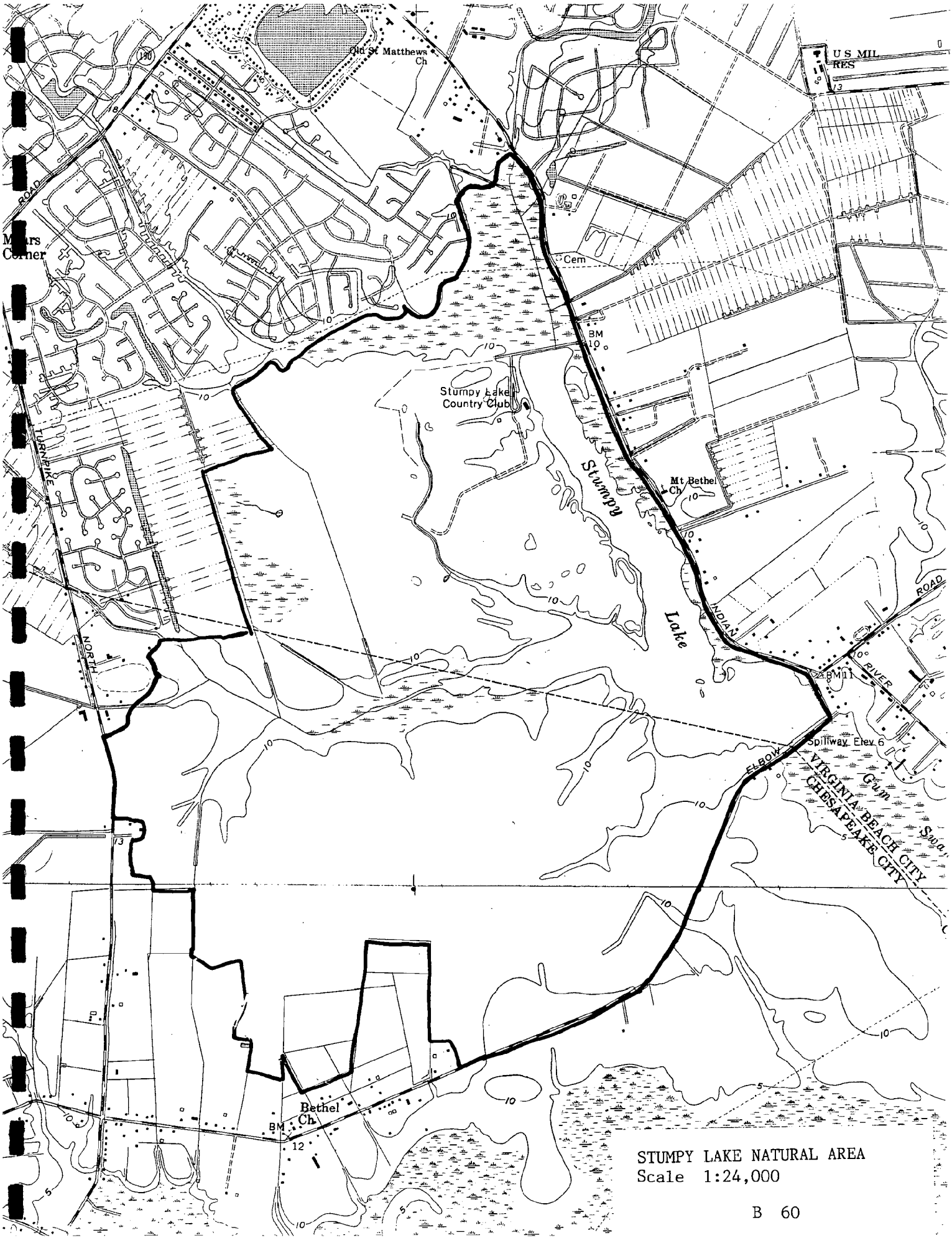
THREATS: The Southeastern Expressway is proposed to cross the North Landing River in or near this site. Construction of this highway or ditches and other hydrologic disruptions or increasing development of surrounding upland habitat could substantially alter this site. Continued development of the surrounding areas directly threatens the rare species.

Runoff from developments may indirectly threaten the rarities by degrading the water in the lake.

CURRENT STATUS: Stumpy Lake Reservoir is owned and operated by the City of Norfolk as a backup water source. The adjacent golf course is owned by the City of Virginia Beach and leased to a concessionaire. The rest of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Verify the presence of rare species in the forests and try to protect their habitat.

MANAGEMENT RECOMMENDATIONS: Work with Norfolk City and Virginia Beach City to ensure that management of the reservoir, golf course and surrounding public lands does not reduce the habitat for the rare species.



STUMPY LAKE NATURAL AREA
Scale 1:24,000

B 60

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED -- UPPER WEST NECK CREEK NATURAL AREA

SIZE: ca. 1,610 acres **BIODIVERSITY RANK:** B5

LOCALITY: City of Virginia Beach

QUADRANGLE: Princess Anne **QUADRANGLE CODE:** 3607671

LOCATION: In the floodplain of West Neck Creek in the vicinity of Princess Anne Road south to Indian River Road.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* VERTEBRATES						
DISMAL SWAMP BOG LEMMING	SYNAPTOMYS COOPERI HELALETES	G5T3	S3			D
DISMAL SWAMP SOUTHEASTERN SHREW	SOREX LONGIROSTRIS FISHERI	G5T2Q	S2	LT	LT	C

SITE DESCRIPTION: The floodplain of West Neck Creek is a mix of young to maturing forests dominated by red maple, sweetgum, black gum and loblolly pine. West Neck Creek has been channelized and the berm is overgrown in grasses, greenbriars, and shrubs. Several powerline and pipeline right-of-ways cross the site and support similar vegetation. The uplands are being developed, especially along London Bridge Road. The Dismal Swamp southeastern shrew, which is listed as an endangered species under federal law, inhabits this site.

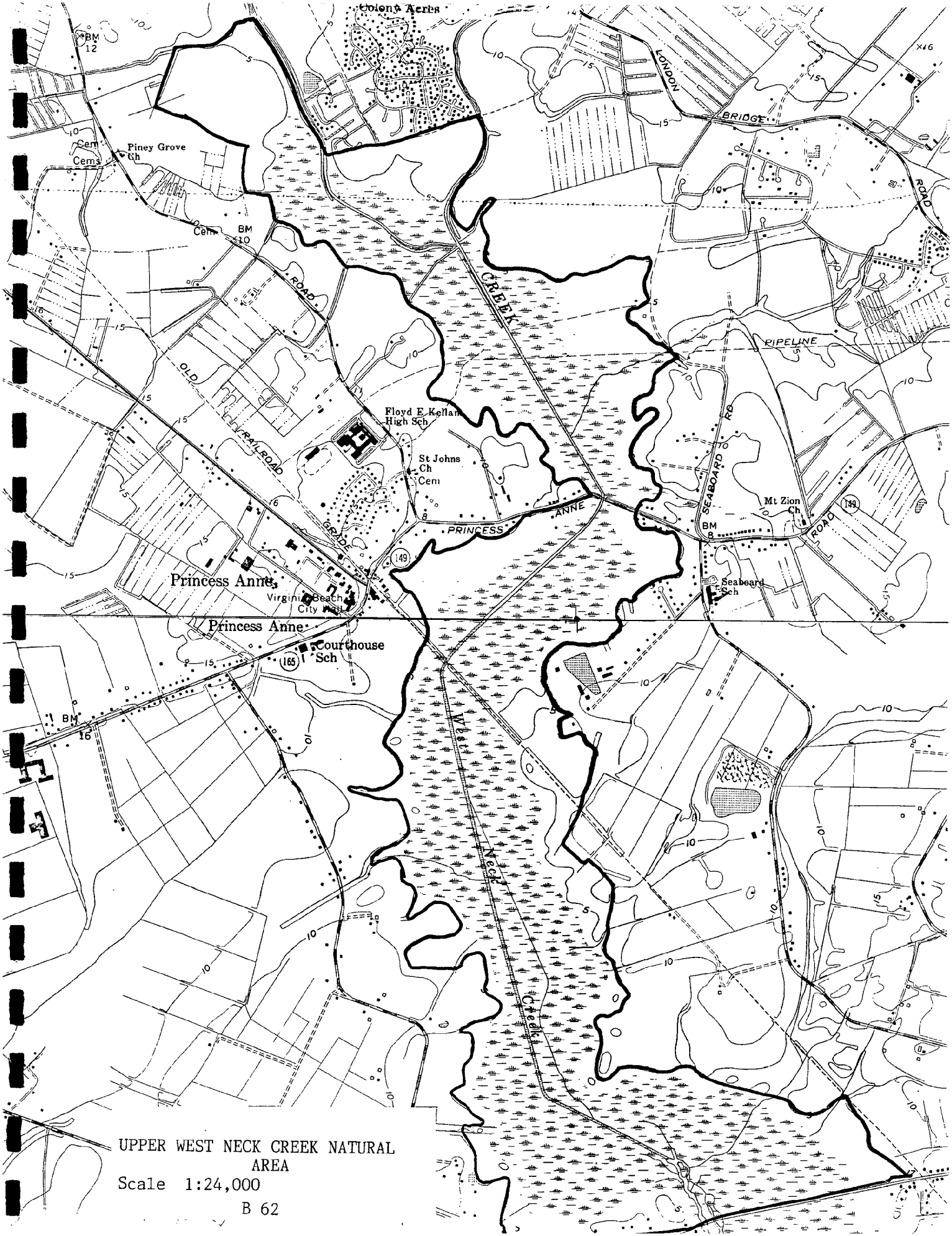
BOUNDARY JUSTIFICATION: The conservation planning boundary for this site includes the forested wetlands along West Neck Creek in the vicinity of known sites for the Dismal Swamp southeastern shrew plus a corridor of similar habitat that connects with the West Neck Creek natural area immediately to the south.

THREATS: Filling or draining the wetlands are the primary threats to this site.

CURRENT STATUS: Much of this site is owned by the City of Virginia Beach. The remainder of the site is in private ownership.

PROTECTION RECOMMENDATIONS: Work with landowners and state and federal regulatory agencies to perpetuate habitat (including buffers) for the Dismal Swamp southeastern shrew and Dismal Swamp bog lemming.

MANAGEMENT RECOMMENDATIONS: Work with landowners and state and federal regulatory agencies to perpetuate habitat for the Dismal Swamp southeastern shrew.



UPPER WEST NECK CREEK NATURAL AREA

Scale 1:24,000

B 62

VIRGINIA BEACH NATURAL AREAS INVENTORY

NORTH LANDING RIVER WATERSHED - WEST NECK CREEK NATURAL AREA

SIZE: ca. 1,780 acres **BIODIVERSITY RANK:** B3

LOCALITY: City of Virginia Beach

QUADRANGLE: Pleasant Ridge **QUADRANGLE CODE:** 3607661
Creeds 3607651

LOCATION: The site includes the wetland and adjacent forested upland on both sides of West Neck Creek from Indian River Road south to its mouth.

NATURAL HERITAGE RESOURCE SUMMARY TABLE

COMMON NAME	SCIENTIFIC NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS LEGAL STATUS	VA LEGAL STATUS	ELEMENT OCCUR. RANK
* COMMUNITIES						
BIG CORDGRASS OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S5			AB
THREE-SQUARE BULRUSH--CATTAIL OLIGOHALINE MARSH	ESTUARINE HERBACEOUS VEGETATION		S3			A
* PLANTS						
ELONGATED LOBELIA	LOBELIA ELONGATA	G3G5	S1			AB
EPIPHYTIC SEDGE	CAREX DECOMPOSITA	G3G4	S1		C	C
JOINT PASPALUM	PASPALUM DISTICHUM	G5	S1			D
* VERTEBRATES						
CANEBRAKE RATTLESNAKE	CROTALUS HORRIDUS ATRICAUDATUS	G5TUQ	S1		LE	H
* INVERTEBRATES						
A DAMSELFLY	ENALLAGMA DURUM	G5	S2			C
SAFFRON SKIPPER	POANES AARONI AARONI	G4T4	S3			U
SCARCE SWAMP SKIPPER	EUPHYES DUKESI	G3G4	S2		C	B

SITE DESCRIPTION: This site, like others along the North Landing River, experiences water level fluctuations resulting from wind tides. The water is fresh to very-slightly brackish. Plant species richness is quite high, and several vegetation types exist: marsh, shrub swamp, and deciduous swamp forest. A population of the globally-rare epiphytic sedge occurs in the swamps along West Neck Creek.

BOUNDARY JUSTIFICATION: The conservation planning boundary includes the communities, rare species. This site represents a critical unit of land within the large North Landing River wetland ecosystem.

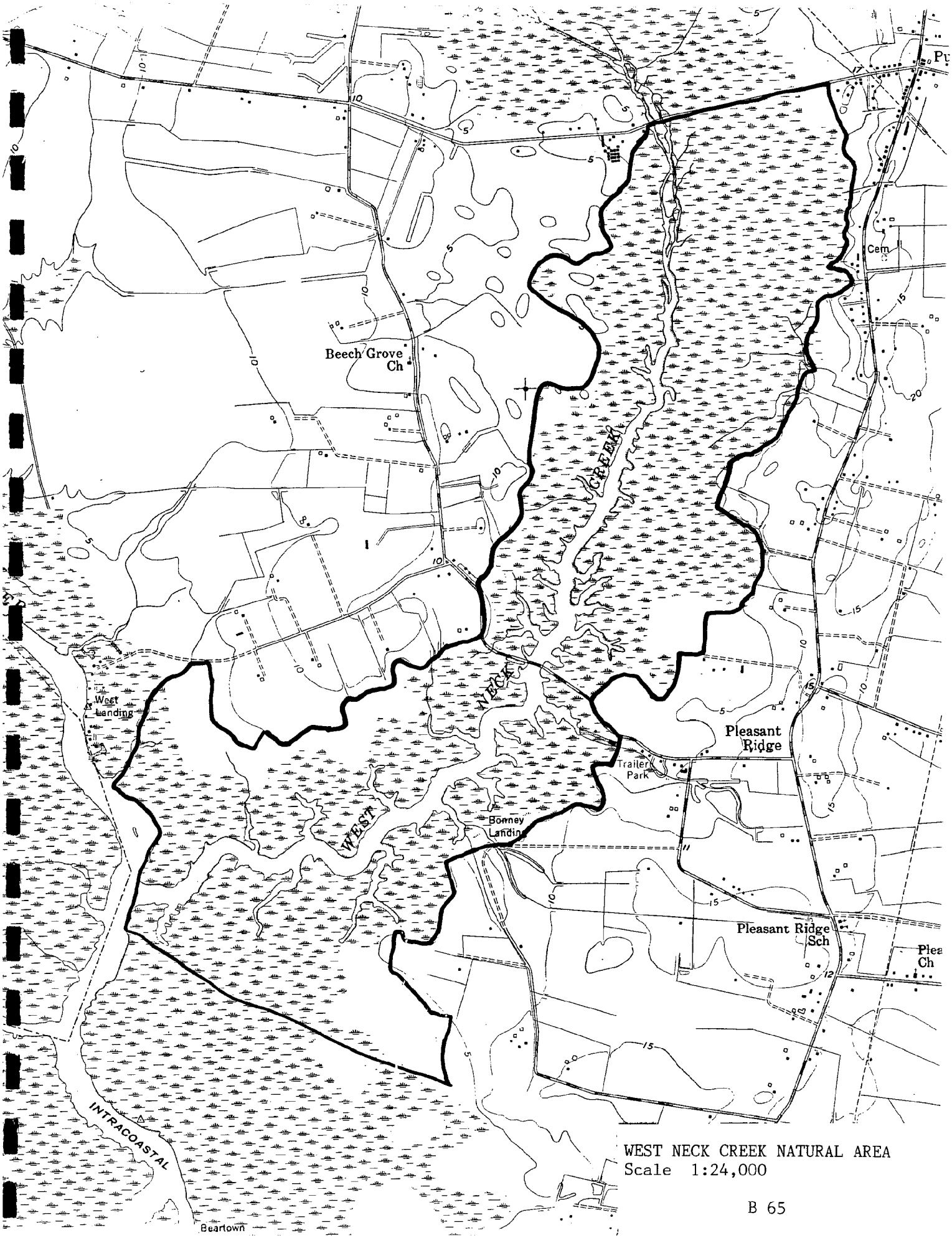
THREATS: The lack of fire is a major threat to the natural marshes. Additional threats are saltwater intrusion as a result of locks in the upstream reach of the creek and perturbations to the natural hydrology of

the wetland, such as ditching. The introduction of common reed in disturbed sites could drastically alter the marshes.

CURRENT STATUS: The City of Virginia beach owns a small portion of the north end of this site, the rest is in private ownership.

PROTECTION RECOMMENDATIONS: Protection of this site and adjacent upland buffer would help form a larger, more viable and defensible preserve along the North Landing River.

MANAGEMENT RECOMMENDATIONS: The marshes require periodic fire for their long-term maintenance. Develop and implement a prescribed burning management plan. Monitor rare species populations and the spread of common reed. Impacts from surrounding agricultural lands should be mitigated by encouraging sound soil and water management practices and maintaining vegetated upland buffers.



WEST NECK CREEK NATURAL AREA
Scale 1:24,000

B 65

CAPE HENRY NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B2

LOCATION: The site encompasses Seashore State Park and Fort Story.

SITE DESCRIPTION: This site contains a superlative natural area with many exemplary plant communities and rare species. Sandy beaches, dune grasslands, live oak scrub, mature maritime forest, bald cypress and evergreen bay swamps, and interdunal ponds provide a variety of habitats for rare and unusual species, most of which are at or near their northern range limits here. Within Seashore State Park, campsites, beaches, a nature center, and an extensive trail system afford many and varied recreational opportunities. While the flora, fauna, and natural communities of Seashore State Park have been very well documented as a result of recent biological inventories, substantially less is known about the current state of natural heritage resources within Fort Story.

CURRENT STATUS: The site is in public ownership; most of Seashore State Park, a registered National Natural Landmark, is managed as a natural area.

VIRGINIA BEACH NATURAL AREAS INVENTORY

CHUB LAKE NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: Northwest corner of Little Creek Naval Amphibious Base.

SITE DESCRIPTION: This site encompasses a maritime forest, a beach dune system and a freshwater lake. Two rare plants inhabit the upland communities, and numerous waterfowl use the lake during the winter.

CURRENT STATUS: This site is entirely within Little Creek Naval Amphibious Base. A report on the rare, threatened and endangered species of Little Creek NAB was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

LITTLE CREEK CHANNEL NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: This site lies next to Chesapeake Bay on the east side of Little Creek Channel within Little Creek Naval Amphibious Base.

SITE DESCRIPTION: This site includes a section of beach where a rare bird nests in some years.

CURRENT STATUS: This site is entirely within Little Creek Naval Amphibious Base. A report on the rare, threatened and endangered species of Little Creek NAB was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

LITTLE CREEK DUNES NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: This site lies along the northern edge of Little Creek Naval Amphibious Base and is divided into two sub-areas by the public beach.

SITE DESCRIPTION: This site includes the least-disturbed beach, dunes interdunal swales, and maritime forest on the base. Three species of rare or uncommon plants inhabit this site.

CURRENT STATUS: This site is entirely within Little Creek Naval Amphibious Base. A report on the rare, threatened and endangered species of Little Creek NAB was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

VIRGINIA BEACH NATURAL AREAS INVENTORY

OCEANA SANDPITS NATURAL AREA

LOCALITY: City of Virginia Beach **BIODIVERSITY RANK:** B5

LOCATION: This site is located in the northeastern section of Naval Air Station Oceana.

SITE DESCRIPTION: This site is an old borrow pit that is inhabited by a rare dragonfly.

CURRENT STATUS: This site is entirely within Naval Air Station Oceana. A report on the rare, threatened and endangered species of NAS Oceana was submitted to natural resources personnel on the base by the Department of Conservation and Recreation in 1990.

APPENDIX C.

Scientific names of common species referred to in the report.

VIRGINIA BEACH NATURAL AREAS INVENTORY

Common Name	Scientific Name
American beachgrass	*Ammophila breviligulata*
American beech	*Fagus grandifolia*
American holly	*Ilex opaca*
American lotus	*Nelumbo lutea*
Atlantic white cedar	*Chamaecyparis thyoides*
bald cypress	*Taxodium distichium*
bayberry	*Myrica pensylvanica*
big cordgrass	*Spartina cynosuroides*
black gum	*Nyssa sylvatica*
black needlerush	*Juncus roemerianus*
bluejack oak	*Quercus incana*
broomsedge	*Andropogon virginicus*
carp	*Cyprinus carpio*
Carolina willow	*Salix caroliniana*
cattails	*Typha* spp.
common reed	*Phragmites australis*
duckweed	*Lemna* spp.
green briar	*Smilax* spp.
hickory	*Carya* spp.
highbush blueberry	*Vaccinium corymbosum*
lance-leaf arrowhead	*Sagittaria falcata*
laurel-leaf greenbrier	*Smilax laurifolia*
live oak	*Quercus virginiana*
loblolly pine	*Pinus taeda*
narrow-leaf cattail	*Typha angustifolia*
pond pine	*Pinus serotina*
red bay	*Perea borbonia*
red maple	*Acer rubrum*
saltmarsh cordgrass	*Spartina alterniflora*
sea oats	*Uniola paniculata*
sourwood	*Oxydendrum arboreum*
southern cattail	*Typha domingensis*
southern red oak	*Quercus falcata*
swamp rose	*Rosa palustris*
swamp tupelo	*Nyssa sylvatica* var. *biflora*
sweetgum	*Liquidambar styraciflua*
switchgrass	*Panicum virgatum*
three-square bulrush	*Scirpus americana*
tulip poplar	*Liriodendron tulipifera*
twig rush	*Cladium mariscoides*
Virginia chain-fern	*Anchistea virginica*
Virginia pine	*Pinus virginiana*
water fern	*Azolla caroliniana*
water oak	*Quercus nigra*
water-tupelo	*Nyssa aquatica*
wax myrtle	*Myrica cerifera*
white oak	*Quercus alba*

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