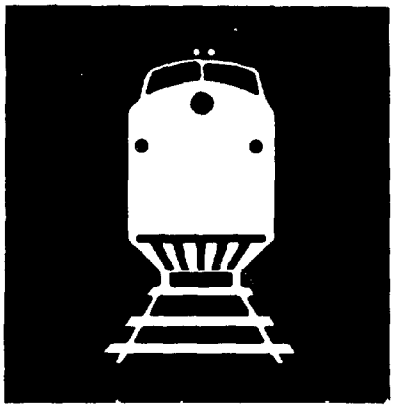

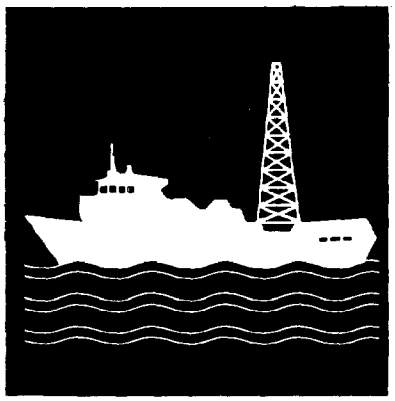

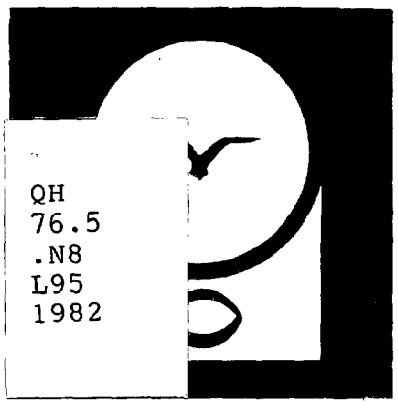

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Natural Areas Inventory of Hyde County, North Carolina

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J. Merrill Lynch
S. Lance Peacock

OCTOBER 1982

North Carolina
Coastal Energy Impact Program
Office of Coastal Management
North Carolina Department of Natural Resources
and Community Development

CEIP REPORT NO. 28

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NATURAL AREA INVENTORY OF HYDE COUNTY, NORTH CAROLINA

BY

J. Merrill Lynch[1]

S. Lance Peacock[2]

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October 1982

CEIP Report No. 28

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PREFACE

The North Carolina Office of Coastal Management and the North Carolina Natural Heritage Program, both units of the Department of Natural Resources and Community Development, have commissioned a series of natural areas inventories for ten counties in the coastal zone of this state. The Hyde County inventory was conducted in 1982 and was financed by a Coastal Energy Impact Program (CEIP) grant. CEIP funded the Hyde County survey because of the potential environmental impacts of peat mining and other energy-related development.

The recommendations made in this report by J. Merrill Lynch and S. Lance Peacock are advisory. Their inventory and recommendations are designed to help state and federal agencies, county officials, resource managers, landowners and developers work out effective land management and preservation mechanisms to protect the seven outstanding or exemplary natural areas described in the report. Agencies such as the N.C. Division of Environmental Management, Division of Land Resources, Division of Marine Fisheries, Wildlife Resources Commission, the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, and Environmental Protection Agency should find this report useful, as may university researchers, private consultants, and private conservation groups. The Office of Coastal Management will use the report in assessing permit applications and for federal and state consistency reviews.

Merrill Lynch and Lance Peacock are experienced field biologists, who have previously been employed with the N.C. Natural Heritage Program and are most familiar with natural habitats throughout the North Carolina coastal plain region. The investigators were exceptionally well qualified to identify, describe, and evaluate the most outstanding natural areas of the project region.

Project investigators were instructed to identify natural areas that contain highly unique, endangered, or rare natural features, or high-quality representations of relatively undisturbed natural habitats, <u>and</u> which may be vulnerable to threats and damage from land use changes. Consequently, the investigators were advised not to report extensively on the large expanses of brackish marshes, or on lands and waters protected and administered by the U.S. Department of the Interior. The Hyde County inventory excludes three categories of natural environments possessing important ecological resources.

Categories of natural environments not described in this inventory are:

(1) Brackish Marsh. Vast expanses of marsh fringe the shoreline along Pamlico Sound. For the most part, this ecosystem is protected through State and federal regulatory programs.

(2) National Wildlife Refuges. Both the Mattamuskeet and Swanquarter National Wildlife Refuges are recognized on the State Registry of Natural Heritage Areas. Lake Mattamuskeet, in excess of 50,000 acres in size, is the largest natural lake in North Carolina. The lake is bordered by a narrow band of woodlands and freshwater marshes. The refuge supports more than 100,000 wintering waterfowl and a large number of breeding ospreys. Bald eagles also over-winter at the lake. Swanquarter refuge is primarily composed of needlerush-brackish marsh and estuarine waters and is noted for large numbers of wintering waterfows and raptors. It supports a population of American Alligators, and a heron colony is known to breed in an old-growth cypress stand. Much of Swanquarter refuge is designated as a National Wilderness Area.

(3) Outer Banks Barrier Islands. Not included in the inventory project, Ocraocke Island is primarily owned and managed by the National Park Service. The narrow 12-mile-long barrier island is relatively undisturbed and provides a fine illustration of zonations--beach, fore dunes, sand flats, relict dunes, tidal creeks, live oak-wax myrtle maritime woods, and spartina marshes. The island supports large nesting populations of shorebirds. Also in the Ocracoke Inlet, on Shell Castle, Beacon, and North Rock Islands, nest the state's largest breeding colony of brown pelicans, which is the northernmost breeding colony on the East Coast.

The Office of Coastal Management, and the Coastal Resources Commission which it serves, implement the Coastal Area Management Act of 1974 (CAMA). Under this statute, the North Carolina Coastal Management Plan has been prepared and approved. It includes the definition and designation of various Areas of Environmental Concern (AEC). In many cases, AECs coincide with natural areas that are herein recommended for preservation or special management. In some cases, AECs may encompass other areas--such as marsh zone wetlands--which are not extensively treated in this inventory.

Peat mining has particular implications for these natural areas, some of which overlay exploitable peat deposits. Mining will remove natural vegetation, permanently alter the hydrology of the region, lower surface soil types from high organic

histosoils to the clayey, sandy, and loamy soils typical of other parts of the outer coastal plain. Thus, natural communities, once mining is complete, almost certainly could never be re-established or reclaimed on mined-out land. Preservation of the best natural areas, and appropriate hydrological management, is necessary prior to and during active peat mining.

The Natural Heritage Program is most pleased to have had this opportunity to conduct this project for the Office of Coastal Management. The inventory has revealed a number of extraordinary natural areas that possess natural elements of statewide or national priority and may be critical to the survival of North Carolina's natural diversity. Most of the identified sites were previously unknown and undocumented by the state'e scientific community. We are particularly impressed by the natural heritage values contained in the series of wetlands in the Alligator River corridor, the Scranton hardwood forest and the Gull Rock Game Land wetlands. The Natural Heritage Program hopes that these areas will be protected for the benefits of present and future generations of North Carolinians and for the preservation of the state's truly exceptional natural heritage.

Charles E. Roe, Coordinator
N.C. Natural Heritage Program
November 16, 1982

ABSTRACT. Seven natural areas are described and delineated for Hyde County as a result of a field survey December 1981 - August 1982. The natural areas contain slightly over 52,000 acres and at least 42 significant features. All but two of the natural areas are wholly in private ownership. Publicly owned natural areas are the Gull Rock Game Lands and Salyer's Ridge. The entire natural area acreage is comprised of wetland habitats.

ACKNOWLEDGEMENTS

The assistance of the following individuals is gratefully acknowledged:

1. Chuck Roe and Julie Moore of the North Carolina Natural Heritage Program, for the preparation of a workable set of inventory specifications, advice, and guidance throughout the project.

2. Rod McClanahan, District Biologist, North Carolina Wildlife Resources Commission; Otto Florschutz, Jr., Biologist, U.S. Fish and Wildlife Service; and Kirby Ballance, Technician, Soil Conservation Service, Hyde County, for their assistance in helping to identify and document the significant natural areas of the county.

3. Pat White, private consulting forester, Plymouth, for his invaluable aid in locating natural areas, identifying landowners, and providing a wealth of information on all aspects of the county's natural diversity.

4. Earl Faison, Roanoke Rapids, our pilot during the reconnaissance flights, who aided our survey immeasurably.

5. Lee Otte, East Carolina University, Department of Geology, who provided valuable comments on pocosin ecology and peat information.

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INTRODUCTION

Hyde County is in the northeastern section of North Carolina, situated in the Coastal Plain Province. The county is one of the oldest in the state, formed in 1705 as a sub-unit of the earlier Bath County, and having the name of Hyde since about 1712 (Powell, 1968). Hyde County has an area of about 1364 square miles, of which 634 are land and 730 are water. The approximately 873,000 acres encompass a variety of habitats, ranging from open lakes, brackish sounds and embayed rivers to freshwater marshes, pocosins and wooded swamps and flats, with minor areas of upland mixed pine-hardwood forests, as well as various maritime habitats on the outer banks.

The mainland part of the county, which is the subject of the present study, is located on the south side of the Pamlimarle peninsula, and is adjoined by Beaufort, Washington, Tyrrell and Dare Counties. Most of mainland Hyde County's boundaries also follow natural features: the Pungo River on the west, the Alligator River on much of the northern boundary, and Pamlico Sound on the east and south. The embayed and non-embayed portions of the Pungo and Alligator Rivers, and their tributaries, drain about half the county, with the other half draining into Pamlico Sound, either directly or through Lake Mattamuskeet. Many small embayments dissect the Pamlico Sound shoreline, including the Long Shoal River, Wyesocking Bay, Juniper Bay, Rose Bay and others. Large natural lakes are a prominent feature of the county, and include New Lake, part of the Pungo Lake, and Lake Mattamuskeet, the largest natural lake in the state. Swan Creek Lake, a much smaller blackwater lake, is located in the northwest part of the county along the channel of Swan Creek. Elevations on the mainland are 18 feet or less.

SOILS AND RECENT GEOLOGY

A modern soil survey of Hyde County has not been conducted, but a General Soils Map and Interpretations (SCS, 1973) has been produced, and is the source of the following soils data. Hyde County has six recognized Soil Associations, as follows:

a) Myatt-Bladen Association - poorly drained soils with gray to dark gray fine sandy loam to loam surface layers and friable sandy clay loam to very firm clay subsoils.

Wet Ultisols which comprise about 7 percent of the county's total land acreage and are about 80 percent in cultivation.

Natural areas identified: none.

b) Weeksville-Pasquotank Association - very poorly drained soils with black to gray very fine sandy loam or silt loam surface layers over friable silt or stratified sands.

Wet Inceptisols which comprise about 11 percent of the county's total land acreage and are 85 percent or more in cultivation.

Natural areas identified: Salyer's Ridge and most of the hardwood stands on the Gull Rock Game Lands natural area.

c) Hyde-Bayboro Association - very poorly drained soils with thick black loam surface layers over firm clay loam to very firm clay subsoils.

Wet Ultisols which comprise about 12 percent of the county's total land acreage and are about 25 percent in cultivation with the rest in timberland including pine plantations.

Natural areas identified: Gull Rock Game Lands (in part); Scranton Hardwoods.

d) Capers Association - very poorly drained soils with dark gray silty clay subsoils and loam surface layers over sticky, plastic, silty clay subsoils.

Wet Entisols (marsh soils) which comprise about 7 percent of the county's total land acreage and are not cultivated.

Natural areas identified: Gull Rock Game Lands (in part).

e) Dare-Pungo-Dorovan Association - very poorly drained soils with thick to moderately thick organic surface layers over mineral subsurface layers ranging from sand to clay.

Deep Histosols which comprise about 20 percent of the county's total land acreage. Large acreages are being placed in cultivation, and peat mining has been proposed within this group of soils.

Natural areas identified: Alligator River; Roper Island (in part); New Lake Fork Pocosin.

f) Ponzer-Belhaven-Wasda Association - very poorly drained soils with moderately thick to thin organic surface layers and loamy subsurface layers.

Shallow Histosols (Wasda series soils are Histic Humaquepts) which comprise about 30 percent of the county's total land acreage. Extensively cleared for agriculture mostly during the past 20 years.

Natural areas identified: Alligator River (in part); Roper Island (in part); Gull Rock Game Lands (in part).

The entire area of mainland Hyde County is on the Pamlico terrace or Pamlico surface. The Pamlico is the lowest and youngest of the several generalized surfaces of the state's Coastal Plain recognized as having been formed during periods of higher sea level. The history of sea rise and fall is complex. About 75,000 years BP (Daniel, 1981), during the Pamlico transgression, the edge of the sea lay inland to a point now marked by the sandy ridge of the Suffolk Scarp. The toe of the scarp is now about 20 feet above modern sea level, and 15 miles west of the western boundary of Hyde County. During the peak of the Wisconsin glaciation (15,000 yrs. BP), sea level stood as much as 400 feet below its modern level (Daniel, 1981). Since that period the sea has risen to its present level, and continues to rise today.

The complex cycle of marine transgressions and regressions has produced differing effects upon the topography of the alternately exposed and submerged surfaces. Rising seas slowed stream erosion by raising stream base level, and planed off or obscured with silts and muds the previous surface features. Falling sea level in contrast exposed areas of the continental shelf and rejuvenated streams, increasing downcutting and topographic relief.

Concurrently with the recent period of rising sea levels, conditions favorable to peat formation have prevailed in Hyde County and throughout the North Carolina Coastal Plain, in a variety of vegetational and topographic situations. During

the past 10,000 years, peat has been forming in blocked drainages, Carolina bays and river floodplains; under swamp forests, pocosins and marshes (Otte, 1981). Of these, however, only floodplain and coastal marsh peats appear to be caused by or directly related to sea level rise and position. Interior Hyde County peats are not a direct result of sea level rise (Otte, 1981).

Peat has filled many of the topographic lows which were developed on the pre-peat Pamlico surface during the full-glacial lower stand of the sea, and peat deposits have spread beyond the original lows to mantle adjacent uplands. In the Dismal Swamp Oaks and Whitehead (1979) have intensively examined the topography at the base of the peat deposits, and find that a dendritic pattern of stream drainage was present before peat formation began. Detailed exploration of the sub-peat "topography" has not been conducted in Hyde County, but extensive sampling of peat depths, in conjunction with surveys of energy-grade peat deposits, indicates the presence of a sub-peat system of stream channels similar to that in the Dismal Swamp (Ingram and Otte, 1982; Plate I). The regional trend of these peat-filled channels is from northwest to southeast. Stream channel peats are the norm in the vicinity of the Alligator River.

THE VEGETATION

Much of mainland Hyde County is comprised of a diversity of wetland habitat types, under the criteria established by Cowardin, et al. (1979). Uncleared areas of the county, almost without exception, support hydrophytic vegetation, and soils of the county, whether drained or undrained, are predominantly hydric (90 percent or more; SCS, 1973). Either of these attributes is sufficient to indicate the presence of wetlands. As in most counties of North Carolina's lower Coastal Plain, large areas of wetland soils and vegetation have been cleared and put into agricultural production. This land use was concentrated on wet mineral soils throughout much of the historical period of development, but recently large acreages of peat lands have been intensively developed.

Scattered areas of better-drained soils, primarily within the Myatt-Bladen and Weeksville-Pasquotank Soils Association, probably supported more mesic vegetation, but virtually all such sites have been cleared for many years.

The forests of Hyde County, particularly the softwood timber, have been exploited since the colonial period. Timber cutting and similar activities do not necessarily entail a permanent alteration of plant communities, however. Plant communities in the north and northeastern and south and southwestern areas

of the county have retained considerable integrity of composition in the face of repeated logging cycles - although with changes in the age class structure and increased presence of some species which are promoted by disturbance or by selective removal of their competitors. Recovery after logging is most complete in communities where extensive ditches have not been constructed. The vegetation of northeastern Hyde County in particular still exhibits a remarkable correlation with soil types, an observation which supports the conclusion that edaphic and related hydrologic and nutrient conditions still exert a controlling influence on the basic wetland communities of that part of the county.

Contemporary disturbances affecting the Hyde County vegetation include continued timber cutting, fire suppression, clearing of wetland vegetation and draining of wetland soils for agriculture, and potentially, peat mining. The now-common practice of extensive ditching in conjunction with timbering will shift wetland sites toward drier conditions and prevent the self-maintenance and recovery of the vegetation. This process is much further advanced and readily observable in the Dismal Swamp (cf. Meanley, 1979).

Modern fire control and suppression also contribute to vegetational changes. Fire is a natural and common force in the pocosin vegetation which dominates the south-central and northeast parts of the county. Fire/vegetation relationships cannot be adequately expressed solely in terms of fire presence or fire absence, however. Where fire occurs, as in Hyde County pocosins, its influence on vegetation will be in large measure a function of its frequency. Although large wildfires continue to occur, fire frequency is being reduced over much of the county, purposely through fire control and incidentally through creation of cleared areas which act as firebreaks.

Long term land-use commitments such as agricultural development obviously require an effectively permanent alteration of the ecosystem, including both biotic and abiotic components. Recent, ongoing and proposed land conversion on the Hyde mainland totals many thousands of acres. Peat mining is the ultimate consumptive use proposed thus far for mainland Hyde County, in which the soil itself is removed from the site and used to produce energy. Peat mining is proposed in various areas near the Hyde/Dare County line.

OUTLINE OF PRINCIPAL VEGETATION TYPES IN MAINLAND HYDE COUNTY

I. Aquatic Communities - submerged and floating aquatic plants are found in numerous areas of Hyde County, and in habitats ranging from fresh to brackish water. Primary localities include the Alligator River shoreline, Pamlico Sound and its embayments, and extensive beds of aquatic species in Lake Mattamuskeet. Minor areas of aquatic vegetation are found in the small lakes in the northeastern part of the county, and in New Lake and Pungo Lake.

II. Wetland Communities

A. Brackish Marsh - very abundant in mainland Hyde County along the shoreline of Pamlico Sound. Vast expanses are located in Swanquarter National Wildlife Refuge.

B. Freshwater Marsh - naturally uncommon in the county; occurs in limited areas along the upper Alligator River, near the west end of Roper Island. The most extensive examples are in Lake Mattamuskeet.

C. Cypress-gum-cedar Swamp Forest (*Taxodium distichum*-*Nyssa sylvatica* var. *biflora*-*Chamaecyparis thyoides*) - One of the most extensive palustrine plant communities of Hyde County, although now reduced in area by timbering and land clearing. Primarily associated with the embayed portion of the Alligator River, with disturbed examples also occurring on Roper Island. These palustrine swamps are on deep peat soils apparently subject to sporadic flooding from adjacent waterways (Otte, 1981). Isolated cypress stands were noted in the vicinity of West Bluff Bay on the shore of Pamlico Sound. Riverine cypress stands are found along the Pungo River, which is now channelized.

D. Atlantic White Cedar - a seral sub-type within the preceeding community. Most monospecific stands resulted after logging opened sites suitable for seedling establishment. In Hyde County occurs principally on deep peats, perhaps where underlain by sand (Buell and Cain, 1943).

E. Pocosin - the most common general habitat in Hyde County. A fire-influenced group of communities, always occurring on peats or peaty sands, but with considerable variation in the vegetation in response to varying peat depth, hydrology and availability of nutrients to the system. Four types recognized by Otte (1981) are Pond Pine Forest, Pond Pine Woodland, High Pocosin and Low Pocosin; his criteria for these types are summarized in Table 2.

F. Mixed Hardwood Flats - this community consists primarily of oaks, including swamp chestnut oak (Quercus michauxii), laurel oak (Q. laurifolia) and cherrybark oak (Q. pagodaefolia). Loblolly pine (Pinus taeda) is usually a common component. Other hardwoods present in varying proportions, depending on site conditions, are tulip poplar (Liriodendron tulipifera), red maple (Acer rubrum), green ash (Fraxinus pennsylvanica), sweetgum (Liquidambar styraciflua) and shagbark hickory (Carya ovata). Beech (Fagus grandifolia) occurs at scattered, slightly better drained locales. Generally occupies flat "upland" areas of poorly drained, silty, clayey, or fine loamy soils (usually wet Ultisols).

Once an extensive community in Hyde County, Mixed Hardwood Flats are now severely reduced by agricultural clearing, logging and pine plantation development, and generally are one of the most threatened communities of the North Carolina Coastal Plain.

G. Seral Pine and Hardwoods - distributed throughout Hyde County are areas of second-growth sweetgum, loblolly pine and red maple, which have grown up on disturbed sites such as old fields, logged areas, etc. These successional communities vary widely in age and size, often being disturbed repeatedly. Only one, Salyer's Ridge, has attained natural significance. They occur predominantly on poorly drained mineral soils. The pre-disturbance vegetation of most of these sites is not known, but probably was dominated by the same hydric to mesic hardwood species associated with palustrine Mixed Hardwood Flats.

III. Terrestrial Communities - we located no true terrestrial plant communities in Hyde County. If significant examples existed historically, they were cleared at a very early stage in the development of the county. Possibly the western portion of the county originally supported terrestrial communities on what is now cleared agricultural land.

TABLE 1

SELECTED CHARACTERISTICS OF OTTE'S POCOSIN TYPES

(from Otte, 1981)

	low pocosin	high pocosin	pond pine woodland	pond pine forest
Soils	greater than four feet of peat	two to four feet of peat	one to two feet of peat	peaty sand to one or two feet of sandy peat
Hydroperiod	abundant surface water in wet season; saturated year-round except in severe drought	flooded in wet season; water table below surface but remains within organic layer in dry season	flooded or saturated in wet season but dropping to mineral layer in dry season	saturated in wet season; water table drops into mineral sediments in dry season
Shrubs	height is two to four feet on moss mats; four to six feet on hummocks; density of lower shrubs open; of taller shrubs closed	height is four to eight feet; tallest on hummocks; density is closed	height six to fifteen feet; shrub layer usually closed	height ten to twenty feet; generally closed
Pond Pines	height to ten feet; trees widely scattered, gnarled	height to 25 feet; widely scattered	up to 60 feet tall and 2 feet dbh; scattered, less than 50% cover	mostly less than 50 feet tall, dbh to 12 inches; canopy generally closed

Other vegetation and land use types in Hyde County include pine plantations, agricultural fields, abandoned fields and habitations, four major wildlife refuges, proposed peat mines, urban areas, and small expanses of impounded brackish marsh.

STUDY OBJECTIVES, METHODS AND RESULTS

Contract requirements called for identification and field inventory of natural areas in mainland Hyde County: the Outer Banks and offshore islands in the sounds were excluded from the study area. The field inventory was community-oriented; we concentrated on locating natural communities of exceptional quality, based on such factors as size and age of canopy species, biologic, edaphic and hydrologic diversity, extensiveness of habitat(s) and contiguity with other natural areas, absence of intensive disturbance and recovery from past disturbance and the presence of a full range of communities and ecological conditions functioning as a system.

To inventory the diverse communities of mainland Hyde County first necessitated a general county-wide reconnaissance. After review of several sets of aerial photographs, particularly November 1981 color infrared photography (US Environmental Protection Agency, 1982), an initial inspection of the county by vehicle and on foot was completed in April, 1982. Shortly later, an aerial reconnaissance of the entire county was conducted. Species and site reports on file with the North Carolina Natural Heritage Program were examined concurrently with these activities, and knowledgeable individuals were interviewed (see acknowledgements). A basic tentative list of potential study areas began to emerge early in the reconnaissance, and was finalized by early June.

During the reconnaissance period most of the private and public roads in the county were driven. Roads in most of the potential study areas identified during photography reviews were walked during April, and some areas were visited by boat later in the season. Throughout all periods of fieldwork, notes were taken on vegetation, both in study areas and, for comparative purposes, in areas not exhibiting superior natural qualities. Orthophotoquad diazo (blackline) prints were used in the field as guides in assessing the extent of large communities, the amount of recent disturbance and to some degree the cover composition of inaccessible stands.

Sites selected as representative of community types to be described in this report were examined on foot. Plant species lists, tree diameters at breast height, tree height and age estimates and a judgement of dominant species were all recorded. Examples we considered representative or superlative and on which we base our descriptions of the vegetation are mapped on the site report maps incorporated in the text.

We conducted an informal but complete survey of the breeding birds at most of the wooded and shrub-bog habitats upon which we report. We did not survey the avifauna of marsh habitats included as natural areas in this report. Other "high profile" vertebrates were noted where observed.

The seven natural areas we have identified are as follows (also see county map):

(1)	Alligator River Swamp Forest - Swan Lake	- 16,300 acres
(2)	Cypress Park	- 300 acres
(3)	Roper Island	- 9,500 acres
(4)	New Lake Fork Pocosin	- 9,300 acres
(5)	Gull Rock Game Lands	- 10,575 acres
(6)	Scranton Hardwoods	- 6,000 acres
(7)	Salyer's Ridge	- 80 acres

The candidates represent several edaphic and biotic combinations. Most of the areas selected have a long history of disturbance of the cover vegetation by human activity; but all are considered to be recovered from past disturbance and ecologically intact; i.e. not drained, having continued frequent fire in fire-adapted vegetation, etc. Most of the areas are large, in keeping with the expansive and still relatively unbroken character of the vegetation in the northern and southern peripheries of the county, but no natural area was chosen on the basis of so-called "wilderness values." All support some rare plant and/or animal species, but none was chosen based solely on the presence of these organisms. Typical questions we considered when examining a potential site were:

(1) Does the site have regional, state or county-wide significance as a natural area?

(2) Are there unusual habitat conditions present?

(3) Has the site recovered from or escaped prior disturbance?

(4) Is the site representative of a type of habitat which is rapidly being converted to other land uses?

(5) Would loss of the habitat constitute an irretrievable loss of resources to Hyde County?

The inventory results reflect a bias toward large areas of relatively undisturbed land. A chief limit inherent in the study is that it was too broad; more attention should have been focused on analysis of communities at specific locations. While such an approach would have satisfied the desire for technically complete community descriptions, it would have diverted us from our objective to present useful natural areas data in the context of the county and its land use patterns as a whole. We recognize that certain biologically significant areas - and significant features at identified sites - have gone unnoted and unreported by us. We wish to point out the following areas in need of further inventory:

(1) Brackish marshes in the upper portion of the Pungo River

(2) Swamp forest along New Lake Fork of the Alligator River

(3) Additional survey work in the New Lake Fork Pocosin

(4) further survey work on Roper Island

(5) Mesic hardwood flats east and southeast of New Holland

(6) additional survey work on low pocosin area of Gull Rock Game Lands

(7) aquatic and marsh communities around Lake Mattamuskeet

(8) further survey work in the wilderness portions of the Swanquarter National Wildlife Refuge

(9) further survey work in pond pine pocosins along the Dare County line.

(10) the "bird refuge" tract of the Swanquarter National Wildlife Refuge.

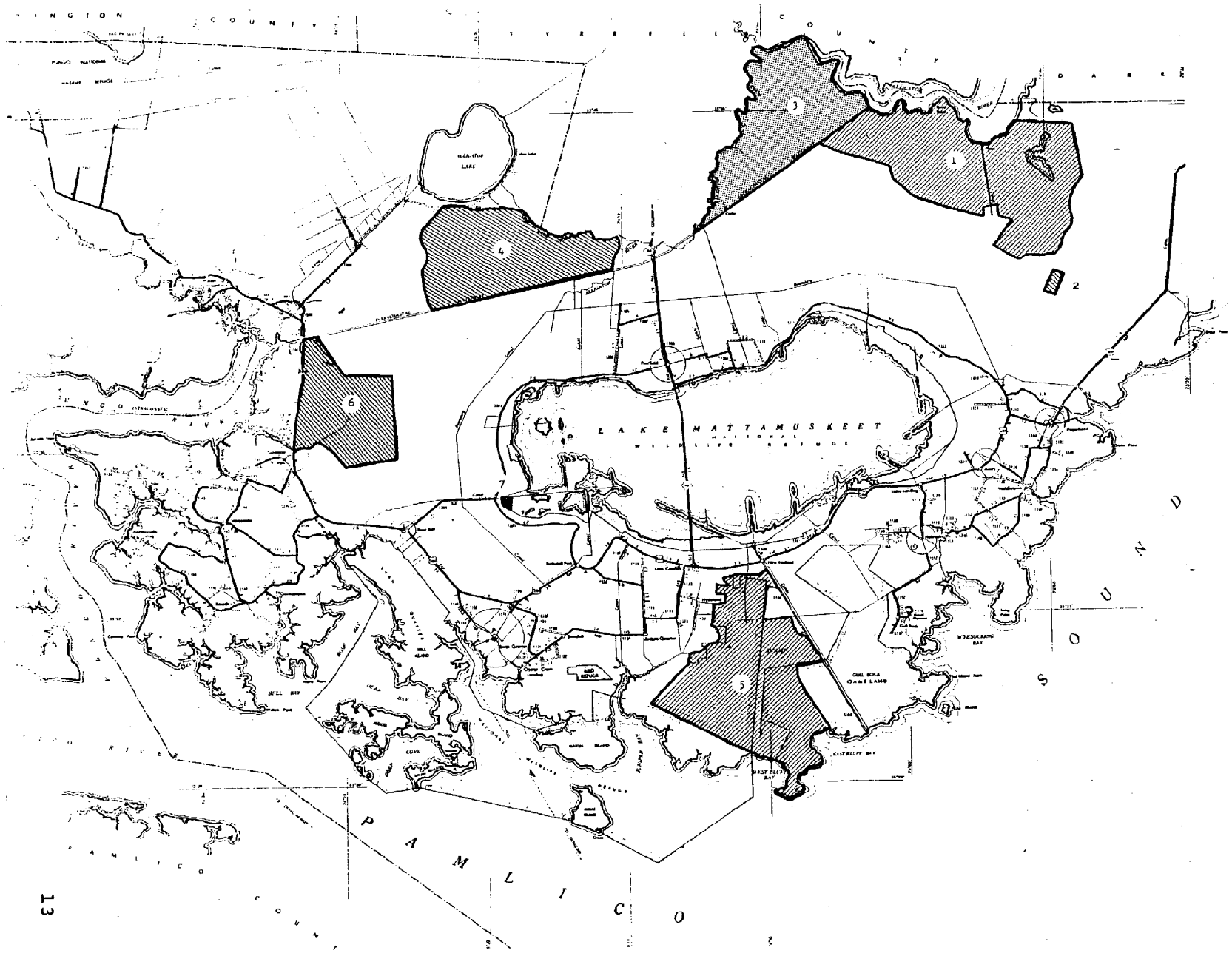


Figure 1.

NATURAL AREAS OF HYDE COUNTY

J. Merrill Lynch
S. Lance Peacock

1962

1. Alligator River - Swan Lake
2. Cypress Park
3. Roper Island
4. New Lake Fork Pocosin
5. Gull Rock Game Lands
6. Scranton Hardwoods
7. Salyer's Ridge

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Alligator River - Swan Lake Natural Area

2. County: Hyde

3. Location: Northeastern Hyde County; the area along the south side of the Alligator River between the Intracoastal Waterway on the west and the Swan Lake area on the east.

4. Topographic quadrangle(s): Fairfield NW (1974), Fairfield NE (1974), Engelhard West (1974), Engelhard East (1975), and Engelhard NW (1975).

5. Size: Approximately 16,300 acres (all private); measured with a grid calculator

6. Elevation: 0-5 feet msl

7. Access: Best access is from the south via First Street and 4th Avenue West. Several unnamed spur roads branch off of 4th Avenue West into portions of swamp interior.

8. Names of investigators:

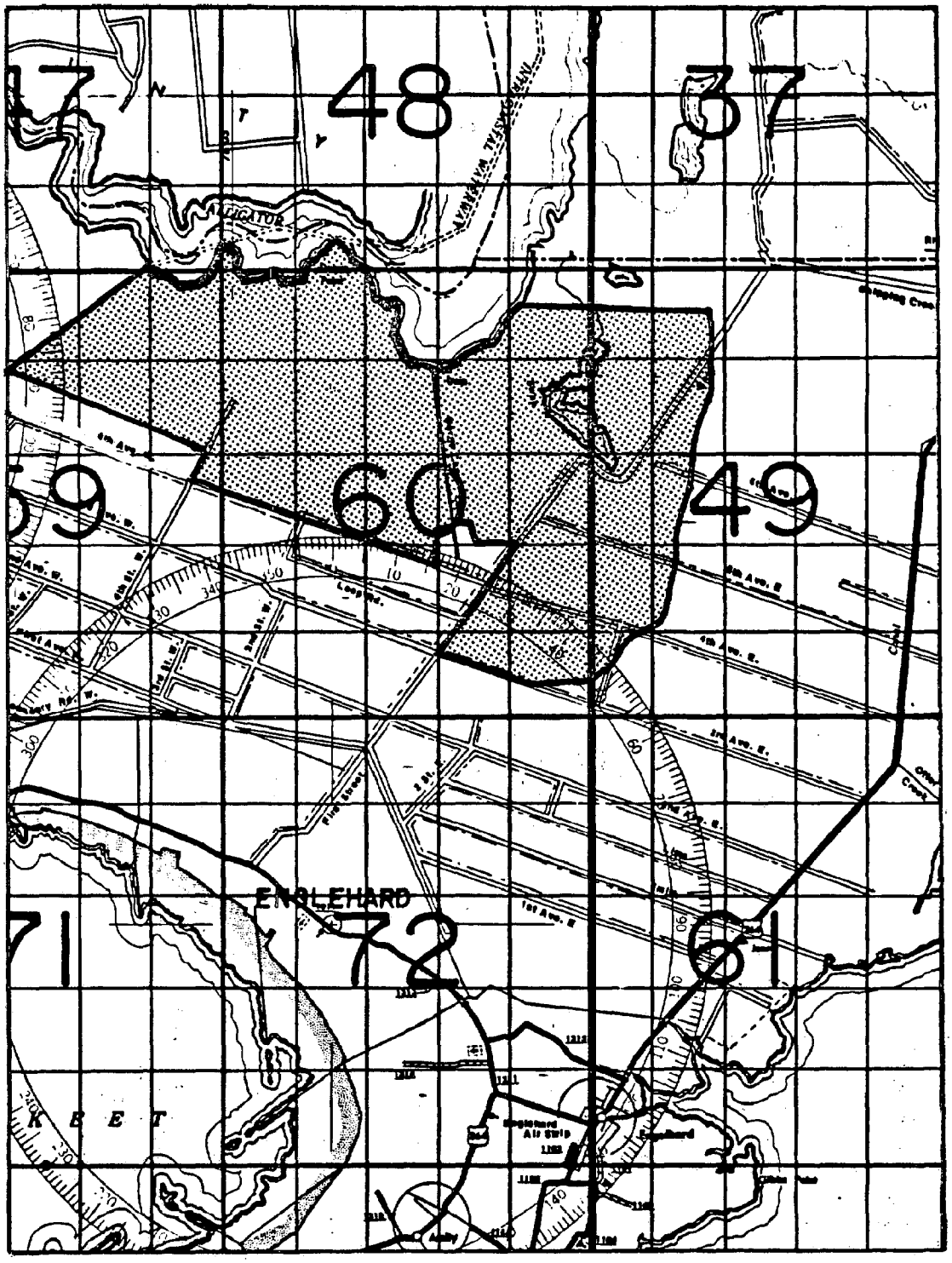
J. Merrill Lynch Route 2, Box 222-B Enfield, NC 27823	S. Lance Peacock P. O. Box 6006 Raleigh, NC 27628

9. Date(s) of investigation: April 8, May 9, June 30, August 12, 1982

10. Priority rating: High

Fig. 2. Access information:

ALLIGATOR RIVER - SWAN LAKE



11a. Prose Description of Natural Area

INTRODUCTION

The most extensive natural lands remaining in Hyde County are located along a corridor bordering the Alligator River in the northern portion of the county. These lands extend from the Dare County line (north of Swan Lake) westward to and including the large island known as Roper Island formed by the Intracoastal Waterway channel and the natural Alligator River channel. Because of the size of this area and the varying qualities of the natural vegetation types, the Alligator River corridor has been divided into two contiguous natural areas, Roper Island (see pp.) and the Alligator River Swamp Forest, the latter site which will be discussed in this site report.

The Alligator River Swamp Forest, encompassing about 16,300 acres, is bordered by Roper Island (Intracoastal Waterway) on the west and by Swan Lake on the east (see Fig.). The natural area exists as a corridor along the Alligator River and varies in width from about 1.5 miles to 3 miles, and has a length of about 7 miles. The southern boundary of the natural area lies adjacent to a huge superfarm development, part of a consortium of agricorporations, which extend south almost to the western end of Lake Mattamuskeet. This vast area, now mostly cleared and planted in corn and soybeans, was originally a pond pine pocosin wetland. The natural area corridor runs generally east-west except for the eastern end near Swan Lake where the Alligator River abruptly turns north and the natural area swings to the north-northeast where it intercepts the Dare County line. Swan Creek Lake, a natural freshwater lake, lies along Swan Creek, a poorly defined drainage tributary of the Alligator River. This tributary extends south beyond Swan Lake into cleared agricultural areas, part of the superfarm development mentioned above. A wooded buffer, dominated by swamp forest vegetation similar to the Alligator River corridor proper, extends as a strip ½ to 1 mile wide along this drainage for a distance of about 3 miles.

The Alligator River Swamp Forest Natural Area is very similar in terms of vegetation types, ecology, and soils to the Dare County portion of the swamp forest which lies just to the north of the site along the east bank of the Alligator River. The Dare County Natural Area is described in detail in "Natural Areas of the Dare County Peninsula," pp. .

The valuable timber resources of the swamp forests have been exploited periodically over the last two centuries by logging interests. As a result the natural area today is a mosaic of various age classes, i.e., selectively cut stands, recent clearcuts, and scattered old-growth stands, depending on the intensity and methods of past logging operations as well as the accessibility of the stands. Much of the natural area adjacent to the Alligator River is roadless, most of the timber apparently having been removed by long-abandoned tram and scid roads which are no longer visible. Access roads and ditches are primarily located along the margins of the natural area and were built for access to the adjacent agricultural fields. Land-clearing operations continue to eat away at the swamp forest corridor, particularly in the arm of the natural area south of Swan Lake. Recently, additional roads and ditches have been constructed into some of the pure Atlantic white cedar (*Chamaecyparis thyoides*) stands near Swan Lake, and some of these stands have been clearcut during the past ten years. The logging of swamp forest timber continues today.

Soils of the natural area are primarily deep Histosols. The area is mapped as the Dare-Pungo-Dorovan association: very poorly drained soils with thick to moderately thick organic surface layers over mineral subsurface layers (SCS 1973). Detailed soil mapping is not available for the site although the Alligator River swamp forests just to the north in Dare County have been mapped (Barnes, 1981). The Pungo soil series, classified as dysic, thermic Typic Medisaprists, is the most extensive soil unit, occurring as a wide band along the Alligator River.

VEGETATION

The predominant vegetation type along much of the Alligator River in Hyde County is swamp forest composed of four principal species which form the canopy in a mixture of varying proportions. In most of the stands no single species is a true dominant but rather the canopy is a heterogeneous mixture of species. Swamp blackgum (*Nyssa sylvatica* var. *biflora*) is the tree species which is most widely distributed and a conspicuous co-dominant in most of the stands. Based on canopy dominance data taken in a fairly typical stand south of Swan Creek Lake, swamp blackgum is the predicted co-dominant in most of the swamp forest stands in the natural area. The physiognomy of the mature swamp blackgum stands along the Alligator River is much different from that of stands along brownwater river systems, due to the significant

component of swamp and lowland conifers in the canopy and subcanopy layers and to the density of bay trees and other wetland shrubs in the shrub layers.

Atlantic white cedar or juniper (Chamaecyparis thyoides) and loblolly pine (Pinus taeda) join swamp blackgum in the canopy, and often can be considered a co-dominant gymnosperm component of the canopy. The distribution and relative dominance of these two species is much more variable than that of swamp blackgum. Atlantic white cedar particularly has a patchy distribution as a result of both selective and clearcutting operations in many parts of the natural area. In most stands it is a less important co-dominant; in others its dominance locally exceeds that of swamp blackgum. Throughout the natural area in the mature stands, Atlantic white cedar is a medium to large and beautiful tree with a shaggy conical top and long clear trunk. Some individuals reach 24 inches dbh. Loblolly pine is much more scattered in all stands investigated, but often attains comparable diameters and usually exceeds cedar and swamp blackgum in height. The fourth characteristic swamp forest tree is baldcypress (Taxodium distichum). This species is usually present as scattered old-growth, flat-topped, "cull" trees which are often 80-90 feet in height. These old-growth giants are almost invariably deformed specimens of low commercial value left behind from past logging operations. They are usually too scattered to be considered co-dominants in the community but because of their superior height and trunk diameters they are conspicuous members of the swamp forest landscape. The cypress of the natural area do not seen to regenerate readily after cutting. In most swamp forest stands cypress has importance values of 50% or less although in a few localized old-growth stands it is a true dominant, sharing the canopy with a few tall loblolly pines, under which swamp blackgum and Atlantic white cedar form a subcanopy layer.

In addition to the four principal tree species just discussed, several others reach the canopy but are of far less importance. Red maple (Acer rubrum) is locally dominant where cypress, cedar and swamp gum have been removed or thinned out by logging, but does not attain dominance in stands where the latter species have been less heavily cut or where fewer logging cycles have occurred. Pond pine (Pinus serotina) is occasional in the canopy, as are isolated large sweet bays (Magnolia virginiana).

Generally, the swamp forest subcanopy consists of smaller individuals of swamp blackgum and red maple, with an occasional sweet bay. This stratum is not well-developed, except as noted where bald cypress forms the true canopy. The shrub layers of the swamp forest are rather open and are generally occupied by one or two species. A tall shrub layer of red bay (Persea borbonia) is locally present, ranging in height from 15-20 feet. Sweet pepperbush (Clethra alnifolia) and fetterbush (Lyonia lucida) are usually the dominant low shrubs; bitter gallberry (Ilex glabra) and highbush blueberry (Vaccinium corymbosum) are scattered. Ground cover is absent except for sphagnum mats. The ground surface is wet, with shallow standing water present in local depressions during winter and spring. Cypress knees (to 2 feet tall) and many fallen logs add to the rough and hummocky surface pattern.

Two main community types are designated in the swamp forest portions of the natural area, based on the features summarized in the preceding discussion. Occupying most of the swamp forest sites is a community consisting of Nyssa sylvatica var. biflora-mixed lowland conifers/Persea borbonia/Clethra alnifolia-Lyonia lucida (Swamp black gum-mixed lowland conifers/Red bay/Sweet pepperbush-fetterbush; CT 1); bald cypress is usually present but reduced in importance due to past cutting. The second community type occurs where bald cypress is still dominant: Taxodium distichum/Nyssa sylvatica var. biflora-mixed lowland conifers/Persea borbonia/Clethra alnifolia-Lyonia lucida (Bald cypress/Swamp black gum-mixed lowland conifers/Red bay/Sweet pepperbush-fetterbush; CT 2). Both these community types are correlated with the Pungo soil series which is the predominant soil mapping unit in the Alligator River natural area.

The average height and trunk diameters of these two community types varies considerably within the natural area. Generally the swamp blackgum-mixed conifer (CT 1) stands range from 60-75 feet in height and have average dbh values of 12-18 inches. Scattered trees of 24 inches dbh and higher are usually present. The baldcypress dominated stands are usually taller (75-90 feet) and have average dbh values of 14-20 inches, sometimes more. Atlantic white cedar is widely distributed throughout the natural area and is found in two distinct physiognomic forms. Over much of the area is occurs as scattered medium to old-growth trees either in the subcanopy or canopy layers. It may reach 25%-50% relative dominance on these sites. In some areas it occurs as a distinct even-age monospecific community (Chamaecyparis thyoides/mixed shrubs (Atlantic white cedar/mixed shrubs; CT 3),

usually in relatively young age classes. In these situations the white cedar forms dense, uniform-height stands excluding most other species except for bay and pocosin shrubs which usually form a rather sparse low shrub layer. These stands range in height from 15 feet up to 35-40 feet with the older stands having a more diverse mixture of other swamp forest canopy trees.

The shrub layer is moderately well developed in this community, but not extremely dense or diverse. Typical species include sweet pepperbush, highbush blueberry and sweet gallberry. Herbs are scarce; some partridgeberry (Mitchella repens) and netted chain fern (Woodwardia areolata) are usually found.

These monospecific stands develop after fire or clear-cutting, when open, sunny conditions promote germination and subsequent rapid growth of seedlings. Within the natural area are several stands ranging from several acres to over 200 acres in size almost all of which are located within the swamp blackgum-mixed conifer dominated communities.

A fourth and very different community is a series of pond pine stands located in the western and northeastern corners of the natural area. The most extensive area is located east and northeast of Swan Creek Lake and extends into Dare County. This portion was examined only during a brief aerial reconnaissance. The western section is located along 4th Avenue West near the margin of large agricultural fields adjacent to the southern boundary of the natural area.

The community type in closely-examined stands is Pinus serotina/Acer rubrum-Persea borbonia/mixed shrubs (Pond pine/Red maple-red bay/mixed shrubs; CT 4). The canopy size classes are varied in this community but most of the stands are mature ranging to old-growth. The largest pines seen are along 4th Avenue West on a 700-acre stand (see map). Here the average dbh is 12-14 inches, height about 70 feet and the canopy is open. The subcanopy in this stand is poorly defined; red maple is present but not dominant, and a few pockets of swamp black gum occur locally. Associated with the latter are scattered bald cypress which join pond pine in the canopy. A distinctly lower tall-shrub stratum is composed of red bay and lesser amounts of small red maples. The lowest shrubs present include fetterbush and bitter gallberry beneath the red bay layer; some cane (Arundinaria gigantea) also occupies this lowest layer. These species do not form a dense growth and the ground is fairly open within the stand.

The community along 4th Avenue West is the best-quality pond pine stand in the Alligator River natural area in terms of a mature stand of well-developed large trees.

The pond pine stands near Swan Creek Lake (about 4300 acres) appear to be very similar to the 4th Avenue West stand in composition, but without equivalent size and height in the canopy. These stands are excellent examples of Otte's (1981) pond pine forest pocosin type, although considerably more open than is called for by his classification, perhaps due to fire and/or logging history. The canopy is open ranging to scattered; trees are 40-50 feet tall and 8-12 inches dbh. The tall shrub layer is again distinctly below the canopy, and is comprised of red bay and red maple. Cane is locally dense; the low shrubs occurring at the 4th Avenue West site are present here also. These stands are not burned regularly.

The pond pine stands are associated with soils of the Roper series (mineral with a histic epipedon) and Ponzer, Belhaven and Kilkenny series (shallow Histosols). These represent the shallowest organic deposits in the Alligator River natural area.

ECOLOGY OF CYPRESS-GUM AND CEDAR STANDS

The swamp forests along the Alligator River are non-alluvial in the sense that the Alligator is an estuary or embayed stream, not heavily loaded with sediment from the upstream parts of the Alligator River system, or frequently experiencing high overbank flows. These swamp forest communities correlate closely with deep Histosols of the Pungo series (see Barnes, 1981), although certain of the dominant tree species are common associates on mineral alluvium and floodplain peats along brownwater coastal plain rivers. Furthermore, the Pungo series and similar deep peats are dominated by pocosin vegetation in other parts of Hyde County and elsewhere. Although the Hyde County swamp forests are physiognomically and hydrologically distinct from those of the river floodplains, they appear to be much more closely related to the distant river swamps than to the nearby pocosins. The question arises as to what ecological influences are controlling the development of the swamp forests of the Alligator River, and conversely, what factors prevent pocosin development.

Otte (1981), in addressing the problem of transitional development from swamp forest to pocosin vegetation, states that neither peat thickness nor fire can be considered sufficient to control pocosin development. He points out that many thick peats, including those in the Alligator River natural area, are vegetated by swamp forest. He also notes

that fire has historically occurred in such vegetation without a subsequent pocosin development, as indicated by charcoal layers sandwiched within forest peat profiles. Otte reports that water flow patterns are the major difference between swamp forest sites and pocosin sites.

> In swamp forests the water flows primarily into and through the system, whereas, in pocosins the major direction of flow is out of the system. Thus, for pocosins, the only major source of water is precipitation, whereas for swamp forests, besides precipitation, a large amount of water comes in from the surrounding higher ground [or adjacent through-flowing streams] (Otte, 1981).

Daniel (1981), discussing flow sources and relationships in peatlands, makes supporting observations of the correlation between vegetation types and the predominant direction and source of water movements. He links the swamp forest vegetation type directly with relatively nutrient-rich groundwater, stream and surface flows into peatlands which are topographically situated to receive such flows; while interstream peatlands elevated above the surrounding terrain receive water only from nutrient-poor precipitation. Otte (pers. comm., 1982), based on field surveys and laboratory peat analyses conducted on the Alligator River peat deposits, feels that the swamp forests occupy locations which are and have been subject to flooding by sediment-laden waters backing up the Alligator River during major flooding events in the Albemarle Sound/Roanoke River system, with the resulting sediment and nutrient input maintaining the swamp forest system as predicted by his and Daniel's hypothesis. Otte's data demonstrate that the mineral content in peat is greatest close to the river, an expected pattern if river flooding provides sediment to the system. The topographic arrangement of the Hyde County peatlands is consistent with Otte's view. Many of the thick peat deposits are not domed, but instead are associated with the Alligator River and its tributaries (Otte and Ingram, 1980); Ingram and Otte, 1982); where they are theoretically exposed to flooding from the river.

One question which may be asked is whether the Alligator River swamp forests might be correctly considered alluvial in light of Otte's convincing argument that flood-transported sediment so strongly influences the vegetation. An additional point of interest is whether the land-clearing activities of man have in the past three centuries tended to favor swamp forests locally on peats by increasing stream sediment loads

and thus nutrient influx. Otte (pers. comm., 1982), without proposing an answer to this elusive problem, has noted an increased mineral content in the extreme upper layer of peats he has sampled which may be subject to flooding; and he attributes this to such human activity. At the same time the direct effect of logging and clearing for agriculture has been to reduce the extent of the swamp forest community throughout the peatlands of North Carolina (Ashe and Pinchot, 1897; Kologiski, 1977; Christensen, et al. 1981; Daniel, 1981).

OTHER FEATURES

A geomorphological feature of interest is Swan Creek Lake (400 acres; see map). This blackwater lake represents a type which is characteristic of small tributaries to the Alligator River in Hyde and Dare Counties. These small lakes are irregular in shape but often elongate on a north-south axis, and usually appear to have been formed by local widening along pre-existing stream systems. Long reaches of the original narrow channel are often present upstream and downstream from a given lake, as is the case with Swan Creek Lake. These lakes are of uncertain origin, but may be deep peat burns which have been shaped by wave and current action.

WILDLIFE AND AVIAN DIVERSITY

Wildlife values through the Alligator River natural area are superior. Black bear sign (tracks, scat, clawed trees) were common along all roads throughout the site. Although no attempt is made here to interpret the highly visible sign of this large and mobile animal in terms of relative or absolute abundance, the species is evidently using all habitats in the natural area. White-tailed deer are common at least in association with roads. Raccoon, marsh rabbit and gray squirrel are fairly common.

Breeding bird diversity is exceptional in the natural area, due both to the diverse habitats present and to the structural diversity of the swamp forests in particular. The wood warblers are especially well-represented, with 10 species breeding in the swamp forest communities proper, where certain species are exceptionally abundant (see Table 1).

The black-throated green warbler, while found in much younger vegetation elsewhere in Hyde County, occurs in its greatest densities in mature swamp forests where conifers such as bald cypress, Atlantic white cedar and loblolly pine are an important component of the canopy; this warbler is also common in pure white cedar stands. It is a very local breeder in the Coastal Plain of North Carolina (Parnell, 1977).

Two other generally uncommon to rare nesting species in the Coastal Plain are Swainson's and worm-eating warblers (Potter, et al., 1980); both are fairly common throughout the swamp forests of the Alligator River natural area. Swainson's warbler prefers shrub thickets, often sweet pepperbush (Clethra alnifolia), within mature swamp forest stands having a closed canopy; it was not recorded in pure white cedar stands. Worm-eating warblers are less habitat-specific, occurring in mature swamp growth, pure cedar stands and second-growth scrub.

Our Hyde County observations on habitat and relative abundance during the 1982 breeding season agree closely with Meanley's (1979) conclusions based on field work during eight consecutive breeding seasons from 1966 to 1973 in similar habitats in the Dismal Swamp, centered about 70 miles to the northwest. Meanley notes the abundance of the black-throated green warbler in the Dismal Swamp. He also points out the scarcity of Kentucky warblers (three in eight seasons) and black-and-white warblers; we found none of either species during the nesting season. In his study area he found Swainson's warbler slightly more common than we did in Hyde, but considered the worm-eating warbler a notably rare breeder, whereas it is fairly common in the natural area.

11b. Prose Description of Site Significance:

The qualities of extent, development and maturity which make the stands attractive to various timber companies are the same qualities which impart significance to the Alligator River swamp forests as a natural area. Although subjected to steady and continuing cutting in recent decades, significant amounts of these swamp forests remain as excellent examples of a vegetation type which has been exploited since the early colonial period. The mature swamp forests of southern Dare County also offer an exceptional opportunity for research into the ecological factors controlling the vegetation over peats in the southeast. Together with adjacent wetlands to the north, these swamp forests provide an uninterrupted corridor along the Alligator River from Roper Island to the Dare County line and on into Dare County itself.

The southern swamp forest fauna is well-represented in the natural area. Black bear occur throughout, and the available habitat is extensive enough to maintain a population. The avifaunal component particularly is intact and notably diverse, in keeping with the structural diversity of the swamp forest itself. Approximately 40 breeding bird species are known to date from the swamp forests proper, including 10 wood warblers.

Two less extensive vegetation types within the described area add to the overall diversity and have significant features in their own right. The monospecific Atlantic white cedar stands, actually part of the general swamp forest system, support many of the same breeding birds discussed above. The pond pine stands in places attain canopy tree sizes of note.

Also, of geomorphological interest, is the 400-acre Swan Creek Lake, a blackwater lake which supports a small American Alligator population and is an undisturbed example of a natural lake type limited to deep peat areas of Hyde and Dare Counties.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Nyssa sylvatica var. biflora-mixed lowland conifers/Persea borbonia/Clethra alnifolia-Lyonia lucida	The swamp forests of the Alligator River in Hyde County form, with contiguous stands in Dare County, the state's best remaining example of the palustrine swamp forest system which once was a predominant vegetation type over much of the eastern North Carolina peatlands. They are virtually the only example of significant areal extent. Although much impacted by centuries of logging activities, the natural area retains a significant amount of old-growth timber, superlative wildlife habitat (particularly for black bear), a wilderness aspect, and contiguity with swamp forest wetlands to the north in Dare County and to the west (Roper Island).
		Representative example of CT inventoried by authors	
High-quality wetland plant community	CT 2	Taxodium distichum/Nyssa sylvatica var. biflora-mixed lowland conifers/Persea borbonia/Clethra alnifolia-Lyonia lucida	See preceding comparative assessment; this CT is a less disturbed but much less extensive type within the same swamp forest system.
		Representative example inventoried by authors	

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 3	Chamaecyparis thyoides/mixed shrubs	Well-developed examples of a younger seral vegetation type
		Representative example surveyed by aerial reconnaissance	which contributes to the overall diversity of the natural
			area.
High-quality wetland plant community	CT 4	Pinus serotina/Acer rubrum-Persea borbonia/mixed shrubs	Good to excellent examples of pone pine forest and pond pine
		Representative example inventoried by authors	woodland (sensu Otte, 1981); contiguity with adjacent swamp
			forest communities contributes to the overall diversity of
			the natural area and enhances the diversity of wildlife
			habitat.
Endangered species	5	American Alligator	Federal and state endangered; a small but apparently reproducing population in Swan Creek Lake; near northern
			limits of species range.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Threatened species	Through-out	Red-shouldered Hawk	Listed as threatened in N.C. by Cooper, et al., 1977; sizable and vigorous population in excellent habitat.
Special concern species	Through-out	Black Bear	Listed as of Special Concern in N.C. by Cooper, et al., 1977; undetermined population but believed to be relatively high; habitat sufficiently extensive and remote for maintenance of long-term population.
Rare species	CT 1, CT 2, CT 3	Black-throated Green Warbler, Swainson's Warbler, Worm-eating Warbler	Species of wood warblers which are uncommon and locally distributed breeding birds in the N.C. coastal plain, primarily in forested wetland habitats associated with peat or peaty mineral soils. The swamp forest communities of the natural area have large populations of these species; the disjunct coastal plain population of the Black-throated Green Warbler occurs in numbers equalled only in the Great Dismal Swamp and the adjacent Dare County portion of the Alligator River swamp.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Avian Species Diversity	CT 1,2,3	Diverse assemblage of breeding birds	Approximately 40 species are known or are suspected of breeding in the swamp forest communities. This total includes 10 species of wood warblers and 5 species of woodpeckers. This represents an excellent total for a forested wetland ecosystem in the N.C. coastal plain.
Unusual geomorphological feature	5	Swan Creek Lake	Swan Creek Lake is located along the channel of Swan Creek. This lake and several other examples in the adjoining Dare County peninsula (Back Lake, Milltail Lake, Whipping Creek Lake) are dissimilar from most other natural coastal plain lakes, such as Phelps and Pungo, in being located along peat-filled stream channels rather than in topographically elevated portions of the landscape. These "stream channel" lakes may be the result of deep peat burns, although their origin is still uncertain. Swan Creek Lake is an excellent example of this rare geomorphological feature,

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
			both in terms of lack of disturbance and its wilder-
			ness character.

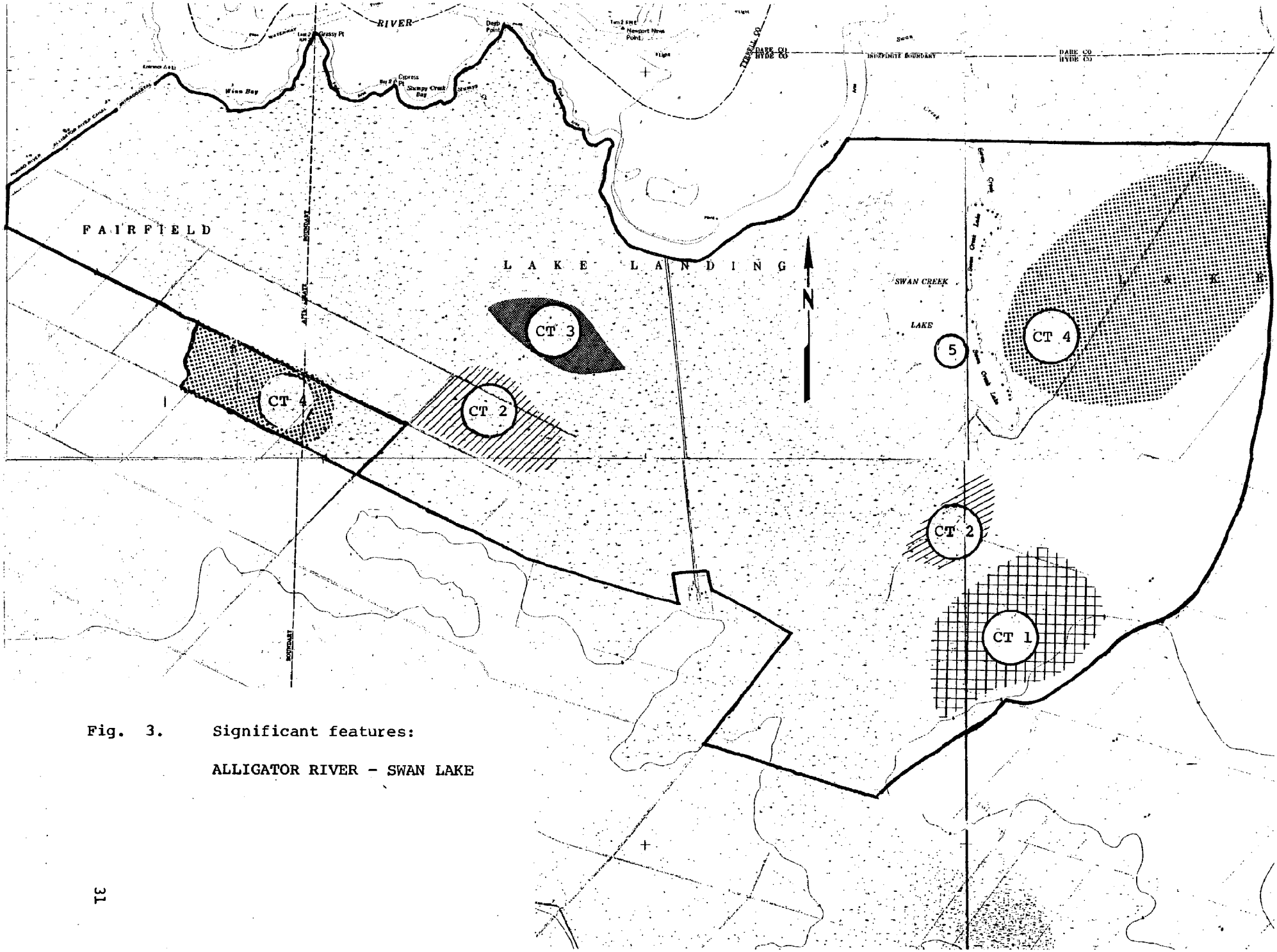


Fig. 3. Significant features:

ALLIGATOR RIVER - SWAN LAKE

Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	100 %
Public	%
Unknown	%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

Pamlico Properties, Inc., P. O. Box G, Macon, GA 31202

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

Steve Barnes ,agronomist

First Colony Farms

Route 1, Box 201

Creswell NC 27928

17. Attitude of owner or custodian toward preservation (contacted?):

Not known.

18. Uses of natural area:

Essentially all of the natural area has been logged over in several cycles to obtain the successively most valuable remaining or regenerated timber. Most of the timber was removed by a combination of barge and a system of tram roads. Recently, Atlantic white cedar stands have been clearcut, particularly in the Swan Creek drainage area. Other species which have been selectively logged are baldcypress, loblolly pine, and swamp blackgum.

Hunting is a low-intensity use throughout the area; deer and black bear are the principal game species. Bee yards are placed seasonally at scattered locations along the roads.

The inland margins of the natural area are steadily being cleared and drained for agricultural development. Portions along the southern margin have been ditched and a road system constructed although clearing of the vegetation has not yet begun. Peat mining for energy production is possible on these soils in the long term. Pamlico Properties, Inc. has recently applied for a permit to begin experimental peat mining within the natural area.

19. Uses of surrounding land:

a. Wildland 50 %
b. Agricultural land 50 %
c. high-intensity forestry _____ %
d. developed _____ %

20. Preservation Status:

Cat	* %	*Description of preservation status
6	100	private land, not protected as a natural area by owner

21. Regulatory protections in force:

The Army Corps of Engineers "404" permit regulations apply to this area. The Federal Endangered Species Act of 1973 protects the American Alligator and its habitat. These two sources of regulation are limited in scope and ultimate effect.

22. Threats:

Timber cutting is the chief threat to the natural integrity of the site in the short term. Additional land clearing associated with the "superfarm" development to the south continues to erode the margins of the natural area. Logging, per se, is not the primary cause of ecological degradation. It is the associated ditch and road construction which results in lowered water tables and in increasing accessibility of the swamp forest interior. Although the road construction increases the "edge effect" and benefits certain species, it also increases access and makes large game species, such as black bear, more susceptible to hunting pressure.

There is also a threat of peat mining in the area. Recently, a peat mining permit application has been submitted for much of the natural area. Otte and Ingram (1980) have found energy grade peat (less than 25% ash at 0% moisture) under much of the natural area. Agricultural development is limited as a threat to some degree because the woody peats are uneconomical to farm.

23. Management and Preservation Recommendation:

The Alligator River-Swan Creek Lake natural area offers an excellent opportunity for conservation of a superlative palustrine (non-riverine) swamp forest system. In conjunction with adjacent Dare County natural areas, the tract contains an extensive wetland ecosystem containing a diverse assemblage of communities and associated wildlife diversity. The Alligator River natural lands corridor is one of the largest relatively undisturbed swamp forest tracts remaining in the N.C. coastal plain. The U. S. Fish and Wildlife Service should look into the possibility of acquiring the land and establishing a national wildlife refuge unit.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: Nyssa sylvatica var. biflora-mixed lowland conifers/ Persea borbonia/Clethra alnifolia-Lyonia lucida

Community cover type: Nyssa sylvatica var. biflora-mixed lowland conifers

General habitat feature: palustrine swamp

Average canopy height: 60-75 feet

Estimated age of canopy trees: 50-75+ years

Canopy cover: partially open-closed

Estimated size of community: 9400 acres

Successional stage: near climax

Common canopy species in community cover or community type (but not dominant):

Nyssa sylvatica var. biflora
Chamaecyparis thyoides
Pinus taeda

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Acer rubrum
canopy species transgressives

Common herb stratum species in community cover or community type (but not dominant):

None.

Sphagnum sp. is abundant ground cover over much of area.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 2

Community type: Taxodium distichum/Nyssa sylvatica var. biflora-mixed lowland conifers/Persea borbonia/Clethra alnifolia-Lyonia lucida

Community cover type: Taxodium distichum

General habitat feature: palustrine swamp

Average canopy height: 75-90 feet

Estimated age of canopy trees: 75+ years

Canopy cover: open

Estimated size of community: 1000

Successional stage: Climax

Common canopy species in community cover or community type (but not dominant):

Pinus taeda

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Acer rubrum

Common herb stratum species in community cover or community type (but not dominant):

None

Sphagnum sp. is an abundant ground cover of much of the area.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 3

Community type: Chamaecyparis thyoides/mixed shrubs

Community cover type: Chamaecyparis thyoides

General habitat feature: palustrine swamp

Average canopy height: 30-40 feet

Estimated age of canopy trees: less than 50 years

Canopy cover: closed

Estimated size of community: 500

Successional stage: early-mid successional

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Acer rubrum	Clethra alnifolia
Persea borbonia	Vaccinium corymbosum
	Ilex coriacea

Common herb stratum species in community cover or community type (but not dominant):

None

Sphagnum sp. mats are usually present.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 4

Community type: Pinus serotina/Acer rubrum-Persea borbonia/mixed shrubs

Community cover type: Pinus serotina

General habitat feature: palustrine wetland

Average canopy height: 60-75 feet

Estimated age of canopy trees: 50-75 years

Canopy cover: Open

Estimated size of community: 5000 acres

Successional stage: near climax to climax (probably pyroclimax)

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Nyssa sylvatica var. biflora Ilex glabra
Lyonia lucida

Common herb stratum species in community cover or community type (but not dominant):

Arundinaria gigantea (locally dominant)

Vines: Smilax laurifolia

24b. Soil Summary (by community type) CT 1, 2, 3, 4

Soil series: Pungo

Soil classification: dysic, thermic Typic Medisaprists

Soil association: Dare-Pungo-Dorovan

pH class: Extremely acid (less than 4.5)

Source of information: General Soil Map of Hyde County, N.C., SCS, USDA, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1, 2, 3, 4

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh-acid

Water regime: Saturated

Drainage class: Very poorly drained

Drainage basin: Alligator River

Hydrology characterization: A very poorly drained, saturated, fresh-acid, interaqueous palustrine system.

24d. Topography Summary: CT 1, 2, 3, 4

Landform: Peat-mantled flat

Shelter: Open

Aspect: Not applicable

Slope Angle: Not applicable

Profile: Not applicable

Surface patterns: Hummocky; many fallen logs and uprooted trees; scattered numerous depressions

Position: Not applicable

25. Physiographic characterization of natural area:

An assemblage of early successional to climax communities occupying a very poorly drained, peat-mantled flat plain along the Alligator River and Swan Creek in the Coastal Plain Province of the Atlantic Plain.

Geological Formation:

Pleistocene Pamlico Terrace formation (less than 100,000 yrs. BP) overlying the Miocene Yorktown formation (15-25 my BP).

Geological Formation age:

See above.

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Society of America Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: American alligator

Species legal status and authority: Federally endangered Endangered Species Act of 1973

Number of populations on site: Unknown.

Number of individuals per population: Unknown.

Size or Maturity of individuals: probably all age classes

Phenology of population: not applicable

Eg: vegetative %
flowering %
fruiting %

General vigor of population: unknown-not observed by authors within natural area.

Disturbance or threats to population: Illegal trapping

Habitat characteristics

Plant community: aquatic communities in Swan Lake

Topography: n/a

Soil Series: n/a

Microclimate: n/a

Drainage basin: n/a

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Red-shouldered Hawk

Species legal status and authority: Threatened in North Carolina (Cooper et al., 1977)

Number of populations on site: Unknown, probably at least 2-3 nesting pairs

Number of individuals per population: 2 adults plus young of the year

Size or Maturity of individuals: adult and immatures

Phenology of population: not applicable

Eg: vegetative %
flowering %
fruiting %

General vigor of population: Excellent

Disturbance or threats to population: Clearcutting, conversion of swamp forest to agriculture

Habitat characteristics

Plant community: all of the swamp forest communities

Topography:

Soil Series:

Microclimate:

Drainage basin:

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Black Bear

Species legal status and authority: Of Special Concern in N.C. (Cooper et al., 1977)

Number of populations on site: one

Number of individuals per population: not known but believed to be significantly high

Size or Maturity of individuals: probably all ages

Phenology of population:

Eg: vegetative %
flowering %
fruiting %

General vigor of population: Not known but believed to be good. At least one bear was observed (near 4th Avenue West on 12 August) and numerous tracks and scat were seen throughout natural area.

Disturbance or threats to population: Illegal hunting, land clearing and conversion of swamp forest and pocosin habitats to agriculture.

Habitat characteristics

Plant community: Throughout

Topography: n/a

Soil Series: n/a

Microclimate: n/a

Drainage basin: n/a

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master species lists:

Alligator River Swamp Forest

ACERACEAE
  Acer rubrum
ANACARDIACEAE
  Rhus radicans
AQUIFOLIACEAE
  Ilex glabra
  I. coriacea
  I. opaca
BLECHNACEAE
  Woodwardia areolata
  W. virginica
CAPRIFOLIACEAE
  Viburnum nudum
CLETHRACEAE
  Clethra alnifolia
CUPRESSACEAE
  Chamaecyparis thyoides
CYPERACEAE
  Carex spp.
CYRILLACEAE
  Cyrilla racemiflora
ERICACEAE
  Leucothoe axillaris
  Lyonia lucida
  Vaccinium corymbosum
LAURACEAE
  Persea borbonia
LILIACEAE
  Smilax laurifolia
LOGANIACEAE
  Gelsemium sempervirens
LORANTHACEAE
  Phoradendron serotinum
MAGNOLIACEAE
  Magnolia virginiana
MYRICACEAE
  Myrica heterophylla
NYSSACEAE
  Nyssa sylvatica var. biflora
ORCHIDACEAE
  Tipularia discolor
PINACEAE
  Pinus taeda
  P. serotina

POACEAE
  Andropogon sp.
  Arundinaria gigantea
POLYPODIACEAE
  Polypodium polypodioides
TAXODIACEAE
  Taxodium distichum
THEACEAE
  Gordonia lasianthus
VITACEAE
  Parthenocissus quinquefolia

AMPHIBIANS

Green Frog
Southern Leopard Frog
Carpenter Frog

REPTILES

Canebrake Rattlesnake

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient; spring or fall
PV, SV, WV = Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Wood Duck	PR*
Great Blue Heron	PR
Green Heron	SR*
Red-tailed Hawk	PR*
Red-shouldered Hawk	PR*
Common Bobwhite	PR*
Ring-billed Gull	WV
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Screech Owl	PR*
Great Horned Owl	PR*
Barred Owl	PR*
Ruby-throated Hummingbird	SR*
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Great Crested Flycatcher	SR*
Barn Swallow	SV
Purple Martin	SV
Common Crow	PR*
Fish Crow	PV
Carolina Chickadee	PR*
Tufted Titmouse	PR*
Winter Wren	WR
Carolina Wren	PR*
Gray Catbird	PR*
Brown Thrasher	PR*
Wood Thrush	SR*
Hermit Thrush	WR

Blue-gray Gnatcatcher	SR*
Ruby-crowned Kinglet	WR
White-eyed Vireo	SR*, possibly winters
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Worm-eating Warbler	SR*
Northern Parula Warbler	SR*
Yellow-rumped Warbler	WR
Black-throated Green Warbler	SR*
Yellow-throated Warbler	SR*
Pine Warbler	PR*
Prairie Warbler	SR*
Common Yellowthroat	PR*
Hooded Warbler	SR*
Common Grackle	PV
Brown-headed Cowbird	PR*
Northern Cardinal	PR*
Indigo Bunting	SR*
Pine Siskin	WV
Rufous-sided Towhee	PR*
Swamp Sparrow	WR
Song Sparrow	WR

MAMMALS

Raccoon - many tracks, several seen
White-tailed Deer - abundant tracks, many seen
Eastern Gray Squirrel - commonly seen
Black Bear - many tracks and scat, at least one observed near 4th Avenue West
Bobcat - one set of tracks
Marsh Rabbit - tracks

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Cypress Park

2. County: Hyde

3. Location: In northeastern Hyde County about 4.3 air-miles north of Engelhard

4. Topographic quadrangle(s): Engelhard East (1975)
Engelhard West (1974)

5. Size: 300 acres (measured with a grid calculator)

6. Elevation: 4-5 feet mean sea level

7. Access: The natural area can be reached from one of several ways.
1) From the Town of Engelhard go north on US 264 for about 4.3 miles to junction with 2nd Avenue East on left, a private farm road. Turn left (west) and go about 2.8 miles through large cleared fields to block of swamp forest on right (north). Sign marks entrance to gated dirt road and trail which enters the natural area.
2) The site can also be reached by taking SR 1311 north from junction with US 264 about 2 miles west of Engelhard. Continue on SR 1311 about 4.5 miles to junction with private dirt road on right (1st Street) which provides access to Mattamuskeet and Lux Farms. Turn right on 1st Street and go north about 2.6 miles to junction with 2nd Avenue East. Turn right (east) on this road and go about 2.7 miles to Cypress Park entrance (on left).

8. Names of investigators:

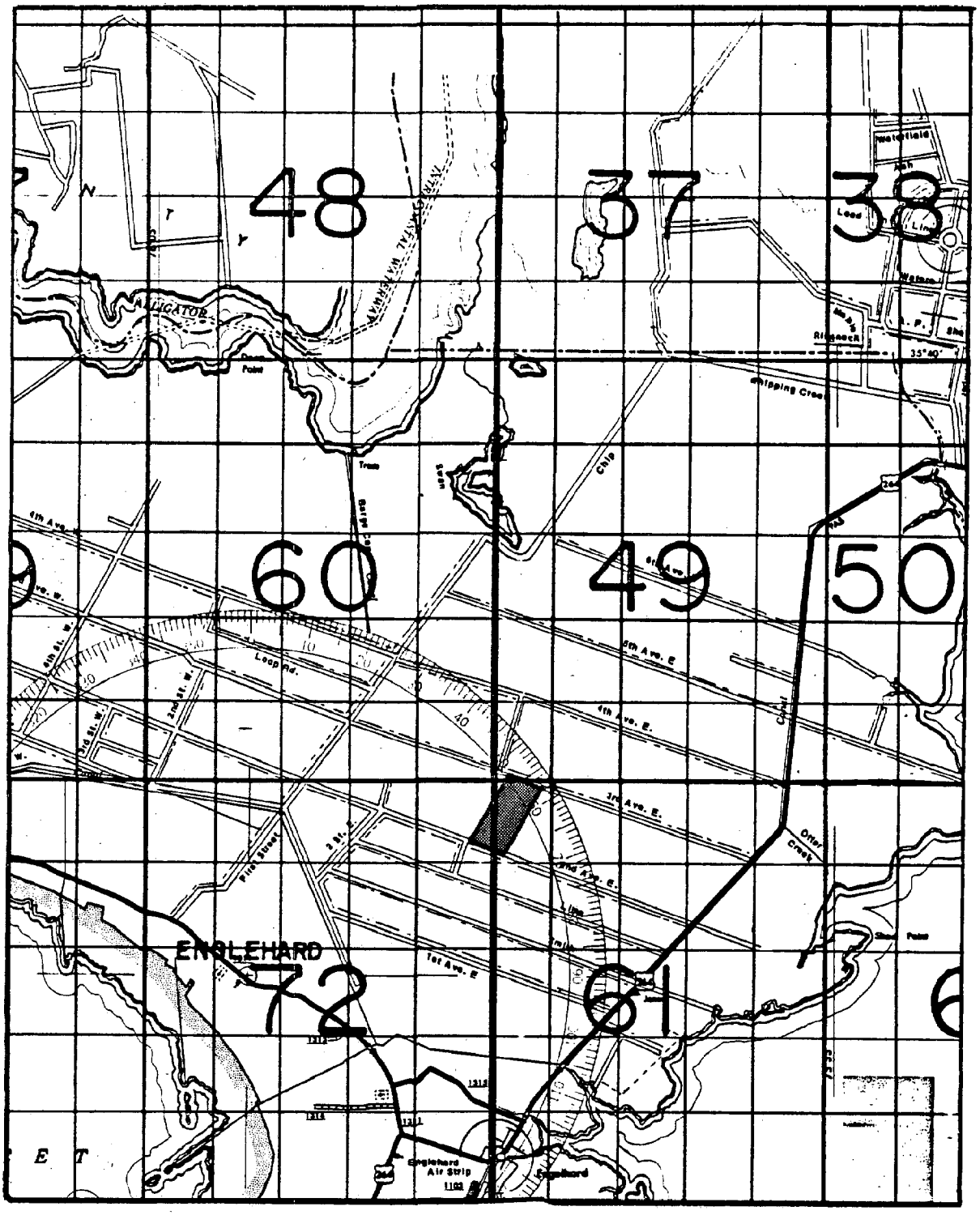
J. Merrill Lynch	S. Lance Peacock
Route 2, Box 222-B	P. O. Box 6006
Enfield, NC 27823	Raleigh, NC 27628

9. Dates of investigation: April 7, June 30, 1982

10. Priority rating: Medium

Fig. 4. Access information:

CYPRESS PARK



11a. Prose Description of Site:

Cypress Park is a 300-acre tract of old-growth swamp forest timber located in a very poorly drained, peat-dominated area northeast of Lake Mattamuskeet. The stand has been protected as a natural area for a number of years. It probably is the last remaining stand of virgin or near-virgin swamp forest remaining in Hyde County.

The topography of the natural area and the surrounding land is essentially flat. There is a poorly defined drainage system connected with Swan Creek Lake to the north which extends south to Cypress Park. This drainage corridor is about 1-1.5 miles wide and is slightly lower (4-5 feet msl) in elevation than the surrounding flat landscape (5-7 feet msl). Before the advent of drainage canals and ditches, natural flow was probably from Cypress Park north along the drainage corridor to Swan Creek then into Swan Creek Lake and eventually the Alligator River. Storm flooding from the Alligator River probably inundated the natural area on rare occasions. Today, a well-intregrated network of parallel drainage canals connected by a series of lateral ditches has been constructed which completely surrounds the natural area. This drainage network has significantly altered the natural hydrology of the natural area by diverting runoff into adjacent Pamlico Sound and by lowering the water table by several feet. This drainage system, accompanied by large-scale land clearing for row crop agriculture, has effectively isolated the Cypress Park natural area from the drainage corridor. The long-term effects of this development on the vegetation community is probably substantial and will be discussed later in this section.

The vegetation of Cypress Park is dominated by an old-growth stand of baldcypress (Taxodium distichum). The community type is Taxodium distichum/Acer rubrum/Persea borbonia (baldcypress/red maple/redbay; CT 1). This community is characterized by a tall, open to partially closed canopy of baldcypress 80-90 feet tall over a subcanopy of red maple and a tall shrub layer of redbay. There is no well-defined low shrub layer although redbay transgressives and seedlings are common throughout. The ground cover is sparse except for scattered patches of Virginia chain-fern (Woodwardia virginica), poison-ivy (Rhus radicans), and yellow jessamine (Gelsemium sempervirens), the latter species locally abundant in openings.

Although there are occasional canopy specimens of swamp blackgum (Nyssa sylvatica var. biflora) scattered throughout, the overwhelmingly dominant tree is baldcypress. This is an

old-age stand with average dbh's of about 33 inches with some trees reaching 53 inches dbh. The cypress have characteristic flat-topped crowns but do not have very enlarged buttresses, a trait which has been observed elsewhere in the Alligator River palustrine wetlands of Hyde and Dare Counties. Evidence of fire is apparent throughout the tract; almost all of the canopy trees have burn scars on their lower trunks. These scars do not appear to be very recent however, and it is likely that the isolation of the tract by the adjacent land clearing has prevented recent fires and will continue to act as a fire buffer in the future.

The average trunk diameter and the canopy height of the cypress are strikingly uniform, suggesting that the trees are all about the same age. Equally striking is the absence of cypress transgressives or seedlings in the stand, indicating that the species is not reproducing itself. Other similar mature cypress stands in the Alligator River region exhibit this apparent lack of successful reproduction. The species needs abundant sunlight and a moist but not inundated seedbed for successful germination. Young seedlings cannot tolerate extended flooding or fire (Fowells, 1965). Conditions which would prepare an ideal seedbed for cypress regeneration probably would include an extended drought accompanied by an intense crown fire which would kill the existing overshadowing vegetation. Catastrophic events such as these probably occurred rarely during pre-settlement times. Once the cypress reached sufficient height they were probably able to withstand all but the most intense wildfires, as evidenced by the abundant burn marks on the still living trees within the tract.

The stand appears to be slowly changing due to the attrition of the standing cypress. Many old but still standing dead trees are scattered throughout and many fallen logs litter the ground. Interestingly, the sizeable gaps left by the fallen giants are not being occupied by other smaller cypress. As mentioned before there are no younger cypress present to replace them. Red maple, red bay, and an occasional sweetgum (Liquidambar styraciflua) are quick to assume dominance within these open spots in the canopy.

The drainage of the region for agricultural development began in the 1960's and is continuing at the present time. There is now cleared land containing row crops on three sides of the natural area and additional swamp forest and pocosin wetlands are being drained and cleared. Although difficult to quantitatively document, this large-scale regional drainage has undoubtedly had a profound effect on the natural area. There are several visible signs of disturbance. Cypress "knees" up to about one foot tall are scattered throughout the natural area. These modified roots indicate that, at

least formerly, the seasonal high water table ranged up to about the one foot depth over much of the site. Today, the upper layers of the organic soils covering the area remain dried out throughout much of the year. These generally drier conditions are coupled with an absence of fire provided by the buffering effect of nearby fields. Sweetgum, a typical "weed" tree which often invades heavily cut-over or drained swamps, is now present within the natural area. It is not known to occur in undrained palustrine swamp forests in other areas of the Alligator River corridor. Probably this species is a recent "invader" on the site. It is also a competitor with cypress, and because of its less exacting germination requirements and fast-growth, it will likely increase as the cypress gradually die out from natural diseases and other causes.

The prognosis for the natural area is not a good one. Currently the site represents an excellent example of a climax swamp forest palustrine wetland, and is probably the nearest thing to virgin timber remaining in Hyde County. It is a stand which is probably representative of the original Alligator River swamp forests of Hyde and Dare Counties before the advent of extensive logging operations. However, in a long-term sense the stand is dying. In a large, unaltered and undrained wetland system a stand such as this might be expected to continue indefinitely, if natural wildfires and other natural conditions were allowed to exist. The present situation is far from natural conditions. As already mentioned, the stand has been almost completely isolated by adjacent land clearing operations. The natural hydrological patterns have been altered. The stand now is even acting as a wind-borne sediment trap. Large amounts of fine-grained peat and silt particles collect on the leaves of the vegetation, blown in from adjacent fields.

Because of these man-induced conditions which appear to be permanent and probably intensifying in the future, the natural area is not given a high priority for protection, although it is still considered a significant remnant example of a swamp forest wetland.

The soils within the natural area are mapped as the Dare-Pungo-Dorovan association, very poorly drained soils with thick to moderately thick organic surface layers which range from 51 to over 91 inches in depth (SCS, 1973). Soil Series designation for the natural area proper has not been made but it is likely to be Pungo, classified as dysic, thermic Typic Medisaprists (based on soil mapping data from adjacent Dare County; Barnes, 1981). These deep peat soils are prominant throughout much of the Alligator River corridor in Hyde, Dare, and Tyrrell Counties.

The wildlife values of the tract are high. The numerous cavities supplied by the old-growth cypress provide important denning and nesting sites for mammals and many species of cavity-nesting birds. Black bears use the area as evidenced by common scratch marks on the cypress trunks and by scat deposits. Other common game mammals include eastern gray squirrel and white-tailed deer. The tract plays an increasingly important role as escape cover and refuge for many wildlife species as more acreage is continually cleared for agriculture. The tract is presently connected via a disturbed but still wooded buffer strip to the Alligator River Swamp Forest natural area. Because of its small size (300 acres), its significance as wildlife habitat will decline markedly if it is severed from the nearby natural area. Unfortunately, it appears likely that the adjacent connecting corridor will soon be converted to agriculture.

11b. Prose Description of Site Significance:

The Cypress Park natural area contains probably the last remaining, near-virgin stand of baldcypress in Hyde County. Although other mature, old-growth stands exist in the Alligator River swamp forest, none are known which approach the trunk diameters and overall size of the trees in Cypress Park. The stand (structurally and compositionally) probably most closely approximates the original presettlement palustrine swamp forest wetlands along the Alligator River corridor.

The site, when combined with the much larger Alligator River Swamp Forest natural area to the north, contains significant habitat for a number of game and non-game wildlife species, notably black bear.

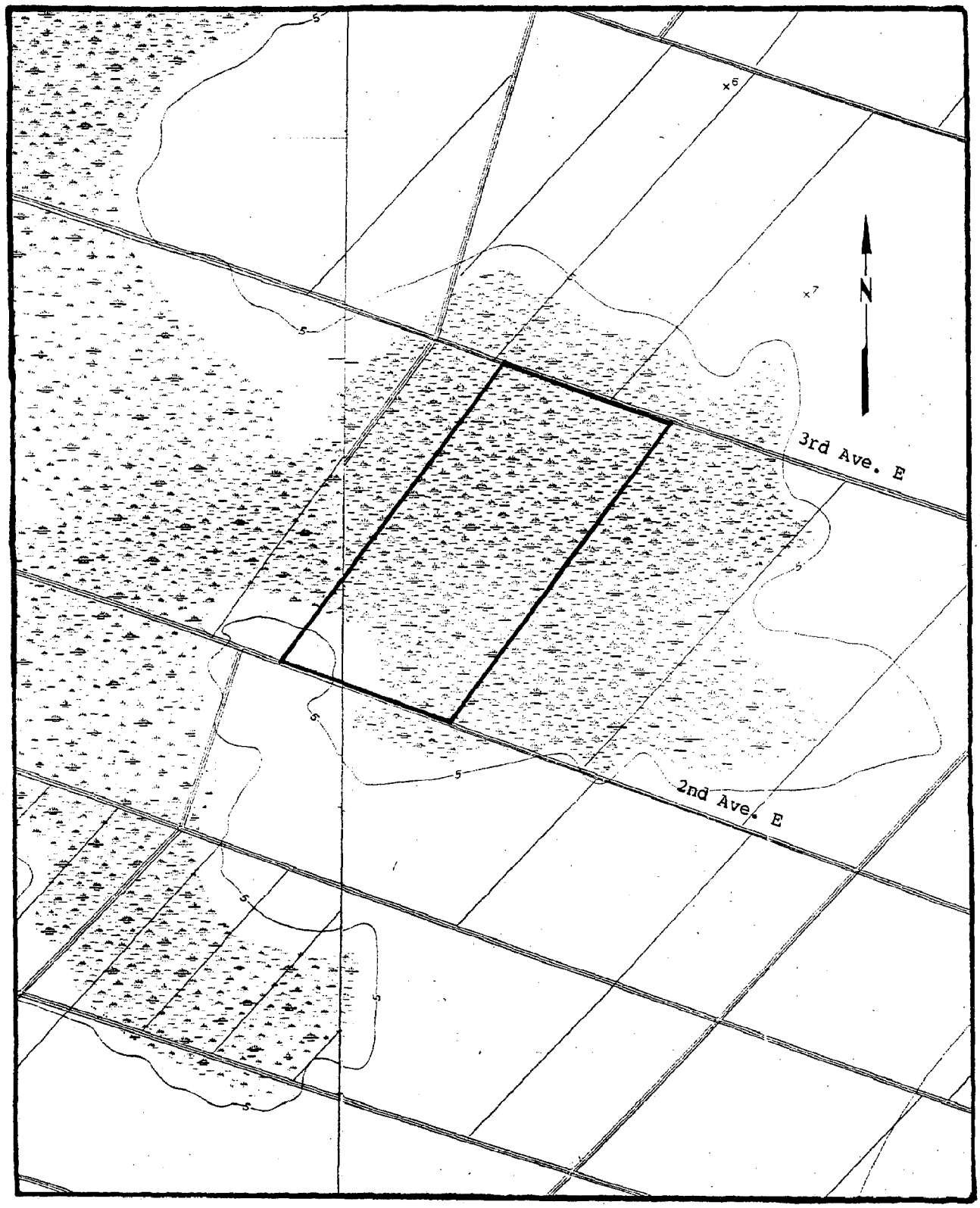
12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Taxodium distichum/Acer rubrum/Persea borbonia	Excellent example of a climax, near-virgin swamp forest stand, dominated by very old-growth baldcypress; although recently disturbed by nearly drainage projects the stand still is one of the best remaining relictual examples of swamp forest timber once commonly associated with peat-dominated palustrine wetland systems in the N.C. coastal plain.
Special Concern species	CT 1	Black bear	Listed as of Special Concern in N.C. (Cooper, et al., 1977). Increasingly rare in the coastal plain due to wide scale destruction of pocosin and swamp forest habitat. Probably uses natural area for feeding and escape cover; natural area not nearly large enough by itself to support viable population.
Large tree size	CT 1	Taxodium distichum	Some of the largest baldcypress known in Hyde County. Trees up to 90 feet tall and 53 inches dbh are present.

Fig. 5. Significant features:

CYPRESS PARK

(community type occupies entire natural area)



Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	100 %
Public	%
Unknown	%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

Georgia Timberlands

P. O. Box G

Macon, GA 31202

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

B. B. (Pat) White

P. O. Box 851

Plymouth, NC 27962

17. Attitude of owner or custodian toward preservation (contacted?):

Not definitely known, but apparently owner has decided to protect site.

18. Uses of natural area:

The natural area has been protected by the owner as a nature preserve for some time. The southern border of the site is marked by a large wooden sign proclaiming "Cypress Park." A gated narrow road leads into the site from the southern border and deadends at the edge of the cypress stand. From this point a foot trail leads further into the stand and makes a loop, connecting back to the starting point. The site is apparently used from time to time for nature walks by school groups and other groups. In fact, the site achieved a degree of notoriety when a wedding ceremony was performed a few years ago under the cypress. It is obvious that the site is protected and maintained by the owner in recognition of its natural values.

19. Uses of surrounding land:

a. Wildland 10 %

b. Agricultural land 90 %

c. high-intensity forestry _____ %

d. developed _____ %

20. Preservation Status:

Cat	* %	*Description of preservation status
4	100	Private land, protected by owner or lessee.

21. Regulatory protections in force:

The Army Corps of Engineers "404" permit process applies to this area.

22. Threats:

Although, as already mentioned, the site is protected and maintained in its natural condition, it is imminently threatened by the fairly recent land-use alterations which have occurred around it. Three sides of the natural area are now bounded by extensive agricultural fields, the result of large-scale ditching and canal construction which lowered the water table sufficiently to allow crop production. The natural area itself and a thin buffer strip were left intact during this land-clearing process. However, the resultant lowering of the water table and removal of surrounding vegetation have significantly altered the hydrological and ecological processes of the swamp forest system, and have effectively doomed the site. The lowered water table has allowed the invasion of "weedy" tree species such as sweetgum, and the proliferation of red maple. Unless the former high water conditions can be reintroduced, the old-growth cypress and swamp blackgum will eventually die out and be replaced by a red maple-sweetgum forest. Unable to regenerate itself because of the competition from these species, the old-growth cypress stand will slowly change as the older trees die out from disease, lightning, and other factors.

23. Management and Preservation Recommendation:

The Cypress Park natural area at present represents a protected remnant example of a palustrine swamp forest wetland in a relatively undisturbed old-growth condition. Because of past logging operations, very few swamp forest stands remain in the eastern coastal plain which are still dominated by old-growth cypress. The site would make an ideal study area to use as a comparison with non-cypress dominated communities. From a long-term perspective, the site has probably been irreparably altered by the clearing and drainage operations which have almost completely encircled the area. It is doubtful that water control measures could be implemented to raise the water table to previous levels and recreate a more natural hydrologic regime.

However, this does not mean the site should not be preserved. At the present time and for some years henceforth, it will represent an interesting remnant of a peat-dominated, palustrine swamp forest ecosystem which was quite extensive but is now rapidly being cleared and converted to other uses. The site could be used as an interpretive outdoor classroom for schools, natural history organizations and other interested groups.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: Taxodium distichum/Acer rubrum/Persea borbonia

Community cover type: Taxodium distichum

General habitat feature: palustrine swamp forest

Average canopy height: 80-90 feet

Estimated age of canopy trees: 200+

Canopy cover: Partially closed to open

Estimated size of community: 300 acres

Successional stage: Climax

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Nyssa sylvatica var. biflora, Ilex opaca, Liquidambar styraciflua, Ilex glabra

Common herb stratum species in community cover or community type (but not dominant):

Woodwardia virginica, Rhus radicans, Gelsemium sempervirens, Euonymus americanus

24b. Soil Summary (by community type) CT 1

Soil series: not known

Soil classification: -

Soil association: Dare-Pungo-Dorovan

pH class: very strongly acid

Source of information: General Soil Map of Hyde County, N.C., SCS, USDA, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh-acid

Water regime: Saturated (originally), now temporarily flooded (?)

Drainage class: Very poorly drained

Drainage basin: Swan Lake Creek -- Alligator River

Hydrology characterization: A very poorly drained, originally saturated now temporarily flooded (?) due to artificial drainage, fresh-acid, interaqueous palustrine system.

24d. Topography Summary: CT 1

Landform: Palustrine swamp forest

Shelter: open

Aspect: n/a

Slope Angle: n/a

Profile: Flat

Surface patterns: Hummocky; many logs and stumps, shallow depressions

Position: n/a

25. Physiographic characterization of natural area:

A climax community occupying a very poorly drained, peat-mantled drainage corridor which drains into Swan Creek and eventually into the Alligator River in the Coastal Plain Province of the Atlantic Plain.

Geological Formation:

Surficial peat deposits overlying Pleistocene (Pamlico Terrace formation) sediments.

Geological Formation age:

Recent (less than 10,000 BP) - peat sediments

Pleistocene (less than 100,000 yrs. BP) - sands and clays of Pamlico Terrace

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of N.C. Soil Science Soc. of Am. Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: Black bear

Species legal status and authority: Of Special Concern in N.C. (Cooper et al., 1977)

Number of populations on site: one

Number of individuals per population: Unknown; a few individuals travel through the site from large swamp forestarea to the north.

Size or Maturity of individuals: -

Phenology of population: not applicable

Eg: vegetative %
flowering %
fruiting %

General vigor of population: unknown

Disturbance or threats to population: land clearing; illegal hunting

Habitat characteristics

Plant community: CT 1

Topography:

Soil Series:

Microclimate:

Drainage basin:

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master species lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
  Acer rubrum
ANACARDIACEAE
  Rhus radicans
AQUIFOLIACEAE
  Ilex coriacea
  I. glabra
  I. opaca
ASPLENIACEAE
  Asplenium platyneuron
BLECHNACEAE
  Woodwardia virginica
CELASTRACEAE
  Euonymus americanus
ERICACEAE
  Vaccinium corymbosum
HAMAMELIDACEAE
  Liquidambar styraciflua
LAURACEAE
  Persea borbonia
LILIACEAE
  Smilax laurifolia
  S. rotundifolia
LOGANIACEAE
  Gelsemium sempervirens
LORANTHACEAE
  Phoradendron serotinum
MAGNOLIACEAE
  Magnolia virginiana
NYSSACEAE
  Nyssa sylvatica var. biflora
PINACEAE
  Pinus taeda
POLYPODIACEAE
  Polypodium polypodioides
SAXIFRAGACEAE
  Decumaria barbara
TAXODIACEAE
  Taxodium distichum

AMPHIBIANS

None recorded

REPTILES

Canebrake Rattlesnake

BIRDS

(Emphasis of bird lists if on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; year-round, summer, or winter
* = Breeding or suspected breeding at site

Wood Duck	PR*
Great Horned Owl	PR*
Pileated Woodpecker	PR*
Hairy Woodpecker	PR*
Red-bellied Woodpecker	PR*
Downy Woodpecker	PR*
Carolina Chickadee	PR*
Fish Crow	PV
Blue-gray Gnatcatcher	SR*
Carolina Wren	PR*
Hermit Thrush	WR
Yellow-rumped Warbler	WR
Northern Cardinal	PR*
Rufous-sided Towhee	PR*

MAMMALS

Eastern Gray Squirrel (several seen)
White-tailed Deer (abundant tracks)
Black Bear (scratch marks, scat)

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Roper Island

2. County: Hyde

3. Location: Along the Alligator River in northern Hyde County. Island formed by Intracoastal Waterway on south and river on north, east, and west. About 6 air-miles due north of Lake Mattamuskeet.

4. Topographic quadrangle(s): Fairfield (1974)
Fairfield NW (1974)
Fairfield NE (1974)

5. Size: About 9,500 acres; measured with a grid calculator

6. Elevation: 0-4 feet above mean sea level

7. Access: By boat only; several private boat ramps along the Alligator River in Tyrrell County. Closest ramp open to public is on the Intracoastal Waterway at the NC 94 bridge, about 3 miles SW of island.

8. Names of investigators:

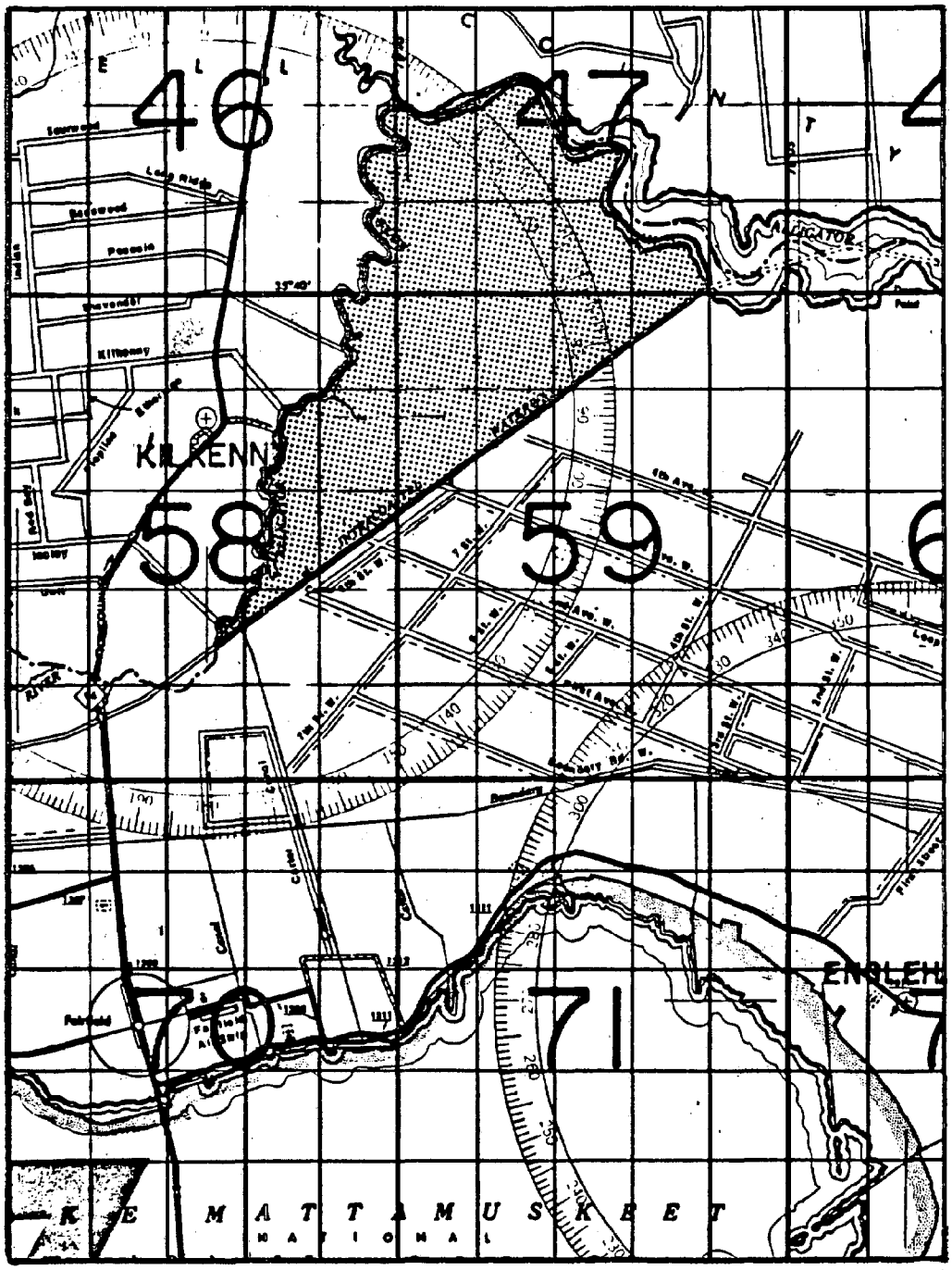
J. Merrill Lynch	S. Lance Peacock
Route 2, Box 222-B	P. O. Box 6006
Enfield, NC 27823	Raleigh, NC 27628

9. Dates of investigation: April 8, June 16, 1982

10. Priority rating: Low-medium

Fig. 6. Access information:

ROPER ISLAND



11a. Prose Description of Site:

Roper Island is part of an extensive wetland corridor along the Alligator River in the northern portion of Hyde County. The most extensive natural lands remaining in the county occur along this corridor which stretches from the New Lake Fork Pocosin natural area on the west across Roper Island, and to the Alligator River-Swan Lake natural area on the east, a distance of over 21 air-miles. When combined the three natural areas encompass over 35,000 acres.

The Roper Island natural area is about 9500 acres in size. It is located in a wide bend of the Alligator River, which forms a natural boundary on three sides. The southern boundary is along the Intracoastal Waterway (IWW), a man-made channel constructed during the 1930's creating Roper Island (see map). Much of the land across the IWW from the island was formerly pocosin and swamp forest but has now been cleared for agriculture. Lands opposite the Alligator River (in Tyrrell County) from the natural area are generally forested wetlands although former wetlands in the vicinity of Gum Neck are now in agriculture.

The Alligator River channel upstream from the Northwest Fork confluence is a typical coastal plain blackwater stream characterized by a series of sharp meanders. The slow-moving river maintains a channel width of about 400-500 feet in this section. Three small blackwater streams drain into this section of the river along the western side of Roper Island. These streams originate ¼ to ½ mile in the island interior.

Downstream from the Northwest Fork confluence, the Alligator River widens considerably to about 1500-3000 feet and becomes an embayed estuarine stream. The river continues to widen gradually to the confluence of the IWW at the extreme eastern end of the natural area.

The topography of Roper Island is essentially flat. Elevation of the natural portions ranges from sea level along the river to about four feet msl. The only significant topographic relief on the island is along the IWW spoil banks where the elevation reaches 8 feet msl. This sandy spoil bank varies from 100-300 yards wide and is approximately seven miles long, paralleling the north bank of the IWW.

The remainder of the island is dominated by peaty sands and shallow to deep peats.

Two soil associations are recognized on the island (SCS 1973). The southeastern portion adjacent to the IWW (excluding the spoil banks) is classified as the Ponzer-Belhaven-Wasda association: very poorly drained soils with moderately thick to thin organic surface layers. Most of the western, northern, and eastern portions are classified as the Dare-Pungo-Dorovan association: very poorly drained soils with thick to moderately thick organic surface layers.

No detailed soil mapping has been done on Roper Island; however, based on soils information from similar areas along the Alligator River in Dare County, the deeper peats are probably the Pungo series (Barnes 1981).

Ingram and Otte (1982) have mapped the peat deposits of Roper Island as part of a study of deposits throughout the Pamlimarle Peninsula. Depths of 8-10 feet are prevalent along the Alligator River and gradually thin towards the interior of the island. Relatively small areas of peaty sand or sandy peat are mapped near the IWW. About 75% of the island is underlain by peat 2 feet or more in depth.

THE VEGETATION

A brackish marsh community is located along the Alligator River in the southwestern portion of Roper Island. It extends along both sides of the river from the confluence with the IWW downstream (north-northeast) for about 7.5 river miles. The most extensive marshes are located at the extreme southwestern corner of the island near the IWW and gradually become narrower and more shrub-dominated towards the northern end of the island before the Northwest Fork confluence.

The brackish marsh community (780 acres) is dominated by narrow-leaved cattail (*Typha angustifolia*) with some sawgrass (*Cladium jamaicense*) intermixed. The primary community type is *Typha angustifolia* (narrow-leaved cattail; CT 1) although in some areas sawgrass is frequent enough to be considered a codominant. Along the back edges of the marsh shrubs such as groundsel tree (*Baccharis halimifolia*) and seashore mallow (*Kosteletskya virginica*) are common with shrub-sized loblolly pine (*Pinus taeda*), red maple (*Acer rubrum*), and some Atlantic white cedar (*Chamaecyparis thyoides*). The shrub marsh zone becomes more prominent in the downstream sections, particularly past Kilkenny Landing, where it extends from the riverbank inland until grading into various forested wetland communities.

The cattail marsh is widest near the IWW-Alligator River confluence where it reaches a width of about 2000 feet. The marshes are also quite extensive on the Tyrrell County side of the river where they extend downstream to the NC 94 bridge.

The Roper Island marshes are characterized by an abundance of standing dead baldcypress (Taxodium distichum). These "skeleton" stands of dead timber occur throughout the brackish marsh community, from along the riverbank inland to the forested edge of the marsh community. The dead cypress vary in size class. Most are rather small, about 6-8 inches dbh and about 20-30 feet tall. There are scattered stands of much larger dead cypress, up to 70 feet tall and 18 inches dbh (diameter at breast height).

The cause of the massive cypress kill is believed to be saltwater intrusion associated with storm tides in the late 1950's and early 1960's (Otto Florschutz, pers. comm. 1982). "Skeleton" cypress stands are a common feature along the upper reaches of tidal creeks and estuarine rivers in the lower North Carolina coastal plain.

The cypress die-off has resulted in more extensive marshes on Roper Island although there are signs that woody vegetation is invading rapidly and may eventually replace the marsh system. As mentioned earlier, red maples and loblolly pine are vigorously invading the marsh, particularly in the downstream sections more distant from the IWW. These shrub-sized (5-15 feet) trees are also spreading from the forested interior towards the riverbank. It is noteworthy that the most extensive, best developed portions of the marsh are near the IWW. This implies that the saline influence of the waterway may be controlling the establishment of woody vegetation in this section.

The cattail marsh community also extends up the several major and the numerous minor streams draining the west side of Roper Island. Along the shallow margins of these streams beds of pickerelweed (Pontederia cordata) are common. Other species noted include water pimpernel (Samolus parviflorus), various bladderworts (Utricularia spp.), and fragrant waterlily (Nymphaea odorata). The blackwater streams range from several hundred feet in length (many) to ¼-½ mile long (three).

American alligators have been reported from Roper Island by local fishermen and Wildlife Resources Commission personnel (N.C. Natural Heritage Program files). Although we saw no sign of the species, there appeared to be excellent habitat available along these blackwater tributary streams. Other wildlife noted included abundant raccoon tracks and many nesting birds. One active Osprey nest was seen in a dead cypress tree and nesting red-winged blackbirds, eastern kingbirds, prothonotary warblers, common yellowthroats, and great crested flycatchers were very common. Secretive marsh nesting birds are probably present

although we saw only least bitterns on our boat trip.

Unlike the brackish marsh community which is easily accessible by boat, the interior forested wetlands of the island are much more difficult to survey and inventory. Comprising about 90% of the island's acreage, these forested wetlands are accessible from only one location along a road and canal leading from the Alligator River about ½ mile into the island interior (see map). Notes taken along this canal were compared with observations made during our aerial reconnaissance of the entire island. Extrapolations were made using a combination of our ground and aerial observations. We emphasize that more detailed ground field work is needed to more accurately describe and delineate the various plant communities present on the island. The following descriptions are general in nature and point to the need for more field work.

The forested wetlands of the island can be divided into two major types: 1) a swamp forest dominated by various combinations of baldcypress (Taxodium distichum, red maple (Acer rubrum), loblolly pine (Pinus taeda), swamp blackgum (Nyssa sylvatica var. biflora), and Atlantic white cedar (Chamaecyparis thyoides); and 2) an open pond pine (Pinus serotina) forest over a dense understory of bay trees and evergreen shrubs.

The swamp forest is located primarily along the northern portion of the island adjacent to the embayed section of the Alligator River, and in the southwestern corner near the head of Jack's Creek (see map). Most of the areas surveyed along the river contain young to medium growth closed stands of loblolly pine, red maple, and sweetgum (Liquidambar styraciflua). Canopy heights are generally 40-60 feet. Most of the cypress have been removed during past timber operations. Swamp blackgum is sometimes present in almost pure stands. Occasional stands of baldcypress are also present but these are relatively minor in extent and are composed of trees in young age classes. Most cypress stands seen were 40-50 feet in height and 12-14 inches dbh. The swamp forest stands appear to be limited mainly to a fairly narrow band (to 2500 feet) adjacent to the river channel. We saw no stands in the northern section which were significant enough to be granted community type designations or mentioned in the significance summary of this report.

The swamp forest stands in the southwestern corner of the island are centered around the headwaters of Jack's Creek. This area was surveyed by air only. Several stands of baldcypress were observed along with scattered small groups of Atlantic white cedar. One area south of Jack's Creek has a fairly high density of white cedar. Swamp blackgum is fairly common with the cypress and white cedar in this section. The height of the vegetation and the underlying shrub composition could not be determined during our aerial observations. However, some

of the cypress appeared to be fairly tall (+70 feet) and flat-topped, indicating a mature or climax condition. The white cedar appeared to be young to medium growth (10-40 feet tall). Most of the white cedar of the island is located in the Jack's Creek area. Some of the white cedar stands appear to be dense enough to be considered a monospecific community and are classified as Chamaecyparis thyoides (Atlantic white cedar; CT 2).

The combined acreage of the swamp forest vegetation is estimated to be about 800-1000 acres. Most of this area was probably originally dominated by a greater proportion of baldcypress, swamp blackgum, and white cedar. Today, most of the timber is composed of red maple, sweetgum, and loblolly pine, species which assumed dominance when the more valuable timber species were cut out.

The vegetation association most prominent on the island, and the least disturbed by past logging activities, is the pond pine-dominated wetlands. Most of the island interior is dominated by this association (about 7200 acres).

This association is characterized by open stands of pond pine, some of which reach 80 feet in height and have dbh's of 12-14 inches. These older-growth stands are composed of flat-top pines and represent the least disturbed forest community on the island.

The understory vegetation is somewhat variable, both structurally and in species composition. Based on our ground observations along a transect adjacent to a canal (see map), the understory is composed of a dense tall shrub layer of red maple, redbay, and some sweetbay. This layer ranges from 20-40 feet tall. Underneath is a dense low shrub (2-20 feet) layer dominated by smaller redbay, fetterbush (Lyonia lucida), sweet gallberry (Ilex coriacea), and locally, giant cane (Arundinaria gigantea). Virginia chain fern (Woodwardia virginica) is common as a ground cover over much of the area, and is particularly abundant in openings or in disturbed cut-over sections. The lower shrub layer is covered by very dense, impenetrable tangles of laurel-leaved greenbriar (Smilax laurifolia).

Scattered amongst the flattop pond pines are a few old-growth baldcypress which are about the same size. These cypress are probably "cull" trees left by past timber operations because of various imperfections.

Based on our aerial observations, the open pond pine stands are quite extensive in the island's interior. In some areas red

maple and the bay species form a distinct subcanopy under the pines. In other areas, a dense evergreen shrub layer composed of bays, fetterbush, and gallberries is the dominant undergrowth with red maple essentially absent.

Also present in scattered dense stands is swamp blackgum. This species usually seems to occur in dense, almost monospecific stands within the pond pine community. Scattered individuals of small to medium-size Atlantic white cedar are present. No dense stands of this species are present in the pond pine stands.

The community type(s) can be classified as Pinus serotina/Acer rubrum-Persea borbonia/Persea borbonia and mixed evergreen shrubs//Smilax laurifolia (Pond pine/red maple-redbay/redbay and mixed evergreen shrubs//laurel-leaved greenbriar or Pinus serotina/Persea borbonia and mixed evergreen shrubs//Smilax laurifolia; CT 3).

WILDLIFE AND AVIAN DIVERSITY

The wildlife values of the pond pine stands and the swamp forest areas are probably significant. White-tailed deer sign is prevalent and the species is reported to be very common on the island (Florschutz 1979). Florschutz (op. cit.) also reports plentiful bobcat and raccoon although we saw no sign of the former. Black bear are present, as evidenced by tracks and other sign, and the habitats are sufficiently diverse and extensive to support a viable population of this declining mammal. The American alligator, a federally listed endangered species, has been reported and suitable habitat is present in the small creeks draining into the Alligator River on the island's west side. At least 39 species of breeding birds are present, including species such as Osprey and Wood Duck. Additional field work will undoubtedly reveal the presence of additional nesting species. Although no evidence was seen, there is a good possibility that one or two clans of red-cockaded woodpeckers, a federally endangered species, are present. The open stands of old-growth pond pines provide excellent habitat for the species.

An active cavity tree was discovered this summer in an open pond pine stand directly across the IWW from the island. The location of this cavity is only about 1000 feet from the natural area; it is highly possible that the birds of this colony use the pines on Roper Island as foraging habitat. Intensive ground reconnaissance is needed to assess the species' status on the island.

11b. Prose Description of Site Significance:

The Roper Island natural area is situated within an extensive corridor of nearly contiguous natural wetlands associated with the Alligator River. The New Lake Fork Pocosin natural area (9300 acres) lies about 5 miles west of the island. The Alligator River-Swan Lake natural area (16,300 acres) lies directly adjacent to the east side of the natural area. When combined these three tracts encompass about 35,100 acres containing almost the entire spectrum of wetland habitats associated with the deep peat landscape of the lower coastal plain. These wetlands have superlative wildlife values, particularly for nesting birds and for many species of furbearers including bobcat and black bear, which require substantial amounts of land to maintain viable populations.

Roper Island does not contain the best examples of forested wetland types known in the coastal plain. Less disturbed, older-growth stands are present in other sections of the Alligator River corridor. Its wetland vegetation, the majority of which is not in a pristine condition, nonetheless represents a significant acreage which has never been drained or clearcut, and which still retains a relatively natural hydrological system. The construction of the Intracoastal Waterway, which may have had a negative impact on the natural drainage systems of the region, also has had a positive effect on the Roper Island natural area, isolating it from the mainland and, in effect, creating a de facto wilderness.

Another significant aspect of the natural area is the pristine esthetic quality of the Alligator River, particularly the meandering section along the west side of Roper Island. The clear, unpolluted, tea-colored water, the scenic marshes, and the vast, undeveloped landscape combine to give this section a high mark as an esthetically pleasing landscape.

Wildlife values of Roper Island are considered high. The American alligator, a federally endangered species, is reported to occur in the small streams along the island's west side. Other rare species, such as black bear and red-shouldered hawk are also present. There is a good possibility, though there is no definite proof at present, that the island supports a small but significant population of red-cockaded woodpeckers, a federally endangered species.

12. Significance Summary Table (categories represented and descriptions) - by site

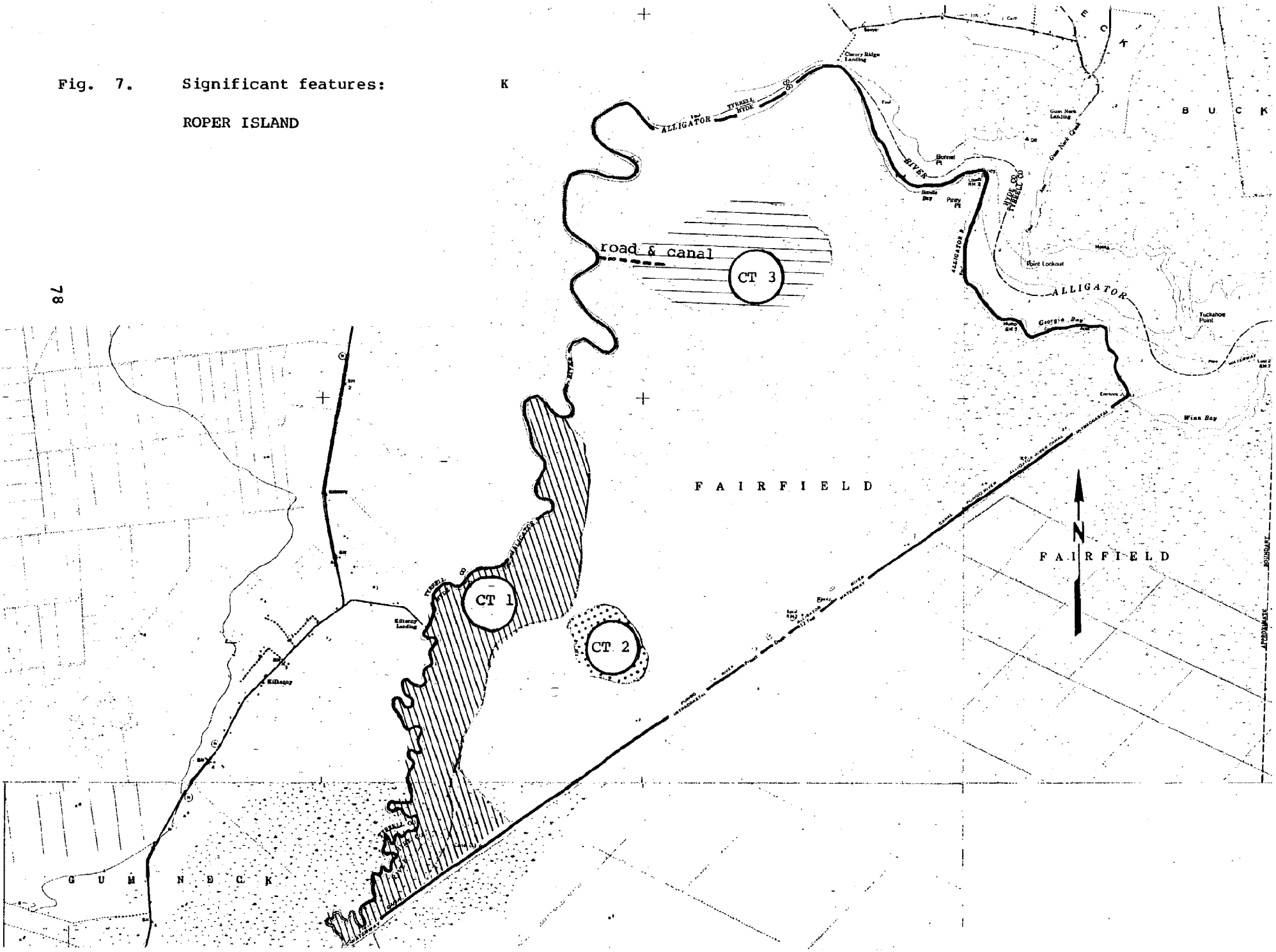
a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Typha angustifolia	Fairly extensive (780 acres) brackish marsh. Habitat for a
		areal extent of marsh	number of marsh-nesting birds and animals. Habitat for
			federally endangered American alligator.
High-quality wetland plant community	CT 2	Chamaecyparis thyoides	Several dense stands are located near headwaters of Jack's
		areal extent of white cedar stands	Creek. While not unusually extensive or old-growth, these
			stands add to the overall diversity of the island and pro-
			vide nesting habitat for certain woodland breeding birds.
High-quality wetland plant community	CT 3	Pinus serotina/Acer rubrum-Persea bor-	Extensive (7000+ acres) commun-
		bonia/Persea borbonia and mixed ever-	ity occupying most of island.
		green shrubs//Smilax laurifolia	Includes some old-growth stands
		or	containing trees to 80 feet tall
		Pinus serotina/Persea borbonia and	with dbh's of 12-14 inches.
		mixed evergreen shrubs//Smilax lauri-	Good habitat for black bear.
		folia	
		Representative example of old-growth	
		stand surveyed by authors	

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Endangered Species	CT 1	American Alligator	Federally endangered (Endan-
	small		gered Species Act, 1973). Not
	streams		seen by authors but reported
	draining		by WRC personnel and local
	west side		fishermen from creeks along
	of island		west side of island. Habitat
			good for species.
Threatened Species	through-	Red-shouldered Hawk	Threatened in N.C. (Cooper, et.
	out		al., 1977). At least 2-3 nesting
			pairs are present on island.
			Habitat excellent.
Special Concern Species	CT 1,	Osprey	Of special concern in N.C.
	IWW and		(Cooper, et al., 1977). At
	Alligator		least one nesting pair is
	River		present along west side of
			island on river.
Special Concern Species	through-	Black Bear	Of special concern in N.C.
	out		(Cooper, et al., 1977). Unde-
			termined population present.
			Habitat sufficiently extensive
			and diverse, along with other
			Alligator River corridor wet-
			lands, to support population.

Fig. 7. Significant features:

ROPER ISLAND



Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	100 %
Public	%
Unknown	%

14. Number of Owners: 3

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

1) Adams-Roper, Inc. (8210 acres) - primary owner
c/o Jay M. DeVoss, Sec.
Devoss and Scott
P. O. Box 30
Decatur, Indiana 47633

2) Glenn B. O'Neal (275 acres)
Creek Road
Piperville, PA 18947

3) Harry M. DeWitt (370 acres)
11619 Gibson St.
Silver Spring, MD 20962

*Adams-Roper, Inc. went bankrupt in July, 1982 - present status of ownership is not known.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

1) Otto Florschutz, Jr., Biologist
U.S. Fish and Wildlife Service
P. O. Box 581
Washington, NC 27889

17. Attitude of owner or custodian toward preservation (contacted?):

Not known; previous owners were interested in selling property to U.S. Fish and Wildlife Service or The Nature Conservancy.

18. Uses of natural area:

Much of the natural area has been logged over in several cycles to obtain the successively most valuable remaining or regenerated timber. Early loggers used barges and a series of tram roads to remove timber. Recently (1979), loggers dug a short canal into the Alligator River side of the island and selectively cut timber along this canal and along a series of skidder trails. The canal construction was halted when the Army Corps of Engineers issued a cease-and-desist order requiring a "404" wetlands permit. Some logging continues at the present time by cable.

There has been no agricultural development on the island. However, there have been some small-scale logging, clearing, and bush-hogging operations along the Intracoastal Waterway (IWW) spoil area. A portion of the spoil area has been opened to cattle grazing.

Construction of the IWW in the 1930's created Roper Island and effectively curtailed many uses by cutting the area off from the mainland.

Some deer hunting is done by the present and neighboring owners. Excellent fishing is reported along the Alligator River and along the three major streams which drain out of Roper Island.

19. Uses of surrounding land:

a. Wildland 70 %
b. Agricultural land _____ %
c. high-intensity forestry _____ %
d. developed 30 % (Intracoastal Waterway)

20. Preservation Status:

Cat	* %	*Description of preservation status
6	100	Private land, not protected as a natural area by owner.

21. Regulatory protections in force:

The Army Corps of Engineers "404" permit process applies to this area.

22. Threats:

The major threat to Roper Island is continued logging operations. Much merchantable loblolly and pond pine, baldcypress, swamp blackgum, and some Atlantic white cedar are present on the island. Much of this timber is located in the relatively inaccessible interior. Logging of course results in locally severe disturbance; however, the island may have some degree of protection from modern timbering practices (i.e., construction of access roads and associated drainage canals) because of the requirements for federal dredge and fill permits (Section 404 of Clean Water Act). This permit regulation has already halted one attempt to construct an access canal on the island.

Peat mining is a potential threat; Otte and Ingram (1980) found energy grade peat (less than 25% ash at 0% moisture) under much of the island.

However, the lack of vehicular access to the natural area and the low elevation of the site will probably prohibit any mining in the foreseeable future.

Agricultural development is another potential threat. The southeastern portion of the island is shallow peat or peaty sand and could be successfully farmed if drained. Again, the problem of access and the federal permit requirements pose a severe constraint for any development plans.

23. Management and Preservation Recommendation:

The section of the Alligator River from the southwest confluence with the IWW downstream to the Northwest Fork confluence should be nominated for designation as a wild and scenic river.

If Roper Island is offered to The Nature Conservancy as a bargain sale or as a gift, TNC should accept and transfer the lands eventually to the U.S. Fish and Wildlife Service as a part of the national wildlife refuge system. Other more significant natural areas in the Alligator River corridor of Hyde and Dare Counties should receive a higher priority for protection and this should be taken into account if and when negotiations for the acquisition of Roper Island occur.

The entire island should be acquired, including the 400-acre IWW spoil bank, so that management activities such as controlled burning could be freely implemented. The interior of the island should be protected and preserved in its natural state with only limited trails, boardwalks, and other public use facilities maintained.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: Typha angustifolia

Community cover type: Typha angustifolia

General habitat feature: Brackish marsh

Average canopy height: -

Estimated age of canopy trees: -

Canopy cover: -

Estimated size of community: 780 acres

Successional stage: successional to forested wetland

Common canopy species in community cover or community type (but not dominant):

standing dead Taxodium distichum

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

None

Common herb stratum species in community cover or community type (but not dominant):

Cladium jamaicense

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 2

Community type: Chamaecyparis thyoides

Community cover type: Chamaecyparis thyoides

General habitat feature: White cedar bog

Average canopy height: unknown

Estimated age of canopy trees: unknown

Canopy cover: closed

Estimated size of community: 200 acres

Successional stage: early-mid successional

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Not known.

Common herb stratum species in community cover or community type (but not dominant):

Not known.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 3

Community type: Pinus serotina/Acer rubrum-Persea borbonia/ Persea borbonia and mixed evergreen shrubs// Smilax laurifolia

or

Pinus serotina/Persea borbonia and mixed evergreen shrubs//Smilax laurifolia

Community cover type: Pinus serotina

General habitat feature: palustrine swamp or pocosin

Average canopy height: 50-60 up to 80 feet

Estimated age of canopy trees: 50 to 100+ years

Canopy cover: open

Estimated size of community: 7200 acres

Successional stage: late successional to pyroclimax

Common canopy species in community cover or community type (but not dominant):

none

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Lyonia lucida, Ilex coriacea, Magnolia virginiana

Common herb stratum species in community cover or community type (but not dominant):

Arundinaria giganta (occasionally dominant)

24b. Soil Summary (by community type) CT 1, 2, 3

Soil series: not known

Soil classification: not determined

Soil association: 1) Ponzer-Belhaven-Wasda
2) Dare-Pungo-Dorovan

pH class: extremely acid

Source of information: General Soil Map of Hyde County, N.C., SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1, 2, 3

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh-acid

Water regime: Saturated (CT 2, 3) to intermittently flooded (CT 1)

Drainage class: Very poorly drained

Drainage basin: Alligator River

Hydrology characterization: A very poorly drained, saturated to intermittently flooded, fresh-acid, interaqueous, palustrine system.

24d. Topography Summary: CT 1, 2, 3

Landform: Peat-mantled terrace or flat

Shelter: Open (CT 1) to sheltered (CT 2, 3)

Aspect: not applicable

Slope Angle: not applicable

Profile: Flat

Surface patterns: generally smooth, except for small depressions, stream channels, etc.

Position: not applicable

25. Physiographic characterization of natural area:

An assemblage of early successional to pyroclimax brackish marsh and palustrine forested wetland communities occupying a very poorly drained, peat-mantled flat plain along the Alligator River and the Intracoastal Waterway in the Coastal Plain Province of the Atlantic Plain.

Geological Formation:

Recent peats over Pleistocene Pamlico Terrace Formation sands and clays over Upper Miocene Yorktown Formation sands and clays.

Geological Formation age:

Recent = less than 10,000 yrs. BP
Pleistocene Pamlico Terrace = less than 100,000 yrs. BP
Upper Miocene Yorktown Formation = 18-22 million years BP

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Society of America Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: American alligator

Species legal status and authority: Federally endangered (Endangered Species Act of 1973)

Number of populations on site: ?

Number of individuals per population: ?

Size or Maturity of individuals: ?

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Unknown. Not seen by authors but reported by WRC personnel and local fishermen to occur in small creeks draining into Alligator River on west side of island.

Disturbance or threats to population: Illegal shooting

Habitat characteristics

Plant community: CT 1, open water of creeks

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Red-shouldered Hawk

Species legal status and authority: Threatened In N.C. (Cooper, et al., 1977)

Number of populations on site: 2-3 pairs

Number of individuals per population: 2 (male and female) plus young of year

Size or Maturity of individuals: adult and immature

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Excellent. Habitat extensive and diverse.

Disturbance or threats to population: Clearcutting, drainage, pesticides.

Habitat characteristics

Plant community: Throughout

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Osprey

Species legal status and authority: Of Special Concern in N.C. (Cooper *et al.*, 1977)

Number of populations on site: one

Number of individuals per population: 2 plus young of year

Size or Maturity of individuals: adult and immature

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Good. At least one nest observed in top of dead cypress along Alligator River about 1 mile upstream from confluence with Northwest Fork.

Disturbance or threats to population: pesticides, illegal shooting

Habitat characteristics

Plant community: CT 1, open water

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Black Bear

Species legal status and authority: Of Special Concern in N.C. (Cooper, et al., 1977)

Number of populations on site: one

Number of individuals per population: undetermined

Size or Maturity of individuals: unknown

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Unknown. One set of tracks seen by authors along canal edge in northern section of island. Florschutz (1979) reports den tree on island. Habitat extensive and diverse; most of island is inaccessible to hunters.
Disturbance or threats to population: clearcutting, drainage

Habitat characteristics

Plant community: Throughout

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master Species List:

VASCULAR PLANTS
(arranged alphabetically by family)

ACERACEAE
  Acer rubrum
ALISMATACEAE
  Sagittaria sp.
ANACARDIACEAE
  Rhus radicans
AQUIFOLIACEAE
  Ilex coriacea
  I. glabra
ASTERACEAE
  Baccharis halimifolia
BLECHNACEAE
  Woodwardia virginica
CLETHRACEAE
  Clethra alnifolia
CUPRESSACEAE
  Chamaecyparis thyoides
CYPERACEAE
  Carex spp.
  Cladium jamaicense
  Scirpus americanus
CYRILLACEAE
  Cyrilla racemiflora
ERICACEAE
  Leucothoe axillaris
  Lyonia lucida
  Rhododendron viscosum
  Vaccinium corymbosum
HAMAMELIDACEAE
  Liuqidambar styraciflua
LAURACEAE
  Persea borbonia
LENTIBULARIACEAE
  Utricularia spp.
LILIACEAE
  Smilax laurifolia
LOGANIACEAE
  Gelsemium sempervirens
MAGNOLIACEAE
  Magnolia virginiana
MALVACEAE
  Kosteletskya virginica

MYRICACEAE
  Myrica cerifera
  M. heterophylla
NYSSACEAE
  Nyssa sylvatica var. biflora
NYMPHAEACEAE
  Nymphaea odorata
OSMUNDACEAE
  Osmunda regalis var. spectabilis
PINACEAE
  Pinus serotina
  P. taeda
POACEAE
  Arundinaria gigantea
PONTEDERIACEAE
  Pontederia cordata
PRIMULACEAE
  Samolus parviflorus
TAXODIACEAE
  Taxodium distichum
TYPHACEAE
  Typha angustifolia

AMPHIBIANS

Green Treefrog
Gray Treefrog
Southern Cricket Frog
Carpenter Frog
Green Frog

REPTILES

None recorded

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient; spring or fall
PV, SV, WV = Visitor; year-round, summer or winter
* = Breeding or suspected breeding at site

Great Blue Heron	PV
Green Heron	SR*
Least Bittern	SR*
Wood Duck	PR*
Turkey Vulture	PR*
Red-shouldered Hawk	PR*
Osprey	SR*
Common Bobwhite	PR*
Laughing Gull	SV
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Chimney Swift	SV
Ruby-throated Hummingbird	SR*
Belted Kingfisher	PV
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Downy Woodpecker	PR*
Red-headed Woodpecker	PR*
Eastern Kingbird	SR*
Great Crested Flycatcher	SR*
Eastern Pewee	SR*
Barn Swallow	SV
Common Crow	PR*
Fish Crow	PR*
Carolina Chickadee	PR*
Carolina Wren	PR*
Gray Catbird	PR*
Wood Thrush	SR*
White-eyed Vireo	SR*
Prothonotary Warbler	SR*
Northern Parula Warbler	SR*

Yellow-throated Warbler	SR*
Pine Warbler	PR*
Prairie Warbler	SR*
Ovenbird	SR*
Common Yellowthroat	PR*
Hooded Warbler	SR*
Red-winged Blackbird	PR*
Common Grackle	PR*
Brown-headed Cowbird	PR*
Northern Cardinal	PR*
Indigo Bunting	SR*
Rufous-sided Towhee	PR*

MAMMALS

Raccoon - tracks common
White-tailed Deer - abundant tracks
Black Bear - one set of tracks

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: New Lake Fork Pocosin

2. County: Hyde

3. Location: Southeast of Alligator (New) Lake between New Lake Fork of the Alligator River and the Intra-coastal Waterway

4. Topographic quadrangle(s): New Lake SE (1974)

5. Size: Approximately 9300 acres, measured with grid calculator

6. Elevation: 2-12 feet above mean sea level

7. Access: The southwestern side can be reached by taking SR 1303 north towards Alligator (New) Lake. About 4 miles north of the SR 1302 junction, the road bends sharply to the right (east). At this corner take the unmarked private dirt road on the right (southeast) which intersects SR 1303. Natural area begins about one mile down this road (named Boundary Road on some maps).

8. Names of investigators:

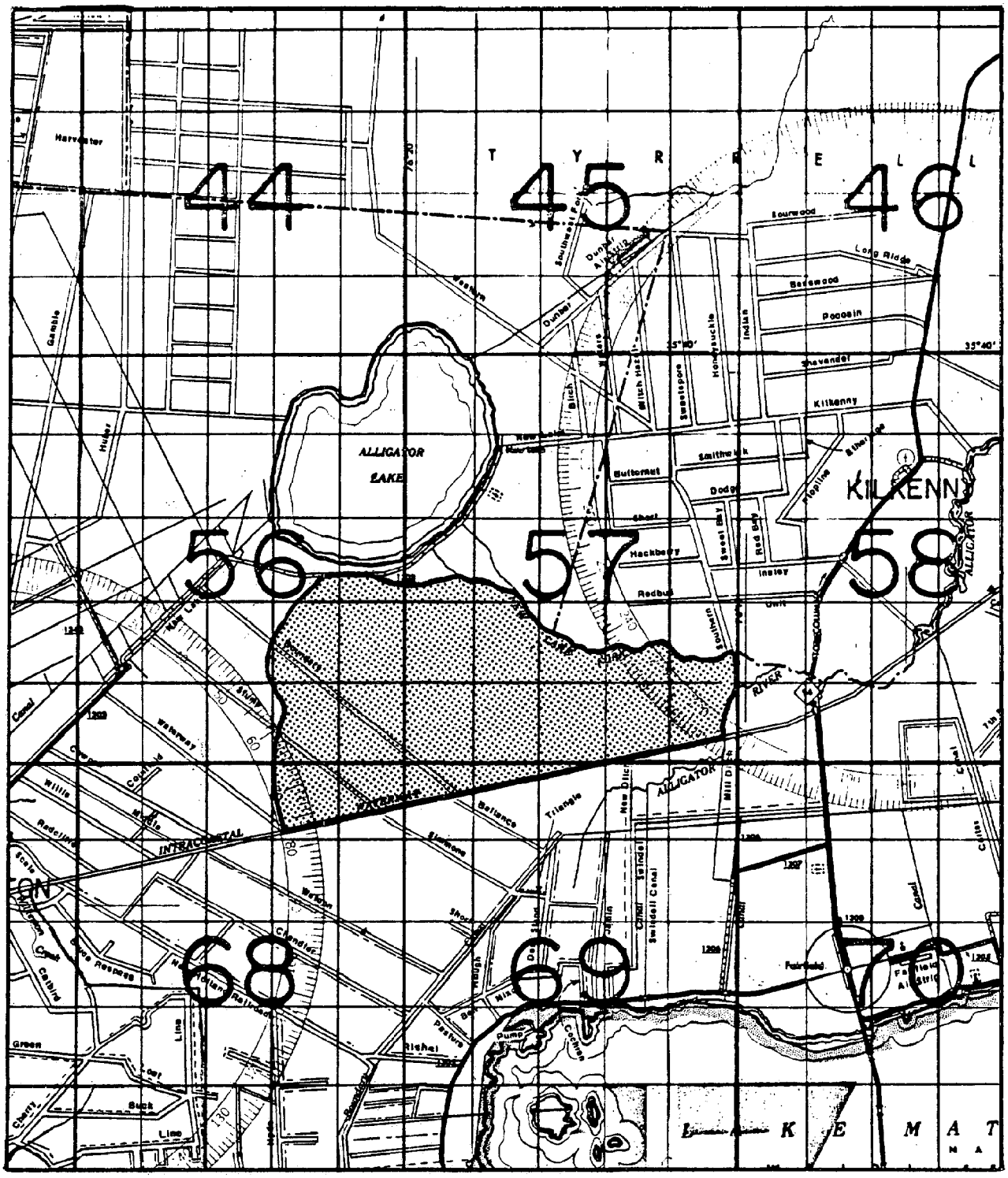
J. Merrill Lynch	S. Lance Peacock
Route 2, Box 222-B	P. O. Box 6006
Enfield, NC 27823	Raleigh, NC 27628

9. Date(s) of investigation: April 8, August 11, 1982

10. Priority rating: Medium.

Fig. 8. Access information:

NEW LAKE FORK POCOSIN



11a. Prose Description of Site:

The New Lake Fork Pocosin is a 9300-acre tract of various pocosin habitats located about one mile southeast of Alligator (New) Lake. The predominantly high pocosin vegetation of the tract is associated with a long, finger-like extension of deep peat which occurs along the drainage and headwaters region of the Alligator River. The natural area contains a representative example of high pocosin vegetation which has not been drained and which is contiguous with other pocosin and swamp forest wetlands in the Alligator River drainage corridor. Other pocosin vegetation types present are pond pine woodland and possibly pond pine forest. These and the high pocosin type are categories of pocosin vegetation proposed by Otte (1981). His definitions of the types are summarized in Table 1.

The natural area is bordered on the west and southwest by drained pocosin and cleared fields. The southern border is along the Intracoastal Waterway and the east and north boundary is the New Lake Fork of the Alligator River.

The entire natural area was intensely burned during the spring of 1982. This fire completely killed about 90% of the pond pines; the remaining 10% were resprouting from the trunk during our visit. At least some sections of the pocosin peat were still burning in August. Smoke rising from a bed of peat near Boundary Road was observed.

Before the fire the site was dominated by an open stand of low, second-growth pond pines (Pinus serotina), about 15 feet tall with average dbh's of 4-6 inches. Several different age classes of taller pines were also present. Trees in the 30-40 foot height range were fairly common but widely scattered. A few old-growth, flat-topped pines 60-70 feet tall were also present. Frequent fires and/or timbering probably removed most of the old-growth trees, leaving a thicker growth of scrubby, second-growth trees.

The post-fire community has a distinctly different aspect. Standing dead pond pine trunks are numerous and are variable in height depending on age class as discussed in the previous paragraph. This skeleton forest extends along both sides of Boundary Road as far as one can see.

The shrub layer underneath the pine trunks is very dense, averaging 2-4 feet in height. The fire burned most of the shrub stems to the ground but there was vigorous new growth from root sprouts. Although a close examination of the shrub

flora indicated a number of species present, honeybells (Zenobia pulverulenta) appeared to be most abundant. This species forms a dense shrub layer over about 80% of the pocosin. Scattered with honeybells is fetterbush (Lyonia lucida), bitter gallberry (Ilex glabra), a blueberry (Vaccinium sp.), chokecherry (Sorbus arbutifolia), and dwarfed red bay (Persea borbonia). Throughout the site numerous pond pine seedlings about one foot tall are present.

Laurel-leaved greenbriar (Smilax laurifolia) is a common vine in the shrub layer but has not yet developed the inpenetrable tangle characteristic of many burned pocosins. The herb layer is poorly developed. In the more open areas, Virginia chain fern (Woodwardia virginica) forms dense colonies. It is also present in smaller numbers under the denser shrub layers. In some openings with standing surface water, a sedge (Carex walteriana) is present in small patches.

Some portions of the pocosin are dominated in the shrub zone by dense patches of giant cane (Arundinaria gigantea). Cane is usually associated with shallow peats or peaty mineral soils so it is assumed that these patches are correlated with shallow peat or where there is a significant mineral component in the soil.

The community type of the pocosin can be classified as dead Pinus serotina trunks/Zenobia pulverulenta-mixed pocosin shrubs or Arundinaria gigantea (dead pond pine trunks/honeybells-mixed pocosin shrubs or giant cane; CT 1). The giant cane-dominated areas are relatively minor in extent (20%) and are not separated out in the vegetation mapping. The other pocosin vegetation types are also not mapped.

The natural area boundary extends to the New Lake Fork of the Alligator River. This northern section of the natural area is inaccessible except by boat and time constraints prevented a field survey. Aerial reconnaissance and review of aerial photography indicates that the pocosin vegetation described above is gradually replaced by swamp forest along New Lake Fork. A zone dominated by what appears to be swamp blackgum (Nyssa sylvatica var. biflora), red maple (Acer rubrum), and some baldcypress (Taxodium distichum) is present.

The extent of fire damage to the swamp forest section is unknown. Dense smoke in the vicinity during our aerial reconnaissance prevented a close inspection of the swamp forest.

The entire natural area is underlain by shallow to moderately deep peats (Ingram and Otte, 1982). Peat depths vary from 0-8 feet. Generally the deeper peats (6-8 feet) extend NE-SW across

the central portion of the natural area and gradually thin out toward Alligator Lake to the north and the Intracoastal Waterway to the south.

Two soil associations are found in the natural area (SCS, 1973). The shallower peat areas are mapped as the Ponzer-Belhaven-Wasda association. The deeper peats are mapped as the Dare-Pungo-Dorovan association. Both soils associations are characterized by organic surface layers which are very poorly drained.

11b. Prose Description of Site Significance:

The New Lake Fork Pocosin is one of the two largest relatively undisturbed pocosins remaining in Hyde County. It and the Gull Rock Game Lands Pocosin are the two most extensive examples of a wetland ecosystem which once was a widespread and dominant aspect of the county landscape. Most of the other large pocosins in the county, located north of Lake Mattamuskeet and west of Alligator Lake, have been ditched, drained, and in most cases cleared for agriculture. Relatively small tracts of ditched pocosin remain in these areas.

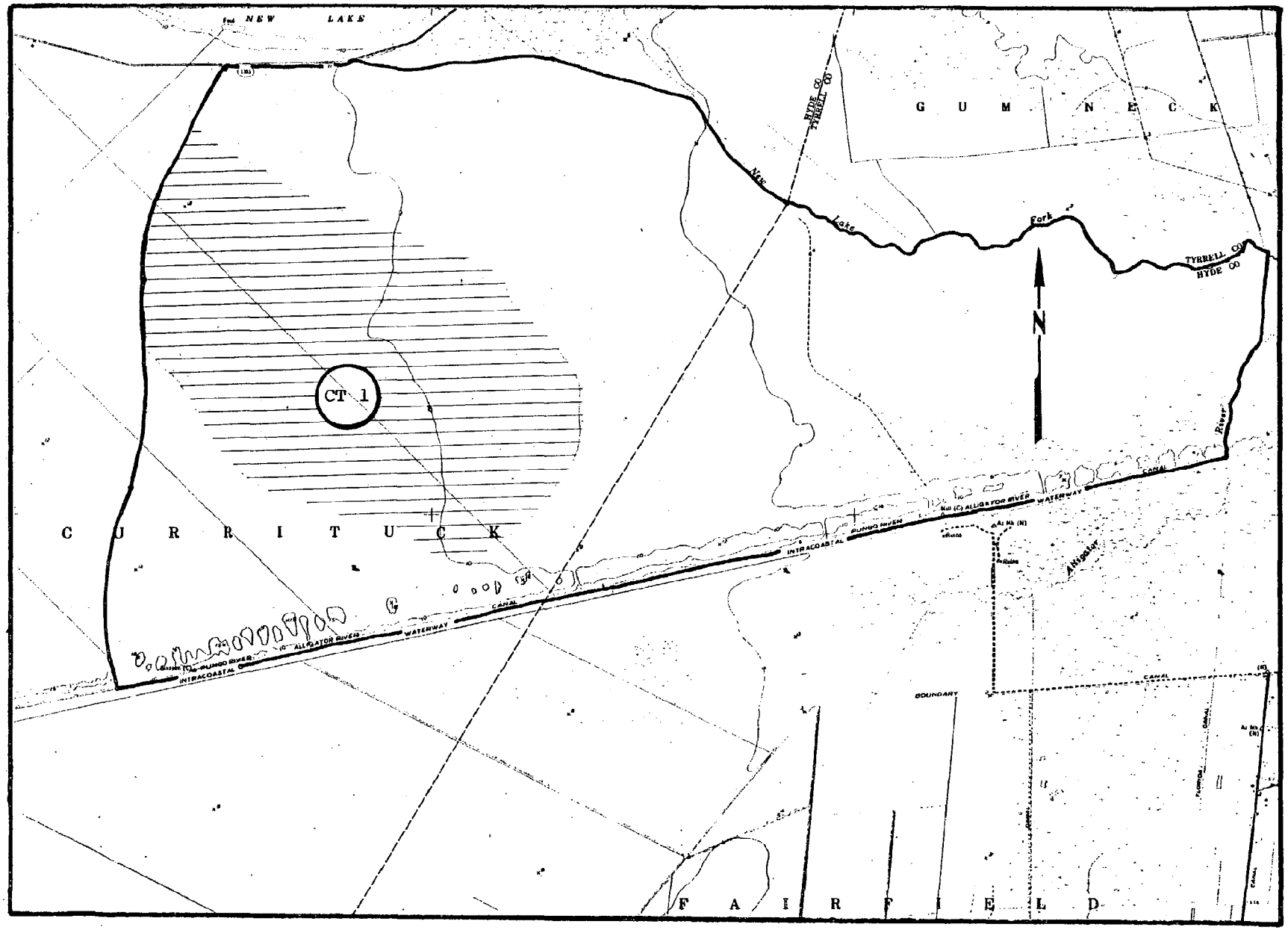
Black bear are known to occur and the tract is extensive enough along with adjacent wooded buffers along the Alligator River to support a viable population. Bobcat are also present in the natural area along with a sizeable population of white-tailed deer. A small breeding population of Red-shouldered Hawks, a state threatened species, is present.

The undrained condition and extensive size of the natural area coupled with its location contiguous or nearly contiguous with adjacent forested wetlands is of primary significance.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	dead Pinus serotina trunks/Zenobia pulverulenta-mixed pocosin shrubs or Arundinaria gigantea	Extensive (8000+ acres) tract of undrained high pocosin vegetation. Along with the Gull Rock Game Lands pocosin, this tract is one of the two best remaining pocosin examples in Hyde County. Part of the Alligator River wetlands corridor which includes the Roper Island and Alligator River Swamp Forest natural areas.
		Portion of CT inventoried by authors	
Threatened Species	through-out	Red-shouldered Hawk	Threatened in N.C. (Cooper, et al., 1977). At least 1-2 breeding pairs are present. Habitat extensive enough to support viable population.
Special Concern Species	through-out	Black Bear	Of special concern in N.C. (Cooper, et al., 1977). Population of undetermined size present. Habitat excellent for species because of its large size, lack of access, and abundance of berry-producing shrubs.

Fig. 9. Significant features: NEW LAKE FORK POCOSIN



Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	100 %
Public	%
Unknown	%

14. Number of Owners: 2

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

1) First Colony Farms
Route 1, Box 201
Creswell, NC 27928

2) Rich Farms
Belhaven, NC 27810

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

None known.

17. Attitude of owner or custodian toward preservation (contacted?):

Not known.

18. Uses of natural area:

The natural area has been logged over in the past and much of the larger merchantable pond pine has been removed. Wildfires have removed most remaining merchantable timber from the tract.

Hunting is a low intensity use throughout the western portion of the area accessible by roads. The degree of illegal hunting, if any, is unknown.

Modern agricultural development has not been attempted in the natural area; the predominantly deep peat soils are considered inferior for agricultural use due to excessive wood content (Barnes, pers. comm., 1982). Peat mining for energy production is possible on these soils in the long term.

19. Uses of surrounding land:

a. Wildland 40 %
b. Agricultural land 30 %
c. high-intensity forestry ____ %
d. developed 30 % (Intracoastal Waterway)

20. Preservation Status:

Cat	* %	*Description of preservation status
6	100	Private land, not protected as a natural area by owner.

21. Regulatory protections in force:

The Army Corps of Engineers "404" permit process applies to this area.

22. Threats:

Peat mining is a potential threat; Otte and Ingram (1980) have found energy grade peat (less than 25% ash at 0% moisture) under much of the natural area. Agricultural development is limited as a threat to some degree because the woody peats are currently uneconomical to farm.

23. Management and Preservation Recommendation:

The area should be recognized as a crucial component of the Alligator River wetlands corridor which extends east of the natural area and includes Roper Island and the Alligator River Swamp Forest. Its importance as an excellent representative pocosin ecosystem will increase as additional drainage and clearing operations continue to fragment the remaining pocosin areas along the Alligator River corridor.

Contact with the owners should be made by the N.C. Natural Heritage Program to determine their short and long-term plans for the tract and to inform them of the natural area's biological significance as a relatively large, intact pocosin system.

If, in the future, the site is protected, management will be required to maintain the pocosin vegetation in its present state. Controlled burning should be implemented to maintain the diversity of the pocosin system. Patrolling, gates, and enforcement agreements with the state's Wildlife Resources Commission may be needed to control unlawful hunting.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: dead Pinus serotina trunks/Zenobia pulverulenta-mixed pocosin shrubs or Arundinaria gigantea

Community cover type: Zenobia pulverulenta-mixed pocosin shrubs or Arundinaria gigantea

General habitat feature: high pocosin

Average canopy height: pre-fire = 15 feet, now 2-4 feet (shrubs)

Estimated age of canopy trees: -

Canopy cover: not applicable

Estimated size of community: 8000+ acres

Successional stage: Pyroclimax

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Lyonia lucida, Ilex glabra, Vaccinium sp., Persea borbonia, Sorbus arbutifolia

Common herb stratum species in community cover or community type (but not dominant):

Smilax laurifolia
Woodwardia virginica
Carex walteriana

24b. Soil Summary (by community type) CT 1

Soil series: not known

Soil classification: -

Soil association: 1) Ponzer-Belhaven-Wasda (shallow peats)
2) Dare-Pungo-Dorovan (deep peats)

pH class: Extremely acid

Source of information: General Soil Map of Hyde County, SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh-acid

Water regime: Saturated

Drainage class: Very poorly drained

Drainage basin: New Lake Fork of Alligator River

Hydrology characterization: A very poorly drained, saturated, fresh-acid, interaqueous palustrine system.

24d. Topography Summary: CT 1

Landform: peat-mantled flat

Shelter: Open

Aspect: not applicable

Slope Angle: not applicable

Profile: Flat

Surface patterns: Hummocky, many small depressions and fallen tree trunks

Position: not applicable

25. Physiographic characterization of natural area:

Pyroclimax and successional communities occupying a very poorly drained, peat-mantled flat near the headwaters of the New Lake Fork of the Alligator River in the Coastal Plain province of the Atlantic Plain.

Geological Formation:

Recent peats over Pleistocene (Pamlico Terrace) sands and clays over Upper Miocene (Yorktown Formation) fossiliferous sands and clays.

Geological Formation age:

Recent - less than 10,000 yrs. BP
Pleistocene - 10,000 to 100,000 yrs. BP
Upper Miocene - 18-22 million years BP

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science of America Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: Red-shouldered Hawk

Species legal status and authority: Threatened in N.C. (Cooper *et al.*, 1977)

Number of populations on site: one

Number of individuals per population: 2 plus young of year

Size or Maturity of individuals: adult and immature

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Believed to be good. One pair with young seen along Boundary Road; other pairs probably present along New Lake Fork.

Disturbance or threats to population: Land clearing and drainage

Habitat characteristics

Plant community: CT 1

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Black Bear

Species legal status and authority: Of Special Concern in N.C. (Cooper *et al.*, 1977)

Number of populations on site: one

Number of individuals per population: unknown

Size or Maturity of individuals: unknown

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Not known. One set of tracks seen along Boundary Road.

Disturbance or threats to population: Land clearing, drainage, road construction, illegal hunting.

Habitat characteristics

Plant community: CT 1

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master Species List:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
  Acer rubrum
AQUIFOLIACEAE
  Ilex glabra
  I. coriacea
BLECHNACEAE
  Woodwardia virginica
CYPERACEAE
  Carex walteriana
ERICACEAE
  Gaylussacia frondosa
  Kalmia angustifolia
  Lyonia lucida
  Vaccinium sp.
  Zenobia pulerulenta
LAURACEAE
  Persea borbonia
LILIACEAE
  Smilax laurifolia
MAGNOLIACEAE
  Magnolia virginiana
NYSSACEAE
  Nyssa sylvatica var. biflora
PINACEAE
  Pinus serotina
POACEAE
  Arundinaria gigantea
ROSACEAE
  Sorbus arbutifolia
THEACEAE
  Gordonia lasianthus

AMPHIBIANS

None recorded

REPTILES

None recorded.

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient; spring or fall
PV, SV, WV = Visitor; year-round, summer or winter
* = Breeding or suspected breeding at site

Great Blue Heron	PV
Turkey Vulture	PV
Red-shouldered Hawk	PR*
Common Bobwhite	PR*
Mourning Dove	PR*
Screech Owl	PR*
Common Flicker	PR*
Downy Woodpecker	PR*
Red-headed Woodpecker	PR*
Belted Kingfisher	PV
Eastern Kingbird	SR*
Tree Swallow	T
Fish Crow	PR*
Carolina Chickadee	PR*
Gray Catbird	PR*
Brown Thrasher	PR*
Eastern Bluebird	PR*
Prairie Warbler	SR*
Common Yellowthroat	SR*
Blue Grosbeak	SR*
Indigo Bunting	SR*

MAMMALS

Raccoon (tracks)
White-tailed Deer (abundant tracks)
Bobcat (1 set of tracks)
Black Bear (1 set of tracks and scat)

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Gull Rock Game Lands

2. County: Hyde

3. Location: In the southern part of the county between New Holland and Pamlico Sound.

4. Topographic quadrangle(s): New Holland (1974)
Bluff Point (1951)

5. Size: Approximately 10,575 acres, measured with a grid calculator

6. Elevation: 0-4 feet above mean sea level

7. Access: There are several access points. The sweetgum stand is best reached by taking SR 1122 to Hydeland and from there a private dirt road due east 0.7 miles. The eastern side of the sweetgum stand can be reached from several points along SR 1164 0.3-1.3 miles south of New Holland. The pond pine pocosin is along the west side of SR 1164 between 3.1 and 4.2 miles south of New Holland. The eastern margin of the low pocosin can be reached by going south from New Holland 3.1 miles on SR 1164 to dirt road on right (west). Turn right and walk down dirt road for about 1.2 miles to junction with north-south dirt road. Low pocosin is along west side of this road. A representative example of brackish marsh can be seen at end of SR 1164 at Pamlico Sound.

8. Names of investigators:

J. Merrill Lynch
Route 2, Box 222-B
Enfield, NC 27823

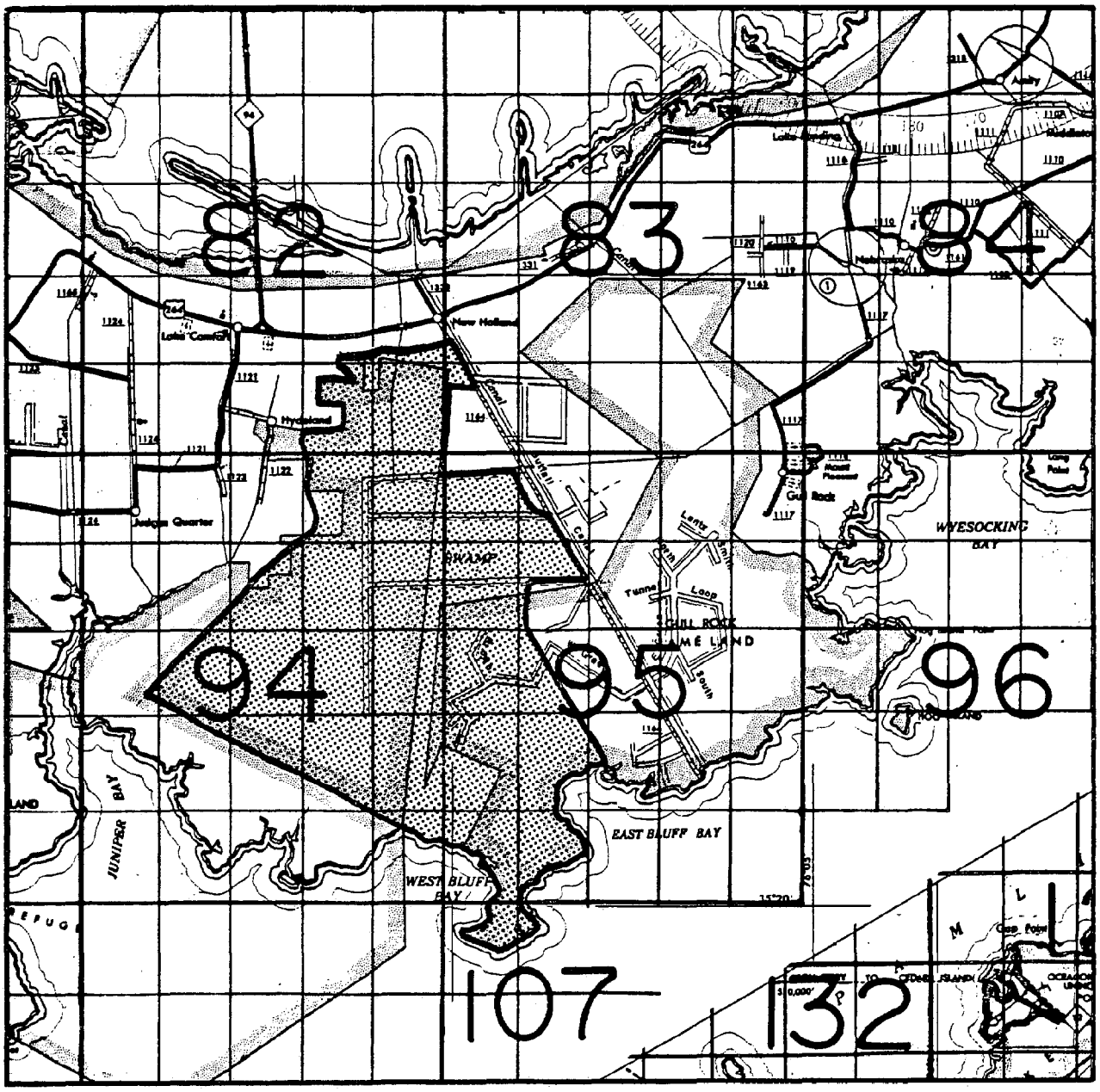
S. Lance Peacock
P. O. Box 6006
Raleigh, NC 27628

9. Date(s) of investigation: April 9, 29, June 16, 17, 28, 1982

10. Priority rating: High

Fig. 10. Access information:

GULL ROCK GAME LANDS



11a. Prose Description of Natural Area

INTRODUCTION

Located between Lake Mattamuskeet and Pamlico Sound in the southern part of Hyde County, the Gull Rock Game Lands Natural Area encompasses a variety of wetland habitats ranging from hardwood-dominated swamp forest and pond pine pocosin to shrub marsh and brackish marsh systems. This wide band of contiguous wetland habitats forms an uninterrupted transect which begins in the Hydeland sweetgum-mixed hardwoods swamp forest, proceeds through the extensive pond pine pocosins in the central portion of the natural area, and includes an area of open, low shrub pocosin. Beyond that the natural area extends to the Pamlico Sound brackish marshes.

This wide band of natural wetlands is split into four distinct habitat units based on differences in soils, hydrology, and fire regime. The four major vegetation associations correlated with each unit are discussed in the following pages along with their soil-habitat relationships, general ecology, and wildlife components.

The Gull Rock Game Lands natural area, about 10,575 acres in size, is bounded on the east by the Lake Mattamuskeet Outfall Canal (SR 1164) and on the west by agricultural fields near SR 1122 (in the vicinity of Hydeland) and the Swanquarter National Wildlife Refuge boundary. Much of this immense tract is located within the boundaries of the state-owned Gull Rock Game Lands, but there are also privately-owned tracts along the northern periphery and in the central interior.

In terms of local topography, the entire natural area is a broad, very poorly drained flat associated with the headwater region of the Juniper Bay Creek drainage system. Overall drainage is poorly developed but water flow appears to be in a southwestward direction into Juniper Bay Creek. Elevation ranges from sea level to about 4 feet.

Soils of the natural area have been mapped as four distinct soil associations (SCS 1973). No detailed soil mapping is currently available. These four soil associations occur as wide bands trending generally east-west parallel to the long axis of Lake Mattamuskeet and the Pamlico Sound shoreline. There is a significant correlation between the soil associations and the four habitat units which comprise the natural area. The four soil associations are (north to south):

1) Weeksville-Pasquotank: Very poorly and poorly drained mineral soils with black to gray very fine sandy loam or silt loam surface layers (Typic Humaquepts and Typic Haplaquepts)

2) Hyde-Bayboro: Very poorly drained mineral soils with thick black loam surface layers (Typic Umbraquults and Umbric Paleaquults)

3) Ponzer-Belhaven-Wasda: Very poorly drained organic soils with moderately thick to thin organic surface layers (Terric Medisaprists and Histic Humaquepts)

4) Capers: Very poorly drained mineral soils with dark gray silty clay and loamy surface layers (Typic Sulfaquents) Descriptions from SCS (1973).

VEGETATION

The vegetation of the natural area is a diverse assemblage of hardwood-dominated stands, baldcypress stands, pond pine pocosin, low shrub pocosin, shrub marsh, and brackish marsh. In general these vegetation associations occur as wide bands or zones in a transect running north to south. They are closely correlated with the four soil associations described in the preceding section. These vegetation-soil associations do not exhibit discrete boundaries, but rather change gradually along moisture and peat depth gradients.

For the sake of clarity, it is best to describe these vegetation associations individually. In the following discussion they are arranged in order as they are encountered along a north-south transect beginning near Hydeland and ending at Pamlico Sound:

1) Hydeland-Gull Rock Sweetgum-Hardwoods Stand

2) Gull Rock Pond Pine Pocosin (this includes several small, isolated baldcypress stands)

3) Gull Rock Low Pocosin

4) Gull Rock brackish marshes (includes shrub marsh zone)

(1) Hydeland-Gull Rock Sweetgum-Hardwoods Stands

Along the northern portion of the natural area is a band of swamp or bottomland hardwoods dominated in many areas by sweetgum (*Liquidambar styraciflua*). These stands occupy an area about one mile wide by two miles long. The eastern end is along the Outfall Canal (SR 1164) just south of New Holland. The western end is at the edge of agricultural fields about 0.7 mile east of Hydeland. The northern boundary runs along the edge of agricultural fields adjacent to US 264 and the southern boundary grades into pond pine pocosin. The areal extent of this association is about 1000 acres.

Sweetgum is the most widespread of the many hardwoods comprising the stands, exhibiting the most consistent density and distribution. Red maple (*Acer rubrum*) is also very common and often is codominant with sweetgum in the canopy. Other less common but widely distributed canopy trees include laurel oak (*Quercus laurifolia*), American elm (*Ulmus americana*), baldcypress (*Taxodium distichum*), and swamp blackgum (*Nyssa sylvatica* var. *biflora*). Surprisingly, loblolly pine (*Pinus taeda*) is generally very uncommon in the area. Age and size classes of the sweetgum-mixed hardwoods stands vary considerably from one area to another, probably due to varying intensity and frequency of past logging operations.

Several community types at least are present within the natural area, of which the two most commonly encountered are described here. The oldest, least disturbed stands are characterized as *Liquidambar styraciflua*-mixed hydric hardwoods/locally dominant *Symplocos tinctoria*-*Ligustrum sinense*/mixed mesic herbs and ferns (sweetgum-mixed hydric hardwoods/locally dominant horsesugar-swamp privet/mixed hydric herbs and ferns; CT 1). Sweetgum accounts for about 50% of the importance value. Other common canopy trees are baldcypress, American elm, red maple, and laurel oak. There is essentially no subcanopy layer in these stands. Horsesugar and swamp privet form locally dense shrub thickets 10-20 feet tall. However, over much of the area these two shrubs are only sparingly present along with scattered canopy transgressives. Almost everywhere a number of ferns and herbs form a 100 percent ground cover. Most common is netted chain fern (*Woodwardia areolata*). In some areas this species forms almost pure populations. Other common species include Virginia chain fern (*Woodwardia virginica*) which is usually associated with depressions of standing water, cinnamon fern (*Osmunda cin-*

namomea), poison ivy (Rhus radicans), southern lady fern (Athyrium asplenioides), enchanters' nightshade (Circaea lutetians) and giant cane (Arundinaria gigantea). Interestingly, Japanese honeysuckle (Lonicera japonica) is rather uncommon and, except in disturbed areas, does not form extensive ground patches.

High-climbing vines are abundant throughout the hardwood stands. Most common species are trumpet creeper (Campsis radicans), cross vine (Anisostichus capreolata), poison ivy, climbing hydrangea (Decumaria barbara), and wild grape (Vitis sp.).

The canopy height of the sweetgum-mixed hydric hardwoods community ranges to a maximum 75-80 feet although generally it is in the 60-75 foot range. The canopy is usually closed except where windfalls or other disturbances have created openings. The average dbh of the canopy trees ranges from 16 to 19 inches. The absence of a subcanopy layer and the absence of a well-defined shrub layer (except locally) gives the understory an open, park-like aspect. This openness makes traversing the area on foot relatively easy and provides esthetic appeal.

The fern diversity of the community is worth mentioning. Eleven species are known to occur: Southern lady, cinnamon, netted and Virginia chain, royal (Osmunda regalis var. spectabilis), bracken (Pteridium aquilinum), resurrection (Polypodium polypodioides), New York (Thelypteris noveboracensis), ebony spleenwort (Asplenium platyneuron), sensitive (Onoclea sensibilis), and log (Dryopteris celsa). We know of no other area in the North Carolina coastal plain (with the possible exception of the Great Dismal Swamp) with a comparable diversity of ferns. It is likely that further field work in the area will uncover the presence of rare hybrids or additional species.

A second widely distributed community type is Liquidambar styraciflua-Acer rubrum/locally dominant Myrica heterophylla/mixed hydricherbs and ferns (sweetgum-red maple/locally dominant bayberry/mixed hydricherbs and ferns). This community is similar to the one previously described except that red maple is a co-dominant canopy component with sweetgum. Local patches of bayberry are associated with wet depressions. This community is generally younger in age with corresponding lower average canopy height (50-60 feet) and average dbh (12-14 inches). This is probably a result of more intensive and/or more frequent cutting disturbances. Understory density of canopy transgressives is somewhat higher than in the older sweetgum-

mixed mesic hardwood stands. Ground cover is usually 100% with the same species composition present.

The ground surface of the sweetgum-hardwood stands is slightly undulating or uneven. There are many scattered depressions which contain standing water up to 6 inches deep. These semipermanent pools are not large enough to noticeably affect the canopy tree distribution. However, they clearly affect the distribution of the ground cover species and some of the shrubs. Virginia chain fern usually is found growing in dense patches only within the depressions. Bayberry is also associated with the pools; it forms dense thickets in and around some of them. It is probable that standing water covers most if not all of the area periodically during the winter months and that only the deeper depressions retain standing water during the late summer and autumn.

Scattered old stumps are present throughout. There is no evidence of cutting within the past 40-50 years, at least within the game lands portion of the hardwood stands. Although the entire area shows signs of past cutting disturbance, much of it has regained characteristics usually associated with mature or climax stands: distinct zonation of canopy and herb layers; open, park-like understory; and low density and frequency of introduced exotics, i.e., Japonese honeysuckle and swamp privet.

The soils of the sweetgum-hardwood stands has been mapped as the Weeksville-Pasquotank association (SCS 1973). These are very poorly drained mineral soils which occur around the periphery of Lake Mattamuskeet. Portions of the hardwood stands may lie in areas dominated by the Hyde-Bayboro association. This association of very poorly drained mineral soils occurs as a wide zone south of the Weeksville-Pasquotank soils and is transitional to the shallow organic soils occurring within the Pungo-Belhaven-Wasda association.

(2) Gull Rock Pond Pine Pocosin

This vegetation association occupies much of the central and southern portions of the natural area. It is characterized by dense stands of pond pine (*Pinus serotina*).

The association is located south of the adjoining sweetgum-hardwood stands. It is by far the largest of the four associations, encompassing about 7000 acres. The eastern

border is along the Outfall Canal (SR 1164) and the western border grades into the Gull Rock Low Pocosin described later in this report. The southern border grades into shrub marsh near Pamlico Sound.

Otte (1981) proposes a basic pocosin classification which relates vegetation to combined factors of peat depth, seasonal wetness, and nutrient availability from underlying mineral strata or elsewhere (See Table). His system is employed in the following description of the plant communities present in the Gull Rock Pond Pine Pocosin and the Low Pocosin.

The most extensive natural community within this area is Otte's pond pine forest type. The essential criteria for this pocosin type are: sandy peats less than two feet in depth, water table which drops down into the underlying mineral sediments during dry seasons, rare to absent standing water, and site dominated by 10-20 feet tall "bay" shrubs with dense canopy layer of pond pines usually less than 50 feet tall.

A representative example of this pond pine forest type observed in the field is located along the Outfall Canal (SR 1164) about 3.2 miles south of New Holland. The community type is classified as Pinus serotina/Persea borbonia/ mixed pocosin shrubs//Smilax laurifolia (pond pine/red bay/ mixed pocosin shrubs//laurel-leaved greenbriar; CT 2). The closed canopy is 40-50 feet tall and dominated exclusively by pond pine; dbh's are less than 12 inches. A dense tall shrub layer of red bay is located underneath with an underlying dense low shrub layer composed of several pocosin shrubs such as bitter gallberry (Ilex glabra), fetterbush (Lyonia lucida), and chokecherry (Sorbus arbutifolia). There is essentially no ground layer. The intertwining vine, laurel-leaved greenbriar, is ubiquitous and forms an almost inpenetrable tangle in the shrub layers. Other "bay" shrubs are scattered within this community. Sweet bay (Magnolia virginiana) and loblolly bay (Gordonia lasianthus) occur but are not common enough to be considered co-dominant components of the tall shrub layer.

This community occupies much of the natural area between the hardwood stands located on mineral soils to the north and the low pocosin area located on deep peat to the southwest.

The dense pond pine-redbay pocosin community is situated on sandy peats and shallow peats around the outer margin of a deeper peat deposit near the headwaters of the Juniper Bay

Creek drainage. The deepest peat deposits are located in an area dominated by low pocosin and some high pocosin, situated southwest of the dense pond pine stands described above. In general, the vegetational pattern as one moves from the outer margins of the peat deposit to the inner "center" of maximum peat thickness is across a moisture and peat thickness gradient. Pond pine forest around the shallow peat margins grades into high pocosin and finally to low pocosin in the center of the peat body. This pattern follows the general intrapocosin variation described by Otte (1981).

The soils of the pond pine pocosin vegetation association have not been mapped in detail. The soil association is probably Ponzer-Belhaven-Wasda: very poorly drained organic soils. The pond pine stands are associated with the shallower peat deposits of this soil association.

A distinctly different vegetation type is present within the pond pine pocosin area. Baldcypress (*Taxodium distichum*) stands occur as small (less than 50 acres) isolated "islands" along the southern portion of the natural area within 1.5 miles of Pamlico Sound. These stands were not investigated from the ground but were surveyed aerially and located on aerial photographs. Baldcypress predominates in the canopy along with a few tall pines (either *Pinus taeda* or *P. serotina*). Canopy height is 70-90 feet. Understory vegetation could not be definitely determined but appeared to consist of red maple (*Acer rubrum*) and bay shrubs. The physiognomy of these stands is striking when compared with the adjoining pond pine stands. The controlling factors determining the distribution and formation of these cypress stands is unknown. Soil differences and hydrology are probable factors; further field work is needed to determine what the controlling factors are.

(3) Gull Rock Low Pocosin

This vegetation association is located in the central portion of the natural area. It is surrounded on all four sides by the pond pine pocosin described earlier. The low pocosin, about 1900 acres in size, is located almost wholly within the state-owned game lands except for a very small area along its eastern margin contained in the Ficklen tract.

Otte (1981) describes the following characteristics of low pocosin: greater than 4 feet of peat, saturated soils with abundant surface water up to 2 feet deep during wet seasons, dense pocosin shrub vegetation with heights of 2-4 feet with scattered, stunted pond pines up to 10 feet tall.

A representative example of low pocosin observed in the field is located along a north-south access road situated about 1.25 miles west of the Outfall Canal Road (SR 1164). The dominant vegetation observed here is titi (Cyrilla racemiflora), 4-6 feet tall over an assemblage of slightly lower shrubs including stunted redbay (Persea borbonia), fetterbush (Lyonia lucida), honeybells (Zenobia pulverulenta) and chokecherry (Sorbus arbutifolia). In more open patches a dense herb layer composed of Virginia chain fern (Woodwardia virginica) is present. Pond pines are very scattered to almost completely absent. They are stunted, less than 10 feet tall and with dbh's less than three inches. Scattered small loblolly bays (Gordonia lasianthus) 5-10 feet tall are also present.

The community type is Cyrilla racemiflora-mixed pocosin shrubs/Woodwardia virginica (titi-mixed pocosin shrubs/Virginia chain fern; CT 3). There is much local variation in dominance of the shrub species. In some areas there are open zones dominated exclusively by Virginia chain fern. Sweet pepperbush (Clethra alnifolia) forms locally dense zones in scattered locations. Other zones dominated by honeybells, chokecherry, and fetterbush are also present.

Laurel-leaved greenbriar (Smilax laurifolia) forms a dense tangle throughout much of the shrub zone.

In some open, wet depressions several pitcherplants occur (Sarracenia purpurea, S. flava). Pitcherplants are also found along the ditch and road margins.

Unfortunately, the wettest and lowest portions of the low pocosin were not field checked. An area of about 500 acres located southwest of the north-south access road appears to be dominated by low shrubs 2-4 feet in height and possibly by a sedge marsh system. This area was surveyed by air in April 1982. From our aerial observations this area appears to be a very wet, treeless, low shrub and/or sedge marsh dominated wetland. Ground field work is needed to determine the community types present.

The low pocosin vegetation types described above appear to be correlated with a deep peat deposit mapped by Otte and Ingram (1980). Their peat survey covered six square miles, of which approximately 1.5 are underlain by peat up to 2 feet thick, 2.25 by peat 2-4 feet thick, and 2.25 by peat 4-5 feet thick. The deepest parts of this peat deposit are believed to lie underneath the low pocosin area.

It should also be mentioned that a third pocosin type, high pocosin, is also present within the natural area. This type is transitional between low pocosin and pond pine forest. Its characteristics are: peat depth of 2-4 feet, saturated organic soils with water tables which drop 1-2 feet below the surface in dry seasons, dense shrub layer dominated by bay species 4-8 feet tall with scattered pond pines to 25 feet tall. Areas sampled which match this description are located between the Outfall Canal Road and the Low Pocosin area. There is a gradual increase in pond pine density and height and shrub layer height as one proceeds east from the low pocosin to the pond pine forest along the Outfall Canal. Most areas of high pocosin are included in the Gull Rock pond pine pocosin vegetation association. Because there is a continuum of vegetation types it is not practical to delineate the areal extent of the high pocosin-dominated areas.

The soils of the low pocosin have been mapped as the Ponzer-Belhaven-Wasda association (SCS 1973). The deeper organics, i.e., Ponzer and Belhaven series, probably dominate in this area.

(4) Gull Rock Brackish Marshes

This vegetation association occupies about 675 acres along the Pamlico Sound shoreline in the southern portion of the natural area. The brackish marsh zone is fairly extensive along the sound and its many small bays, averaging between 1000 and 3000 feet in width.

Three distinct zones are present which are controlled by flooding frequency and duration. Adjacent to the open water is a zone dominated by almost pure stands of black needlerush (*Juncus roemarianus*). The needlerush marsh is irregularly flooded by above average high tides and storm tides. Threesquare (*Scirpus americanus*) forms small, dense patches within the needlerush zone. The next higher marsh is dominated by sawgrass (*Cladium jamaicense*). These plants form a dense layer up to nine feet in height. The separation of the needlerush and sawgrass zones is usually quite distinct. Flooding occurs only occasionally in this zone. These two marsh types are listed as CT 4 in the significance summary and biotic summary tables.

Further inland the sawgrass grades gradually into a shrub marsh system which contains along with sawgrass various shrubs such as bayberry (*Myrica* sp.), groundsel

tree (Baccharis halimifolia), small red maple (Acer rubrum) transgressives and small pond pine. The shrubs assume increasing dominance and gradually increase in height as one moves inland. The shrub zone grades gradually into a pond pine-red maple low tree zone which eventually becomes pond pine pocosin. The shrub marsh zone is flooded on rare occasions by storm tides.

The soils of this vegetation type have been mapped as the Capers association: very poorly drained mineral soils which are mildly alkaline due to the salt influence from the adjacent brackish sound.

WILDLIFE AND AVIAN DIVERSITY

The Gull Rock Game Lands natural area has superlative values for a diversity of game and non-game species. The natural area, by virtue of its size, remoteness, and habitat diversity, supports one of the last viable black bear populations in the coastal plain. The natural area, along with the adjacent wilderness areas of Swanquarter National Wildlife Refuge and more disturbed portions of the Gull Rock Game Lands, encompasses a total of about 20,000 acres. Much of this acreage is either formally designated wilderness (8800 acres of the Swanquarter National Wildlife Refuge) or de facto wilderness (much of the Gull Rock Game Lands). Its large size and ecological diversity provide crutial nesting, denning, and feeding habitat for many wildlife species.

Sixty-three species of breeding birds are known to occur and at least 8 species of mammals are present. According to Rod McClanahan (WRC District biologist) the area supports "very large" black bear and "large" white-tailed deer populations. Our observations of numerous track and scat sign of both black bear and white-tailed deer support McClanahan's information. Bear sign are particularly prevalent in the low pocosin area. Bobcat are also reported to be present in undetermined numbers.

11b. Prose Description of Site Significance:

The Gull Rock Game Lands natural area contains the highest diversity of wetland habitat types in a relatively natural state remaining in Hyde County. The natural area contains excellent examples of brackish marsh; low, high, and pond pine-dominated pocosin; and sweetgum-mixed hardwood flats. All of these vegetation types are situated in one contiguous tract and form an uninterrupted corridor from Pamlico Sound inland to New Holland, with extensive marshes adjoining to the west on Swanquarter National Wildlife Refuge. Although subjected to periodic cutting in the past, the pocosin and hardwoods communities have retained significant natural qualities in the present second-growth timber.

The sweetgum-hardwood flats are an example of a rapidly disappearing coastal plain vegetation association. Although more disturbed than the hardwood flats contained in the Scranton Hardwoods natural area, they nevertheless contain a substantial amount of mature timber and provide habitat for a number of wildlife species.

The low pocosin community is an excellent example of an undrained, shrub-dominated wetland system and is buffered by an extensive pond pine pocosin surrounding it.

The brackish marshes along Pamlico Sound are critical habitat for a number of invertebrate as well as vertebrate animals. These marshes are widespread along the sound and are included in the natural area primarily because they are part of a continuum of habitats which add to the natural area's diversity.

The southern coastal fauna is well-represented in the natural area. Black bear occur throughout and the diversity and extensiveness of the habitats is sufficient to maintain a viable population. The avifaunal component is notably diverse, in keeping with the habitat diversity present. Approximately 63 breeding bird species are known to occur, including five species of woodpeckers and 12 species of wood warblers.

The natural area provides habitat for a small American Alligator population, an endangered species. A state endangered peripheral plant, Southern Twayblade, is present in the sweetgum-hardwood flats. An unusually high diversity of ferns (eleven species) is also a noteworthy feature of that habitat.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Liquidambar styraciflua-mixed hydric hardwoods/locally dominant Symplocos tinctoria-Ligustrum sinense/mixed hydric herbs and ferns Old-growth section of CT inventoried by authors	Mature, second-growth wetland community which is an excellent example of a mesic-hydric hardwood stand associated with wet mineral soils. Most of the "hardwood flats" in Hyde County and elsewhere in the N.C. coastal plain have been drained and converted to either agricultural or silvicultural production. This is one of the few remaining tracts which contains mature timber.
High-quality wetland plant community	CT 2	Pinus serotina/Persea borbonia/mixed pocosin shrubs//Smilax laurifolia Representative example of CT	Good example of pond pine-dominated pocosin. This community is similar to many other pond pine stands associated with peat-dominated pocosins in the coastal plain. Its major significance is as a buffer around the low pocosin community and its contiguity with both that community and the mixed mesic hardwood stands. It is also significant for its value as wildlife habitat, particularly for black bear.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 3	Cyrilla racemiflora-mixed pocosin shrubs/Woodwardia virginica	Excellent example of a wet low pocosin in an undrained, un-
		Approximate areal extent of CT	disturbed condition. It forms with CT 2 a system of relative-
			ly undisturbed pocosin habitats which illustrate most of the
			characteristic pocosin vege- tation types.
High-quality wetland plant community	CT 4	a) Juncus roemarianus and	Excellent example of undrained brackish marsh systems.
		b) Cladium jamaicense	Habitat for a number of marsh and wading birds. Primary
		Approximate areal extent of CT	significance of these marshes is their contiguity along a
			vegetation gradient with the pond pine pocosin communities
			mentioned in the text.
Endangered species	CT 1	Listera australis (Southern twayblade)	Endangered peripheral in N.C. (Cooper, et al., 1977). Com-
			mon throughout much of the hardwood stands.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Endangered species	portions of CT 2,	American alligator	Federally endangered (Endan-
	3, 4		gered Species Act of 1973).
			Reported to occur in potholes
			and drainage canals in eastern
			and southern portions of
			natural area (Rod McClanahan,
			WRC District biologist, pers.
			comm., 1982).
Threatened species	CT 1,	Red-shouldered Hawk	Threatened throughout N.C.
	CT 2		(Cooper et al., 1977). At
			least 2 nesting pairs are
			present in wooded northern and
			central sections of natural
			area.
Special Concern Species	edge of	Osprey	Of Special Concern in N.C.
	Pamlico		(Cooper et al., 1977). At
	Sound		least several nesting pairs
			are known in natural area.
Special Concern Species	through-	Black Bear	Of Special Concern in N.C.
	out		(Cooper et al. 1977). "Very
			large" population in natural
			area (Rod McClanahan, WRC
			district biologist, pers. comm.,
			1982). Area is large and di-
			verse enough to support viable
			population. One of two re-

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
			maining strongholds for species in county (the other is the
			Alligator River swamp forest corridor).
Unusual fern diversity	CT 1	Eleven species of ferns	Eleven species of ferns are known to occur in the mixed
			hydrichardwood stands. This is considered to be an unusual-
			ly high diversity for the N.C. Coastal Plain. Only known area
			of comparable diversity is in the Great Dismal Swamp.

Fig. 11. Significant features: GULL ROCK GAME LANDS

Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	15 %
Public	85 %
Unknown	%

14. Number of Owners: 17

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information). (in order of importance)

1) State of North Carolina
Wildlife Resources Commission
Gull Rock Game Lands Unit
512 N. Salisbury Street
Raleigh, NC 27611

2) James S. Ficklen, Jr. (agent)
P. O. Box 2127
E.C.U. Station
Greenville, NC 27834

3) C. Gilbert Gibbs
Engelhard, NC 27824

4) Zelma Howard
Route 1, Box 131
Swanquarter, NC 27885

plus additional 13 owners of small fractions of sweetgum section of natural area; various addresses.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

1) Rod McClanahan
Route 1, Box 442-B
Jamesville, NC 27846

17. Attitude of owner or custodiam toward preservation (contacted?):

Not known.

18. Uses of natural area:

The state-owned gamelands section of the natural area is open to public hunting and is managed for that purpose. The primary game species is white-tailed deer; other smaller game such as squirrel, rabbit, quail, and dove are also hunted. The gamelands is a protected black bear sanctuary; no hunting is allowed for that species. Hunting is also a primary use on the privately owner tracts within the natural area, particularly those adjoining agricultural fields along the northern border.

Timber harvesting is an on-going use throughout the state game lands where there is merchantable timber. Blocks of timber are periodically sold to private companies to generate revenue. Much of the recent timber sales have been in the extensive pond pine stands where clearcutting methods have been used to remove the timber. Much of the game lands portion on the sweetgum-hardwood stands has been selectively cut (high-graded) over the years. Logging in this area was periodically active at least back into the 1800's and early 1900's when much of the timber was removed by rail. An old tram road, now maintained as a hunting access trail, runs east-west across the natural area between Hydeland and SR 1164. There has apparently been no timbering in this portion of the natural area within the past twenty years or so. The privately owned portions of the sweetgum-hardwood stands have a similar cutting history.

Portions of the pond pine pocosin stands on the gamelands just outside the natural area boundaries have recently been burned, diked, and impounded to create waterfowl impoundments. Two large impoundments are located near the end of SR 1164 along the west side of the road. Several others are planned east of SR 1164 several miles from the natural area. As far as is known, the Wildlife Resources Commission has no plans to impound any areas within the natural area boundaries.

19. Uses of surrounding land:

a. Wildland 75 %

b. Agricultural land 25 %

c. high-intensity forestry _____ %

d. developed _____ %

20. Preservation Status:

Cat	* %	*Description of preservation status
2	85	Public land, informally recognized as a natural area
6	15	Private land, not protected by owner or lessee

21. Regulatory protections in force:

The Army Corps of Engineers "404" permit process applies to this area; the Federal Endangered Species Act of 1973 protects the American alligator and its habitat. These two sources of regulation are limited in scope and effect.

22. Threats:

The natural area contains a relatively small body of energy-grade peats (Otte and Ingram, 1980). Barnes (pers. comm., 1982) states that peats of the Ponzer soil series, which are prevalent on the site, are considered generally well suited to peat energy production, within certain mineral (ash) content limits which must be tested on a per-site basis. Exploitation of peat for energy must be considered a potential activity at the site, although it is highly unlikely that the Wildlife Resources Commission will find such use compatible with present wildlife management policies.

Timber management on the game lands, particularly in the pond pine stands, is an ongoing use. Blocks of timber have been clearcut within the past ten years and additional areas are slated to be cut. The associated road and ditch construction has a negative impact on some wildlife species, notably black bear, by increasing access and likelihood of illegal hunting.

The hardwood stands, although not timbered in recent years, may be subject to cutting in the future.

Waterfowl impoundments have been established adjacent to the natural area in areas formerly dominated by high marsh and pond pine pocosin. There are no additional impoundments planned for the near future within the natural area.

23. Management and Preservation Recommendation:

The natural area offers an excellent opportunity for conservation of a variety of wetland habitats. The N.C. Natural Heritage Program should initiate contact with the N.C. Wildlife Resources Commission about the possibility of designating portions of the game lands as registered natural areas. Portions of the sweetgum-mixed hardwoods stands and the low pocosin should receive top priority for additional protection because of their superlative natural values.

Management of the natural area should include controlled burning of portions of the low pocosin area, and restrictions on timber sales in the best preserved, mature hardwood and baldcypress stands.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: Liquidambar styraciflua-mixed hydric hardwoods/ locally dominant Symplocos tinctoria-Ligustrum sinese/mixed hydric herbs and ferns.

Community cover type: Liquidambar styraciflua-mixed hydric hardwoods

General habitat feature: hardwood flats

Average canopy height: 75-80 feet

Estimated age of canopy trees: unknown

Canopy cover: closed

Estimated size of community: less than 1000 acres

Successional stage: late successional

Common canopy species in community cover or community type (but not dominant):

Ulmus americana, Acer rubrum, Quercus laurifolia, Taxodium distichum

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Leucothoe axillaris, Ilex opaca

Common herb stratum species in community cover or community type (but not dominant):

Woodwardia areolata, W. virginica, Circaea lutetiana, Osmunda cinnamomea, Arundinaria gigantea, Rhus radicans, Athyrium asplenioides, Lonicera japonica

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 2

Community type: Pinus serotina/Persea borbonia/mixed pocosin shrubs// Smilax laurifolia

Community cover type: Pinus serotina

General habitat feature: pond pine pocosin

Average canopy height: 40-50 feet

Estimated age of canopy trees: unknown

Canopy cover: closed

Estimated size of community: less than 7000 acres

Successional stage: mid to late successional

Common canopy species in community cover or community type (but not dominant):

none

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Magnolia virginiana, Gordonia lasianthus, Acer rubrum, Lyonia lucida, Ilex glabra, Sorbus arbutifolia

Common herb stratum species in community cover or community type (but not dominant):

Woodwardia virginica

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 3

Community type: Cyrilla racemiflora-mixed pocosin shrubs/Woodwardia virginica

Community cover type: Cyrilla racemiflora-mixed pocosin shrubs

General habitat feature: low pocosin

Average canopy height: not applicable

Estimated age of canopy trees: not applicable

Canopy cover: not applicable

Estimated size of community: 1900 acres

Successional stage: late successional or pyro-edaphic climax?

Common canopy species in community cover or community type (but not dominant):

none

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Persea borbonia, Lyonia lucida, Zenobia pulverulenta, Sorbus arbutifolia, Clethra alnifolia, Gordonia lasianthus

Common herb stratum species in community cover or community type (but not dominant):

Smilax laurifolia

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 4

Community type: 1) Juncus roemarianus, 2) Cladium jamaicense

Community cover type: 1) Juncus roemarianus, 2) Cladium jamaicense

General habitat feature: irregularly flooded brackish marsh

Average canopy height: not applicable

Estimated age of canopy trees: not applicable

Canopy cover: not applicable

Estimated size of community: 675 acres

Successional stage: climax

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Baccharis haliminifolia, Myrica cerifera

Common herb stratum species in community cover or community type (but not dominant):

Scirpus americanus

24b. Soil Summary (by community type) CT 1

Soil series: Undetermined

Soil classification: Weeksville: Typic Humaquepts
Pasquotank: Typic Haplaquepts

Soil association: Weeksville-Pasquotank

pH class: very strongly acid

Source of information: General Soil Map of Hyde County, SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: fresh

Water regime: Intermittently flooded

Drainage class: Very poorly drained

Drainage basin: Juniper Bay Creek into Pamlico Sound

Hydrology characterization: A very poorly drained, intermittently flooded, fresh, interaqueous, palustrine system.

24b. Soil Summary (by community type) CT 2

Soil series: Undetermined

Soil classification: Ponzer: Terric Medisaprists
Belhaven: Terric Medisaprists
Wasda: Histic Humaquepts

Soil association: Ponzer-Belhaven-Wasda

pH class: Extremely acid

Source of information: General Soil Map of Hyde County, SCS, 1973

Other notes: This community is probably dominated by the shallower organics.

24c. Hydrology Summary (by community type) CT 2

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: fresh

Water regime: temporarily flooded to saturated

Drainage class: very poorly drained

Drainage basin: Juniper Bay Creek into Pamlico Sound

Hydrology characterization: A very poorly drained, temporarily flooded to saturated, fresh, interaqueous palustrine system.

24b. Soil Summary (by community type) CT 3

Soil series: probably Ponzer

Soil classification: See CT 2

Soil association: Ponzer-Belhaven-Wasda

pH class: Extremely acid

Source of information: General Soil Map of Hyde County, SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 3

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh

Water regime: saturated

Drainage class: Very poorly drained

Drainage basin: Juniper Bay Creek into Pamlico Sound

Hydrology characterization: A very poorly drained, saturated, fresh, interaqueous palustrine system.

24b. Soil Summary (by community type) CT 4

Soil series: undetermined, probably Capers

Soil classification: Capers: Typic Sulfaquents

Soil association: Capers

pH class: unknown

Source of information: General Soil Map of Hyde County, SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 4

Hydrologic system: Estuarine

Hydrologic subsystem: Intertidal

Water chemistry: Brackish

Water regime: Irregularly flooded

Drainage class: Very poorly drained

Drainage basin: Pamlico Sound

Hydrology characterization: A very poorly drained, irregularly flooded, brackish, intertidal, estuarine system.

24b. 1) Topography Summary: CT 1

Landform: non-alluvial flat

Shelter: Sheltered

Aspect: not applicable

Slope Angle: not applicable

Profile: Flat

Surface patterns: Generally smooth; many scattered depressions

Position: not applicable

2) Topography Summary: CT 2, 3

Landform: non-alluvial, peat-mantled flat

Shelter: sheltered

Aspect: not applicable

Slope Angle: not applicable

Profile: Flat

Surface patterns: hummocky; particularly in CT 3

Position: not applicable

3) Topography Summary: CT 4

Landform: brackish marsh

Shelter: open

Aspect: not applicable

Slope Angle: not applicable

Profile: Flat

Surface patterns: Smooth, except for small scattered depressions and small tidal creeks

Position: not applicable

25. Physiographic characterization of natural area:

Mid-successional to near-climax communities on mineral and peat-dominated landscape on the Pamlico Terrace in the Coastal Plain Province of the Atlantic Plain.

Geological Formation:

Pleistocene Pamlico Terrace formation over the Upper Miocene Yorktown Formation.

Geological Formation age:

Pleistocene Pamlico Terrace: less than 100,000 yrs. BP
Upper Miocene Yorktown Formation: 18-22 million yrs. BP

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Soc. of Am. Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: Listera australis

Species legal status and authority: Endangered peripheral in North Carolina (Cooper et al., 1977)

Number of populations on site: one

Number of individuals per population: Present as scattered individuals over a large area.

Size or Maturity of individuals: all ages

Phenology of population: not known

Eg: vegetative %
flowering %
fruiting %

General vigor of population: Excellent

Disturbance or threats to population: Clearcutting or conversion of hardwood forests to other uses

Habitat characteristics

Plant community: CT 1

Topography: slightly elevated rises

Soil Series: Weeksville-Pasquotank association

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: American Alligator

Species legal status and authority: Federally Endangered (Endangered Species Act of 1973)

Number of populations on site: one

Number of individuals per population: undetermined; not observed by authors, reported to occur in potholes and drainage ditches in portions of natural area.

Size or Maturity of individuals: not known

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: not known

Disturbance or threats to population: none known

Habitat characteristics

Plant community: CT 2, 3, 4

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Red-shouldered Hawk

Species legal status and authority: Threatened in North Carolina (Cooper et al., 1977).

Number of populations on site: 2+ pairs

Number of individuals per population: 2 (male and female) per pair plus young of year

Size or Maturity of individuals: all ages

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Excellent

Disturbance or threats to population: Drainage and conversion to agriculture, pesticides, clear-cutting

Habitat characteristics

Plant community: CT 1, 2

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Black Bear

Species legal status and authority: Of Special Concern in N.C. (Cooper, et al., 1977)

Number of populations on site: one

Number of individuals per population: Undetermined but believed to be relatively high

Size or Maturity of individuals: all ages

Phenology of population: not applicable

Eg: vegetative %
flowering %
fruiting %

General vigor of population: Probably excellent

Disturbance or threats to population: Clearcutting, conversion of wetlands to agriculture, illegal hunting

Habitat characteristics

Plant community: throughout

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species Lists.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master Species List:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
  Acer rubrum
ANACARDIACEAE
  Rhus radicans
  R. copalina
APIACEAE
  Centella asiatica
  Sanicula sp.
AQUIFOLIACEAE
  Ilex coriacea
  I. glabra
  I. opaca
ARACEAE
  Arisaema triphyllum
ARECACEAE
  Sabal minor
ASCLEPIADACEAE
  Matelea sp.
ASPIDIACEAE
  Athyrum asplenioides
  Dryopteris celsa
  Onoclea sensibilis
  Thelypteris noveboracensis
ASPLENIACEAE
  Asplenium platyneuron
ASTERACEAE
  Baccharis haliminifolia
BALSAMINACEAE
  Impatiens capensis
BLECHNACEAE
  Woodwardia areolata
  W. virginica
BIGNONIACEAE
  Anisostichus capreolata
  Campsis radicans
CAPRIFOLIACEAE
  Lonicera japonica
CELASTRACEAE
  Euonymus americanus
CLETHRACEAE
  Clethra alnifolia
COMMELINACEAE
  Commelina virginica

CONVOLVULACEAE
  Cuscuta sp.
CORNACEAE
  Cornus stricta
CUPRESSACEAE
  Juniperus virginiana
CYPERACEAE
  Carex spp.
  Scirpus americanus
  Cladium jamaicense
CYRILLACEAE
  Cyrilla racemiflora
DIOSCOREACEAE
  Dioscorea villosa
ERICACEAE
  Galussacia sp.
  Vaccinium corymbosum
  Vaccinium sp.
  Leucothoe axillaris
  Zenobia pulverulenta
  Lyonia lucida
  L. mariana
FAGACEAE
  Quercus laurifolia
  Q. michauxii
GENTIANACEAE
  Bartonia virginica
HAMAMELIDACEAE
  Liquidambar styraciflua
JUNCACEAE
  Juncus roemarianus
  Juncus sp.
LAURACEAE
  Persea borbonia
  Lindera benzoin
LILIACEAE
  Smilax rotundifolia
  S. laurifolia
LOGANIACEAE
  Gelsemium sempervirens
LORANTHACEAE
  Phoradendron serotinum
MAGNOLIACEAE
  Magnolia virginiana
  Liriodendron tulipifera
MORACEAE
  Morus rubra
MYRICACEAE
  Myrica cerifera
  M. heterophylla

NYSSACEAE
  Nyssa sylvatica var. biflora
OLEACEAE
  Fraxinus pennsylvanica
  Ligustrum sinense
ONAGRACEAE
  Circaea lutetiana

OPHIOGLOSSACEAE
  Botrychium sp.
ORCHIDACEAE
  Listera australis
OSMUNDACEAE
  Osmunda cinnamomea
  O. regalis var. spectabilis
OXALIDACEAE
  Oxalis sp.
PHYTOLACCACEAE
  Phytolacca americana
PINACEAE
  Pinus taeda
  P. serotina
POACEAE
  Arundinaria gigantea
  Distichlis spicata
  Uniola sessiliflora
POLYGONACEAE
  Polygonum sp.
POLYPODIACEAE
  Polypodium polypodioides
PONTEDERIACEAE
  Pontederia cordata
PTERIDACEAE
  Pteridium aquilinum
RHAMNACEAE
  Berchemia scandens
ROSACEAE
  Crataequs sp.
  Prunus serotina
  Rubus sp.
  Sorbus arbutifolia
RUBIACEAE
  Cephalanthus occidentalis
  Mitchella repens
  Galium spp.
SALICACEAE
  Salix sp.
  Populus heterophylla
SARRACENIACEAE
  Sarracenia flava
  S. purpurea

SAURURACEAE
  Saururus cernuus
SAXIFRAGACEAE
  Decumaria barbara
  Itea virginica
SYMPLOCOCEAE
  Symplocos tinctoria
TAXODIACEAE
  Taxodium distichum
THEACEAE
  Gordonia lasianthus
TYPHACEAE
  Typha latifolia
  T. angustifolia
ULMACEAE
  Ulmus americana
URTICACEAE
  Boehmeria cylindrica
VERBENACEAE
  Callicarpa americana
VIOLACEAE
  Viola sp.
VITACEAE
  Parthenocissus quinquefolia
  Vitis sp.

AMPHIBIANS

Gray Treefrog
Southern Toad

REPTILES

Eastern Kingsnake
Banded Watersnake
Hog-nosed Snake
Rough Green Snake
Black Rat Snake
Painted Turtle
Yellow-bellied Turtle
Five-lined Skink
Broad-headed Skink

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; year-round, summer, or winter
* = Breeding or suspected breeding at site

Common Loon	WR
Double-crested Cormorant	PV
Green Heron	SR*
Louisiana Heron	PV
Great Blue Heron	PR*
Least Bittern	SR*
Black Duck	PR (may breed)
Godwall	PR (may breed)
Wood Duck	PR*
Turkey Vulture	PR*
Black Vulture	PV
Red-tailed Hawk	PR*
Red-shouldered Hawk	PR*
Osprey	SR*
Common Bobwhite	PR*
Sora	T
Clapper Rail	PR*
Spotted Sandpiper	T
Lesser Yellowlegs	T
Least Sandpiper	T
Great Black-backed Gull	WR
Herring Gull	WR
Ring-billed Gull	WR
Laughing Gull	SR
Forster's Tern	SR*
Least Tern	SV
Royal Tern	SV
Mourning Dove	PR*
Chuck-will's-Widow	SR*
Common Nighthawk	SR
Yellow-billed Cuckoo	SR*
Chimney Swift	SV
Ruby-throated Hummingbird	SR*

Common Flicker	PR*	
Pileated Woodpecker	PR*	
Red-bellied Woodpecker	PR*	
Hairy Woodpecker	PR*	
Downy Woodpecker	PR*	
Eastern Kingbird	SR*	
Great Crested Flycatcher	SR*	
Acadian Flycatcher	SR*	
Eastern Pewee	SR*	
Barn Swallow	SV	
Purple Martin	SV	
Blue Jay	PR*	
Common Crow	PR*	
Fish Crow	PR*	
Carolina Chickadee	PR*	
Tufted Titmouse	PR*	
Brown-headed Nuthatch	PR*	
Carolina Wren	PR*	
Long-billed Marsh Wren	PR*	
Gray Catbird	PR*	
Brown Thrasher	PR*	
American Robin	PR*	
Wood Thrush	SR*	
Blue-gray Gnatcatcher	SR*	
Starling	PV	
White-eyed Vireo	SR*	(may winter)
Red-eyed Vireo	SR*	
Prothonotary Warbler	SR*	
Swainson's Warbler	SR*	
Yellow Warbler	T	
Northern Parula Warbler	SR*	
Yellow-rumped Warbler	WR	
Black-throated Green Warbler	SR*	
Yellow-throated Warbler	SR*	
Pine Warbler	PR*	
Prairie Warbler	SR*	
Northern Waterthrush	T	
Ovenbird	SR*	
Common Yellowthroat	PR*	
Yellow-breasted Chat	SR*	
Hooded Warbler	SR*	
American Redstart	SR*	
Bobolink	T	
Eastern Meadowlark	PR*	
Red-winged Blackbird	PR*	
Orchard Oriole	SR*	
Boat-tailed Grackle	PR*	
Common Grackle	PR*	

Brown-headed Cowbird	PR*
Northern Cardinal	PR*
Blue Grosbeak	SR*
Indigo Bunting	SR*
American Goldfinch	PV
Rufous-sided Towhee	PR*
Seaside Sparrow	PR*
Swamp Sparrow	WR
Song Sparrow	WR

MAMMALS

White-tailed Deer	- abundant tracks throughout
Marsh Rabbit	- several seen
Cottontail Rabbit	- several seen
Bobcat	- no sign observed by authors, reported by WRC personnel
Raccoon	- tracks common
Opossum	- several sets of tracks
Eastern Gray Squirrel	- several seen
Black Bear	- numerous signs observed including scratched trees, scat, and 4-5 sets of tracks; most sign around low pocosin area.

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Scranton Hardwoods

2. County: Hyde

3. Location: Along the east side of US 264 between Scranton Creek and the Intracoastal Waterway.

4. Topographic quadrangle(s): Ponzer (1974)
Scranton (1974)

5. Size: Approximately 6000 acres; measured with grid calculator

6. Elevation: 4-8 feet above mean sea level

7. Access: Any number of points along US 264 which forms west boundary of natural area. Old-growth stands are located primarily between 1.4 and 2.5 miles south of the Intracoastal Waterway bridge.

8. Names of investigators:

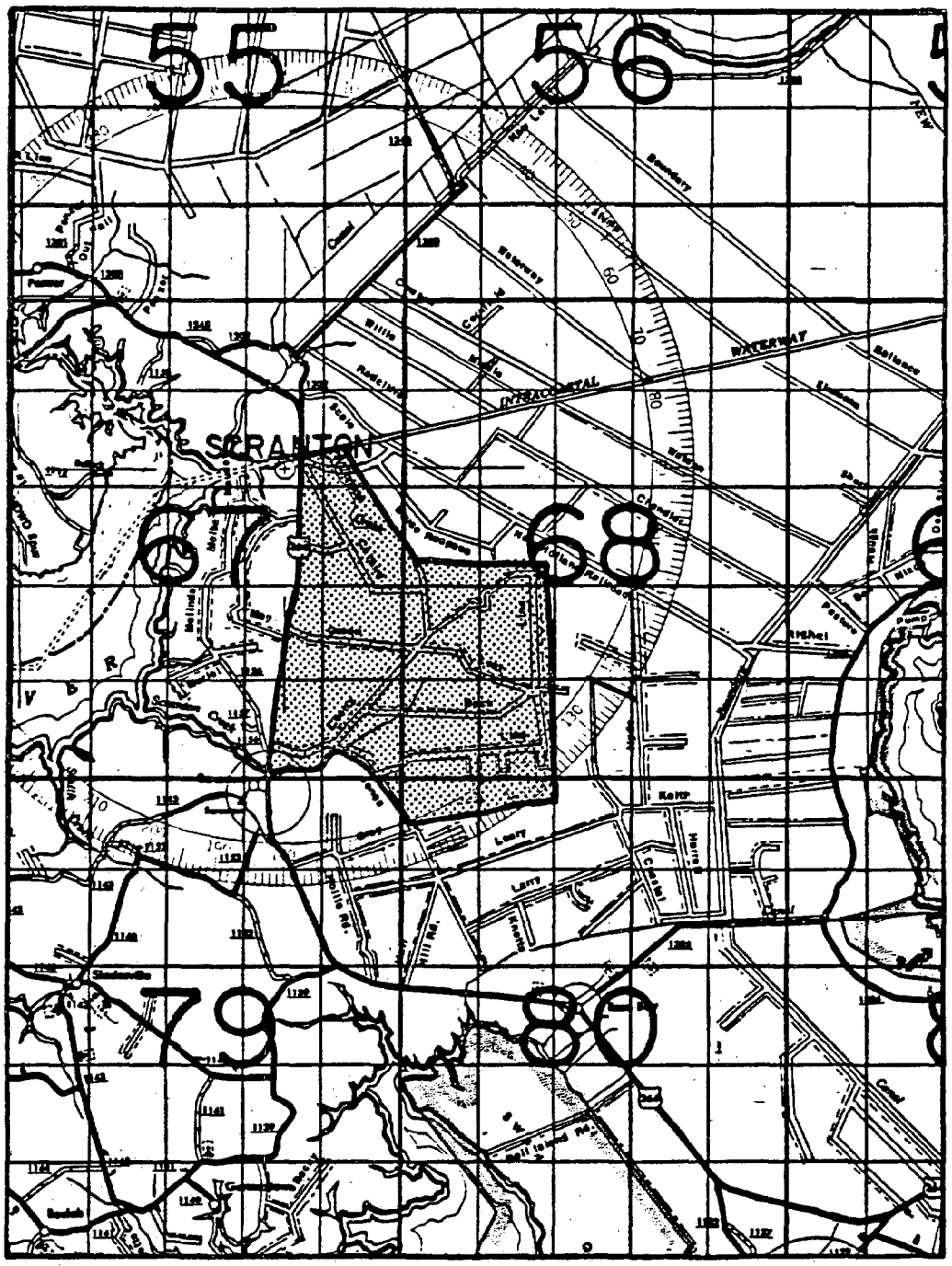
J. Merrill Lynch	S. Lance Peacock
Route 2, Box 222-B	P. O. Box 6006
Enfield, NC 27823	Raleigh, NC 27628

9. Date(s) of investigation: February 26, April 9, June 28, August 12, 1982

10. Priority rating: High-very high

Fig. 12. Access information:

SCRANTON HARDWOODS



11a. Prose Description of Site:

INTRODUCTION

The Scranton Hardwoods natural area is a 6000-acre wetland containing the most extensive tract of non-alluvial, hydric hardwoods known in the Pamlimarle Peninsula and probably the largest contiguous block anywhere in the North Carolina coastal plain. The wetland hardwood stands are an outstanding example of an undrained, relatively undisturbed system and include several tracts of climax, old-growth timber representing several plant communities which are endangered in the coastal plain. The area also has superlative wildlife values and supports a diversity of game and nongame wildlife species.

Hydric hardwood flats, otherwise known as oak flats or bottoms, are similar in species composition and structural physiognomy to bottomland hardwoods found on alluvial terraces and natural levees along brownwater rivers in the coastal plain. The major difference is the geomorphic landform with which they are associated. Hardwood or oak flats are situated on "upland" terraces underlain by poorly drained soils, and differ from alluvial bottomland hardwoods in not being associated with stream or river floodplains and therefore not subject to annual stream flooding. These non-alluvial oak flats are usually associated with poorly drained silty, clayey, or fine loamy soils located on the lower marine terraces of the lower coastal plain. The oak flats wetland system is discussed in more detail in the Vegetation section.

The Scranton Hardwoods natural area is located in western Hyde County between Lake Mattamuskeet and the Pungo River. The tract is bordered on the north by the Intracoastal Waterway, on the south by Scranton Creek, on the west by US Highway 264, and on the east by extensive pine plantations and agricultural fields.

The natural area is situated about 1.75 miles east of the embayed Pungo River estuary and is drained by two small tributaries of that river. Wilkerson Creek, a portion of which has been modified by the Intracoastal Waterway, drains the northern portion of the tract. A poorly defined, narrow drainage basin or floodplain occurs along the stream channel. Water flow is intermittent in the upper parts of the stream basin. The southern part of the natural area is drained by Scranton Creek, a somewhat larger stream which is affected by tidal influence from the Pungo River. Most of the natural area between

these two streams is essentially flat; elevations range from about 4 feet along the streams to 8 feet in the eastern margin of the tract. This interstream flat is essentially undrained. Surface ponding is common, particularly during the winter months, and the seasonal high water table is at or near the surface during this period.

Soils of the natural area are primarily wet Ultisols. No detailed soil mapping is available for the area although the soil association is mapped as Hyde-Bayboro (SCS, 1973). The Hyde silt loam series is classified as fine-silty, mixed, thermic Typic Umbraquults. The Bayboro loam series is classified as clayey, mixed, thermic Umbric Paleaquults. Both soil types are very poorly drained soils with thick loamy surface layers over firm clay loam to very firm clay subsoils.

VEGETATION

The natural area is dominated for the most part by stands of mixed hardwoods or pine-mixed hardwoods. The hardwood stands vary in structure, age, and species composition depending on a number of interrelated factors, including soil differences and past logging history. In these mesic hardwood stands there are no dominant canopy species; rather a number of species share co-dominance with loblolly pine (*Pinus taeda*) in varying proportions. Slight rises or depressions affect soils and drainage with a corresponding shift in canopy species composition and relative dominance. Differences in canopy composition between slightly higher and lower portions of the landscape are slight compared with the differences between the climax, old-growth stands and recently cut, younger growth stands. Frequency and intensity of past logging operations account for most of the vegetation differences.

A series of quarter points was taken to quantitatively determine the relative frequency, dominance, and density of the various canopy tree species. Based on this data the mature climax stands are classified as Mixed hydric oaks and *Pinus taeda/Carpinus caroliniana/Carex* spp. or *Saururus cernuus* (Mixed hydricoaks and loblolly pine/ironwood/mixed sedges or lizard's tail; CT 1). The principle oaks in this community, listed in order of their importance are: cherrybark oak (*Quercus falcata* var. *pagodaefolia*), laurel oak (*Q. laurifolia*), and swamp chestnut oak (*Q. michauxii*). Other hardwoods present in varying proportions

include (in order of importance): tulip poplar (Liriodendron tulipifera), red maple (Acer rubrum), green ash (Fraxinus pennsylvanica), American elm (Ulmus americana), sweetgum (Liquidambar styraciflua), shagbark hickory (Carya ovata), and swamp blackgum (Nyssa sylvatica var. biflora). Scattered throughout the slightly higher, better drained areas are large beech (Fagus grandifolia).

In general, swamp chestnut and cherrybark oaks along with loblolly pine are more common on the slightly better drained areas of the tract and laurel oak, green ash, and American elm are more frequent in the lower, more poorly drained areas. There is no subcanopy layer. A tall shrub zone dominated by ironwood is present throughout much of the natural area although pawpaw (Asimina triloba), and spicebush (Lindera benzoin) are locally common. There is much variation in dominance of the ground cover. The higher areas are dominated by spanglegrass (Uniola sessiliflora) or in some areas by giant cane (Arundinaria gigantea). Other slightly wetter sites are dominated by various sedges (Carex spp.) or by lizard's tail. There appears also to be some seasonal variation in ground cover dominance. Lizard's tail and spanglegrass form dense colonies during the late summer but are much less abundant during the early part of the growing season.

Vines are common throughout the natural area. Common species include cross-vine (Anisostichus capreolata), trumpet creeper (Campsis radicans), rattan vine (Berchemia scandens), grape (Vitis sp.), and climbing hydrangea (Decumaria barbara).

The canopy is essentially closed although numerous windthrown trees provide openings. Canopy height ranges from 75-90 feet and individual crowns of the oaks are characteristically broad and expansive, a common condition in old-growth hardwood stands. Consequently, the individual trees are rather widely spaced. In one area sampled there was an average of 100 canopy trees per acre. The average dbh (diameter at breast height) of the stands varies considerably. In the mature, climax stands along US 264, the average dbh is 20 inches although there are many scattered old-growth trees much larger. Some of the maximum dbh's measured were: green ash (38 inches), swamp chestnut oak (51 inches), cherrybark oak (45 inches), and laurel oak (66.5 inches).

The understory layer of ironwood is essentially open. The low density of shrubs and canopy transgressives gives the area an open, park-like aspect.

The plant community (CT 1) described above is represented by mature stands just east of US 264 (see map). Thes high-quality stands have undergone the least disturbance in terms of past timber cutting. Scattered old stumps and old logging trails are still visible and indicate that at least some of the high-grade timber was removed. The age of the stumps suggests that logging operations were conducted some time ago, probably no more recently than 75 years ago. The high average dbh (20 inches) and the presence of numerous old-growth trees indicates that the cutting was not very intense.

The surface underlying much of the pine-mixed oaks community is relatively flat. There are numerous slight, localized rises and depressions. Relief is on the order of 1-2 feet between these topographic highs and lows. Some low-lying areas have ponded waters up to several inches deep even during midsummer. These and other slightly higher areas are probably often inundated during the winter months when water tables are high and evapotranspiration rates are low. Numerous depressions formed by uprooted trees are scattered throughout. These depressions along with the slight undulations mentioned above give the ground surface an uneven appearance.

The best-formed, mature stands of mixed oaks and loblolly pine occupy an area of about 1720 acres (see map).

Other sections included within the natural area have been subjected to recent heavy thinning and clearcutting. One rectangular block (75 acres) located in the northern interior of the natural area has been clearcut and reseeded in dense loblolly pines 10-20 feet tall. Another much larger tract located in the eastern part of the natural area has been heavily thinned within the past 10-15 years. Thinning removed almost all of the high-grade oaks, ash, and pine. The canopy in this section is now dominated by sweetgum, tulip poplar, red maple, and swamp blackgum. The canopy is more open than in the mature stands and there is an abundance of shrubby canopy transgressives. Understory layers are much denser due to the increased amount of sunlight. Although these more heavily timbered stands are not considered to be of high natural significance relative to the undisturbed stands, they still retain some natural qualities because of the continued domination by hardwood species. This point can be more clearly understood when one compares the vegetation surrounding the natural area to the thinned hardwood stands. Intensively managed loblolly pine plantations covering several thousand acres now almostly completely encompass the natural area. Conversion of the hardwood stands to managed tree farms greatly reduces both floristic and faunistic diversity; artificial drainage associated with the development of these tree farms further alters the ecosystem.

The thinned hardwood stands may, over time, slowly develop into mature mixed oak communities similar to the present old-growth stands. There is an abundant seed source present and gradual replacement of more "weedy" tree species by the climax forest species can occur on the site, if no further cutting occurs. The thinned stands occupy about 4180 acres and serve as an important hardwood buffer adjoining the surrounding pine plantation.

Contrasting with the hardwood-dominated forest community described above is a small area (100 acres) of brackish marsh located along Scranton Creek. This marsh can be divided into three distinct zones which are correlated with flooding frequency and duration. The lower marsh zone along the stream channel is dominated by an almost pure zone of black needlerush (Juncus roemarianus). The higher marsh zone is dominated by dense stands of sawgrass (Cladium jamaicense). Salt grass (Distichlis spicata) forms small, concentric zones within the sawgrass marsh. This zonation pattern seems to be typical of most brackish creeks in western and southern Hyde County. Because much more extensive examples of these brackish marsh communities occur elsewhere in the county, the natural area marsh is not considered to be a highly significant example of this habitat type.

Ecology of HydricHardwood or "Oak" Flats

The term "oak flats" has been used to describe this characteristic bottomland hardwood forest type in the coastal plain. Pinchot and Ashe (1897) in a discussion of the various vegetation types in the North Carolina coastal plain listed four general bottomland or wetland forest types: 1) pond pine pocosin, 2) Atlantic white cedar swamps, 3) gum and cypress swamps, and 4) oak flats.

In their definition of oak flats Pinchot and Ashe (op. cit.) described them as forests "... in which numerous broad-leaf trees, chiefly oaks, constitute the greater portion of the growth ..." They further state that oak flats occur along the borders of cypress and gum swamps on damp or moist usually deep loams, and are often inundated during the spring. They mention a diversity of bottomland oaks along with loblolly pine as characteristic canopy components. They include bottomland associations of broad-leaf trees which occur on floodplain terraces and natural levees along brownwater streams and rivers in the oak flats category.

Although similar in many respects we feel that the alluvial bottomland forests and the non-alluvial, "upland" wetland forests should be considered distinct types based on their position on different geomorphological landforms.

Non-riverine oak flats were probably once extensive in Hyde County in areas dominated by fine loamy, silty and clayey soils with high water tables. Soils of this type occur as wide bands around Lake Mattamuskeet and along the Pungo River (SCS 1973). However, these soil types when properly drained have high agricultural productivity, and most have been drained, cleared, and converted to farmland. The wettest, most poorly drained mineral soils have been largely converted to silviculture, as evidenced by the extensive pine plantations surrounding the natural area. The remaining "scraps" of hardwood flats are typically small (less than 100 acres) and isolated. Their ecological integrity has been severely reduced as a result of the large scale clearing operations.

Today in Hyde County there are only two remaining large blocks of hardwood flats which have not been converted to other uses. The Scranton Hardwoods stand is the last privately owned tract and the state-owned Gull Rock Gamelands south of Lake Mattamuskeet contains the remaining stands. The conversion of the oak (hardwood) flats has not been limited to Hyde County; once-extensive stands in other lower coastal plain counties have also been reduced to small, isolated remnants. Other than Hyde County, the best remaining stands are located in Pamlico County. For a description of these see "Natural Areas of Pamlico County" (Peacock and Lynch, 1982; pp.16-49).

The hardwood stands in Hyde County and elsewhere tend to occur as concentric bands surrounding areas of medium to deep peats. To the east of the natural area is a large peat deposit associated with the Alligator River drainage. This peat body extends across the northern part of the county and includes much of the area between Alligator (New) and Pungo Lakes. The peaty surface layers gradually thin out in the direction of the Pungo River and the natural area. Several miles east of the natural area the peat-dominated (organic) soils are gradually replaced by mesic to hydric mineral soils. This soil change has a pronounced effect on the vegetation communities. Pond pine-bay shrub pocosin and swamp blackgum communities associated with the peat soils are replaced by mesic hardwoods occupying the wet mineral soils. The gradation between the two vegetation types is gradual and has been altered by extensive land-use changes in the area (pine plantations and cleared fields).

The same relative position of hardwood flats along the outer margins of a peat-dominated landscape is found in Pamlico County in and around the Light Grounds Pocosin. There hardwood flats similar to the Scranton Hardwoods stands occur as a concentric band surrounding the peaty pocosin wetland. This relationship has not been described previously in the literature and further, more intensive field work by hydrologists, botanists, pedologists and others is urgently needed to describe this unique and rapidly disappearing pocosin-hardwood flats ecosystem.

Wildlife and Avian Diversity

The Scranton Hardwoods natural area has superlative values in terms of wildlife habitat and avian diversity. The tract supports the largest deer herd in Hyde County (Rod McClanahan, WRC District biologist, pers. comm. 1982) and probably some of the densest populations known anywhere in the state.

The area is designated an official black bear sanctuary by the N.C. Wildlife Resources Commission. Although no bear sign was observed by us, bears are reported to feed in and pass through the area occasionally (McClanahan, pers. comm. 1982). Because of the increasing isolation of the tract due to massive land clearing operations north and east of the natural area, it is unlikely that the site can support a viable bear population in the future.

The natural area also contains a Wild Turkey population as a result of a February 1981 release of 15 birds (Rod McClanahan, WRC biologist, pers. comm. 1982). At least one brood was successfully reared in the summer of 1982 and it is likely that a viable breeding population will become established. The mature oak stands provide ideal habitat for the species and its large size (6000 acres) insures sufficient space to support a population.

Wild Turkeys were probably originally native in Hyde and adjacent counties until illegal hunting and habitat destruction caused their demise some years ago (McClanahan, pers. comm., 1982).

The forested wetland supports at least 35 species of breeding birds including 5 species of woodpeckers and 7 species of wood warblers. The only known Hyde County population of White-breasted Nuthatches is found here. In the lower coastal plain this species is restricted to mature riverine cypress-gum swamps and hardwood flats.

11b. Prose Description of Site Significance:

Scranton Hardwoods natural area is the most extensive example of a hydric palustrine (non-riverine) hardwood system located in the North Carolina coastal plain. The old-growth hydrichardwood stands total about 1700 acres and are surrounded by about 4000 acres of less significant but still important buffer hardwood stands of various age classes.

The old-growth component is the largest contiguous "block" of relatively undisturbed,hydric oaks and other hardwoods in a climax successional stage known in the North Carolina coastal plain.

The hardwood stands are one of the most endangered wetland forest systems in the coastal plain. When adequately drained, the soils of the hardwood "flats" make productive cropland and they are also excellent for intensive loblolly pine tree farms. For these reasons, much of what once was dominated by these wetlands is now in row crop agriculture and pine plantations. The last remnants of natural vegetation have been reduced in most cases to scattered woodlots and other small, isolated blocks.

The Scranton Hardwoods tract protects by far the largest "block" of these wetlands known in the coastal plain. The natural area should receive top priority for the protection of this last protected example of a once extensive wetland system.

Equally significant is the superlative wildlife values of the natural area. Its large size (6000 acres) coupled with an abundance of mast-producing oaks and other hardwoods provides ideal habitat for a number of species dependent on mature hardwood stands. The tract supports a very large white-tailed deer population (reported to be one of the largest in the county) and serves as an important sanctuary for black bear during their seasonal movements. A Wild Turkey restoration program is underway on the property and an additional 35 species of breeding birds are known to occur. Birds associated with mature hardwoods are particularly abundant.

At least one endangered plant species is known to occur. Southern twayblade, a species of orchid listed as a state endangered peripheral, is found over much of the natural area. Further field work may reveal additional rare or endangered species.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Mixed bottomland oaks and Pinus taeda/ Carpinus caroliniana/Carex spp. or Saururus cernuus	This is the most extensive tract of mature hydric to mesic oaks and other hardwoods associated with a non-riverine hardwood flat wetland known in the N.C. coastal plain. The mature, climax stands encompass a contiguous 1720 acres, by far the largest block known anywhere in the N.C. coastal plain. Average canopy dbh of these stands is 20 inches and canopy height is 75-90 feet. An additional nearly 4000 acres of more disturbed but still intact hardwood stands provides a significant buffer to the best stands.
		Mature, old-growth portion of CT 1	
Endangered species	CT 1	Listera australis (Southern Twayblade)	Endangered peripheral in N.C. (Cooper et al. 1977). Large, vigorous population present throughout natural area.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Threatened Species	through-out	Red-shouldered Hawk	Considered threatened in N.C. by Cooper et al (1977). At least 2-3 breeding pairs occur within the natural area. Habitat is sufficiently extensive to support breeding population.
Species Concern species	through-out	Black Bear	Considered to be "of special concern" in N.C. by Cooper et al. (1977). Area provides sanctuary and feeding habitat for transient bears although not extensive enough to support viable population.
Rare Species	through-out	White-breasted Nuthatch	Uncommon to rare in the Pamlimarle Peninsula of N.C. Restricted to mature cypress-gum swamps and hardwood flats. Fairly common permanent resident in natural area. Only known population in Hyde County.

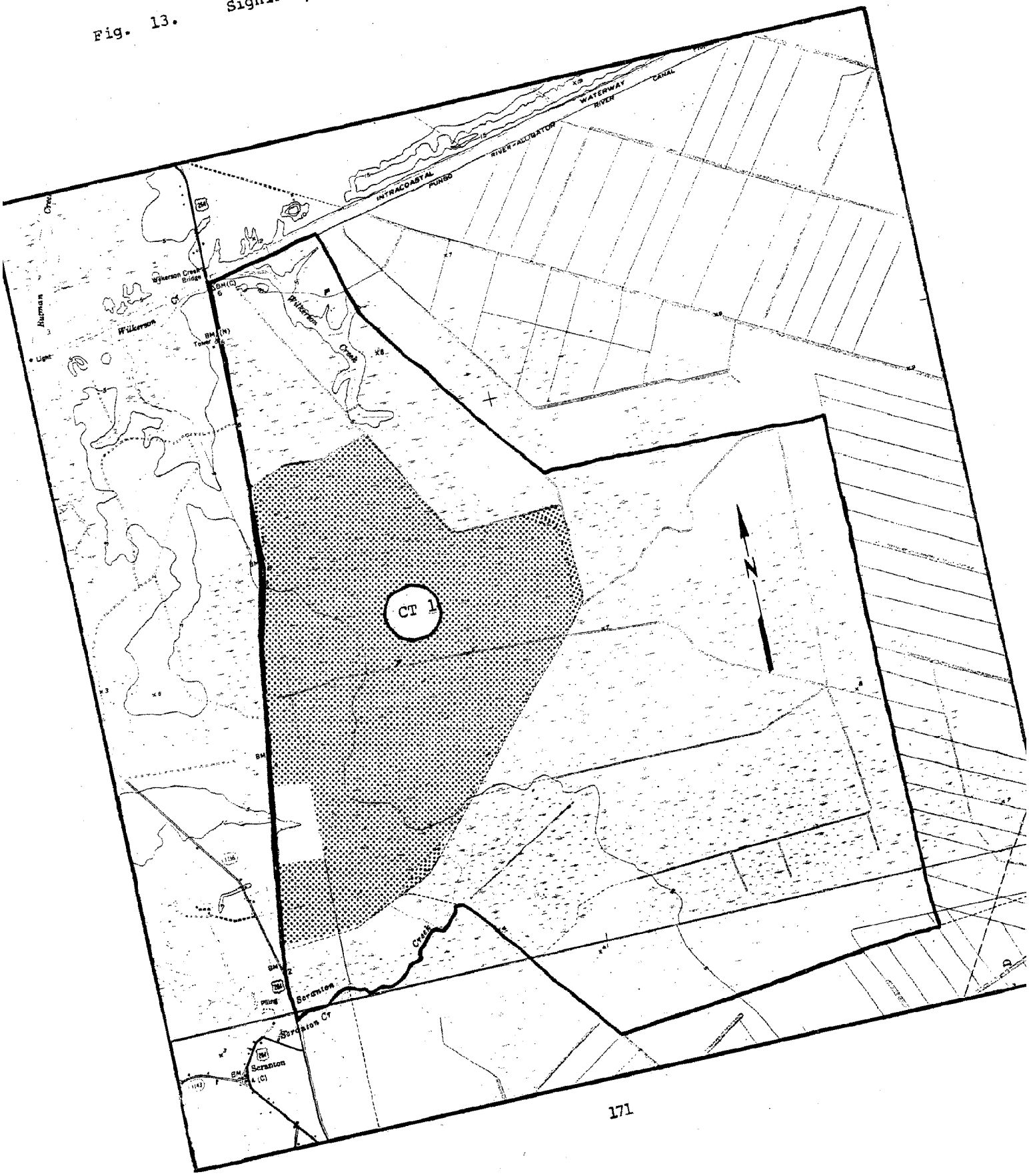
12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Avian Species Diversity	through-out	35 species of breeding woodland birds	Extensive forested wetland provides critical habitat for a diversity of woodland species many of which require mature, climax hardwoods for nesting habitat. Total includes 5 species of woodpeckers and 7 species of wood warblers. Many species are becoming increasingly uncommon in county and elsewhere due to habitat destruction as a result of draining and clearing operations.
Superlative Wildlife Habitat	through-out	White-tailed deer, Wild Turkey, Eastern gray squirrel	Area supports one of the largest deer herds in Hyde County (Rod McClanahan, pers. comm., 1982). Excellent habitat for introduced Wild Turkeys which were released on the tract in 1981. Only known population of turkeys in the Pamlimarle Peninsula. Mature oak stands provide habitat for a large population of eastern gray squirrels. Other furbearers, including raccoon and eastern cottontail, are also common.

12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Unusually large trees	CT 1	Quercus laurifolia, Q. michauxii, Q. falcata var. pagodaefolia, Fraxinus pennsylvanica	Many scattered very large old-growth canopy trees are scattered in the mature hardwood stands. Some of the largest dbh's measured include: Swamp chestnut oak (Quercus michauxii)-51 inches, Cherry-bark oak (Q. falcata var. pagodaefolia)-45 inches, Laurel oak (Q. laurifolia)-66.5 inches, Green ash (Fraxinus pennsylvanica)-38 inches. Many trees reach 90 feet in height. The laurel oak is of state champion size. There is potential for several other state champion trees in tract.

Fig. 13. Significant features: SCRANTON HARDWOODS



Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	100 %
Public	%
Unknown	%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

Bruce B. Cameron

P. O. Box 3649

Wilmington, NC 28406

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

Rod McClanahan	Bill Lawrence
WRC District Biologist	WRC Wildlife Protector
Route 1, Box 442-B	Box 27
Jamesville, NC 27846	Scranton, NC 27875

17. Attitude of owner or custodian toward preservation (contacted?):

Not contacted.

18. Uses of natural area:

All of the natural area has been selectively logged in several cycles to obtain the successively most valuable remaining or regenerated timber. Some of the older growth stands contain old stumps which appear to be cypress. These stands contain a significant amount of valuable mature standing timber, mostly loblolly pine, swamp chestnut oak and cherrybark oak. The older growth stands do not appear to have been logged during the past fifty to seventy-five years. Other stands have been selectively logged for valuable oak, pine, and hickory timber much more recently. These stands contain a higher proportion of lower quality timber such as sweetgum and red maple mixed in with oaks and other species.

A network of roads and associated clearings is maintained within the natural area. These roads are used primarily for hunting activities and secondarily for fire control and access for timber removal. In addition to the road system, a grass airplane runway is maintained along with several cabins near the Intracoastal Waterway.

The area is used as a private hunting and fishing retreat by the owner and is actively managed for wildlife production by the owner in conjunction with the N.C. Wildlife Resources Commission (WRC). Access to the property is strictly limited and all roads leading in from the adjacent US 264 highway are blocked by locked gates. Hunting rights in the area are restricted and there are no areas open to the general public. This policy of access restrictions and limited hunting along with accompanying game management in effect protects the wildlife of the area.

Although some timber harvesting is done on the tract, it appears that this practice is mainly to enhance wildlife habitat by creating more edge effect and a greater diversity of game foods rather than providing cash flow or timber sales profits.

The tract is regularly patrolled by WRC personnel and "no hunting" signs are posted at frequent intervals along US 264. Recently, WRC biologists have cooperated with the owner in attempting to establish a Wild Turkey population in the area. Wild birds were released about a year ago and reproduction was successful this spring with at least one brood produced.

Apparently at least a portion of the natural area was the site of attempted farming operations. Old furrows can still be seen in some areas adjacent to US 264. Judging from the size of the present vegetation, these operations ceased at least 75 years ago if not longer.

19. Uses of surrounding land:

a. Wildland 10 %

b. Agricultural land _____ %

c. High-intensity forestry 90 %

d. Developed _____ %

20. Preservation Status:

Cat	*%	*Description of preservation status
4	100	Private land, protected by owner

21. Regulatory protections in force:

None known.

22. Threats:

Timber cutting is the chief disruptive activity in the short term. The selective cutting which has been practiced over much of the natural area has maintained dominance by valuable wildlife food trees such as oaks, hickories, and other hardwoods. More intense cutting in the future could cause a proportional shift to less desirable hardwoods such as sweetgum and red maple, and significantly lower the site's natural and wildlife values.

Good conservation techniques are presently being practiced to maintain the mature oak-pine stands along with some desirable edge effect along the roads. It appears that the present owner intends to maintain a high-quality bottomland hardwoods habitat for wildlife. However, in the long-term the tract could be sold or divided and the present conditions altered. The long term plans of the owner are not known.

Another more minor threat is the possible widening of the existing dual-lane highway to a four-lane superhighway. This would damage a significant portion of the old-growth stands, most of which lie adjacent to the highway.

23. Management and Preservation Recommendation:

The Scranton Hardwoods natural area offers an excellent opportunity for conservation of a significantly large block of an undrained, palustrine (non-riverine) mesic hardwoods system. It is the largest contiguous block of palustrine

mesic hardwoods known in the coastal plain of North Carolina. Its values are enhanced by its relatively undisturbed character, the presence of old-growth forest stands, and its superlative wildlife values.

The owner should be encouraged to continue the wise management of the tract's wildlife and natural values in cooperation with the N.C. Wildlife Resources Commission. In addition, the tract should be registered as an outstanding example of a mesic hardwoods ecosystem by the N.C. Natural Heritage Program. To assure protection in the long term, The Nature Conservancy should make contact with the owner and investigate the possibility of establishing a nature preserve in an estate settlement.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: Mixed hydricoaks and Pinus taeda/Carpinus caroliniana/ Carex spp. or Saururus cernuus

Community cover type: Mixed hydricoaks and Pinus taeda

General habitat feature: nonalluvial hardwood flats

Average canopy height: 80 feet

Estimated age of canopy trees: 100+

Canopy cover: Closed

Estimated size of community: old-growth stands total about 1720 acres

Successional stage: near-climax to climax

Common canopy species in community cover or community type (but not dominant): Listed in order of importance value (based on 10 quarter points): Quercus pagodaefolia, Pinus taeda, Quercus laurifolia, Liriodendron tulipifera, Acer rubrum, Quercus michauxii

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Diospyros virginiana, Asimina triloba, Cornus sp., Magnolia virginiana, Vaccinium corymbosum, Crataequs sp., Sabal minor, Lindera benzoin

Common herb stratum species in community cover or community type (but not dominant):

Galium sp., Tipularia discolor, Lonicera japonica, Asplenium platyneuron, Mitchella repens, Euonymus americanus, Uniola sessilifolia

24b. Soil Summary (by community type) CT 1

Soil series: unknown, probably Hyde and Bayboro

Soil classification: Hyde: fine-silty, mixed, thermic Typic Umbraquults
Bayboro: clayey, mixed, thermic Umbric Paleaquults

Soil association: Hyde-Bayboro

pH class: Very strongly acid

Source of information: General Soil Map of Hyde County, North Carolina, SCS, USDA, 1973.

Other notes:

24c. Hydrology Summary (by community type) CT 1

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh-acid

Water regime: intermittently flooded

Drainage class: Very poorly drained

Drainage basin: Wilkerson and Scranton Creeks-- Pungo River-- Pamlico River

Hydrology characterization: A very poorly drained, intermittently flooded, fresh-acid, interaqueous palustrine system.

24d. Topography Summary: CT 1

Landform: Interstream flat dominated by mineral soils

Shelter: sheltered

Aspect: n/a

Slope Angle: n/a

Profile: Flat

Surface patterns: Generally smooth, except for small depressions and slightly elevated ridges; elevation gradient less than 2 feet over much of the area.

25. Physiographic characterization of natural area:

A series of mid-successional to climax bottomland hardwoods and brackish marsh communities located on the Pamlico Terrace and drained by Wilkerson and Scranton Creeks, in the Coastal Plain province of the Atlantic Plain.

Geological Formation:

Pleistocene Pamlico Terrace deposits overlying Upper Miocene Yorktown Formation.

Geological Formation age:

Pamlico Terrace: less than 100,000 yrs. BP
Yorktown Formation: 15-25 million yrs. BP

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Soc. of Am. Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: Listera australis

Species legal status and authority: Endangered peripheral in N.C. (Cooper et al., 1977)

Number of populations on site: one

Number of individuals per population: 500 plus

Size or Maturity of individuals: immature and mature

Phenology of population: not known

Eg: vegetative %
flowering %
fruiting %

General vigor of population: excellent

Disturbance or threats to population: none known

Habitat characteristics

Plant community: CT 1

Topography: slightly elevated flats

Soil Series: Hyde-Bayboro association

Microclimate: -

Drainage basin: Pungo River

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Red-shouldered Hawk

Species legal status and authority: Threatened in North Carolina (Cooper *et al.*, 1977)

Number of populations on site: 2+ breeding pairs

Number of individuals per population: 2 adults plus young of the year

Size or Maturity of individuals: adult and immature

Phenology of population: not applicable

Eg: vegetative % -
flowering % -
fruiting % -

General vigor of population: Excellent

Disturbance or threats to population: Clearcutting, conversion of hardwoods to pine plantations

Habitat characteristics

Plant community: Throughout

Topography: Flat

Soil Series: Hyde-Bayboro

Microclimate: -

Drainage basin: Pungo River

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

26. Summary - Endangered and threatened species

Name of species: Black bear

Species legal status and authority: Of Special Concern in North Carolina (Cooper et al., 1977)

Number of populations on site: unknown

Number of individuals per population: unknown

Size or Maturity of individuals: all ages

Phenology of population: not applicable

Eg: vegetative %
flowering %
fruiting %

General vigor of population: Not seen nor sign observed by authors. Reported to pass through the area occasionally on way to and from large pocosin areas to northeast (WRC biologists, pers. comm., 1982).

Disturbance or threats to population:

Habitat characteristics

Plant community: Throughout

Topography: -

Soil Series: -

Microclimate: -

Drainage basin: -

Other plants and animal species present: See Master Species List.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master Species List:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE
  Ruellia caroliniensis
ACERACEAE
  Acer rubrum
ANACARDIACEAE
  Rhus radicans
ANNONACEAE
  Asimina triloba
AQUIFOLIACEAE
  Ilex opaca
ARECACEAE
  Sabal minor
ASPIDIACEAE
  Athyrium asplenioides
  Polystichum acrostichoides
ASPLENIACEAE
  Asplenium platyneuron
BERBERIDACEAE
  Podophyllum peltatum
BETULACEAE
  Carpinus caroliniana
BLECHNACEAE
  Woodwardia areolata
  W. virginica
BIGNONIACEAE
  Anisostichus capreolata
  Campsis radicans
CAPRIFOLIACEAE
  Lonicera japonica
CELASTRACEAE
  Euonymus americanus
CLETHRACEAE
  Clethra alnifolia
CORNACEAE
  Cornus stricta
CYPERACEAE
  Carex spp.
EBENACEAE
  Diospyros virginiana
ERICACEAE
  Vaccinium corymbosum
  Leucothoe axillaris

FAGACEAE
  Fagus grandifolia
  Quercus laurifolia
  Q. michauxii
  Q. phellos
  Q. falcata var. pagodaefolia
HAMAMELIDACEAE
  Liquidambar styraciflua
JUGLANDACEAE
  Carya ovata
  C. glabra
JUNCACEAE
  Juncus sp.
LAMIACEAE
  Scutellaria sp.
LAURACEAE
  Lindera benzoin
  Persea borbonia
LILIACEAE
  Smilax rotundifolia
  Smilax spp.
LOGANIACEAE
  Gelsemium sempervirens
LORANTHACEAE
  Phoradendron serotinum
MAGNOLIACEAE
  Liriodendron tulipifera
  Magnolia virginiana
NYSSACEAE
  Nyssa sylvatica var. biflora
OLEACEAE
  Fraxinus pennsylvanica
OPHIOGLOSSACEAE
  Botrychium sp.
ORCHIDACEAE
  Listera australis
  Tipularia discolor
PINACEAE
  Pinus taeda
  P. palustris
POACEAE
  Arundinaria gigantea
  Uniola sessiliflora
POLYPODIACEAE
  Polypodium polypodioides
RANUNCULACEAE
  Ranunculus sp.
RHAMNACEAE
  Berchemia scandens

ROSACEAE
  Crataegus spp.
RUBIACEAE
  Galium sp.
  Mitchella repens
SALICACEAE
  Populus heterophylla
SAURURACEAE
  Saururus cernuus
SAXIFRAGACEAE
  Decumaria barbara
TAXODIACEAE
  Taxodium distichum
ULMACEAE
  Ulmus americana
URTICACEAE
  Boehmeria cylindrica
VIOLACEAE
  Viola sp.
VITACEAE
  Parthenocissus quinquefolia
  Vitis spp.

AMPHIBIANS

Spring Peeper
Fowler's Toad
Gray Treefrog

REPTILES

Eastern Box Turtle (common)
Ground Skink
Five-lined Skink
Black Rat Snake

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; year-round, summer, or winter
* = Breeding or suspected breeding at site

Wood Duck	PR*	
Turkey Vulture	PR	
Black Vulture	PR	
Red-tailed Hawk	PR*	
Red-shouldered Hawk	PR*	
Wild Turkey	PR*	(introduced; 15 birds released February 1981)
Mourning Dove	PR*	
Yellow-billed Cuckoo	SR*	
Barred Owl	PR*	
Chimney Swift	SV	
Ruby-throated Hummingbird	SR*	
Common Flicker	PR*	
Pileated Woodpecker	PR*	
Red-bellied Woodpecker	PR*	
Hairy Woodpecker	PR*	
Downy Woodpecker	PR*	
Great Crested Flycatcher	SR*	
Acadian Flycatcher	SR*	
Eastern Pewee	SR*	
Blue Jay	PR*	
Common Crow	PR*	
Carolina Chickadee	PR*	
Tufted Titmouse	PR*	
White-breasted Nuthatch	PR*	
Carolina Wren	PR*	
American Robin	PR	
Wood Thrush	SR*	
Blue-gray Gnatcatcher	SR*	
Golden-crowned Kinglet	WR	
Ruby-crowned Kinglet	WR	
White-eyed Vireo	SR*	
Red-eyed Vireo	SR*	
Prothonotary Warbler	SR*	

Yellow-rumped Warbler	WR
Black-throated Green Warbler	T
Yellow-throated Warbler	SR*
Pine Warbler	PR*
Ovenbird	SR*
Common Yellowthroat	SR*
Hooded Warbler	SR*
Louisiana Waterthrush	SR*
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Northern Cardinal	PR*
Evening Grosbeak	WR
White-throated Sparrow	WR

MAMMALS

White-tailed Deer - abundant; up to 35 seen each trip; tracks and scat everywhere
Eastern Cottontail Rabbit - several seen, tracks
Raccoon - tracks common
Opossum - tracks
Eastern Gray Squirrel - several seen
Black Bear - no tracks or sign observed by authors; reported to occur in area by WRC personnel

NATURAL AREA INVENTORY FORM
(To be prepared for each site)

Basic Information Summary Sheet

1. Natural Area Name: Salyer's Ridge Natural Area

2. County: Hyde

3. Location: Along the southern border of Rose Bay Canal near where it enters Lake Mattamuskeet. Natural area is completely within the Mattamuskeet National Wildlife Refuge.

4. Topographic quadrangle(s): Swanquarter (1974)

5. Size: 80 acres

6. Elevation: 3-5 feet above mean sea level

7. Access: At Swindell Fork (junction of US 264 and SR 1304), go north on SR 1304 for 4.7 miles to Rose Bay Canal. Turn right (east) on dirt access road parallel to canal and go about 0.2 mile to deadend at entrance to refuge. Natural area is south and east of the refuge boundary on south side of canal.

8. Names of investigators:

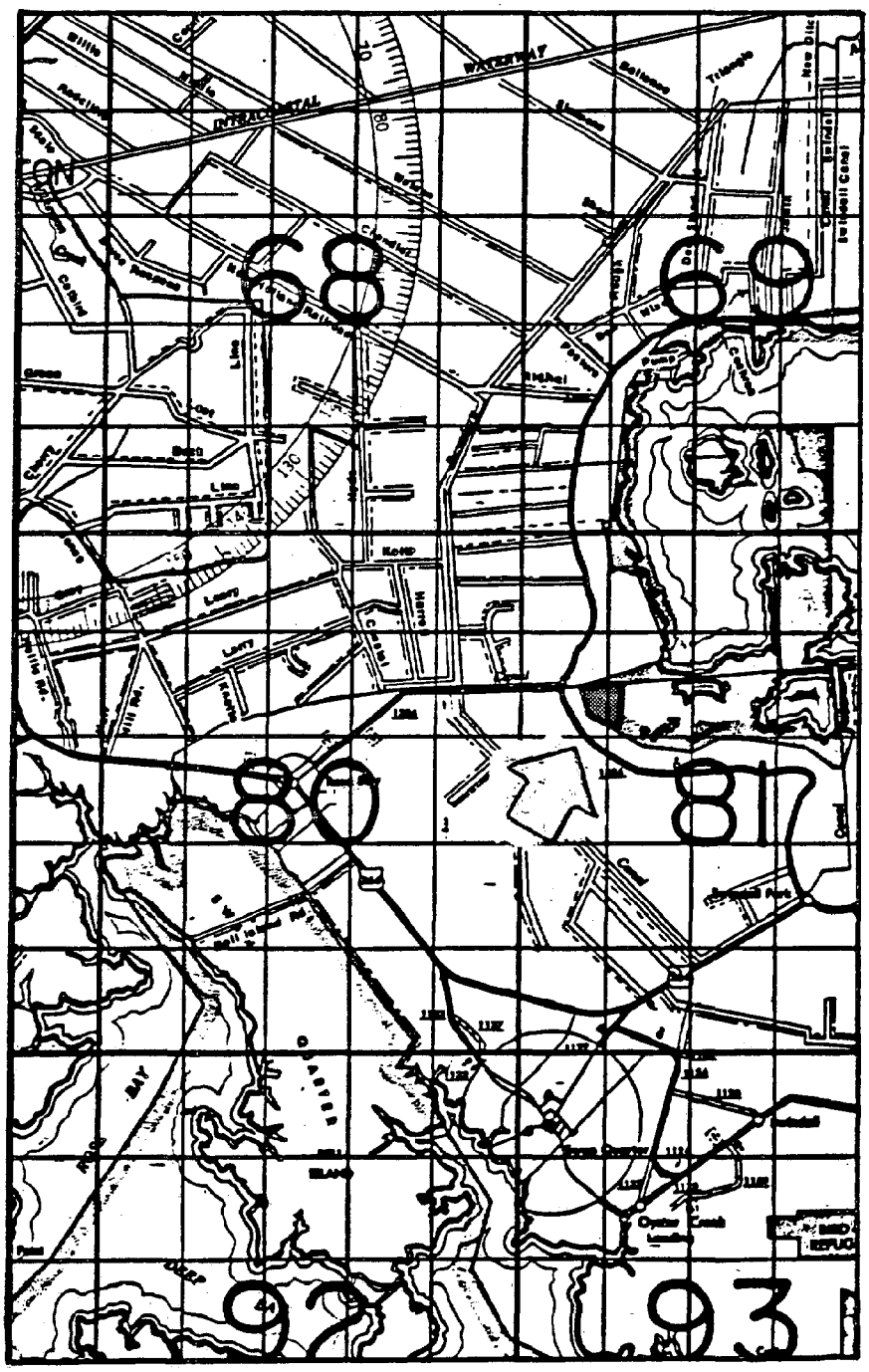
J. Merrill Lynch	S. Lance Peacock
Route 2, Box 222-B	P. O. Box 6006
Enfield, NC 27823	Raleigh, NC 27628

9. Date(s) of investigation: April 8, 1982

10. Priority rating: Low

Fig. 14. Access information:

SALYER'S RIDGE



11a. Prose Description of Site:

The Salyer's Ridge Natural Area contains a mature stand of loblolly pine, one of the oldest-growth stands dominated by this species known in Hyde County. The 80-acre stand is part of the Mattamuskeet National Wildlife Refuge and is designated a Research Natural Area by the U.S. Fish and Wildlife Service. The size and stature of the pines gives the tract impressive esthetic and scenic qualities although its overall significance as a natural area is not exceptionally high because of its suspected anthropomorphic origins.

The tract is located near the southwestern corner of Lake Mattamuskeet, a large natural freshwater body encompassing about 40,000 acres. Much of the lake margin itself is dominated by emergent marsh vegetation and many sites have been impounded to enhance waterfowl habitat. Behind the marsh fringe is a forested swamp forest which, depending on location and past disturbance, is dominated by a number of wetland trees.

The natural area proper is a part of the "lake margin" forested swamp forest complex. It is located about 0.5 mile from the present-day lake margin. In order to understand the natural area's relationship to the lake and the underlying soils it is necessary to describe briefly the geomorphology of the lake and the immediately surrounding lands.

Lake Mattamuskeet's origin is not known. It has been suggested that the lake formed as a result of a deep peat burn and subsequently enlarged itself by wind and wave erosion along its shoreline. Another theory suggests that the lake may be multiple carolina bays although this view is not a popular one at the present time (Mattamuskeet NWR Master Plan, no date).

Regardless of its origin, the lake must at one time have been substantially larger than it is today. Examination of topographic maps covering the Lake Mattamuskeet area clearly indicate an arcuate series of slightly elevated ridges (5-8 feet msl) which encircle the lake at distances which average about one mile from the current lakeshore. These ridges were formed by a former lake shoreline when lake water levels were 3-5 feet higher than present levels. The area between these ridges and the present lakeshore is presently occupied by a mosaic of swamp forest wetlands, waterfowl impoundments, and drained cultivated fields. Many North Carolinians have probably heard or read about the ill-fated attempt during the 1930's to drain the lake and convert it to agriculture. Although unsuccessful, this drainage attempt did allow some marginal farming operations to become established particularly

around the rim of the lake. Other slightly higher areas, particularly on the southern and eastern sides of the lake, have been under agriculture for a long time, probably at least since the mid-1700's.

The natural area is situated in the area between the ridges (the former lake margin) and the present lake margin. At only 3-5 feet above sea level, the natural area occupies a low flat which was probably originally dominated by either a hardwood wetland or a baldcypress-hardwood wetland.

The soils of the natural area are classified as the Weeksville-Pasquotank association: very poorly and poorly drained soils with black to gray very fine sandy loam or silty loam surface layers (SCS, 1973). The majority of this association in Hyde County occurs as a large, homogeneous body around the perimeter of Lake Mattamuskeet. Approximately 85% of the association acreage has been cleared for cultivation with many additional acres in the process of being cleared (SCS, 1973).

The vegetation of the natural area is dominated by loblolly pine (Pinus taeda). The community type is Pinus taeda/ Symplocos tinctoria or locally Persea borbonia (loblolly pine/ horsesugar or locally by redbay; CT 1). This community is characterized by a tall closed canopy of pines 90-100 feet tall over a distinct shrub layer of horsesugar (also known as sweetleaf) and in places by dense patches of redbay. There is essentially no herb layer although poison ivy (Rhus radicans) is a locally abundant ground cover.

Red maple (Acer rubrum) and sweetgum (Liquidambar styraciflua) are present as scattered individuals in the subcanopy layer (40-60 feet tall) but are not dominant enough to be considered a subcanopy component in the community type. Vines are abundant throughout and include a diversity of high-climbing species: poison ivy, trumpet creeper (Campsis radicans), cross-vine (Anisostichus capreolata), rattan-vine (Berchemia scandens), Virginia creeper (Parthenocissus quinquefolia), and yellow jessamine (Gelsemium sempervirens). Almost every pine trunk has at least one vine attached. Many of the vines appear to have started growing when the pines were quite small. The vines are free-swinging and are attached to the lower branches of the pines at heights of about 75 feet.

The loblolly pines are impressive in their height (average: 90-100 feet) and in their trunk diameters (average: 22 inches). One of the more striking aspects of the pine stand's physiognomy is the overall even-age character of the trees. Most of the pines have about the same height and trunk diameter measurements. The age of the stand is estimated to be about 110 years old (Steve Frick, pers. comm. 1982). The even-aged character of the stand

suggests that the pines germinated and began growing in an open situation, probably in an abandoned field. The moist mineral soils of the area provided an ideal seedbed and the pines grew at a rapid rate, overtopping competing hardwoods and establishing canopy dominance. The scarcity of oaks and hickories in the subcanopy also suggests that the stand developed in an old-field situation. Oaks and hickories are typically slow growing species and their seed dispersion is usually by animal agents. This puts them at a distinct disadvantage in pioneer oldfield succession when there is an abundance of red maple, loblolly pine, and sweetgum in the vicinity, all of which produce seeds which are primarily wind dispersed. Apparently these latter species were able to colonize the area quickly and the pine, by virtue of its faster growth rate, eventually attained canopy dominance.

The ground surface of the natural area is relatively smooth. There are some shallow depressions scattered about which may hold water after heavy rains but generally the surface is dry. The dense canopy of pines essentially blocks most sunlight from reaching the ground layer and there is very little herbaceous ground cover.

11b. Prose Description of Site Significance:

The Salyer's Ridge natural area contains an old-growth stand of loblolly pine, and is probably the largest and oldest stand of this species in Hyde County. Because of its probable origin from an abandoned field, the stand cannot be considered completely "natural", although it can be considered to be an excellent example of a pine forest in the final stages of oldfield succession.

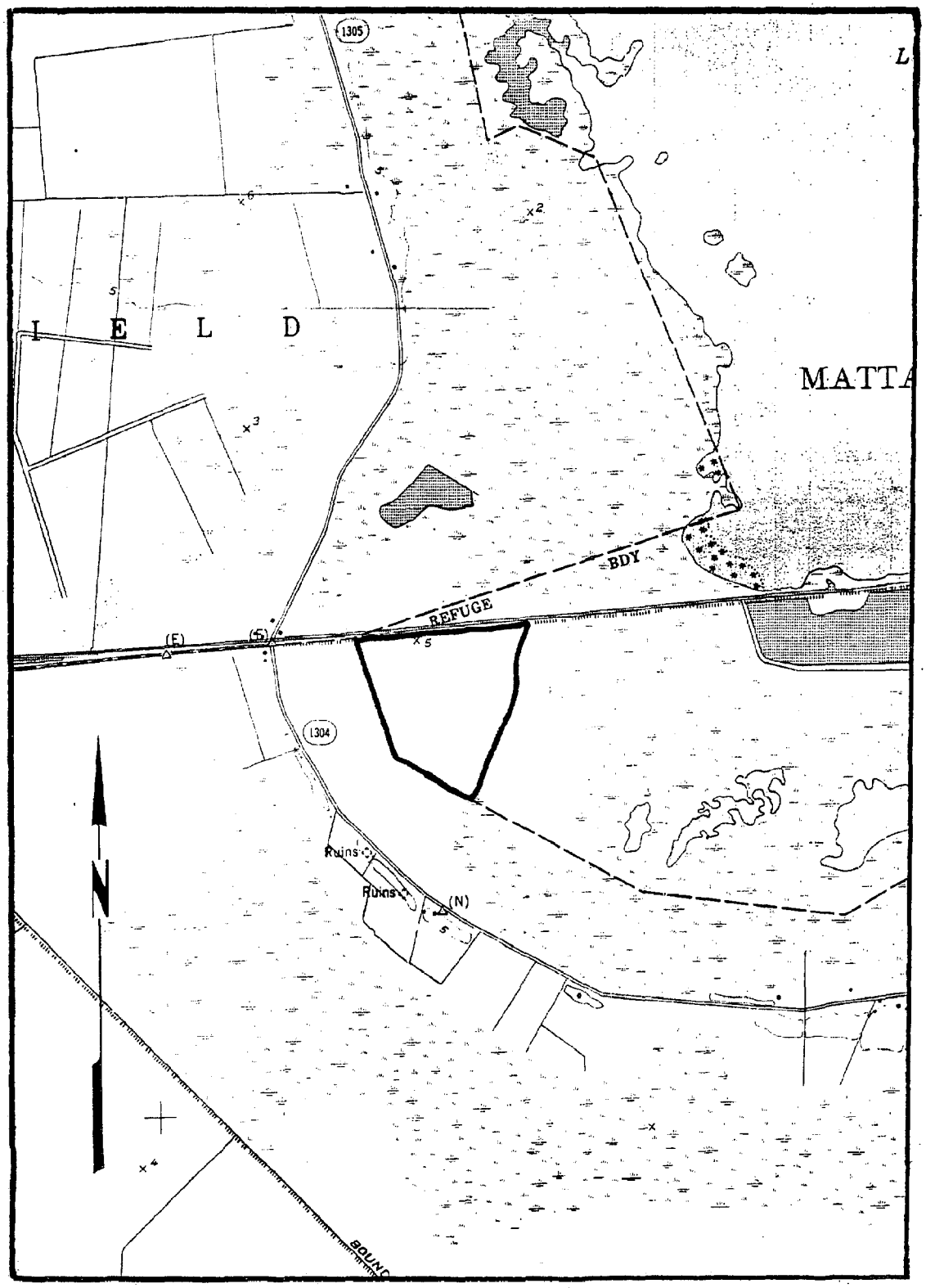
12. Significance Summary Table (categories represented and descriptions) - by site

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High-quality wetland plant community	CT 1	Pinus taeda/Symplocos tinctoria or locally Persea borbonia	Largest stand of old-growth (+110 yrs. old) loblolly pines known in Hyde County. Trees average 90-100 feet tall and 22 inches dbh.

Fig. 15. Significant features:

SALYER'S RIDGE

(community type occupies entire natural area)



Legal Status, Use, and Management

13. Ownership type by percent area:

Type	
Private	%
Public	100 %
Unknown	%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, other pertinent information).

Department of the Interior

U.S. Fish and Wildlife Service

Mattamuskeet National Wildlife Refuge

Route 1, Box W-2

Swanquarter, NC 27885

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information).

Steve Frick, Manager

Mattamuskeet National Wildlife Refuge

Route 1, Box W-2

Swanquarter, NC 27885

17. Attitude of owner or custodian toward preservation (contacted?):

The U.S. Fish and Wildlife Serivce recognizes the site as an official research natural area.

18. Uses of natural area:

The natural area has been set aside as a Research Natural Area within the Mattamuskeet National Wildlife Refuge. It is to be managed for scientific and esthetic values. Natural succession will be allowed to continue and no cutting or other disturbance to the vegetation is planned. The area receives little use from the public. No hunting is allowed within the tract. There is a maintained jeep trail which follows the refuge boundary and skirts the edge of the natural area. This trail is probably used infrequently by hikers, birdwatchers, and others.

The tract is also registered as an outstanding natural area along with other sites within the refuge by the N.C. Natural Heritage Program.

19. Uses of surrounding land:

a. Wildland 100 %
b. Agricultural land _____ %
c. high-intensity forestry _____ %
d. developed _____ %

20. Preservation Status:

Cat	* %	*Description of preservation status
1	100	Public land, formally designated as a natural area.

21. Regulatory protections in force:

Protected by Fish and Wildlife Service regulations as a Research Natural Area.

22. Threats:

At the present time there is no threat to the natural area. It is identified as a Research Natural Area and managed in its natural state for scientific research.

23. Management and Preservation Recommendation:

Refuge personnel should continue to protect the site in its natural state. Natural succession within the forest should be allowed to continue and scientific research activities should be encouraged.

Natural Characteristics Summary

24a. Vegetation - Biotic Community Summary CT 1

Community type: **Pinus taeda/Symplocos tinctoria or locally Persea borbonia**

Community cover type: **Pinus taeda**

General habitat feature: **non-alluvial, bottomland flat**

Average canopy height: **90-100 feet**

Estimated age of canopy trees: **110 years**

Canopy cover: **closed to partially open**

Estimated size of community: **80 acres**

Successional stage: **Late successional**

Common canopy species in community cover or community type (but not dominant):

None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant):

Liquidambar styraciflua
Acer rubrum

Common herb stratum species in community cover or community type (but not dominant):

Vines:	**Rhus radicans**	**Berchemia scandens**
	Campsis radicans	**Parthenocissus quinquefolia**
	Anisostichus capreolata	**Gelsemium sempervirens**

24b. Soil Summary (by community type) CT 1

Soil series: not known

Soil classification: Weeksville: coarse-silty, mixed, acid, thermic Typic Humaquepts
Pasquotank: coarse-silty, mixed, acid, thermic Typic Haplaquepts

Soil association: Weeksville-Pasquotank

pH class: Very strongly acid

Source of information: General Soil Map of Hyde County, N.C., SCS, 1973

Other notes:

24c. Hydrology Summary (by community type) CT 1

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh

Water regime: Intermittently flooded

Drainage class: Very poorly drained

Drainage basin: Lake Mattamuskeet

Hydrology characterization: A very poorly drained, intermittently flooded, fresh, interaqueous, palustrine system.

24d. Topography Summary: CT 1

Landform: non-alluvial flat (former lake margin)

Shelter: closed

Aspect: n/a

Slope Angle: n/a

Profile: Flat

Surface patterns: Generally smooth

Position: n/a

25. Physiographic characterization of natural area:

A late successional community occupying a very poorly drained, non-alluvial flat near the margin of Lake Mattamuskeet in the Coastal Plain Province of the Atlantic Plain.

Geological Formation:

Pleistocene (Pamlico Terrace) sands and clays over Upper Miocene (Yorktown Formation) fossiliferous sands and clays.

Geological Formation age:

Pleistocene (Pamlico Terrace): less than 100,000 yrs. BP
Upper Miocene (Yorktown Formation): 18-22 million yrs. BP

References Cited:

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Soc. of Am. Journal 42: 98-105.

26. Summary - Endangered and threatened species

Name of species: None recorded.

Species legal status and authority:

Number of populations on site:

Number of individuals per population:

Size or Maturity of individuals:

Phenology of population:

Eg: vegetative %
flowering %
fruiting %

General vigor of population:

Disturbance or threats to population:

Habitat characteristics

Plant community:

Topography:

Soil Series:

Microclimate:

Drainage basin:

Other plants and animal species present:

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

27. Master species lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
  Acer rubrum
ANACARDIACEAE
  Rhus radicans
ANNONACEAE
  Asimina triloba
APIACEAE
  Centella asiatica
ASPIDIACEAE
  Athyrium asplenioides
BIGNONIACEAE
  Anisostichus capreolata
  Campsis radicans
BLECHNACEAE
  Woodwardia areolata
  W. virginica
BROMELIACEAE
  Tillandsia usneoides
CELASTRACEAE
  Euonymus americanus
CLETHRACEAE
  Clethra alnifolia
CYPERACEAE
  Carex spp.
ERICACEAE
  Vaccinium sp.
FAGACEAE
  Quercus laurifolia
HAMAMELIDACEAE
  Liquidambar styraciflua
LAURACEAE
  Persea borbonia
LILIACEAE
  Smilax rotundifolia
LOGANIACEAE
  Gelsemium sempervirens
MAGNOLIACEAE
  Liriodendron tulipifera
  Magnolia virginiana
MYRICACEAE
  Myrica cerifera
NYSSACEAE
  Nyssa sylvatica var. biflora
ORCHIDACEAE
  Goodyera pubescens
  Tipularia discolor

OSMUNDACEAE
  Osmunda regalis var. spectabilis
PINACEAE
  Pinus taeda
POLYPODIACEAE
  Polypodium polypodioides
RHAMNACEAE
  Berchamia scandens
RUBIACEAE
  Mitchella repens
SYMPLOCACEAE
  Symplocos tinctoria
TAXODIACEAE
  Taxodium distichum
VITACEAE
  Parthenocissus quinquefolia
  Vitis sp.

AMPHIBIANS

None recorded.

REPTILES

None recorded.

BIRDS

(Emphasis of bird lists is on breeding or summering species; lack of adequate field work during the other seasons prevented compilation of a complete list.)

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; year-round, summer, or winter
* = Breeding or suspected breeding at site

Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Fish Crow	PV
Carolina Chickadee	PR*
Tufted Titmouse	PR*
Blue-gray Gnatcatcher	SR*
Prothonotary Warbler	SR*
Yellow-rumped Warbler	WR
Pine Warbler	PR*
Ovenbird	SR*

MAMMALS

White-tailed Deer (tracks)

BIBLIOGRAPHY

Ashe, W. W. 1894. The Forests, Forest Lands, and Forest Products of Eastern North Carolina. N.C. Geol. Surv. Bull. #5. 128 pp.

Ashe, W. W., and G. Pinchot. 1897. Timber Trees and Forests of North Carolina. N.C. Geol. Surv. Bull. #6. 227 pp.

Barnes, J. S. 1981. Soils Map of First Colony Farms Lands, Dare County. First Colony Farms, Inc. Unpublished map.

Barnes, J. S. 1982. First Colony Farms agronomist, Creswell, N.C. Pers. communication.

Bellis, V., M. P. O'Connor and S. R. Riggs. 1975. Estuarine Shoreline Erosion in the Albemarle-Pamlico Region of North Carolina. University of North Carolina Sea Grant Publication UNC SG 75-29. 67 pp.

Biswell, H. H., and J. E. Foster. 1942. Forest Grazing and Beef Cattle Production in the Coastal Plain of North Carolina: Results of a survey of 100 Cattle Producing Farms. N.C. Ag. Exp. Station Bull. #334. 22 pp.

Biswell, H. H., R. W. Collins, J. E. Foster and T. S. Boggess, Jr. 1945. Native Forage Plants: Species Utilized by Beef Cattle on Forest Range in the North Carolina Coastal Plain. N.C. Ag. Exp. Station Bull. #353. 27 pp.

Buell, M. F., and R. L. Cain. 1943. The Successional Role of Southern White Cedar, Chamaecyparis thyoides, in Southeastern North Carolina. Ecology 24: 85-93.

Campbell, R. G., and J. H. Hughes. 1981. Forest Management Systems in North Carolina Pocosins: Weyerhaeuser. pp. 199-213 in C. J. Richardson, (ed.). Pocosin Wetlands. Hutchinson Ross Publ. Co., Stroudsburg, PA. 364 pp.

Christensen, N. L. 1980. Fire Regimes in Southeastern Ecosystems. pp. 112-136 in H. A. Mooney, T. Bonnicksen, N. L. Christensen, W. A. Reiners, and J. Lotan, (eds.). Fire Regimes and Ecosystem Properties. USDA For. Serv., Gen. Tech. Report, Washington, D.C. 593 pp.

Christensen, N. L., R. Burchell, A. Liggett and E. Simms. 1981. The Structure and Development of Pocosin Vegetation. pp. 43-61 in C. J. Richardson, (ed.). Pocosin Wetlands. Hutchinson Ross Publ. Co., Stroudsburg, PA. 364 pp.

Cooper, J. E., S. S. Robinson and J. B. Funderburg (eds.). 1977. Endangered and Threatened Plants and Animals of North Carolina. N.C. State Museum of Natural History, Raleigh. 444 pp.

Cowardin, L. M., V. Carter, F. C. Golet and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. US FWS Office of Biological Services, Washington, D.C. 103 pp.

Daniel, C., III. 1981. Hydrology, Geology and Soils of Pocosins: A Comparison of Natural and Altered Systems. pp. 69-108 in C. J. Richardson, (ed.). Pocosin Wetlands. Hutchinson Ross Publ. Co., Stroudsburg, PA. 364 pp.

Daniels, R. B., E. E. Gamble, and W. H. Wheeler. 1978. Age of Soil Landscapes in the Coastal Plain of North Carolina. Soil Science Society of America Journal 42: 98-105.

Environmental Protection Agency. 1982. Land Cover Inventory: Albemarle/Pamlico Peninsula. Vol. 2. Infrared aerial photography.

ETCO. 1980. First Colony Farms Peat to Methanol Project. Unpublished report to Synthetic Fuels Corporation.

Florschutz, Otto, Jr. 1979. Roper Island Preliminary Beiological Evaluation Report. Unpublished report. U.S. Fish and Wildlife Service. Asheville, N.C.

Florschutz, Otto, Jr. 1982. U.S. Fish and Wildlife Service, East Coast Biologist, Washington, N.C. Pers. communication.

Fowells, H. G. 1968. Silvics of Forest Trees of the United States. USDA, Agriculture Handbook #271, 762 pp.

Giese, G. L., H. B. Wilder, and G. G. Parker, Jr. 1979. Hydrology of Major Estuaries and Sounds of North Carolina. U.S. Geo. Survey, Water Resources Investigations 79-46, Raleigh. 175 pp.

Godfrey, P. J., and M. M. Godfrey. 1977. Barrier Island Ecology of Cape Lookout National Seashore and Vicinity, North Carolina. NPS Scientific Monograph Series, #9. Washington, D.C. 160 pp.

Hamilton, R. J., and R. L. Marchinton. 1980. Denning and Related Activities of Black Bears in the Coastal Plain of North Carolina. pp. 122-126 in C. J. Martinka and K. L. McArthur, (eds.). Bears-their Biology and Management. Proceedings, International Bear Biol. Assoc. Conf., Kalispell, Montana.

Hughes, R. H. 1957. Response of Cane to Burning in the North Carolina Coastal Plain. N.C. Ag. Exp. Station Bull. #402. 24 pp.

Hughes, R. H. 1966. Fire Ecology of Canebrakes. Tall Timbers Fire Ecology Conference, Tallahassee, FL, 5: 149-157.

Hughes, R. H., E. U. Dillard and J. B. Hilmon. 1960. Vegetation and Cattle Response Under two Systems of Grazing Cane Range in North Carolina. N.C. Ag. Exp. Station Bull. #412. 27 pp.

Ingram, R. L., and L. J. Otte. 1982. Peat Deposits of Pamlimarle Peninsula-Dare, Hyde, Tyrrell, and Washington Counties, North Carolina. Prepared for the U.S. Dept. of Energy and the N.C. Energy Institute. 36 pp. + 1 map.

Kaczorowski, R. T. 1976. The Carolina Bays: a Comparison with Modern Oriented Lakes. University of South Carolina, Coastal Res. Div., Tech. Rep. #13. 124 pp.

Kologiski, R. L. 1977. The Phytosociology of the Green Swamp, North Carolina. N.C. Ag. Exp. Station Tech. Bull. #250. 101 pp.

Martof, B. S., W. M. Palmer, J. R. Bailey, and J. R. Harrison. 1980. Amphibians and Reptiles of the Carolinas and Virginia. University of North Carolina Press, Chapel Hill. 264 pp.

Meanley, B. 1979. An Analysis of the Birdlife of the Dismal Swamp. pp. 261-276 in Paul W. Kirk, Jr. (ed.). The Great Dismal Swamp. University of Virginia Press, Charlottesville. 427 pp.

Mixon, R. B., and O. H. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, North Carolina. Geological Survey Professional Paper 859. Washington, D.C. 45 pp.

Noffsinger, Robert. 1982. U.S. Fish and Wildlife Service, Division of Ecological Services, Raleigh, NC. Pers. communication.

Oaks, R. Q., Jr. and D. R. Whitehead. 1979. Geologic Setting and Origin of the Dismal Swamp, Southeastern Virginia and Northeastern North Carolina. pp. 1-24 in Paul W. Kirk, Jr. (ed.). The Great Dismal Swamp. University of Virginia Press, Charlottesville. 427 pp.

Otte, L. J. 1981. Origin, Development and Maintenance of the Pocosin Wetlands of North Carolina. N.C. Natural Heritage Program, NC DNRCD, Raleigh. Unpublished report. 52 pp.

Otte, L. J. 1982. Geology Department, East Carolina University, Greenville. Pers. communication.

Otte, L. J., and R. L. Ingram. 1980. Peat Resources of North Carolina. Annual Report to N.C. Energy Institute, U.S. Dept. of Energy. DE-ACol-79ET-14693. 60 pp.

Potter, E. F. 1982. Wintering and Breeding Birds of Pocosins and Adjacent Agricultural Fields in Dare County, North Carolina. US Fish and Wildlife Service, Raleigh. Unpublished report. 94 pp.

Potter, E. F., J. F. Parnell and R. P. Teulings. 1980. Birds of the Carolinas. University of North Carolina Press, Chapel Hill. 408 pp.

Powell, W. S. 1968. The North Carolina Gazetteer. University of North Carolina Press, Chapel Hill. 561 pp.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. University of North Carolina Press, Chapel Hill. 1183 pp.

Radford, A. E., D. K. S. Otte, L. J. Otte, J. R. Massey and P. D. Whitson. 1980. Natural Heritage: Classification, Inventory, & Information. University of North Carolina Press, Chapel Hill. 674 pp.

Shepherd, W. O., E. U. Dillard and H. L. Lucas. 1951. Grazing and Fire Influences in Pond Pine Forests. N.C. Ag. Exp. Station Tech. Bull. #97. 57 pp.

Soil Conservation Service. 1973. General Soil Map of Hyde County, N.C. U.S. Department of Agriculture, Washington, D.C.

Wells, B. W. 1928. Plant Communities of the Coastal Plain of North Carolina and their Successional Relations. Ecology 9: 230-242.

Wells, B. W. 1932 (reprinted 1967). The Natural Gardens of North Carolina. University of North Carolina Press, Chapel Hill. 458 pp.

Wells, B. W. 1942. Ecological Problems of the Southeastern United States Coastal Plain. Bot. Rev. 8: 533-561.

GLOSSARY

(from Bellis *et al.*, 1975)

Area of Environmental Concern-(AEC) Especially fragile or ecologically unique areas of the North Carolina Coast where development should occur only if it is in harmony with natural processes. Areas of the coast where the public welfare might be endangered by unwise manipulation of the environment.

BP - Before present.

canopy - A layer of leaves and branches formed by the interlocking mosaic of tree tops in a forest.

Coastal Area Management Act of 1974 - An act passed by the North Carolina legislature in 1974 intended to promote wise development of North Carolina'a coastal resources. Among other provisions this act calls for the designation of certain especially sensitive areas as 'Areas of Environmental Concern.'

cypress fringe - A straight or curved line of cypress running parallel to the shoreline. Older cypress fringe has its trees standing in water while young cypress fringe occupies sandy beaches in front of eroding sand or clay banks.

dbh - Diameter at breast height (diameter of tree in inches measured at a point 4.5 feet above the ground).

ecological succession - Process by which one community of living organisms is gradually replaced by another. Usually each successive community is more stable than the last, thus leading toward a final community especially well suited to the particular environmental conditions existing at that location.

flood plain - Lowlands adjacent to a river or stream which become inundated during periods of high flow. Flood plains are a natural component of the river system and function as overflow storage areas.

msl - Mean sea level.

Pamlico Terrace - A low, flat, featureless, topographic surface extending over the Coastal Plain of the Southeastern U.S. at elevations less than 20 feet above sea level. It is considered the relict sea floor of the Sangamon Interglacial.

Pamlimarle Peninsula - The peninsula bounded on the north by Albemarle Sound and on the south by the Pamlico River. Includes all of Washington, Beaufort, and mainland portions of Dare and Hyde Counties.

peat - Accumulations of slowly decomposing plant remains. Peat is formed in swamps and marshes. Erosion of peat soils releases suspended organic matter into coastal waters as well as certain 'humic acids' which give water a tea colored stain.

Pleistocene Epoch - That period of earth history which saw the advance and retreat of the four great Ice Ages. It is generally considered to have begun between 1 and 2 million years ago and to have continued up until about 18,000 years ago.

relict beach ridge - Throughout the Southeastern U.S. ancient shorelines are detected at various elevations inland from the coast. These shorelines are often manifested as continuous ridges and are considered a product of higher stands of the sea during the Pleistocene Ice Ages.

Sangamon Interglacial - A period of deglaciation (no continental ice sheets) during the Pleistocene Epoch between the Illinoian and Wisconsin Ice Ages. This period is generally considered to have taken place about 80-100,000 years ago.

sp and spp - Species (singular and plural).

Suffolk Scarp - A topographic ridge rising from 20 to 40 feet above sea level which runs parallel to the coast throughout North Carolina. It is considered an ancient shoreline formed during the Pleistocene Epoch.

swamp forest - Type of forest characterized by seasonal flooding and water saturated organic soils. Water tupelo, swamp black gum and bald cypress are dominant tree species.

Talbot (Chowan) Terrace - A rather flat but stream-dissected surface lying at an average elevation of 40-45 feet throughout Southeastern United States. It is considered to have been a sea floor during the Pleistocene Epoch. In North Carolina it lies west of the topographic ridge known as the Suffolk Scarp.

Yorktown Formation - An ancient deposit of clay and clayey sand which typically contains abundant marine fossils including clams, snails, whale vertebrae, and shark teeth. It occurs extensively over eastern North Carolina and is generally considered a depositional product of the Miocene Epoch which took place 15-20 million years ago.

CEIP Publications

1. Hauser, E. W., P. D. Cribbins, P. D. Tschetter, and R. D. Latta. Coastal Energy Transportation Needs to Support Major Energy Projects in North Carolina's Coastal Zone. CEIP Report #1. September 1981. $10.

2. P. D. Cribbins. A Study of OCS Onshore Support Bases and Coal Export Terminals. CEIP Report #2. September 1981. $10.

3. Tschetter, P. D., M. Fisch, and R. D. Latta. An Assessment of Potential Impacts of Energy-Related Transportation Developments on North Carolina's Coastal Zone. CEIP Report #3. July 1981. $10.

4. Cribbins, P. S. An Analysis of State and Federal Policies Affecting Major Energy Projects in North Carolina's Coastal Zone. CEIP Report #4. September 1981. $10.

5. Brower, David, W. D. McElyea, D. R. Godschalk, and N. D. Lofaro. Outer Continental Shelf Development and the North Carolina Coast: A Guide for Local Planners. CEIP Report #5. August 1981. $10.

6. Rogers, Golden and Halpern, Inc., and Engineers for Energy and the Environment, Inc. Mitigating the Impacts of Energy Facilities: A Local Air Quality Program for the Wilmington, N. C. Area. CEIP Report #6. September 1981. $10.

7. Richardson, C. J. (editor). Pocosin Wetlands: an Integrated Analysis of Coastal Plain Freshwater Bogs in North Carolina. Stroudsburg (Pa): Hutchinson Ross. 364 pp. $25. Available from School of Forestry, Duke University, Durham, N. C. 27709. (This proceedings volume is for a conference partially funded by N. C. CEIP. It replaces the N. C. Peat Sourcebook in this publication list.)

8. McDonald, C. B. and A. M. Ash. Natural Areas Inventory of Tyrrell County, N. C. CEIP Report #8. October 1981. $10.

9. Fussell, J., and E. J. Wilson. Natural Areas Inventory of Carteret County, N. C. CEIP Report #9. October 1981. $10.

10. Nyfong, T. D. Natural Areas Inventory of Brunswick County, N. C. CEIP Report #10. October 1981. $10.

11. Leonard, S. W., and R. J. Davis. Natural Areas Inventory for Pender County, N. C. CEIP Report #11. October 1981. $10.

12. Cribbins, Paul D., and Latta, R. Daniel. Coastal Energy Transportation Study: Alternative Technologies for Transporting and Handling Export Coal. CEIP Report #12. January 1982. $10.

13. Creveling, Kenneth. Beach Communities and Oil Spills: Environmental and Economic Consequences for Brunswick County, N. C. CEIP Report #13. May 1982. $10.

CEIP Publications

14. Rogers, Golden and Halpern, Inc., and Engineers for Energy and the Environment. The Design of a Planning Program to Help Mitigate Energy Facility-Related Air Quality Impacts in the Washington County, North Carolina Area. CEIP Report #14. September 1982. $10.

15. Fussell, J., C. B. McDonald, and A. M. Ash. Natural Areas Inventory of Craven County, North Carolina. CEIP Report #15. October 1982. $10.

16. Frost, Cecil C. Natural Areas Inventory of Gates County, North Carolina. CEIP Report #16. April 1982. $10.

17. Stone, John R., Michael T. Stanley, and Paul T. Tschetter. Coastal Energy Transportation Study, Phase III, Volume 3: Impacts of Increased Rail Traffic on Communities in Eastern North Carolina. CEIP Report #17. August 1982. $10.

19. Pate, Preston P., and Jones, Robert. Effects of Upland Drainage on Estuarine Nursery Areas of Pamlico Sound, North Carolina. CEIP Report #19. December 1981. $1.00.

25. Wang Engineering Co., Inc. Analysis of the Impact of Coal Trains Moving Through Morehead City, North Carolina. CEIP Report #25. October 1982. $10.

26. Anderson & Associates, Inc. Coal Train Movements Through the City of Wilmington, North Carolina. CEIP Report #26. October 1982. $10.

27. Peacock, S. Lance and J. Merrill Lynch. Natural Areas Inventory of Mainland Dare County, North Carolina. CEIP Report #27. November 1982. $10.

28. Lynch, J. Merrill and S. Lance Peacock. Natural Areas Inventory of Hyde County, North Carolina. CEIP Report #28. October 1982. $10.

29. Peacock, S. Lance and J. Merrill Lynch. Natural Areas Inventory of Pamlico County, North Carolina. CEIP Report #29. November 1982. $10.

30. Lynch, J. Merrill and S, Lance Peacock. Natural Areas Inventory of Washington County, North Carolina. CEIP Report #30. October 1982. $10.

31. Muga, Bruce J. Review and Evaluation of Oil Spill Models for Application to North Carolina Waters. CEIP Report #31. August 1982. $10.

33. Sorrell, F. Yates and Richard R. Johnson. Oil and Gas Pipelines in Coastal North Carolina: Impacts and Routing Considerations. CEIP Report #33. December 1982. $10.

34. Roberts and Eichler Associates, Inc. Area Development Plan for Radio Island. CEIP Report #34. June 1983. $10.

35. Cribbins, Paul D. Coastal Energy Transportation Study, Phase III, Volume 4: The Potential for Wide-Beam, Shallow-Draft Ships to Serve Coal and Other Bulk Commodity Terminals along the Cape Fear River. CEIP Report #35. August 1982. $10.

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