Natural Areas Inventory of Pender County, North Carolina

Steven W. Leonard
Richard J. Davis

OCTOBER 1981

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

CEIP REPORT NO. 11
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October, 1981

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CEIP REPORT NO. 11
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 Pender County inventory was conducted in 1981 and was financed by a Coastal Energy Impact Program (CEIP) grant. CEIP funded the Pender County survey because of the potential environmental impacts of peat mining and other energy-related development.

The recommendations made in this report by Steven W. Leonard and Richard J. Davis 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 ten outstanding or exemplary natural areas described in this 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.

Steven Leonard and Richard Davis are experienced field biologist, with intimate familiarity with the ecological resources of the project 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, and 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 and salt marshes, that fringe most of the county's shoreline, and which, for the most part, are ecosystems protected through state and federal regulatory programs.
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 some 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 high quality natural areas that possess natural elements of statewide priority and are important parts of North Carolina's natural diversity. Most of the identified sites were previously unknown and undocumented by the state's scientific community. 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 17, 1982
Abstract. Ten natural areas are described and delineated for Pender County as a result of a field survey during May - October 1981. The natural areas contain slightly more than 101,000 acres and at least 104 significant features. The largest percentage of natural area lands (67 percent) is managed by the NC Wildlife Resources Commission. A large fraction of the remaining natural area acreage is comprised of river swamp. Only a small percentage of natural area acreage is non-wetland. Of those areas inventoried, the least satisfactory survey was performed on possibly the most significant natural area in the county -- Angola Bay -- where conventional methods of field analysis are nearly impossible to perform. Several promising natural areas were also discovered, but due to various constraints, were not examined adequately. These sites occur mostly along the Cape Fear River, the upper section of the Northeast Cape Fear River, Holly Shelter Creek sub-basin, Penderlea Game Lands, and the "Mooretown ponds". Research is continuing on the flora associated with the Invershiel-Meggett soil association near Maple Hill, and a composite "Birds of Pender County" is planned.
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INTRODUCTION

Seventh in size in North Carolina, Pender County has an area of 869 sq mi including 857 sq mi of land and 12 sq mi of water. The approximately 550,000 ac in the county consist of forest and forested wetlands (81%), agriculture (11%), developed (2%), water and marshlands (1%) and other miscellaneous land uses (5%).

Pender County is the newest county in eastern North Carolina of those bordering the Atlantic Ocean. The county was formed in 1875 from New Hanover, and in addition to the Atlantic Ocean and New Hanover County, it has contiguous boundaries with the following counties: Brunswick, Columbus, Bladen, Sampson, Duplin, and Onslow (FIGURE 1).

Three major rivers lie partly within the county. The most extensive river mileage is from the Northeast Cape Fear, followed by the Black River, and the Cape Fear River. All three rivers are navigable for lengthy distances, although the upper stretches of the Black River during periods of dry weather can only be safely navigated with small outboard or canoe. Several of the tributary streams which empty into the rivers are also navigable. Major tributary streams of the Northeast Cape Fear River are (in Pender County): Long Creek, Turkey Creek, Island Creek, Harrison/Merrick Creeks, Burgaw Creek, and Holly Shelter Creek. Moores Creek is the largest sub-basin in Pender County which empties into the Black River. There are no major Pender County drainages, other than Black River, which, in Pender, enter the Cape Fear. Nevertheless, the entire county lies within the Cape Fear Basin.

The generalized geology of Pender County dates from the Cretaceous Period, during which time the Pee Dee formation, consisting of gray-to-green sands, impure limestones, and lenses of marine clays and interbedded sands, was deposited. This formation is considered the basement complex beneath the western half of the county. East of the Pee Dee formation and extending in a belt from the Rocky Point area northeast to Maple Hill is Eocene Castle Hayne limestone, a chalky-white, sandy-shell limestone or dense silicified gray limestone. Outcrops of this formation are uncommon but do occur on the McRae Farm, east of Rocky Point. The formation is in significant quantities to make commercial exploitation feasible. The overburden varies considerably, as does the consistency of the stone. Near Maple Hill, the proximity of the Castle Hayne formation to the surface is sufficient to strongly alter soil pH. As a result the basic soil reaction affects vegetation and promotes atypical coastal plain communities. East of the Castle Hayne formation is a broad belt of mostly Quaternary sands and clays, a belt that is roughly delineated by the present route of US 17.

Soils of Pender County are diverse, and the preliminary soil map of the county shows ten soil series:

(1) Johnston-Lumbee Association: Very poorly to poorly drained soils with loamy subsoils, on first bottom floodplains and low-lying stream terraces.
FIGURE 1. Pender County and surrounding features: Atlantic Ocean, and the Counties of New Hanover (N. H.), Brunswick (Br.), Columbus (C.), Bladen (Bl.), Sampson (S.), Duplin (D.), and Onslow (O.).
(2) Dorovan-Ponzer Association: Very poorly drained soils with organic surfaces and sandy to loamy subsoils occurring in upland bays and in flood plains of tributaries of major streams.

(3) Barclay-Pasquotank-Weeksville Association: Somewhat poorly drained to very poorly drained soils with silty surface layers and silty subsoils on level to nearly level low broad flats.

(4) Bladen-Lumbee-Craven Association: Poorly drained to moderately well drained soils with clayey to loamy subsoils on level to gently sloped uplands and broad low-lying stream terrace areas.

(5) Lumbee-Johns-Kalmia Association: Well drained to poorly drained soils with loamy subsoils on level to gently sloping stream terraces in the coastal plain.

(6) Capers-Newhan Association: Very poorly drained to excessively drained, sandy to clayey, marsh and coastal dune soils on tidal flats and gently sloping areas near beaches and waterways along the coast subject to tidal flooding.

(7) Lynn Haven-Leon-Kureb Association: Poorly drained to excessively well drained sandy soils with spodic horizons in the subsoil on broad low flats and sloping ridges in the coastal plain.

(8) Invershiel-Meggett Association: Well drained to poorly drained soils that have loamy subsoils underlain by marl on lower marine terraces, stream terraces, and first bottom.

(9) Wehadkee-Chewacla Association: Poorly drained to somewhat poorly drained soils with friable loamy subsoils on nearly level first bottom flood plains.

(10) Portsmouth-Wakulla Association: Very poorly drained to excessively drained soils that have friable loamy to sandy subsoils on nearly level stream terraces and gently sloping broad upland ridges.

Vegetation and land use in Pender County are similar to that of adjacent counties. Non-forested lands occur throughout the county and include many types of vegetation cover: agriculture, abandoned fields, developed lands, open water, tidal marshes, barrier islands and beaches. Forested lands are predominantly mixed pine, and depending upon site characteristics may be longleaf pine, loblolly pine, slash pine, or pond pine. Bottomlands which are forested are usually covered with cypress, either in relatively pure stands, or more typically in mixed associations with water tupelo, red maple, black gum, sweetgum, or other hardwood species. Tidal influence is felt in the lower stretches of the Northeast Cape Fear and Black Rivers and through all of the Pender portion of the Cape Fear River. Brackish water wedges move upstream in the lower Northeast Cape Fear system, and freshwater to slightly brackish water marshes are occasionally seen along the shoreline. Carolina bay pocosins are not prevalent in Pender County as they are in Bladen and parts of Brunswick, Columbus, and Sampson. However, they do occur, and some of them have been drained for blueberry culture. By far the largest extent of pocosin (and possibly the most significant natural features on the county) are the joint embayments of Angola Bay and Holly Shelter Bay. Minor variations in terms of total county acreage of forests
are found near Rocky Point where a mixed hardwood composition stands out in contrast to the typical loblolly or pond pine forest, and to lesser extent, the red cedar woodlands along the mainland fringe adjacent to the tidal marshes. In the latter case, these woodlands are found on calcareous substrates—Indian middens, or more recently, dredged material islands along the Atlantic Intracoastal Waterway. Except for the coastal and corridor development along US 17, vegetation and land use in Pender County may be visualized as a giant "V", in which the arms of the "V" are comprised of swamps and woodlands along the Cape Fear/Black System to the left and the Northeast Cape Fear/Angola-Holly Shelter Bays System to the right, and separated by a broad wedge-shaped agricultural area.

To inventory these diverse habitats for natural areas and endangered and threatened species first necessitated a county-wide reconnaissance. In late April, 1981 a rapid inspection of the county from as many of the secondary and primary roads as possible was undertaken. Brief side trips, consisting of walks of a few hundred yards were taken at selected points, often in creek bottoms, or in upland woods. Secondly, a planned survey of localities which had previously been recorded by Natural Heritage personnel and provided to us in the format of computer printout of known stations for endangered/threatened species, or unique biotic communities was performed. Thirdly, a survey of bottomlands, marshes, and the barrier islands was conducted by boat. As a tentative list of potential natural areas began to emerge, aerial inspection was completed. Altogether, the Pender County Natural Areas Inventory included 49 field days: 38 by ground, 9 by water, and 2 by air. Road mileage totalled slightly less than 3,700 mi.

The inventory results reflect a bias toward occurrences of endangered species and large areas of contiguous undisturbed lands. Perhaps the chief fault of the study is that it was too broad— that more attention should have been focused on specific areas or types of areas. A glaring shortcoming is that certain areas are biologically significant, but as a result of constraints of this contract, may have unintentionally been excluded. Therefore, we wish to point out the following areas in need of further investigation:

1. Cape Fear River Swamp of Brunswick, Columbus, and Pender Counties
2. Roan Island
3. Larkins Cypress Grove, Bladen and Pender Counties (This remarkable cypress stand of old-growth trees was found late in the study. It is possibly the oldest extant timber stand in Pender County. Buttresses of trees are sometimes 15-20 ft thick; DBH, or diameter above the buttress enlargement is usually 3 ft, but on some individuals reaches 6-8 ft.)
4. Penderlea Game Lands
5. Mooretown Ponds, an area of sinkholes north of Northeast Cape Fear River
6. Holly Shelter savannas
7. Saltmarshes
8. Angola Bay, Pender and Duplin Counties
9. Maple Hill area
We have identified ten significant natural areas that vary in size from about 200 ac to almost 50,000 ac. These ten candidates are representative of several edaphic and biotic combinations. They range from xeric to hydric; from acidic to basic; from sea level to more than 70 ft in elevation; from biologically undisturbed to man-dominated. Some of the areas contain several populations of endangered and threatened species. The decision as to which areas to include and which areas to exclude was largely subjective, but did include objective elements. Typical questions that we considered when examining a potential site were

1. Does the site have regional, state, or county-wide uniqueness?
2. Are there unusual habitat conditions present?
3. Are there endangered, threatened, or rare species present?
4. Is the site representative of a type of habitat which is rapidly being converted to other land uses?
5. Does the site have protective, management, or habitat enhancement status?
6. Would loss of the habitat constitute an irretrievable loss of resource to Pender County?
7. Is natural area designation congruent with the activities and land use intentions of the landowner(s)?

From our own observations of land use activity in the county, and from discussion with officials and landowners, we saw and learned of a few activities which lack provision for biological enhancement. Landowner education on the benefits of a regular controlled-burn program and voluntary implementation would reduce the risks of catastrophic forest fire. Establishment of hedgerows, wildlife food plots, and a crop rotation sequence with food and cover during critical nesting times would greatly benefit wildlife, and should be incorporated into large agricultural enterprises. Consideration of natural flora and fauna, as well as potential impact on wetland systems should be given prominence in development plans for industry. Piecemeal residential development in which maximum numbers of units are placed on minimum acreage should be evaluated with extreme care. Future land use trends and the consequences of estuarine deterioration on finfish and shellfish in Pender waters should be assessed for long term as well as short term effects.

Two natural areas in the county are located in proximity to limestone mines, and therefore, are potentially threatened by mining activity. Two natural areas are located along major highway corridors (I-40, under construction and US 421) and may be affected by industrial development. One natural area is subject to beach residential development.

On the other hand, three natural areas are already afforded protective status, and two others, comprised predominantly of swamp lands are unlikely to be drastically altered. In terms of acreage, the overwhelming percentage of natural area lands in Pender County is now protected under the jurisdiction of the NC Wildlife Resources Commission.

From this brief inventory of the natural features and resources of Pender County, we were very impressed—by their diversity and by their quality. The natural heritage of Pender County is one of which all North Carolinians can be justly proud.
NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Angola Bay, Holly Shelter Bay

2. County: Pender

3. Location: Angola Bay is located in the northeast part of Pender County, east of US 117 and the Northeast Cape Fear River, and extends into southern Duplin County. Holly Shelter Bay is located in east-central Pender County, south of NC 53, east of the Northeast Cape Fear River, and northwest of US 17. Coordinates: Angola Bay: Vicinity of 34°40'N, 77°50'W; Holly Shelter Bay: Vicinity of 34°30'N, 77°40'W. (FIGURES 2,3).


5. Size: Approximately 20,000 ac within the Pender County portion of Angola Bay Game Land, and 48,500 ac within the Holly Shelter Wildlife Management Area.

6. Elevation: 15 ft or slightly less to 30 ft above mean sea level

7. Access: Angola Bay is inaccessible! The southern periphery can be reached by traveling northeast from Burgaw on NC 53 for approximately 8 miles. Private, gated roads extend northward but do not go as far as the State Game Land boundary. Holly Shelter Bay includes limited access from US 17, north of Hampstead and from SR 1520 which parallels the Northeast Cape Fear River. It is advisable, before entering Holly Shelter Bay, to acquaint oneself with pertinent regulations. Therefore, it is suggested that entrance to the natural area include a visit to the Game Lands headquarters on SR 1520, ca. 7 miles north of NC 210.

8. Names of Investigators: S. W. Leonard Ricky Davis
   P. O. Box 3475 126 Duncansby Court
   Wilmington, NC 28406 Cary, NC 27511

9. Date(s) of Investigation: May-September, 1981

10. Priority Rating: High

11A. Prose Description of Site: From the air, the two vast areas of Angola Bay and Holly Shelter Bay appear as limitless green wilderness. With diameters of more than 10 miles, and in the case of Angola Bay, no roads or trails, they rank with Dismal Swamp, the Dare County peninsula, the "open grounds" of Carteret County, and the Green Swamp as some of North Carolina's most inaccessible interior wetlands. For almost fifty years Angola and Holly Shelter have been owned by the State, and
FIGURE 2. Angola Bay section of Angola Bay, Holly Shelter Bay Natural Area.
more recently, managed as wildlife preserves. Adjacent lands are often owned by timber companies which have attempted to replace the inferior forests of pond pine with other species.

The term "bay" is often used in reference to elliptic depressions known more completely as "Carolina bays;" however, the size, shape, and surrounding features of Angola and Holly Shelter suggest instead, a geomorphological origin as gigantic embayments. Close inspection of aerial photographs reveals that within these embayments are typical Carolina bay ellipses. Thus the origin of interior Carolina bays postdates the origin of Angola and Holly Shelter. Several sand ridges, ranging in elevation from a foot or two above the adjacent pocosin swamp to ten to fifteen feet, are located within the boundaries of the pocosin. In Angola Bay, not far from the Duplin County line, one such ridge is used as a Forest Service landing strip.

The history of the bay vegetation is closely linked to wildfires. Old photography occasionally shows fire scars—darkened areas, or tracts of regrowth timber which differs markedly from nearby stands. Because of the impassibility of heavy machinery over the boggy soil, fire fighting is difficult, and may be restricted to aerial application of retardents. Historically, fires were allow to burn and smoulder until rains or soil moisture eventually extinguished them. Thus the vegetation has changed during the past century as a combination of factors—fire prevention, drainage, natural succession—have all interacted to give the ecological conditions observed today.

Vegetation of the bays differs, not so much in overall species composition, but in the relative acreage of communities. Angola Bay is, for the most part, a treeless or near-treeless expanse of evergreen shrubbery, with pond pines scattered here and there, or sometimes a localized zone of sweet bay or loblolly bay. The interior of Holly Shelter has much larger volumes of pond pine timber than Angola Bay, but it nevertheless does have a large treeless area in the northeastern part. The southeastern part of Holly Shelter, in what might be termed the "rim" contains higher-elevation sand and sandy clay, which is covered with longleaf pine that is periodically burned. As a result, the southeast quadrant of Holly Shelter has superlative longleaf pine savannas, which gradually dip toward the northwest into titi and bald cypress wetlands. The only known stand of Atlantic white cedar in either of the two bays occurs in Holly Shelter in the drainage basin of Trumpeter Swamp.

Wildlife in the bays enjoys the seclusion afforded by thousands of acres of pocosin. Black bear populations exist in both bays, and there is probably migration between the two bays. Deer are plentiful, and the Holly Shelter Game Lands provide hunters with bow and conventional firearm seasons. A large shallow waterfowl impoundment of approximately 200 acres has recently been constructed in Holly Shelter, and contains adult alligators as well as waterfowl. Water in the embayments is highly acidic, and hence, is not conducive to gamefish management.
An account of Holly Shelter as it appeared thirty-five years ago is found in B. W. Well's "Vegetation of Holly Shelter Wildlife Management Area"; N. C. Dept. Cons. and Dev., Div. Game and Inland Fisheries, Bulletin #2 (1946).

11B. Prose Description of Site Significance: Angola Bay and Holly Shelter Bay are unique landforms in North Carolina. They are large and biologically poorly known. Angola Bay, particularly, is in need of intensive study, but due to the formidable conditions of saturated soil, floating organic mats, dense shrubs, catbriers, areal expanse, black bears, venomous snakes, mosquitoes, ticks, and sultry weather, summertime study is unthinkable. Nevertheless, the work needs to be done.

That large portions of the two areas are protected and managed assures no immediate threats to the endangered species found within this natural area. Theft of insectivorous plants is a common problem along the eastern boundary of Holly Shelter, but we saw excellent populations of several species.

In summary, the significance of Angola Bay and Holly Shelter Bay is that (a) they are unique, (b) they are large, (c) they are not likely to be threatened, (d) they are owned by the State, (e) they are managed, and (f) they contain endangered plants and animals.

12. Significance Summary: (see TABLE 1)

Legal Status, Use and Management

13. Ownership type by percent area: Private 0%, Public 100%, but with restricted access, Unknown 0%

14. Number of Owners: 1

15. Name(s) of Owner(s) and/or Custodian(s) (with addresses, phone numbers, and other pertinent information): North Carolina Wildlife Resources Commission, Raleigh, NC

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Mr. Charles "Vic" French, Wildlife Management Technician II, Route 1, Box 222, Burgaw, NC 28425. Mr. French is Holly Shelter Game Lands Manager.

17. Attitude of Owner or Custodian Toward Preservation (contact?): Owner not contacted. It is locally rumored that Angola Bay has been considered for a land swap.

18. Uses of Natural Area: Angola Bay—Game Preserve; Holly Shelter Game Lands—Hunting, scientific research, minor amounts of nature study and observation by vacationers and regional residents.

19. Uses of Surrounding Land: Wildland 20%, Agricultural land 10%, High-intensity forestry 70%, Developed 0%
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality wetland community</td>
<td>1</td>
<td>Pond pine pocosin</td>
<td>The most extensive area of this community type in southeastern NC</td>
</tr>
<tr>
<td>High quality terrestrial community</td>
<td>2</td>
<td>Longleaf pine savanna</td>
<td>Extensive, well-managed, containing many rare spp.</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3a</td>
<td>Venus' fly-trap</td>
<td>Large, vigorous populations</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3b</td>
<td>Dwarf fothergilla</td>
<td>Scattered populations; some very large and vigorous</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3c</td>
<td>Rough-leaf loosestrife</td>
<td>Extremely rare in county and in natural area</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3d</td>
<td>Red-cockaded Woodpecker</td>
<td>Several breeding colonies known from natural area</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3e</td>
<td>American Alligator</td>
<td>Three mature individuals and possibly several immature in area</td>
</tr>
<tr>
<td>Special concern species</td>
<td>4</td>
<td>Black bear</td>
<td>One or two populations; known from both bay areas</td>
</tr>
<tr>
<td>Outstanding geomorphology</td>
<td>5</td>
<td>Isolated embayments</td>
<td>Unique landform feature; this natural area possibly best examples in NC</td>
</tr>
<tr>
<td>Special management area</td>
<td>6</td>
<td>NC Game Lands/Preserve</td>
<td>Area owned by State and already protected</td>
</tr>
</tbody>
</table>
20. Preservation Status: Category 1, 100% Wildlife Preserve and Wildlife Management Area

21. Regulatory Protection in Force: Restricted access, regulated hunting, protection of exploited and endangered species, CAMA coastal wetlands, fragile areas, natural hazard areas.

22. Threats: Potential drop in water table from drainage of adjacent swamplands and pocosins. Peat utilization is a possible threat, but at this time, not probable.

23. Management and Preservation Recommendation: Controlled burning would reduce the wildfire hazard, upgrade wildlife habitat, and promote botanically diverse savanna development. We do not make management recommendations for Angola Bay until further study is conducted; in the interim, we strongly encourage minimal access, and no drainage, timber harvest, or wildlife food plot clearance.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: *Pinus serotina/Cyrilla racemiflora-Zenobia pulverulenta*; peripheral stands of *Pinus palustris/Aristida stricta*; isolated examples of *Taxodium distichum-Nyssa biflora*
Community cover type: Predominantly *Pinus serotina*
General habitat feature: Pond pine pocosin
Average canopy height: 25 ft
Estimated age of canopy trees: 40-60 yrs
Canopy cover: Open
Estimated size of community: Total of 40,000 ac
Successional stage: Edaphic climax
Sere type: Hydrosere
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): *Gaylussacia frondosa, Lyonia lucida, Myrica cerifera, Ilex coriacea, Ilex glabra, Persea borbonia*
Common herb stratum species in community cover or community type (but not dominant): *Woodwardia virginica*

24B. Soil Summary (by community type)
Soil series: Pamlico
Soil classification: Histosols; Typic Medihemists to Fibric Terric Medihemists
Soil association: Dorovan-Ponzer
pH class: acidic to extremely acidic
Moisture class: Very poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS (1972); Soil Taxonomy, Agri. Handbook # 436
Other notes: None
24C. Hydrology Summary (by community type)
Hydrologic system: Palustrine
Hydrologic subsystem: Aqueous
Water chemistry: Fresh
Water regime: Saturated to intermittently exposed
Drainage class: Very poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: A very poorly drained, saturated to intermittently exposed, freshwater palustrine system.

24D. Topography Summary
Landform: Nearly circular marine embayments with drainage seaward blocked by Pleistocene sands
Shelter: Deeply sheltered
Aspect: not applicable
Slope angle: not applicable
Profile: Concave to flat
Surface patterns: Smooth
Position: not applicable

25. Physiographic Characterization of Natural Area: An edaphic climax community of a hydroseres which occupies a relict embayment which now drains into the Northeast Cape Fear River and situated in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Cretaceous Pee Dee formation and Eocene Castle Hayne formation overlain by Pleistocene to Recent sands
Geological Formation age: Cretaceous formation: 60 million years; Eocene formation: 40-50 million years; Pleistocene to Recent: 1-3 million years to approximately 6 thousand years before present

26. Summary - Endangered and Threatened Species
(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
Number of populations on site: 3 seen in Holly Shelter
Number of individuals per population: 15 to 1,000
Size or maturity of individuals: All stages
Phenology of population: Vegetative: 60%; Flowering: 25%; Fruiting 15%
General vigor of population: Vigorous
Disturbance or threats to population: Harvesting by local residents; some enforcement by Holly Shelter Game Lands staff
Habitat characteristics:
Plant community: Longleaf pine savannas
Topography: Level to gently sloping
Soil series: Localized occurrence of Leon sand
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River
Other plant and animal species present: Aristida stricta, Vaccinium crassifolium, Polygala lutea, Polygala cruciata, Chaptalia tomentosa, Chrysopsis graminifolia; Whitetail deer (tracks)
(2) Name of species: *Fothergilla gardenii* (HAMAMELIDACEAE) Dwarf fothergilla  
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)  
Number of populations on site: 1  
Number of individuals per population: 100  
Size or maturity of individuals: Mature  
Phenology of population: Vegetative: 50%; Flowering 0%; Fruiting: 50%  
General vigor of population: Vigorous  
Disturbance or threats to population: None evident  
Habitat characteristics:  
- Plant community: Ecotonal border of a black gum/gallberry drainage and a cutover longleaf pine savanna  
- Topography: 2% slope  
- Soil series: Lynn Haven  
- Microclimate: Not determined  
- Drainage basin: Northeast Cape Fear River  
- Other plant and animal species present: Plants: *Ilex glabra*, *Myrica cerifera*, *Vaccinium atrooccum*, *Vaccinium crassifolium*, *Andropogon* sp.  
- Animals: See attached master species lists.

(3) Name of species: *Lysimachia asperulaefolia* (PRIMULACEAE) Rough-leaf loosestrife  
Species legal status and authority: NC endangered endemic (Cooper et al. 1977)  
Number of populations on site: 1  
Number of individuals per population: 6  
Size or maturity of population: Mature  
Phenology of individuals: Vegetative: 66%; Flowering 33%; Fruiting 0%  
General vigor of population: Fair  
Disturbance or threats to population: Plants were found in a firebreak  
Habitat characteristics:  
- Plant community: Ecotonal border between a longleaf pine savanna and a cypress/titi swamp  
- Topography: 2% slope  
- Soil series: Presumed to be Lynn Haven  
- Microclimate: Not determined  
- Drainage basin: Northeast Cape Fear River  

(4) Name of species: Red-cockaded Woodpecker  
Species legal status and authority: Federally endangered (Cooper et al. 1977)  
Number of populations on site: Reported by Holly Shelter Game Lands personnel to be around 14 within Holly Shelter; not determined for Angola Bay  
Number of individuals per population: 1 to ca. 10  
Size or maturity of individuals: Breeding populations present  
Phenology of population: Not applicable
General vigor of population: Not determined
Disturbance or threats to population: In cases where birds are using pond pines for cavity trees, growth of understory, lightning strikes, and natural demise of trees are causing disturbance, but on the whole sufficient habitat remains for a stable population to thrive.

Habitat characteristics:
- Plant community: Primary community is longleaf pine; secondary community is pond pine
- Topography: Usually level or nearly so
- Soil series: Leon sand to Pamlico muck
- Microclimate: Not determined
- Drainage basin: Northeast Cape Fear River
- Other plant and animal species present: See attached master species lists.

(5) Name of species: American Alligator
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: At least 1
Number of individuals: Three or more
Size or maturity of individuals: Mature
Phenology of population: Not applicable
General vigor of population: Good
Disturbance or threats to population: None
Habitat characteristics: Animals were found in a deep canal within an artificial impoundment for waterfowl. This impoundment, when permanently flooded will significantly increase the habitat acreage and improve the habitat quality.

(6) Name of species: Black bear
Species legal status and authority: NC special concern (Cooper et al. 1977)
Number of populations on site: 1, possibly 2
Number of individuals: Thought to be around 35
Size or maturity of individuals: Breeding population(s)
Phenology of population: Not applicable
General vigor of population: Good
Disturbance or threats to population: None
Habitat characteristics: Animals are wide-ranging and use a variety of habitats.

(See FIGURE 4 for detailed map of endangered and threatened species locations.)
FIGURE 4. Significant features of Holly Shelter Game Lands section of Angola Bay, Holly Shelter Bay Natural Area. Code: (1) High quality wetland community, (2) High quality terrestrial community, (3) Endangered or threatened species, (4) Special concern species, (5) Outstanding geomorphology, (6) Special management area. Features 1, 4, 5, and 6 also apply to Angola Bay section. Map scale: 1 in. = 2 mi.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACERACEAE</td>
<td>Acer rubrum</td>
</tr>
<tr>
<td>AMARYLLIDACEAE</td>
<td>Hypoxis hirsuta</td>
</tr>
<tr>
<td></td>
<td>H. hirsuta var. leptocarpa</td>
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<tr>
<td></td>
<td>H. micrantha</td>
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<tr>
<td>ANACARDIACEAE</td>
<td>Rhus radicans</td>
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<td></td>
<td>R. vernix</td>
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<tr>
<td>APIACEAE</td>
<td>Centella asiatica</td>
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<td></td>
<td>Eryngium integrifolium</td>
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<td></td>
<td>E. yuccifolium</td>
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<td></td>
<td>Hydrocotyle umbellata</td>
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<td></td>
<td>Oxypolis filiformis</td>
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<td></td>
<td>O. ternata</td>
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<tr>
<td>AQUIFOLIACEAE</td>
<td>Ilex coriacea</td>
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<tr>
<td></td>
<td>I. glabra</td>
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<tr>
<td></td>
<td>I. opaca</td>
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<tr>
<td>ASCLEPIADACEAE</td>
<td>Asclepias humistrata</td>
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<tr>
<td></td>
<td>A. lanceolata</td>
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<tr>
<td>ASPIDIACEAE</td>
<td>Thelypteris palustris</td>
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<tr>
<td>ASTERACEAE</td>
<td>Aster tortifolius</td>
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<tr>
<td></td>
<td>A. linariifolius</td>
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<td></td>
<td>Carduus repandus</td>
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<td>C. spinosisissimus</td>
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<td>Carphephorus bellidifolius</td>
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<td>C. tomentosus</td>
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<td></td>
<td>Chaptalia tomentosa</td>
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<td></td>
<td>Chrysopsis gossypina</td>
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<tr>
<td></td>
<td>C. graminifolia</td>
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<td></td>
<td>Chondrophora nudata</td>
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<td></td>
<td>Coreopsis angustifolia</td>
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<td></td>
<td>C. basalis</td>
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<tr>
<td></td>
<td>C. falcata</td>
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<td></td>
<td>C. tinctoria</td>
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<tr>
<td></td>
<td>Elephantopus nudatus</td>
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<tr>
<td></td>
<td>Erigeron vernus</td>
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<tr>
<td></td>
<td>Eupatorium album</td>
</tr>
<tr>
<td></td>
<td>E. capillifolium</td>
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<td></td>
<td>E. leucolepis</td>
</tr>
<tr>
<td></td>
<td>E. perfoliatum</td>
</tr>
</tbody>
</table>
Eupatorium pilosum
E. recurvans
E. rotundifolium
E. serotinum
Euthamia tenuifolia
Haplopappus divaricatus
Helianthus atrorubens
H. heterophyllus
Liatris graminifolia
Marshallia graminifolia
Mikania scandens
Pterocephalon pycnostachyum
Pyrrhopappus carolinianus
Solidago odora
S. stricta
Trilisa paniculata

BLECHNACEAE
Woodwardia areolata
W. virginica

BROMELIACEAE
Tillandsia usneoides

BURMANNIACEAE
Burmannia capitata

CAMPANULACEAE
Lobelia elongata
L. glandulosa
L. nuttallii
L. puberula

CAPRIFOLIACEAE
Lonicera sempervirens
Viburnum nudum

CISTACEAE
Lechea leggettii

CLETHraceAE
Clethra alnifolia

CONVOLVULACEAE
Bonamia patens var. angustifolia

CUPRESSACEAE
Chamaecyparis thyoides

CYPERACEAE
Carex crinita
C. walteriana
Dichromena latifolia
Eleocharis obtusa
Fimbristylis autumnalis
Fuirena squarrosa
Psilocarya nitens
Rhynchospora cephalantha
R. chapmanii
R. pallida
R. torreyana
Scleria pauciflora
S. reticularis
S. triglomerata
CYRILLACEAE
Cyrilla racemiflora
DIONAEACEAE
Dionaea muscipula
DROSERACEAE
Drosera brevifolia
D. capillaris
D. intermedia
ERICACEAE
Cassandra calyculata
Gaylussacia dumosa
G. frondosa
Kalmia angustifolia var. caroliniana
Leucothoe axillaris
L. racemosa
Lycia ligustrina
L. lucida
L. mariana
Rhododendron atlanticum
R. viscosum
Vaccinium atrococcum
V. corymbosum
V. crassifolium
V. elliottii
V. stamineum
V. tenellum
Zenobia pulverulenta
ERIOCAULACEAE
Eriocaulon compressum
E. decangulare
Lachnocaulon anceps
EUPHORBIACEAE
Cnidoscolus stimulosus
Euphorbia curtisii
FABACEAE
Amorpha herbacea
Baptisia cinerea
B. tinctoria
Galactia regularis
Indigofera caroliniana
Lespedeza capitata
L. hirta
L. repens
L. steuweii
L. virginica
Rhynchosia difformis
Tephrosia spicata
Zornia bracteata
FAGACEAE
  Castanea pumila
  Quercus incana
  Q. laevis
  Q. margaretta
  Q. marilandica
  Q. pumila
  Q. virginiana

GENTIANACEAE
  Sabatia campanulata
  S. stellaris

HAEMODORACEAE
  Lachnanthes caroliniana

HAMAMELIDACEAE
  Fothergilla gardenii
  Liquidambar styraciflua

HYPERICACEAE
  Hypericum gentianoides
  H. hypericoides
  H. reductum
  H. stans
  H. walteri

IRIDACEAE
  Sisyrinchium mucronatum var. atlanticum

JUNCACEAE
  Juncus coriaceus
  J. repens

LAMIACEAE
  Hyptis alata
  Pycnanthemum flexuosum
  Scutellaria integrifolia

Lauraceae
  Persea borbonia

LENIBULARIACEAE
  Pinguicula caerulea
  P. lutea
  Utricularia subulata

LILIACEAE
  Aletris farinosa
  Mel lanthium virginicum
  Pleee tenuifolia
  Smilax laurifolia
  Tofieldia racemosa
  Zigadenus densus
  Z. glaberrimus

LOGANACEAE
  Gel seminium sempervirens
  Mitreola petiolata
  Poly prenum procumbens

LORANTHACEAE
  Phoradendron serotinum
LYCOPODIACEAE
Lycopodium alopecuroides
L. appressum
L. carolinianum
MAGNOLIACEAE
Liriodendron tulipifera
Magnolia virginiana
MELASTOMATACEAE
Rhexia alifanus
R. lutea
R. mariana
R. petiolata
MYRICACEAE
Myrica cerifera
M. cerifera var. pumila
M. heterophylla
NYSSACEAE
Nyssa biflora
ONAGRACEAE
Ludwigia palustris
Oenothera laciniata
ORCHIDACEAE
Calopogon pallidus
C. pulchellus
Cleistes divaricata
Habenaria blephariglottis
H. ciliaris
H. cristata
H. nivea
Pogonia ophioglossoides
Spiranthes cernua
S. praecox
S. vernalis
OSMUNDACEAE
Osmunda cinnamomea
O. regalis var. spectabilis
PINACEAE
Pinus palustris
P. serotina
P. taeda
POACEAE
Andropogon gerardi
A. scoparius
A. ternarius
A. virginicus
Anthaenantia rufa
Aristida purpurascens
A. stricta
Arundinaria gigantea
Leptoloma cognatum
Muhlenbergia capillaris
Panicum angustifolium
P. commutatum
P. dichotomum
P. laxiflorum
P. scoparium
P. tenue
Paspalum dilatatum
P. praecox
Triplasis purpurea

POLYGALACEAE
Polygala cruciata
P. cymosa
P. hookeri
P. lutea
P. mariana
P. ramosa

POLYPodiaceae
Polypodium polypodioides

PRIMULACEAE
Lysimachia asperulaefolia
L. loomsii

PTERIDACEAE
Pteridium aquilinum

ROSACEAE
Amelanchier canadensis
A. obovalis
Rosa palustris
Rubus trivialis
Sorbus arbutifolia

SARRACENIACEAE
Sarracenia flava
S. purpurea

SAXIFRAGACEAE
Itea virginica

SCROPHYLARIACEAE
Agalinis purpurea
A. setacea
Penstemon australis
Seymeria cassioides

SOLANACEAE
Physalis angulata

TAXODIACEAE
Taxodium distichum

THEACEAE
Gordonia lasianthus

VIOLACEAE
Viola lanceolata

VITACEAE
Vitis rotundifolia
XYRIDACEAE
Xyris ambigua
X. baldwiniana
X. caroliniana
X. difformis
X. platylepis

AMPHIBIANS
Broken-striped Newt
Slimy Salamander
Southern Toad
Oak Toad
Southern Cricket Frog
Squirrel Treefrog
Little Grass Frog
Southern Leopard Frog

REPTILES
American Alligator
Eastern Mud Turtle
Eastern Box Turtle
Spotted Turtle
Yellow-bellied Turtle
Snapping Turtle
Eastern Glass Lizard
Green Anole
Ground Skink
Black Racer
Corn Snake

BIRDS
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

Green Heron SV
Great Blue Heron PV
Wood Duck PR*
Turkey Vulture PR
Black Vulture PR
Red-tailed Hawk PR*
Red-shouldered Hawk PR*
American Kestrel
Bobwhite
Spotted Sandpiper
Solitary Sandpiper
Mourning Dove
Yellow-billed Cuckoo
Chimney Swift
Ruby-throated Hummingbird
Common Flicker
Pileated Woodpecker
Red-cockaded Woodpecker
Red-bellied Woodpecker
Red-headed Woodpecker
Downy Woodpecker
Eastern Kingbird
Great Crested Flycatcher
Eastern Phoebe
Acadian Flycatcher
Eastern Wood Pewee
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Fish Crow
Carolina Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown-headed Nuthatch
Carolina Wren
Mockingbird
Catbird
Brown Thrasher
American Robin
Wood Thrush
Eastern Bluebird
Blue-gray Gnatcatcher
Cedar Waxwing
Starling
White-eyed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Black-and-white Warbler
Prothonotary Warbler
Swainson's Warbler
Worm-eating Warbler
Northern Parula Warbler
Yellow Warbler
Black-throated Blue Warbler
Yellow-rumped Warbler
Yellow-throated Warbler
Pine Warbler
Prairie Warbler
Ovenbird
Northern Waterthrust
Common Yellowthroat
Yellow-breasted Chat
Hooded Warbler
Eastern Meadowlark
Red-winged Blackbird
Orchard Oriole
Common Grackle
Brown-headed Cowbird
Scarlet Tanager
Summer Tanager
Cardinal
Blue Grosbeak
Indigo Bunting
Pine Siskin
American Goldfinch
Rufous-sided Towhee
Chipping Sparrow
Field Sparrow
White-throated Sparrow
Swamp Sparrow

MAMMALS

Eastern Mole
Black Bear
Raccoon
Mink
Fox
Bobcat
Eastern Cottontail
Marsh Rabbit
Whitetail Deer
Basic Information Summary Sheet

1. Natural Area Name: Northeast Cape Fear River
2. County: Pender (with parts of Island Creek in New Hanover)
3. Location: From the New Hanover County line, east of US 421 near 34°20'N, 78°00'W upstream and including portions of Holly Shelter Creek to a point about 2 miles downstream from the NC 53 bridge near 34°35'N, 77°50'W. This natural area is about 40 river miles long (FIGURES 5, 6).
5. Size: 13,800 ac (est.)
6. Elevation: 3 ft to 6 ft above mean sea level, occasionally including higher bluffs adjacent to the river.
7. Access: Boat access points are Cowpens Landing at the end of SR 1428 (private, open to the public for fee), Clarks Landing on Long Creek at the end of SR 1408, Wildlife Resources Commission landing at US 117 bridge, Lanes Ferry landing at NC 210 bridge, Wildlife Resources Commission landing near Holly Shelter Game Lands headquarters, and Wildlife Resources Commission landing at White Stocking at the end of SR 1512.
8. Names of Investigators: S. W. Leonard
   Ricky Davis
   P. O. Box 3475
   126 Duncansby Court
   Wilmington, NC 28406
   Cary, NC 27511
9. Date(s) of Investigation: May through September, 1981
10. Priority Rating: High
11A. Prose Description of Site: Black-water rivers in North Carolina are rare, and among the most pristine is the Northeast Cape Fear. The riverside development of industry which is present along the lower reach of the river in New Hanover County is absent from Pender County. The uppermost industry along the river is located near Castle Hayne and consists of Ideal Cement and Diamond Shamrock—industries which utilize the Castle Hayne limestone, which rarely crops out along the river's bank. Residential development tends to be clustered at but two places—Castle Hayne and Stag Park.
   The river itself winds through a mixed forest of predominantly bald cypress and black gum, occasionally with high bluffs where loblolly pine may be seen. The woods are draped with Spanish moss, and birds
FIGURE 5. Northeast Cape Fear River Natural Area (north section).
Map scale: 1 in. = 2 mi.
FIGURE 6. Northeast Cape Fear River Natural Area (south section). Map scale: 1 in. = 2 mi.
are abundant. Turtles slide off half-submerged logs as one passes, and sometimes a water snake or alligator splashes. Shallows along the shoreline or around the infrequent islands in the river have dense beds of the narrow-leaf form of cowdock. Because the lower reach of the river has no weirs or other impounding structures, anadromous fish move into and out of the river. Fishing pressure is light and is mostly confined to the spring runs of shad. Recreational boating is popular near the public access points, with perhaps heaviest concentration being near Castle Hayne.

The adjacent swamps of the Northeast Cape Fear add to the mystique. Large cypress trees, with diameters in excess of 6 feet are not at all uncommon. The tidally inundated swamp floor is mucky and treacherous to the timid, but unusual and interesting flora and fauna are found there. We saw the mustard, Cardamine elongata, at numerous places south of NC 210, and a small population of the river quillwort, Isoetes riparia, along Island Creek. Old cypress trees with horizontal branches bedecked with resurrection fern turned out to harbor mats of the epiphytic orchid, Epidendrum conopseum. From Burgaw Creek upstream to Holly Shelter Creek, we saw in July, numerous clumps of a yellow-flowered loosestrife, tentatively identified as Lysimachia lanceolata var. hybrida. The scarlet-velvet fruits of the sarvis-leaf holly, Ilex amelanchier, impressed us as we boated up Holly Shelter Creek.

The river has long stretches of placid water south of NC 210; upstream the turns are more frequent, and sometimes an arcing canopy of river birch obscures the sky. Short, dead-end coves attest to a meandering channel, and with the assistance of topographic quadrangles, oxbow ponds can be located.

The history of the river is as alluring as the biota. Barbadoan explorers reached the Stag Park vicinity in the mid-1600s. A century later rich planters— the Ashes, the Moores, and others owned plantations along the banks. Colonial artifacts lie buried in the river silt. A marker at Castle Hayne describes an early drawbridge built across the river.

Rich in lore, rich in flora, rich in fauna, the Northeast Cape Fear demands that we slow our pace and leisurely indulge in the pleasures of an incomparable natural area. Drift with the tide by Point Pleasant or silently paddle a canoe down Harrisons Creek, you will experience a never-to-be-forgotten sensation of the richness of the out-of-doors. Northeast Cape Fear— natural area unexcelled.

11B. Prose Description of Site Significance: The Northeast Cape Fear Natural Area offers multiple recreational opportunities and a superlative study area for black-water river systems. The major feature of the river and its associated swamps is that they are intact; thus they provide a lengthy corridor for wildlife, contain seven species of special interest plants, several animals (many reports of alligators, not verified by our study) of concern, and connect the major wilderness
areas in Pender County. Although activities in navigable waters and wetlands is now regulated by the Corps of Engineers, "high ground" development could have a devastating affect on the quality of the water and the remoteness aspect of the system. We rank the Northeast Cape Fear near the top of Pender County natural areas, based on the condition of its swamplands, the fact that this river is the highest volume black-water stream in southeastern North Carolina, the potential threat to it as industrial and residential development edge upstream from Wilmington, and the presence of several threatened species.

12. Significance Summary (See TABLE 2)

Legal Status, Use, and Management

13. Ownership type by percent area: Private: 99%, Public: 1%, Unknown 0%

14. Number of owners: Approximately 30

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information):
Major landowners are Bruce B. Cameron, 2219 Blythe Rd., Wilmington, NC (763-1054), Corbett Industries, Inc., Wrightsboro (Wilmington, NC) (763-4646), Southern Furniture of Conover, Inc., International Paper Company, Harry W. Williams, Williams Lumber Co., Burgaw, NC, H. H. Bate, Mrs. Nell H. Trask; public land is small section of Holly Shelter Game Lands which borders the east shore of the river.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information): None

17. Attitude of owner or custodian toward preservation (contacted?): Not contacted

18. Uses of natural area: Recreational boating, fishing, hunting

19. Uses of surrounding land: Wildland: 25%; Agricultural land, 40%; High-intensity forestry, 25%; Developed, 5%

20. Preservation Status: Category 7, 100%

21. Regulatory protections in force: Wetlands, natural hazard areas

22. Threats: Piecemeal development along the river bluffs; no threats to the overwhelming percentage of swamplands.

23. Management and Preservation Recommendation: Tributary stream swamps may be easier to manage than the main stem of the river. Island Creek and Harrisons Creek are considered exceptional areas for preservation, either by acquisition or landowner registry. Regulations in effect for activities in wetlands is probably sufficient for adequate site protection.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality wetland community</td>
<td>1</td>
<td>Blackwater river swamp</td>
<td>Broad floodplain with mostly old-growth cypress</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2a</td>
<td>Sarvis-leaf holly</td>
<td>Very large population in lower Holly Shelter Creek drainage</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2b</td>
<td>Long's bittercress</td>
<td>Proposed inclusion, based on occurrence at two NC localities</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2c</td>
<td>River quillwort</td>
<td>Major range extension southward</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2d</td>
<td>European cow-lily</td>
<td>Common throughout all major drainages of natural area</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2e</td>
<td>Creeping marsh-purslane</td>
<td>A single large population in Harrisons Creek</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2f</td>
<td>Green-fly orchid</td>
<td>Probably largest number of colonies in NC</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2g</td>
<td>May hawthorn</td>
<td>Two known populations of very rare species</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2h</td>
<td>Anhinga</td>
<td>Single bird sighted</td>
</tr>
</tbody>
</table>
Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: Taxodium distichum-Acer rubrum-Nyssa biflora
Community cover type: Taxodium distichum
General habitat feature: Riverine swamp
Average canopy height: 60 ft
Estimated age of canopy trees: 50-200 years
Canopy cover: Closed
Estimated size of community: 80% of total acreage or 11,000 ac
Successional stage: Climax
Sere type: Pelosere
Common canopy species in community cover or community type (but not dominant): Liquidambar styraciflua, Pinus taeda
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus stricta, Ilex verticillata
Common herb stratum species in community cover or community type (but not dominant): Senecio glabellus, Gratiola virginiana, Pluchea camphorata, Lobelia cardinalis, Decumaria barbara

24B. Soil Summary (by community type)
Soil series: Dorovan series in tidal region of river; Johnston and Lumbee soils in upper stretches of river floodplain.
Soil classification: Not determined
Soil association: Johnston-Lumbee
pH class: Strongly acid to medium acid
Moisture class: Poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).
Other notes: None

24C. Hydrology Summary (by community type)
Hydrologic system: Riverine
Hydrologic subsystem: Tidal and Lower Perennial
Water chemistry: Fresh to mixosaline
Water regime: Tidal, regularly flooded, irregularly flooded, and nontidal, intermittently exposed, seasonally flooded.
Drainage class: Poorly drained to very poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Poorly to very poorly drained bottomland sloughs, terraces, and bars, covered with moisture-retaining silts and silty sands with water table frequently at the surface.

24D. Topography Summary
Landform: Riverine floodplain
Shelter: Deeply sheltered
Aspect: North - South in lower reach; East - West in upper reach
Slope: Level to gently sloping
Profile: Level to concave
Surface pattern: Irregularly undulating
Position: Not applicable
25. Physiographic characterization of natural area: A tidally flooded to seasonally flooded climax community of a hydric pelosere in the alluvial plain of the Northeast Cape Fear River, underlain by mostly Eocene Castle Hayne limestone in the Coastal Plain province of the Atlantic Plain. The Northeast Cape Fear drains into the estuary of the Cape Fear River.

Geological Formation: Eocene Castle Hayne limestone cover by fluvial deposits of sand, silt, and organic detritus.

Geological Formation age: Eocene formation: 40-50 million years.

26. Summary - Endangered and threatened species

(1) Name of species: Ilex amelanchier (AQUIFOLIACEAE) Sarvis-leaf holly
Species legal status and authority: NC threatened throughout (Cooper et al. 1977).
Number of populations on site: 1
Number of individuals per population: Possibly 500
Size or maturity of individuals: Immature and mature
Phenology of population: Vegetative: 50%; Flowering: 0%; Fruiting: 50%
General vigor of population: Very vigorous
Disturbance or threats to population: None
Habitat characteristics:
- Plant community: Swampy red maple-cypress-black gum woodlands
- Topography: Level
- Soil series: Johnston or Lumbee
- Microclimate: Not determined
- Drainage basin: Holly Shelter Creek and Northeast Cape Fear River
- Other plants and animal species present: Plants: Fraxinus caroliniana, Ilex verticillata, Cornus stricta; Animals: see attached master species lists.

(2) Name of species: Cardamine longii (BRASSICACEAE) Long's bittercress
Species legal status and authority: Proposed NC threatened throughout, based on present records of only two county occurrences in NC-- Pender and Jones.
Number of populations on site: 3
Number of individuals per population: Ca. 50-100
Size or maturity of individuals: Mostly mature
Phenology of population: Vegetative: 20%; Flowering: 0%; Fruiting: 80%
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:
- Plant community: Open, mucky exposures in deep cypress swamps
- Topography: Level
- Soil series: Johnston
- Microclimate: Not determined
- Drainage basin: Northeast Cape Fear River, Long Creek and Island Creek sub-basins
- Other plants and animal species present: Plants: Senecio glabellus, Bacopa caroliniana. Animals: See attached master species lists.
(3) Name of species: *Isoetes riparia* (ISOETACEAE) River quillwort  
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)  
Number of populations on site: 1  
Number of individuals per population: Ca. 50  
Size or maturity of individuals: All mature  
Phenology of population: Vegetative: 0%; Flowering: Not applicable; Fruiting: 100%  
General vigor of population: Fair  
Disturbance or threats to population: None  
Habitat characteristics:  
Plant community: Taxodium distichum (cypress) swamp  
Topography: Level  
Soil series: Johnston  
Microclimate: Not determined  
Drainage basin: Island Creek sub-basin of Northeast Cape Fear River  
Other plants and animal species present: Plants: None is this stratum. Animals: See attached master species lists.

(4) Name of species: *Nuphar luteum* ssp. *sagittifolium* (NYMPHAEACEAE)  
Spatter-dock or cowdock  
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)  
Number of populations on site: Too numerous to count, probably more than 100  
Size or maturity of individuals: All stages of growth and reproduction  
Phenology of population: Vegetative: 60%; Flowering: 20%; Fruiting 20%  
General vigor of population: Very vigorous  
Disturbance or threats to population: None  
Habitat characteristics:  
Plant community: Spatter-dock (floating leaf, rooted)  
Topography: Not applicable  
Soil series: Not determined  
Microclimate: Not determined  
Drainage basin: Northeast Cape Fear River and all tributaries  
Other plants and animal species present: Plants: None. Animals: Not determined.

(5) Name of species: *Ludwigia repens* (ONAGRACEAE) Creeping marsh-purslane  
Number of populations on site: 1  
Number of individuals per population: Ca. 200  
Size or maturity of individuals: Mature  
Phenology of population: Vegetative: 100%; Flowering: 0%; Fruiting:0%  
General vigor of population: Vigorous  
Disturbances or threats to population: None  
Habitat characteristics:  
Plant community: Slough in cypress swamp  
Topography: Concave  
Soil series: Lumbee  
Microclimate: Not determined  
Drainage basin: Harrisons Creek sub-basin of Northeast Cape Fear River.  
Other plants and animal species present: Plants: None in this stratum. Animals: Not determined.
Name of species: *Epidendrum conopseum* (ORCHIDACEAE) Green-fly Orchid

Species legal status and authority: NC endangered peripheral (Cooper et al. 1977)

Number of populations on site: 9

Number of individuals per population: 20 to ca. 200

Size or maturity of populations: Mature

Phenology of population: Due to different times of field survey, some of the populations had not begun to flower. In late July when the species was flowering, a typical colony was about 80% vegetative and 20% flowering.

General vigor of population: Vigorous

Disturbance or threats to population: None

Habitat characteristics:
- Plant community: Cypress swamp
- Topography: Not applicable
- Soil series: Not applicable
- Microclimate: Not determined
- Drainage basin: Northeast Cape Fear River and larger tributary streams
- Other plants and animal species present: Plants: *Polypodium polypodioides, Tillandia usneoides*. Animals: See bird list in attached master species lists.

Name of species: *Crataegus aestivalis* (ROSACEAE) May hawthorn

Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 1 observed

Size or maturity of population: Mature

Phenology of population: The single plant, when found was in fruit

General vigor of population: Good

Disturbance or threats to population: None

Habitat characteristics:
- Plant community: Cypress-mixed hardwood
- Topography: Level
- Soil series: Lumbee
- Microclimate: Not determined
- Drainage basin: Northeast Cape Fear River
- Other plants and animal species present: Plants: *Quercus lyrata, Quercus laurifolia, Viburnum nudum*. Animals: See attached master species lists.

Name of species: *Anhinga anhinga* Water turkey or anhinga

Species legal status and authority: NC threatened (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 1

Size or maturity of population: Mature

Phenology of population: Not applicable

General vigor of population: Not determined

Disturbance or threats to population: Not determined

Habitat characteristics:
- Plant community: Cypress swamp
Topography: Level
Soil series: Johnston
Microclimate: Not applicable
Drainage basin: Island Creek sub-basin of Northeast Cape Fear River
Other plants and animal species present: Plants: *Fraxinus caroliniana*,
*Tillandsia usneoides*, *Acer rubrum*, *Cornus stricta*. Animals: See attached master species lists.

(See FIGURES 7, 8 for detailed maps of endangered and threatened species locations.)
FIGURE 7. Significant features of Northeast Cape Fear River Natural Area (north section). Code: (1) High quality wetland community, (2) Endangered or threatened species. Map scale: 1 in. = 2 mi.
FIGURE 8. Significant features of Northeast Cape Fear River Natural Area (south section). Code: (1) High quality wetland community, (2) Endangered or threatened species. Map scale: 1 in. = 2 mi.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE
  Justicia ovata
  Ruellia caroliniensis

ACERACEAE
  Acer rubrum

ALISMATACEAE
  Sagittaria graminea

AMARANTHACEAE
  Alternanthera philoxeroides
  Amaranthus cannabinus

AMARYLLIDACEAE
  Hymenocallis crassifolia
  Hypoxis hirsuta var. leptocarpa

ANACARDIACEAE
  Rhus radicans
  R. vernix

ANNONACEAE
  Asimina triloba

APIACEAE
  Centella asiatica
  Cicuta maculata
  Eryngium aquaticum
  Hydrocotyle umbellata
  Ptilimnium capillaceum
  Sium suave

AQUIFOLIACEAE
  Ilex amelanchier
  I. coriacea
  I. glabra
  I. opaca
  I. verticillata

ARACEAE
  Arisaema triphyllum
  Orontium aquaticum
  Peltandra virginica

ARALIACEAE
  Aralia spinosa

ARECACEAE
  Sabal minor

ARISTOLOCHIACEAE
  Aristolochia serpentaria
  Hexastylis arifolia

ASPIDIACEAE
  Athyrium asplenioides
  Onoclea sensibilis
  Thelypteris palustris
ASPLENIACEAE
Asplenium platyneuron

ASTERACEAE
Baccharis halimifolia
Bidens bipinnata
B. laevis
Coreopsis helianthoides
Helenium autumnale
Mikania scandens
Pluchea camphorata
Senecio glabellus
Vernonia noveboracensis

BETULACEAE
Alnus serrulata
Betula nigra
Carpinus caroliniana

BIGNONIACEAE
Anisostichus capreolatus
Campsis radicans
Catalpa speciosa

BLECHNACEAE
Woodwardia areolata
W. virginica

BRASSICACEAE
Cardamine hirsuta
C. longii
C. pensylvanica
Rorippa islandica

BROMELIACEAE
Tillandsis usneoides

CALLITRICHACEAE
Callitriche heterophylla

CAMPANULACEAE
Lobelia cardinalis

CAPRIFOLIACEAE
Lonicera japonica
L. sempervirens
Sambucus canadensis
Viburnum nudum

CLETHRACEAE
Clethra alnifolia

CONVOLVULACEAE
Cuscuta compacta

CORNACEAE
Cornus amomum
C. stricta

CUCURBITACEAE
Melothria pendula

CYPERACEAE
Carex crinita
C. elliottii
Carex folliculata var. australis
C. incompta
C. lurida
C. rosea
Eleocharis obtusa
Scirpus cyperinus
CYRILLACEAE
Cyrrilla racemiflora
DIOSCOREACEAE
Dioscorea villosa
EBENACEAE
Diospyros virginiana
ERICACEAE
Leucothoe axillaris
L. racemosa
Lyonia lucida
Rhododendron nudiflorum
Vaccinium stamineum
ERIOCAULACEAE
Eriocaulon compressum
EUPHORBIACEAE
Sapium sebiferum
FABACEAE
Albizia julibrissin
Amorpha fruticosa
Amphicarpa bracteata
Apios americana
Wisteria frutescens
FAGACEAE
Quercus falcata var. pagodaefolia
Q. laurifolia
Q. lyrata
Q. michauxii
Q. nigra
Q. shumardii
GENTIANACEAE
Nymphoides aquatica
HALORAGACEAE
Proserpinaca palustris
P. pectinata
HAMAMELIDACEAE
Liquidambar styraciflua
HIPPOCASTANACEAE
Aesculus pavia
HYDROCHARITACEAE
Egeria densa
HYPERICACEAE
Hypericum densiflorum
IRIDACEAE
Iris tridentata
ISOETACEAE
   Isoetes riparia
JUGLANDACEAE
   Carya aquatica
   C. glabra
   C. tomentosa
JUNCACEAE
   Juncus effusus
   J. repens
LAMIACEAE
   Collinsonia canadensis
   Glechoma hederacea
   Lycopus virginicus
   Teuchrium canadensis
LAURACEAE
   Lindera benzoin
   Persea borbonia
   Sassafras albidum
LEMNACEAE
   Lemna sp.
   Spirodela polyrhiza
   Wolffia flordiana
LILIACEAE
   Medeola virginiana
   Smilax glauca
   S. rotundifolia
LOGANIACEAE
   Gelsemium sempervirens
LORANTHACEAE
   Phoradendron serotinum
LYTHRACEAE
   Decodon verticillatus
   Lythrum lineare
   Rotala ramosior
MAGNOLIACEAE
   Liriodendron tulipifera
   Magnolia virginiana
MALVACEAE
   Hibiscus moscheutos
MENISPERMACEAE
   Cocculus carolinus
MORACEAE
   Maclura pomifera
   Morus rubra
MYRICACEAE
   Myrica cerifera
NYMPHAEACEAE
   Nuphar luteum ssp. sagittifolium
   Nymphoides aquatic
NYSSACEAE
   Nyssa aquatica
   N. biflora
OLEACEAE
   Chionanthus virginicus
   Fraxinus caroliniana
   F. pensylvanica
   F. pensylvanica var. subintegerrima
   Ligustrum sinense
ONAGRACEAE
   Ludwigia alternifolia
   L. palustris
   L. repens
   L. uruguayensis
   Oenothera fruticosa
OPHIOGLOSSACEAE
   Botrychium biternatum
ORCHIDACEAE
   Epidendrum conopseum
   Spiranthes cernua var. odorata
OSMUNDACEAE
   Osmunda cinnamomea
   O. regalis var. spectabilis
PASSIFLORACEAE
   Passiflora lutea
PINACEAE
   Pinus taeda
PLATANACEAE
   Platanus occidentalis
POACEAE
   Arundinaria gigantea
   Axonopus affinis
   Echinochloa crus-galli
   Elymus virginicus
   Leersia oryzoides
   Melica mutica
   Panicum virgatum
   Uniola laxa
   Zizaniopsis miliacea
POLYGONACEAE
   Polygonum arifolium
   P. hydropiperoides
   P. pensylvanicum
   P. persicaria
   P. punctatum
   P. sagittatum
   Rumex verticillatus
   Tovara virginiana
POLYPODIACEAE
   Polypodium polypodioides
PONTEDERIACEAE
   Pontederia cordata
PRIMULACEAE
   Lysimachia lanceolata var. hybrida
   Samolus parviflorus
RANUNCULACEAE
   Clematis crispa
   Ranunculus carolinianus
   Thalictrum thalictroides
RHAMNACEAE
   Berchemia scandens
ROSACEAE
   Crataegus aestivalis
   C. flava
   Rosa palustris
   Rubus betulifolius
   Sorbus arbutifolius
RUBIACEAE
   Cephalanthus occidentalis
   Oldenlandia uniflora
   Richardia brasiliensis
SALICACEAE
   Populus heterophylla
   Salix caroliniana
   S. nigra
SAURURACEAE
   Saururus cernuus
SAXIFRAGACEAE
   Decumaria barbara
   Itea virginica
SCROPHULARIACEAE
   Bacopa caroliniana
   Gratiola virginiana
   Mimulus ringens
SELAGINELLACEAE
   Selaginella apoda
SYMPLOCACEAE
   Symplocos tinctoria
TAXODIACEAE
   Taxodium ascendens
   T. distichum
THEACEAE
   Gordonia lasianthus
   Stewartia malacodendron
TILIACEAE
   Tilia caroliniana
TYPHACEAE
   Typha angustifolia
   T. domingensis
   T. latifolia
ULMACEAE
   Celtis laevigata
   Ulmus americana
URTICACEAE
   Boehmeria cylindrica
   Pilea pumila
VERBENACEAE
  Callicarpa americana
  Lippia nodiflora

VIOLACEAE
  Viola papilionacea

VITACEAE
  Ampelopsis arborea
  Parthenocissus quinquefolia
  Vitis aestivalis
  V. labrusca
  V. rotundifolia

AMPHIBIANS

Slimy Salamander
Southern Toad
Pickerel Frog
Leopard Frog

REPTILES

Snapping Turtle
Yellow-bellied Turtle
Green Anole
Six-lined Racerunner
Five-lined Skink
Banded Water Snake
Brown Water Snake
Rough Green Snake
Mud Snake
Black Racer
Yellow Rat Snake
Southern Copperhead
Eastern Cottonmouth

BIRDS

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

Anhinga                SV
Great Blue Heron       PR* (?)
Green Heron            SR*
Little Blue Heron      SV
<table>
<thead>
<tr>
<th>Bird</th>
<th>Status</th>
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<tbody>
<tr>
<td>Yellow-crowned Night Heron</td>
<td>SR* (?,?)</td>
</tr>
<tr>
<td>White Ibis</td>
<td>SV</td>
</tr>
<tr>
<td>Wood Duck</td>
<td>PR*</td>
</tr>
<tr>
<td>Turkey Vulture</td>
<td>PV</td>
</tr>
<tr>
<td>Red-shouldered Hawk</td>
<td>PR*</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>PR*</td>
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<tr>
<td>Spotted Sandpiper</td>
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<tr>
<td>Solitary Sandpiper</td>
<td>T</td>
</tr>
<tr>
<td>Mourning Dove</td>
<td>PR*</td>
</tr>
<tr>
<td>Yellow-billed Cuckoo</td>
<td>SR*</td>
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<tr>
<td>Screech Owl</td>
<td>PV</td>
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<tr>
<td>Barred Owl</td>
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<tr>
<td>Common Night hawk</td>
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<tr>
<td>Chimney Swift</td>
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<tr>
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<tr>
<td>Belted Kingfisher</td>
<td>PR*</td>
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<tr>
<td>Common Flicker</td>
<td>PR*</td>
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<tr>
<td>Pileated Woodpecker</td>
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<td>Fish Crow</td>
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<td>Carolina Chickadee</td>
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<td>Yellow-throated Warbler</td>
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</tr>
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<td>Prairie Warbler</td>
<td>SV</td>
</tr>
<tr>
<td>Kentucky Warbler</td>
<td>SR* (?)</td>
</tr>
<tr>
<td>Common Yellowthroat</td>
<td>PR*</td>
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<tr>
<td>Yellow-breasted Chat</td>
<td>SV</td>
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<td>Red-winged Blackbird</td>
<td>PR*</td>
</tr>
<tr>
<td>Orchard Oriole</td>
<td>SR*</td>
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<tr>
<td>Common Grackle</td>
<td>PR*</td>
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<tr>
<td>Summer Tanager</td>
<td>SR*</td>
</tr>
<tr>
<td>Cardinal</td>
<td>PR*</td>
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<tr>
<td>Rufous-sided Towhee</td>
<td>PR*</td>
</tr>
<tr>
<td>White-throated Sparrow</td>
<td>WR</td>
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<tr>
<td>Swamp Sparrow</td>
<td>WR</td>
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### Mammals

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<tr>
<td>Opossum</td>
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<td>Eastern Gray Squirrel</td>
</tr>
<tr>
<td>Marsh Rabbit</td>
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<td>Whitetail Deer</td>
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</tbody>
</table>

47
NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Black River

2. County: Pender (and adjacent Bladen)

3. Location: The natural area stretches from the mouth of the Black River where it empties into the Cape Fear upstream for approximately 25 river miles to a point about 2 miles downstream from Beatty Bridge (SR 1201). Coordinates: 34°20'N, 78°03'W to 34°30'N, 78°15'W (FIGURE 9).


5. Size: 9,500 ac

6. Elevation: 3 ft to 8 ft above mean sea level

7. Access: Private and public boating access points along the Cape Fear River; a single Wildlife Resources landing from an unnumbered dirt road off SR 1547 in Bladen County, about a mile downstream from the NC 53 bridge. The river corridor can be reached via NC 210.

8. Names of Investigators: S. W. Leonard Ricky Davis
   P. O. Box 3475 126 Duncansby Court
   Wilmington, NC 28406 Cary, NC 27511

9. Date(s) of Investigation: May through September, 1981

10. Priority Rating: High

11A. Prose Description of Site: The Black River is, in many respects, similar to the Northeast Cape Fear, but it is also different. The channel takes a more winding course, and in the upper stretches, is filled with shallow sandbars, which scarcely allow navigation by small outboard engines. Scattered residential development is present along portions of the river.

   Along the lower reach of the river, luxuriant marshes are frequent, although never reaching appreciable areal extent. Swamps are low and poorly drained, seldom having any banks of a foot or two in height as occurs along the Northeast Cape Fear. Instead, the river gradually decreases in depth to a rooted aquatic vegetation zone that grades into marshlands, or typically into cypress-gum-maple woodlands. Bluffs are unusual and landmarks difficult to discern. Upstream from NC 210, the channel divides and re-divides, thus forming numerous small islands. Short, dead-end sloughs diverge, and unless one is familiar with the river, or has appropriate maps, the first-time trip upstream can result in many wrong turns.
Even before reaching NC 53 on an upstream trip, one encounters segments of sluggish water followed by narrow, sharp bends where river birches bridge the canopy, snags project from the banks, and the water swirls and eddies more like the channels of Piedmont streams.

Vegetation is predominantly a cypress-hardwood forest in the floodplain swamps, until one approaches NC 53. Suddenly a grove of large cypress trees appears on the north bank. The trees are flat-topped, and the horizontal branches contain a profusion of resurrection ferns and Spanish moss. Infrequently, clumps of green-fly orchid can be detected with binoculars. Beyond NC 53, the cypress forest (which we have named the "Larkins Cove Cypress Forest" after one of the owners) becomes more spectacular. The stand extends to the south bank (Bladen County) and partly into the lower reach of Colly Swamp. Ancient individuals have diameters above the swollen buttresses of 6 or more feet; the buttresses themselves may be 15–20 feet in thickness. This forest is unique for Pender (and Bladen?) County and is in need of additional study. During the latter part of the survey, an examination of one small area revealed May hawthorn and sarvis holly, and other rare species are likely to occur there.

Fauna in the area is likewise diverse, particularly birds, and probably amphibians and reptiles. Extremely heavy rains during August prevented intensive investigation.

11B. Prose Description of Site Significance: Several noteworthy plants were found in the Black River corridor during the survey, but the most important feature of the natural area is the Larkins Cove cypress forest. Not only are the trees extraordinarily large, but the shrub stratum and herb layer contains rare species. The area is not delineated on our map, partly because the extent of the forest in Bladen County was not investigated. In all of Pender County, we did not see any counterpart forest, either in overall size of trees, species composition, or size of stand. Future reassessment of this basin may warrant a map revision in order to include more of the Larkins Cove stand and less of the floodplain downstream.

12. Significance Summary (see TABLE 3)

Legal Status, Use, and Management

13. Ownership type by percent area: Private: 100%

14. Number of owners: Approximately 20

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information):
Major landowners are C. Haymore Larkins, Jr., John D. Larkins, Jr., Canal Industries, International Paper Co., Georgia-Pacific, Corbett Industries, David A. Barefoot, Catharine Lewis heirs, Benjamin Cone, A. Wallace Moore, R. S. Hilburn, Carole Keith Bruning heirs.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality wetland community</td>
<td>1</td>
<td>Blackwater river swamp</td>
<td>Broad floodplain which provides a wildland corridor for game spp. and nongame fauna</td>
</tr>
<tr>
<td>High quality wetland community</td>
<td>2</td>
<td>Virgin or ancient second-growth cypress forest</td>
<td>Most extensive grouping of largest cypress seen in county</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3a</td>
<td>Sagittaria stagnorum</td>
<td>One of three populations known in NC (proposed)</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3b</td>
<td>Sarvis-leaf holly</td>
<td>Abundant in upper drainage of natural area</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3c</td>
<td>Green-fly orchid</td>
<td>Occasional colonies, less extensive than in Northeast Cape Fear N. A.</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>3d</td>
<td>May hawthorn</td>
<td>Sparse in area; not seen with fruit</td>
</tr>
<tr>
<td>Outstanding aquatic feature</td>
<td>4</td>
<td>Black River</td>
<td>Sparsely developed, scenic stream, high potential for pastoral recreation</td>
</tr>
</tbody>
</table>
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Not available

17. Attitude of owner or custodian toward preservation (contacted?):
   One custodian was contacted. He is manager of a large tract on the upper stretch of the river, and the property is currently managed for timber and wildlife.

18. Uses of natural area: Recreational boating, hunting, fishing.

19. Uses of surrounding land: Wildland: 60%; Agricultural land: 10%; High-intensity forestry: 25%; Developed: 5%

20. Preservation Status: Category 4, 10%; Category 7, 90%

21. Regulatory protections in force: Wetlands, natural hazard area

22. Threats: Small amounts of local residential development, limited to higher bluffs and banks of river.

23. Management and Preservation Recommendation: Acquisition of the Larkins Cove Cypress Forest, or agreement among landowners to protect the stand as much as possible. The remainder of the river could be better utilized with an additional boat ramp on the east side, downstream from NC 210. At the mouth of Black River is a large island, Roan Island, that was circumnavigated during the survey, but the interior was not examined from the ground. Further study may show this island to be a suitable natural area. It is owned, in various tracts by Corbett Industries.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
   Community type: Taxodium distichum- Acer rubrum forest
   Community cover type: Taxodium distichum
   General habitat feature: Riverine swamp
   Average canopy height: 40 ft
   Estimated age of canopy trees: 80-250 years
   Canopy cover: Closed to somewhat open
   Estimated size of community: 7,500 ac, with the Larkins Cove Cypress stand comprising approximately 600 ac.
   Successional stage: Climax
   Sere type: Pelosere
   Common canopy species in community cover or community type (but not dominant): Polypodium polydoides, Nyssa biflora, Quercus lyrata, Liquidambar styraciflua
   Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus stricta, Crataegus sp. Ilex verticillata, Betula nigra
   Common herb stratum species in community cover or community type (but not dominant): Justicia ovata, Boehmeria cylindrica
24B. Soil Summary (by community type)
Soil series: Dorovan series in tidal region of river; Johnston and Lumbee soils in upper reaches of river
Soil classification: Not determined
Soil association: Johnston-Lumbee
pH class: Strongly acid to medium acid
Moisture class: Poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

24C. Hydrology Summary (by community type)
Hydrologic system: Riverine
Hydrologic subsystem: Tidal and Lower Perrenial
Water chemistry: Fresh to mixosaline
Water regime: Tidal, regularly flooded, irregularly flooded, and nontidal, intermittently exposed, seasonally flooded
Drainage class: Poorly drained to very poorly drained
Drainage basin: Cape Fear River
Hydrology characterization: Poorly to very poorly drained bottomland sloughs, terraces, and bars, covered with moisture-retaining silts and silty sands with water table frequently at the surface.

24D. Topography Summary
Landform: Riverine floodplain
Shelter: Deeply sheltered
Aspect: More or less easy - west
Slope: Level to gently sloping
Profile: Level to concave
Surface patterns: Irregularly undulating
Position: Not applicable

25. Physiographic characterization of natural area: A tidally flooded to seasonally flooded climax community of a hydric pelosere in the alluvial plain of the Black River; area underlain by Cretaceous (Pee Dee formation) sands, impure limestones, marine clays and interbedded sands in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Basement formation is the Cretaceous Pee Dee formation.
Geological Formation age: 60 million years

26. Summary - Endangered and threatened species
(1) Name of species: Sagittaria stagnorum, sensu Godfrey & Wooten; S. subulata var. gracillima sensu Radford et al. (ALISMATACEAE)
no common name
Species legal status and authority: Proposed as a threatened peripheral, based on locations in only Pender and Wilson Counties in North Carolina.
Number of populations on site: 1
Number of individuals per population: Difficult to estimate, but possibly a few thousand
Size or maturity of individuals: Mostly immature
Phenology of population: Vegetative: 85%; Flowering: 10%; Fruiting: 5%
General vigor of population: Presumed to be vigorous, but population
vigor is likely regulated by flooding or other ecological conditions
in the mucky sloughs where the plant grows. When discovered here,
the plants were often covered by a thick algal mat.
Disturbance or threats to population: None
Habitat characteristics:
  Plant community: Cypress, with considerable understory of water ash
  Topography: Slightly concave
  Soil series: Johnston
  Microclimate: Not determined
  Drainage basin: Black River tributary of the Cape Fear River
  Other plants and animal species present: Plants: Bacopa caroliniana,
  Gratiola sp. Micranthemum umbrosum. Animals: See attached master
  species lists.

(2) Name of species: Ilex amelanchier (AQUIFOLIACEAE) Sarvis-leaf holly
Species legal status and authority: NC threatened throughout (Cooper
et al. 1977)
Number of populations on site: 1 observed
Number of individuals per population: 50 or more
Size or maturity of individuals: Immature and mature
Phenology of population: Vegetative: 50%, Flowering: 0%; Fruiting 50%
General vigor of population: Population found after August floods.
Leaves and probably fruits had been stripped from plants. A new growth
of leaves was apparent. Population presumed to be vigorous.
Disturbance or threats to population: None other than aforementioned
flooding hazard.
Habitat characteristics:
  Plant community: Cypress with understory of water ash
  Topography: Level
  Soil series: Johnston or Lumbee
  Microclimate: Not determined
  Drainage basin: Black River tributary of Cape Fear River
  Other plants and animal species present: Plants: Rhus radicans,
  Decumaria barbara, Boehmeria cylindrica. Animals: See attached
  master species lists.

(3) Name of species: Epidendrum conopseum (ORCHIDACEAE) Green-fly orchid
Species legal status and authority: NC endangered peripheral (Cooper
et al. 1977)
Number of populations on site: 1
Number of individuals per population: 50-150
Size or maturity of population: Mature
Phenology of population: Vegetative: 100%; Flowering 0%; Fruiting 0%
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:
  Plant community: Cypress swamp
  Topography: Level
Soil series: Johnston
Microclimate: Not determined
Drainage basin: Black River tributary of Cape Fear River
Other plants and animal species present: Plants: Polypodium polypodioides, Decumaria barbara, Tillandsia usneoides. Animals: See attached master species lists.

(4) Name of species: Crataegus aestivalis (ROSACEAE) May hawthorn
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 10
Size or maturity of population: Immature and mature
Phenology of population: Vegetative: 100%; Flowering: 0%; Fruiting: 0%
General vigor of population: Fair
Disturbance or threats to population: Intense shading and bank erosion
Habitat characteristics:
  Plant community: Cypress swamp
  Topography: Level to gently sloping
  Soil series: Lumbee
  Microclimate: Not determined
Drainage basin: Black River tributary of the Cape Fear River
Other plants and animal species present: Plants: Betula nigra, Salix nigra, Ilex verticillata, Carpinus carolinianus. Animals: See attached master species lists.

(See FIGURE 10 for detailed map of endangered and threatened species locations.)
FIGURE 10. Significant features of Black River Natural Area. Code: (1) High quality wetland community, (2) High quality wetland community (possible virgin stand), (3) Endangered or threatened species, (4) Outstanding aquatic feature. Map scale: 1 in. = 2 mi.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE
    Justicia ovata
ACERACEAE
    Acer rubrum
AIZOACEAE
    Mollugo verticillata
ALISMATACEAE
    Sagittaria graminea
    S. stagnorum (S. subulata var. gracillima)
    S. subulata
AMARANTHACEAE
    Alternanthera philoxeroides
AMARYLLIDACEAE
    Hymenocallis crassifolia
ANACARDIACEAE
    Rhus radicans
    R. vernix
APIACEAE
    Centella asiatica
    Cicuta maculata
    Hydrocotyle umbellata
    Ptilimnium capillaceum
AQUIFOLIACEAE
    Ilex amelanchier
    I. coriacea
    I. glabra
    I. verticillata
ARACEAE
    Orontium aquaticum
    Peltandra virginica
ARECACEAE
    Sabal minor
ASPIDIACEAE
    Athyrium asplenioideis
    Onoclea sensibilis
    Thelypteris palustris
ASPLENIACEAE
    Asplenium platyneuron
ASTERACEAE
    Bidens aristosa
    Mikania scandens
    Pluchea camphorata
    Senecio glabellus
    Vernonii noveboracensis
BETULACEAE
    Alnus serrulata
Betula nigra
Carpinus caroliniana
BIGNONIACEAE
Anisostichus capreolata
Campsis radicans
BLECHNACEAE
Woodwardia areolata
W. virginica
BROMELIACEAE
Tillandsia usneoides
CAMPANULACEAE
Lobelia cardinalis
CAPRIFOLIACEAE
Sambucus canadensis
Viburnum nudum
CLETHRACEAE
Clethra alnifolia
CONVOLVULACEAE
Cuscuta compacta
CORNACEAE
Cornus stricta
CYPERACEAE
Carex intumescens
C. lupulina
C. rosea
Fuirena squarrosa
Rhynchospora macrostachya
Scirpus cyperinus
CYRILLACEAE
Cyrilla racemiflora
ERICACEAE
Leucothoe axillaris
L. racemosa
Lyonia lucida
Rhododendron nudiflorum
R. viscosum
ERIOCAULACEAE
Eriocaulon compressum
FABACEAE
Amorpha fruticosa
Cassia nictitans
Daubentonia punicea
Wisteria sinensis
FAGACEAE
Quercus laurifolia
Q. lyrata
Q. michauxii
Q. nigra
Q. phellos
HAMAMELIDACEAE
Liquidambar styraciflua
IRIDACEAE
  Iris tridentata

JUGLANDACEAE
  Carya aquatica
  C. glabra

JUNCACEAE
  Juncus biflorus
  J. effusus

LAMIACEAE
  Lycopus rubellus
  Salvia lyrata
  Satureja georgiana
  Teuchrium canadensis

LAURACEAE
  Persea borbonia

LILIACEAE
  Smilax glauca
  S. laurifolia
  S. rotundifolia

LOGANIACEAE
  Gelsemium sempervirens

LORANTHACEAE
  Phoradendron serotinum

LYTHRACEAE
  Decodon verticillatus

MAGNOLIACEAE
  Liriodendron tulipifera
  Magnolia virginiana

MORACEAE
  Morus rubra

MYRICACEAE
  Myrica cerifera

NYMPHAEACEAE
  Nuphar luteum ssp. sagittifolium

NYSSACEAE
  Nyssa aquatica
  N. biflora

OLEACEAE
  Fraxinus caroliniana
  F. pensylvanica var. subintegerrima

ONAGRACEAE
  Ludwigia palustris

ORCHIDACEAE
  Epidendrum conopseum
  Spiranthus cernua var. odorata

OSMUNDACEAE
  Osmunda cinnamomea
  O. regalis var. spectabilis

PINACEAE
  Pinus taeda
PLATANACEAE
Platanus occidentalis

POACEAE
Andropogon gerardi
Arundinaria gigantea
Eleusine indica
Elymus virginicus
Erianthus giganteus
Glyceria striata
Panicum hemitomon
Sacciolepis striata

POLYGONACEAE
Polygonum arifolium
P. hydropiperoides
P. punctatum
P. Sagittatum

POLYPODIACEAE
Polypodium polypodioides

PONTEDERIACEAE
Pontederia cordata

PRIMULACEAE
Samolus parviflorus

RHAMNACEAE
Berchemia scandens

ROSACEAE
Crataegus aestivalis
Rosa palustris
Rubus argutus

RUBIACEAE
Cephalanthus occidentalis

SALICACEAE
Populus heterophyllus
Salix caroliniana
S. nigra

SAURURACEAE
Saururus cernuus

SAXIFRAGACEAE
Decumaria barbara
Itea virginica

SCROPHULARIACEAE
Bacopa caroliniana
Gratiola neglecta
G. virginiana
Micranthemum umbrosum

TAXODIACEAE
Taxodium distichum

TYPHACEAE
Typha angustifolia
T. domingensis
T. latifolia
ULMACEAE
    Celtis laevigata
    Ulmus americana
URTICACEAE
    Boehmeria cylindrica
VERBENACEAE
    Lippia nodiflora
VIOLACEAE
    Viola papilionacea
VITACEAE
    Ampelopsis arborea
    Parthenocissus quinquefolia
    Vitis aestivalis
    V. rotundifolia

AMPHIBIANS

Leopard Frog
Bullfrog

REPTILES

Yellow-bellied Turtle
Banded Water Snake
Red-bellied Water Snake
Black Racer
Corn Snake

BIRDS

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

Great Blue Heron          PR* (?)  
Green Heron               SR*  
Little Blue Heron         SV  
Louisiana Heron           SV  
Yellow-crowned Night Heron SR* (?)  
White Ibis                SV  
Wood Duck                 PR*  
Turkey Vulture            PV  
Black Vulture             PV  
Red-tailed Hawk           PV  
Red-shouldered Hawk       PR*  

61
Osprey
Bobwhite
Spotted Sandpiper
Mourning Dove
Yellow-billed Cuckoo
Barred Owl
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Common Flicker
Pileated Woodpecker
Red-bellied Woodpecker
Red-headed Woodpecker
Hairy Woodpecker
Downy Woodpecker
Crested Flycatcher
Acadian Flycatcher
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Fish Crow
Common Crow
Carolina Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown-headed Nuthatch
Carolina Wren
Mockingbird
Catbird
Brown Thrasher
Wood Thrush
Eastern Bluebird
Blue-gray Gnatcatcher
Starling
White-eyed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Black-and-white Warbler
Prothonotary Warbler
Swainson's Warbler
Northern Parula Warbler
Yellow-rumped Warbler
Yellow-throated Warbler
Pine Warbler
Prairie Warbler
Northern Waterthrush
Louisiana Waterthrush
Common Yellowthroat
Hooded Warbler
American Redstart
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<td>Red-winged Blackbird</td>
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<td>Common Grackle</td>
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</tr>
<tr>
<td>American Goldfinch</td>
<td>WR</td>
</tr>
<tr>
<td>Rufous-sided Towhee</td>
<td>PR*</td>
</tr>
<tr>
<td>White-throated Sparrow</td>
<td>WR</td>
</tr>
</tbody>
</table>

**MAMMALS**

<table>
<thead>
<tr>
<th>Mammal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opossum</td>
</tr>
<tr>
<td>Raccoon</td>
</tr>
<tr>
<td>Eastern Gray Squirrel</td>
</tr>
<tr>
<td>Muskrat</td>
</tr>
<tr>
<td>Whitetail Deer</td>
</tr>
</tbody>
</table>
Basic Information Summary Sheet

1. Natural Area Name: Southwest Ridge

2. County: Pender

3. Location: East central part of county in the Northeast Cape Fear River Basin. Area is south to west of Ashes Creek and lie adjacent to and parallels the northern boundary of Holly Shelter Game Lands. Coordinates: 34°32'N, 77°44'W (FIGURE 1).

4. Topographic Quadrangle(s): Maple Hill, NC 1981

5. Size: 200 acres

6. Elevation: 33 ft to 44 ft above mean sea level

7. Access: From Northeast Cape Fear River on NC 210, go 1.1 miles east on NC 210 to the intersection of SR 1520. Turn left (north) and go approximately 7 miles to the Holly Shelter Game Lands headquarters. Turn right (east) through a gate on the Game Land's Lodge Road and go 4.2 miles to the last hunter access trail (unmarked, but with pocosin trees and shrubs cut in a more or less linear corridor) just before large impoundment on right side of Lodge Road. Walk the hunter trail to the ridge, about 0.5 miles.

8. Names of Investigators: S. W. Leonard Ricky Davis
   P. O. Box 3475 126 Duncansby Court
   Wilmington, NC 28406 Cary, NC 27511

9. Date(s) of Investigation: May 19, June 25, and July 23, 1981

10. Priority Rating: High

11A. Prose Description of Site: Southwest Ridge is a weakly crescent-shaped sand body which trends east-west and is located adjacent to the northern boundary of Holly Shelter Bay. An inspection of aerial photography or the USGS topographic quadrangle shows Southwest Ridge matching a counterpart northeast ridge, thus forming an elliptic landform of the general shape and orientation of a Carolina Bay.

   The ridge is composed of loose well-drained and grayish-to-pale yellow sand, except along the edges and the topographically lower western tip where this layer of sand covers dark organic materials. Elevation of the ridge is about 10-15 ft higher than the adjacent pocosin. Water table varies, and fluctuations are hampered by the presence within the soil profile of pans. The typical occurrence of a large body of sand along the southeast margin of most Carolina bays is missing from this area-- a fact which may be related to the
FIGURE 11. Southwest Ridge Natural Area. Map scale: 1 in. = 2 mi.
bisection of the bay by Ashes Creek. Streamflow, however, is not toward the southeast as one would logically surmise from examination of maps, but instead, is in the opposite direction.

Surrounding vegetation is mostly dense evergreen shrub pocosin beneath an open pond pine canopy on the south; on the north is a wet, incipient savanna (now mostly covered with shrubs as a result of fire prevention). Canopy species vary north of the ridge, and depending upon elevation, and hence, water regime, may be longleaf pine, pond pine, or a combination of each.

Vegetation of Southwest Ridge is predominantly open longleaf pine woods with a marginal pond pine ecotone (along with wiregrass). There are no turkey oaks present on the ridge. Ground cover is comprised of wiregrass and creeping blueberry as dominants with scattered clones or individuals of other herbaceous, or rarely, woody species. A shrub layer as well as a subcanopy are missing. Bases of the longleaf pines are not charred, thus ruling out fire as a causative agent in preventing development of woody subcanopy layers, although longleaf pine is traditionally recognized as a fire-maintained edaphic climax. Grass-stage seedlings and saplings of longleaf pine are sparse and do not show any visible and obvious colonization pattern. Dead canopy trees are also sparse, although present over much of the ridge, and they appear to have died as a result of factors other than lightning strikes.

Human occupancy of the site is presumed to be prehistoric, and site use continues to the present on a seasonal basis. Fabric-impressed, grit-tempered potsherds and cracked rock and flakes were recovered from exposed soil on the northeast counterpart of Southwest Ridge. Many of the longleaf pines show scars from the turpentine/naval stores industry, and as late as 1954-56, the area was selectively logged. Southwest Ridge is a popular hunting area, and in addition to pedestrian access from Lodge Road south of the site, a jeep trail has been constructed from the north. (This access road was not investigated during the study.)


11B. Prose Description of Site Significance: The features of Southwest Ridge which are most distinctive to the first-time visitor are (1) the contrast in vegetation types between the extraordinarily dense pocosin and the open, park-like appearance of the ridge; (2) the lack of a shrub layer, which accentuates the height of the pines; (3) the isolation of the site; and (4) the abrupt rise in elevation, as one approaches the ridge from the south.

The combination of a relatively large and vigorous population
of the federally endangered Red-cockaded Woodpecker in a 150-year old longleaf pine stand surrounded by thousands of acres of pocosin is the primary significant feature of this natural area. Of secondary importance, larger because of the lesser status, are occurrences of Venus' fly-traps, roughleaf loosestrife, and dwarf fothergilla. The location of Southwest Ridge is unique—there being to our knowledge, only one other large sand ridge within a major expanse of bay (located in Angola Bay in northern Pender County).

The significance of the Red-cockaded Woodpecker colony is that it is apparently in a stable condition, is thriving, and occupies a timber stand with arrested subcanopy development. The number of cavity trees per number of available longleaf pines is quite high. Owing to the inaccessibility of the ridge and the absence of logging, the colony site should continue to remain in satisfactory condition and should be preserved.

The plant community, with its absence of turkey oak, is unusual and probably should be considered an anomalous variant of the longleaf pine/turkey oak/wire grass community type. Isolation of the ridge may be the limiting factor for turkey oak, since a few scattered plants of that species were found on the northeast counterpart ridge. Moreover, the dense ground cover of creeping blueberry and wire grass on Southwest Ridge, together with infrequent fires, may account for the absence of turkey oak and also the scarcity of longleaf pine seedlings.

12. Significance Summary: (see TABLE 4)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 32%, Public 68%, Unknown 0%

14. Number of Owners: 3

15. Name(s) of Owner(s) and/or Custodian(s) (with addresses, phone numbers, and other pertinent information):
   (1) University of North Carolina, Board of Trustees of the Endowment Fund (Mrs. Grace Wagoner, University Property Office, 134 East Franklin Street (165-A), Chapel Hill, NC 27514 (919/966-3296)
   (2) W. F. Sledge, P. O. Box 523, Whiteville, NC 28742 (919/642-7029)
   (3) Jabe Six Properties, Ltd., P. O. Box 1806, Wilmington, NC 28402 (James Z. Godwin/E. W. Godwin's Sons Lumber Co. 919/762-7747)

16. Name(s) of Knowledgeable Person(s) (with addresses, phone numbers, and other pertinent information):
   (1) Charles "Vic" French, Wildlife Management Technician II, Route 1, Box 222, Burgaw, NC 28425. Mr. French is Holly Shelter Game Lands Manager, and he has a thorough knowledge of the property and surrounding areas.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality terrestrial community</td>
<td>1</td>
<td>Longleaf pine - wiregrass sand ridge</td>
<td>Isolated ridge with 150-year old longleaf pines</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2a</td>
<td>Venus' fly-trap</td>
<td>Sparse population in ecotone</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2b</td>
<td>Rough-leaf loosestrife</td>
<td>Sparse population in ecotone</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2c</td>
<td>Dwarf fothergilla</td>
<td>Extremely large population at west end of ridge</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2d</td>
<td>Red-cockaded Woodpecker</td>
<td>Fifteen active, 11 inactive, and 1 enlarged cavity. Ten adults seen; population appears stable</td>
</tr>
</tbody>
</table>
17. Attitude of Owner or Custodian Toward Preservation (contacted?):
Jabe Six Properties, Ltd., was contacted on July 24, 1981. The owners expressed an interest to sell their 1/6 undivided interest in the 800 ac parcel which includes Southwest Ridge.

Mr. W. F. Sledge was contacted on July 27, 1981 regarding his 1/2 interest in the 90 ac tract at the east end of Southwest Ridge. He also expressed a favorable attitude toward sale of the property, or other disposition of his share to a conservation foundation.

18. Uses of Natural Area: The area was last selectively logged between 1954 and 1956. Evidence is present that indicates use, formerly, of the area for gathering naval stores. Historically and at present, the area is used mainly for deer hunting. The ridge might have some archaeological significance.

19. Uses of Surrounding Land: Wildland 100%

20. Preservation Status: Category 3, 68%; Category 6, 32%

21. Regulatory Protection in Force: No regulatory protections in effect

22. Threats: No major threats to the area at this time except that possible timber harvest of some of the trees is feasible during very dry weather or when access from the north is provided. A deed from 1954 indicates that timber rights are held separately for the western portion of the tract.

23. Management and Preservation Recommendation: (1) Improved access by pedestrian trail, (2) abandonment of jeep trail from north, (3) plan for control burns, (4) discouragement for game food-plot development, (5) prohibition of logging, and (6) acquisition for potential inclusion into Holly Shelter Game Lands with regulated hunter access and utilization.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris/Aristida stricta-Vaccinium crassifolium
Community cover type: Pinus palustris
General habitat feature: Longleaf pine sand ridge
Average canopy height: 50-60 ft
Estimated age of canopy trees: 150 yrs (tree ring counts of 146, 149, and 154 yrs from increment borings)
Canopy cover: Open
Estimated size of community: 200 ac
Successional stage: Edaphic climax
Sere type: Psammosere
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): None
Common herb stratum species in community cover or community type (but not dominant): Amorpha herbacea, Pteridium aquilinum, Chrysopsis graminifolia, Pterocaulon pycnostachyum

24B. Soil Summary (by community type)
Soil series: Mandorin and Alpin
Soil classification: Mandorin: Fine sand, mixed acidic, humic; Alpin: Fine sand, mixed acidic, thermic, coated typic, quartzpsamments
Soil association: Alpin-Mandorin
pH class: Mandorin: Extremely acid to neutral; Alpin: Extremely acid to neutral
Moisture class: Mandorin: Somewhat poorly drained; Alpin: Excessively drained
Source of information: Description prepared from site analyses on July 23, 1981 by W. L. Barnhill, Soil Scientist and assisted by John Ray and Jay Milam, Pender County SCS Office.
Other notes: Barnhill cautioned that the pH readings of 7.0 may have been faulty because of the techniques used during the field analyses. Slight acidity was expected.

24C. Hydrology Summary (by community type)
Hydrologic system: Terrestrial
Hydrologic subsystem: Mesic (Mandorin) to Dry-xeric (Alpin)
Water chemistry: Fresh
Water regime: not applicable
Drainage class: Somewhat poorly to excessively drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly to excessively drained elevated sand ridge surrounded by poorly drained muck and mucky sands.

24D. Topography Summary
Landform: Sand ridge with Carolina Bay rim characteristics
Shelter: Deeply sheltered
Aspect: North - South
Slope angle: Gently sloping (2-6°)
Profile: Convex
Surface patterns: Smooth
Position: Entire slope

25. Physiographic Characterization of Natural Area: A fire-maintained climax community of a psammosere on an isolated sand ridge in the Holly Shelter Bay. The ridge drains toward the Northeast Cape Fear River and is underlain by Eocene Castle Hayne limestone in the Embayed Section of the Coastal Plain province of the Atlantic Plain region. Geological Formation: Eocene Castle Hayne limestone overlain by Quaternary sands (Renfro and Peray 1978).
Geological Formation Age: Eocene formation: 40-50 million yrs; Quaternary sands: 6,000 to 1 million yrs.
26. Summary - Endangered and Threatened Species

(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited
(Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: Less than 50
Size or maturity of individuals: Small and scattered; probably declining
population size due to minimum site disturbance, infrequent fires, and
shading by pocosin shrubs.
Phenology of population: Vegetative: 40%; Flowering 60%; Fruiting: Not
determined
General vigor of population: Mostly mature plants; little reproduction
Disturbance or threats to population: Natural invasion and growth of
evergreen shrubs
Habitat characteristics:
Plant community: Disturbed ecotonal margin between longleaf pine
ridge and evergreen shrub pocosin
Topography: 1% slope
Soil series: Slumped sand over Pamlico or Murville muck
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River
Other plant and animal species present: Plants: Clethra alnifolia,
Cyrilla racemiflora, Vaccinium crassifolium, Pinus serotina,
Gaylussacia frondosa, Ilex glabra, Ilex coriacea, Persea borbonia,
Magnolia virginiana, Drosera intermedia, Aristida stricta, Xyris
baldwiniana. Animals: See attached master species lists.

(2) Name of species: Fothergilla gardenii (HAMAMELIDACEAE) Dwarf
fothergilla
Species legal status and authority: NC threatened peripheral (Cooper
et al. 1977)
Number of populations on site: 1
Number of individuals per population: Several thousand
Size or maturity of individuals: Mature plants 1-2 ft tall
Phenology of population: Vegetative: 30%; Flowering 70%; Fruiting 50%
General vigor of population: Excellent
Disturbance or threats to population: None
Habitat characteristics:
Plant community: Ecotone between longleaf pine ridge and evergreen
shrub pocosin
Topography: Level
Soil series: Mandorin
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River
Other plant and animal species present: Plants: Pinus palustris
Pinus serotina, Clethra alnifolia, Vaccinium crassifolium, Aristida
stricta, Vaccinium tenellum, Ilex glabra, Myrica cerifera var. pumila.
Animals: See attached master species lists.
Name of species: Lysimachia asperulaefolia (PRIMULACEAE) Rough-leaf loosestrife
Species legal status and authority: NC endangered endemic (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 23
Size or maturity of individuals: Approximately 1 ft in height; mature
Phenology of population: Vegetative: 75%; Flowering 25%; Fruiting 25%
General vigor of population: Fair
Disturbance or threats to population: Natural invasion and growth of evergreen shrubs. Population is located in a disturbed area of hunter trail. At this site, plants probably require disturbance by man for survival.
Habitat characteristics:
  Plant community: Open, chopped area of hunter access trail in a pond pine pocosin
  Topography: Level
  Soil series: Pamlico or Murville muck
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River
Other plant and animal species present: Plants: Pinus serotina, Ilex glabra, Ilex coriacea, Ilex americana, Magnolia virginiana, Persea borbonia, Zenobia pulverulenta, Cassandra calyculata, Smilax laurifolia, Drosera intermedia. Animals: See attached master species lists.

Name of species: Red-cockaded Woodpecker
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 15 active cavities, 10 adults seen
Size or maturity of individuals: Adult
Phenology of population: Not applicable
General vigor of population: Apparently healthy and reproducing
Disturbance or threats to population: None
Habitat characteristics:
  Plant community: Longleaf pine/wire grass--creeping blueberry
  Topography: Sloping to level
  Soil series: Mandorin and Alpin
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River
Other plant and animal species present: See attached master species lists.

(See FIGURE 12 for detailed map of endangered and threatened species locations.)
FIGURE 12. Significant features of Southwest Ridge Natural Area.
Code: (1) High quality terrestrial community, (2) Endangered or threatened species. Map scale: 1 in. = 2,000 ft.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

AQUIFOLIACEAE
Ilex glabra

ASTERACEAE
Carduus repandus
Carphephorus bellidifolius
Chrysopsis graminifolia
Liatris graminifolia
Pterocaulon pycnostachyum

BLECHNACEAE
Woodwardia virginica

CLETHRACEAE
Clethra alnifolia

CONVOLVULACEAE
Bonamia patens var. angustifolia

CYRILLACEAE
Cyrilla racemiflora

DIONAEACEAE
Dionaea muscipula

DROSERACEAE
Drosera capillaris
D. intermedia

ERICACEAE
Gaylussacia frondosa
Leucothoe ligustrina
Vaccinium crassifolium
V. tenellum

EUPHORBIAECEAE
Cnidoscolus stimulosus

FABACEAE
Amorpha herbacea
Stylosanthes biflora

HAMAMELIDACEAE
Fothergilla gardenii

HYPERICACEAE
Hypericum reductum

IRIDACEAE
Sisyrinchium arenicola

LORACEAE
Persea borbonia

MAGNOLIACEAE
Magnolia virginiana

MELASTOMATACEAE
Rhexia alifanus
R. mariana

MYRICACEAE
Myrica cerifera
Myrica cerifera var. pumila
M. heterophylla
PINACEAE
Pinus palustris
P. serotina
POACEAE
Andropogon scoparius
A. virginicus
Aristida stricta
Panicum sp.
PRIMULACEAE
Lysimachia asperulaefolia
PTERIDACEAE
Pteridium aquilinum
SARRACENIACEAE
Sarracenia flava
S. purpurea
THEACEAE
Gordonia lasianthus
XYRIDACEAE
Xyris sp.

AMPHIBIANS

Southern Toad
Oak Toad

REPTILES

Eastern Box Turtle
Green Anole
Six-lined Racerunner
Ground Skink
Broad-headed Skink
Northern Black Racer
Corn Snake

BIRDS

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

Turkey Vulture
Bobwhite
Mourning Dove
Chimney Swift

PV
PR*
PV
SV
Common Flicker  PR*
Pileated Woodpecker  PR*
Red-bellied Woodpecker  PV
Downy Woodpecker  PR*
Red-cockaded Woodpecker  PR*
Eastern Kingbird  SR*
Crested Flycatcher  SR*
Eastern Wood Pewee  SR*
Blue Jay  PV
Common Crow  PV
Fish Crow  PV
Carolina Chickadee  PR*
Brown-headed Nuthatch  PR*
Carolina Wren  PR*
Gray Catbird  SR*
Eastern Bluebird  PR*
Starling  PV
Pine Warbler  PR*
Prairie Warbler  SV
Common Yellowthroat  SR*
Yellow-breasted Chat  SV
Eastern Meadowlark  PV
Common Grackle  PV
Brown-headed Cowbird  PV
Summer Tanager  SR*
Cardinal  PR*
Blue Grosbeak  SV
Indigo Bunting  SV
Rufous-sided Towhee  PR*
Field Sparrow  WV

MAMMALS

Whitetail Deer
Black Bear
Basic Information Summary Sheet

1. Natural Area Name: Lanier Quarry Savanna

2. County: Pender

3. Location: Lanier Quarry Savanna is located southeast of Maple Hill and south of NC 50, 0.3 miles, and southeast of SR 1532, approximately 0.4 miles. The site is reached by dirt road which turns left (east) off SR 1532 at a small cemetery. Coordinates: 34°38'N, 77°40'W (FIGURE 13).

4. Topographic Quadrangle(s): Maple Hill, NC 1981; Maple Hill, SW, NC (1981)

5. Size: Ca. 140 ac

6. Elevation: 18 ft to 24 ft above mean sea level

7. Access: By private road from SR 1532, proceed 2.2 mi. southeast of Maple Hill to the intersection of SR 1532, turn right (south) and go 0.3 mi. to private road on left by cemetery. Turn on dirt road and follow this road past quarry to an open, disturbed area, eventually to be mined. The central part of savanna is then located west of this clearing, but parts of woodlands are included in natural area.

8. Names of investigators: S. W. Leonard Ricky Davis
   P. O. Box 3475 126 Duncansby Court
   Wilmington, NC 28406 Cary, NC 27511

9. Date(s) of Investigation: May-October, 1981

10. Priority Rating: High

11A. Prose Description of Site: Lanier Quarry Savanna is a flat expanse with scattered longleaf pines surrounded by the swamp of Sandy Run Creek and small, wooded tributary drainages. The savanna is reportedly maintained by local landowners who periodically burn the area in order to promote growth of insectivorous plants, which they harvest for local sale. During the investigation of the savanna, peripheral woodlands were found to contain several rare species of interest, and therefore, the natural area has been expanded from the initial site study by Alan S. Weakley in August 1980.

   In addition to the botanical significance of the natural area, and perhaps the major contributing factor to the uniqueness of the flora is the presence of underlying strata of a weakly consolidated, fossiliferous limestone. Overburden is relatively thin, generally being less than 10 ft. Soil pH was tested by Lamotte kit found to be in the range of 7.5 to 8.0. No other savannas are known in Pender County which contain comparable flora and have these soil conditions,
FIGURE 13. Lanier Quarry Savanna Natural Area. Map scale: 1 in. = 2 mi.
although nearby areas in Onslow County are similar.

The savanna contains a profusion of herbaceous plants, and is dominated by the grass, *Ctenium aromaticum*. Large numbers of pitcher plants are present, and in certain areas of the savanna, Venus' fly-traps. The peak of the flowering season occurs in late spring and early summer and again in early autumn.

11B. Prose Description of Site Significance: Physical and biological features are important site characteristics. According to personal communication between Lee Otte and Alan Weakley, the site is an important type location for marine Miocene fauna as well as an "excellent example of fossiliferous Castle Hayne limestone."

Significant botanical components are Venus'fly-traps, pitcher plants, Cooley's meadow-rue, the recently-discovered prairie onion, *Allium stellatum*, and a potentially undescribed species of the family *Apiaceae*. The site may be the most important representative example of a *Pinus palustris/Ctenium aromaticum* savanna in North Carolina.

12. Significance Summary: (See TABLE 5)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%, Public 0%, Unknown 0%

14. Number of Owners: 13, possibly others

15. Name(s) of owner(s) and/or custodian(s) (with address, phone numbers, and other pertinent information): S. A. Lanier; Heirs of Christine James; Boyce J. Williams; Mildred James; Heirs of Hannah James; Coy A. Lee; Theodore Lee; Preston Marshburn; Terry Lee and Leora Lee; Linbert and Frances Shepard; Isaac and Mildred Lee; June Williams heirs; John Shepard, Jr., Evelyn Shepard Lee, Mamie Shepard Watkins, Luberta Shepard Walker, Viola Shepard Hand; Sampson James, Bertie Wheeler, and Bert L. Wheeler; and Marvin L. Goodson.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Alan S. Weakley, Duke University, Department of Botany, Durham, NC

17. Attitude of owner or custodian toward preservation (contacted?): Two of the owners who are utilizing the limestone resource for agricultural lime were contacted (S. A. Lanier and Marvin Goodson). A plant rescue effort was arranged for removal of some of the plants. Owners of the main part of the savanna were not contacted. Most of these owners reside in the Maple Hill area.

18. Uses of natural area: The chief uses are related to exploitation of insectivorous plant population and limestone mining.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endangered or threatened sp.</td>
<td>1a</td>
<td>Venus' fly-trap</td>
<td>Large population but exploited at this site</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1b</td>
<td>Prairie onion</td>
<td>New species to NC, disjunct from Midwest</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1c</td>
<td>Cooley's meadow-rue</td>
<td>Small population, endemic to southeast NC, possibly in GA and FL</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1d</td>
<td>Carolina parnassia</td>
<td>Scattered over much of area, but small colonies</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1e</td>
<td>Scale-leaf gerardia</td>
<td>Small colonies over much of savanna; seldom found elsewhere</td>
</tr>
<tr>
<td>Unusual species assemblage</td>
<td>2</td>
<td>A potential new sp. of Oxypolis growing with 1b, 1c, and 1e</td>
<td>Unusual occurrence of basic soil conditions in savanna habitat</td>
</tr>
<tr>
<td>High floristic diversity</td>
<td>3</td>
<td>Large population of insectivorous plants</td>
<td>Similar to Holly Shelter savannas, but with different soil conditions</td>
</tr>
</tbody>
</table>
19. Uses of Surrounding Land: Wildland 80%, Agricultural land 10%, Developed 10%

20. Preservation Status: Category 6, 100%

21. Regulatory Protections in Force: No regulatory protections known

22. Threats: Potential for limestone mining, residential development or farming.

23. Management and Preservation Recommendation: Change of ownership through donations of land or acquisition will require an annual or biennial controlled burn to keep the savanna in its present condition. At the present time, this management alternative is achieved, albeit for different purposes (to sustain an insectivorous plant population for small-scale harvest). There are no major threats for timber harvest since the board-footage per acre is small; however, pine plantation would probably alter the site characteristics, and thus is not recommended. Due to the large number of landowners, any change in the "status quo" of the site may have serious implications and lead toward loss of habitat. Acquisition of site seems to be the most urgent need, although protection from insectivorous plant exploitation would be impossible. However, protection of mineral resource and therefore site integrity, with above-stated limitations, would then be possible.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris/Ctenium aromaticum
Community cover type: Pinus palustris
General habitat feature: Savanna
Average canopy height: 50 ft
Estimated age of canopy trees: 50-75 years
Canopy cover: Open
Estimated size of community: 40 ac of contiguous savanna; 30 ac of peripheral savanna; 20 ac of disturbed area; 50 ac of miscellaneous timberland
Successional stage: Fire-maintained climax
Sere type: Variant of psamosere
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): None
Common herb stratum species in community cover or community type (but not dominant): Centella asiatica, Chondrophora nudata, Chrysopsis graminifolia, Marshallia graminifolia, Eupatorium recurvans, Drosera spp., Rhexia spp., Melanthium virginicum, Zigadenus glaberrimus, Tofieldia racemosa, Habenaria spp., Aristida spp., Polygala spp., Lycopodium carolinianum
24B. Soil Summary (by community type)
Soil series: Invershiel and Meggett
Soil classification: Spodosols
Soil association: Invershiel-Meggett
pH class: Frequently 7.5 or higher; localized conditions with slightly acidic soils or acidic surface horizons, seldom lower than pH of 6.
Moisture class: Well drained to poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

24C. Hydrology Summary (by community type)
Hydrologic system: Palustrine
Hydrologic subsystem: Interaqueous
Water chemistry: Fresh
Water regime: Saturated
Drainage class: Somewhat poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly drained flat to gently sloping savanna over calcareous substrates of the Invershiel-Meggett soil association.

24D. Topography Summary
Landform: Terrace; flat
Shelter: Open
Aspect: None
Slope Angle: Nearly level with slight slope to the south (0-2°)
Profile: Flat
Surface patterns: Nearly smooth
Position: Not applicable

25. Physiographic characterization of natural area: A fire-maintained climax community of a basic psammosere on a flat to gently sloping terrace of Sandy Run Swamp, a tributary of the Northeast Cape Fear River. The terrace is underlain by Eocene Castle Hayne limestone in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Eocene Castle Hayne limestone
Geological Formation age: 40-50 million years

26. Summary - Endangered and threatened species
(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: several hundred
Size or maturity of individuals: Various; immature to mature
Phenology of population: Vegetative: 60%; Flowering: 40%; Fruiting: not determined
General vigor of population: Very vigorous
Disturbance or threats to population: Limestone mining, local collecting
Habitat characteristics:
   Plant community: Longleaf pine savanna
Topography: Flat
Soil series: Invershiel and/or Meggett
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River
Other plants and animal species present: Plants: Drosera capillaris, Drosera leucantha, Polygala lutea, Polygala cruciata, Rhexia mariana, Rhexia alifanus, Habenaria spp., Marshallia graminifolia; Animals: see attached master species lists.

(2) Name of species: (Proposed, new to North Carolina) Allium stellatum (LILIACEAE) Prairie onion
Species legal status and authority: None
Number of populations on site: 2
Number of individuals per population: 10 and 40
Size or maturity of individuals: Mature
Phenology of population: Vegetative: Not determined; Flowering: 100%; Fruiting: 80%
General vigor of population: Very vigorous to fair
Disturbance or threats to population: The larger population subject to eradication if road to quarry is widened.
Habitat characteristics:
  Plant community: Ecotonal margin between wiregrass savanna and mixed hardwood/cypress drainage; also mixed hardwoods
  Topography: Level to slightly concave
  Soil series: Invershiel and/or Meggett
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River
Other plants and animal species present: Agalinis purpurea, Oxypolis ternata, Andropogon sp., Aristida stricta, Zigadenus glaberrimus, Coreopsis helianthoides, Helenium autumnale; Animals: see attached master species lists.

(3) Name of species: Thalictrum cooleyi (RANUNCULACEAE) Cooley's meadow rue
Species legal status and authority: NC endangered endemic (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: Ca. 25
Size or maturity of individuals: Immature and mature
Phenology of population: Vegetative: 60%; Flowering: 40%; Fruiting: not determined
General vigor of population: Fair
Disturbance or threats to population: Shading
Habitat characteristics:
  Plant community: Ecotone of wiregrass savanna and mixed hardwoods
  Topography: Flat to slightly concave
  Soil series: Invershiel and/or Meggett
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River
Other plants and animal species present: Plants: Carex sp., Elephantopus carolinianus, Rosa palustris, Myrica cerifera, Asclepias lanceolata; Animals: see attached master species lists.
(4) Name of species: **Parnassia caroliniana** (SAXIFRAGACEAE) Carolina parnassia  
Species legal status and authority: NC threatened (Cooper et al. 1977)  
Number of populations on site: 1, possibly others  
Number of individuals per population: 40  
Size or maturity of individuals: Mature  
Phenology of population: Vegetative: 100%  
General vigor of population: Fair  
Disturbance or threats to population: None  
Habitat characteristics:  
   Plant community: Longleaf pine/wiregrass savanna  
   Topography: Level  
   Soil series: Invershiel and/or Meggett  
   Microclimate: Not determined  
   Drainage basin: Northeast Cape Fear River  
   Other plants and animal species present: Plants: *Andropogon* sp., *Asclepias lanceolata*, *Marshallia graminifolia*, *Aster* sp., *Polygala ramosa*, *Dichromena latifolia*; Animals: see attached master species lists.

(5) Name of species: **Agalinis aphylla** (SCROPHULARIACEAE) Scale leaf gerardia  
Species legal status and authority: NC endangered peripheral (Cooper et al. 1977)  
Number of populations on site: 1  
Number of individuals per population: 25  
Size or maturity of individuals: Mature  
Phenology of population: Vegetative: 0%; Flowering: 20%; Fruiting: 80%  
General vigor of population: Vigorous  
Disturbance or threats to population: None  
Habitat characteristics:  
   Plant community: Wiregrass savanna  
   Topography: Level  
   Soil series: Invershiel and/or Meggett  
   Microclimate: Not determined  
   Drainage basin: Northeast Cape Fear River  
   Other plants and animal species present: Plants: *Agalinis purpurea*, *Eryngium integrifolium*, *Coreopsis helianthoides*, *Helenium autumnale*, *Oxypolis ternata*, *Andropogon* sp., *Allium stellatum*, *Zigadenus glaberrimus*; Animals: see attached master species lists.

(6) Note: Late in the survey, during a brief inspection of the area, numerous plants of **Agalinis fasciculata** were seen in the general area. Population and habitat characteristics were not determined, due to time constraints.

(See FIGURE 14 for detailed map of endangered and threatened species locations.)
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
   Acer rubrum

AMARYLLIDACEAE
   Hypoxis hirsuta
   H. micrantha

ANACARDIACEAE
   Rhus copallina
   R. radicans

APICACEAE
   Centella asiatica
   Eryngium integrifolium
   E. yuccifolium
   Hydrocotyle umbellata
   Oxypolis filiformis
   O. ternata

AQUIFOLIACEAE
   Ilex coriacea
   I. glabra

ASCLEPIADACEAE
   Asclepias lanceolata

ASTERACEAE
   Aster linariifolius
   A. novi-belgii
   Baccharis halimifolia
   Balduina uniflora
   Cacalia lanceolata
   Carduus repandus
   Carphephorus tomentosus
   Chaptalia tomentosa
   Chondrophora nudata
   Chrysopsis graminifolia
   Conyza canadensis
   Coreopsis angustifolia
   C. falcata
   C. helianthoides
   C. lanceolata
   Euphrantzus nudatus
   Eupatorium capillifolium
   E. coelestinum
   E. recurvans
   E. rotundifolium
   Euthamia tenuifolia
   Helenium autumnale
   Helianthus angustifolius
   H. heterophyllus
   Krigia virginica
Liatris graminifolia
L. spicata var. resinosa
Marshallia graminifolia
Mikania scandens
Pluchea camphorata
Pyrrhopappus carolinianus
Solidago stricta
Trilisa paniculata
Vernonia angustifolia

**BIGNONIACEAE**
Campsis radicans

**BLECHNACEAE**
Woodwardia virginica

**BROMELIACEAE**
Tillandsia usneoides

**CAMPANULACEAE**
Lobelia elongata
L. nuttallii

**CLETHRACEAE**
Clethra alnifolia

**CYPERACEAE**
Carex walteriana
Dichromena latifolia
Eleocharis obtusa
Fuirena squarrosa
Psilocarya nitens
Rhynchospora baldwinii
R. cephalantha
R. fascicularis
Scleria pauciflora
S. reticularis

**CYRILLACEAE**
Cyrilla racemiflora

**DIAPENSIACEAE**
Pyxidanthera barbulata

**DIONAEACEAE**
Dionaea muscipula

**DROSERACEAE**
Drosera capillaris
D. intermedia
D. leucanthes

**ERIACEAE**
Gaylussacia dumosa
Kalmia angustifolia var. caroliniana
Lyonia ligustrina
Rhododendron atlanticum
Vaccinium crassifolium

**ERIOCAULACEAE**
Eriocaulon decangulare
Lachnocaulon anceps
FABACEAE
- Baptisia tinctoria
- Cassia fasciculata
- Centrosema virginianum
- Crotalaria purshii
- Desmodium lineatum
- D. tenuifolium
- Galactia volubilis
- Stylocanthes biflora
- Tephrosia spicata
- Zornia bracteata

FAGACEAE
- Quercus nigra

GENTIANACEAE
- Sabatia brachiata
- S. campanulata
- S. difformis

HAEMODORACEAE
- Lachnanthes caroliniana

HALORAGACEAE
- Proserpinaca palustris

HAMAMELIDACEAE
- Liquidambar styraciflua

HYPERICACEAE
- Hypericum cistifolium
- H. galioides
- H. stans

IRIDACEAE
- Iris tridentata
- Sisyrinchium mucronatum var. atlanticum

LAMIACEAE
- Pycnanthemum flexuosum
- Scutellaria integrifolia

LARACEAE
- Persea borbonia

LENTIBULARIACEAE
- Pinguicula caerulea

LILIACEAE
- Aletris farinosa
- Allium stellatum
- Lilium catesbaei
- Melanthium virginicum
- Pleea tenuifolia
- Smilax glauca
- S. laurifolia
- Tofieldia racemosa
- Zigadenus glaberrimus

LOGANIACEAE
- Gelsemium sempervirens
- Mitreola petiolata
LORANTHACEAE
Phoradendron serotinum

LYCOPODIACEAE
Lycopodium aloepecuriodes
L. carolinianum

MAGNOLIACEAE
Liriodendron tulipifera
Magnolia virginiana

MELASTOMATACEAE
Rhexia alifanus
R. lutea
R. mariana
R. petiolata

MYRICACEAE
Myrica cerifera
M. cerifera var. pumila
M. heterophylla

NYSSACEAE
Nyssa biflora

ONAGRACEAE
Ludwigia linearis
L. palustris

ORCHIDACEAE
Calopogon pallidus
C. pulchellus
Cleistes divaricata
Habenaria blephariglottis
H. ciliaris
H. clavellata
H. cristata
Pogonia ophioglossoides
Spiranthes cernua

OSMUNDACEAE
Osmunda cinnamomea
O. regalis var. spectabilis

PINACEAE
Pinus palustris
P. serotina
P. taeda

POACEAE
Agrostis hyemalis
Andropogon scoparius
A. virginicus
Anthaenantia rufa
Aristida longispica
A. stricta
A. virgata
Arundinaria gigantea
Ctenium aromaticum
Erianthus giganteus
Muhlenber gia expansa
Panicum aciculare
P. tenue
P. sp.
Paspalum dilatatum
P. praecox
POLYGALACEAE
Polygala brevifolia
P. cruciata
P. cymosa
P. hookeri
P. lutea
P. ramosa
POLYPODIACEAE
Polypodium polypodioides
PRIMULACEAE
Lysimachia loomsii
PTERIDACEAE
Pteridium aquilinum
RANUNCULACEAE
Thalictrum cooleyi
ROSACEAE
Sorbus arbutifolia
SALICACEAE
Salix caroliniana
SARRACENIACEAE
Sarracenia flava
S. purpurea
SAXIFRAGACEAE
Itea virginica
Parnassia caroliniana
SCROPHULARIACEAE
Agalinis aphylla
A. purpurea
Linaria canadensis
Penstemon laevigatus
Seymeria cassioides
SYMPOCACEAE
Symplacos tinctoria
TYPHACEAE
Typha domingensis
VERBENACEAE
Lippia nodiflora
VIOLACEAE
Viola lanceolata
TAXODIACEAE
Taxodium ascendens
T. distichum
XYRIDACEAE
Xyris baldwiniana
X. brevifolia
X. caroliniana
AMPHIBIANS

Southern Toad
Oak Toad

REPTILES

Eastern Box Turtle

BIRDS

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

Turkey Vulture
Black Vulture
Red-tailed Hawk
Bobwhite
Mourning Dove
Chimney Swift
Common Flicker
Red-bellied Woodpecker
Red-headed Woodpecker
Downy Woodpecker
Eastern Kingbird
Crested Flycatcher
Eastern Wood Pewee
Purple Martin
Blue Jay
Common Crow
Fish Crow
Carolina Chickadee
Brown-headed Nuthatch
Carolina Wren
Mockingbird
Brown Thrasher
Eastern Bluebird
Starling
White-eyed Vireo
Pine Warbler
Prairie Warbler
Common Yellowthroat
Eastern Meadowlark
Orchard Oriole
Common Grackle

PV
PV
PV
PR*
PR*
SV
PR*
PR*
PR*
PR*
SR*
SR*
SR*
SV
PV
PV
PV
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
PR*
Summer Tanager  SR*
Cardinal         PR*
Blue Grosbeak    SR*
Rufous-sided Towhee PR*
Field Sparrow    PR*

MAMMALS

Raccoon
Eastern Cottontail
Whitetail Deer
Basic Information Summary Sheet

1. Natural Area Name: Jones Creek Savanna

2. County: Pender

3. Location: The savanna is located on the south side of SR 1201 in the northwestern part of the county, northwest of Atkinson, about 3 miles by road, and on the east side of the drainage of Jones Creek. Coordinates: 34°32'N, 78°13'W (FIGURE 15).

4. Topographic Quadrangle: Atkinson, NC 1955 (15' series)

5. Size: 350 ac

6. Elevation: 60 ft to 75 ft above mean sea level

7. Access: By paved road (SR 1201) and private driveway; site is approximately 2 miles east of Black River.

8. Names of investigators: S. W. Leonard
   Ricky Davis
   P. O. Box 3475
   126 Duncansby Court
   Wilmington, NC 28406    Cary, NC 27511

9. Date(s) of Investigation: May-September 1981

10. Priority Rating: High

11A. Prose Description of Site: The Jones Creek Savanna is part of a 9,000 acre tract, privately owned, between SR 1201 and NC 53 on the east side of the Black River. The savanna has been managed for several years for timber and wildlife— the owner being aware of the significant features herein described. Wildlife food plots have been strategically located on the property, and some of these are included within the boundaries of the natural area. Although the preponderance of the tract is comprised of longleaf pine, loblolly pine, and some pond pine timber, smaller habitats of mixed pine-hardwoods and drainage ditches and pocosin are also present.

To the west of the site is a large undulating tract of sloughs and ridges which were formed by channel meandering of Black River. North, east, and southeast of the tract are agricultural lands and other tracts of pine timber, but none of the woodlands have been managed with the intensity and care as the Jones Creek tract.

Jones Creek Savanna is located near the western contact of the Lumbee-Johns-Kalmia soil association with the Lynn Haven-Leon-Kureb association. The topography is flat to gently sloping and poorly drained. The major feature of the site is a vigorous population of
FIGURE 15. Jones Creek Savanna Natural Area. Map scale: 1 in. = 2 mi.
the federally endangered Red-cockaded Woodpecker. Suitable habitat also occurs outside the boundaries of the natural area, which was here restricted to include the better part of open savanna lands.

On the upland portions of the property, and over all of the delineated natural area, there is low probability of prehistoric cultural material; however, the ridges and bluffs adjacent to Black River were utilized, and further archaeological investigations in this area may prove to be significant. Therefore, the boundaries, as identified, may need revision in the future.

11B. Prose Description of Site Significance: Three biological features of Jones Creek savanna were recorded: Red-cockaded Woodpeckers, Bachman's Sparrow, and Venus' fly-traps. The site is given additional consideration and higher rank because of protected status and excellent land management by the owner. Furthermore, the total holdings of the tract, comprising almost 10,000 acres of diverse communities, ranging from riverine swamp to high flatwoods merits placement as one of Pender County's more significant natural areas.

Field work was concentrated in the savanna portions of the property and subsequent investigations may reveal additional acreages which need to be described.

12. Significance Summary (See TABLE 6)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Owner prefers to remain anonymous.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): See 15; also Lance Peacock, The Nature Conservancy, Raleigh, and Merrill Lynch, NC Natural Heritage Program, Raleigh.

17. Attitude of owner or custodian toward preservation (contacted?): Custodian contacted. Attitude of owner is very favorable toward preservation.

18. Uses of natural area: Privately used for hunting; game management.

19. Uses of surrounding land: Wildland 70%; High-intensity forestry 30%

20. Preservation Status: Category 4, 100%
### TABLE 6. Significance summary of Jones Creek Savanna Natural Area.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endangered or threatened sp.</td>
<td>1a</td>
<td>Venus' fly-trap</td>
<td>Small population in wettest part of savanna</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1b</td>
<td>Red-cockaded Woodpecker</td>
<td>Population in good condition, natural area managed for timber and game; good habitat available</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1c</td>
<td>Bachman's Sparrow</td>
<td>Twelve males and several family groups seen</td>
</tr>
<tr>
<td>Special management area</td>
<td>2</td>
<td>Pine savanna on rotational burn program; game food plot development</td>
<td>Part of 9,000 ac preserve; diverse habitats and spp.</td>
</tr>
</tbody>
</table>
21. Regulatory protections in force: None other than those provided by landowner.

22. Threats: None

23. Management and Preservation Recommendations: None needed as presently managed. Landowner may be receptive to registration of site.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris/Aristida stricta savanna
Community cover type: Pinus palustris
General habitat feature: Longleaf pine savanna
Average canopy height: 60 ft
Estimated age of canopy trees: 60-80 years as determined by increment borings
Canopy cover: Open
Estimated size of community: Approximately 300 ac, but in discontinuous tracts, interrupted by small drainages, and areas of pocosin.
Successional stage: Fire-maintained climax
Sere type: Psammooere
Common canopy species in community cover or community type (but not dominant): Pinus serotina
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Stump sprouts of Liquidambar styraciflua, Magnolia virginiana, Persea borbonia, and Ilex glabra
Common herb stratum species in community cover or community type (but not dominant): Xyris platylepis, Lobelia nuttallii, Liatris graminifolia, Scleria sp., Sarracenia flava, Drosera capillaris, Lycopodium alopecuroides, Polygala cruciata

24B. Soil Summary (by community type)
Soil series: Lumbee, Johns, and Kalmia
Soil classification: Alfisols
Soil association: Lumbee-Johns-Kalmia
pH class: 5.0 to 6.0; very strongly acid to medium acid
Moisture class: Well drained to poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS (1972) and site testing with Lamotte test kit

24C. Hydrology Summary (by community type)
Hydrologic system: Terrestrial
Hydrologic subsystem: Wet to mesic
Water chemistry: Fresh
Water regime: Not applicable
Drainage class: Somewhat poorly drained
Drainage basin: Black River tributary of Cape Fear River
Hydrology characterization: Somewhat poorly drained elevated terrace of Black River system, nearly level to very gently sloping into the lesser drainage of Jones Creek.
24D. Topography Summary
Landform: Terrace flat
Shelter: Partly sheltered
Aspect: If applicable, west
Slope angle: Very gently sloping (0-2°) to flat
Profile: Flat
Surface patterns: Smooth
Position: Not applicable

25. Physiographic characterization of natural area: A fire-maintained climax community of a poorly drained psammosere on an upland terrace of Jones Creek, a tributary of Black River, and underlain by Cretaceous Pee Dee formation of impure limestones and sands and sandy clays of the Coastal Plain province of the Atlantic Plain.
Geological Formation: Cretaceous Pee Dee formation overlain by Quaternary sands.
Geological Formation age: Cretaceous formation: 60 million years; Quaternary sands: 6,000 to 1 million years.

26. Summary - Endangered and threatened species:
(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 40
Size or maturity of individuals: Seedlings, mature plants
Phenology of population: Vegetative: 100%; site not visited during flowering or fruiting times.
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:
  Plant community: Longleaf pine savanna
  Topography: Level
  Soil series: Lumbee, Johns, or Kalmia
  Microclimate: Not determined
  Drainage basin: Cape Fear River
  Other plants and animal species present: Plants: Sarracenia flava, Drosera sp., Eriocaulon decangulare, Xyris sp.; Animals: see attached master species lists.
(2) Name of species: Red-cockaded Woodpecker
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: Not determined
Number of individuals per population: 5 active cavities, 7 inactive cavities, 2 active starts, and 3 inactive starts
Size or maturity of individuals: Adult
Phenology of population: Not applicable
General vigor of population: Apparently healthy and reproducing
Disturbance or threats to population: None
Habitat characteristics:
Plant community:  Longleaf pine savanna
Topography:  Level
Soil series:  Lumbee, Johns, or Kalmia
Microclimate:  Not determined
Drainage basin:  Cape Fear River
Other plant and animal species present:  See attached master species lists.

(3) Name of species:  Bachman's Sparrow
Species Legal status and authority:  NC threatened (Cooper et al. 1977)
Number of populations on site:  1
Number of individuals per population:  Twelve singing males and several family groups
Size or maturity of individuals:  Immature and mature
Phenology of population:  Not applicable
General vigor of population:  Vigorous
Disturbance or threats to population:  None
Habitat characteristics:
  Plant community:  Longleaf pine savanna
  Topography:  Level
  Soil series:  Lumbee, Johns, or Kalmia
  Microclimate:  Not determined
  Drainage basin:  Cape Fear River
  Other plants and animals present:  See attached master species lists.

(See FIGURE 16 for detailed map of endangered and threatened species locations.)
FIGURE 16. Significant features of Jones Creek Savanna Natural Area. Code: (1) Endangered or threatened species, (2) Special management area. Map scale: 1 in. = 1200 ft.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
   Acer rubrum

AMARYLLIDACEAE
   Hypoxis hirsuta
   H. micrantha

ANACARDIACEAE
   Rhus radicans

APIACEAE
   Eryngium yuccifolium
   Hydrocotyle umbellata
   Oxypolis ternata

AQUIFOLIACEAE
   Ilex glabra

ASCLEPIADACEAE
   Asclepias humistrata
   A. lanceolata

ASTERACEAE
   Aster linariifolius
   A. spectabilis
   A. squarrosus
   A. tortifolius
   Carduus lecontei
   Carphephorus tomentosus
   Chaptalia tomentosa
   Chrysopsis gossypina
   C. graminifolia
   Coreopsis angustifolia
   Elephantopus nudatus
   Eupatorium album
   E. leucolepis
   E. rotundifolium
   Helianthus heterophyllus
   Liatris graminifolia
   Marshallia graminifolia
   Solidago stricta
   Trilisa odoratissima

BLECHNACEAE
   Woodwardia virginica

BROMELIACEAE
   Tillandsia usneoides

CAMPANULACEAE
   Lobelia nuttallii

CLETHRACEAE
   Clethra alnifolia

CYPERACEAE
   Dichromena latifolia
Fuirena squarrosa
Rhynchospora cephalantha
Scleria pauciflora

Cyrillaceae
Cyrilla racemiflora

Dionaeaceae
Dionaea muscipula

Droseraceae
Drosera capillaris
D. leucantha

Ericaceae
Gaylussacia dumosa
Lyonia ligustrina
Vaccinium crassifolium

Eriocaulaceae
Eriocaulon decangulare

Fabaceae
Amorpha herbacea
Baptisia cinerea
B. tinctoria
Cassia nictitans
Lespedeza virginica
Tephrosia spicata

Fagaceae
Quercus marilandica

Gentianaceae
Sabatia campanulata
S. stellaris

Haemodoraceae
Lachnathes caroliniana

Hamamelidaceae
Liquidambar styraciflua

Hypericaceae
Hypericum stans

Iridaceae
Sisyrinchium mucronatum var. atlanticum

Lamiaceae
Pycnanthemum flexuosum

Lauraceae
Persea borbonia

Lentibulariaceae
Pinguicula caerulea
P. lutea
Utricularia subulata

Liliaceae
Aletris farinosa
Lilium catesbaei
Melanthium virginicum
Smilax bona-nox
S. laurifolia
Tofieldia racemosa
Zigadenus glaberrimus
<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGANIACEAE</td>
<td>Gelsemium sempervirens</td>
</tr>
<tr>
<td></td>
<td>Mitreola petiolata</td>
</tr>
<tr>
<td>LORANTHACEAE</td>
<td>Phoradendron serotinum</td>
</tr>
<tr>
<td>LYCOPODIACEAE</td>
<td>Lycopodium aloepelcuroides</td>
</tr>
<tr>
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SCROPHULARIACEAE
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  Seymeria cassioides
SOLANACEAE
  Physalis angulata
SYMPLOCACEAE
  Symplocos tinctoria
TAXODIACEAE
  Taxodium distichum
VIOLACEAE
  Viola lanceolata
XYRIDACEAE
  Xyris ambigua
  X. baldwiniana
  X. platylepis

AMPHIBIANS

Southern Toad
Southern Cricket Frog

REPTILES

Eastern Mud Turtle
Eastern Box Turtle
Eastern Glass Lizard
Green Anole
Six-lined Racerunner
Ground Skink
Black Racer
Canebrake Rattlesnake

BIRDS

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

Turkey Vulture
Red-tailed Hawk
Bobwhite
Turkey
Mourning Dove
Common Flicker
Pileated Woodpecker
Red-bellied Woodpecker  PR*
Downy Woodpecker  PR*
Red-cockaded Woodpecker  PR*
Eastern Kingbird  SR*
Crested Flycatcher  SR*
Eastern Wood Pewee  SR*
Blue Jay  PR*
Common Crow  PR*
Carolina Chickadee  PR*
Tufted Titmouse  PR*
Brown-headed Nuthatch  PR*
Carolina Wren  PR*
Mockingbird  PR*
Catbird  PR*
Brown Thrasher  PR*
Eastern Bluebird  PR*
Blue-gray Gnatcatcher  SR*
Starling  PR*
White-eyed Vireo  SR*
Red-eyed Vireo  SV
Northern Parula Warbler  SV
Yellow-throated Warbler  SV
Pine Warbler  PR*
Prairie Warbler  SR*
Common Yellowthroat  PR*
Yellow-breasted Chat  SR*
Eastern Meadowlark  PR*
Orchard Oriole  SR*
Common Grackle  PR*
Brown-headed Cowbird  PR*
Summer Tanager  SR*
Cardinal  PR*
Indigo Bunting  SR*
Blue Grosbeak  SR*
Rufous-sided Towhee  PR*
Field Sparrow  PR*
Bachman's Sparrow  PR*

MAMMALS

Raccoon
Eastern Mole
Eastern Gray Squirrel
Eastern Cottontail
Whitetail Deer
Basic Information Summary Sheet

1. Natural Area Name: 421 Sand Ridge
2. County: Pender
3. Location: On both sides of US 421, from the Pender-New Hanover County line, northwest for approximately 3 miles. The natural area is bounded of the east by the swamp of the Northeast Cape Fear River and on the west by the swamp of Black River, included in the Black River Natural Area. Coordinates: 34°22'N, 78°01'W (FIGURE 17).
4. Topographic Quadrangle: Acme, NC 1954 (15' series)
5. Size: 3,080 ac
6. Elevation: 10 ft to 40 ft above mean sea level
7. Access: Pedestrian access from US 421; infrequent hunter trails usually gated and locked.
8. Names of Investigators: S. W. Leonard       Ricky Davis
               P. O. Box 3475            126 Duncansby Court
               Wilmington, NC 28406    Cary, NC 27511
9. Date(s) of Investigation: May 6 and August 28, 1981
10. Priority rating: High
11A. Prose Description of Site: The 421 Sand Ridge Natural Area occupies a peninsula between the Northeast Cape Fear and the Cape Fear Rivers. The geologic processes which were responsible for this landform include marine, riverine, and eolian factors. Sand was initially deposited during Pleistocene high sea level periods, uplifted, became increasingly well drained as the river valleys deepened, and during previous periods of vegetation cover absence, was sculptured by wind erosion and deposition. This landform is unique in North Carolina, partly because few other narrow peninsulas between major river systems have the contrast in elevation and particle size magnitude that is found on the 421 ridge. (A similar peninsula is present in South Carolina at the confluence of the Pee Dee and Little Pee Dee Rivers.) Subsurface sand is yellow and deep; surface material is highly leached, and appears white, or grayish when mixed with organics. The topography is seldom level, and the surface is marked by eolian depressions, solution slumps, Carolina bay ellipses, and sluggish, meandering streams.

From the crest of the ridge to the river swamps, the cover vegetation changes from longleaf pine - turkey oak to longleaf pine - gallberry and eventually to pond pine pocosin. Wet depressions are usually filled
FIGURE 17. 421 Sand Ridge Natural Area. Map scale: 1 in. = 2 mi.
by thickets of evergreen shrubs and catbrier or occasionally by pond
cypress. Forests on the ridge do not contain unusual-size trees,
unique assemblages of species, or high volume boardfootage. The
natural area includes, however, colonies of the federally-protected
Red-cockaded Woodpecker, and the size class and condition of the
longleaf pine forests indicates that a larger population of birds
could be sustained, under proper management conditions. Altogether
the 421 Sand Ridge Natural Area contains the largest area of longleaf
pine - turkey oak forest that we found in Pender County.

11B. Prose Description of Site Significance: The so-called "Brunswick
Escarpment" extends from Brunswick County, near Orton Plantation,
across northwestern New Hanover County, and terminates in southern
Pender County--as the 421 sand ridge. While escarpments such as
this are not unknown elsewhere, the occurrence in North Carolina of
a sizeable sand body, excluding the fall-line sandhills, is relatively
unique. A second factor of significance in this natural area is the
occurrence of several colonies of Red-cockaded Woodpeckers.

Prehistoric and historic significance was not investigated during
this study, but prior to 1980, several archaeological forays in the
area produced noteworthy collections of artifacts. Aboriginal implements
have been found in the area which indicate occupancy around 5,000
years before present. Further investigations along these lines should
be conducted.

12. Significance Summary (See TABLE 7)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%

14. Number of Owners: Generally, 2

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers,
and other pertinent information):
   (1) Bruce B. Cameron, 2219 Blythe Rd., Wilmington, NC (763-1054)
   (2) Corbett Package Co., and Corbett Industries, Wrightsboro (Wilmington),
       NC (763-4646)

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and
other pertinent information): Jay Carter, Southern Pines, is familiar
with locations of Red-cockaded Woodpeckers in natural area.

17. Attitude of owner or custodian toward preservation (contacted?):
Owners not contacted, but reportedly favor industrial development of
tract.

18. Uses of natural area: Hunting

19. Uses of surrounding land: Wildland 100%
TABLE 7. Significance summary of 421 Sand Ridge Natural Area.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endangered or threatened sp.</td>
<td>1a</td>
<td>Beyrich's bog button</td>
<td>Stable population with intermediates; infrequent</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>1b</td>
<td>Red-cockaded Woodpecker</td>
<td>Several small colonies; fairly good habitat</td>
</tr>
<tr>
<td>Outstanding geomorphologic feature</td>
<td>2</td>
<td>Brunswick escarpment</td>
<td>Present in three-county area only</td>
</tr>
</tbody>
</table>
20. Preservation Status: Category 7, 100%

21. Regulatory protections in force: Unknown

22. Threats: No major threats are evident.

23. Management and Preservation Recommendation: Because both of the principal landowners are among the largest landholders in Pender County, there may be opportunity to preserve all or significant pieces of this natural area. Based on land use trends in New Hanover County and the apparent planning and zoning strategy in Brunswick to encourage industrial development, the Pender County portion of the Brunswick Escarpment may, in the future, be all that remains in a natural condition. Therefore, it is recommended that second phase investigation (precise boundary delineation, discussion with landowners, etc.) be conducted. Fire is a significant component of ecology of this natural area, and piecemeal industrial and/or residential development may require increased fire protection of both developed and undeveloped woodlands. Should this be the case, management and preservation would be difficult to implement.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris-Quercus laevis/Aristida stricta forest
Community cover type: Pinus palustris
General habitat feature: Longleaf pine sand ridge
Average canopy height: 35 ft
Estimated age of canopy trees: 40-70 years
Canopy cover: Varies from closed to open
Estimated size of community: Probably more than 10,000 ac, but in the circumscribed natural area, possibly 75 percent of the 3,080 ac.
Successional stage: Edaphic climax
Sere type: Psammosere
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): Quercus margaretta, Quercus incana
Common herb stratum species in community cover or community type (but not dominant): Cnidoscolus stimulus, Chrysopsis gossypina, Stipulicida setacea, Agalinis setacea, Selaginella arenicola spp. acanthonota

24B. Soil Summary (by community type)
Soil series: Kureb, Rimini, Lakeland, Leon, and Wakulla sands
Soil classification: Not determined
Soil association: Lynn Haven-Leon-Kureb
pH class: Very strongly acid
Moisture class: Excessively drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

24C. Hydrology Summary (by community type)
Hydrologic system: Terrestrial
Hydrologic subsystem: Very dry-xeric
Water chemistry: Fresh
Water regime: Not applicable
Drainage class: Excessively drained
Drainage basin: Northeast Cape Fear and Cape Fear Rivers
Hydrology characterization: Excessively drained sand ridge occupying the peninsula between the Northeast Cape Fear and the Cape Fear River Basins.

24D. Topography Summary
Landform: Escarpment sand ridge
Shelter: Open to partly sheltered
Aspect: Northeast - southwest
Slope Angle: Gently sloping to sloping
Profile: Constant, with slight variations of microrelief
Surface patterns: Irregular
Position: Upper and mid-slope

25. Physiographic characterization of natural area: An edaphic climax community of a psammosere on an escarpment sand ridge, scalloped laterally by meanders of the Northeast Cape Fear and Cape Fear Rivers, and vertically by wind erosion, Carolina bay formation, and/or solution slumping. The ridge drains into both river basins, is underlain by Eocene Castle Hayne limestone, and is comprised of deep sands of Pleistocene and Holocene origin, deposited in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Eocene Castle Hayne limestone; Pleistocene and Holocene sands
Geological Formation age: Eocene formation: 40-50 million years; Pleistocene deposits: 6,000 to ca. 3 million years before present; Holocene: slightly less than 6,000 years before present

26. Summary - Endangered and threatened species:
(1) Name of species: Red-cockaded Woodpecker
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: Not determined
Number of individuals per population: Five trees with active cavities, inactive cavities or starts were seen; also one bird.
Size or maturity of individuals: Presumed to be a breeding population
Phenology of population: Not applicable
General vigor of population: Not determined
Disturbance or threats to population: None visible
Habitat characteristics:
  Plant community: Longleaf pine - turkey oak sand ridge
  Topography: Gently sloping to sloping
  Soil series: Kureb sand
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River, Cape Fear River
Other plants and animal species present: Plants: Polygonella polygama, Froelichia sp., Vaccinium sp.; Animals: see attached master species lists.

(See FIGURE 18 for detailed map of endangered and threatened species locations.)
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE
  Acer rubrum

AMARANTHACEAE
  Froelichia floridana

AMARYLLIDACEAE
  Hypoxis hirsuta
  H. micrantha

ANACARDIACEAE
  Rhus copallina
  R. radicans
  R. toxicodendron

ANNONACEAE
  Asimina parviflora

APIACEAE
  Centella asiatica

AQUIFOLIACEAE
  Ilex cassine
  I. cassine var. myrtifolia
  I. coriacea
  I. glabra
  I. opaca

ASPLENIACEAE
  Asplenium platyneuron

ASTERACEAE
  Ambrosia artemisiifolia
  Carduus lecontei
  C. spinosissimus
  Chondrophora nudata
  Chrysopsis gossypina
  C. graminifolia
  Conyza canadensis
  Coreopsis angustifolia
  Erigeron quercifolius
  Eupatorium capillifolium
  E. recurvans
  Haplopappus divaricatus
  Helcnium amarum
  Krigia virginica
  Liatris graminifolia
  Marshallia graminifolia
  Mikania scandens
  Silphium compositum
  Trilisa paniculata

BLECHNACEAE
  Woodwardia areolata
  W. virginica
BROMELIACEAE
  Tillandsia usneoides
CACTACEAE
  Opuntia compressa
CAPRIFOLIACEAE
  Lonicera sempervirens
CARYOPHYLLACEAE
  Arenaria caroliniana
  Stipulicida setacea
CISTACEAE
  Lechea villosa
CLETHRAEAE
  Clethra alnifolia
COMMELINACEAE
  Tradescantia rosea var. graminea
CONVOLVULACEAE
  Bonamia patens var. patens
  B. patens var. angustifolia
  Ipomoea pandurata
CYPERACEAE
  Bulbostylis capillaris
  B. ciliatifolia
  Carex grayi
  Dichromena latifolia
  Rhynchospora chalarocephala
  R. corniculata
DIAPENSIACEAE
  Pyxidanthera barbulata
DROSERACEAE
  Drosera capillaris
EBENACEAE
  Diospyros virginiana
ERICACEAE
  Gaylussacia dumosa
  G. frondosa
  Lyonia lucida
  Rhododendron atlanticum
  Vaccinium arboreum
  V. crassifolium
  V. elliottii
  V. stamineum
  V. tenellum
ERIOCAULACEAE
  Lachnocaulon anceps
  L. beyrichianum
EUPHORBIACEAE
  Cnidoscolus stimulosus
  Euphorbia ipecacuanhae
FABACEAE
  Amorpha herbacea
Baptisia tinctoria
Crotalaria purshii
Galactia regularis
Lupinus perennis
L. villosus
Rhynchosia difformis
Tephrosia spicata

FAGACEAE
Castanea pumila
Quercus incana
Q. laevis
Q. margaretta
Q. pumila
Q. virginiana

HYPERICACEAE
Hypericum reductum

LAURACEAE
Persea borbonia
Sassafras albidum

LILIACEAE
Smilax bona-nox
S. laurifolia

LOGANIACEAE
Gelsemium sempervirens

LYCOPODIACEAE
Lycopodium alopecuroides
L. carolinianum

MELASTOMATACEAE
Rhexia mariana

MYRICACEAE
Myrica cerifera

NYSSACEAE
Nyssa biflora

OLEACEAE
Osmanthus americanus

OSMUNDACEAE
Osmunda cinnamomea
O. regalis var. spectabilis

PINACEAE
Pinus palustris
P. serotina
P. taeda

POACEAE
Andropogon scoparius
A. virginicus
Arundinaria gigantea
Panicum ciliatum
P. lancearium

POLYGALACEAE
Polygala cymosa
POLYGONACEAE
   Polygonella polygama
PTERIDACEAE
   Pteridium aquilinum
RUBIACEAE
   Richardia scabra
SCROPHULARIACEAE
   Agalinis purpurea
    A. setacea
    Seymeria cassioides
SELAGINELLACEAE
   Selaginella arenicola spp. acanthonota
TAXODIACEAE
   Taxodium distichum
VERBENACEAE
   Callicarpa americana
VITACEAE
   Vitis rotundifolia

AMPHIBIANS

Southern Toad
Oak Toad
Southern Cricket Frog
Squirrel Tree Frog

REPTILES

Eastern Glass Lizard
Green Anole
Six-lined Racerunner
Ground Skink
Black Racer

BIRDS

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

Turkey Vulture                                  PV
Red-tailed Hawk                                 PV
American Kestrel                                WR
Bobwhite                                        PR*
<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Status</th>
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<tr>
<td>Mourning Dove</td>
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<tr>
<td>Common Nighthawk</td>
<td>SR*</td>
</tr>
<tr>
<td>Common Flicker</td>
<td>PR*</td>
</tr>
<tr>
<td>Red-cockaded Woodpecker</td>
<td>PR*</td>
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<tr>
<td>Eastern Kingbird</td>
<td>SR*</td>
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<tr>
<td>Crested Flycatcher</td>
<td>SR*</td>
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<td>Blue Jay</td>
<td>PR*</td>
</tr>
<tr>
<td>Common Crow</td>
<td>PR*</td>
</tr>
<tr>
<td>Fish Crow</td>
<td>PV</td>
</tr>
<tr>
<td>Carolina Chickadee</td>
<td>PR*</td>
</tr>
<tr>
<td>Brown-headed Nuthatch</td>
<td>PR*</td>
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<tr>
<td>Carolina Wren</td>
<td>PR*</td>
</tr>
<tr>
<td>Mockingbird</td>
<td>PR*</td>
</tr>
<tr>
<td>Catbird</td>
<td>PR*</td>
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<tr>
<td>American Robin</td>
<td>WR</td>
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<tr>
<td>Eastern Bluebird</td>
<td>PR*</td>
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<tr>
<td>Blue-gray Gnatcatcher</td>
<td>SR*</td>
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<tr>
<td>Starling</td>
<td>PR*</td>
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<td>Prairie Warbler</td>
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<td>Eastern Meadowlark</td>
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<tr>
<td>Red-winged Blackbird</td>
<td>PV</td>
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<tr>
<td>Common Grackle</td>
<td>PR*</td>
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<td>PR*</td>
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<tr>
<td>Blue Grosbeak</td>
<td>SR*</td>
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<tr>
<td>Rufous-sided Towhee</td>
<td>PR*</td>
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<tr>
<td>Field Sparrow</td>
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**MAMMALS**

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<thead>
<tr>
<th>Mammal</th>
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</thead>
<tbody>
<tr>
<td>Eastern Mole</td>
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<td>Eastern Fox Squirrel</td>
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<tr>
<td>Eastern Cottontail</td>
</tr>
<tr>
<td>Whitetail Deer</td>
</tr>
</tbody>
</table>
NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Moores Creek Wildlife Reservation

2. County: Pender

3. Location: The natural area stretches from NC 53 along both sides of Moores Creek, downstream to a point about a mile south of Moores Creek National Military Park, and includes the bottomlands of Mill Branch upstream to SR 1128 and an area of flatwoods along SR 1100. Coordinates: 34°30'N, 78°08'W (FIGURE 19).

4. Topographic Quadrangle(s): Acme, NC 1954; Atkinson, NC 1955 (15' series)

5. Size: 4,500 ac

6. Elevation: 8 ft to 60 ft above mean sea level

7. Access: Natural area can be reached by travelling west from US 421 on NC 210, following the signs to Moores Creek National Military Park, or by following NC 53 west toward Atkinson. An excellent access route is to follow SR 1125 between Yamacraw and Rooks. Limited access is possible via the abandoned Atlantic Coast Line Railroad right-of-way northwest of Currie.

8. Names of Investigators: S. W. Leonard Ricky Davis
   P. O. Box 3475 126 Duncansby Court
   Wilmington, NC 28406 Cary, NC 27511

9. Date(s) of Investigation: May-September 1981

10. Priority Rating: High

11A. Prose Description of Site: Moores Creek Wildlife Reservation (and registered black bear sanctuary) is a consolidated tract of land that formerly consisted of several parcels belonging to various members of the Simpson family, and now held under a single ownership. The land is situated on both sides of Moores Creek and is largely wooded, the major vegetation type of the lowlands being seasonally flooded cypress and mixed hardwoods, whereas the uplands are comprised of loblolly pine woods, old fields, or cultivated lands.

   Brief community surveys were made where the major roads cross the floodplain of Moores Creek; interior sections of the tract were not inventoried. There is no reason to indicate that community composition differs greatly from the southern extremity of the tract to the northern limits. Because the tract connects with the extreme lower portion of Moores Creek, and hence with the Black River corridor, the contiguity of forest provides sanctuary and lengthy habitat for wide-ranging fauna.
FIGURE 19. Moores Creek Wildlife Reservation Natural Area. Map scale: 1 in. = 2 mi.
No unique communities, assemblages of species, endangered or threatened plant species were found in the Moores Creek Wildlife Reservation. In addition, landforms and underlying rock types and soil associations are not significantly different from other inner coastal plain streams. Consequently the site was included as a significant natural area in Pender County for other than botanical reasons.

11B. Prose Description of Site Significance: The features of Moores Creek Wildlife Reservation which make it a significant site are (1) the owner's attitude toward preservation and management, (2) the fact that the tract is relatively large and not divided into small landholdings, (3) the assemblages of communities are representative of large coastal plain stream floodplains and slopes, (4) the already existing registration of the area as a game sanctuary, and (5) the presence of at least one thriving colony of the federally endangered Red-cockaded Woodpecker. Additionally, and with possible future implications for park status, is the location of the tract adjacent to the Moores Creek National Military Park.

12. Significance Summary (See TABLE 8)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%

14. Number of Owners: 1

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Dr. C. F. Simpson; Route 1, Box 273-A; Atkinson, NC 28421

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): None known

17. Attitude of owner or custodian toward preservation (contacted?): Owner was very cordial when contacted and provided a considerable volume of background information pertaining to the Simpson family, their activities in the community, and historical details of the plantation and family home. The owner's attitude toward preservation was assessed as excellent.

18. Uses of natural area: Marginal areas of agriculture, timber management, but largely game management for very limited large and small game hunting.

19. Uses of surrounding land: Wildland 30%; Agricultural land 40%; High-intensity forestry 15%; Developed 10% Undeveloped park land 5%

20. Preservation Status: Category 4, 100% (This area may be Category 5 land, depending upon criteria of which we were unaware.)
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endangered or threatened sp.</td>
<td>1</td>
<td>Red-cockaded Woodpecker</td>
<td>Active colony in declining habitat; 11 cavity (active and inact.) trees</td>
</tr>
<tr>
<td>Special management area</td>
<td>2</td>
<td>Black bear sanctuary</td>
<td>Large corridor connecting with Black River/Cape Fear River swamps</td>
</tr>
<tr>
<td>High faunistic diversity</td>
<td>3</td>
<td>Passerine bird habitat</td>
<td>Bottomland swamps and nearby pine woods offer secluded space for birds</td>
</tr>
</tbody>
</table>
21. Regulatory protections in force: Large portions of the property are regulated wetlands, being contiguous to navigable waters.

22. Threats: No major threats to the area.

23. Management and Preservation Recommendation: None beyond those procedures already implemented by owner.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary
Community type: CT-1: Taxodium distichum-Mixed hardwoods
Community cover type: Taxodium distichum
General habitat feature: Bottomland swamp
Average canopy height: 50-60 ft
Estimated age of canopy trees: 50 years
Canopy cover: Closed
Estimated size of community: 2,500 ac
Successional stage: Late transient
Sere type: Hydrosere
Common canopy species in community cover or community type (but not dominant): Betula nigra, Liquidambar styraciflua, Pinus taeda, Quercus michauxii
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Alnus serrulata, Itea virginica, Ilex opaca
Common herb stratum species in community cover or community type (but not dominant): Orontium aquaticum, Pluchea camphorata, Boehmeria cylindrica

Community type: CT-2 Pinus taeda/Ilex glabra
Community cover type: Pinus taeda
General habitat feature: Pine flatwoods
Average canopy height: 60 ft
Estimated age of canopy trees: 75 years
Canopy cover: Closed
Estimated size of community: 1,000 ac
Successional stage: Transient
Sere type: Psammosere
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): Vaccinium atrooccum, Magnolia virginiana
Common herb stratum species in community cover or community type (but not dominant): Cnidoscolus stimulosus, Andropogon virginicus, Panicum sp.

24B. Soil Summary (CT-1)
Soil series: Lumbee
Soil classification: Not determined
Soil association: Lumbee-Johns-Kalmia
pH class: Very strongly acid to medium acid
Moisture class: Poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).
Soil Summary (CT-2)
Soil series: Johns and Kalmia
Soil classification: Not determined
Soil association: Lumbee-Johns-Kalmia
pH class: Strongly acid to medium acid
Moisture class: Somewhat poorly drained to well drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

24C. Hydrology Summary (CT-1)
Hydrologic system: Riverine
Hydrologic subsystem: Lower perennial
Water chemistry: Fresh
Water regime: Intermittently flooded
Drainage class: Poorly drained
Drainage basin: Cape Fear River
Hydrology characterization: Poorly drained bottomlands adjacent to and including Moores Creek,

Hydrology Summary (CT-2)
Hydrologic system: Terrestrial
Hydrologic subsystem: Mesic to dry-mesic
Water chemistry: Fresh
Water regime: Not applicable
Drainage class: Somewhat poorly drained to moderately well drained
Drainage basin: Cape Fear River
Hydrology characterization: Somewhat poorly drained to moderately well drained sands occupying elevated terraces, sub-basin slopes, level inter-basin, slightly eroded plains.

24D. Topography Summary (CT-1)
Landform: Alluvial plain
Shelter: Deeply sheltered
Aspect: East-west
Slope angle: Less than 2%
Profile: Irregular to flat to slightly concave
Surface patterns: Slightly undulating to smooth
Position: Entire plain

Topography Summary (CT-2)
Landform: Interbasin flat
Shelter: Partly sheltered
Aspect: Not applicable
Slope angle: Mostly less than 2%
Profile: Flat
Surface patterns: Smooth
Position: Not applicable

25. Physiographic characterization of natural area: Moores Creek Natural Area is a biologically, edaphically, hydrologically, and topographically diverse area of two major habitat types, bottomlands and uplands, which are dominated by transients and which drain into the Cape Fear River Basin
of the Coastal Plain province of the Atlantic Plain.
Geological Formation: Cretaceous Pee Dee formation overlain by Pleistocene and Holocene sands
Geological Formation age: Cretaceous formation: 60 million years Pleistocene and Holocene: 3 million years to present

26. Summary - Endangered and threatened species
(1) Name of species: Red-cockaded Woodpecker
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations of site: 1 observed
Number of individuals per population: Two birds (adults) seen; one nest containing chicks located; seven inactive cavities and starts in live trees; two inactive cavities in dead trees; and one active start.
Size or maturity of populations: Adult and immature
Phenology of population: Not applicable
General vigor of population: Evidence of reproduction
Disturbance or threats to population: None present, although understory is dense, and if not burned in a few years could jeopardize degree of site activity.
Habitat characteristics:
Plant community: Loblolly pine forest
Topography: Level
Soil series: Probably Kalmia, but not determined
Microclimate: Not determined
Drainage basin: Cape Fear River
Other plants and animal species present: Plants: Ilex glabra, Ilex opaca, Liquidambar styraciflua, Magnolia virginiana, Gaylussacia frondosa, Acer rubrum, Vaccinium spp.; Animals: see attached master species lists.

(See FIGURE 20 for detailed map of endangered species location.)
FIGURE 20. Significant features of Moores Creek Wildlife Reservation Natural Area. Code: (1) Endangered or threatened species, (2) Special management area, (3) High faunistic diversity. Map scale: 1 in = 2 mi.
27. Master Species Lists:

**VASCULAR PLANTS**
(listed alphabetically by family)

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACANTHACEAE</td>
<td>Justicia ovata</td>
</tr>
<tr>
<td>ACERACEAE</td>
<td>Acer rubrum</td>
</tr>
<tr>
<td>ALISMATACEAE</td>
<td>Sagittaria falcata</td>
</tr>
<tr>
<td></td>
<td>S. graminea</td>
</tr>
<tr>
<td>AMARANTHACEAE</td>
<td>Alternanthera philoxeroides</td>
</tr>
<tr>
<td>AMARYLLIDACEAE</td>
<td>Hymenocallis crssifolia</td>
</tr>
<tr>
<td>ANACARDIACEAE</td>
<td>Rhus radicans</td>
</tr>
<tr>
<td></td>
<td>R. vernix</td>
</tr>
<tr>
<td>APIACEAE</td>
<td>Centella asiatica</td>
</tr>
<tr>
<td></td>
<td>Cicuta maculata</td>
</tr>
<tr>
<td></td>
<td>Hydrocotyle umbellata</td>
</tr>
<tr>
<td></td>
<td>Ptilimnium capillaceum</td>
</tr>
<tr>
<td>AQUIFOLIACEAE</td>
<td>Ilex coriacea</td>
</tr>
<tr>
<td></td>
<td>I. glabra</td>
</tr>
<tr>
<td></td>
<td>I. opaca</td>
</tr>
<tr>
<td></td>
<td>I. verticillata</td>
</tr>
<tr>
<td>ARACEAE</td>
<td>Arisaema triphyllum</td>
</tr>
<tr>
<td></td>
<td>Orontium aquaticum</td>
</tr>
<tr>
<td></td>
<td>Peltandra virginica</td>
</tr>
<tr>
<td>ASPIDIACEAE</td>
<td>Athyrium asplenioides</td>
</tr>
<tr>
<td></td>
<td>Onoclea sensibilis</td>
</tr>
<tr>
<td></td>
<td>Thelypteris palustris</td>
</tr>
<tr>
<td>ASPLENIACEAE</td>
<td>Asplenium platyneuron</td>
</tr>
<tr>
<td>ASTERACEAE</td>
<td>Eupatorium fistulosum</td>
</tr>
<tr>
<td></td>
<td>Mikania scandens</td>
</tr>
<tr>
<td></td>
<td>Senecio glabellus</td>
</tr>
<tr>
<td></td>
<td>Vernonia noveboracensis</td>
</tr>
<tr>
<td>BETULACEAE</td>
<td>Alnus serrulata</td>
</tr>
<tr>
<td></td>
<td>Betula nigra</td>
</tr>
<tr>
<td></td>
<td>Carpinus caroliniana</td>
</tr>
<tr>
<td>BIGNONIACEAE</td>
<td>Anisostichus capreolata</td>
</tr>
<tr>
<td></td>
<td>Campsis radicans</td>
</tr>
</tbody>
</table>
BLECHNACEAE
   Woodwardia areolata
   W. virginica
BROMELIACEAE
   Tillandsia usneoides
CAMBANULACEAE
   Lobelia cardinalis
CAPRIFOLIACEAE
   Lonicera japonica
   L. sempervirens
   Sambucus canadensis
   Viburnum nudum
   V. prunifolium
CLETHRACEAE
   Clethra alnifolia
CORNACEAE
   Cornus amomum
   C. florida
   C. stricta
CYPERACEAE
   Carex albolutecens
   C. comosa
   C. crinita
   C. folliculata var. australis
   C. intumescens
   C. leptalea
   C. rosea
   C. tribuloides
   Cyperus iria
   C. strigosus
   Scirpus cyperinus
CYRILLACEAE
   Cyrilla racemiflora
ERICACEAE
   Chimaphila maculata
   Epigaea repens
   Gaylussacia frondosa
   Kalmia angustifolia var. caroliniana
   Leucothoe axillaris
   L. racemosa
   Lyonia ligustrina
   L. lucida
   L. mariana
   Rhododendron viscosum
   Vaccinium atrooccum
   V. corymbosum
   V. crassifolium
   V. elliottii
   V. stamineum
EUPHORBIACEAE
   Acalypha rhomboidea
FABACEAE
- Amorpha fruticosa
- A. herbacea
- Apios americana
- Clitoria mariana
- Indigofera caroliniana
- Melilotus officinalis
- Pueraria lobata
- Trifolium campestre
- Vicia angustifolia
- Wisteria frutescens

FAGACEAE
- Quercus laurifolia
- Q. lyrata
- Q. michauxii
- Q. nigra

HAMAMELIDACEAE
- Liquid amber styraciflua

JUGLANDACEAE
- Carya aquatica

LAURACEAE
- Persea borbonia

LILIACEAE
- Smilax glauca
- S. laurifolia
- S. rotundifolia

LOGANIACEAE
- Gelsemium sempervirens

LORANTHACEAE
- Phoradendron serotinum

MAGNOLIACEAE
- Liriodendron tulipifera
- Magnolia virginiana

MYRICACEAE
- Myrica cerifera
- M. heterophylla

NYMPHAEACEAE
- Nuphar luteum ssp. sagittifolium

NYSSACEAE
- Nyssa aquatica
- N. biflora
- N. sylvatica

OLEACEAE
- Chionanthus virginicus
- Fraxinus caroliniana
- F. pensylvanica
- F. tomentosa
- Ligustrum sinense
- Osmanthus americana

ONAGRACEAE
- Ludwigia palustris
OSMUNDACEAE
  Osmunda cinnamomea
  O. regalis var. spectabilis
PINACEAE
  Pinus taeda
PLATANACEAE
  Platanus occidentalis
POACEAE
  Arundinaria gigantea
  Erianthus giganteus
  Glyceria striata
  Sacciolepis striata
POLYGONACEAE
  Polygonum arifolium
  P. hydropiperoides
  P. punctatum
  P. sagittatum
POLYPODIOIDES
  Polypodium polypodioides
PRIMULACEAE
  Samolus parviflorus
RHAMNACEAE
  Berchemia scandens
ROSACEAE
  Rosa palustris
RUBIACEAE
  Cephalanthus occidentalis
  Galium circaeazans
SALICACEAE
  Populus heterophyllus
  Salix nigra
SAURURACEAE
  Saururus cernuus
SAXIFRAGACEAE
  Decumaria barbara
  Itea virginica
SCROPHULARIACEAE
  Gratiola virginiana
  Micranthemum umbrosum
TAXODIACEAE
  Taxodium distichum
TYPHACEAE
  Typha latifolia
ULMACEAE
  Ulmus americana
URTICACEAE
  Boehmeria clyndrica
VITACEAE
  Ampelopsis arborea
  Parthenocissus quinquefolia
  Vitis rotundifolia
AMPHIBIANS

Slimy Salamander
Southern Toad
Leopard Frog
Bullfrog

REPTILES

Stinkpot
Eastern Box Turtle
Spotted Turtle
Yellow-bellied Turtle
Green Anole
Fence Lizard
Ground Skink
Five-lined Skink
Eastern Garter Snake
Eastern King Snake

BIRDS

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

Green Heron
Wood Duck
Turkey Vulture
Black Vulture
Red-tailed Hawk
Red-shouldered Hawk
Bobwhite
Mourning Dove
Yellow-billed Cuckoo
Chimney Swift
Ruby-throated Hummingbird
Common Flicker
Pileated Woodpecker
Red-bellied Woodpecker
Hairy Woodpecker
Downy Woodpecker
Red-cockaded Woodpecker
Eastern Kingbird
Great Crested Flycatcher
Acadian Flycatcher
Eastern Wood Pewee
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Carolina Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown-headed Nuthatch
Carolina Wren
Mockingbird
Catbird
Brown Thrasher
American Robin
Wood Thrush
Blue-gnat Gnatcatcher
Starling
White-eyed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Black-and-white Warbler
Prothonotary Warbler
Swainson's Warbler
Northern Parula Warbler
Yellow-rumped Warbler
Yellow-throated Warbler
Prairie Warbler
Louisiana Waterthrush
Common Yellowthroat
Yellow-breasted Chat
Hooded Warbler
American Redstart
House Sparrow
Orchard Oriole
Northern Oriole
Common Grackle
Brown-headed Cowbird
Summer Tanager
Cardinal
Blue Grosbeak
Indigo Bunting
American Goldfinch
Rufous-sided Towhee
Field Sparrow
White-throated Sparrow
Swamp Sparrow

MAMMALS

Opossum
Raccoon
Eastern Gray Squirrel
Eastern Cottontail
Whitetail Deer

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NATURAL AREA INVENTORY FORM

Basic Information Summary Sheet

1. Natural Area Name: Lea Island, Hutaff Island
2. County: Pender
3. Location: The two coastal barrier islands are located in the southeast quadrant of the county, southeast of Hampstead and southwest of Surf City. They are separated from each other by Old Topsail Inlet. Lea Island, the northernmost of the two, is separated from Topsail Island and Topsail Beach by New Topsail Inlet. Hutaff Island, on its southwestern extremity, is separated from Figure Eight Island (New Hanover County) by Rich Inlet. Coordinates for the two barrier islands are as follows: 34°20'N, 77°40'W (Lea); 34°19'N, 77°41' (Hutaff). (FIGURE 21)
4. Topographic Quadrangle: Hampstead, NC 1970
5. Size: Approximately 550 acres (200 ac on Lea; 350 ac on Hutaff)
6. Elevation: Sealevel to 20 ft MSL for Lea; sealevel to 25 ft MSL for Hutaff
7. Access: Boat: Coast Guard marked navigation channel through New Topsail Inlet; Howard Channel from Atlantic Intracoastal Waterway (AIWW) to northern end of Lea Island, passable only with small boat at or near high tide; Greene Channel and Nixon Channel to Rich Inlet and to south end of Hutaff Island are navigable from AIWW at low tide.
8. Names of Investigators: S. W. Leonard Ricky Davis
    P. O. Box 3475 126 Duncansby Court
    Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: July 10, July 21, 1981
10. Priority Rating: High
11A. Prose Description of Site: Lea and Hutaff Islands are two of the six unoccupied and undeveloped islands south of Cape Lookout in North Carolina. Seasonally occupied structures are located on each (one on Lea Island and two on Hutaff). A recently-constructed, private dock with space for multiple boat moorings is present on the mainland side of Lea Island.

    The islands are composed of sand and fragments of shell, and may contain buried lenses of peat. The leeward portions grade into salt-marsh, salt flats, or mud flats, and here, the sediment is finer-grained. Accretion is occurring at the southwest ends of both islands, whereas wind and wave erosion have removed much of the foredunes in the midsections of the islands. Dredged material deposition at the north
FIGURE 21. Lea Island, Hutafl Island Natural Area. Map scale: 1 in. = 2 mi.
end of Lea Island accounts for an unexpectedly high berm. Storm overwash is minimal, and occurs predominantly on the low southern portions of the islands. A high remnant foredune of a former barrier location is present on the northwest side of Lea Island, near the point where Long Point Channel curves into Eddy Sound.

Vegetation of the islands is comprised of typical foredune herbs, such as sea oats and saltmeadow grass, sometimes mixed with waxmyrtle and yaupon shrubs, and an occasional juniper or live oak. There is no significant maritime forest on the islands.

Fauna is best represented by shorebirds which feed, rest, and nest there, although deer are present on Hutaff Island. The fairly long expanses of beach provide nesting grounds for sea turtles. The shallow creeks and flats along the mainland sides of the islands contain a few areas of oyster "rocks", but may be more important biologically (and recreationally) as clam and crab grounds.

11B. Prose Description of Site Significance: The most significant features of Lea and Hutaff Islands are their absence of residential and commercial development, their use as turtle nesting areas, two rookery sites for terns, black skimmers, and Wilson's plover, populations of Drummond's prickly pear cactus and the seashore amaranth, and their geographical position and function as wave energy dissipaters.

Indications are that development of Lea Island is forthcoming. It is difficult to envisage a development plan which will provide access, electricity, water, sewerage, and other amenities of residential land use that will not be imperilled by foredune erosion, storm overwash, inlet migration, and water quality decline. While the floristic significance of the islands would not necessarily be impaired by development, the faunistic components are susceptible to loss of habitat. Therefore, a high priority rating is given to the islands, and is based on the scarcity of undeveloped barrier islands in North Carolina and on the faunal utilization.

12. Significance Summary: (See TABLE 9)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%, Public 0%, Unknown 0%, based on the assumption that State of North Carolina does not claim that portion of the marshlands and tidal flats lying below mean high tide.

14. Number of Owners: 2

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Lea Island, Inc.; heirs of George Henry Hutaff
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality terrestrial community</td>
<td>1</td>
<td>Maritime mixed shrub/herb community</td>
<td>Only two relatively undisturbed barrier islands in county</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2a</td>
<td>Beach amaranth</td>
<td>Small colonies on upper beach berm; sp. very rare (proposed)</td>
</tr>
<tr>
<td>Endangered or threatened sp.</td>
<td>2b</td>
<td>Brown Pelican</td>
<td>Regular visitor to islands and adjacent waters</td>
</tr>
<tr>
<td>Special geomorphologic feature</td>
<td>3</td>
<td>Barrier islands</td>
<td>Dynamic landform, protecting estuarine communities and shore of mainland</td>
</tr>
</tbody>
</table>
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Alan S. Weakley, Duke University, Dept. of Botany, Durham, NC

17. Attitude of owner or custodian toward preservation (contacted?): Owners not contacted; new boat dock located of the mainland side of Lea Island and a fairly new house near the north end support the inference that this island may be slated for development.

18. Uses of natural area: Recreational use, primarily focused on beach and surf-related activities; seasonal residency; fishing and shellfishing.

19. Uses of surrounding land: Wildland (including open water, marshes, tidal flats, etc.) 80%; Developed 20%

20. Preservation Status: Category 7, 100%

21. Regulatory protections in force: CAMA wetlands, hazard areas, fragile areas

22. Threats: Natural erosion of beach; potential residential development; overwash hazard. Note should be made of a second level of threat to this natural area. Nesting shorebirds are especially vulnerable to recreational visitors' dogs which are seldom, if ever, kept on leash. In addition, nests are frequently difficult to see, and eggs and chicks may be crushed by pedestrian access. Finally, eggs and young birds which are left unprotected from the sun when adults are disturbed by visitors and pets are also vulnerable. Thus the significance of the islands as shorebird nesting sites can be indirectly lost through negligence, lack of user education, and a multiplicity of man-related factors. To a lesser degree, and depending upon future use of ORV (off-road vehicle) activity on the islands, comparable threats may affect utilization of the beaches by nesting sea turtles.

23. Management and Preservation Recommendation: The islands are prohibitively expensive for acquisition. Owner cooperation to preserve, voluntarily, as much of the natural area as possible is recommended. Dredged material deposition to the northern end of Lea Island indirectly benefits both shorebirds and littoral drift southward, by providing a sandy, elevated nesting area, which gradually erodes with particles of shell and sand moved along the beach. We are of the opinion that beach nourishment, dune stabilization, and/or marsh creation are unwarranted in this natural area, eventhough severe erosion could occur in the future. Public access should be restricted and the island communities monitored for signs of abuse and excessive man-related community disturbance.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary
Community type: (This natural area contains all of the classic maritime strand communities with the exception of live oak forest. A broad
interpretation will be used in this treatment, and will deal with
dunelands, which may be high foredunes, dominated by sea oats, or
low rear dunes and overwash flats with a mixture of shrubs, small
trees, forbs, or barren spots. One should also keep in mind that
as presently delineated, the natural area contains wetland communities
comprised of smooth cordgrass, ox-eye, purslane, and other vascular
plants as well as sand flats and mud flats which are tidally inundated.
A composite community, dominated by waxmyrtle, yaupon, and sea oats
is used here as the representative "beach" type, since it occupies a
large percentage of the total natural area acreage, and is the community
complex most likely to be threatened by activities of people on the
islands.) **Myrica cerifera-Ilex vomitoria/Uniola paniculata**
Community cover type:  *Ilex vomitoria*
General habitat feature:  Beach dunes
Average canopy height:  6 ft when present
Estimated age of canopy trees:  Not applicable
Canopy cover:  Open to closed
Estimated size of community:  200 ac
Successional stage:  Pioneer and Trnasient
Sere type:  Psammosere
Common canopy species in community cover or community type (but not
dominant):  *Juniperus virginiana*
Common sub-canopy or shrub stratum species in community cover or
community type (but not dominant):  *Iva frutescens*
Common herb stratum species in community cover or community type
(but not dominant):  *Croton punctatus, Iresine rhizomatosa, Physalis
viscosa ssp. maritima*

24B. Soil Summary (by community type)
Soil series:  Capers, Corolla, Newhan, and beach soils
Soil classification:  Not determined
Soil association:  Beach-foredune association; Newhan-Corolla complex
pH class:  Not determined
Moisture class:  Excessively drained
Source of information:  Soil Survey, Outer Banks, North Carolina,
USDA, SCS (1977)

24C. Hydrology Summary (by community type)
Hydrologic system:  Terrestrial
Hydrologic subsystem:  Dry-xeric
Water chemistry:  Fresh to saline
Water regime:  Not applicable
Drainage class:  Somewhat excessively drained
Drainage basin:  Coastal; not applicable
Hydrology characterization:  Somewhat excessively drained dunes, which
are alternately wetted by salt spray and rainwater with a perched
water table "floating" over saline water (Ghyben-Herzberg lens).

24D. Topography Summary
Landform:  Barrier islands
Shelter: Open
Aspect: Northwest-southeast
Slope angle: variable, 1-8%
Profile: Convex
Surface patterns: Irregular
Position: All of slope above mean high water

25. Physiographic characterization of natural area: A dune-decorated barrier covered sparsely by shrubs and forbs of a halopsammosere of Holocene age in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Holocene sands
Geological Formation age: 6,000 years or less

26. Summary - Endangered and threatened species
(1) Name of species: (Proposed addition, based on a three-county NC distribution, presence of species on upper beach berm, and subject to erosional processes, flooding, etc., and in our experience, never found in any abundance—often populations of 20 or fewer plants) *Amaranthus pumilus* (AMARANTHACEAE) Beach amaranth
Species legal status and authority: None
Number of populations on site: 2
Number of individuals per population: 10 and 20
Size or maturity of individuals: Mature
Phenology of population: Vegetative: 0%; Flowering: 100%; Fruiting: 100%
General vigor of population: Good
Disturbance or threats to population: Flooding, overwash, burial, sand-blasting, dessication, etc. are all habitat factors, but plants persist and evidently have adapted to these "threats."

Habitat characteristics:
- Plant community: Not applicable. This species is usually the most seaward species on the upper beach berm.
- Topography: Flat
- Soil series: Beach soil, undifferentiated by horizon
- Microclimate: Not determined
- Drainage basin: Not applicable
- Other plants and animal species present: Plants: none; Animals: see attached master species lists.

Drainage basin: Not applicable
Other plants and animal species present: Plants: none; Animals: various shorebirds, see attached master species list of birds.

(2) Name of species: Brown Pelican
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: Not determined
Number of individuals per population: 50-100?
Size or maturity of individuals: Immature and mature
Phenology of population: Not applicable
General vigor of population: Not determined
Disturbance or threats to population: Not determined
Habitat characteristics:
Plant community: Not applicable
Topography: Not applicable
Soil series: Not applicable
Microclimate: Not determined
Drainage basin: Not applicable
Other plants and animal species present: Plants: none; Animals: see attached master species list of birds.

(See FIGURE 22 for detailed map of endangered and threatened species locations)
FIGURE 22. Significant features of Lea Island, Hutaff Island Natural Area. Code: (1) High quality terrestrial community, (2) Endangered or threatened species, (3) Special geomorphologic feature. Map scale: 1 in. = 2 mi.
27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

AMARANTHACEAE
Amaranthus pumilus
Iresine rhizomatosa

APIACEAE
Centella asiatica
Hydrocotyle bonariensis

AQUIFOLIACEAE
Ilex vomitoria

ASCLEPIADACEAE
Cynanchum angustifolium

ASPLENIACEAE
Asplenium platyneuron

ASTERACEAE
Baccharis halimifolia
Borrichia frutescens
Carduus spinosissimus
Chrysopsis mariana
C. subaxillaris
Conyza canadensis
Eupatorium capillifolium
Gnaphalium obtusifolium
Iva frutescens
I. imbricata
Solidago sempervirens

BRASSICACEAE
Cakile edentula
Lepidium virginicum

CACTACEAE
Opuntia drummondii

CHENOPODIACEAE
Salicornia bigelovii
S. virginica
Salsola kali

COMMELINACEAE
Commelina erecta

CUPRESSACEAE
Juniperus virginiana

CYPERACEAE
Cyperus esculentus
C. retrorsus
Fimbristylis castanea

EUPHORBIACEAE
Croton punctatus
Euphorbia polygonifolia

FABACEAE
Strophostyles helvola
FAGACEAE
  Quercus geminata
JUNCACEAE
  Juncus roemerianus
LAURACEAE
  Persea borbonia
LILIACEAE
  Smilax auriculata
  S. bona-nox
  Yucca aloifolia
MYRICACEAE
  Myrica cerifera
ONAGRACEAE
  Oenothera humifusa
PLUMBAGINACEAE
  Limonium carolinianum
POACEAE
  Andropogon virginicus
  Cenchrus tribuloides
  Cynodon dactylon
  Eragrostis spectabilis
  Panicum amarum
  P. amarulum
  P. virgatum
  Spartina alterniflora
  S. patens
  Triplasis purpurea
  Uniola paniculata
ROSACEAE
  Prunus caroliniana
RUBIACEAE
  Diodia teres
SOLANACEAE
  Physalis viscosa ssp. maritima
ULMACEAE
  Celtis laevigata
VITACEAE
  Vitis labrusca

REPTILES

Carolina Diamondback Terrapin
Eastern Glass Lizard
**BIRDS**

**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

<table>
<thead>
<tr>
<th>Species</th>
<th>Visitor Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Pelican</td>
<td>SV</td>
</tr>
<tr>
<td>Double-crested Cormorant</td>
<td>PV</td>
</tr>
<tr>
<td>Great Blue Heron</td>
<td>PV</td>
</tr>
<tr>
<td>Green Heron</td>
<td>SV</td>
</tr>
<tr>
<td>Little Blue Heron</td>
<td>SV</td>
</tr>
<tr>
<td>Cattle Egret</td>
<td>SV</td>
</tr>
<tr>
<td>Great Egret</td>
<td>PV</td>
</tr>
<tr>
<td>Snowy Egret</td>
<td>PV</td>
</tr>
<tr>
<td>Louisiana Heron</td>
<td>PV</td>
</tr>
<tr>
<td>Black-crowned Night Heron</td>
<td>PV</td>
</tr>
<tr>
<td>White Ibis</td>
<td>PV</td>
</tr>
<tr>
<td>Osprey</td>
<td>SV</td>
</tr>
<tr>
<td>Clapper Rail</td>
<td>PR*</td>
</tr>
<tr>
<td>American Oystercatcher</td>
<td>PR*</td>
</tr>
<tr>
<td>Semi-palmated Plover</td>
<td>WR</td>
</tr>
<tr>
<td>Piping Plover</td>
<td>WR</td>
</tr>
<tr>
<td>Wilson's Plover</td>
<td>SR*</td>
</tr>
<tr>
<td>American Golden Plover</td>
<td>T</td>
</tr>
<tr>
<td>Black-bellied Plover</td>
<td>WR</td>
</tr>
<tr>
<td>Ruddy Turnstone</td>
<td>WR</td>
</tr>
<tr>
<td>Whimbrel</td>
<td>T</td>
</tr>
<tr>
<td>Spotted Sandpiper</td>
<td>T</td>
</tr>
<tr>
<td>Willet</td>
<td>PR*</td>
</tr>
<tr>
<td>Greater Yellowlegs</td>
<td>WR</td>
</tr>
<tr>
<td>Lesser Yellowlegs</td>
<td>T</td>
</tr>
<tr>
<td>Red Knot</td>
<td>T</td>
</tr>
<tr>
<td>Pectoral Sandpiper</td>
<td>WR</td>
</tr>
<tr>
<td>Least Sandpiper</td>
<td>WR</td>
</tr>
<tr>
<td>Dunlin</td>
<td>WR</td>
</tr>
<tr>
<td>Short-billed Dowitcher</td>
<td>WR</td>
</tr>
<tr>
<td>Semi-palmated Sandpiper</td>
<td>T</td>
</tr>
<tr>
<td>Western Sandpiper</td>
<td>WR</td>
</tr>
<tr>
<td>Marbled Godwit</td>
<td>WR</td>
</tr>
<tr>
<td>Sanderling</td>
<td>WR</td>
</tr>
<tr>
<td>Great Black-backed Gull</td>
<td>WR</td>
</tr>
<tr>
<td>Herring Gull</td>
<td>WR</td>
</tr>
<tr>
<td>Ring-billed Gull</td>
<td>WR</td>
</tr>
<tr>
<td>Laughing Gull</td>
<td>SV</td>
</tr>
<tr>
<td>Gull-billed Tern</td>
<td>SR*</td>
</tr>
<tr>
<td>Forster's Tern</td>
<td>WR</td>
</tr>
</tbody>
</table>

144
Common Tern           SR*
Least Tern           SR*
Royal Tern           PV
Sandwich Tern         SV
Caspian Tern          T
Black Tern            T
Black Skimmer         PR*
Rock Dove            PV
Mourning Dove         PR*
Chimney Swift         SV
Belted Kingfisher     PV
Eastern Kingbird      SV
Tree Swallow          WR
Bank Swallow          T
Barn Swallow          SV
Purple Martin         SV
Fish Crow             PV*
Carolina Wren         PV
Mockingbird           PR*
Brown Thrasher        PV
Starling              PV
White-eyed Vireo      SV
Yellow Warbler        T
Prairie Warbler       SV
Common Yellowthroat   PV
American Redstart     T
House Sparrow         PV
Bobolink              T
Eastern Meadowlark    PR*
Red-wing Blackbird    PR*
Boat-tailed Grackle   PR*
Common Grackle        PV
Brown-headed Cowbird  PV
Cardinal              PR*
Indigo Bunting        SV
Painted Bunting       SV
Rufous-sided Towhee   PR*
Seaside Sparrow       PR*

Mammals

Eastern Cottontail
Whitetail Deer
NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Rocky Point Marl Forest
2. County: Pender
3. Location: The original location of the Rocky Point Marl Forest was north of NC 210 and SR 1516, about 1.5 miles northeast of the village of Rocky Point, and situated on the old McRae property, now owned by Oleander Corporation. This area was examined intermittently from 1968 until 1980, and a preliminary site description was prepared by Alan S. Weakley. Around 1978 or 1979, the area was timbered, and while none of the threatened species which were known from there were harvested, it may be decades before this tract returns, if ever, to any semblance of its former condition. Being familiar with the original Rocky Point Marl Forest, we searched for other examples of this unique vegetation assemblage in the area, and found two potential candidates. One site, located on Batts property, northeast of the McRae place, is comprised of little more than a small springy drainage with very sparse outcroppings of the Castle Hayne limestone. A second area was located which contains a sizeable population of nutmeg hickory—one of the dominant indicators—and is now described as the Rocky Point Marl Forest. This timber stand is located east of US 117, on both sides (north and south) of SR 1517, beginning just east of Rocky Point School, or about 0.6 miles east of US 117. Coordinates: 34°25'N, 77°52'W (FIGURE 23).

4. Topographic Quadrangle(s): Rocky Point, NC 1970, Mooretown, NC 1970
5. Size: 400 ac
6. Elevation: 25 ft to 30 ft above mean sea level
7. Access: Natural area may be reached by travelling east on SR 1517 from US 117, a road which is paved as far as Rocky Point School. Continue on this road to a major overhead power line which passes through the natural area, as does the right-of-way for Interstate 40.

8. Names of Investigators: S. W. Leonard
   P. O. Box 3475
   Wilmington, NC 28406
   Ricky Davis
   126 Duncansby Court
   Cary, NC 27511
9. Date(s) of Investigation: May-September 1981
10. Priority Rating: High
11A. Prose Description of Site: In southeastern North Carolina, outcrops of the Castle Hayne limestone are usually restricted to bluffs along
FIGURE 23. Rocky Point Marl Forest Natural Area. Map scale: 1 in. = 2 mi.
larger creeks and rivers. Seldom are these outcrops exposed above the ordinary water level, and if they do occur at higher elevations, any unusual plants which may temporarily become established there are soon swept away by flood waters. In contrast to these rare occurrences along creeks and rivers is a large area of Castle Hayne limestone that crops out on the surface, or is buried beneath a few inches of soil, in the vicinity of Rocky Point. The calcareous substrate is mapped on the Pender County Soil Survey (1972) as an Invershiel-Meggett soil association, but the better exposures of rock are located between US 117 and the Northeast Cape Fear River.

Along SR 1517, a flat wooded area has been recognized for several years by the senior author as floristically unusual, but never examined extensively. These woodlands can be immediately recognized by several botanical indicators. Wet, swampy areas often have a very dense understory (shrub stratum) of the dwarf palmetto, Sabal minor. The dominant forest is usually a mix of hardwood species, but not the common oak-hickory association which is found elsewhere in the State. Basswood is a common canopy component along woodland borders, and pines are very infrequent, if at all present in any given stand. In deciduous forests the spring flora is sometimes notable; here, it is not unusually diverse, but the associates may be uncommon. For example, the red buckeye is very abundant, and in some parts of the woodlands, the wild ginger, Asarum. Species more commonly found in the Piedmont and Blue Ridge sometimes reach their eastern range limits in these forests. In woodlands with circumneutral soils, we have collected such taxa as Collinsonia canadensis, Thalictrum thalictroides, Anemone virginiana, and Silphium asteriscus. A few noteworthy southern species reach the northern limits of their distribution in this area.

Because the soil is sometimes rocky, gravelly, or fossiliferous, the area is occasionally frequented by paleontologists or others seeking sharks teeth, bones, or other animal remains. The natural area provides many opportunities for research, and is one of the most distinctive habitats in Pender County.

11B. Prose Description of Site Significance: Significant features of the Rocky Point Marl Forest include a broad spectrum of geological, edaphic, and biological elements. The most important feature to us is the uniqueness of the total habitat—a mixed hardwood forest developed over a calcareous substrate. Plants of interest in this natural area are nutmeg hickory (Carya myristicaeformis) which was first reported from the McRae farm (only known county where it occurs in NC), Ruellia strepens, also known only from this area in NC, Scirpus fontinalis, a rare member of the sedge family, Cornus asperifolia, known only from New Hanover and Pender Counties, and Carex willdenowii var. megarhyncha, a variety collected only once from the McRae farm, and found elsewhere in Georgia, Alabama, and Louisiana. Further botanical investigation will doubtlessly disclose other species of interest. With the exception of the Maple Hill area, the Rocky Point Marl Forest probably has the highest potential for new species occurrences as any place in the county.
12. Significance Summary (See TABLE 10)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 90%; Public 10%

14. Number of Owners: At least 8

15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): State of NC (Interstate 40 right-of-way) Harry Williams, Mrs. J. R. Croom, Rocky Point Elementary School, S. W. Causey, Richard Shew, Daisy R. Ford Scott, Georgia-Pacific Co.

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): None

17. Attitude of owner or custodian toward preservation (contacted?): Owners were not contacted.

18. Uses of natural area: Hunting, timber harvest

19. Uses of surrounding land: Wildland 30%; Agricultural land 50%; High-intensity forestry 10%; Developed 10%

20. Preservation Status: Category 3, 10%; Category 7, 90%

21. Regulatory protections in force: None known

22. Threats: Construction of I-40 will likely increase the potential threat of development along the highway corridor. Other threats are potential limestone extraction, borrow material for road fill, timber harvest, clearance for agriculture.

23. Management and Preservation Recommendation: Protection of the forest through acquisition is recommended. In this case, exclusion of fire is required since the dominant woodland species do not have fire tolerance.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary
Community type: Mixed hardwoods/Sabal minor
Community cover type: Mixed hardwoods
General habitat feature: Hardwood forest over marl
Average canopy height: 50 ft
Estimated age of canopy trees: Various; 50 years
Canopy cover: Closed
Estimated size of community: 400 ac
Successional stage: Transient
Sere type: Lithosere?
<table>
<thead>
<tr>
<th>Feature</th>
<th>Map Legend</th>
<th>Description of feature</th>
<th>Comparative assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endangered or threatened sp.</td>
<td>1</td>
<td>Nutmeg hickory</td>
<td>Only known population in NC in this area</td>
</tr>
<tr>
<td>Unusual species assemblage</td>
<td>2</td>
<td>Disjunct occurrences and unique species associations</td>
<td>One of two sites in county with Invershiel-Meggett soil assoc.; limestone at surface or very shallow</td>
</tr>
<tr>
<td>Outstanding geologic feature</td>
<td>3</td>
<td>Castle Hayne limestone</td>
<td>Exploited resource; important fossils and type locality in general area</td>
</tr>
</tbody>
</table>
Common canopy species in community cover or community type (but not dominant): Morus rubra, Quercus shumardii, Ulmus americana
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus florida, Cercis canadensis, Myrica cerifera
Common herb stratum species in community cover or community type (but not dominant): Cardamine bulbosa, Dryopteris ludoviciana, Geranium maculatum, Arisaema triphyllum

24B. Soil Summary (by community type)
Soil series: Invershiel and/or Meggett
Soil classification: Alfisol
Soil association: Invershiel-Meggett
pH class: Depending upon depth of underlying limestone, strongly acidic to moderately alkaline
Moisture class: Hydric
Source of information: Natural area inventory (preliminary) prepared by Alan S. Weakley for McRae tract; Pender County General Soil Map, USDA, SCS, 1972.

24C. Hydrology Summary (by community type)
Hydrologic System: Terrestrial to palustrine
Hydrologic subsystem: Mesic to interaqueous
Water chemistry: Fresh
Water regime: Intermittently flooded for palustrine system
Drainage class: Somewhat poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly drained loamy sands and calcareous clays over Eocene Castle Hayne limestone, intermittently flooded, and draining into the Northeast Cape Fear River Basin.

24D. Topography Summary
Landform: Lowland plain
Shelter: Open to moderately sheltered
Aspect: Not applicable
Slope angle: Nearly level
Profile: Flat
Surface patterns: Flats, pans, slightly dissected by drainages
Position: Not applicable

25. Physiographic characterization of natural area: A mixed mesophytic forest of a pelosere on a nearly level lowland plain, underlain by limestone of the Coastal Plain province of the Atlantic Plain.
Geological Formation: Eocene Castle Hayne limestone
Geological Formation age: 40-50 million years

26. Summary - Endangered and threatened species
(1) Name of species: Carya myristicaeformis (JUGLANDACEAE) Nutmeg hickory
Species legal status and authority: NC Endangered peripheral (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 40
Size or Maturity of individuals: Immature and mature
Phenology of population: Vegetative: 70%; Flowering: 0%; Fruiting 30%
General vigor of population: Vigorous
Disturbance or threats to population: Some trees were cut during clearance for I-40; no other disturbances visible or known.
Habitat characteristics:
  Plant community: Mixed hardwoods
  Topography: Smooth
  Soil series: Invershiel or Meggett
  Microclimate: Not determined
  Drainage basin: Northeast Cape Fear River
Other plants and animals present: Plants: Cornus asperifolia, Cercis canadensis, Sabal minor, Quercus nigra, Q. michauxii, Tilia caroliniana; Animals: see attached master species lists.

(See FIGURE 24 for detailed map of endangered and threatened species locations)
FIGURE 24. Significant features of Rocky Point Marl Forest Natural Area. Code: (1) Endangered or threatened species, (2) Unusual species assemblage, (3) Outstanding geologic feature. Map scale: 1 in. = 1500 ft.
ACANTHACEAE
   Justicia ovata
   Ruellia caroliniensis
   R. strepens
ACERACEAE
   Acer negundo
   A. rubrum
   A. saccharum ssp. floridanum
AIZOACEAE
   Mollugo verticillata
ANACARDIACEAE
   Rhus radicans
ANNONACEAE
   Asimina triloba
APIACEAE
   Centella asiatica
   Chaerophyllum tainturieri
   Cryptotaenia canadensis
   Sanicula canadensis
   S. marilandica
   Sium suave
APOCYNACEAE
   Apocynum cannabinum
AQUIFOLIACEAE
   Ilex opaca
ARACEAE
   Arisaema triphyllum
   Orontium aquaticum
   Peltandra virginica
ARALIACEAE
   Aralia spinosa
ARECACEAE
   Sabal minor
ASPIDIACEAE
   Athyrium aspleniiodes
   Dryopteris ludoviciana
   Polystichum acrostichoides
   Thelypteris palustris
ASPLENIACEAE
   Asplenium platyneuron
ARISTOLOCHIACEAE
   Aristolochia serpentaria
   Asarum canadense
ASCLEPIADACEAE
   Asclepias variegata
   Matelea gonocarpa
ASTERACEAE
Ambrosia artemesiifolia
Antennaria solitaria
Aster pilosus
Baccharis halimifolia
Elephantopus carolinianus
Erechtites hieracifolia
Eupatorium capillifolium
Senecio glabellus
Silphium asteriscus
Vernonia noveboracensis

BALSAMINACEAE
Impatiens capensis

BERBERIDACEAE
Podophyllum peltatum

BETULACEAE
Carpinus caroliniana
Ostrya virginiana

BIGNONIACEAE
Anisostichus capreolata
Campsis radicans

BLECHNACEAE
Woodwardia areolata

BRASSICACEAE
Cardamine bulbosa
C. pensylvanica

BROMELIACEAE
Tillandsia usneoides

CALLITRICHACEAE
Callitriche heterophylla

CAPRIFOLIACEAE
Lonicera japonica
Sambucus canadensis
Viburnum dentatum var. lucidum
V. nudum
V. prunifolium

CELASTRACEAE
Euonymus americanus

CONVOLVULACEAE
Ipomoea lacunosa
I. pandurata
I. purpurea
I. trichocarpa

CORNACEAE
Cornus asperifolia
C. florida
C. stricta

CYPERACEAE
Carex debilis
C. glaucescens
Scirpus fontinalis
DIOSCOREACEAE
  Dioscorea villosa
EBENACEAE
  Diospyros virginiana
ERICACEAE
  Vaccinium stamineum
FABACEAE
  Amphicarpa bracteata
  Cassia fasciculata
  Cercis canadensis
FAGACEAE
  Quercus alba
  Q. lyrata
  Q. michauxii
  Q. nigra
  Q. phellos
  Q. shumardii
GERANIACEAE
  Geranium carolinianum
  G. maculatum
HAMAMELIDACEAE
  Liquidambar styraciflua
HIPPOCASTANACEAE
  Aesculus pavia
  A. sylvatica
  A. pavia X sylvatica
HYPERICACEAE
  Hypericum mutilum
IRIDACEAE
  Sisyrinchium sp.
JUGLANDACEAE
  Carya aquatica
  C. cordiformis
  C. glabra
  C. myristicaeformis
  Juglans nigra
LAMIACEAE
  Salvia lyrata
  Teuchrium canadensis
LAURACEAE
  Lindera benzoin
  Persea borbonia
  Sassafras albidum
LILIACEAE
  Allium bivalve
  Amianthemum muscaetoxicum
  Smilax bona-nox
  S. glauca
  S. laurifolia
  S. rotundifolia
LOGANIACEAE  
Gelsemium sempervirens

LORANTHACEAE  
Phoradendron serotinum

LYTHRACEAE  
Lythrum lanceolatum

MAGNOLIACEAE  
Liriodendron tulipifera

MENISPERMACEAE  
Cocculus carolinus

MORACEAE  
Morus rubra

MYRICACEAE  
Myrica cerifera

OLEACEAE  
Chionanthus virginicus
Fraxinus pensylvanica
F. tomentosa
Ligustrum sinense

ONAGRACEAE  
Circaea lutetiana ssp. canadensis
Ludwigia palustris
L. virgata
Oenothera laciniata

OPHIOGLOSSACEAE  
Botrychium virginianum

OSMUNDACEAE  
Osmunda cinnamomea

PASSIFLORACEAE  
Passiflora incarnata
P. lutea

PHRYMACEAE  
Phryma leptostachya

PHYTOLACCACEAE  
Phytolacca americana

PINACEAE  
Pinus taeda

POACEAE  
Arundinaria gigantea
Briza minor
Calamagrostis cinnoides
Digitaria sanguinalis
Echinochloa walteri
Eleusine indica
Elymus virginicus
Melica mutica
Panicum sp.
Poa autumnalis
Uniola laxa
POLYGONACEAE
  Polygonum punctatum
  Tovara virginiana
POLYPODIACEAE
  Polypodium polypodioides
PORTULACACEAE
  Claytonia virginica
PRIMULACEAE
  Samolus parviflorus
PTERIDACEAE
  Pteridium aquilinum
RANUNCULACEAE
  Anemone virginiana
  Clematis crispa
  C. virginiana
  Ranunculus carolinianus
  R. recurvatus
RHAMNACEAE
  Berchemia scandens
  Ceanothus americanus
ROSACEAE
  Agrimonia pubescens var. microcarpa
  Duchesnea indica
  Geum canadense
  Prunus caroliniana
  Rosa palustris
  Rubus argutus
  R. betulifolius
  R. flagellaris
  R. hispidus
RUBIACEAE
  Diodia virginiana
  Galium circaezans
  Houstonia purpurea
SALICACEAE
  Salix caroliniana
  S. nigra
SAXIFRAGACEAE
  Decumaris barbara
SCROPHULARIACEAE
  Mecardonia acuminata
  Mimulus ringens
  Penstemon australis
  Verbascum blattaria
SELAGINELLACEAE
  Selaginella apoda
STERCULIACEAE
  Melochia corchorifolia
TILIACEAE
  Tilia caroliniana
ULMACEAE
   Celtis laevigata
   Ulmus alata
   U. americana
URTICACEAE
   Boehmeria cylindrica
VALERIANACEAE
   Valerianella radiata
VERBENACEAE
   Callicarpa americana
   Verbena brasilienis
   V. uralicifolia
VITACEAE
   Ampelopsis arborea
   Parthenocissus quinquefolius
   Vitis aestivalis
   V. rotundifolia

AMPHIBIANS

Slimy Salamander
Southern Toad

REPTILES

Eastern Box Turtle
Black Racer

BIRDS

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

Great Blue Heron  PV
Green Heron       SV
Wood Duck         PV
Turkey Vulture    PV
Red-tailed Hawk   PV
Red-shouldered Hawk PR*
Bobwhite          PR*
Rock Dove         PV
Mourning Dove     PR*
Yellow-billed Cuckoo SR*
Chimney Swift
Ruby-throated Hummingbird
Common Flicker
Pileated Woodpecker
Red-bellied Woodpecker
Hairy Woodpecker
Downy Woodpecker
Eastern Kingbird
Great Crested Flycatcher
Eastern Phoebe
Acadian Flycatcher
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Fish Crow
Carolina Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown-headed Nuthatch
Carolina Wren
Mockingbird
Brown Thrasher
Wood Thrush
Blue-gray Gnatcatcher
Starling
White-eyed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Black-and-white Warbler
Prothonotary Warbler
Swainson’s Warbler
Northern Parula Warbler
Yellow Warbler
Black-throated Blue Warbler
Yellow-throated Warbler
Blackpoll Warbler
Prairie Warbler
Ovenbird
Louisiana Waterthrush
Kentucky Warbler
Common Yellowthroat
Yellow-breasted Chat
Hooded Warbler
American Redstart
House Sparrow
Bobolink
Eastern Meadowlark
Red-winged Blackbird

SV
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<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Status</th>
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<tbody>
<tr>
<td>Orchard Oriole</td>
<td>SR*</td>
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<tr>
<td>Common Grackle</td>
<td>PR*</td>
</tr>
<tr>
<td>Brown-headed Cowbird</td>
<td>PR*</td>
</tr>
<tr>
<td>Summer Tanager</td>
<td>SR*</td>
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<tr>
<td>Cardinal</td>
<td>PR*</td>
</tr>
<tr>
<td>Indigo Bunting</td>
<td>SR*</td>
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<tr>
<td>Rufous-sided Towhee</td>
<td>PR*</td>
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<tr>
<td>Field Sparrow</td>
<td>PV</td>
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<tr>
<td>White-throated Sparrow</td>
<td>WR</td>
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</tbody>
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**Mammals**

- Opossum
- Raccoon
- Marsh Rabbit
- Whitetail Deer
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<td>Fussell, J., C. B. M. Inventory of Craven County, No $10. 15.</td>
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