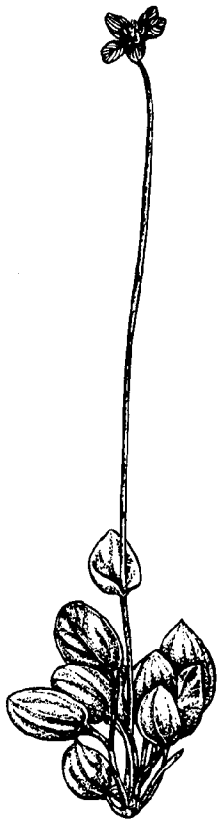
South Carolina Coastal Zone Management Program

# Inventory of Botanical Natural Areas in Colleton, Dorchester, Horry and Jasper Counties, South Carolina





## September, 1984



Equal Opportunity Agency

S.C. Wildlife and Marine Resources Department
Division of Wildlife and Freshwater Fisheries
Jefferson C. Fuller, Jr., Director

## PREFACE

Inventories of botanical natural areas in Colleton, Dorchester, Horry and Jasper Counties were conducted from April, 1983, to June, 1984. These inventories were financed by a Coastal Energy Impact Program (CEIP) grant to the S.C. Wildlife and Marine Resources Department. CEIP funded these inventories because of the potential environmental impacts of energy-related development, especially peat mining.

Project coordination was provided by Dr. Douglas A. Rayner, botanist with the Heritage Trust Program of the S.C. Wildlife and Marine Resources Department. Dr. Rayner also produced the inventory of Colleton County. The Heritage Trust Program has been involved in inventories for unique natural areas throughout South Carolina since its inception in 1974. The other project participants (Dr. Richard Porcher, The Citadel; Dr. Joseph N. Pinson, Jr., Coastal Carolina College; and Ms. Cynthia Aulbach-Smith, University of South Carolina at Columbia) were selected because of their familiarity with the ecological resources of their project areas and their botanical expertise.

The recommendations made in this report were made in consultation with staff of the Heritage Trust Program. All recommendations are advisory. Information and recommendations here are designed to help state and federal agencies, county officials, resources managers, landowners and developers make informed decisions concerning the impact of development, in general, and energy-related development, in particular, on significant, botanical natural areas.

The large size and rich natural diversity of the inventoried counties, along with time and funding constraints, make it likely that the investigators overlooked some significant sites. Dr. Pinson specifically states that he

made no attempt to survey all potential habitats of rare, threatened or endangered plants. This report should be considered a preliminary planning aid and not a definitive planning guide.

These inventories have revealed at least 50 natural areas of national, statewide or local significance. Many of the identified sites were previously unknown, including two areas of national significance and 10 areas of statewide significance. These inventories also revealed several potential conflicts between energy-related development and significant natural areas. The S.C. Heritage Trust Program hopes significant natural areas recommended here will be protected for the benefit of present and future generations of South Carolinians and this report will help minimize the potential conflict between development and the protection of significant natural areas.

Douglas A. Rayner, Ph.D.
S.C. Heritage Trust Program

## ACKNOWLEDGEMENTS

On behalf of all project participants I would like to thank the many individuals and organizations who provided assistance with this project. Individuals and their affiliations are listed in the Personal Contacts or Acknowledgements sections of the individual county reports. To each and everyone I extend a heart-felt thank you. Without your assistance this project would have been much more difficult to complete. A special word of thanks is due to Mr. Robert Folk who provided assistance throughout the project period with transportation, lodging and advise on a wide range of topics.

I also would like to thank the many landowners and plantation managers who allowed access to their property. Without your assistance this project could not have been undertaken.

The Citadel Development Foundation provided some additional funds to support the work by Dr. Richard Porcher in Dorchester County, The Foundation's assistance is gratefully acknowledged.

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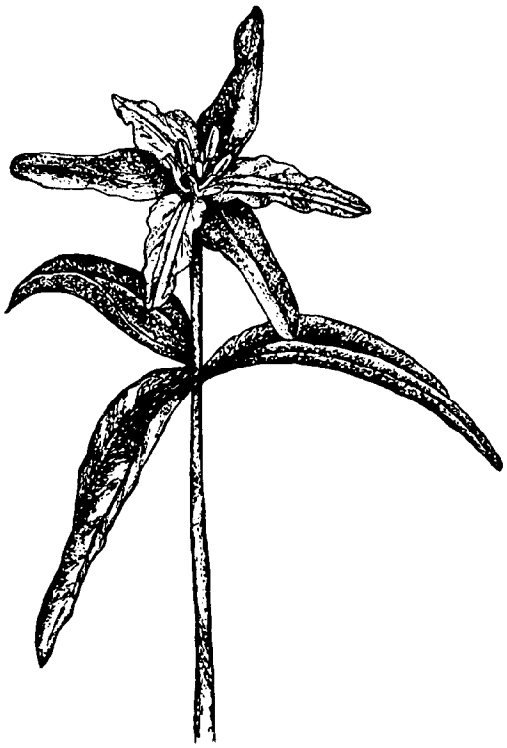

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# AN INVENTORY OF BOTANICAL NATURAL AREAS IN THE COASTAL ZONE OF S.C.

## (DORCHESTER COUNTY)

by

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September, 1984 Final Report for CEIP-8307

This project was made possible by a Coastal Energy Impact Program Grant, established under the Coastal Zone Management Act of 1972, as amended, and administrated by the Office of Coastal Zone Management, NOAA.

This report was prepared for the Office of the Governor, Division of Natural Resources.

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## INTRODUCTION

Dorchester County is located on the outer Coastal Plain of South Carolina. It is exposed to a maritime influence only in the extreme southeast corner where the Ashley River and Rantowles Creek enter the county. Dorchester is a rural county with only the towns of Summerville (1980 census, 6,368) and St. George (1980 census, 2,134) having populations of over 1,000. The 1980 census for the county was 58,761. The county has 569 square miles or approximately 364,000 acres.

Dorchester County was founded in 1897, but its present boundaries were not established until 1902 (Parker, 1979). It is bounded on the south and southeast by Charleston County, the northeast by Berkeley County, the northwest by Orangeburg County and the south and southwest by Colleton County. Its elevation ranges from 130 feet above sea level in the northwest corner to zero feet. Two major rivers traverse the county. The Ashley River originates north of Summerville, runs for about 20 miles and is a saltwater tidal river only for a few miles. The Edisto River is the dominant river of the county. A freshwater river throughout the county, its entire length forms the county line. It runs for approximately 35 miles and its origin is in the inner Coastal Plain. Although Four Holes Swamp is a true river only in its lower reach as it enters the Edisto River, it has a wide floodplain that dominates the northeast and central parts of the county. Along the northeast portion the county line is the run of the swamp. Beidler Forest, the most significant natural area in Dorchester County, is located here.

Dorchester County's 364,000 acres are allocated in the following manner: [1]private, 249,000; corporate, 23,000; forest industries, 83,000;

[1]Data obtained from Soil Conservation Office in St. George.

state and county, 9,000; and federal, insignificant. These acres' major land uses are as follows: croplands, 60,000; pasture and haylands, 5,000; woodlands, 260,000; urban and built-up, 30,000; and rural homesteads, 9,000. The major crops are corn and soybeans.

The most dynamic part of Dorchester County is in the Summerville area. As the urban area of Charleston spreads towards Summerville, this area is experiencing tremendous growth. The rest of the county is moving at a slower pace and changing very little. Its major historic district is along the Ashley River where Middleton Gardens, Mateeba Gardens and Fort Dorchester are located.

Most recreation revolves around hunting and water-related activities. Numerous deer hunting clubs lease woodlands from private individuals or timber companies such as Westvaco, a major timber company in the coastal region. The Ashley and Edisto Rivers provide excellent fishing, boating and swimming. Numerous public boat landings occur on these rivers, and two state parks, Givhans Ferry and Fort Dorchester, provide recreational facilities.

The rural aspect of the county is not likely to change in the near future. Industrialization will cause only minor changes in the county's land use. Only with the discovery of such a natural resource as coal or oil will the rural nature of Dorchester be affected. Until then, major changes in the county will occur in the Summerville area.

Pine and swamp forests dominate the vegetation of Dorchester County. It has few hardwood forests. Large pine plantations occur in the southern portion; Westvaco Corporation is a major landholder there. The western part of the county is mainly agricultural, this section has fewer pine forests. The entire county is laced with creeks and branches

which support secondary swamp forests: Indian Field Swamp, Four Holes Swamp, Cattle Creek, Great Cypress Swamp and Polk Swamp, for examples. Virtually no original growth timber exists in the county with the exception of the Beidler Forest in Four Holes Swamp. Most of the major stands of mature hardwood timber occur in the central and southern parts of the county.

One landowner dominates the central part of the county, the Southern Railway. Its plantation consists of approximately 30,000 acres. This plantation is kept in open pine laced with game patches to provide quail hunting for executives and guests of the company.

The natural history of Dorchester County is not well-documented. Only four species of vascular plants proposed for federally endangered or threatened status have been reported in the county: Trillium pusillum, Eulophia ecristata, Narthecium americanum and Ilex amelanchier. The only significant vertebrate species reported are the American Alligator and Gulf Coast Mud Salamander. This is the first major detailed study of the natural history of Dorchester County with the exception of the various surveys of the Beidler Forest in Four Holes Swamp.

METHODS

The inventory of significant natural areas in Dorchester began on 2 April 1983 and was completed in May, 1984. Field work scheduled throughout the year emphasized certain periods when species of major importance (i.e. Trillium pusillum) were in bloom. A variety of methods was used to locate significant natural areas:

Topo maps: There are 17 individual U.S.G.S. topographic maps for Dorchester County. Several potential sites were located by looking for contour lines, lakes, drainage areas, etc.

Aerial reconnaissance: Three flights over Dorchester were made in a fixed-wing aircraft on 30 April 1983, 4 July 1983 and 18 September 1983. The trips coincided with the major growing seasons. Virtually the entire county was covered during the three flights. Considerable data were obtained as several areas spotted from the air are significant natural areas. Black and white aerial photographs helped us mark potential sites on the county road map so they could be found in the field.

Aerial black and white photographs: A set of 1979 aerial photographs of Dorchester County was obtained from the U.S. Soil Conservation Service. These 45 individual photographs cover all of Dorchester County.

Herbarium records: Herbarium records were used to locate sites of rare, endangered or threatened species of plants. Two records were significant: a 1957 collection of Trillium pusillum, a candidate for nationally-endangered status; and Asplenium resiliens, considered of state-wide concern in S.C. (Rayner et al., 1979). Neither listing was relocated in this study.

Field survey: The majority of sites were found by field surveys. Field survey consisted of driving throughout the county and observing the vegetation formations for potential sites. All U.S., state primary and state secondary roads were driven on during the course of the study. A considerable portion of the unnumbered back roads and many lumber roads were also traveled. When a potential site was observed, an initial survey was made. If the site was significant, another trip was made to gather additional data.

Individuals or organizations: Whenever possible, persons knowledgeable with Dorchester County were consulted. For example, Dr. Julian Harrison directed me to Site RS18; I also consulted Steve Leonard about his record of Asplenium resiliens at Givhans Ferry. In general this means

of obtaining information was not helpful, since little field work had been conducted in Dorchester County.

Soil maps: The soil survey of Dorchester County is incomplete. The available maps were of no value for locating sites.

Literature: I found no literature that was useful for locating sites. An article in Castanea by Gaddy (1982) refers to the "Summerville Savannah" in Dorchester County. It has been determined, however, that this savannah is actually in Berkeley County adjacent to I-26. It is not included in this report. I also reviewed a privately published history of Dorchester County by Legare Walker (Parker, 1979), but I found no information that led me to suitable natural sites. Also reviewed was Ecological Characterization of the Sea Island and Coastal Region of South Carolina and Georgia (Davis, 1980). No useful information on natural areas was in this report.

## RESULTS AND DISCUSSION

(a) Criteria used to select high priority sites: (1) the presence of threatened, endangered or rare species. The reference for such species is Native Vascular Plants Endangered, Threatened, or Otherwise in Jeopardy in South Carolina (Rayner et al., 1979); (2) uncommon geological formations that harbor significant communities; (3) regional sites that have significant recreational and educational value; (4) communities that are rare because of natural constraints or rapid elimination through man's activities; and (5) sites that are potential habitat for significant species.

(b) List of sites by acreage and priority: Nine sites surveyed in this study are considered significant. Locations of significant sites as well as rejected sites are indicated on the map in Appendix I. One site

is considered nationally significant. Three are of statewide significance, and five are of local significance. A listing by priority is as follows:

Nationally Significant:
Beidler Forest. 3,500 acres

Statewide Significance:
Givhans Limestone Bluff. 50 acres
McAlhany's Southern Mixed Hardwood Forest. 100 acres
Highway 165 Beech-Magnolia Forest. 50 acres

Locally Significant:
McAlhany's Ilex amelanchier. 50 acres
Givhans Savannah. 100 acres
Kells' Limestone Bluff. 20 acres
Middleton Southern Mixed Hardwood Forest. 150 acres
Ridgeville Savannah. 20 acres

(c) Brief prose description of high priority sites:

(1) Sites of National Significance

Beidler Forest. Beidler Forest represents the most significant remaining stand of original growth bald cypress-tupelo gum (Taxodium distichum-Nyssa aquatica) swamp forest in the United States (Porcher, 1981). In recognition of this, the Department of Interior designated Beidler Forest a Registered National Natural Landmark in 1979. Besides the bald cypress-tupelo gum community, four additional communities comprise Beidler Forest: mixed mesophytic hardwood forest, seepage bog, hardwood bottom and ridge bottom. The mesophytic forest is also the site for Trillium pusillum, a candidate for nationally-endangered status (Rayner et al., 1979). Beidler Forest also harbors a significant diversity of fauna.

Beidler Forest is significant for the following reasons: (1) It is the most significant example of an original growth bald cypress-tupelo gum community in the United

States; (2) it provides habitat for the nationally endangered Trillium pusillum; (3) it is a nationally-recognized recreational site; (4) it has educational value; (5) it provides habitat for wildlife; and (6) it is a bench mark to gauge man's impact on the natural world.

There is no apparent threat to Beidler Forest at present. The National Audubon Society operates Beidler Forest as a nature sanctuary and requires that the Forest be kept in its natural state in perpetuity. The main potential threat is to the water quality in Four Holes Swamp above Beidler Forest. Audubon has no control of this. Pollutant discharge by local residences (sewage, pesticides) can often go undetected until damage has been done. Poaching for wildlife may occur but should be at a minimum because the Audubon staff patrols the forest. The joint owners, the National Audubon Society and The Nature Conservancy, prevent any development in the forest.

The National Audubon Society's present management of the sanctuary ensures the continued integrity of the site.

(2) Sites of Statewide Significance

Givhans Limestone Bluff. Givhans Limestone Bluff represents one of the two known limestone outcrops in Dorchester County and one of the few in the coastal region of South Carolina. As a rare geological formation, it is significant. It harbors a unique assemblage of vascular plants that does not occur on other formations. Species

such as Asplenium resiliens, Heuchera americana, Adiantum capillus-veneris, Uniola latifolia, Thelypteris kunthii, Ostrya virginiana and Penthorum sedoides represent a unique assemblage of species. The bluff runs from Highway 61 to approximately one-half of a mile up the Edisto River. Below the main house of the State Park, a floodplain extends from the bluff to the river; however, beginning at the main house, the bluff rises vertically from the river. It is on this face that the unique assemblage of species occurs.

The site is unique and significant for the following reasons: (1) it is a reported site for Asplenium resiliens, a rare fern; (2) it is a rare geological formation; and (3) it has a unique assemblage of species.

There appears to be no threat to the limestone bluff above the main building. The bluff is so steep here that persons cannot readily climb the limestone. The area below the main building, where a floodplain occurs between the outcrop and the river, is highly disturbed. Persons visiting the park have easy access to this area. Camp cabins are on the top of the bluff, and campers frequently climb the bluff and throw trash on it. A dense growth of honeysuckle covers some of the outcrops and may have eliminated the population of Asplenium resiliens found there in 1970.

Management of the bluff above the main building should make certain no visitors attempt to climb the bluff. A

protective fence has been placed on the top of the bluff. This fence should be maintained and signs posted stating that the bluff is off limits. No cutting in the narrow zone of mixed hardwood forest on top of the bluff should be allowed. Management of the outcrop below the main building will be difficult. The narrow floodplain allows easy access to the outcrop. A fence could also be installed at the base of the bluff to prevent persons from climbing the bluff. The entire bluff should be left in its natural state and no manipulation of the system should be allowed.

McAlhany's Southern Mixed Hardwood Forest. This site harbors probably the richest and most diverse southern mixed hardwood forest in Dorchester County. Its dense and mature canopy of hardwood trees includes Fagus grandifolia, Pinus glabra, Quercus michauxii, Liriodendron tulipifera, Magnolia grandiflora, Acer rubrum and Liquidambar styraciflua. The herbaceous layer is especially rich and includes Tipularia discolor, Sanguinaria canadensis, Epifagus virginiana, Podophyllum peltatum, Athyrium asplenioides, Conopholis americana, Zephyranthes atamasco and Woodwardia areolata. The forest is also on an unusual site. Most rich southern mixed mesophytic hardwood forests in the coastal region occur on the slopes of bluffs, are well-elevated and drain quickly. The McAlhany forest occurs on what appears to be an old floodplain on an abandoned part of the Edisto River. The forest is laced

with slightly lower sites dominated by a swamp forest community.

Its richness, maturity, size, undisturbed nature and possible location on a former floodplain make this forest of statewide significance.

There appears to be no actual or potential threat to the site. The owner was at one time trying to sell the property to an environmental organization such as the Audubon Society or the Nature Conservancy. The owner has no plans to timber the site or develop it for industrial or residential use. Such development also appears unlikely in the near future because of the remoteness of the property.

There is no active management of the site. The forest is in a climax condition and will remain so unless disturbed. This site should be left free of man's intervention. Fire should be kept out because it would damage the beech trees.

Highway 165 Beech-Magnolia Forest. This community fits the description of Braun's (1950) Beech-Magnolia Forest. The site doesn't fit the description of Quarterman and Keever's (1962) Southern Mixed Hardwood Forest because it appears to occur on a moist, not mesic, site. They excluded many stands that had a high incidence of beech and magnolia from their study because these trees occurred on excessively moist sites. It seems best, then, to list this community separately from a Southern Mixed Hardwood Forest and refer to it as the Beech-Magnolia Forest described by Braun.

This site represents the most well-developed example of this type community that I am aware of in the coastal region of South Carolina. Its location makes it an excellent educational resource. It is a very rich community with a diverse and interesting herbaceous stratum.

One disjunct species, Lycopodium obscurum, goundpine, primarily a mountainous species, was found growing under a large spruce pine. This is the first of this species found in the coastal area of South Carolina. Disjunct species, such as L. obscurum, are bocanically significant. They have a gene pool unlike the main populations; thus they may present opportunities for genetic research.

The site is presently undisturbed and is leased by a deer hunting club. No appreciable perturbation results from hunting; however, the presence of hunters increases the chance of an accidental fire. There is a threat that the site may be timbered. The land adjacent to the site, owned by the same party, has recently been selectively cut. Any type of timbering on the site will destroy the significance of it. I see little chance of the site being developed into commercial or residential property because it is too remote. I also see little possibility of it being used agriculturally.

Highway 165 Beech-Magnolia Forest represents a rare community in coastal South Carolina. Although the site is small, approximately 50 acres, it is still of significant size to warrant listing. It is a climax community and

should be left in its natural state. No active management plans are necessary, and as long as no major disturbance occurs, the community should remain a mature, climax forest. Fire should be kept out of the site as beech trees are fire intolerant. The site will not suffer damage from frequent visits by educational groups.

(3) Sites of Local Significance.

McAlhany's Ilex amelanchier. Ilex amelanchier, Sarvis holly, is rare in the Coastal Plain (Rayner et al., 1979; Radford et al., 1968; and Cooper, 1977). It is presently under federal status review by the U.S. Fish and Wildlife Service as a candidate for threatened status. However, in 1984 state botanists removed this species from the list of rare, threatened and endangered plants in South Carolina. It should be considered of local, rather than national, significance. The S.C. Heritage Trust Program, through the Heritage Trust Act of 1976, is authorized to conduct research and work to protect the habitats of rare, threatened and endangered plants. This plant is rare and its habitat should be protected.

The McAlhany population of Ilex amelanchier was located on May 27, 1981. The population consists of one colony on the bank of a section of the Edisto River cut off from the main river by stream piracy. The colony occurs in a swamp forest community.

I see no immediate threat to the site. There are no present plans to develop or dispose of the property. The

site is far enough removed from the Edisto River that local fisherman are not likely to venture near it.

This site should be made known to the owners and their cooperation sought to ensure that the site is not disturbed. An organization such as The Nature Conservancy should seek an easement or attempt to purchase the site. Whatever the status of ownership, the site should be left alone as no actual management practice would benefit its population.

Givhans Savannah. This savannah is dominated by longleaf and pond pine and has a well-developed herbaceous flora of typical bog-savannah plants: Sarracenia minor, Calopogon pallidus, Rhexia alifanus, Pinquicula lutea, Aletris sp. and Ctenium aromaticum. Its excellent pond cypress depression harbors the rare Utricularia inflata var. minor. In the areas that have not been burned in the last few years, sweet-gum is quickly becoming an understory tree. Typical bog shrubs that also occur are: Magnolia virginica, Ilex glabra and Clethra alnifolia.

The extensive disappearance of savannah lands in the South (Schnell, 1976, and Folkerts, 1982) makes preservation of remaining savannah lands with pitcher plants and other carnivorous plants a priority. Representating a vanishing and threatened ecosystem in the southeastern United States, this site is considered significant. It is one of the two known savannahs in Dorchester County that are in a natural state. The site also offers excellent educational oppor-

tunities for local primary and secondary schools in the Dorchester area.

Lack of annual burning presently threatens the integrity of the site as savannah species may be eliminated by the invasion of shrubs and trees.[2] I have no way of determining whether the site may be turned into rural homesites. The site does not appear suitable for industry because of its location.

Management of the site should include annual burning. Visits by naturalists and educational groups will not damage it. No type of drainage system should be constructed as this would lower the water table and induce the invasion of shrubs. Timbering should not be allowed as it would change the present savannah-like nature of the syscem.

Kells' Limestone Bluff. Kells' Limestone Bluff is similar to the portion of Givhans Bluff above the main building. The bluff rises vertically from the river bed and runs for approximately one-third of a mile. On the face of the bluff occurs a community similar to that in Givhans Limestone Bluff. This site is considered significant because of its geological formation (limescone bluff outcrop).

The highland above the site is occupied by home sites; however, the bluff appears to be undisturbed. The bluff is too steep for walking or climbing. One owner stated there

[2]Although burning every two or three years is probably sufficient to maintain the savannah, annual burning is best because it is easier to observe the carnivorous plants and other bog species when there is no litter left from previous seasons. As this is an educational site, it is important to readily be able to locate and observe its bog plants.

were no plans by his family or other owners to disrupt the bluff in any manner. I see no immediate or potential threat to this limestone bluff.

Management of the site should be limited to a "hands-off policy." A fence might be installed at the top of the bluff to prevent people from climbing down the slope on the upper part of the bluff.

Middleton Southern Mixed Hardwood Forest. This site is on the property of Middleton Place, a nationally-known garden along S.C. 61. It is a rich, mature, relatively-undisturbed southern mixed hardwood forest of approximately 150 acres. Dominant canopy trees are Fagus grandifolia, Quercus michauxii, Pinus taeda, P. glabra, Ilex opaca, Magnolia grandiflora and Quercus laurifolia. The herbaceous layer is especially rich and diverse including Trillium cuneatum, Conopholis americana, Hexastylis arifolia, Luzula echinata, Epifagus virginiana, Podophyllum peltatum, and Obolaria virginica. Although it is undisturbed and natural today, it appears to occupy a formerly-disturbed site. There is evidence of old phosphate mining,and embankments that might have been used for water control structures in the old inland rice industry are present. The site has been undisturbed so long, however, that it is now a climax southern mixed hardwood forest.

Large tracts of undisturbed, mature, rich southern mixed hardwood forest are not common in the coastal region. The site is also close to educational centers in Charleston

and can be used as an outdoor field laboratory. For these two reasons this site is locally significant.

There is no actual threat to the site today. The property is being leased to a hunt club. The potential threat, however, is great. The site is ideally suited for commercial or residential development. A significant portion of Middleton Place has already been developed into home sites. Easy access is provided by Highway 61, a major scenic highway running along the Ashley River. A proposed expressway in the area will also make the property more suitable for development.

To protect the integrity of this natural area, it should be left alone. It will remain a climax forest unless disturbed. It can be used educationally without any appreciable damage to the ecosystem. Continued leasing to the hunt club will also have no adverse effects. Timbering should not be allowed. Fire should be kept out because of potential damage to the beech trees and promotion of fungi.

Ridgeville Savannah. Ridgeville Savannah is a small site, approximately 20 acres, completely surrounded by rural houses. One dirt road passes through the site, and several drainage ditches traverse the area. The site evidently is burned every year. This somewhat negates the adverse conditions created by the drainage ditches, which lower the water table and allow shrubs to invade the site. The site harbors an excellent community of savannah-bog species: S. minor, S. flava, Pinguicula caerulea, Drosera spp., Utricularia spp.

and Chaptalia tomentosa. It is a dry savannah and Sarracenia minor is much more common that S. flava. The latter prefers wetter conditions.

The once extensive savannah lands of the southeastern coastal area have been reduced severely (Wells, 1932; Schnell, 1976; and Folkerts, 1982), and bogs in a natural or nearly natural state are now rare. This community has a unique assemblage of species and is being eliminated rapidly today. Thus it is considered significant and worthy of protection.

The site is in a very vulnerable location. It is surrounded by rural farm homes. Some of the original site has already been converted into fields. Unless steps are taken soon, the remaining area will probably be turned into fields or homesites. Since the bog is rurally-located and owned by rurally-oriented persons, it is unlikely to be donated to any conservation group. Outright purchase will be necessary, but even this may not protect the site since yearly surveillance is not possible. Also drainage ditches in the area may so change the hydrology that the bog may still be eliminated.

Management of the site will require burning and possible modification of the present water regime.

(d) Energy- related impacts on high priority sites.

Beidler Forest. Peat mining impact on Beidler Forest will be minimal as there are no apparent peat deposits in Beidler Forest. This is primarily a floodplain system not condusive to peat formation. Con-

struction of hydroelectric facilities would flood Four Holes Swamp thus completely destroying the natural condition of Beidler Forest. Timbering the forest for fuel would also destroy the integrity of Beidler Forest and its standing as a National Natural Landmark. Oil drilling in Four Holes Swamp or its tributaries would have significant detrimental effects on the Four Holes Swamp ecosystem if a crude oil spill resulted. The amount of oil spilled and longevity of the oil in the water would determine the degree of adverse effects. Coal-burning facilities, such as a coal-fueled electricity-generating plant, should have no adverse effects on Beidler Forest as long as the facilities were operated under present EPA guidelines. Any acid rain would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

Givhans Limestone Bluff. No peat reserves are on this site. Conversion of this part of the Edisto River into a lake by construction of a hydroelectric facility would destroy the site. No commercial timber reserves exist on the site. The site does not appear to be a prime location for an oil-drilling rig; however, such a rig on top of the bluff would significantly degrade the site. An oil spill in the Edisto River above the site would have some minimal detrimental effects; however, since the water level of the river is at the base of the bluff, only a small part of the bluff would be affected. Coal-burning facilities should have no effect on air quality as long as the facility comes under present EPA guidelines. Any acid rain would come from emissions generated by distant and not local facilities, so this poses no threat to the area.

McAlhany's Southern Mixed Hardwood Forest. There are no appreciable peat deposits on this site. Conversion of the Edisto River into a lake by construction of a hydroelectric project would flood this site because it is an old bed of the river. There is a good stand of hardwood timber on the site,

and cutting it for commercial fuel would destroy the significance of the site. A large oil spill from a drilling rig upstream from the site, if it occurred during extreme flood conditions, might make its way via the water to the site. The degree of damage would depend on the quantity of oil spilled and the length of time the oil was in the water, but some detrimental effects would occur. An oil-drilling rig on the site would be significantly detrimental. Coal-burning facilities in Dorchester County should have no effect on the site if EPA guidelines are followed. Any acid rain would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

Highway 165 Beech-Magnolia Forest. No appreciable peat deposits are on this site. There is a good stand of softwood and hardwood timber there; cutting this timber for commercial fuel would destroy the significance of the site. The site would not be affected by any hydroelectric project in Dorchester County. An oil-drilling rig would have significant detrimental effects on the natural integrity of the site. Coal-burning facilities in Dorchester County will have no appreciable effects on the site as long as present EPA guidelines are followed. Any acid rain would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

McAlhany's Ilex amelanchier. Flooding is the most serious threat to the site. This could be the result of a hydroelectric facility operating on the Edisto River and would eliminate the Ilex amelanchier. Peat mining is no threat. Conditions are not condusive for peat formation, and no peat reserves exist at this time. No appreciable timber exists as a commercial fuel source. Oil drilling above the site on the Edisto River could result in elimination of the population of Ilex amelanchier, if a

spill occurred. Coal-burning facilities should have no effect on the site as long as the facility comes under EPA guidelines. An oil-drilling rig on the immediate site would eliminate the species. Any acid ran would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

Givhans Savannah. No peat reserves are on this site. It doesn't have sufficient amounts of timber to be a commercial fuel source; however, even complete removal of the pine trees may not destroy the savannah if periodic burning continues and the hydrology of the site is maintained. Removal of the trees, however, should still be avoided. An oil-drilling rig on the site would probably destroy its integrity as a natural area. A hydroelectric plant on the Edisto River below this area would probably flood the site because of the site's low elevation and close proximity to the Edisto River. A coal-burning facility, as long as it comes under present EPA guidelines, should not significantly affect the quality of the site's air. Any acid rain would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

Kells' Limestone Bluff. Energy-related impacts on this site and Givhans Limestone Bluff are identical.

Middleton Southern Mixed Hardwood Forest. No appreciable peat deposits occur on this site. A good stand of hardwood timber is present. If it is commercially removed for fuel, the integrity of the site would be destroyed. No hydroelectric plant could threaten this site. Coal-burning facilities located in Dorchester should have no appreciable effect on the site as long as EPA guidelines are followed. An oil-drilling facility at the site would significanly perturb the natural integrity of the community. Any acid rain would come from emissions generated by distant and not,

local facilities, so this poses no threat to the area.

Ridgeville Savannah. No appreciable peat deposit or commercial timber are on this savannah. The site would not be affected by any type of hydroelectric facility located in Dorchester County. An oil-drilling facility on the site would significantly affect the natural integrity of the site because of the small size of this area. Coal-burning facilities in Dorchester County should have no appreciable effect on the site as long as present EPA guidelines are followed. Any acid rain would come from emissions generated by distant, not local, facilities, so this poses no threat to the area.

(e) Slides. A series of color slides was taken of select rejected and high-priority sites. The slides are not included in the report; however, they are on file at the Heritage Trust office in Columbia and are available for viewing. The following slides are included in the series.

1. Trillium pusillum in Beidler Forest
2. Overview of Givhans Savannah
3. Givhans Limestone Bluff
4. Kells' Limestone Bluff
5. Overview of McAlhany's Southern Mixed Hardwood Forest
6. Overview of Middleton Southern Mixed Hardwood Forest
7. Sarracenia minor in Ridgeville Savannah
8. Overview of Ridgeville Savannah
9. Overview of Highway 165 Beech-Magnolia Forest
10. Bald Cypress-Tupelo Gum Swamp Forest in Beidler Forest
11. Mallard Lake in Beidler Forest
12. Colony of Ilex amelanchier in Swamp Forest
13. Colony of Ilex amelanchier
14. Portion of Givhans Savannah Unburned Previous Year
15. Givhans Savannah After Spring Burn
16. Kells' Limestone Bluff Showing Plant Community (Fern is Thelypteris kunthii)
17. Former Bank of Edisto River at Base of Bluff (Site of McAlhany's Southern Mixed Hardwood Forest)
18. McAlhany's Southern Mixed Hardwood Forest
19. Westvaco Savannah
20. Locklair Savannah
21. Harts Bluff Xeric Community
22. Harleyville Savannah
23. Highway 178 Savannah
24. Dorchester Pond Cypress Depression

25. Four Holes Swamp Southern Mixed Hardwood Forest
26. Dorchester Longleaf Pine Community
27. Reevesville Longleaf Pine Community
28. Delemar Highway Southern Mixed Hardwood Forest
29. Givhans Bridge Southern Mixed Hardwood Forest and Xeric Community
30. Givhans Bridge Southern Mixed Hardwood Forest and Xeric Community
31. Dorchester Shrub Bog
32. Slands Bridge
33. Overview of Sawmill Creek Gulf Coast Mud Salamander Site

(f) Status of rare, threatened and endangered plants in Dorchester County. Four species of vascular plants reported from Dorchester County are under federal review as potential nationally-endangered or threatened species: Trillium pusillum, Narthecium americanum, Eulophia ecristata and Ilex amelanchier (Department of Interior, 1983). Considerable time was spent looking for populations of Trillium. Two savannahs along Highway 178 were searched, but no specimens were found (see rejected Sites RS5 and RS6.) In addition to these two sites, Trillium was constantly looked for during field work in March and April. Every rejected site and high-priority site containing suitable habitat was searched, but no populations were located. The only known Trillium pusillum in Dorchester County is the population in Beidler Forest.

Although Ilex amelanchier is presently under federal review as a potential threatened species, state botanists have recently removed it from the state list of potentially-endangered or threatened species. Although some time was spent in 1983 looking for additional populations of this species, no time was spent in 1984 looking for it because of its revised state status. The only known population of Ilex occurs on the McAlhany property near the Edisto River. The original location of Narthecium americanum was "Summerville, S.C." I searched all savannah sites in this study for this species to no avail. There are four savannahs along Interstate 26. The Berkeley/Dorchester county line runs parallel to this

interstate between the interstate and Summerville (see county road map). These four savannahs are only a few miles from Summerville. As recently as 1982 one of the savannahs was mistakenly referred to as being in Dorchester County (Gaddy, 1982). Also, there is no savannah near Summerville in Dorchester County except the one near Locklair Airport (See rejected site number RS2.) These data lead me to conclude that the collection of Narthecium was not from Dorchester County.

Eulophia ecristata was reported by D. A. Rayner on 3 Sept. 1982 in a pine-broomsedge savannah in Dorchester County. The savannah is at the following location: 1.05 miles NW on Sec. Road 30 from its junction with S.C. 61. Dr. Rayner and I searched this site in 1983 but could not find any specimens. I also searched every savannah listed in this report, but could not find any populations of Eulophia. Although it is a potential candidate for federal listing as a nationally-threatened or endangered species, it probably is more common than presently believed. It has a short blooming time and is sometimes difficult to observe in the dense broomstraw where it often is found. I found it on several sites in the Francis Marion National Forest, along I-26 in Berkeley County and on the Webb Wildlife Center in Hampton. However, as long as it is a candidate for federal listing, continued efforts should be made to locate it in Dorchester County. Accordingly, I recommended additional searches for Eulophia in the two savannahs given priority status in this report and in the site where it was found by Dr. Rayner in 1982.

Several rare plants were found during the study that are botanically significant and need to be included in this report. A county record for Habenaria nivea (snowy orchid) was found on Givhans Savannah. This species is rare as it is not often found in the coastal area. Also, in the pond cypress depression within the Givhans Savannah I found a population of

Utricularia inflata var. minor. I have collected this species from only two other sites in the coastal area. Although it is not listed as rare by Radford et al. (1968), my field studies in the coastal area lead me to believe a listing of rare or infrequent is justified. A disjunct population of Lycopodium obscurum (groundpine) was found in the Highway 165 Beech-Magnolia Forest. This collection represents the first population found in the coastal region (Radford et. al., 1968).

The several specimens of Magnolia macrophylla (umbrella tree) found at Middleton Gardens present a difficult problem for botanists. The question has arisen as to whether the tree is native or introduced. Hunt (1947) mentions several thriving, young trees there which he states are apparently volunteers from older trees in the gardens. He does not mention the origin of the older trees. Officials at Middleton Gardens do not know the origin of the older trees. Until records reveal whether the original trees are native or introduced, the source of the trees will remain a mystery. Because of the rarity of the umbrella tree throughout its native range (Radford et al., 1968; Peattie, 1963), the Middleton Gardens population should be an area of special concern regardless of the origin of the older trees. The population is well-established and represents a significant reservior of this unusual species of magnolia.

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Appendix I: Dorchester County Map with Locations of Priority Sites and Rejected Sites.

Priority Sites:

PS1= Beidler Forest

PS2= Givhans Limestone Bluff

PS3= McAlhany's Southern Mixed Hardwood Forest

PS4= Highway 165 Beech-Magnolia Forest

PS5= McAlhany's Ilex amelanchier

PS6= Givhans Savannah

PS7= Kells' Limestone Bluff

PS8= Middleton Southern Mixed Hardwood Forest

PS9= Ridgeville Savannah

Site Boundary = _ _ _ _ _

Rejected Sites:

RS1= Westvaco Savannah

RS2= Locklair Savannah

RS3= Dorchester State Park Southern Mixed Hardwood Forest

RS4= Harts Bluff Xeric Community

RS5= Harleyville Savannah

RS6= Highway 178 Savannah

RS7= Dorchester Pond Cypress Depression

RS8= St. George Savannah

RS9= Four Hole Swamp Southern Mixed Hardwood Forest

RS10= Edisto Xeric Community

RS11= Schultz Lake

RS12= Dorchester Longleaf Pine Community

RS13= Reevesville Longleaf Pine Community

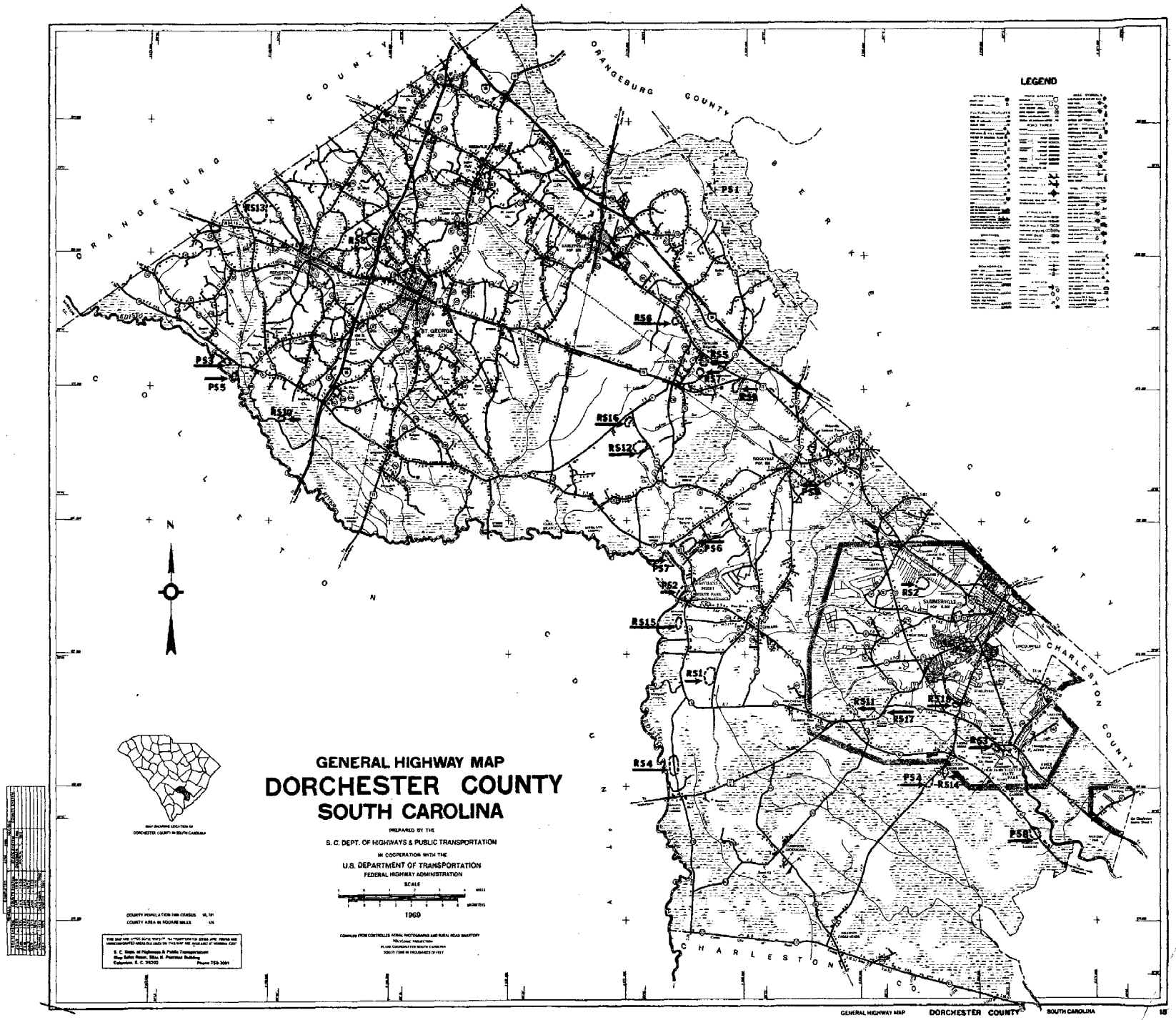
RS14= Delemar Southern Mixed Hardwood Forest

RS15= Givhans Bridge Southern Mixed Hardwood Forest and Xeric Community

RS16= Dorchester Shrub Bog

RS17= Slands Bridge

RS18= Sawmill Creek Gulf Coast Mud Salamander Site


LEGEND
ORANGEBURG COUNTY
BERKELEY COUNTY
COLLETON COUNTY
CHARLESTON COUNTY
ST. GEORGE
SUMMERVILLE
N
GENERAL HIGHWAY MAP
DORCHESTER COUNTY
SOUTH CAROLINA
PREPARED BY THE
S. C. DEPT. OF HIGHWAYS & PUBLIC TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
1969
COUNTY POPULATION 1960 CENSUS 16,191
COUNTY AREA IN SQUARE MILES 575
S. C. Dept. of Highways & Public Transportation
Hwy. Safety Assoc., Wm. H. Pearman Building
Columbia, S. C. 29202
Phone 758-3091

# Inventory of Botanical Natural Areas in Horry County, South Carolina

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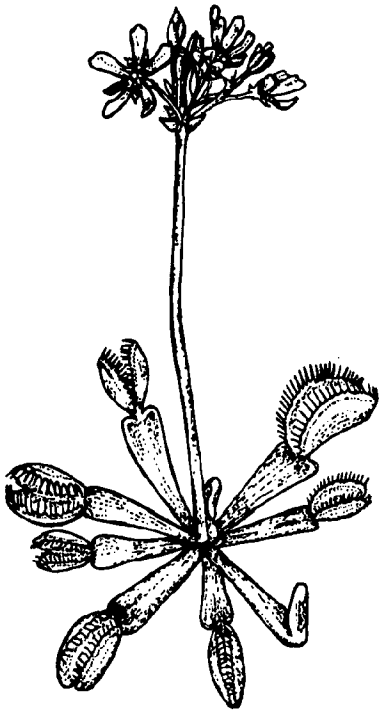

## September, 1984

Equal Opportunity Agency

S.C. Wildlife and Marine Resources Department
Division of Wildlife and Freshwater Fisheries
Jefferson C. Fuller, Jr., Director

# FINAL REPORT

# INVENTORY OF BOTANICAL NATURAL AREAS

# IN

# HORRY COUNTY, SOUTH CAROLINA

SEPTEMBER 1984

JOSEPH N. PINSON

COASTAL CAROLINA COLLEGE

This project was made possible by a Coastal Energy Impact Program Grant, established under the Coastal Zone Management Act of 1972, as amended, and administered by the Office of Coastal Zone Management, NOAA.

This project was prepared for the Office of the Governor, Division of Natural Resources.

TABLE OF CONTENTS

# INTRODUCTION

Horry County is located in the northeastern corner of South Carolina. The northeastern border of the county is a surveyor's line forming the boundary with North Carolina. The county is bounded on the southeast by the Atlantic Ocean. The northwestern and southwestern boundaries are formed by the Little Pee Dee River, the Great Pee Dee River and Big Bull Creek. Horry County is the largest county in the state with 737,280 acres of land within its boundaries. Topography within this area of the coastal plain is flat to slightly rolling with elevations from 0 to 110 feet. The main topographic features are sandy ridges, river swamps and Carolina bays.

According to the Land Use Plan for Horry County prepared in May, 1976, 43.7 percent of the land in the county was in agricultural use. This figure includes timber production, grazing lands and surface crop production. About two percent of the land is incorporated. High density development is restricted to the Grand Strand and the City of Conway. Residential development in rural areas is primarily limited to areas adjacent to highways.

Many diverse plant habitats occur in Horry County. Wetland plant habitats include those associated with lime sinks, brackish marshes, swamps and pocosins. Lime sinks are the rarest wetland habitat in the county. Inlets from the ocean are few and small. As a result there are few brackish marshlands in the county. Swamp forests and pocosins are abundant in Horry County. Terrestrial plant habitats have for the most part been exploited for economic gain. Pine flatwoods have just about vanished since the soils underlying them can be successfully used for agriculture. Coastal dunes and the associated vegetation have largely been destroyed by development for tourism.

Prominent on aerial photographs of Horry County are elliptical bay swamps outlined by sparsely vegetated sand ridges. Many of these Carolina bays are

filled with peat. These depressions have been the subject of numerous publications regarding the possible origins of the bays. Several authors have presented data that these geological formations are of extraterrestrial origin, formed by the impacts of meteors or comet fragments on the earth (Melton and Shriever, 1933, Prouty, 1950, and Wells and Boyce, 1953). Other authors have concluded that water, wind or other terrestrial phenomena have shaped the bays (Cooke, 1940, Johnson, 1942, and Kaczorowski, 1976). A good summary of conflicting data about the origins of Carolina bays may be found in The Mysterious Carolina Bays (Savage, 1982).

A major threat to existing natural ecosystems in Horry County is residential and commercial development. For such development to continue expanded wastewater treatment facilities and additional highways are planned. Not only do new highways cover ecosystems with pavement, but also drainage patterns are changed in adjacent ecosystems. According to the Land Use Plan for Horry County (1976), Horry County is expected to have 10,582 acres of its presently undeveloped land classified as developed by 1995. A proposal to use Carolina bays as tertiary treatment sites for sewage is a threat to the composition of the plant communities within these pocosins. Another threat to wetland ecosystems is the commercial production of peat from Carolina bays. A recent study by $CH_2M$ Hill (1983) has documented that some of these pocosins have peat layers to a depth of 15 feet.

## METHODS

The historic richness of the botanical natural diversity of Horry County was known prior to this study. At least 20 rare, threatened or endangered plant species had been reported in the county (Rayner et al., 1979). The county was also known to contain the largest concentration of peat-based Carolina bays in

the state and essentially the only undisturbed bays in South Carolina harboring the Venus' fly trap. Because of the restraints of time and funding, the decision was made, in consultation with Dr. Douglas Rayner, to concentrate survey efforts on natural ponds, large bays and bay complexes within the county. Although many habitats with the potential for the presence of rare plants were surveyed, no attempt was made to relocate all historic sites of rare, threatened or endangered plants reported from Horry County.

The study began with a thorough survey of existing maps. Topographic maps were useful in locating bays and natural ponds. Infra-red aerial photographs for the county were checked at Waccamaw Regional Planning Commission in Georgetown. A detailed soil survey report with recent maps is not yet available for Horry County. The most useful maps were a series of 198 aerial photographs (1"=400') made in 1975 and located in the office of the tax assessor for the county. These maps were much more detailed than the topographic maps, and they were already referenced by number to the county highway map. I could easily determine whether a bay shown on a topographic map was one bay or a complex of several bays. I could also determine whether a bay or pond had been altered prior to 1975 as the result of filling or draining. Since this complete set of fairly recent photographs was readily available for photocopying, I used this source extensively. Aerial reconnaissance was not necessary since these excellent photographs were available.

Natural ponds, large bays and bay complexes identified from aerial photographs were sketched onto a county highway map. These sites were then checked in the field for the presence of endangered or threatened plants. An exception was made in the case of the Buist Tract, an area between Conway and Myrtle Beach bounded by S.C. Highway 90, the Atlantic Intracoastal Waterway and U.S. Highway 501. The Buist Tract has been previously inventoried for rare plant habitats (Rayner, personal communication). Pine savanna habitat was difficult to locate

by using tax maps. This type habitat was easy to recognize visually while traveling along backroads from one bay to another in the county. The floristics of the Socastee Savanna were documented prior to this study. Data included in this report concerning Socastee Savanna were supplied by the South Carolina Heritage Trust Program.

Herbarium specimens were collected at each site visited. These specimens have been identified and placed in the herbarium at Coastal Carolina College. A list of 70 record plants from Horry County collected in connection with this study has been given to Doug Rayner of the South Carolina Heritage Trust Program.

After the preliminary selection of sites, personnel with the South Carolina Heritage Trust Program assisted in determining the priority of each site. These evaluations were based upon on-site inspections of some of the areas and upon written descriptions in the draft of the final report. The insight of Heritage Trust personnel was very valuable in determining the state and national significance of the various sites.

## RESULTS AND DISCUSSION

High and medium priority sites listed in this report were primarily selected and ranked on the basis of natural plant populations present at each site. The sites are listed in this report on the basis of priority. A summary list of sites with priority numbers is found in Appendix I. The Carolina bays and many of the ponds are also interesting in a geological sense. Since many of the rare plant communities in Horry County depend upon periodic fires for maintenance of the habitats, surrounding land use was also a factor in determining priority.

On-site inspections of eighteen bays or bay complexes were made during this

study. The best sites were visited more than once at different seasons of the year. Most of these bays were found to have little herbaceous species diversity. A dense shrub layer often reaching the tree canopy is an indication that fire has been kept out of these bays for many years. In the absence of fire every two or three years, the herbaceous flora is gradually eliminated from the wet margins of bays as the shrubs and tree seedlings flourish. It is primarily the herbaceous flora that has become rare in the coastal plain. Once the herbaceous flora has been eliminated from an area, a fire every ten to twenty years does not restore the habitat or the species diversity. The potential for restoration of rare plant habitat through controlled fires over a period of years in a bay habitat is always a possibility.

Nineteen sites are recommended as significant on the national, state or local level. Three of the sites, Cartwheel Bay, Socastee Savanna and Money Pond are of national significance. Seven sites, Buist Tract, Lewis Ocean Bay Complex, Horry's Borrow Pit, Prices Swamp, Joiner Bay-Horsepen Bay, Salem Pond and Little River Swamp are of statewide significance. The remaining nine sites, Flat Bay, Brown Bay, Juniper Bay and Swamp, Collins Creek Limesink Complex, Clear Pond Complex, Poplar Swamp, Perry Road Bay Complex, Fifteen Mile Bay Complex and Wolf Pit Bay Complex are of local significance. These sites are individually discussed in the following paragraphs in order of priority. A summary of sites showing priority may be found in Appendix I.

## Cartwheel Bay Complex

The Cartwheel Bay Complex (Site 5) located in the remote northwestern section of Horry County is a botanical treasure garden. Fire has been frequent in the Cartwheel complex as evidenced by wide, open, wet margins around bays and drainage areas within the complex. In addition to an amazing diversity of species, the population of each species is also impressive. Thousands of Venus'

fly traps cover the ground in places, four species of pitcher plants are common, and nine species of orchids grow in abundance. The largest population of Pyxidanthera barbulata var. barbulata (pixie moss) in South Carolina occurs within this complex.

The Cartwheel Savanna and Bay Complex is completely out of the path of rapid development at the present time. The open character of the area and the great diversity of plant species is due to periodic burning over a long period of time. I speculate that periodic fire has been a part of the ecology of this area for hundreds of years. Certainly the area has been burned repeatedly in the last 75 years. The diversity of coastal plain species in this area is unmatched in Horry County. The topography includes wet flatlands supporting longleaf pine in the overstory, Carolina bays, sandy ridges and transition zones between each of these topographic features. If large bays in this complex were drained or mined for peat the naturalness of this area would be destroyed.

The Cartwheel Savanna and Bay Complex is the best savanna and bay complex in Horry County. Numbers of Venus' fly traps here are greater than in any other site outside the Buist Tract. The largest and the only undisturbed stand of pixie moss in the state occurs here. Thousands of terrestrial orchids dot the landscape in August including Habenaria ciliaris, H. cristata, H. nivea and H. blephariglottis. Four species of pitcher plants are also abundant (Sarracenia flava, S. purpurea, S. minor and S. rubra). There is no habitat like this one in public ownership in South Carolina. This site is considered to be of national significance by the South Carolina Heritage Trust Program.

### Socastee Savanna

One of the previously known, outstanding natural areas in Horry County is Socastee Savanna (Site 35). Socastee Savanna is in many ways a typical savanna

of the southeastern coastal plain, and yet this savanna is unique in the assemblage of rare plants within its boundaries. The overstory is very open and is dominated by Pinus serotina and Pinus palustris. The relative absence of understory and shrub layers is due to frequent fires that typically occur in the winter or spring every three to seven years. Grasses such as Aristida, Ctenium and Muhlenbergia dominate the very diverse herbaceous layer. Since savannas occur on nearly level soils underlain by an impervious clay hardpan, they are frequently flooded for relatively long periods of time after heavy rains.

Socastee Savanna is not threatened by any energy-related development. The savanna is threatened by rapidly accelerating commercial and residential development. Two golf courses have been completed nearby within the last few years. The completion of a new wastewater treatment plant in 1982 has increased the numbers of single-family and multi-family units in the vicinity. Each new encroachment in this area reduces the possibility that this significant natural site can be managed in its natural state.

Socastee Savanna is significant for several reasons. The savanna contains excellent examples of Pinus-Aristida and Pinus-Ctenium communities that are rare and rapidly disappearing from the coastal plain of South Carolina. Three plant species presently under status review (U.S. Department of Interior, 1983) for listing as potentially endangered or threatened species are found here. It has excellent populations of Parnassia caroliniana, Schwalbea americana and Eulophia ecristata. Parnassia caroliniana (Carolina grass-of parnassus) is known to occur in five southeastern states, and only South Carolina and North Carolina have more than one population. Five populations are known in South Carolina, and this is the second best one. Schwalbea americana (chaff-seed) has been reported to occur in thirteen eastern states, but has been extirpated from more than three-fourths of its range. South Carolina harbors more of this rare plant than the other states combined. The largest known population was recently

found in Jasper County. The second largest population in existence is at Socastee Savanna. The population of Eulophia ecristata (false coco) at Socastee Savanna is by far the largest known in South Carolina. Although there are about thirteen populations of this species in seven counties in the state, most populations are very small. Many other populations of plants found infrequently in the state inhabit this savanna, including Anthaenantia rufa and Coreopsis gladiata. The South Carolina Heritage Trust Program considers Socastee Savanna to be a natural area of national significance.

## Money Pond

Money Pond (Site 22) is a circular to oval-shaped, relatively deep depression. Surrounding the pond is relatively undisturbed woodland. In the late summer of 1983 the pond was complete dry. Fimbristylis perpusilla was collected at this site in October, 1983.

Fimbristylis perpusilla is considered "of national concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). This species is also under federal status review for listing as a potentially endangered species (U.S. Department of Interior, 1983).

Money Pond is in the path of development from North Myrtle Beach and Little River south along S.C. Highway 90 and S.C. Highway 9. Although Fimbristylis perpusilla is more abundant at Horry's Borrow Pit (Site 28), Money Pond represents a much more natural site for the presence of this species. This site is considered to be of national significance by the South Carolina Heritage Trust Program.

## Buist Tract

The Buist Tract (Site 29) is located in the eastern part of Horry County

across the Atlantic Intracoastal Waterway from Myrtle Beach. Aerial photographs of this area clearly show large numbers of Carolina bays interspersed with sandy pinelands. Large bays, small bays, heart-shaped bays, overlapping bays and bays within bays are all present within this area. Many of the photographs used by Savage (1983) to illustrate various types of Carolina bays were taken within this area. Vegetation associated with the bays is essentially pond pine-evergreen shrub bog. Most of the sandy upland is planted in slash pine.

The moist, open margins of Carolina bays provide ideal habitat for Dionaea muscipula, Venus' fly trap. Although this species is exploited by both commercial and private collectors, a greater threat to the Venus' fly trap is loss of habitat by drainage projects and by absence of periodic fire. Attempts to locate populations of this species, known to occur in Charleston and Georgetown Counties from herbarium specimens, have been unsuccessful. The Horry County populations are very likely the only remaining ones in the state. A large percentage of these remaining populations is contained within the Buist Tract.

Dionaea muscipula was under federal status review as a potentially endangered or threatened species in 1979. In that same year the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants listed this species as "of national concern-endangered." Since that time the species has been removed from the list of plant species of concern in North Carolina. This action necessitated the lowering of the status of the species in South Carolina to "of regional concern-endangered" (S.C. Advisory Committee, 1984).

Wildfires have burned the Buist tract periodically for hundreds of years. Two of the most recent fires burned almost the entire tract. The most recent fire burned 30,000 acres and occurred in April, 1975. A large fire in the same area occurred in 1954. These fires, by opening up the bay margins and reducing competition, are of great benefit to populations of the Venus' fly trap. Periodic fire is the best management technique for maintaining healthy popu-

lations of this species.

Peltandra sagittaefolia (white arrow-arum) is another rare plant known from the Buist Tract. Members of this species are found rooted in the thick peat layer toward the centers of relatively large bays. Periodic fire contributes to the maintenance of a sunny habitat needed for flower and fruit production. White arrow-arum is considered a species "of concern-status unresolved" by the South Carolina Advisory Committee (1984). Carnivorous plants, including three species of pitcher plants, sundews and bladderworts are abundant in some of the moist, savanna-like areas within and adjacent to the bays.

In addition to unusual plant life, the Buist Tract harbors the largest remaining populations of black bears in the coastal plain of South Carolina. Although the black bear is a game animal in mountainous regions of the state, it is considered by the South Carolina Heritage Trust Program to be threatened in the coastal plain.

The Buist Tract is subject to several major threats. Any of these threats could seriously affect the natural significance of the site. A major energy-related threat concerns the potential for peat mining in the area. Peat deposits up to fifteen feet in depth have been recently documented in this area ($CH_2M$ Hill, 1983). A small, viable peat mining operation already exists in Colleton County, South Carolina. Peat from this operation is sold as a soil conditioner. Cohen et al. (1982) indicate that South Carolina does contain fuel-grade peat deposits, and that the technology exists to make economic use of deposits of less than 20,000 acres. Peat mining in the Buist Tract would probably destroy all elements of significance within this site.

Several areas within the Buist Tract have been selected as potential sites for tertiary treatment of wastewater ($CH_2M$ Hill, 1983). The addition of wastewater to a bay would cause drastic changes in plant community composition,

particularly in those areas receiving direct input. It is possible that the vegetation of the entire bay would be impacted by relatively high sodium levels in wastewater from Horry County. During periods of high rainfall even the edges of bays are flooded. The populations of Venus' fly traps around the margins could be adversely affected by high rates of evaporation which would leave behind ever-increasing levels of sodium. The significance of the site would be severely reduced if the bays were used for the tertiary treatment of wastewater effluent.

A third major threat to the Buist Tract is drainage to facilitate the building of highways. Drainage lowers the water table and adversely affects plant communities dependent upon periodic flooding. Completion of highways would accelerate residential and commercial development. Expansion of drainage systems would be necessary for this further development to occur. Controlled burning for habitat maintenance is not possible near an area with a dense human population.

The Buist Tract is the largest contiguous tract of relatively undisturbed pond pine-evergreen shrub dominated bays in South Carolina. This area contains the largest population of the rare Venus' fly trap in the state, a good population of white arrow-arum and the largest population of black bear in the coastal regions of the state. The Buist Tract is considered of statewide significance by the South Carolina Heritage Trust Program.

## Lewis Ocean Bay

Lewis Ocean Bay Complex (Site 11) is one of the largest bay complexes in Horry County. This complex includes three overlapping bays and what appears from aerial photographs to be a bay-within-a-bay. Following a fire in 1975, the Lewis Ocean Bay Complex was a natural garden of species native to pine savannas. Fewer and fewer hebaceous species have flowered each year as the shrub layer has

become taller and thicker. Dionáea muscipula (Venus' fly trap) is abundant here. This site is one of the few in the state where Asclepias pedicellata has been collected. Timber management practices have scarred some areas of this bay complex.

Dionaea muscipula is considered to be "of state concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). The population of this species was quite large for several years following the fire in 1975. It has been progressively harder to locate plants in recent years as the shrub layer has grown taller and thicker.

Asclepias pedicellata, a rare milkweed, is considered "of regional concern-threatened" by the South Carolina Advisory Commmittee on Rare, Threatened and Endangered Plants (1984). Three widely scattered plants were located in June, 1983. One of these plants was in flower and fruit and was growing in the center of a seldom-used road. The other two were in fruit and were found between the eastern sand ridge and Ocean Bay. Probably the absence of fire has contributed to habitat destruction and has reduced the size of the population. The flowers of this species are green which makes field location difficult.

Potential threats to the Lewis Ocean Bay Complex include mining for peat, drainage for development, and absence of periodic fire. This site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Horry's Borrow Pit

Horry's Borrow Pit (Site·28) is flooded most of the year with water from the Waccamaw River. During wet years it is flooded year-round. Following the hot, dry summer of 1983 the borrow pit had no standing water during September and October. The bottom of the borrow pit at this time was carpeted with a variety of flowering herbaceous plants. A borrow pit is not a natural area.

This one would not be significant except that four threatened or endangered plants are present here. The four are Fimbristylis perpusilla, Coreopsis rosea, Hemicarpha micrantha, and Sabatia kennedyana.

Several thousand specimens of Fimbristylis perpusilla, an annual plant, grew to maturity during September and October, 1983, at this site. This habitat dries completely about once in a five-ten year period. F. perpusilla is considered "of national concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). This species is also under federal status review for listing as a potentially endangered species (U.S. Department of Interior, 1983). Coreopsis rosea is listed as "of statewide concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). About 25 plants were persistently in flower from 1 September to 18 October, 1983. These plants grow just above the high water-mark on sandy soil between the highway fill and the borrow pit.

Hemicarpha micrantha is listed as "of state concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). Hundreds of plants flowered at this site in the dry fall of 1983. These plants are almost microscopic and very hard to locate because they are hidden by other vegetation. Members of this species grow on the bottom of the dry borrow pit along with Fimbristylis perpusilla.

Sabatia kennedyana (Plymouth gentian) has been given a status of "regional concern-endangered" by the South Carolina Advisory Committee (1984). The relatively small population of this species at this site occurs between the highway fill and the borrow pit near the high-water mark.

Because of the presence of four threatened or endangered species, this site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Prices Swamp

Prices Swamp (Site 27) consists of two overlapping bays. A power line right-of-way crosses both bays. There is a wide flat transition zone on the western edge of the northernmost bay. This zone had dozens of specimens of Dionaea muscipula in flower on 29 June, 1983. The southernmost bay supports a population of Peltandra sagittaefolia along the power line right-of-way. Both of these species are listed by the South Carolina Advisory Committee (1984) as endangered or threatened. Periodic fire is necessary for the maintenance of populations of both Dionaea muscipula and Peltandra sagittaefolia. In this instance the maintenance of power line right-of-way helps to keep the canopy open for white arrow-arum. This area was burned in 1975, and many of the overstory trees were damaged or destroyed. The shrub layer has become very dense over the last nine years due to the absence of fire.

The bays of Prices Swamp are among the sites proposed for tertiary treatment of wastewater by Grand Strand Water & Sewer Authority ($CH_2M$ Hill, 1983). The natural character of these bays would be destroyed by the introduction of wastewater. This site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Joiner Bay-Horsepen Bay

Joiner Bay and Horsepen Bay (Site 15) are adjacent to each other and have no clear delineation between them. Neither bay has a classic oval shape with a sand ridge on the southeastern side. These bays are probably better described as pine flatwoods. Pinus serotina dominates the lower sites, and Pinus palustris dominates the higher sites. Along S. 45 coming from Bayboro, Horsepen Bay has been logged within the last few years. A dense shrub and transgressive

tree layer dominates this part of the bay. Across S. 45 to the right, fire has been frequent, maintaining a 100-yard wide savanna along the highway. Joiner Bay to the north of Horsepen Bay has been recently ditched by deep trenches several miles long in two directions.

The natural character of Joiner Bay has been destroyed by recent ditching. Horsepen Bay is bisected by S. 45. Parts of Horsepen Bay have been severely disturbed by logging and agriculture. A narrow strip of savanna near the road supports an interesting assemblage of herbaceous flora. On 15 May, 1984, leaves of Parnassia caroliniana (Carolina grass-of-parnassus) were found along the roadside and in edge of the savanna area. This fringe area between S. 45 and a shallow fire brake seems to burn every two to three years. If this bay were burned more frequently it might be possible for the range of Parnassia to be extended within the area. Carolina grass-of-parnassus is considered to be "of national concern-threatened" by the South Carolina Advisory Committee (1984). This site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Salem Pond

Salem Pond (Site 16) is a relatively shallow, irregularly shaped, dolomitic pond. Specimens of Taxodium ascendens up to 28" dbh dominate the interior parts. Edges of the pond are dominated by Litsea aestivalis (pond spice). An unsuccessful search was made to locate Lindera melissaefolium here. This pond is an undisturbed natural site. Old growth pond cypress, black gum, red bay, titi and sweet bay are common in and around the pond. More than a hundred specimens of Litsea aestivalis were found around the upper edges of the pond. These plants are a mixture of young and mature specimens up to 15 feet high. The ecosystem surrounding Salem Pond seems stable. As older plants die, young ones of the same species are there for replacement. Fire does not seem to be a

necessary factor in maintaining the present species composition. Seasonal fluctuation of water level is a factor in keeping the pond canopy relatively open.

Salem Pond supports the largest population of Litsea aestivalis in Horry County. According to Doug Rayner, it is among the best sites for Litsea (pond spice) in South Carolina. The mature plants reach 10 - 15 feet in height. Seedlings abound in the area. Litsea aestivalis is considered "of regional concern-threatened" by Rayner et al. (1979). This species was deleted on the 1984 Revised List of Rare, Threatened and Endangered Plants. This plant is still infrequently encountered and generally occupies a distinct habitat. The Salem Pond site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Little River Swamp

The Little River Swamp Complex (Site 26) consists of two classic Carolina bays and an oval-shaped cypress pond. The southernmost bay supports typical shrub bog vegetation growing on a 15-foot layer of peat. The northernmost bay supports a dense forest of relatively young trees. Little or no peat is present in the forested bay, possibly because fire in the past burned away the peat leaving behind a mineral soil. The cypress pond in this complex supports a dense, old-growth stand of Cyrilla racemiflora around the edges of the pond. The sand ridge at the southeastern edge of the northermost bay supports an excellent stand of Ceratiola ericoides (rosemary). This population of Ceratiola is the best one in Horry County. The Horry County populations represent the easternmost extension of the range for this species. The nearest reported populations of rosemary to the Horry County populations occur about 100 miles away in the sand hills of central South Carolina.

The two bays in the complex are proposed as tertiary treatment sites for wastewater from North Myrtle Beach ($CH_2M$ Hill, 1983). High sodium levels in wastewater from Horry County will likely kill most vegetation in the bays if this plan is carried out. The addition of wastewater would probably not directly affect the population of rosemary growing on the sandy ridges.

The cypress ponds in the Little River Swamp Complex are surrounded by a magnificent, dense stand of Cyrilla racemiflora. One pond is circular and covers about two acres. The larger pond is oval and covers about 18 acres. Relatively large specimens of pond cypress are present in both ponds. Three colonies of Litsea aestivalis are present at the smaller pond. Water levels on 26 June, 1984, were quite low. Turtle and alligator tracks were clearly visible in the soft, dark mud. This site is considered to be of statewide significance by the South Carolina Heritage Trust Program.

## Flat Bay

Flat Bay (Site 23) is a large bay covering about 600 acres. The canopy, largely composed of Pinus serotina, is closed. The dense shrub layer has regenerated following a fire about three years ago. No particularly rare plants occur here with the exception of a population of Pyxidanthera barbulata (pixie moss). Fire in and around this bay has been infrequent. About half of the sand ridge on the eastern edge has been logged within the past two years, and young pines have been planted on the recently prepared site. No evidence of Venus' fly traps, pitcher plants or orchids was found at this bay.

Pyxidanthera barbulata var. barbulata is considered to be "of statewide concern-threatened" by the South Carolina Advisory Committee on Rare, Threatened and Endangered Plants (1984). The population of pixie moss is growing largely between the tracks left by four-wheel drive vehicles which apparently frequent the area. This is the second best of three sites for pixie moss in Horry County

and in South Carolina. This site is considered to be of local significance by the South Carolina Heritage Program.

### Brown Bay

Brown Bay (Site 25) has been cut over within the last few years. A relatively new road with adjacent drainage ditches bisects the bay. Fire in the area has been intermittent. This bay does not have the classic oval shape of a Carolina bay and is probably best described as a flatwoods dominated by pond pine. Controlled fire in this area would contribute to the expansion of habitat for remnant populations of three threatened or endangered plants.

On the fringes of Brown Bay a small population of Pyxidanthera barbulata survives between a roadside ditch and the bay. The area is kept open by periodic mowing. Sarracenia rubra and Dionaea muscipula are represented in this same area by small populations. This site is considered to be of local significance by the South Carolina Heritage Trust Program.

### Juniper Bay and Swamp

Juniper Bay and a small swamp associated with it (site 24) cover about thirty acres and are habitat for a stand of Chamaecyparis thyoides. This population of Atlantic white cedar is composed of mature trees, transgressive saplings and seedlings. Since the canopy is almost closed, the shrub layer is in the process of being shaded out. Tree species that have reached the canopy and now compete with Chamaecyparis for light include Pinus serotina, Acer rubrum, Gordonia lasianthus and Liquidambar styraciflua. This site contains one of the few remaining stands of Atlantic white cedar in the outer coastal plain of South Carolina.

The management of Atlantic white cedar habitat is not well defined at

present. This species is not tolerant of fire (Sharitz & Gibbons, 1982). A symposium on "Atlantic White Cedar Wetlands" will be held October 9-11, 1984, at the Marine Biological Laboratory, Woods Hole, Massachusetts. This symposium should provide some guidelines for management. One of the objectives of the symposium is to determine future research needs. It also will address the role of fire, succession and a variety of additional topics. Juniper Bay and the associated small swamp represent the best example of an Atlantic white cedar bog in Horry County. This site is considered to be of local significance by the South Carolina Heritage Trust Program.

## Collins Creek Limesink Complex

The Collins Creek Lime Sink Complex (Site 4) is characterized by many small, shallow to deep sinks. In addition, there are two relatively large shallow sinks present. The deeper sinks contain large specimens of Taxodium and Nyssa. A limited amount of Litsea aestivalis is present in the area. The area was burned about four years ago. Trees in the sinks were not damaged by the fires. Litsea plants that were burned seemed to be regenerating nicely. Depending on rainfall, these sinks are dry or have water levels up to 3-4 feet. Lindera melissaefolium was searched for but was not located at this site.

The Collins Creek Lime Sink Complex is the largest lime sink complex in Horry County. Uplands around the sinks are mostly covered with planted pine. Vegetation in the larger sinks is magnificent, old-growth Taxodium and Nyssa. This site is primarily of geological interest. It is considered to be of local significance by the South Carolina Heritage Trust Program.

## Clear Pond Complex

The Clear Pond Complex (Site 17) consists of three, small circular ponds and two irregularly shaped ponds. The largest of the circular ponds is Clear

Pond, which covers about two acres. The water in the pond is clear, and there is little fluctation in water level. Even in the dry, hot summer of 1983, the water level was not down significantly. Most other natural ponds in Horry County were almost completely dry by September, 1983. Clear Pond has been extensively used as a community recreation site for many years. Vegetation around the pond is sparse due to camping and other human activity.

Alligator Pond is about one acre in size. Vegetation around Alligator Pond has been cleared for the planting of pine trees. The smallest circular pond is less than 0.25 acre in size. It is completely filled with peat but is still open; vegetation is only around the periphery. The two irregularly shaped ponds cover a total of about 10 acres. Each has Taxodium ascendens and Nyssa sylvatica as the dominant canopy species. Litsea aestivalis is present in small amounts around both ponds.

The Clear Pond area does not have any particular floristic significance. The area is interesting geologically and hydrologically as it is the only spring-fed pond in Horry County. This site is considered to be of local significance by the South Carolina Heritage Trust Program.

## Poplar Swamp

Poplar Swamp (Site 21) was completely dry at the time of my visit in August, 1983. The canopy here is closed. Even when flooded, the swamp is relatively shallow. Nyssa biflora and Taxodium distichum are interspersed with Acer rubrum, Liquidambar styraciflua, Ilex opaca and Liriodendron tulipifera. A healthy population of Chamaecyparis thyoides is present in the swamp. These conifers vary in height from 3 - 25 feet. About 35 mature trees occur in this area.

Poplar Swamp is one of two sites known to harbor Chamaecyparis thyoides in

Horry County. The swamp has been somewhat disturbed by a drainage ditch on the eastern edge of the swamp. This site is considered to be of local significance by the South Carolina Heritage Trust Program.

## Perry Road Bay Complex

The Perry Road Bay Complex (Site 3) includes three bays, one smaller (25 acres) than the others (50 acres each). A cleared power line right-of-way crosses the two larger bays. Fire has been kept out of these bays for several years. A small population of Dionaea muscipula (Venus' fly trap) is present at the smallest bay. The area where these plants grow is kept open by the presence of a small access road crossing the sand ridge to the power line.

The two larger bays in the complex are not significant as a natural area because of timber management practices such as plowing around bays, and the presence of a cleared power line right-of-way through them. This site does have potential for supporting rare plant species through proper use of periodic fire. A small population of Dionaea muscipula is associated with the smallest bay in this complex. This small bay is considered to be of local significance by the South Carolina Heritage Trust Program.

## Fifteen Mile Bay Complex

The Fifteen Mile Bay Complex (Site 9) consists of two medium-sized bays (400 acres) and three smaller bays (250 acres). The westernmost bay in this complex has been ditched. The other four bays support bay forests. Fire has not been frequent in any of these bays.

The Fifteen Mile Bay Complex supports a dense bay forest with a dense shrub layer. There is little or no interesting herbaceous flora. Unpaved roads surround the bay complex. In most cases these roads occupy transition areas between the sand ridges and the wetter parts of the bays. This site is con-

sidered to be of local significance by the South Carolina Heritage Trust Program.

## Wolf Pit Bay Complex

The Wolf Pit Bay Complex (Site 8) consists of one classically-shaped Carolina Bay and a larger, more or less heart-shaped, bay to the north. Separating these two bays is a sand ridge supporting a dense stand of turkey oak with scattered long-leaf pines. The canopy in these bays is closed, indicating an absence of frequent fires. A dense shrub layer is present beneath the overstory.

The Wolf Pit Bay Complex is not recommended for further investigation because of the paucity of the herbaceous flora. However, there is potential for rare habitat restoration through proper use of fire. The overlapping, heart-shaped bay configuration is of geological interest. This site is considered to be of local significance by the South Carolina Heritage Trust Program.

## Lilaeopsis caroliniensis

The presence of Lilaeopsis caroliniensis (Carolina lilaeopsis) at various locations indicated as Site 31 on the map in Appendix I, has been recently verified by the South Carolina Heritage Trust Program. This species presently is under federal status review as a possible endangered or threatened species. The unofficial South Carolina list of rare plants (Rayner et al., 1979) lists this species as "of national concern-endangered." The status was lowered by the South Carolina Advisory Committee (1984) to "of statewide concern-threatened." The recommendation to lower the status of this species was based upon incomplete information. New information suggests that Carolina lilaeopsis is taxonomically distinct from a naturalized, weedy species introduced from South America. The

native species occurs in eight southeastern states and is apparently rare throughout its range. The only occurrences in South Carolina are in Horry County. Carolina lilaeopsis typically is found in dune swale ponds within a half-mile of the Atlantic Ocean.

## Coreopsis rosea

The locality (Site 32) shown in Appendix I was found in 1980. Coreopsis rosea (pink tickseed) has an unofficial status of "statewide concern-threatened" (South Carolina Advisory Committee, 1984). The species is found in grass-sedge bays and on muddy riverbanks. Coreopsis rosea is present at Horry's Borrow Pit (Site 28). This species was not found along the banks of the Waccamaw River and adjacent oxbow lakes away from S.C. Highway 9 during the present study.

## Crotonopsis linearis

Crotonopsis linearis (narrow-leaved rushfoil) was found in Horry County in 1973 at Site 33. Rayner et al. (1979) consider this species "of concern-status unresolved." The status or significance of this population is undetermined. No additional sites for this species were located during this study.

## Dionaea muscipula

Several sites harboring Dionaea muscipula, Venus' fly trap, are recommended for status as significant natural areas in this study (Sites 3, 5, 11, and 27). Additional sites previously reported to the South Carolina Heritage Trust Program are collectively listed on the map in Appendix I as Site 34. The status and significance of these sites is undetermined, but Dionaea muscipula is considered significantly rare in South Carolina.

## Schwalbea americana

A location for Schwalbea americana, chaff-seed, indicated as Site 35 in Appendix I, was reported in 1954. A specimen of this species collected in May, 1982, from Socastee Savanna (Site 30) is in the herbarium at Coastal Carolina College. Chaff-seed is presently under federal status review for listing as a potential endangered or threatened species (U.S. Department of the Interior, 1983). No attempts were made to relocate this population. Searches for this species at other savanna sites in Horry County during this study were unsuccessful.

## Reports of Additional Rare Plants from Horry County

Several significantly rare plants have been reported form Horry County including Helianthus schweinitzii, Fimbristylis vahlii, Chelone cuthbertii and Arenaria godfreyi. Localities for these species were not included in Appendix I because locality data in reports did not allow precise relocation or because the sites have been destroyed as natural sites. Additional populations were not found during the present study.

Helianthus schweinitzii (Schweinitz' sunflower) is known only from North and South Carolina. This species is presently under federal status review for listing as a potentially endangered or threatened species. In the coastal plain it is reported from savannas.

Fimbristylis vahlii (Vahl's fimbry) is considered "of concern-status unresolved" (South Carolina Advisory Committee, 1984). Although this species has been reported from Horry County in Radford et al. (1968), no herbarium specimen has been found to validate this report. The habitat for Vahl's fimbry is moist, sandy soil.

Chelone cuthbertii (Cuthbert's turtlehead) was given a status of "regional

concern-threatened" by Rayner et al. (1979) and a status "of concern-status unresolved" by the South Carolina Advisory Committee (1984). This species is only known in North Carolina, South Carolina and Virginia. The only coastal plain report for the species is from Horry County, South Carolina. In 1931 a specimen was collected by John Bright "in wet, low fields near Aynor."

Arenaria godfreyi (Godfrey's sandwort) is under federal status review for listing as a potentially endangered or threatened species. This taxon is known only in Alabama, Florida, North Carolina and South Carolina. The only report from South Carolina is from Horry County. The species may have been extirpated since the originally reported site is now a subdivision. The habitat for this species is a marshy, open woodland over a marl substrate.

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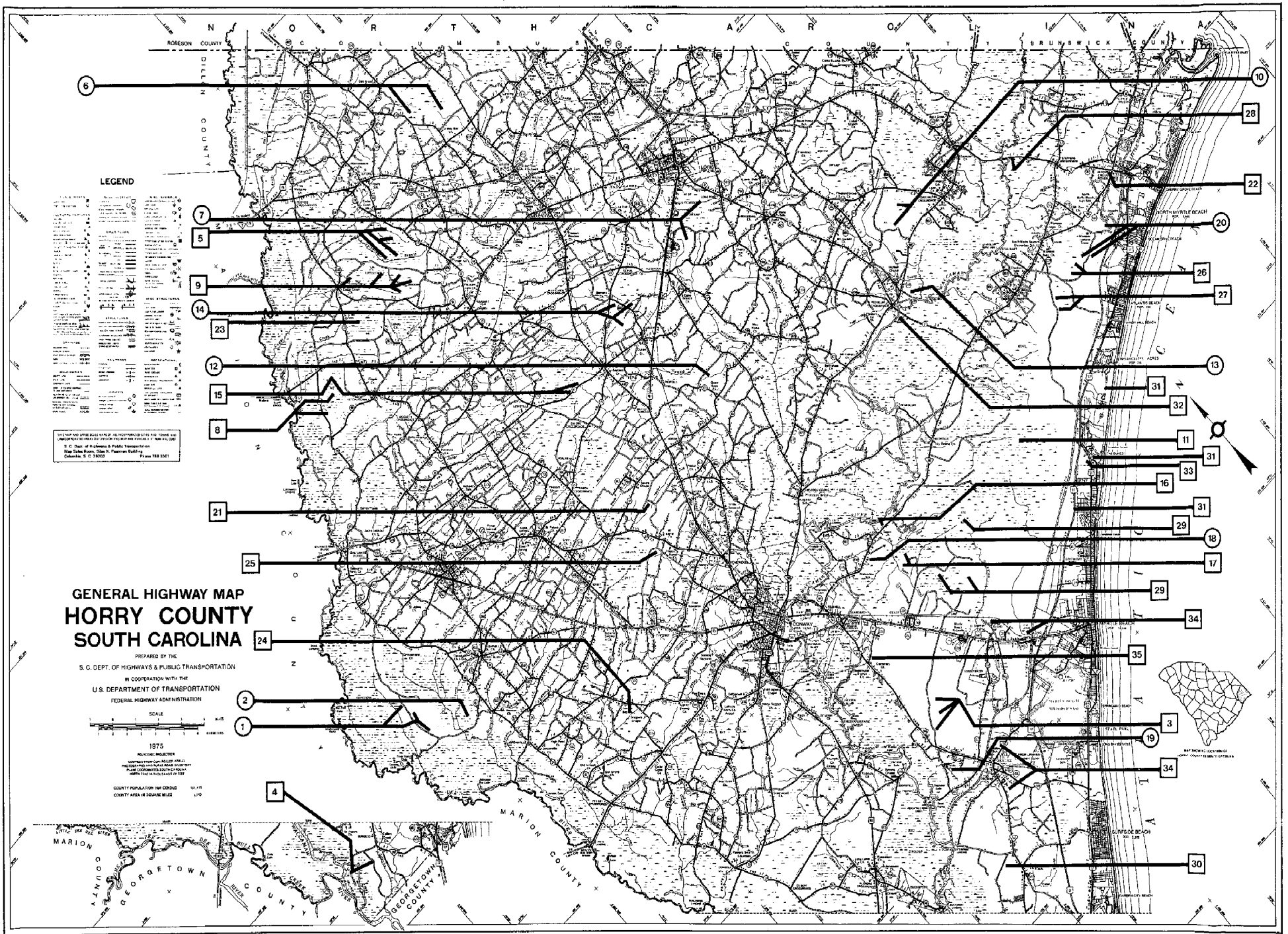
APPENDIX I. Horry County: Location and Status of Surveyed Natural Areas

☐ Significant Natural Areas

| Site Number | Site Name | Priority Number |
|---|---|---|
| 3 | Perry Road Bay Complex | 17 |
| 4 | Collins Creek Limesink Complex | 14 |
| 5 | Cartwheel Bay Complex | 1 |
| 8 | Wolf Pit Bay Complex | 19 |
| 9 | Fifteen Mile Bay Complex | 18 |
| 11 | Lewis Ocean Bay Complex | 5 |
| 15 | Joiner Bay-Horsepen Bay | 8 |
| 16 | Salem Pond | 9 |
| 17 | Clear Pond Complex | 15 |
| 21 | Poplar Swamp | 16 |
| 22 | Money Pond | 3 |
| 23 | Flat Bay | 11 |
| 24 | Juniper Bay and Swamp | 13 |
| 25 | Brown Bay | 12 |
| 26 | Little River Swamp | 10 |
| 27 | Prices Swamp | 7 |
| 28 | Horry's Borrow Pit | 6 |
| 29 | Buist Tract | 4 |
| 30 | Socastee Savanna | 2 |
| 31 | *Lilaeopsis carolinensis* | |
| 32 | *Coreopsis rosea* | |
| 33 | *Crotonopsis linearis* | |
| 34 | *Dionaea muscipula* | |
| 35 | *Schwalbea americana* | |

◯ Non-significant Areas

| Site Number | Site Name |
|---|---|
| 1 | Gunter's Island Bay Complex |
| 2 | Jordanville Bay |
| 6 | Grassy Bay Complex |
| 7 | Cushion Swamp Bay Complex |
| 10 | Chestnut Cross Roads Bay Complex |
| 12 | Opening Pond Site |
| 13 | Red Bluff Bay |
| 14 | Gurley Bay Complex |
| 18 | Horry Landfill Pond Complex |
| 19 | Mills Pond |
| 20 | Wampee Pond Complex |


NORTH CAROLINA
ROBESON COUNTY
COLUMBUS COUNTY
BRUNSWICK COUNTY
LEGEND
GENERAL HIGHWAY MAP
HORRY COUNTY
SOUTH CAROLINA
PREPARED BY THE
S.C. DEPT. OF HIGHWAYS & PUBLIC TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
1975
MARION COUNTY
GEORGETOWN COUNTY
MARION
GEORGETOWN
CONWAY
MYRTLE BEACH
NORTH MYRTLE BEACH
ATLANTIC BEACH
SURFSIDE BEACH
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# Inventory of Botanical Natural Areas in Jasper County, South Carolina

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University of South Carolina
Columbia, SC

## September, 1984

Equal Opportunity Agency

S.C. Wildlife and Marine Resources Department
Division of Wildlife and Freshwater Fisheries
Jefferson C. Fuller, Jr., Director

FINAL REPORT

# INVENTORY OF BOTANICAL NATURAL AREAS

# IN

# JASPER COUNTY, SOUTH CAROLINA

SEPTEMBER, 1984

CYNTHIA AULBACH-SMITH

UNIVERSITY OF SOUTH CAROLINA

This project was made possible by a Coastal Energy Impact Program Grant, established under the Coastal Zone Management Act of 1972, as amended, and administered by the Office of Coastal Zone Management, NOAA.

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## INTRODUCTION

Jasper County is the southernmost county in South Carolina and lies wholly within the Atlantic Coastal Plain. It is bounded on the south and west by the Savannah River and Georgia, on the east by Beaufort County and on the north by Hampton County. Most of the borders of the county are natural drainage systems; the north-central boundary is formed by the Coosawhatchie and Tullifinny rivers, the northeastern boundary by the Pocotaligo and Broad rivers, the western and southern boundaries by the Savannah River and the southeastern boundary by the New River.

The total area of Jasper County is 428,000 acres or 668.75 square miles. Of this, over 40,000 acres, or 10% of the county, is salt, brackish or freshwater marsh. Elevation ranges from sea level to 103 feet above sea level. Almost all of the southern part of the county, i.e. south of Hardeeville, has an elevation of 20 feet or less above sea level.

Most of the county consists of nearly level lowlands dissected by drainages. There are a few sand ridges along the Savannah River. The extreme northern part of Jasper County can be characterized as an area of low, rolling hills.

The southernmost portion of the county is recent in geologic origin and is characterized by salt and brackish marshes. The central portion is Pleistocene in origin, and the northern quarter was deposited during the Miocene epoch. Most of these Miocene deposits are covered by Pleistocene deposits of the Wicomico terrace (Cooke, 1936). Four of the seven Pleistocene terraces occur in Jasper County. These are: Pamlico terrace, 0-25 feet above sea level; Talbot terrace, 25-42 feet above sea

level; Penholoway terrace, 42-70 feet above sea level; and the Wicomico terrace, 70-100 feet above sea level.

Recreational use of the land in Jasper County is mostly restricted to hunting and fishing. A large percentage of the acreage of the county is presently managed for timber production and for hunting preserves.

There are five major vegetation types in Jasper County. These are listed below along with the percentage of the county they occupy:

--10% Marshes, including salt, brackish and freshwater marshes

--35% River swamps

--35% Savannahs, flatwoods and associated depressions

--10% Sand hills and sand ridges

--10% Other, including maritime forest, mixed mesophytic forest, etc.

From these figures, it can be seen that up to 80 percent of the county is low-lying and poorly drained. Permanent alteration of the natural drainage systems is used to control flooding and to improve land for housing, agriculture, industry and timber management. Widescale drainage is, however, the largest single threat to the natural ecosystems in Jasper County.

## METHODS

A systematic survey of potential natural areas which possess national, state or local ecological significance was conducted in Jasper County. A survey of Jasper County was undertaken in order to identify all natural areas of possible ecological significance, and in-depth studies of those natural areas that were determined to be significant were done.

The following technical information was generated: (1) County and topographic maps with marked boundaries of rare species habitats, exemplary natural communities, unique or unusual geomorphic features, and other outstanding features or natural areas; (2) comprehensive inventory information on all significant natural areas, including management recommendations and actual or potential threats from energy-related activities with special attention given to peat mining; (3) ranking of all inventoried sites into preservation priority categories based on uniqueness of the area, presence of endangered, threatened or rare species, and natural quality in comparison to already protected natural areas of a similar type. The inventoried information was compiled in the standardized format presently used by the South Carolina Heritage Trust Program.

In order that this information be in a consistent form and useful to the Heritage Trust Program and other state and local agencies responsible for making environmental reviews and general land use decisions, specifications for field methods, report formats, and information resources to be used for Natural Areas Inventories prepared by the South Carolina Heritage Trust Program (1983) were followed.

1. Potentially unique or unusual botanical areas were selected by: (a) Examining available soil, topographic, and geologic maps; (b) studying black and white and color infra-red aerial photos; (c) reviewing pertinent scientific literature; and (d) consulting with knowledgeable individuals and organizations, particularly the South Carolina Heritage Trust Program, the South Carolina Coastal Council and the Soil Conservation Service offices in Ridgeland and Columbia.

2. Boundaries of potential natural areas were marked on county highway maps, topographic maps and aerial photos from the Soil Survey of Beaufort and Jasper counties.

3. Aerial reconnaissance using a fixed-wing aircraft was used to: (a) Screen potential natural areas and select those worthy of preliminary ground survey, (b) locate additional potential natural areas, and (c) determine boundaries of significant natural areas. This aerial survey was limited in its application and results. However, we were able to locate undisturbed savannahs and determine recent or fairly recent unnatural disturbances. Preliminary ground surveys were made of all potential natural areas identified by aerial reconnaissance and areas meriting further investigation were selected.

4. Heritage Trust Program staff were consulted before any on-site investigations were initiated. Heritage staff reviewed the list of potential natural areas that was developed and helped determine priorities for on-site investigations.

5. Areas selected for preliminary or intensive on-site investigations were studied using methods and formats presently in use by the South Carolina Heritage Trust Program. For potentially unique areas, an

On-site Data Collection Form was completed and, as needed, Community Survey Forms and Special Flora Element Data Sheets were used.

6. At each significant natural area, a collection of herbarium voucher specimens was made for all species with sufficient material for accurate identification. The collection of specimens was made on a seasonal basis, and on-site visits were made during all seasons, when possible. Specimens were deposited in the University of South Carolina Herbarium (USCH) in Columbia, South Carolina.

## RESULTS AND DISCUSSION

Prior to the start of this study in early 1983, portions of Jasper County were known to be botanically rich. The Tillman Sand Ridge and Okeetee Savannah are two areas which were well-known, not only as natural areas supporting rare plants, but also for their reptile populations.

At the beginning of this study, there were 20 species of rare, threatened or endangered plants reported in Jasper County; these are listed below. Despite extensive searching, only 12 of these species were found. These species are preceded by an asterisk.

*Athaenantia rufa - Purple silkyscale
*Balduina uniflora - Single-flowered balduina
*Canna flaccida - Golden cannalily
*Crotonopsis linearis - Narrow-leaved rushfoil
*Dicerandra odoratissima - Rose dicerandra
*Eulophia ecristata - False coco
*Halesia diptera - Two-winged silverbell
*Licania michauxii - Gopher apples
*Litsea aestivalis - Pond spice
*Pinckneya pubens - Georgia fever-bark tree
*Rudbeckia mollis - Soft-haired coneflower
*Schwalbea americana - Chaff-seed
Cliftonia monophylla - Black titi
Habenaria integra - Yellow fringless orchid
Hypericum adpressum - Creeping St. Johns wort
Lepuropetalon spathulatum - Southern lepuropetalon
Polygala nana - Low milkwort
Potamogeton foliosus - Leafy pondweed
Sageretia minutiflora - Shell-mound buckthorn
Scleria baldwinii - Baldwin's nutrush
Spiranthes longilabris - Giant spiral orchid

Many reports of the occurrence of these rare plants are dated from the 1960s or earlier. Since that time, Jasper County has undergone considerable changes. Most significantly, drainage systems have been added to many large tracts of land to improve them for forestry and agriculture. This has been detrimental to those rare plant species which are adapted to low, wet conditions.

The possible reasons why previously reported populations of some rare plants could not be relocated include: (1) The site has been drained, (2) the site had been recently cut-over or otherwise disturbed, (3) most of the field work was done in 1983, and it was a very dry year, (4) the locality information available was vague, erroneous or non-existent, or (5) the species is ephemeral and/or requires special environmental conditions. Polygala nana and possibly Lepuropetalon spathulatum are two species which may be ephemeral and were not found. Habenaria integra, Scleria baldwinii and Spiranthes longilabris were reported from areas which now appear to be drained. Potamogeton foliosus, an aquatic plant, occurs on Turtle Island, according to reports. Due to the inaccessibility of the site, all of the field time was spent searching the upland areas. Cliftonia monophylla was not found despite numerous searches. Suitable habitat exists in the Robertville area, and it is recommended that the search for this species continue. Hypericum adpressum is typically found in bogs, but the site on which it was reported is now a major drainage channel and is highly disturbed. Sageretia minutiflora was not found on Turtle Island, but all potential habitat was not searched.

During the course of this study, two species were found which were not previously known to occur in South Carolina. These are Forestiera segregata and Pycnanthemum nudum. Forestiera segregata has recently been added to the list of threatened and endangered plants of South Carolina (S.C. Advisory Committee, 1984). Two additional rare, threatened or endangered species were found in Jasper County. Although earlier reports documented these species' existence in South Carolina, their localities

were previously unknown. These are Leucothoe populifolia (Carolina dog-hobble) and Nyssa ogeche (Ogeechee-lime).

Criteria Used to Select High-Priority Sites

All investigated sites were ranked into preservation priority categories. Ranking was based on the uniqueness of the area, the presence of endangered and threatened species, and the site's natural quality.

Sites of National Significance: The site must satisfy the following requirements to be considered of national significance: (a) Contain one or more plant species currently under federal status review (U.S.D.I., 1983), and (b) the site must support a high-quality community type.

Sites of State Significance: Those sites which are considered to be of statewide significance must meet at least one of the following requirements: (a) It supports a population of a plant species which is listed as endangered or threatened in South Carolina, and the site must be of high quality; or (b) the site must support an element which is under federal status review for listing as an endangered or threatened species in South Carolina, but the site is not a high-quality example of its type.

Sites of Local Significance: To be considered of local significance, a site must satisfy one of the following requirements: (a) It is a high-quality example of a community type that is rare in the coastal plain; (b) it supports a population of an endangered or threatened plant species, but the site is not a high-quality example of its type; or (c) the site is reported to have supported a rare plant species in the recent past.

A very conservative approach was taken in determining the significance of high-priority sites. Many sites were rejected on the basis that they were disturbed and the rare plant species which had been reported there could not be found. After these sites recover from the disturbance, the sites should be revisited to determine whether the rare plants have become reestablished in the areas.

List of Sites by Priority and Acreage

| | | |
|---|---|---|
| A. | Sites of National Significance | |
| | Okeetee Savannah - Code #1 | 4,000 acres |
| B. | Sites of Statewide Significance | |
| | Tillman Sand Ridge - Code #2 | 3,000 acres |
| | Forks Lake Bluff - Code #3 | 5 acres |
| | Turtle Island - Code #4 | 1,750 acres |
| | Grays Sand Hill - Code #6 | 200 acres |
| | *Pinckneya* Site - Code #7 | 5 acres |
| | *Leucothoe populifolia* Site - Code #9 | undetermined |
| | Hodgins Hill - Code #15 | 20 acres |
| C. | Sites of Local Significance | |
| | Coosawhatchie River Bluff - Code #5 | 10 acres |
| | *Balduina* Site - Code #8 | undetermined |
| | S.C. 46 Savannah - Code #11 | 20 acres |
| | Jasper County Park - Code #12 | undetermined |
| | Robertville Savannah - Code #29 | 2 acres |
| | Purysburgh Ponds - Code #33 | 30 acres |
| | Calvary Church Savannah - Code #34 | 10 acres |

In the following discussion, the status is listed for the rare plant species occurring on these sites. This information is from Rayner et al. (1979) unless cited otherwise. The locations of these sites are marked on a Jasper County General Highway Map (Appendix 1). All information on the soils of the sites has been taken directly from Stuck (1980).

OKEETEE SAVANNAH - Code #1

Site Description: Okeetee Savannah is located west of Ridgeland and occurs within the boundaries of U.S. Highway 321 on the west, S.C. Highway 336 on the south and County Road 22 on the north and east. Okeetee Savannah is a complex of eight intergrading plant communities. These communities are: (1) longleaf pine savannah, (2) oak savannah, (3) cypress savannah, (4) longleaf pine flatwoods, (5) pond pine flatwoods, (6) cypress ponds, (7) gum ponds and (8) low woods. This complex is one of the largest, undisturbed examples of its type in the world.

All of these communities are distinguished by the canopy trees; however, in the savannahs and flatwoods, the herbaceous component is the most important. It is characterized by a high diversity of species. Of the 85 species of plants found in the savannahs and flatwoods, only 15 are trees or shrubs. Of the 70 herbaceous species, nine are native orchids and lilies, four are parasitic species, and three are insectivorous plants.

The savannahs are characterized by scattered trees providing less than 30 percent canopy cover. The cypress savannahs occur in slightly lower and wetter areas than the longleaf pine savannahs. The oak savannah probably represents those areas of pine savannah which have been less intensely burned or not burned at all sometime in the past. The

pond pine flatwoods appear to occupy very shallow, natural drainages in the savannahs. The longleaf pine flatwoods are slightly elevated above the surrounding savannahs. Canopy trees here are more closely spaced and provide more cover than those in the savannahs. Cypress and gum ponds are numerous and occupy small depressions scattered throughout the site. They are generally oval or circular and contain water or are wet throughout much of the year. They are important refuges for wildlife during fires or periods of drought.

The soil types here include Paxville and those of the Rains-Lynchburg Association. Paxville fine, sandy loam is very poorly drained, has a pH of 4.5 to 6.5, and occurs in the drainages. Rains fine, sandy loam is poorly drained, has a pH of 4.5 to 6.0, and occurs on the flat lowlands; this soil type supports the savannah communities. Lynchburg loamy, fine sand is somewhat poorly drained, has a pH of 3.6 to 5.5, and occurs on somewhat higher ground. This soil type supports the longleaf pine flatwoods. At certain depths these soil types are impermeable. This results in saturated soil during wet seasons and very dry soil during dry seasons.

Site Significance: Okeetee Savannah is an undisturbed, high quality savannah/flatwoods complex. It is the largest undisturbed example of this community complex in South Carolina and is one of the largest of its type in the world. This community type is endangered in the United States. This site supports the largest known population of Schwalbea americana (chaff-seed) in the world and contains more individual plants of this species than all other known populations combined. Schwalbea is listed in South Carolina as "of national concern - threatened" and is currently under federal status review (USDI, 1983). Schwalbea is found

throughout the longleaf pine flatwoods of Okeetee. Nyssa ogeche (Ogeechee lime), which is listed as "of statewide concern - endangered" in South Carolina, occurs on this site in low woods. This is the only recently verified locality for this species in South Carolina. Anthaenantia rufa (purple silkyscale) is found in one locality on Okeetee Savannah; this species is listed in South Carolina as "of concern - status unresolved." The red-cockaded woodpecker also occurs here; it is listed officially as endangered in South Carolina (Rule 123-150 and Amendments; Section 50-15-80; 1976; S.C. Code of Laws) and is federally endangered (U.S.D.I., 1984). Suitable habitat is present for at least eight other species on South Carolina's rare and endangered plant list. These include Habenaria integra, Scleria baldwinii, Spiranthes longilabris, Asclepias pedicillata, Parnassia caroliniana, Canna flaccida, Spiranthes laciniata and Pinckneya pubens.

In addition to supporting these rare elements, Okeetee Savannah also is a spectacular wildflower area. There is an impressive display of color and diversity of wildflowers from April through October.

Threats to Area and Natural Elements: At this time there are a few direct threats to the Okeetee Savannah complex. The primary threat is the proximity of the Upper New River Watershed Project, which is draining a large tract of land in the immediate vicinity. The effects of this drainage on Okeetee Savannah are unknown at this time. This site is maintained as a hunting preserve; therefore, many wildlife planting areas occur on the site. The best sites for Schwalbea are also the best sites for the wildlife planting areas. Site preparation for wildlife plantings in the Schwalbea habitat would destroy the species.

There are several potential threats to Okeetee Savannah. The first is the possibility of large-scale timber operations. Presently, there is some selective cutting taking place; this has minimal impact due to the fact that the canopy trees are not the most important component of the community. Large-scale clear cutting and subsequent planting of pine plantations would be detrimental to the site due to changes in canopy cover and evapo-transpiration rates. Another potential threat, related to the first, would be land treatment measures for timber and water management. Large-scale drainage has become a common practice in Jasper County; one of the reasons Okeetee Savannah is considered to be of national significance is because it has not been affected by drainage projects. Drainage could allow for high-intensity forest management, including clearing, discing and planting in pine.

Management recommendations: Maintenance as a hunting preserve has probably been the one crucial factor in the preservation of this site as a significant natural area. Except for those ditches necessary for road maintenance, there have been no artificial drainage systems added to the site. Also, to maintain good habitat for hunting purposes, the site has been subjected to annual prescribed fires. Recommended management for this area would entail continuing the present burning practices and no alteration of the natural drainage systems. Selective timber cutting probably would be beneficial to the savannah and flatwoods communities as long as it is followed by natural regeneration.

TILLMAN SAND RIDGE - Code #2

Site Description: The Tillman Sand Ridge is an elongated sand ridge that parallels the Savannah River. It has a northwest to southeast

orientation. It is bounded on the southeast, south and southwest by the Savannah River Swamp, on the north and northeast by the Black Swamp, and on the east and southeast by Cypress Creek. The primary soil type is Buncombe sand, pH 6.1 to 6.5. This site is an excessively drained, dry terrestrial ecosystem. The elevation ranges from 25 feet to 60 feet. Presently, most of the site has been planted in pine or has been recently clear-cut. Prior to this use of the site, the flat to moderately sloping central portion of the ridge supported an open longleaf pine-turkey oak forest. The intermediate ridges at the lower elevations probably supported a southern mixed hardwood forest or a spruce pine-laurel oak forest.

Site Significance: This site contains populations of five plant species of concern in South Carolina. Of these, Rudbeckia mollis (soft-haired cone-flower), Dicerandra odoratissima (rose dicerandra) and Litsea aestivalis (pond spice) are listed in South Carolina as "of regional concern - threatened." Licania michauxii (gopher apples) is listed as "of statewide concern - threatened" and Crotonopsis linearis (narrow-leaved rushfoil) is listed as "of concern - status unresolved."

Threats to Area and Natural Elements: Present threats to the area are clear cutting and intensive site preparation followed by pine monoculture. Potential threats include grazing, sand mining, farming, residential and industrial development and reservoir construction.

Management Recommendations: The natural forest communities of the Tillman Sand Ridge were originally dominated by longleaf pine on the higher ridges and by spruce pine on the intermediate ridges. These forests have been replaced mostly by planted slash and loblolly pine stands with trees spaced much closer than they would naturally occur.

This increased canopy cover does not allow for the optimum development of the herbaceous and shrub layers. In addition, slash and loblolly pine are not as tolerant of fire as longleaf pine; therefore, prescribed burning is not done as frequently, particularly during the first ten to fifteen years after planting. To provide suitable habitat for the rare and endangered plant species and the gopher tortoise, the use of occasional prescribed fires and thinning pine stands is recommended. It is also recommended that longleaf pine be planted in the future rather than slash or loblolly. After a clear-cut, the use of intensive site preparation techniques is detrimental to some of the rare and endangered plant species and to the gopher tortoise.

FORKS LAKE BLUFF - Code #3

Site Description: This site is an intermediate-level sand ridge located along the eastern margin of Forks Lake along the Savannah River. It is a well drained, dry to mesic terrestrial system. There is a moderate slope along the eastern boundary which grades into floodplain forest and a steep slope along the western margin. The plant community occupying the ridge is a climax southern mixed hardwood forest. This community is dominated by Quercus laurifolia (laurel oak) and Pinus glabra (spruce pine) in the overstory and by Ostrya virginiana (hop hornbeam), Ilex opaca (American holly) and Osmanthus americana (American olive) in the understory. The soil here is the Buncombe component of the Buncombe-Santee Association, which is sandy and has a pH of 6.1 to 6.5.

Site Significance: Forks Lake Bluff supports an undisturbed, climax southern mixed hardwood forest. This is the best known example of this community type, as defined by Monk (1965, 1968), in South Carolina, and

this is the first formal report of this community in the state. This site is characterized by a very high diversity of tree and shrub species. There are 18 tree species and 20 species of shrubs identified on this site.

Forks Lake Bluff supports a population of Halesia diptera (two-winged silverbell), a species which is listed as "of statewide concern - threatened" in South Carolina. This is the only recently verified locality for this species in South Carolina and is the northernmost known population. This site also contains a small population of Cyperus tetragonus which is listed as "of concern - status unresolved" (S.C. Advisory Committee, 1984). In South Carolina, C. tetragonus is known only in Jasper and Charleston counties.

Threats to Area and Natural Elements: There are several threats which are currently impacting Forks Lake Bluff. The first is casual habitation, such as camping and picnicking; results of this include litter and the increased possibility of fire. Fire probably would have a negative impact both on the rare plants and the community itself. An unimproved road extending along the eastern border of the site has resulted in the introduction of weedy plant species and has had a severe impact on the upland to lowland ecotone. Also, an old road at the south end of the bluff has undergone serious erosion. Erosion also is occurring along the steep western slope adjacent to Forks Lake. Potential threats include plant removal for forestry or other reasons.

Management Recommendations: According to Monk (1965, 1968), this community type develops when fire is kept out for a long period of time. This site is well protected from natural fires due to the lake along one margin and the floodplain forest along the other margin. This site

should not be subjected to prescribed fires. The access road along the ecotone on the eastern margin is detrimental to the site due to the destruction of the ecotone, the introduction of weedy species and the erosion of the south end of the ridge. It is recommended that this road be blocked off and that the area be allowed to regenerate naturally.

TURTLE ISLAND - Code #4

Site Description: Turtle Island is a barrier island bounded on the north by the New River, on the west and southwest by the Wright River and on the east and southeast by the Atlantic Ocean. Of the 1,750 acres, 1,600 acres are salt marsh and 150 acres are upland forest and coastal beach. The salt marsh is dominated by Spartina alterniflora (smooth cordgrass) and is on level, very poorly drained Bohicket soils which are flooded twice daily by saltwater. The upland woods, supporting maritime forest and maritime shrub thicket communities, occur on the Fripp-Baratari complex of soils. Both soil types are sandy. The excessively drained Fripp soils (pH 5.6 to 7.8) occupy the old dune ridges, and the poorly drained Baratari soils (pH 3.6 to 5.5) are found in the troughs or depressions between the ridges. This upland area is small and consists of two narrow strips of land which parallel each other and the Atlantic Ocean. Due to the small size of this upland area, the old dune ridges and depressions are not well differentiated.

Site Significance: Turtle Island is a high quality, undisturbed barrier island. This site contains a population of Forestiera segregata, which is listed in South Carolina as "of concern - status unresolved" (S.C. Advisory Committee, 1984). This is the only known location for this species in South Carolina. Litsea aestivalis (pond spice),

Sageretia minutiflora (shell-mound buckthorn) and Potamogeton foliosus (leafy pondweed) have been reported to occur on Turtle Island; the first two species are listed in South Carolina as "of regional concern - threatened" and the latter is listed as "of concern - status unresolved."

Threats to Area or Natural Elements: Currently, the only actual threat to Turtle Island is from casual human use of the island, which presently is resulting in litter and the possibility of fire. Potential threats include the possibility of oil spills if off-shore drilling is done.

Management Recommendations: This area is now owned and managed by the S.C. Department of Wildlife and Marine Resources.

GRAYS SAND HILL - Code #6

Site Description: This site is an elongated sand ridge north of and parallel to Cypress Creek. The soil here is Blanton fine sand, a deep, well drained soil with a pH of 4.5 to 6.0. Most of this site has been cleared and planted in pine, so the natural forest communities are no longer present.

Site Significance: Grays Sand Hill is a well developed sand ridge which supports a population of gopher tortoises. The gopher tortoise is listed as endangered in South Carolina (Rule 123 and Amendments). Licania michauxii (gopher apples) has previously been found at this site; this species is listed in South Carolina as "of statewide concern - threatened."

Threats to Site and Management Recommendations: Present threats to the area are clear-cutting and intensive site preparation followed by pine monoculture. Potential threats include grazing, sand mining and

farming. The original longleaf pine-turkey oak forest which once occupied this site has been replaced by planted slash and loblolly pine stands. This has resulted in increased canopy cover and reduced herbaceous and shrubby vegetation; it has also reduced suitable habitat and food for the gopher tortoise. In addition, since slash and loblolly pine are not as well adapted to fire as longleaf pine, fire is not as frequent an occurrence as it would be if the original longleaf pine were present. To provide suitable habitat for the gopher tortoise and to promote the growth of rare and endangered plant species, the use of prescribed fires on a two- to three-year cycle and thinning pine stands to create an open canopy is recommended. The use of intensive site preparation techniques prior to planting pines is detrimental to the gopher tortoise and to the associated rare plants.

PINCKNEYA SITE - Code #7

Site Description: This site is part of an elongated depression which drains into the Great Swamp. The plant community here is referred to as low woods or branch head vegetation. The soil type is Paxville fine sandy loam. This soil has a pH of 4.5 to 6.5, is very poorly drained, and has a medium level content of organic matter.

Site Significance: The most important feature of this site is the fairly large population of the Georgia fever-bark tree, Pinckneya pubens. This species is listed in South Carolina as "of statewide concern - threatened." There is a possibility that Pinckneya was introduced to this site. The Swiss who settled in Purysburgh moved to this area (now called Switzerland) because malaria was prevalent in Purysburgh. Pinckneya was commonly used as a treatment for malaria, hence the common

name Georgia fever-bark tree. It is likely that the Swiss would have brought along their medicinal plants when they moved to Switzerland.

Threats to Site and Management Recommendations: There are currently no threats to this site. This area has been subjected to prescribed fires on an annual or biennial basis. It is recommended that this management be continued. Late spring and summer fires should be avoided; this is the time period that Pinckneya flowers and fruits and it appears to recover slowly from late season fires.

LEUCOTHOE POPULIFOLIA SITE - Code #9

Site Description and Significance: Leucothoe populifolia (Carolina dog-hobble) occurs in the low woods and swamps of the Long Branch drainage system. To date, it has been found only on the Paxville soil type; this is a very poorly drained, fine sandy loam with a pH of 4.5 to 6.5. Paxville soils are considered to have a medium-level content of organic matter. L. populifolia is listed in South Carolina as "of statewide concern - threatened." The Long Branch system is the only verified locality for this species in South Carolina; in the United States it is known only in Florida and South Carolina. This drainage system is suitable habitat for Cliftonia monophylla (black titi), which was documented in this area in the early 1900s. Cliftonia has not been relocated in South Carolina and is presented listed as "of concern - status unresolved."

Threats to Site and Management Recommendations: There are few threats at this time to the known populations of Leucothoe populifolia. In one area the site has been cut over, and another area has been bisected by a power line right-of-way. However, in both of these areas, L.

populifolia has come back vigorously. Potential threats include intensive site preparation associated with forestry and draining or channelizing the Long Branch system.

HODGINS HILL - Code #15

Site Description and Significance: Hodgins Hill is a series of small sand hills or intermediate-level sand ridges in the Savannah River Swamp. The soil here is Buncombe sand, which is excessively drained and has a pH of 6.1 to 6.5. This system of sand ridges probably supported a spruce pine-laurel oak forest or perhaps a southern mixed hardwood forest in the past. The ridges were logged some time ago and are now characterized by scattered spruce pines and laurel oaks with large patches of open sand. This site supports two elements of concern, Crotonopsis linearis (narrow-leaved rushfoil) and the gopher tortoise. Crotonopsis is listed in South Carolina as "of concern - status unresolved." The gopher tortoise is listed as endangered in South Carolina (Rule 123-150 and Amendments).

Threats to Site and Management Recommendations: There are no immediate threats to this site; the present property owners are aware of the elements of concern and are developing appropriate management guidelines.

COOSAWHATCHIE RIVER BLUFF - Code #5

Site Description: This site is located just south of the Hampton County line in the Possum Corner area of northern Jasper County. It is south of and parallel to the Coosawhatchie River. The soils occupying this site are Blanton fine sand which grades into Paxville fine, sandy

loam toward the base of the slope. This is a mesic terrestrial system characterized by moderate to steep slopes ranging from 10 percent to 40 percent to an almost vertical drop in places. The bluff is up to 30 feet tall and 100 feet wide. This site is characterized by downhill seepage and supports a mixed mesophytic hardwood forest dominated by beech. This grades into a pine-oak forest at the top of the slope and into low woods and floodplain forest at the base of the slope.

Site Significance: This is an undisturbed, high quality, climax seepage bluff or slope forest dominated by beech and magnolia. This site is characterized by a high diversity of tree and shrub species and is the best known example of this community type in Jasper County. The two most significant aspects of this site are its natural seepage and climax condition. Based on the size of the beech trees, this site has been undisturbed for at least 150 years and probably longer. Factors contributing to this are: (1) It is too steep to cultivate, (2) it is too wet to burn except in times of extreme drought, and (3) the swamp on the north and east affords much protection from fire.

Threats to Area or Natural Elements: At this time, there are two actual threats to the bluff. The first is runoff and erosion due to the steepness of the slope, disturbance of the buffer of pine-oak woods at the top of the slope, and the proximity of agricultural fields. The other actual threat to the site is the presence of exotic animals, such as feral pigs. There are two potential threats to this site; fire and sand mining. There is an abandoned sand quarry on a small portion of the site.

Management Recommendations: It is recommended that the buffer zone at the slope remain intact and be expanded, if possible. This site

should be protected from fire. Casual use of some portions of the steepest parts of the bluff by people and animals is causing some minor erosion. The trail should be re-routed so that it does not lead directly down the slope.

BALDUINA SITE - Code #8

Site Description and Significance: Balduina uniflora (single-flowered balduina) occurs along the margins of planted pine flatwoods and roadsides between Pineland and Gillisonville. It occurs on Albany, Pelham and Ocilla loamy fine sands, which are poorly drained and strongly acid in reaction. Balduina requires an open canopy and probably was much more widespread prior to the advent of pine monoculture; it now occurs along the margins of areas it probably once covered. Balduina uniflora is listed as "of concern - status unresolved" in South Carolina.

Threats to Site and Management Recommendations: The natural habitat of Balduina uniflora is savannahs and open pine flatwoods. The greatest threat to this species is from drainage and the development of pine plantations. Baulduina uniflora probably was much more abundant at some time in the past and has responded to these pressures of land use by moving to the margins of sites it probably once covered. Maintenance of the highway margins and ditches through fires promotes the growth of this plant. Mowing of the highway right-of-way would be detrimental to this species during the time it flowers and sets fruit. Therefore, it is recommended that mowing should not take place during July, August and September.

S.C. 46 SAVANNAH - Code #11

Site Description and Significance: This site is a broad, low, nearly level, marshy, savannah-like area which was drained and cut over many years ago. It occurs on Argent fine, sandy loam which is poorly drained and has a pH of 3.6 to 6.0. This site supports a population of Canna flaccida (golden canna lily), which is listed as "of statewide concern - threatened" in South Carolina. Canna is locally abundant in the lowest, wettest part of the site which is flooded in the spring. Based on observations of the surrounding area, it appears the portion of the site on which Canna occurs was once a gum pond. This site also supports a high diversity of typical savannah species.

JASPER COUNTY PARK - Code #12

Site Description and Significance: This area is the proposed site for the Jasper County Park. It is a highly disturbed area; most of the land in the general vicinity has been used for fill material and the natural drainage into Bob Dam Swamp has been partially blocked. This site lies between a large borrow pit and an artificial marsh area. Polygala nana (low milkwort) has been found in the longleaf pine-bracken fern woods on this site. Despite numerous site visits, P. nana has not been relocated; it is known only on two other localities in the state and is ephemeral at those sites. P. nana is listed as "of statewide concern - threatened" in South Carolina. After many field surveys and a review of topographic maps, this site appears to be wholly altered and is no longer considered to be of local significance.

ROBERTVILLE SAVANNAH - Code #29

Site Description and Significance: This site is an open, disturbed savannah-like area. It is low, level and occurs on Lynchburg loamy, fine sand; this soil is somewhat poorly drained and acidic. This site is considered to be of local significance because it supports a small population of Eulophia ecristata (false coco). This species is currently under federal status review (U.S.D.I. 1983).

PURYSBURG PONDS - Code #33

Site Description and Significance: This site is a disturbed, recently cut-over, pine flatwoods area. The soil type is the Okeetee component of the Okeetee-Eulonia Association. This site is named after the two gum ponds which occur on this site. It is considered to be of local significance because of documented reports of the presence of Anthaenantia rufa (purple silkyscale). This species is listed in South Carolina as "of concern - status unresolved."

CALVARY CHURCH SAVANNAH - Code #34

Site Description and Significance: This site is a pine flatwoods/ savannah area. The soil type is the Okeetee component of the Argent-Okeetee Association. The site has been moderately to highly disturbed. Certain portions have been used for borrow and sand pits. This area is dominated by longleaf pine and toothache grass and supports a high diversity of herbaceous species. This site is considered to be of local significance because of documented reports of the presence of Anthaenantia rufa (purple silkyscale), which is listed as "of concern - status unresolved" in South Carolina.

Consideration of Energy Related Impacts

Only a few of the significant natural areas in Jasper County are potentially threatened by energy-related development. No actual threats are known at present.

There is only one area of Jasper County which is known to have a significant deposit of peat (Cohen et al., 1982). This deposit is adjacent to the Savannah River, south of Interstate Highway 95 and north of U.S. Highway 17. Most of this land is part of the Savannah National Wildlife Refuge and, as such, is protected from peat mining by the federal government.

Off-shore drilling for oil or gas along the Georgia or South Carolina coast would greatly increase the potential for oil spills. An oil spill reaching Turtle Island would have a severe negative impact on Turtle Island, particularly on the salt marshes and other low-lying areas.

Reservoir construction on the Savannah River for the generation of hydroelectric power, although unlikely, could have a negative impact on the Tillman Sand Ridge and on Forks Lake Bluff. The sandhills and ridges could be flooded forming mesic habitats. Reservoir construction also would encourage residential development.

ACKNOWLEDGEMENTS

During the course of this study, many individuals assisted me with the selection of sites, technical advice and assistance in the field. I would like to express my appreciation and thanks for this help to the following people: Douglas Rayner and John Nelson, S.C. Heritage Trust Program, Columbia; William Melven, Soil Conservation Service, Columbia; Charles Holland and Harvey Lucas, Soil Conservation Service, Ridgeland; Jim Cope, S.C. Land Resources Conservation Commission, Ridgeland; Walter F. Baxter, Jr., S.C. Wildlife and Marine Resources Department, Ridgeland; Curtis Smart, Ridgeland; N.B. Bryan, Levy Station; Ed Floyd, Okeetee Club, Switzerland; Bill Mathis, Continental Can Corporation; and Wallace Roberts and Gene Kodoma, Westvaco Corporation.

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APPENDIX I

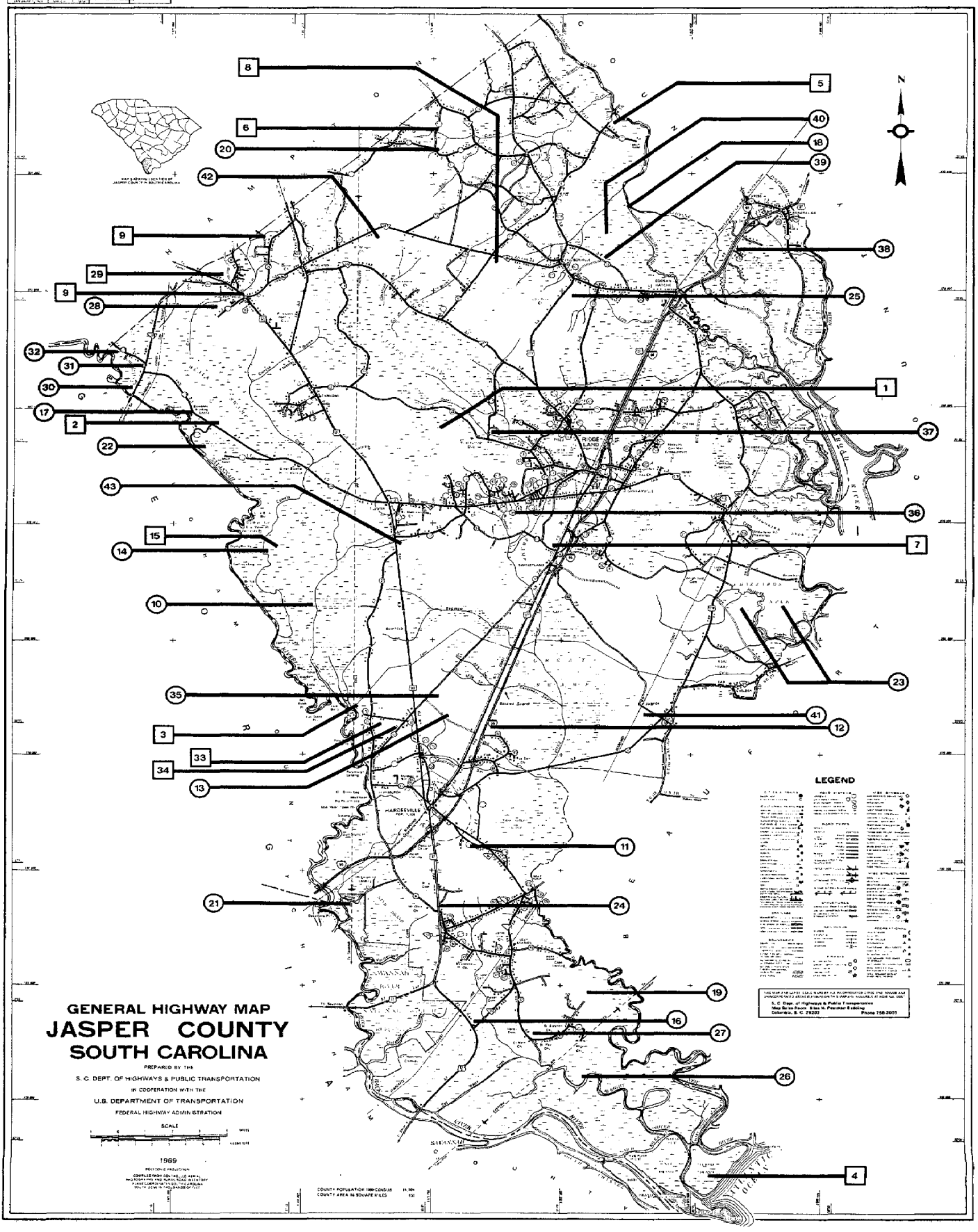
Jasper County - Sites Surveyed as Potential Natural Areas

□ Significant Natural Areas

1. Okeetee Savannah
2. Tillman Sand Ridge
3. Forks Lake Bluff
4. Turtle Island
5. Coosawhatchie River Bluff
6. Grays Sand Hill
7. *Pinckneya* Site
8. *Balduina* Site
9. *Leucothoe populifolia* Site
11. S.C. 46 Savannah
15. Hodgins Hill
29. Robertville Savannah
33. Purysburgh Ponds
34. Calvary Church Savannah

○ Non-Significant Natural Areas

10. Horse Bluff
12. Jasper County Park
13. Turkey Pond
15. Hodgins Lake
16. Monkey John Swamp
17. New Landing
18. Bear Savannah
19. Red Bluff Plantation
20. Cypress Creek Sand Ridge
21. Union Creek
22. Snooks and Little Snooks Lakes
23. Chelsea Savannah
24. Limehouse Savannah
25. Gillisonville Savannah
26. Marsh Islands
27. *Lepuropetalon* Site
28. Black Swamp
30. Savannah River Bottomlands
31. *Bacopa cyclophylla* Site
32. Stokes Bluff Hill
35. South Okeetee Oak Savannah
36. Upper South Okeetee Savannah
37. Great Swamp
38. Pocotaligo Depressions
39. *Gordonia* Site
40. Gillisonville Sand Ridge
41. Jasper Flatwoods
42. *Pycnanthemum nudum* Site
43. *Hypericum adpressum* Site


GENERAL HIGHWAY MAP
JASPER COUNTY
SOUTH CAROLINA
PREPARED BY THE
S. C. DEPT. OF HIGHWAYS & PUBLIC TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
1989
LEGEND
RIDGELAND
HARDEEVILLE
8
5
6
40
20
18
42
39
9
38
29
25
9
28
32
1
31
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37
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# Inventory of Botanical Natural Areas in Colleton County, South Carolina

Douglas A. Rayner
Nongame, Endangered Species
Heritage Trust Section

## September, 1984

Equal Opportunity Agency

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FINAL REPORT

# INVENTORY OF BOTANNICAL NATURAL AREAS

IN

COLLETON COUNTY, SOUTH CAROLINA

SEPTEMBER, 1984

DOUGLAS A. RAYNER, PH.D.

S.C. WILDLIFE DEPARTMENT

This project was made possible by a Coastal Energy Impact Program Grant, established under the Coastal Zone Management Act of 1972, as amended, and administered by the Office of Coastal Zone Management, NOAA.

This project was prepared for the Office of the Governor, Division of Natural Resources.

TABLE OF CONTENTS

## INTRODUCTION

Colleton County is in the southeastern portion of the outer Coastal Plain of South Carolina. It is bounded on the south by the Atlantic Ocean and on the north by Bamberg County. The Salkehatchie and Combahee rivers form its western boundary and separate it from Hampton and Beaufort counties. The Edisto River forms the eastern boundary, and separates Colleton County from Dorchester and Charleston counties, except for Edisto Beach which was annexed to Colleton County from Charleston County in 1975. The total land area of Colleton County is about 652,600 acres or 1,051 square miles, including Edisto Beach. Of this total about 17,200 acres are in state ownership and about 30 acres are in federal ownership. The county is rather sparsely populated; the Colleton County Chamber of Commerce estimates the 1984 population to be about 32,500. Walterboro is the largest city in the county and is the county seat. It has a population of 27,600 (Stuck, 1982).

Colleton County was first settled by Europeans in 1663. In that year King Charles II of England granted to eight lord proprietors the area now encompassing most of Georgia and the Carolinas. Colleton County was named after Sir John Colleton, one of the original lord proprietors. The original Colleton County consisted of three parishes. The present boundaries of the county, excluding Edisto Beach, are the same as those of one original parish, St. Bartholomew (Lander and Ackerman, 1973; Glover, 1969).

Furs and skins were probably the first commercially important products from Colleton County. A series of crops soon supplanted wildlife products as the major commercial product, beginning with rice in 1680, indigo in 1739 and long-staple sea island cotton around 1785. Indigo completely disappeared as a commercial crop by 1799, and cotton dropped in importance with the onslaught of the boll weevil around 1813. The hurricane of 1893 destroyed most of the

water-control structures necessary for the production of rice, and this crop has never regained its prior prominence. Agriculture today is much more diversified than in the past. Corn, soybeans, tobacco and small grains are all major crops. Raising beef cattle and hogs are significant enterprises. Forest products also make a major contribution to the economy of the county (Stuck, 1982). The contribution of forest products is likely to increase in the future because of recent efforts to intensify forest management practices. Important in this regard are efforts to ditch and drain large areas of poorly and very poorly drained soils. Industrial development has increased in the past two decades, but the county remains one of the less-industrialized counties in the state.

According to the Soil Survey for Colleton County (Stuck, 1982), major land uses are approximately as follows: cultivated crops, 15 percent; pasture, 5 percent; woodland, 70 percent, salt or brackish marsh, 6 percent; and urban or built-up land, less than 5 percent. According to the South Carolina Soil and Water Conservation Needs Inventory (USDA, 1970), more than 237,000 acres of potentially good cropland was in woodland and about 18,000 acres was in pasture in 1967. Soil drainage is considered the major management need on much of the acreage used or potentially useable as cropland or pasture.

Topographic relief in Colleton County generally is not marked. Most of the county is nearly level, dotted with shallow depressions, and dissected by shallow drainages. Ridges are low, and slopes are gentle. Elevation ranges from 0 to 134 feet. Eleven percent of the soils are predominantly mucky and clayey soils that are flooded.

Colleton County is entirely within the outer portion of the Coastal Plain Province of South Carolina. The outer Coastal Plain consists of nearly level, unconsolidated sands, clays and soft limestones. According to Cooke (1936), seven coastal terraces, abandoned or former shorelines, have been discovered along the Atlantic coast. Four of these coastal terraces and part of a fifth are found in Colleton County including: the Pamplico terrace, 0 to 25 feet elevation; the Talbot terrace, 25 to 42 feet elevation; the Penholoway terrace, 42 to 70 feet elevation, the Wicomico terrace 70 to 100 feet elevation, and part of the Sunderland terrace, 100 to 170 feet elevation.

Part of three geologic formations are included in Colleton County. The southern fourth of the county and approximately south of U.S. 17, consists of sand, clay, and shells of Pleistocene to Recent ages (less than one million years old). Most of the county, except for a narrow band adjacent to Bamberg County and the northwestern half of Dorchester County, consists of Waccamaw, Duplin and Hawthorn Formations of Miocene and younger ages (less than 25 million years old). A narrow band adjacent to Bamberg and northwestern Dorchester County consists of Cooper Marl and Flint River Formations of Oligocene age (25-36 million years old).

The vegetation of Colleton County, as in most counties in the outer coastal plain, is dominated by pine flatwoods and swamp forest. Virtually no original growth timber remains in the county. Small, wet depressions, generally less than ten acres, are extremely common. Another community that is probably more extensive here than in any other coastal plain county is marshy peat land. Although it appears to be relatively undisturbed, Cohen et al. (1982) indicate that drainage has been altered in the last 100 years or so in Snuggedy Swamp, the most extensive of these peat lands.

The vegetation of Colleton County probably can be described briefly and most effectively by indicating which plant communities are not present or are poorly represented in the county. Pine savannas, mesic mixed hardwood forests, Carolina bay, and well-developed longleaf pine-turkey oak forests are poorly represented. Marl outcrops and Atlantic white cedar forests are not present in the county.

## Methods

Potentially unique or unusual botanical natural areas were selected by: (a) examining available soil, topographic, and geologic maps, (b) studying black and white and color infra-red aerial photos, (c) reviewing pertinent scientific literature, and (d) consulting with knowledgeable individuals and organizations, particularly the S.C. Heritage Trust Program, the S.C. Coastal Council and the local Soil Conservation Service office. Maps and photos were searched for: (1) unusual soil types or combinations of soils; (2) areas of distinct, abrupt or unusual topography; (3) distinctive community types such as Carolina bays, grass-sedge wet depressions, natural ponds, savannas and pocosins; (4) large, undisturbed areas; (5) areas of mature, old-growth forest; and (6) potential habitat for rare, threatened or endangered plants.

Aerial reconnaissance using fixed-wing aircraft was used to (a) screen potential natural areas and select those worthy of preliminary ground survey, (b) locate additional potential natural areas, and (c) determine boundaries of significant natural areas. Preliminary ground surveys were made of most potential natural areas identified by aerial reconnaissance.

All primary and secondary highways and many unimproved dirt roads were traveled in an attempt to locate additional potential natural areas.

Areas selected for preliminary or intensive on-site investigations were studied using methods and formats presently employed by the S.C. Heritage Trust Program. For potentially unique areas, an On-site Data Collection Form was completed and, when appropriate, Community Survey Forms, Special Floral Element Data Sheets and Special Physical Element Data Sheets were also filled out. Completed forms for all significant natural areas are on file with the S.C. Heritage Trust Program in Columbia.

## Results and Discussion

### General Comments:

Appendix I gives the name, code number and location on a Colleton County General Highway Map for all sites, significant and non-significant, that were evaluated as potential natural areas for this study. Prior to this study, the S.C. Heritage Trust Program had in its files for Colleton County at least some information on the following areas or rare plant species: outer Otter Island (site 101), Pine Island (site 111), Deer Creek (site 84), the Ashepoo River, the Colleton County Cowbane Preserve (site 105), the Edisto Island Natural Area (site 116), the Ashepoo Natural Area (site 113), the Edisto Nature Trail (site 119), the Edisto Sink Holes (site 5), the Bear Island Game Management Area, *Pieris phillyreifolia* (climbing fetterbush) and *Thalia dealbata* (powdery-thalia, site 114). Most of these sites were studied in greater detail for this study, and sites 5, 101, 105, 113, 114 and 116 are recommended here for consideration as significant natural areas.

A review of pertinent literature revealed only a few additional potential natural areas. Radford et al. (1968) included Colleton County in the known distribution of *Lindera melissaefolium*, Jove's fruit; unfortunately, no herbarium specimen or other source of information was found that provided even general locality information. Ballington et al. (1980) report from Colleton County the first collection in South Carolina of *Vaccinium ashei* (rabbit-eye blueberry) and the first Colleton County locality for *Vaccinium crassifolium* (creeping blueberry); these reports provided the basis for searches for several potentially significant pine flatwoods communities (i.e., sites 120 and 121). Staub (1977) studied the geomorphology, sedimentology and depositional history of the Snuggedy Swamp; part of this area (site 88) is recommended here for consideration as a significant natural area.

The U.S. Fish and Wildlife service (USDI, 1981) recommended the Ashepoo-Combahee-Edisto River Basin, essentially all of Colleton County south of U.S. Highway 17, as a "significant wildlife resource area." Three areas recommended here for consideration as significant natural areas are within the ACE Basin (Ashepoo Natural Area, Otter Islands, and Snuggedy Swamp). I agree that the entire ACE Basin should be considered a "significant wildlife resource area."

Communications with knowledgeable individuals (Appendix II) resulted in recommendations on numerous potential natural areas, including sites 10, 11, 25, 43, 48, 74, 82, 84, 101, 111, 115, 117 and 118. Most of these sites were surveyed either by a fixed-wing aircraft or on the ground: Calfpen Swamp (site 74) was surveyed from the air but not on the ground; a ground survey is needed. Many of the personal contacts recommended large river swamps and barrier islands as the best potential sites of significant natural areas in Colleton County. Otter Islands (site 101) is recommended here for consideration as a significant natural area.

Colleton County Soil Survey maps (Stuck, 1982) and infra-red aerial photos (Charleston office of the S.C. Coastal Council) were the major sources of new sites to be surveyed as potential significant natural areas. Topographic maps, for two reasons, proved to be much less useful. First, topographic relief in Colleton County generally is not marked, and second, most of the county is covered by older, less-detailed, 1:62,500 maps rather than 1:24,000 maps. Maps were searched for: (1) unusual soil types, or combinations of soils; (2) areas of distinct, abrupt or unusual topography; (3) distinctive community types such as Carolina bays, grass-sedge-dominated wet depressions, natural ponds, savannas and pocosins; (4) large, undisturbed areas, and (5) areas of mature, old-growth forest. More than 75 potential

sites were selected in this manner. Of course, the quality of this information is not high, and only a small percentage of the areas found in this manner could be expected to be significant. Big Survey Natural Area (site 67), Koger Intermittent Pond (site 34), Pond Cypress Natural Area (site 59) and Sandy Run Carolina Bay (site 60) are recommended here for consideration as significant natural areas.

Three aerial surveys using a fixed-wing aircraft were made during May, 1983. These surveys were useful in screening potential natural areas and selecting those worthy of preliminary ground surveys. Of the 43 sites surveyed from the air, 17 were found to have disturbances or other factors that precluded the need for ground surveys. The most common disturbances were recent lumbering activities, drainage ditches, and roads. Some of the largest tracts of pineland and swampland were found to have been recently clearcut (i.e. Burden Swamp (site 65), St. John's Swamp (site 56) and flatwoods on alpin fine sand (site 68).

Aerial surveys were of some limited value in locating additional potential natural areas. Pond Spice Natural Area (site 106) was located during aerial surveys and is here recommended for consideration as a significant natural area.

A few interesting sites were found by driving along state and county highways and accessible dirt roads (i.e. Ctenium savanna along S-24 (site 107) and Pine flatwoods-pocosin along S-456). This method probably would have been more useful if the dirt roads through many of the larger areas had not been gated; no attempt was made to obtain the necessary gate keys unless a previously identified, potential natural area was along one of these roads.

A primary focus of the field surveys was for potential habitats of rare, threatened or endangered plants known in Colleton County or that could occur in the county if appropriate habitat was present. Field surveys were made specifically for the following species, Agrimonia incisa, Amaranthus pumilus, Carex chapmanii, Ilex amelanchier, Leucothoe populifolia, Lindera melissaefolium, Litsea aestivalis, Lobelia boykinii, Oxypolis canbyi, Pieris phillyreifolia, Sageretia minutiflora and Trillium pusillum. All areas searched for these species are not included in Appendix I; generally, only the best potential sites are included. To include all sites even briefly searched would make the map in Appendix I all but unreadable. The focus of specific search efforts for each of these species is indicated in the followng brief narrative.

Small, wet depressions are widespread throughout Colleton County. Grass-sedge wet depressions are known to be potential habitat for at least 20 rare, threatened or endangered plants, including Oxypolis canbyi, Ptlimnium nodosum, Fimbristylis perpusilla, Rhexia aristosa, Myriophyllum laxum, Croton elliottii, Litsea aestivalis, Lobelia boykinii, Scleria baldwinii, Echinodorus parvulus, Coreopsis rosea, Ludwigia spathulata, Habenaria lacera, Utricularia olivacea, U. floridana, Rhynchospora tracyi, R. inundata, Sagittaria isoetiformis, Amphicarpum muhlenbergianum and Hypericum adpressum; the first six of these are under federal status review for listing as potentially endangered or threatened species. For these reasons, grass-sedge wet depressions were a major focus of this survey. More than 35 were selected for additional survey during this study, and 24 were actually surveyed. Three of these, Pond Spice Natural Area (site 106), Koger Intermittent Pond (site 34), and Pond Cypress Natural Area (site 59), are recommended here for consideration as significant natural areas.

Searches for Oxypolis canbyi, Canby's cowbane, probably were more extensive than for any other species. Canby's cowbane is found in open bogs and grass-sedge wet depressions. The known locality (site 105) was surveyed in some detail. More than 24 wet depressions were searched, and a five mile radius around the known site was searched thoroughly for potential habitat. Eight additional populations of the closely related species, Oxypolis filiformis, were found, but no additional populations of O. canbyi were discovered.

Agrimonia incisa, incised groovebur, was found in Edisto State Park by Dr. Richard Porcher in 1972. This site is recommended here for consideration as a significant natural area (Edisto Beach Natural Area) even though it technically is in Charlestion County; this area is in a part of Edisto Island that probably will soon be annexed to Colleton County. Although A. incisa typically is found in dry pine flatwoods, the two extant South Carolina populations are in maritime forests adjacent to brackish marshes. Similar areas searched specifically for this species include sites 96, 100, 101, 111, 115 and 118. No additional populations of this species were found.

Amaranthus pumilus, coast pigweed, is under federal status review (USDI, 1983) and is found on sand dunes of barrier islands. Sites 101 and 111 were searched unsuccessfully for this species.

Carex chapmanii, Chapman's sedge, presently is under federal status review. It is found in well-drained hummock woodland areas, typically dominated by beech, magnolia, maple, oaks and pine. Sites 29, 57 and 72 were searched unsuccessfully.

Ilex amelanchier, sarvis holly, is presently under federal status review. It typically is found on the riverbanks and floodplains of blackwater streams. Bridge crossings over blackwater streams are ideal places to look. Most of the bridge crossings over the Edisto and Big Salkehatchie rivers north of U.S. 17 were searched unsuccessfully for this species.

Leucothoe populifolia, Carolina dog-hobble, recently has been found in some abundance in Jasper County along small streams over Paxville fine, sandy loam soils. The best concentrations of these soils, in the vicinity of Islandton and Snider's Crossroads, were surveyed without success.

Radford et al. (1968) include Colleton County in the distribution of Lindera melissaefolium, Jove's fruit, but no herbarium specimen or other source has been found that provides general locality information. Since the Berkeley County populations are almost all associated with lime sinks, searches in Colleton County focused on the uppermost part of the county, the part underlain by Cooper marl. Some searches also were made in the vicinity of Jacksonboro. All searches were unsuccessful.

Litsea aestivalis, pond spice, is found in and around grass-sedge wet depressions. Of the 24 wet depressions searched during this study, two were found to contain small populations of pond spice. Both sites containing pond spice, sites 34 and 106, are recommended here for consideration as significant natural areas.

Lobelia boykinii, Boykins' lobelia, presently is under federal status review. Boykin's lobelia typically is found in wet, pond cypress savannahs. Sites 48, 39 and numerous pond cypress domes west of Cross Swamp were searched for this species. This species was only found at site 49, and this site is recommended here for consideration as a significant natural area.

Climbing fetterbush, Pieris phillyreifolia, has a most unusual growth habit; it climbs pond cypress by growing under the bark and periodically sending out leafy, lateral branches. An herbarium specimen collected by Robert K. Godfrey in June, 1969, reports this species from "swamp, Moselle Swamp, west of Islandton." Dr. Godfrey was contacted at Florida State University, but he was unable to provide more specific locality information. Extensive searches were made in Moselle Swamp, Cross Swamp, cypress domes west of Cross Swamp and in other areas where pond cypress was encountered (i.e. sites 48, 59 and west of site 107). No climbing fetterbush was found.

Sageretia minutiflora, shell-mound buckthorn, is typically found in association with Indian shell mounds and other upland areas with soils displaying high concentrations of old shell materials. Herman Crosby, Jr. carried me by boat to what he considered the best shell bluffs in the county (sites 101, 118 and several additional unmarked sites). Sageretia was found at Ashe Island and on one of the small hummock islands associated with the Otter Islands. It also was found at site 115 and was already known to occur at the Edisto Beach Natural Area.

Trillium pusillum, dwarf or Carolina trillium, is under federal status review and is found typically in South Carolina in mesic hummocks in swamp forests. It typically is found on soils with a circumneutral pH. On the recommendation of Warren Stuck, soil scientist with the Soil Conservation Service, areas in the vicinity of Jacksonboro were searched (especially sites 72 and 119). Areas also were searched in the upper part of the county, the part underlain by Cooper marl (especially site 29 and woodlands near Green Pond Church). All searches were unsuccessful.

An examination of species lists from Colleton County and adjacent counties prior to this study indicated that very few typical or rare savanna species or species associated with rich, mesic woods (typically north slopes dominated by beech) had been found in Colleton County. Since these community types are often the richest and most diverse communities found in coastal counties, extra efforts were made to locate these community types in Colleton County. A few interesting areas with some typical savanna species were found. A few rare savanna plants, including Lobelia boykinni and Aristida spiciformis, were found, and two areas harboring at least some savanna species are recommended here for consideration as locally significant natural areas (Big Survey Natural Area and Pond Cypress Natural Area). However, since none of the savanna areas that were located were of statewide or national significance, the savanna searches were disappointing.

The best of the rich, mesic woods located are on hummocks that are at least partially surrounded by swamp forest (i.e. sites 73 and 29). These areas are quite mature. However, species diversity is not especially high, and no unusual species are present. The undisturbed nature of both areas changed during the course of this study; unimproved roads recently were cut into both areas.

Colleton County has, in the Big Salkehatchie, Little Salkehatchie, and Edisto rivers, some of the most extensive and least-disturbed blackwater swamps in the coastal plain. No rare plant species or old-growth, uncut swamp forest are present, but the present swamp has good stands of cypress, tupelo and other swamp species. Ditching and draining, however, are minimal and the swamps, for the most part, are functioning as swamps should. They are functioning in the storage and discharge of fresh water; they dampen the effects of severe floods. They improve water quality by trapping nutrients

and immobilizing pollutants such as herbicides, pesticides and metals; and they are highly productive systems for a variety of fauna and flora (Wharton et al., 1982). These blackwater swamps are significant ecological resources, and every effort should be made to keep them intact and functioning.

Criteria Used in Determining Site Significance:

The S.C. Heritage Trust Program bases determinations of site significance on: (1) the uniqueness of the elements (i.e. plants, animals, plant communities, animal communities or geological features) that constitute a site and (2) a site's natural quality (i.e. lack of disturbance, maturity, size, etc.) in comparison with similar sites. A site that harbors an element or elements that are rare, threatened or endangered, throughout their entire range is potentially of national significance; this potential is realized if the site also is a high quality example of the type in question. A site that harbors a nationally-significant element is only of statewide significance if the site is a poor example of the type in question. For example, Canby's cowbane is a plant species that is rare and endangered throughout its range. A population that is found in a natural, undisturbed habitat would be nationally significant. A population found in a roadside ditch would still be significant (statewide significance), but it would not be nationally significant.

A site that contains elements that are not rare throughout their range, but are rare in South Carolina is of statewide significance if it also is a high-quality example of the type in question. A site's significance, once again, is lowered if it is not a high-quality example of the type in question.

A site that harbors elements that are rare locally in South Carolina is considered of local significance if it also is a high-quality example of its type. If it is not a high-quality example, then it is not significant.

## Proposed Botanical Natural Areas in Colleton County, South Carolina

National Significance:

Colleton County Cowbane Preserve (site 105) - 12 acres

Otter Islands (site 101) - 2100 acres

Ashepoo Natural Area (site 113) - 400 acres

State Significance:

Edisto Beach Natural Area (site 112) - 1-2 acres

Edisto Sink Holes (site 5) - 200 acres

Koger Intermittent Pond (site 34) - 6-8 acres

Snuggedy Swamp (site 88) - 2300 acres

Local Significance:

Big Survey Natural Area (site 67) - 30-50 acres

Pond Spice Natural Area (site 106)- 2 acres

Pond Cypress Natural Area (site 59) - 6 acres

Sandy Run Carolina Bay (site 60) - 10 acres

*Thalia dealbata* (site 114) - 1-2 acres

## Colleton County Cowbane Preserve

### Site Description

This site is a swamp tupelo-cypress-slash pine swamp on Rains sandy loam near the upper reaches of a small, broad drainage. It has a relatively closed canopy and a thick shrub zone, except in small openings that are scattered through the area. It is in these small openings that herbaceous species are best represented, and it is here that the very rare Canby's cowbane is found. Herbaceous associates include Sarracenia flava, Rhynchospora sp., Erianthus strictus, Woodwardia virginica, Juncus repens, Solidago microcephala and Erianthus sp. The area merges into a wetter cypress swamp to the south and drier, denser pocosin to the east. Lands to the north, east and west have been cut over recently. Very little Oxypolis filiformis is found in the area, but is very abundant just north across S.C. Highway 63. Very little O. canbyi occurs north of S.C. Highway 63.

In 1982, 1 1/2 years after the site burned, Melissa Johnston counted over 500 stems of Oxypolis canbyi, usually in clumps of 10-20. Since the species is stoloniferous, it is not possible to determine exactly how many individual plants this represents.

### Site Significance

Oxypolis canbyi is the primary element of significance at this site. This species presently is under federal status review for listing as a potentially endangered plant species (USDI, 1983). Only six populations of this species are known to exist, three in Georgia, one in Maryland and two in South Carolina. Two additional sites in South Carolina and one in Delaware once harbored the species, but recent attempts to relocate the species at these sites have been unsuccessful.

The S.C. Heritage Program considers this site to be of national significance and a high priority for protection. The S.C. Nature Conservancy acquired the site in 1983. The area is now managed as a nature preserve. It is managed specifically for the protection of Oxypolis canbyi.

Actual of Potential Threats

Since the area was recently acquired by the S.C. Nature Conservancy, potential threats to the site have been reduced. Sufficient lands were acquired so drainage of adjacent lands should not alter the hydrology of the area.

Intensive residential development around the area could introduce pollution. It also could preclude the use of one management option, regular controlled burns, an option that may be necessary to maintain suitable habitat for O. canbyi.

Agricultural runoff shouldn't be a problem since the area is separated from adjacent agricultural lands by highways without underground drains.

There are no direct, energy-related threats to the area at this time, and potential threats are unlikely.

Management Recommendations

Periodic, controlled burns may be necessary to maintain the openings within which Oxypolis canbyi apparently grows best. Establishing and monitoring permanent quadrants will be needed to determine: (1) whether or not controlled burns are needed, and (2) if so , at what intervals controlled burns are most effective in maintaining or increasing the population of Oxypolis canbyi. Kral (1983) notes that prescribed burns and thinning the

overstory are beneficial to the species if done properly. Experimental, controlled burns on only a small portion of the area should be tried before attempts are made to burn the entire area.

## Otter Islands

### Site Description

This site consists of the whole complex of physical features and natural communities associated with the barrier island complex known as Otter Islands, including beach, sand dunes, maritime forest, maritime scrub thicket, hummock islands, salt marsh, salt flats, fresh to brackish ponds and tidal creeks. It is bounded to the north by Jefford Creek, to the east by Fish Creek, to the west by the Ashepoo River and St. Helena Sound, and to the south by the Atlantic Ocean.

The main oceanfront island is broadly and shallowly U-shaped and contains about 260 acres of upland and nearly 2.5 miles of beach. Low sand dunes comprise about two-fifths of the upland and are nearly 600 feet wide in places. The maritime forest is fairly typical of those this far south on the coast, except for the absence of Magnolia grandiflora. It is undisturbed, but trees are not especially well-developed in terms of height or diameter. A large cattail marsh and several smaller ponds lie between the dunes and the maritime forest in the southwest portion of the island. There are no roads, paths, or signs of previous habitation on the islands. This island has a high concentration of nesting loggerhead sea turtles, a small nesting population of least terns, and (according to unconfirmed reports) the American alligator. The sand dunes here also harbor a small population of Florida pellitory, Parietaria floridiana.

Several smaller islands dominated by maritime forest and surrounded by salt marshes, including one of ca. 25 acres in size, one of ca. 35 acres, one of ca. nine acres, and nine less than four acres, are part of this complex. One small, circular marsh island contains an unusual assemblage of plants. It is dominated by live oak, cabbage palmetto, southern red cedar and Carolina cherry laurel. Basswood is important in places as is red buckeye and shell-mound buckthorn, Sageretia minutiflora.

The majority of this site consists of undisturbed salt marshes and tidal creeks (ca. 1700 acres).

Site Significance:

This is one of the few undeveloped, undisturbed, oceanfront barrier islands remaining on the Atlantic coast.

Outer Otter Island has the highest number of nesting loggerhead sea turtles on the southern half of coastal South Carolina. The loggerhead is on state and federal lists of endangered and threatened wildlife.

The least tern is considered in need of management and "threatened" in South Carolina.

This site has the largest population of Sageretia minutiflora known in Colleton County. Shell-mound buckthorn, Sageretia minutiflora, was considered "of regional concern - threatened" in 1979 (Rayner et al.). A 1984 update of the list recommends dropping this species from the South Carolina list of rare, threatened or endangered plants. The S.C. Heritage Program still considers this species to be of significance and concern in South Carolina .

Parietaria floridana, Florida pellitory, is rare in the northern half of its range (North Carolina and South Carolina ). This is one of only three known populations in South Carolina.

The S.C. Heritage Trust Program considers this site to be of national significance and a high priority for protection. This area was recommended as part of one of the "Significant Wildlife Resources Areas of South Carolina" (USDI, 1981).

Actual or Potential Threats:

Residential development of outer Otter Island is the greatest threat to the site. Such development almost certainly would lower the number of loggerhead sea turtle nests.

This is a low-lying barrier island that could be seriously affected by oil spills. Oil spills could affect the nesting by loggerhead sea turtles and least terns and might also affect the shell-mound buckthorn and Florida pellitory.

Management Recommendations:

This barrier island complex appears to be quite stable. No management is needed. The complex simply needs to be protected from development, overuse and, if possible, oil spills.

## Ashepoo Natural Area

Site Description:

This site consists of a large freshwater marsh on Santee loam soil and part of the surrounding swamp which is on Argent loam. The marsh has a nearly continuous herbaceous cover and very few areas of open water, although most of the area has standing water from December to April or May. Small changes in topography in the marsh are reflected in differences in floristic composition. Thus, some areas are dominated by Panicum hemitomon, others by Peltandra virginica and Iris virginica, others by Typha latifolia, and still others by Woodwardia virginica and Carex walteriana. Sagittaria lancifolia, a species that is rare in the coastal plain of South Carolina, is relatively

abundant throughout the large, freshwater marsh. Shrubs and trees are a very minor component of the marsh, although a small pocket of pond cypress is present in the northeast sector, and shrubs are widely scattered throughout. This is one of the largest freshwater marshes on a shallow peat substrate in the coastal plain of South Carolina.

Most of the surrounding swamp is dominated by cypress and/or swamp tupelo. One small, relatively open pocket in this swamp contains a major wading bird rookery. Of especial interest here is the presence of the only known wood stork rookery in South Carolina. Seven additional species of wading birds also nest there. This rookery is registered as a Heritage Site with the S.C. Heritage Trust Program.

Most of this site is inaccessible and undisturbed. The freshwater marsh has an old fence line running through the southeast section. The dirt road that forms the northern property boundary probably has altered the drainage in the swamp somewhat, especially immediately south of the road.

The freshwater marsh and wood stork rookery are the main features of interest here. The boundaries for the area were drawn to include sufficient buffer for the continued existence of these features. The exact location of the wood stork rookery is considered sensitive information and is not pinpointed on maps of the area.

Site Significance:

This area harbors one of the largest freshwater marshes on shallow peat substrate in the coastal plain of South Carolina. The marsh has a diverse herbaceous flora and a large population of Sagittatia lancifolia, a species that is rare in the coastal plain of South Carolina.

This area harbors the only known wood stork rookery (22 nests) in South Carolina. This is the northernmost known rookery of wood storks, a species that was recently listed as federally endangered by the U.S. Fish and Wildlife Service (USDI, 1984). This rookery also is a nesting area for great blue herons (60 nests), great egrets (60 nests), snowy egrets (40 nests), cattle egrets (150 nests), anhingas (40 nests), Louisiana herons (20 nests) and little blue herons (20 nests).

The S.C. Heritage Trust Program considers this area to be of national significance and recommends it as a high priority for protection.

Actual or Potential Threats:

The greatest threat to the area is from ditching and drainage operations intended to improve site conditions for pine production.

Wetlands in the vicinity also have been diked and managed as waterfowl impoundments. This probably is not a serious threat here.

This area presently has no known energy-related threats. The peat here is too shallow to be exploited for fuel or horticultural use.

Management Recommendations:

This wetland requires very little management. The area may need prescribed burns every 10-15 years. Shrubs and trees probably will invade the marsh if it is not burned occasionally.

## Edisto Beach Natural Area

This site consists of a raised Indian shell mound and adjacent mainland maritime forest on the southwest extremity of Edisto Beach State Park. The southeast boundary of the site is Scott Creek, and the southwest boundary is a salt marsh. The forest just northeast of the shell mound harbors the largest of only two South Carolina populations of Agrimonia incisa, incised groovebur. The forest here is a typical mainland maritime forest dominated

by laurel oak, cabbage palmetto and an occasional live or water oak. The herbaceous cover in the vicinity of the incised groovebur is unusual in that it consists of a nearly complete cover of several species of legumes. The incised groovebur is found within 3-4 feet of an old dirt road that now serves as a nature trail. Sixteen plants were found in 1983, and 22 plants, including four seedings, were found in 1984.

The 60 by 20-foot shell mound harbors a large population of Sageretia minutiflora, the shell-mound buckthorn. This species is only found in association with shell deposits. Carolina cherry laurel dominates the low canopy here.

Agrimonia incisa is only known to occur in South Carolina , Florida and Mississippi; there are fewer than 20 known populations. It presently is under federal status review for listing as a potentially endangered or threatened species. The species was listed in South Carolina as "of statewide concern - threatened" in Rayner et al. (1979), but a recent (1984) unpublished update of the South Carolina list considers the species "of national concern - threatened." The S.C. Heritage Trust Program considers the species to be a high priority for protection. This is the best of two South Carolina populations.

Sageretia minutiflora is listed as "of regional concern - threatened" in Rayner et al. (1979), but the recent (1984) update of this list recommends dropping the species from the South Carolina list of rare, threatened or endangered plants. The plant still usually occupies a very distinct habitat and is infrequently encountered.

Shell mounds are of archeological and historic interest. Shell mounds and shell rings are apparent sites of Indian occupation. Shell mounds probably are no more than Indian refuse dumps, but the larger, distinctively-shaped, shell rings probably served some additional purpose.

The S.C. Heritage Trust Program considers this site to be of statewide significance and of high priority for protection.

Actual or Potential Threats:

At least two Agrimonia incisa plants occur within the old road bed to the shell mound and are in danger of being trampled by visitors to the site.

The trails on and around the shell mound are eroding somewhat from visitor use. Because the substrate is very hard, this should not be a major problem.

Development could be a major problem if the area were not already owned by the state of South Carolina.

Energy-related activities should have no potential impact on this site.

Management Recommendations:

Dr. Robert Kral (1983) suggests that prescribed burns, thinning the overstory, and cutting the overstory could be beneficial to Agrimonia incisa, if done properly; intensive site preparation or grazing would damage or destroy the species, according to Kral.

Kral (1983) estimates: (1) prescribed burns and intensive site preparation would destroy the Sageretia minutiflora, (2) cutting the overstory would damage the species, and (3) thinning the overstory would have no lasting effect.

No management should be undertaken until additional management-related research is completed. Thinning the overstory in the area of the Agrimonia is the most likely, ultimate management recommendation.

The old road leading to the shell mound still is occasionally used by vehicles, in spite of the presence of a gate to prevent such use. Additional efforts to prevent vehicular use of this road are needed.

## Snuggedy Swamp

### Site Description:

Snuggedy Swamp consists of a 9,500 acre complex of tidal, salt to brackish marsh, freshwater marsh and swamp, and ancient barrier islands. Natural conditions have been rather severely altered by man's activities in most of this area. The area recommended here consists of about 2,300 acres of relatively undisturbed marsh and swamp. It is bounded to the west by the Ashepoo River and Deer Creek, to the north by Cattle Island, to the east by a drainage ditch and to the south by the abandoned bed of the Seaboard Railroad.

The geomorphology, sedimentology and depositional history of this area have been studied in some detail by Staub (1977). The nature and extent of the peat deposits here have been determined by Cohen et al. (1982). Information concerning the floristic composition is less complete. General vegetative types were determined from aerial surveys, and floristic composition of peripheral areas was determined by boat and on foot. No floristic surveys have been made of the inaccessible interior of the area, and no attempts were made to correlate floristic composition with depositional history.

A narrow band of brackish, tidal marsh is adjacent to the Ashepoo River and Deer Creek. Interesting or unusual species here include Sagittaria lancifolia, Scirpus californicus, Lilaeopsis chinensis and Hymenocallis crassifolia. Sagittaria lancifolia has a very restricted distribution in South Carolina but is apparently quite abundant in fresh to brackish marshes over peat. According to Cohen et al. (1982) this tidal marsh is underlain by about 12 inches of peat.

Aerial surveys indicate that most of Snuggedy Swamp is a mosaic of fresh marsh and swamp with a few, small, scattered ponds. The "basic" community type here probably is a loblolly bay (Gordonia lasianthus) dominated shrub bog. Differences in vegetation and floristic composition for this "basic" community are related primarily to fire history. Staub (1977) presents evidence that fires ignited during dry periods burned down into the peat and created topographic depressions. Depending on the depth of the peat burn, burned areas may develop into a variety of grass-sedge or emergent-floating aquatic communities; if a fire burns little or no peat, the original community may regenerate, minus loblolly bay (it is intolerant of fire) and possibly with the addition of pond pine (it is highly tolerant of fire). Hardwoods such as swamp tupelo and red maple also are intolerant of fire.

Important pocosin species include Persea borbonia, Myrica cerifera, Lyonia lucida and Vaccinium corymbosum. Emergent or floating aquatics include Nymphaea odorata, Lemna sp., Decodon verticillata, Limnobium spongia, Habenaria repens and Alternanthera philoxeroides. Grass-sedge marsh areas may consist of thick zones of just a few species, such as Typha latifolia, Cladium jamaicense, Woodwardia virginica, Lachnanthes caroliniana or Erianthus sp. Or, grasss-sedge marsh areas may be quite high in diversity and include such species as Andropogon virginicus, Sagittaria lancifolia, Centella asiatica, Pluchea foetida, Bidens laevis, Xyris sp. and Lachnocaulon sp. At least some pocosin shrubs are present in all grass-sedge marshes and shrub are predominant in some.

Site Significance:

This is by far the largest grass-sedge marsh/loblolly bay pocosin complex in South Carolina. For this reason, it is considered a site of statewide significance by the S.C. Heritage Trust Program. Larger and better examples

of this natural community type are known in Florida, Georgia, North Carolina and Virginia, so the area cannot be considered an area of national significance. The extensive work done on the geomorphology, sedimentology and petrology of the area provides an excellent background for an extensive botanical and ecological survey. Searches for additional rare plants should be an important part of such a study.

Actual and Potential Threats:

According to Cohen et al. (1982) the average peat depth in this area is about six feet, and some deposits are 12 feet deep or more. The peat here is of sufficient quality to be used as fuel. Cohen et al (1982) indicate that this deposit is relatively small compared to major peat gasification projects under development in the U.S. but that deposits of similar size are exploited in Russia and Europe. The threat to the area from a peat-fuel project probably is not high or immediate.

Peat is mined commercially for horticultural use in an area just south of the southern boundary of this site. Similar operations pose a serious threat to this area. The immediacy of this threat is not known.

Most of the wetlands immediately north, east and south of this area are diked and managed to attract waterfowl. This area easily could be converted to similar purposes. This could be the most immediate threat to the area.

Management Recommendations:

A large ditch is parallel to the old Seaboard Railroad bed, which forms the southern boundary of this proposed natural area, and another ditch forms the proposed eastern boundary. Cohen et al. (1982, p. 36) state:

"Evidence of recent fires in surface samples analyzed microscopically as well as evidence of recent vegetational changes in the upper portions of the cores suggests that the Snuggedy Swamp drainage has been altered in the last 100 years or so. Thus, the present surface vegetation would no longer be considered to be virgin swamp vegetation."

This comment was in reference to the Snuggedy Swamp as a whole (9,500 plus acres), and, admittedly, most of the area outside this proposed area has been altered greatly. There probably has been little direct effect from the above-mentioned drainage ditches in the area recommended here except in the immediate vicinity of the ditches. The effect of these drainage ditches needs to be determined more completely and, if necessary, changes made to offset their effects.

This area requires no additonal active management. Fire is a natural component of this system and natural fires should be allowed to burn. Adjacent areas may be artifically burned to promote growth of certain waterfowl foods; efforts should be made to keep these fires out of this area.

## Edisto Sink Holes

This site consists of: (1) a series of 20 or more small sink holes scattered over an area of about 200 acres and (2) a large artesian spring which boils up out of the base of a small bluff about six-tenths of a mile north from the closest major sink hole.

Sink holes are generally small, relatively deep, and steep-walled depressions that occur in parts of the Coastal Plain Province that are underlain by marl or limestone. In South Carolina they usually are less than 100 feet across; and they may be as much as 50 feet deep. They are associated with underground streams and/or caverns. A running stream may be seen at the bottom of a sink hole, or a stream may flow into a sink hole and "disappear."

The Edisto Sink Holes are not impressive in terms of size, but they are impressive in terms of number and diversity. At least 20 sink holes, varying from nearly 20 feet to less than three feet deep, are present at this site; at least seven contain water almost year-round. Streams enter and disappear in at least two; one serves as an obvious exit point for the underground

(artesian) aquifer. The larger, water-filled sinks contain fish and are fished. The plant life varies from sink to sink and is not particularly distinctive. No rare species typically associated with marl or limestone outcrops are found here, and no outcrops of marl or limestone are present.

Clinking Hole (all names are from "The Sink Holes of Edisto by Norman E. Spell, Sr., 1974) is probably the most impressive and distinctive sink hole here. Clinking Hole is 30 feet long, 20 feet wide; it is 15 or more feet to the top of the water level that is maintained in the hole. The sink hole is situated at the edge of a gently sloping ridge. A stream flows from the adjacent swamp through a narrow gorge-like channel into the sink and disappears, apparently by way of an underground stream.

Roaring Hole is another sink hole that receives a small stream, and the water then disappears through the bottom of the sink. According to Spell (1974), water tumbles down several little falls and into the sink during periods of low water, but water roars as it swirls "round and round in the Roaring Hole like water in a giant funnel" following heavy rains. The Roaring Hole did not roar when the site was visited in the summer of 1984; water was standing and backed up into the narrow swamp that normally feeds the Roaring Hole. Several other holes were flooded. Norman E. Spell, Jr. noted that he had never seen the Roaring Hole blocked or water so high in a few other sinks. He suggested that somehow the underground streams in part of the area had been blocked, possibly as a result of recent lumbering activities in the area.

Big Spring is an artesian spring, i.e: the water bubbles up out of the spring because it is under hydrostatic pressure. Spell (1974) states that "many think that it is one of the places the underground river comes to the surface." It is very likely that the "underground rivers" feed into a deep

aquifer, and this artesian spring is connected to this aquifer. Since this is an artesian spring, a spring under pressure, there cannot be an unbroken connection between the "underground rivers" and this spring.

Associated wetlands at the site include an extensive sweet-gum-dominated wet flat, and a swamp tupelo pond known as Summer House Pond.

The woods surrounding most sink holes have recently been clear-cut and planted in pine. This should have little effect on the sink holes. Somehow, however, some of the sinks in the area apparently have lost their underground connection.

Site Significance:

The significance of the Edisto Sink Holes is entirely due to their unique geological features; there are no significant plants, plant communities or animals known on this site. Although individual sink holes are not rare, complexes containing numerous sinkholes are rare. This site contains more sink holes than any other sink hole complex in South Carolina. It also contains a wide variety of sink types, i.e. shallow sinks, deep sinks, sinks with and without standing water, sinks that capture streams and an artesian spring. Clinking Hole, Roaring Hole, and Big Spring are especially impressive. The site is an excellent educational resource for demonstrating sink holes and related geologic processes. This site is considered of statewide significance by the S.C. Heritage Trust Program.

Actual or Potential Threats:

There are no energy-related threats to this area. Much of the area has recently been lumbered; lumbering activities should not have a detrimental effect on the sink holes proper, although they do reduce the aesthetic appeal of the area. Residential or commercial development are not threats at present, and development could be planned to avoid any negative impacts.

Management Recommendations:

Management recommendations for the area are few. No active management is needed. The significance of the area can best be maintained by keeping the area in an undisturbed, natural condition. Alteration of drainage patterns must be avoided. Research is needed to determine why water no longer disappears through the bottom of Roaring Hole.

## Koger Intermittent Pond

Site Description:

This site is a shallow, intermittent, natural pond surrounded by loblolly pine woods that are kept open by regular prescribed burns. The open pond area is elliptic and about 400 feet long. The site probably contains at least some standing water during most of the year. In the spring of 1984 about one half of the pond contained emergent, aquatic vegetation. Emergent vegetation was most abundant in the deeper water areas and the overwhelming dominant was Sagittatia graminea var. graminea. Water was 18 inches or deeper (a maximum of about 40 inches) in most of the open pond. Although emergent vegetation was not dense, most of the pond bottom was covered by a dense mat of Bacopa, Gratiola, and Juncus. The open pond area is bordered by a 20- to 120-foot wide zone of scattered to relatively dense Ilex, Nyssa and Pinus, water from zero to eight inches deep, and sparce herbaceous vegetation. A small population of Litsea aestivalis is present in this zone toward the north-northwest margin. This zone in turn is bounded by a 20- to 30-foot wide "draw down" ecotone between the pond and the adjacent loblolly pine woods; this zone has a canopy coverage of about 80 percent and sparce shrub and herb layers. A 200-foot wide buffer of pine woods is recommended to provide protection to the site.

Some stumps are present toward the open pond margins, and an old fire lane runs obliquely from the south margin through the northeast margin. No other disturbances are present.

Site Significance:

The floristic composition of this area is distinctive. Information is available on more than 100 grass-sedge-dominated wet depressions and natural ponds, and this is the only known example in South Carolina dominated by Sagittaria graminea var. graminea. The presence of Drosera intermedia, a species uncommon in the outer coastal plain and previously unreported in Colleton County, suggests additional rarities may be present. Additional rarities to look for during summer and fall surveys include Rhexia aristosa, Ptlimnium nodosum, Myriophyllum laxum, Oxypolis canbyi and Utricularia olivacea.

This site harbors one of only two known populations of Litsea aestivalis in Colleton County. This species was considered "of regional concern - threatened" in South Carolina's 1979 list of rare, threatened and endangered species (Rayner et al., 1979). This species is found only in North Carolina, South Carolina, Georgia and Florida and is considered significantly rare throughout its range. It apparently is much more abundant in South Carolina than elsewhere in its range. Because of its apparent abundance in South Carolina , the S.C. Advisory Committee (1984) recommended deleting this species from the South Carolina list of rare, threatened or endangered plants. The S.C. Heritage Program still considers this species significantly rare.

The S.C. Heritage Trust Program considers this site to be of statewide significance.

Threats to Area or Natural Elements:

Drainage probably is the only potential threat to the area. However, since the area is small, it is unlikely that any attempts will be made to drain the area.

Another possible threat to the area is irrigation. If the surrounding uplands were cleared and farmed the area might become a source of water to irrigate nearby fields.

There are no potential threats from energy-related activities.

A prescribe burn in the adjacent pinelands, if done when the pond and the area around the Litsea is dry, could burn through the pond and destroy the Litsea.

Management Recommendations:

Kral (1983) estimates: (1) thinning the overstory would be beneficial, if done properly, (2) a prescribe burn would have no lasting effect, and (3) extensive site preparation for forest regeneration would damage or destory Litsea aestivalis. I disagree with Kral's estimate concerning prescribed burn; hot prescribe burns easily could destory a population as small as this one.

No active management is needed for this site.

## Big Survey Natural Area

Site Description:

This site consists of a pond pine - low shrub pocosin which merges into a longleaf pine, dry flatwoods to the north and a wetter, pond pine-swamp tupelo bay to the south. The pond pine-dominated areas appear to be on Pinckney loamy sand, and the longleaf pine flatwoods are on Leon sand. The pond pine pocosin contains numerous small savanna-like openings. This area, particularly the savanna-like openings, harbors a good diversity of savanna

or bog plants. One species, Aristida spiciformis, is very rare in the coastal plain of South Carolina. Another species, Zigadenus glaberrimus, is unknown elsewhere in Colleton County, and several other species are rarely found in Colleton County.

The longleaf pine flatwoods and parts of the pond pine pocosin are burned on a regular basis; the wetter pond pine-swamp tupelo bay probably is burned very infrequently.

This site is bisected by Secondary Road 28. There are no additional disturbances at the site.

Site Significance:

This is one of only two known locations in South Carolina for Aristida spiciforms. This species is distributed from Florida to Texas, South Carolina and the West Indies. It is rare in Mississippi, South Carolina and Puerto Rico.

All three species of pitcher plants known from Colleton County, Sarracenia flava, S. minor, and S. rubra, are found here. This is the largest population of Sarracenia rubra known to the author in this county; in 1979 this species was considered "of statewide concern - threatened" on the unofficial South Carolina list of rare and endangered plants (Rayner et al., 1979).

Zigadenus glaberrimus is unknown elsewhere in Colleton County and Habenaria blephariglottis, Cleistes divaricata and Bartonia paniculata are rarely encountered in Colleton County.

The S.C. Heritage Program considers this site to be of local significance.

Threats to Area or Natural Elements:

This area could be ditched, drained and planted in pine, a fate that has befallen similar areas in Colleton County.

There are no known threats from energy-related activities.

Management Recommendations:

Present management is ideal for this area. The drier parts of the area should be prescribe-burned every 2 to 3 years. Only a narrow portion of the area at the pine flatwoods ecotone was burned in the winter of 1984.

## Pond Spice Natural Area

Site Description:

This is small, grass-sedge dominated, intermittent wetland. Standing water usually is present from January through May and occasionally into August. An almost pure stand of Carex walteriana dominates the dense herbaceous layer. Panicum hemitomon, Woodwardia virginica and Sphagnum sp. are important in places. Trees are absent except for a small stand of swamp tupelo in a deeper, wetter, central area. Toward the east margin, in a area matted with Sphagnum moss, is a small colony of pond spice, Litsea aestivalis. This is one of only two populations of this rare shrub known to occur in Colleton County.

The area as a whole is nearly surrounded by a narrow zone of pond pine and thick bay or pocosin shrubs. The area is surrounded by an 8 to 10-inch deep fire lane.

Site Significance:

Litsea aestivalis, pond spice, is found only in North Carolina, South Carolina, Georgia and Florida. It is considered significantly rare in all states in its range. South Carolina probably has more of this species than

any other state with more than 20 populations reported from 8 coastal counties.

The species was considered "of regional concern - threatened" in South Carolina's 1979 list of rare, threatened and endangered species (Rayner et al., 1979). Because of its apparent abundance in South Carolina , the S.C. Advisory Committee (1984) recommended deleting this species from the state list of rare, threatened or endangered plants. The S.C. Heritage Program still considers this species to be significantly rare. This is one of only two populations of this species known in Colleton County.

The S.C. Heritage Trust Program considers this site to be of local significance.

Actual or Potential Threats:

Litsea aestivalis does not respond well to fire. The presence of a fire break, which tends to pool water around the area, should prevent fire from entering the area on a regular basis.

Since most of the surrounding area has been planted in pines less than 10 years ago, it is unlikely that any attempts will be made to drain the area.

There are no known threats to the area from energy-related activities.

Management Recommendations:

Kral (1983) estimates: (1) thinning the overstory would be beneficial, if done properly, (2) a prescribed burn would have no lasting effect, and (3) extensive site preparation for forest regeneration would damage or destroy Litsea aestivalis.

I disagree with Kral's estimate concerning prescribed burn. Hot prescribed burns easily could destroy a population as small as this.

At present no management is needed. A prescribed burn when the area surrounding the Litsea has standing water would be helpful in checking the encroachment of pocosin shrubs.

## Sandy Run Carolina Bay

Site Description:

This site consists of a small Carolina bay on Pickney loamy sand. The bay is about 980 feet long and 500 feet wide at its widest point. The margins of the area consist of a swamp with a closed canopy and vary in width from less than 30 feet to more than 200 feet. The interior of the bay consists of a swamp tupelo - pond cypress pond or marsh with scattered shrubs or low trees.

This is a typical Carolina bay in that it is elliptic and its long axis is oriented northwest to southeast. Sand rims are not present along any of the margins; this is typical of Carolina bays in the upper coastal plain. Although several large areas with "bay-like" vegetation in Colleton County are called bays, (i.e. Jones Bay and Big Bay), most of these areas are not Carolina bays. Carolina bays are very rare in Colleton County, and this is the only one in the county that is essentially undisturbed. The only disturbance to the area is a small, shallow, and ineffectual ditch that leads out of the northwest margin.

This area contains a small heron rookery, the exact size and composition of which have not been determined. Wood ducks also nest in the area.

Site Significance:

This is the only undisturbed Carolina bay in Colleton County. Carolina bays are unique biogeomorphic features scattered on the coastal plain from

Virginia to Florida. Although they are very abundant in some coastal counties, they are very rare in Colleton County. Even where they are abundant, few examples are as undisturbed as this one.

This site has one of the few heron rookeries in the northern half of Colleton County.

The S.C. Heritage Trust Program considers this site a natural area of local significance.

Actual or Potential Threats:

The only real threat to this area is from ditching and draining. The area is so small and wet that efforts to ditch and drain probably will not be attempted.

The area might be used as a source of water for spray irrigation of adjacent agricultural lands.

There are no known energy-related threats to this site.

Management Recommendations:

If the shallow ditch leading from the northwest margin does allow drainage of excess water during periods of high water levels, then the ditch needs to be blocked off. No additional management is needed.

## Pond Cypress Natural Area

Site Description:

This site consists of a pond cypress savanna-marsh occupying a small, wet depression that has developed in a valley between gently sloping sandhills. The site is surrounded by longleaf pine flatwoods which merge into longleaf pine - turkey oak on the hillsides. The soils in this site have not been mapped separately from the surrounding lands, all of which have been mapped as

loamy sands or fine sands. Soils at the site are loamy and probably consist of either Paxville fine sandy loam, or Rains sandy loam; these soils are found in similar wet depressions in the vicinity.

The sparse canopy is dominated by mature, flat-topped pond cypress. Although the largest pond cypress are only about 14 inches in diameter and 70 feet tall, these trees are probably more than 100 years old; pond cypress grow very slowly in environments of wet, highly acidic soils. A few pond pines and swamp tupelo also are present in the canopy.

Two major herbaceous zones are obvious, a central wet marsh and a peripheral savanna. The central marsh is relatively homogeneous and dominated by Carex walteriana, Woodwardia virginica and Sphagnum sp. Diversity here is not high; fewer than 10 herbaceous species occupy this zone.

The peripheral savanna area is, like most savannas, quite diverse; at least 35 species are found here. This peripheral zone also is not homogeneous. Some areas are dominated by Aristida affinis, others by Andropogon virginicus or Rhynchospora spp. Some of the more interesting species found here include Sarracenia minor, S. flava, Tofieldia racemosa, Oxypolis filiformis and Lobelia boykinii. The Lobelia and several other species actually are most abundant in the indistinct ecotone between the central wet marsh and the drier, peripheral savanna.

The central wet marsh may have standing water for six months or more. The driest parts of the adjacent savanna may have saturated soils for several months, but standing water may only be present occasionally and for short periods following heavy rains.

Fire scars are present on trees and stumps within and surrounding this site. Occasional fires are necessary for maintenance of this savanna-marsh community.

Site Significance:

This is an excellent example of a mature, pond cypress savanna-marsh community. This community type is not rare in the coastal plain or in Colleton County. This is the best example of this type known in Colleton County.

This is the only known population of Lobelia boykinii, Boykin's lobelia, in Colleton County. Lobelia boykinii is known in seven states from New Jersey to Alabama. It presently is under federal status review for listing as a potentially endangered or threatened species (USDI, 1983). There are at least 15 populations known from 10 South Carolina counties. Because of its apparent abundance in South Carolina, the S.C. Advisory Committee (1984) recommended that this species not be added to the South Carolina list of rare, threatened or endangered species. Since there are fewer reports of this species from the remainder of its range (six states) than from just South Carolina, protection of the species in South Carolina may be important to range-wide preservation efforts. The S.C. Advisory Committee's recommendation may need to be changed if no additional populations outside South Carolina are found.

The S.C. Heritage Trust Program considers this site of local significance. This is the best pond cypress savanna-marsh in Colleton County and is the only location in the county for Lobelia boykinii. If Lobelia boykinii at some future date is added to the South Carolina list of rare, threatened or endangered plants, this site would become one of statewide significance.

Actual and Potential Threats:

There are no real threats to this site from energy-related activities. Anything which alters the hydrology of the area would constitute a serious threat. The area could be ditched to provide drainage necessary for increased forest productivity. The area is probably too small to warrant efforts to ditch and drain.

Management Recommendations:

This community is dependent on periodic fire for maintenance. In the absence of fire the area will be invaded by trees and shrubs and will soon lose many of its distinctive herbaceous associates. The area should be prescribe-burned every 3-5 years. Presently the surrounding woodlands are burned at least that frequently.

## Thalia dealbata

Site Description:

This site consists of a roadside ditch and a channelized stream just northwest of Secondary Road 66. Several robust colonies of Thalia dealbata, powdery thalia, are scattered for about 135 yards along the ditch paralleling the road along the channelized stream that flows under S-66. The channelized stream forms the western boundary of the population. The Thalia is most abundant and vigorous in the channelized stream just northwest of S-66; much of the drainage ditch is overgrown with weedy species, such as Rumex and Rubus.

Site Significance:

Thalia dealbata is considered a species "of concern status unresolved" by the S.C. Advisory Committee (1984). In South Carolina it is known from populations in five additional coastal counties. This obviously is a highly disturbed site.

The presence here of a plant species that is considered significantly rare in South Carolina automatically makes the site of some significance. The highly disturbed nature of the site, however, lowers its significance. This site is considered of local significance by the S.C. Heritage Trust Program.

Actual and Potential Threats:

The main threat to the site is from maintenance operations in the roadside ditch and on Secondary Road 66 itself. The Highway Department should be told about this population and requested to restrict maintenance activities in the area.

Management Recommendations:

No active management is needed in this highly disturbed site.

## Energy-related Threats to Significant Natural Areas

The most direct threat from energy-related development is from peat mining for fuel. Cohen et al. (1982) indicate that the Snuggedy Swamp contains fuel-quality peat in quantities that could make mining for fuel economically feasible. About one-fourth of Snuggedy Swamp (Site 88) is recommended here for listing as a significant natural area. Peat mining for fuel, or for horticultural purposes as is already being done nearby, would destroy this natural area.

According to Mr. Chris Brooks, the Water Resources Commission has recently approved permits for some exploratory drilling for oil in Colleton County. An oil drilling facility on any of the proposed natural areas could have serious negative impacts. With advance planning, however, it is possible that negative impacts could be avoided or at least minimized.

Oil spills from offshore oil drilling would have negative impacts on parts of Otter Islands (Site 101). It is not known when or if this could become a serious threat.

A coal-burning or nuclear power plant on any of the proposed natural areas could have serious negative impacts. Since these facilities require large amounts of water, part of the Edisto Sink Holes (Site 5) probably is the only area that would be directly or indirectly impacted by such facilites.

Construction of hydroelectric facilities on the Edisto River could adversely impact part of the Edisto Sink Holes (Site 5). None of the other recommended areas would be potentially impacted by hydroelectric development.

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Appendix I

Colleton County: Sites Surveyed as Potential Natural Areas

□ Significant Natural Areas

5 - Edisto Sink Holes
34 - Koger Intermittent Pond
59 - Pond Cypress Natural Area
60 - Sandy Run Carolina Bay
67 - Big Survey Natural Area
88 - Snuggedy Swamp
101 - Otter Islands
105 - Colleton County Cowbane Preserve
106 - Pond Spice Natural Area
113 - Ashepoo Natural Area
114 - *Thalia dealbata*
116 - Edisto Beach Natural Area

○ Non-significant Areas

1&2 - Wet Depressions in Pelham Loamy Sand
3 - Wet Flatwoods on U.S. 21
4 - Natural Wet Depression near Mt. Olive Church
7 - Pond near Williams
8 - Wet Depression North of Ruffin
9 - Hardwood Bluffs along the Edisto River
11 - Lynn Haven Soil Site
12 - Natural Pond near Maple Cane Church
13 - Mature Uplands on Alpin Fine Sand
16 - Wet Depression in Albany Loamy Sand
17 - Cypress-Pine Wet Depression
19 - Swamp Tupelo Wet Depression
24 - Pond Pine Pocosin near Sidney
25 - Loblolly Pine Wetland
27 - Wet Depression near Cross Swamp
28 - Mature Bottomland along Cross Swamp
29 - Beech Hummock in Moselle Swamp

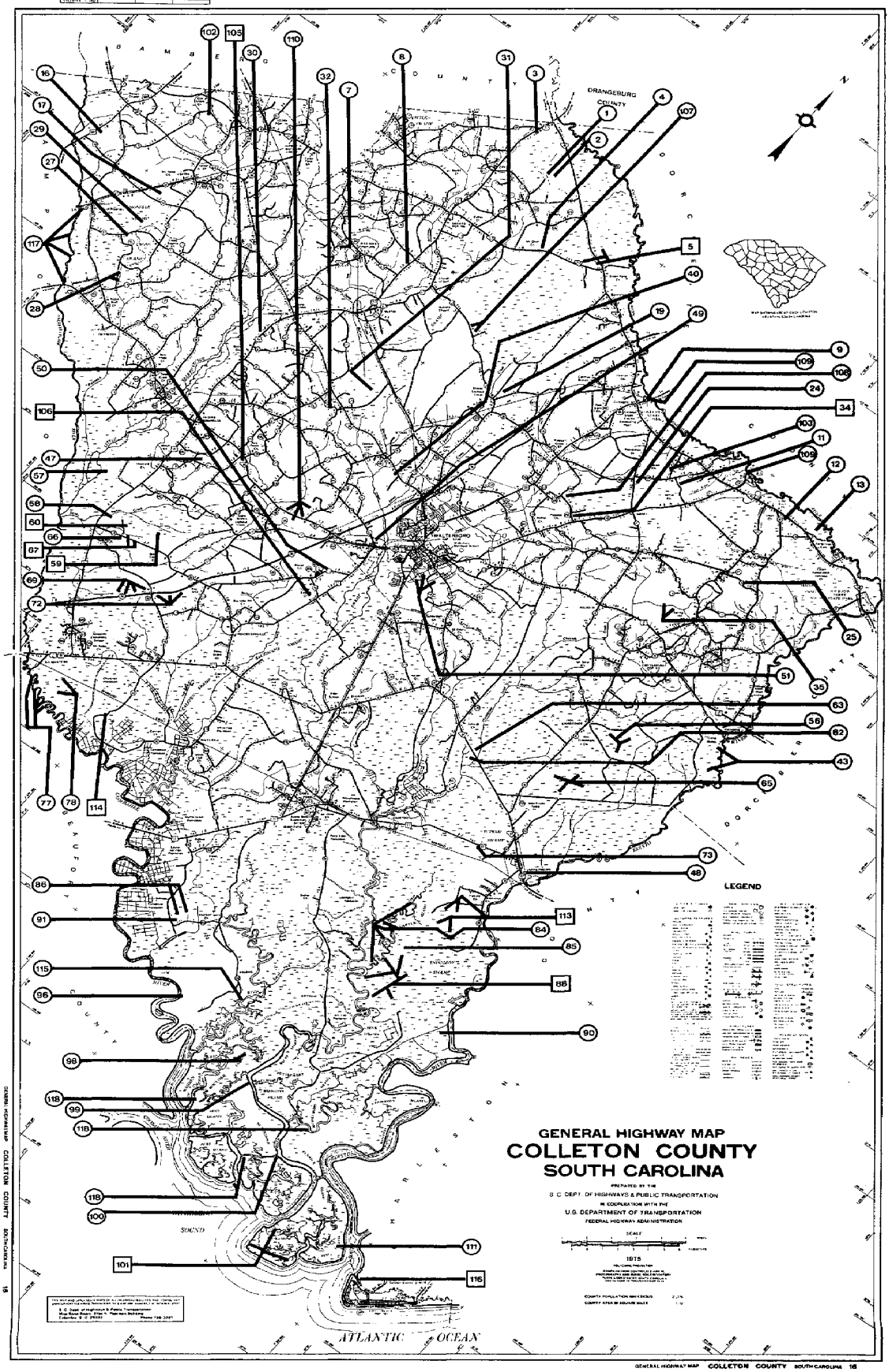
31 - Ridge and Swale Series
32 - Wet Depression on Paxville Soil
35 - Natural Ponds?
40 - Natural Pond near Jones Swamp
43 - Leon Soil Site
47 - Wet Depression near Snider's Crossroads
48 - Edisto Nature Trail
49 - North Bluffs along Doctor's Creek
50 - Flatwoods on Seagate Fine Sand
51 - Grass-sedge Wet Depression in Walterboro
57 - Mesic Hardwood Bluffs
58 - Pine Pocosin along Sandy Run Creek
62 - Swamp Tupelo Pond SE of Neyles Crossroads
63 - Wet Depression in Santee Loam
65 - Burden Swamp
66 - Dry Pine Flatwoods along S-28
69 - Gordonia Swamp along I-95
72 - Pine Flatwoods along I-95
73 - Beech Hummock off U.S. 17
77 - Sand Bars along the Combahee River
78 - Marsh in Hardwood Swamp
84 - Deer Creek
85 - Red Maple - Red Bay Fern Marsh
86 - Wet Depressions near Trinity Church
90 - Pocosin East of Bear Island
91 - Flatwoods and Wet Depressions along S-162
96 - Mature Pine Forest on Lakeland Soil
98 - Small Marshes on Boulder Island
99 - Small Marshes among Scattered Pine
100 - Mature Live Oak - Pine
102 - Carolina Bay?
103 - Carolina Bay?
107 - Ctenium Savanna along S-24
108 - Pine Flatwoods and Pocosin along S-456
109 - Ilex amelanchier search
110 - Large Bay and Adjacent Flatwoods along S.C. 63

111 - Pine Island

115 - Bluff along Old Chehaw River

117 - Big Salkahatchie Swamp

118 - *Sageretia minutiflora* search


GENERAL HIGHWAY MAP
COLLETON COUNTY
SOUTH CAROLINA
PREPARED BY THE
S C DEPT OF HIGHWAYS & PUBLIC TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1975
LEGEND
ORANGEBURG COUNTY
BAMBERG COUNTY
BARNWELL COUNTY
HAMPTON COUNTY
BERKELEY COUNTY
DORCHESTER COUNTY
CHARLESTON COUNTY
BEAUFORT COUNTY
WALTERBORO
EDISTO BEACH
ST HELENA SOUND
ATLANTIC OCEAN

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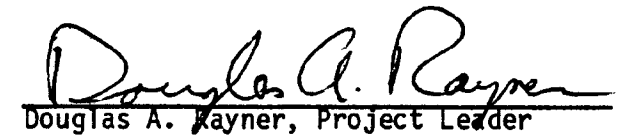

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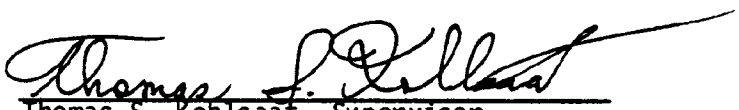
Reviewed by:



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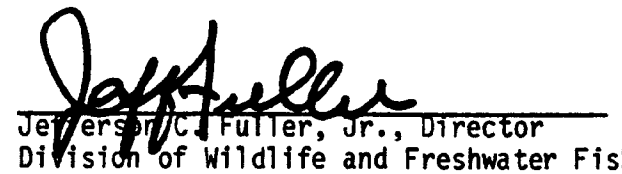
South Carolina Wildlife and Marine Resources Department



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