

INVENTORY OF THE NATURAL AREAS  
AND RARE SPECIES

OF

COLUMBUS COUNTY, NORTH CAROLINA

by

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## **SUMMARY**

This inventory of the natural areas and rare species of Columbus County was funded by a grant from the North Carolina Natural Heritage Trust Fund. The purpose of the inventory was to identify the most significant natural areas, describe their features, and document the rare species associated with them. Habitat conditions, natural processes, and threats were also documented. This inventory is intended to provide guidance for land use decisions by the county government, conservation and land management organizations, and interested citizens. Field work was supervised by the North Carolina Natural Heritage Program, and carried out between September 1993 and November 1994. The inventory identifies 32 sites significant at the national, state, or regional level, as determined by criteria established by the Natural Heritage Program.



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## INTRODUCTION

### Objectives

The primary objective of the Columbus County natural areas inventory is to identify areas of outstanding natural significance. These areas contain the best examples of natural habitats and/or locations of rare plants and animals. Natural areas are resources that make North Carolina and its counties attractive to live in and to visit.

These areas are critical for their recreational, ecological, educational, scientific, cultural, aesthetic, and environmental health values. Natural areas are reservoirs of biological diversity, sanctuaries for native plants and animals whose survival may be in jeopardy, and key resources for recreational activities. With ongoing population growth and land development in all parts of North Carolina, it is urgent that areas of outstanding natural significance be identified, and that efforts are made to protect these sites through the willing cooperation of land owners.

### Methods and Procedures

The methods employed in this inventory follow guidelines established by the North Carolina Natural Heritage Program (NHP), an agency in the Division of Parks and Recreation within the Department of Environment, Health, and Natural Resources. NHP maintains the state's primary database for rare plants and animals, high quality natural communities (ecosystem components), and outstanding natural areas.

The focus of the inventory was the identification and description of outstanding natural areas and high quality natural communities. Survey work in 1993 and 1994 also included the identification of rare plant species by the principal investigator, botanist Richard LeBlond. The scope of this inventory did not permit a systematic survey of the animals of Columbus County during 1993 and 1994, and previous research was consulted for this information. It is anticipated that a systematic survey of animals will be conducted in Columbus County in the near future.

The natural area inventory was designed to identify the highest quality natural areas and natural communities in Columbus County. A **natural area**, while not necessarily undisturbed, substantially retains the natural character it would have without human influence. It is also an area of biological interest, usually because of a clustering of rare species or of exemplary natural communities, or both. Natural area boundaries are placed to encompass the ecological features of primary interest, and the areas that influence them the most. In some cases there are natural boundaries; in others, an artificial buffer is used. A **natural community** is defined as a distinct and reoccurring assemblage of plants, animals, bacteria, and fungi naturally associated with each other and their physical environment. A natural area can contain

one to several natural community types and sites. Although natural areas and natural communities do not need to contain rare species to be judged of high quality, they usually do. The natural area and natural community inventory also was designed to map locations, assess integrity, and make management recommendations for protection.

According to their size, natural areas are referred to in this report as "megasites," "macrosites," or "standard sites." **Megasites** are large, cohesive areas generally of a size greater than 100 square miles (64,000 acres). **Macrosites** are smaller areas, generally of 5 to 100 square miles (3,200 to 64,000 acres). **Standard sites** typically are smaller than 3,200 acres. Standard sites are usually referred to as "sites" unless greater clarification is needed. Frequently, sites occur in clusters. The occurrence of a site in association with other sites increases its potential long term viability and ecological significance. Such clusters are designated as macrosites or megasites, with the standard sites nested within them. These macrosites and megasites may contain lower quality lands that are not included in a standard site, but which provide ecologically important buffers and corridors.

Criteria used to determine significant sites were (1) the quality and significance of the natural features within an area, and (2) the overall integrity of the area. All natural communities and rare species known to occur within a site were documented, with detailed descriptions made of each exemplary natural community type. All identified sites were then ranked according to biological importance, using criteria developed by the NHP and The Nature Conservancy. Depending upon the global or statewide rarity of the most critical species and natural features at a site, it was ranked as having national, statewide, regional, or countywide significance. This report describes in detail those sites having national, statewide, or regional significance.

In addition to field surveys of known and potential sites, the inventory utilized existing rare species and natural area data maintained by the NHP, topographic quad maps prepared by the U.S. Geological Survey, soil maps prepared by the U.S. Natural Resources Conservation Service (formerly U.S. Soil Conservation Service), and aerial photographs made available by the U.S. Agricultural Stabilization and Conservation Service and N.C. Cooperative Extension Service. Knowledgeable individuals and organizations were also consulted. Report formats developed by the NHP were utilized for documenting rare species and significant natural areas.

## GENERAL FEATURES OF COLUMBUS COUNTY

### Inventory Area

The natural areas inventory covered by this report is confined to Columbus County, North Carolina (Fig. 1). Columbus County is located near the southeastern corner of the state along the state line with South Carolina. It is bordered by Brunswick County on the southeast, by Pender County on the northeast, by Bladen County on the north, by Robeson County on the northwest, and by Horry County in South Carolina on the southwest. At 937 square land miles, Columbus County is the third largest county in North Carolina after Robeson and Sampson counties. As of 1990, the population was 49,587, or 53 persons per square mile (SDC 1991). Approximately 70% of the land surface is forested, and the remainder is primarily in agricultural use.

### Topography and Physiography

Columbus County is situated on the Coastal Plain Physiographic Province, in the Inner Coastal Plain Region of the Cape Fear Section. The Coastal Plain Province includes all of North Carolina east and southeast of the fall line, which lies northeastward from Richmond County at the South Carolina border to Northampton County at the Virginia border. The fall line marks the boundary between the Coastal Plain and Piedmont provinces. The Cape Fear Section is that area lying southwest of the Cape Fear River and southeast of the fall line. The Inner Coastal Plain Region includes all of Columbus and Robeson counties, the mainland area of Brunswick County, and portions of Bladen, Cumberland, Harnett, Hoke, and Scotland counties.

The elevation gradient in Columbus County is 0 to 131 feet. The Cape Fear River, at the northeast corner of the county, is tidal in this area, and therefore at sea level. The highest areas of the county occur on the Surry Scarp, an ancient shoreline formed by the Atlantic Ocean when sea level was higher and extended much farther inland. The scarp extends south-centrally through Columbus County from Bladen County near Slap Swamp to South Carolina near Tabor City. The land surface east of the scarp gradually descends from 95 feet at the edge of the scarp to near 20 feet at Waccamaw River and sea level at Cape Fear River. West from the scarp, the surface gradually descends to near 60 feet at Lumber River.

The land surface of Columbus County is characterized by broad, flat terraces of unconsolidated sand, silt, clay, and peat in varying combinations. These terraces are intersected and drained by four rivers and/or their tributaries: Waccamaw River, Lumber River, Cape Fear River, and Little Pee Dee River (Fig. 2). The Waccamaw



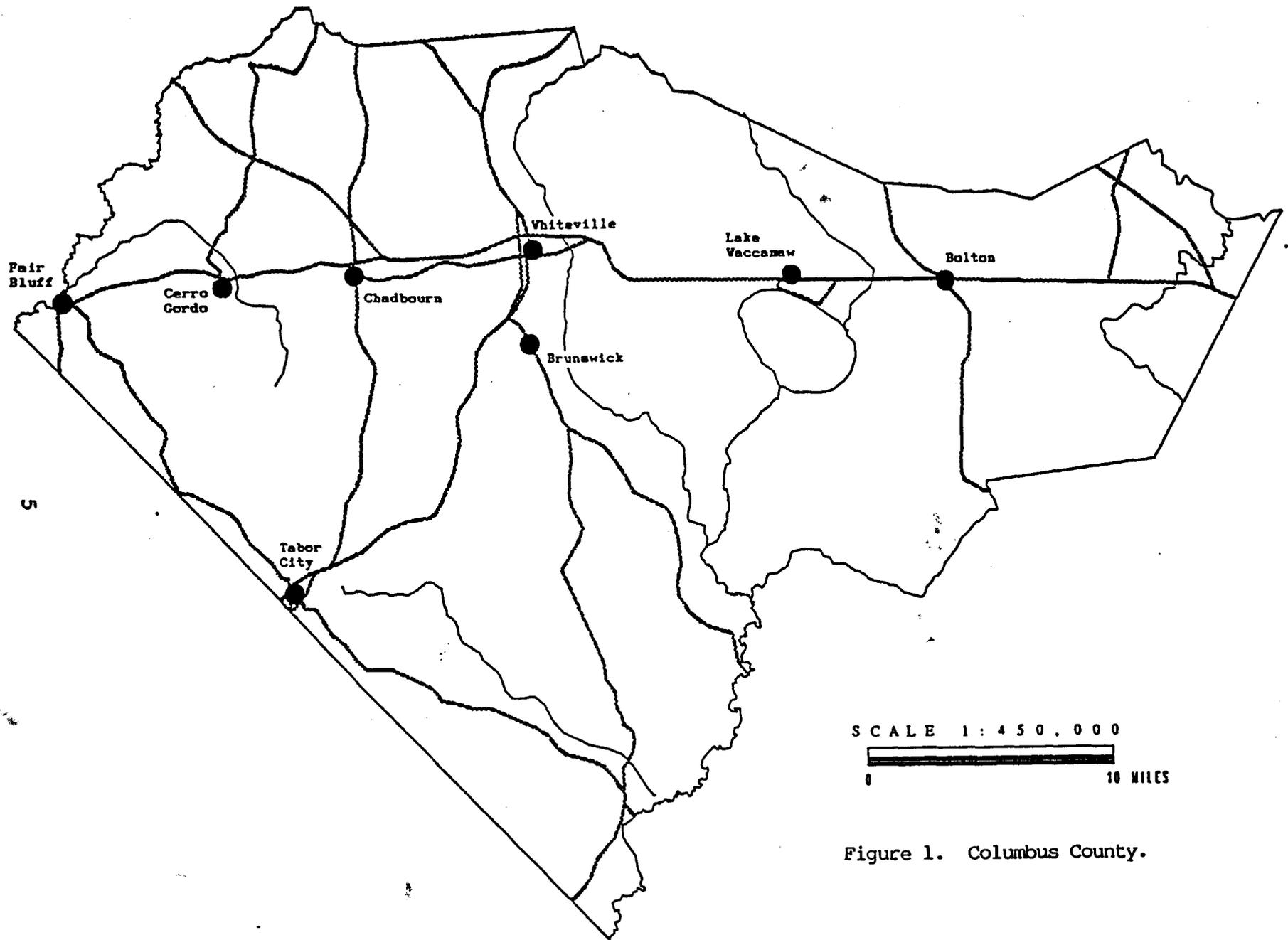
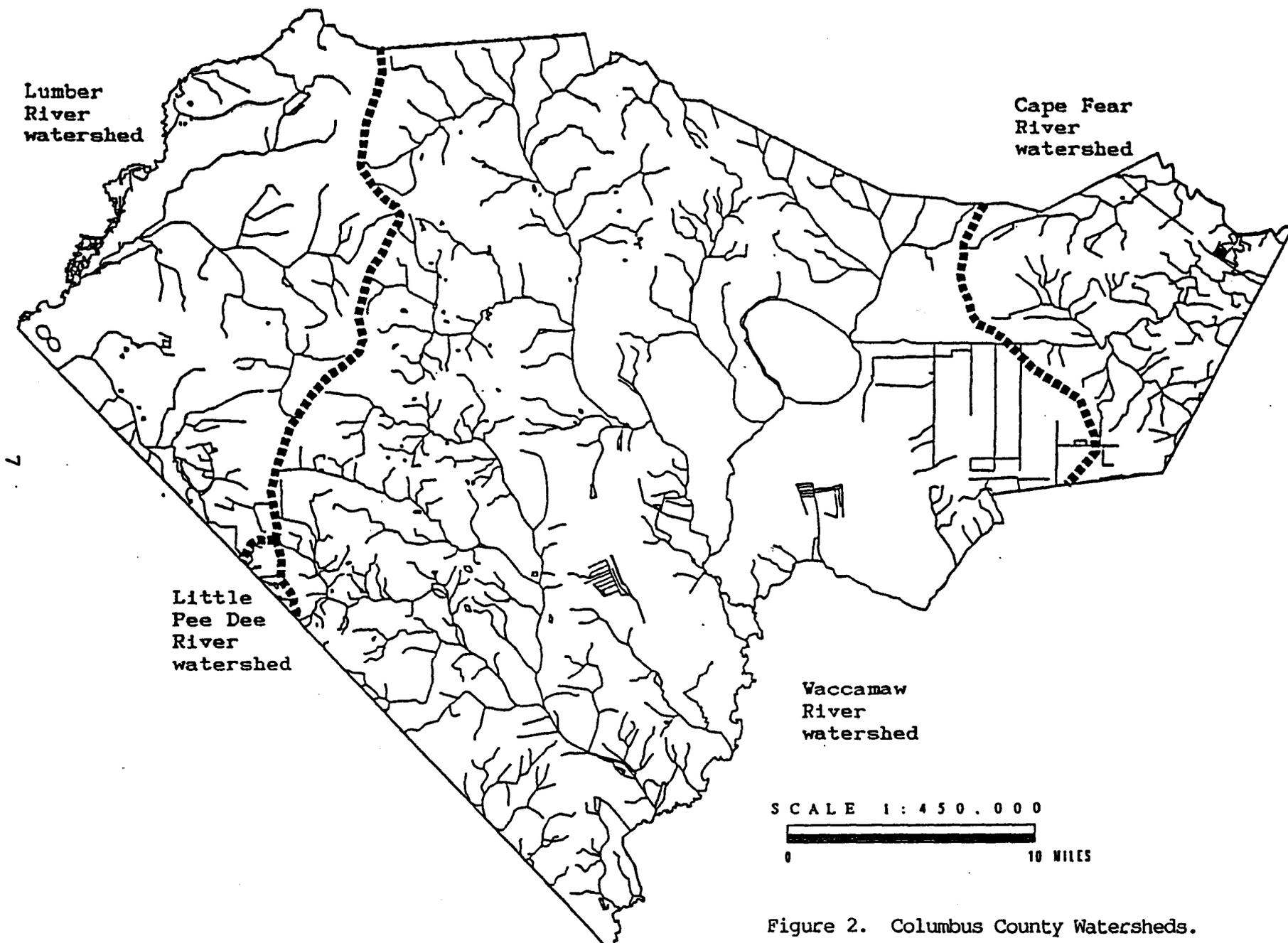


Figure 1. Columbus County.





Lumber  
River  
watershed

Cape Fear  
River  
watershed

Little  
Pee Dee  
River  
watershed

Waccamaw  
River  
watershed

SCALE 1 : 4 5 0 . 0 0 0  
0 10 MILES

Figure 2. Columbus County Watersheds.

River system is the largest watershed in Columbus County, the river and its tributaries collecting ground and surface water from more than two-thirds (676 square miles) of the county land and water surface. The drainage area is approximately bounded by Bolton on the east, and by Chadbourn and Tabor City on the west. Most of the area east of Bolton is in the Cape Fear River drainage (101 square miles), and most of the area west of Chadbourn and Tabor City is in the Lumber River drainage (167 square miles) and Pee Dee River drainage (8 square miles).

The Waccamaw River has its source in Lake Waccamaw, from where it flows southward into South Carolina. The watershed extends well beyond the river floodplain. The largest drainage tributary in the Waccamaw River system is White Marsh, which is fed by Brown Marsh Swamp from north of Clarkton in Bladen County. Another major tributary is Juniper Creek, which is fed by Green Swamp in Columbus and Brunswick counties. South from Juniper Creek, the Waccamaw River forms the boundary between Columbus and Brunswick counties. A third major tributary is Seven Creeks/Grissett Swamp, which drains swamp eastward from near Tabor City. Included in the watershed are swamps feeding into Lake Waccamaw, the largest of which is Friar Swamp off the northeast shore. The headwaters of Friar Swamp are in Bladen County north of Council. A small area near the southern corner of the county (southwest of Dulah) is drained by tributaries that enter the Waccamaw River in South Carolina.

The Lumber River is formed by the confluence of Buffalo and Drowning creeks along the Scotland and Hoke county line. The river forms the boundary between Columbus and Robeson counties south (downstream) from the confluence with Big Swamp. The largest Lumber River tributary in Columbus County is Porter Swamp, which drains the majority of the area west of Chadbourn. An area southeast of Fair Bluff is drained by Gapway Swamp, which enters the Lumber River in South Carolina.

A small area northwest of Tabor City is drained by Huggins Creek, which flows south into Mitchell Swamp in South Carolina. Mitchell Swamp flows into Lake Swamp, and Lake Swamp flows into the Little Pee Dee River downstream of its confluence with the Lumber River. The Huggins Creek drainage is therefore part of the Little Pee Dee River watershed.

The Cape Fear River is formed by the confluence of the Deep and Haw rivers along the Chatham and Lee county boundary in the Piedmont Province. In Columbus County, the Cape Fear River forms the northeast boundary with Pender County. Livingston Creek is the largest tributary of the river in Columbus County. Its headwaters are in Green Swamp, and it drains most of the land east of Bolton and south of highway US 74-76. Another tributary, Weyman Creek, drains swamps north of highway US 74-76 near the Bladen County line.

Like the upland terraces between them, the basins of the river floodplains and tributary swamps and streams tend to be broad and flat, and water flow typically is slow, even in the rivers. With the exception of the Cape Fear River itself, which is a brownwater river, all of the flowing waters in Columbus County are blackwater rivers or streams, including the tributaries of the Cape Fear River. The characteristics of blackwater and brownwater rivers and streams are discussed in the "Natural Communities" section.

Another major feature of the Columbus County landscape is the large pocosin known as Green Swamp, located southeast of Lake Waccamaw and continuing into Brunswick County. Large areas of Green Swamp have been ditched and drained, and converted to pine plantations. Green Swamp is a raised, or "domed," peatland, and serves as headwaters for Juniper Creek flowing into the Waccamaw River, and Livingston Creek flowing into the Cape Fear River.

Smaller topographic features occur within the upland terraces and watershed floodplains. Several of these features are unusual or uncommon landforms, and can support significant natural communities. Prominent among these are Carolina bays, elliptical depressions primarily found on the upland terraces. Carolina bays are usually oriented along a northwest/southeast axis and surrounded by a low sand ridge called a bay rim. The cause of their formation is still debated, but most appear to be over 100,000 years old. Most bay rims have been altered for agriculture or silviculture, and many bay basins have been ditched and drained for crop production. Bays that have not been drained usually support swamp or pocosin vegetation. A major exception is Lake Waccamaw, the largest of all water-filled Carolina bays, and the third largest natural lake in North Carolina. The Lake Waccamaw Carolina bay is also unusual in having limestone outcrops on its shoreline. A remnant of what appears to be the original rim of the bay persists as two sand ridges off the southeast shore of the lake in Lake Waccamaw State Park: Council Ridge and Tar Barrel.

Other isolated water bodies in Columbus County are much smaller than Lake Waccamaw, and the largest are of artificial origin. Among these are Meares Millpond along the Bladen County line, Richardson and Buffkin ponds northwest of Tabor City, and Lays Lake adjacent to Waccamaw River near the South Carolina border.

The Waccamaw and Lumber river floodplains contain several landform features not found elsewhere in the county, and which are unusual for blackwater rivers. Their floodplains are unusually large for blackwater rivers, possessing features typically associated with a well-developed brownwater river floodplain (Schafale, et al. 1986). These features include channel bars, point bars and ridges, levees, oxbows, active and relict sloughs, and active and relict ridges and swales. It is believed that the Waccamaw and Lumber rivers originated as brownwater rivers flowing out of the Piedmont. About 75,000 years ago, an uplift along the Cape Fear Fault resulted in

the beheading of the rivers, and the diversion of Piedmont waters into the Cape Fear River (Zullo and Harris 1979). This theory conforms with the present-day smallness of the Waccamaw and Lumber rivers and their extensive floodplains, which along the Waccamaw River is as much as two or more miles wide in areas with features more typical of brownwater rivers.

The physiography of the Waccamaw River and its floodplain varies considerably as it courses downstream from Lake Waccamaw. From the headwaters dam at Lake Waccamaw to near the confluence with White Marsh creek (a distance of about 10 river miles), the river courses through a large swamp complex with little topographic relief. The river bank is low along this stretch, and floodwaters quickly overflow and spread out in the floodplain swamp. The floodplain in this area does not exhibit the ridge and swale pattern that is characteristic farther downstream. It is possible that these ancient fluvial patterns are buried beneath the gradual buildup of peat deposits in the swamp, which may be influenced by input from Green Swamp to the east.

Downstream from the confluence with White Marsh creek, the bank of the Waccamaw River becomes more prominent and the river begins a complex series of meanders that continues into South Carolina. River width, depth, and flow rate become more variable, and flooding of adjacent habitat requires higher flood levels than in the swampy area upstream of White Marsh creek. The floodplain is characterized by terraces formed of ridge-and-swale systems associated with large meanders apparently made by a larger Waccamaw River during its life as a brownwater river. These older ridge-and-swale systems extend as much as a mile or more away from the river on either side. The present, smaller river continues to create new meanders and smaller ridge-and-swale systems, with these superimposed on the older system. The result is a complex mix of new and old landforms.

The Lumber River shares some of the features of the Waccamaw River, and in addition contains a significant feature known as the aeolian sand ridge. South (downstream) of the confluence with Big Swamp near Boardman in Columbus County, the character of the Lumber River itself changes dramatically. Upstream of the confluence, the river is narrow and frequently overhung by trees, and shoreline sandbars are uncommon. Big Swamp nearly doubles the volume of flow in the Lumber River, and the downstream river and floodplain are much broader. The river channel is more exposed, and characterized by landforms associated with meanders: point bars, levees, sloughs, and oxbows. The large ridge-and-swale systems associated with the Waccamaw River, however, are not evident. The meander section of the river downstream from Big Swamp occurs entirely within Columbus and Robeson counties, with the river forming the county line.

Adjacent to or included within the Lumber River floodplain are sand ridges believed to be of aeolian origin. These ridges are uncommon landforms in North Carolina, and support inland occurrences of

natural communities more typical of coastal areas. Two significant sand ridges--Big Sandy Ridge and Parkers Landing Sand Ridge--occur entirely within Columbus County.

These unusual landforms--Carolina bays and rims, river floodplain features, and aeolian sand ridges--often support significant natural communities and rare species. They are further described in the section on "Natural Communities."

## **Geology and Soils**

The geology of Columbus County is characterized by unconsolidated sand overlying layers of clayey sand and weakly consolidated marine shell deposits (coquina limestone known locally as "marl"). These sediments were deposited and reshaped during several cycles of coastal emergence and submergence from the Cretaceous period to the present. The most prominent geological feature is the Surry Scarp, an ancient shoreline formed by the Atlantic Ocean when sea level was higher and extended much farther inland. The scarp extends south-centrally through Columbus County from Bladen County near Slap Swamp to South Carolina near Tabor City. Other prominent geological features include numerous Carolina bays, aeolian sand ridges, and landforms associated with river floodplains.

Soil characteristics are among the most critical factors in determining natural community distribution and composition. Natural communities are directly influenced by soil chemistry, moisture, and texture. Many of the county's rarer natural community types are restricted primarily because of their association with uncommon soil types. Soils in Columbus County range from nearly pure sand on dry ridges and lake and river shorelines, to organic mucks in pocosin and floodplain swamps. Soils on upland terraces typically are a mixture of sand and peat, and range from sandy to loamy textures. The only exposed rock in the county is coquina limestone ("marl"), which occurs along the shores of the Waccamaw River, Lake Waccamaw, and the Cape Fear River. However, limestone is near the surface in some areas, where it influences biotic communities by reducing the acidity typical of most Columbus County soils. Limestone-influenced acidic soils are very rare, and support one of the rarest and most significant natural communities in North Carolina, the Pine Savanna Very Wet Clay Variant.

The moisture content of soil is particularly critical in determining the distribution of natural communities. Soil moisture is influenced by topography, substrate composition, and elevation above groundwater. In concert with other factors such as fire, soil moisture influences natural community structure and composition. The majority of remaining natural community sites in Columbus County occur on wet soils. This is primarily due to the conversion of drier sites to pine plantations and cropland.

## **Climate**

Columbus County experiences hot and humid subtropical summers and cool, temperate winters with subfreezing periods. Persistent snow accumulation is rare, averaging 3 inches per year. According to data recorded from 1951 to 1981 at Whiteville, the annual average temperature is 61.8°. Average temperature is highest in July (78.7°), and lowest in January (43.5°). The average daily maximum temperature in summer is 88°. The annual average precipitation in Whiteville is 49.8 inches, with 51% (25.7 inches) falling from May to September (Spruill 1990).

The mild winters in particular are responsible for the affinity of the plants and animals of Columbus County with the southern Atlantic and Gulf Coast coastal plains. Many species are at their northern limit in southeastern North Carolina.

## **Land Use**

Approximately 70% of the land surface in Columbus County is forested. The great majority of the remainder is cultivated cropland. Of the forested land, about 45% is dominated by pine (Pinus spp.), mostly on upland terraces. Swamps contain about 35% of the forested land, with oaks (Quercus spp.), gums (Nyssa spp.), and cypresses (Taxodium spp.) dominating. The remaining forested land is mostly dominated by oak and pine or oak and hickory (Carya spp.) (SDC 1991; Johnson 1990). More than 99% of the forested land is privately owned. Although figures are not available, much of the forested land is managed for timber production, and wood products are an important part of the local economy, including lumber, plywood, paper pulp, and cabinets.

Tobacco is the primary income crop in the county. Other important crops are soybeans, corn, sweet potatoes, small grains, peanuts, strawberries, and cabbage. Forestry products rank behind tobacco (Spruill 1990).

## **Natural Communities**

A natural community is defined as a distinct and reoccurring assemblage of populations of plants, animals, bacteria, and fungi naturally associated with each other and their physical environment.

A natural community thus combines biological and habitat elements. Only land in an approximately natural state is classified as a natural community. For example, the many loblolly pine plantations in Columbus County are not regarded as natural communities, as they are quite different from the communities that would have occurred under natural conditions. Natural community names and

classification as used here are from Schafale (1994) and Schafale and Weakley (1990).

Natural communities are closely associated with specific soil types, which in turn are associated with topography. For descriptive purposes, the natural communities are here grouped by the prominent topographic features with which they most frequently occur in Columbus County. These topographic features and their associated natural communities are, in order of discussion:

#### Blackwater River Floodplains and Terraces

- Aquatic Community
- Oxbow Lake
- Sand and Mud Bar
- Coastal Plain Levee Forest (Blackwater Subtype)
- Cypress--Gum Swamp (Blackwater Subtype)
- Nonriverine Swamp Forest
- Coastal Plain Small Stream Swamp (Blackwater Subtype)
- Coastal Plain Bottomland Hardwoods (Blackwater Subtype)
- Nonriverine Wet Hardwood Forest
- Mesic Mixed Hardwood Forest
- Coastal Fringe Evergreen Forest

#### Lakes and Millponds

- Natural Lake Shoreline
- Coastal Plain Marl Outcrop
- Coastal Plain Semipermanent Impoundment

#### River Bluff

- Piedmont/Coastal Plain Acidic Cliff

#### Pocosin Communities

- Small Depression Pocosin
- Pond Pine Woodland
- Bay Forest

#### Upland Terrace Pinelands

- Pine Savanna
- Wet Pine Flatwoods
- Mesic Pine Flatwoods
- Pine/Scrub Oak Sandhill

#### Sand Ridges

- Coastal Fringe Sandhill
- Xeric Sandhill Scrub

#### Disturbed habitats

- roadside and powerline savannas

## Blackwater River Floodplains and Terraces

The Waccamaw and Lumber rivers are blackwater rivers, so called because of the blackish appearance of the water, and contrasted with brownwater rivers that flow out of the Piedmont, such as the Cape Fear River. Blackwater rivers have headwaters in the Coastal Plain. Because of the low relief, they are slow-moving rivers with a very low sediment load, and thus the water is essentially clear. The darkness comes from tannic acid, a byproduct of organic decomposition in the swamps that feed the rivers. (In small concentrations, the river water is tea-colored, not black.) Over time, the rivers and their floodwaters have worked and reworked the sediments of the channel and floodplain into a variety of landforms supporting distinctive natural community types.

### Aquatic Community

The Aquatic Community occurs in permanently flooded areas: the river channel itself, and features associated with the channel called fishponds. In most places, the river channel is characterized by flowing water and a sandy or silty bottom. Fishponds are wide, deep, slow-flowing sections of river often a half-mile or more long. They are located along relatively straight stretches, primarily where the river flows through broad swamps. The permanently flooded portion of the river channel is essentially devoid of vegetation, though beds of rooted or floating aquatic plants sometime occur along quiet edges and in fishponds. In the Waccamaw River and Lake Waccamaw, the Aquatic Community is the habitat for all of the rare fish and most of the rare mussels and snails globally restricted to the Waccamaw River system.

### Oxbow Lake

Oxbow lakes occur in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped water body. Although oxbow lake waters are still, they are periodically flushed by floodwaters. Oxbow lakes are uncommon and restricted to the meander sections of the Waccamaw and Lumber rivers. Still waters of oxbow lakes may support rooted and floating aquatic plants, and emergent cypress and gum trees. Over time, the oxbow lake will fill in and succeed to Cypress--Gum Swamp, but this process is slow because of the low sediment load of blackwater rivers.

### Sand and Mud Bar

Sediments deposited by the Waccamaw and Lumber rivers along the sides of the channel form the Sand and Mud Bar natural community. These deposits occur within the normal river channel, and are

exposed only during periods of below-average water levels. The bars typically are small, low, and flat. During periods of low water levels (drawdowns) in the river, the exposed bars are quickly vegetated by fast-growing and often very small flowering plants (quickness and smallness are adaptations to the brief periods of exposure). Because of the long periods of inundation, woody plants are unable to persist at these sites. A few large perennial herbaceous plants have been able to adapt to the bars because of well-developed underground storage systems. Red top panic grass (Panicum rigidulum var. rigidulum) is frequently the dominant large herb on bars. Water smartweed (Polygonum punctatum), another large herb, can also form large patches.

#### Natural Levee Forest (Blackwater Subtype)

The natural levee community develops on two landform types: on levees formed where the river flows through broad, low swamps; and on the highest, landward portions of point bars, known as point bar ridges, in the meander sections. The levees typically are only one or two feet higher than the river at mean water level, and they flood more shallowly and for a shorter duration because of the rapid dispersal of floodwaters into the broad, low swamps behind them. Point bar ridges occur on the inside of meanders (convex shore of the river), landward of the developing point bar. Because they are less frequently flooded, they are able to support forest vegetation. Over time, point bar ridges become less directly influenced by the river, and gradually succeed geomorphically and vegetationally to floodplain ridge community types.

The Cypress--Gum Swamp canopy is dominated by various mixtures of cypress (Taxodium spp.) and tupelo (Nyssa spp.), with scattered red maple (Acer rubrum). Carolina ash (Fraxinus caroliniana) and water-elm (Planera aquatica) frequently are prominent in the understory.

#### Coastal Plain Cypress--Gum Swamp (Blackwater Subtype)

The Cypress--Gum Swamp is found in broad swamps known as backswamps, and in active and relict sloughs. Backswamps are frequently flooded broad areas extending away from the river behind the levee. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Sloughs associated with the current river channel are frequently flooded and are known as active sloughs. The downstream end of active sloughs are often permanently flooded by river water, forming lobes in the channel called backwaters. Relict sloughs are older landforms now more isolated from the active channel. These sloughs flood less frequently than active sloughs, but some flood enough to support the cypress--gum swamp community.

The Cypress--Gum Swamp canopy is dominated by various mixtures of cypress (Taxodium spp.) and tupelo (Nyssa spp.). Also scattered in

the canopy are swamp tupelo (N. biflora), and red maple (Acer rubrum). Carolina ash (Fraxinus caroliniana) and water-elm (Planera aquatica) frequently are prominent in the understory.

#### Nonriverine Swamp Forest

A community possibly fitting this type has been found at Friar Swamp northeast of Lake Waccamaw, on wet organic soil that appears to flood infrequently or shallowly. The canopy is dominated by swamp red maple (Acer rubrum var. drummondii), with tuliptree (Liriodendron tulipifera) a codominant in places; swamp tupelo (Nyssa biflora) is prominent. The moderately dense understory is dominated by swamp red bay (Persea palustris). Classification of the community type at this site is uncertain, since red maple dominance is usually a successional stage following disturbance. However, there is no evidence of widespread disturbance at this site, and the red maple canopy appears to be natural.

#### Coastal Plain Small Stream Swamp (Blackwater Subtype)

The Small Stream Swamp community occurs on intermittently flooded alluvial mineral soils of small streams without well-developed alluvial landforms. The community is characterized by a mixed canopy of swamp tupelo (Nyssa biflora), baldcypress (Taxodium distichum), swamp red maple (Acer rubrum var. drummondii), laurel oak (Quercus laurifolia), swamp chestnut oak (Q. michauxii), and loblolly pine (Pinus taeda). Prominent understory species include Carolina ash (Fraxinus caroliniana), ironwood (Carpinus caroliniana), swamp red bay (Persea palustris), and American holly (Ilex opaca).

#### Coastal Plain Bottomland Hardwoods (Blackwater Subtype)

The Bottomland Hardwoods community occurs on higher ground in the floodplain that is flooded for short durations with low flow velocity. Bottomland Hardwoods in Columbus County are characterized by a mix of hardwood and conifer trees. Most prominent are laurel oak (Quercus laurifolia), red maple (Acer rubrum), loblolly pine (Pinus taeda), Atlantic white cedar (Chamaecyparis thyoides), and overcup oak (Q. lyrata). Prominent understory species include American holly (Ilex opaca), swamp red bay (Persea palustris), mayberry (Vaccinium elliotii), and titi (Cyrilla racemiflora). Cane (Arundinaria tecta) sometimes forms dense patches. The Waccamaw River floodplain is the only area in the state where Atlantic white cedar is an important component of Bottomland Hardwoods.

### Nonriverine Wet Hardwood Forest

Low elevation floodplain rises in Friar Swamp northeast of Lake Waccamaw, and in River Swamp in the upper Waccamaw River floodplain, support a community tentatively assigned to the Nonriverine Wet Hardwood Forest. The canopy at these sites is dominated by water oak (Quercus nigra), swamp red maple (Acer rubrum var. drummondii), and loblolly pine (Pinus taeda). Swamp red bay (Persea palustris) and wild olive (Osmanthus americana) form a moderate to dense understory. The shrub layer is dense, with blue huckleberry (Gaylussacia frondosa) prominent. The classification of this community is uncertain, and may represent a new natural community type known only from Upper Waccamaw River Swamp, Friar Swamp, and possibly a few sites on the Lumber River. The presence of wild olive is highly unusual, as it is not known from occurrences of this community type elsewhere.

### Mesic Mixed Hardwood Forest

Intermediate elevation floodplain rises in River Swamp in the upper Waccamaw River floodplain support a community assigned to the Mesic Mixed Hardwood Forest. The canopy is dominated by loblolly pine, beech (Fagus grandifolia), laurel oak (Quercus laurifolia), and sweetgum (Liquidambar styraciflua). Ironwood (Carpinus caroliniana), sassafras (Sassafras albidum), American holly (Ilex opaca), and swamp red bay are prominent in the understory. The classification of this community occurrence is uncertain. It appears to represent the Swamp Island Variant of the Mesic Mixed Hardwood Forest, but it is a highly unusual and perhaps unique assemblage.

### Coastal Fringe Evergreen Forest

Higher elevation floodplain rises in Friar Swamp, and in Bogue Swamp in the upper Waccamaw River floodplain, support a community assigned to the Coastal Fringe Evergreen Forest type. The canopy is dominated by sand laurel oak (Quercus hemisphaerica), with hickory (Carya ovalis?), beech (Fagus grandifolia), loblolly pine, and water oak prominent. Wild olive, American holly, and swamp red bay are prominent in the understory. Muscadine (Vitis rotundifolia) and bracken (Pteridium aquilinum) form large patches in the ground layer. On the narrow, elongate rises in Bogue Swamp, this community is transitional to the Mesic Mixed Hardwood Forest community type.

### Lake and Millpond Communities

In addition to supporting aquatic communities, natural lakes and artificial millponds support other natural community types in shallow waters and along the shoreline. The Natural Lake Shoreline,

Coastal Plain Marl Outcrop, and Coastal Plain Semipermanent Impoundment community types are found in or along lakes and millponds in Columbus County.

### Natural Lake Shoreline

The Natural Lake Shoreline is found in the shallow, near-shore waters of Lake Waccamaw. It is characterized by a broad zone of emergent grasses, sedges, and wildflowers. Although this zone is essentially permanently flooded, lake waters are often very shallow, periodically exposing some offshore sand bars and permitting a greater diversity of plant life. A few larger sand bars are more-or-less permanently exposed--small islands supporting a few trees and shrubs. Prominent tall herbs include maidencane grass (Panicum hemitomon), twig-rush sedge (Cladium mariscoides), white doll's-daisy (Boltonia asteroides), and globe-fruit seedbox (Ludwigia sphaerocarpa). Prominent low herbs include bright-green spikerush (Eleocharis olivacea), one-flower hardscale (Sclerolepis uniflora), and spadeleaf (Centella erecta). The Lake Waccamaw natural lake shoreline community supports 12 plant species recognized as rare in North Carolina, and supports many of the lake's rare animal species during at least a part of their life cycles.

### Coastal Plain Marl Outcrop

The Coastal Plain Marl Outcrop natural community occurs above the shore of Lake Waccamaw. This community is characterized by vertical and overhanging low limestone ("marl") cliffs within the wave spray zone of the lake. The cliffs extend for about 1000 feet along the lake shore, and are notable for supporting the only natural population of Venus hair fern (Adiantum capillus-veneris) in North Carolina. The moist cliff faces are mostly exposed rock except for prominent patches of mosses and liverworts.

### Coastal Plain Semipermanent Impoundment

This community type occurs at Meares Millpond along the Bladen County line. Meares Millpond is an artificial impoundment created by the damming of a stream channel. The Coastal Plain Semipermanent Impoundment occurs on extensive, broad, shallowly flooded shelves supporting an open canopy of small pond cypress (Taxodium ascendens) and swamp tupelo (Nyssa biflora) trees. Wax-myrtle (Myrica cerifera var. cerifera) and titi (Cyrilla racemiflora) are prominent shrubs on the flooded shelf. Prominent herbs include horsetail spikerush (Eleocharis equisetoides), peatmoss (Sphagnum sp.), redroot (Lachnanthes caroliniana), threadleaf beaksedge (Rhynchospora filifolia), longspur creeping bladderwort (Utricularia biflora), and rosy camphorweed (Pluchea rosea).

## River Bluff Communities

### Piedmont/Coastal Plain Acidic Cliff

This community type occurs on bluffs along the Cape Fear River near the Columbus/Brunswick county line. The bluff face is very steep to vertical and is kept moist by groundwater seepage. The vertical faces are bare in some places, and dominated by herbs, mosses, and liverworts in others. Large-leaved grass-of-parnassus (Parnassia grandifolia) is a patch dominant on the vertical faces. Non-vertical but steep faces support woody and herbaceous vegetation, with wax-myrtle (Myrica cerifera var. cerifera) prominent. The Acidic Cliff community in this area is also influenced by narrow limestone beds and calcareous seepage, making it unusual compared with other examples.

## Pocosin Communities

Pocosins occur on nearly flat, poorly drained areas in small-to-large, shallow depressions such as Carolina bays. Peat deposits develop where the soil is saturated for long enough periods that organic matter cannot completely decompose. Once peat has developed, it acts as a sponge, raising water levels in the soil and making the site wetter. Because of restrictions to decomposition, soil nutrients are tied up in organic matter and the soil is extremely infertile and acidic.

### Small Depression Pocosin

This community type occurs in small basins filled with organic deposits. The vegetation is a dense thicket of pocosin shrubs, with Carolina sheeplaurel (Kalmia carolina), zenobia (Zenobia pulverulenta), and blue huckleberry (Gaylussacia frondosa) prominent. Pond pine (Pinus serotina), sweetbay (Magnolia virginiana), and swamp red bay (Persea palustris) often form a low canopy.

### Pond Pine Woodland

Pond Pine Woodlands occur on shallow organic deposits on the edge of peatlands and in shallow swales and bays, where tree roots can grow through the organic layer to reach mineral soil below. Pond pines are tall and often fairly dense, and the shrub layer is tall and usually very thick. Loblolly bay (Gordonia lasianthus) is often a canopy co-dominant with pond pine, or forms a subcanopy. Prominent shrubs include gallberry (Ilex coriacea), wax-myrtle (Myrica cerifera var. cerifera), inkberry (Ilex glabra), and fetterbush

(Lyonia lucida). Blaspheme-vine (Smilax laurifolia) is prominent in the understory.

### Bay Forest

In Columbus County, Bay Forests are found along the edges of sand ridges in the Lumber River floodplain. The canopy is dominated by loblolly bay (Gordonia lasianthus), with sweetbay dominating the subcanopy. The moderate to dense shrub layer is dominated by gallberry (Ilex coriacea), with blue huckleberry, Carolina sheeplaurel, and fetterbush prominent.

### Upland Terrace Pineland Communities

These community types occur on mineral soils and were frequently burned under natural conditions. With frequent fire they have an open canopy dominated by longleaf pine (Pinus palustris) or pond pine over a grassy herb layer. Shrubs are short and sparse with frequent fire, but become dense if fire is suppressed for more than a couple of years.

### Pine Savanna

The Pine Savanna community type occurs in flat areas that are saturated or even slightly flooded during the wetter parts of the year. The herb layer is dominated by grasses and sedges, most typically wiregrass (Aristida stricta) and Carolina dropseed (Sporobolus sp. 1). The herb layer usually contains many showy composites, orchids, and insectivorous plants. Southeastern North Carolina Pine Savannas have among the highest species diversity values in temperate North America. More rare species are associated with Pine Savannas than any other community type in North Carolina.

Three Pine Savanna variants occur in Columbus County: Wet Spodosol, Wet Ultisol, and Very Wet Clay. The Wet Spodosol variant occurs on sandy soils and often exhibits a pocosin influence in its flora. The Wet Ultisol variant occurs on loamy or clayey soils, and its flora indicates a broader moisture range than that for the Wet Spodosol variant. The Very Wet Clay variant occurs on clayey soils usually or always underlain by limestone ("marl"), and pondcypress (Taxodium ascendens) can be prominent in the canopy. The herb layer is dominated by wireleaf dropseed (Sporobolus teretifolius) and Carolina dropseed. The Pine Savanna Very Wet Clay variant is extremely rare, known only from the vicinity of the Columbus/Brunswick and Pender/Onslow county lines.

### Wet Pine Flatwoods

Wet Pine Flatwoods resemble Pine Savannas in general structure, with an open pine canopy over a grassy ground cover with low shrubs when frequently burned. They typically occur on flat areas that are not as wet or fertile as those that support savannas. Longleaf pine is usually the dominant canopy tree, although loblolly pine can be prominent to dominant. Wiregrass is always the dominant herb, but unlike Pine Savannas, the herb diversity is low. Shrubs become dense if fire is excluded. Two variants of the Wet Pine Flatwoods community occur in Columbus County: the Wet Spodosol variant occurs on sandy soils, and the Wet Ultisol variant occurs on loamy or clayey soils.

### Mesic Pine Flatwoods

The Mesic Pine Flatwoods community occurs on broad flats of moderately well drained sandy soil. The canopy is dominated by longleaf and loblolly pines over an understory of scattered oaks. Staggerbush (Lyonia mariana) is a prominent low shrub. The herb layer is diverse, with many showy composites and legumes. Silkgrass (Pityopsis graminifolia var. latifolia) dominates large patches. This community has been found at only one site in the county, on the Surry Scarp near the Bladen County line.

### Pine/Scrub Oak Sandhill

The Pine/Scrub Oak Sandhill community (Mixed Oak variant) occurs on well drained sandy soil. It is characterized by a longleaf pine canopy over an oak subcanopy and moderately sparse ground cover. The dominant subcanopy oaks are bluejack oak (Quercus incana) and turkey oak (Q. laevis). Lichens (Cladonia spp.) cover large patches, and wiregrass is prominent in the herb layer.

### Sand Ridge Communities

Sand ridges and the sandhill communities they support are rare in Columbus County, and are known only from aeolian ridges in the Lumber River floodplain, bay rim remnants off Lake Waccamaw, and the highest relict floodplain ridges in the Waccamaw River floodplain. The sandhill pine communities occur on excessively drained coarse sand which often produces near desert conditions for plants. These communities as they occur in Columbus County differ from typical occurrences nearer the coast. The dominance of the canopy by loblolly pine at some sites may be due to prior logging of longleaf pine and/or fire suppression.

### Coastal Fringe Sandhill

The Coastal Fringe Sandhill occurs on the dry sands of ridges and ridge slopes. The canopy is dominated by loblolly pine or longleaf pine, with sand laurel oak and often turkey oak abundant in the subcanopy, or forming a low canopy where pines are absent. The shrub and herb layers are open to sparse, with lichens forming large patches on the sandy surface.

### Xeric Sandhill Scrub

This community occurs on the highest, driest areas of sand ridges, with a canopy dominated by longleaf pine or loblolly pine. Turkey oak dominates the subcanopy, and the shrub and herb layers are sparse. Sand laurel oak is sparse to absent in this community.

### **Special Habitat Communities**

#### Wading Bird Rookery

The Wading Bird Rookery Special Habitat supports breeding colonies of wading birds. Two of these special habitats are located in the Upper Waccamaw River Swamp site, and they contain breeding colonies of the great blue heron (Ardea herodias).

### **Disturbed Habitat Communities**

#### Roadside and powerline savannas

Rare plant species occasionally occur along roadsides and in powerline corridors. Typically, two or more rare species are present at these artificially maintained sites. The plant association most frequently found at these sites in Columbus County is that of the Pine Savanna. There is evidence that the savanna plant association and rare species are present because of conditions that pre-date road and powerline construction. The soil types at these sites are those that support the rare species' natural community, and often fragments of the natural community persist nearby. Because of the degree of artificial disturbance, these sites are not classified as natural communities, but they nonetheless provide critical habitat for rare species, and can serve as important seed sources if adjacent habitat is managed for natural community restoration. The most significant roadside and powerline rare species occurrences are treated as standard sites.

## Rare Plants and Animals

### General Comments

The flora and fauna of Columbus County is very diverse, and the number of known rare species is directly related to this diversity.

A total of 31 rare animals are known from the county (Table 1), comprising two mammals, seven birds, three reptiles, six fishes, and 13 invertebrates (11 mollusks, one crustacean, and one butterfly). A total of 69 rare plants are known from the county (Table 2), comprising 64 seed plants, one fern, and four liverworts. Among these rare species are 14 federally designated animals and 13 federally designated plants.

The great majority of rare plants and animals in the county are restricted to wetlands or aquatic habitats. Most significant among these wet habitats are Lake Waccamaw and adjacent waters, and the Pine Savanna sites. Lake Waccamaw and adjacent waters and wetlands support populations of 25 rare animal species, including 10 species found nowhere else in the world (Table 3). Lake Waccamaw, Waccamaw River, and adjacent wetlands also support 24 rare plant species. Among these rare species, 10 animals and two plants are federally designated.

The species diversity of the Pine Savanna in southeastern North Carolina is among the highest of any community type in temperate North America. This is reflected in the 33 rare plants and three rare animals in Columbus County that are associated with savannas. Among them is one plant--savanna indigo-bush (Amorpha georgiana var. confusa)--currently known only from Columbus and Brunswick counties, and nowhere else in the world. Included among the rare plants are 10 federally designated species.

### Definition of Status and Rank Codes in Tables 1 and 2

Table 1 (rare animals) and Table 2 (rare plants) list all of the federal and state listed rare species documented in Columbus County.

The federal and state rarity status codes and global and state abundance ranks are given for each species in the tables. These status and rank codes are defined below (only those codes applying to rare species in Columbus County are given). The code definitions and application to individual species are from LeGrand (1993) and Weakley (1993).

#### Status Codes (designated rarity)

Federal Status. As designated by the U.S. Fish and Wildlife Service (USFWS).

E = Endangered. A species that is threatened with extinction throughout all or a significant portion of its range.

T = Threatened. A species that is likely to become endangered in the foreseeable future.

C2 = Candidate. A species for which there is some evidence of vulnerability, but for which there are not enough data to support listing as Endangered or Threatened at this time. Listing is "warranted but precluded by other pending proposals of higher priority." The USFWS is "directed to make prompt use of the emergency listing provisions if the wellbeing of any such species is at significant risk."

#### State Status - Animals.

E = Endangered. Any native or once-native species of wild animal whose continued existence as a viable component of the state's fauna is determined by the Wildlife Resources Commission to be in jeopardy, or any species of wild animal determined to be an Endangered species pursuant to the U.S. Endangered Species Act.

T = Threatened. Any native or once-native species of wild animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range in North Carolina, or one that is designated as a Threatened species pursuant to the U.S. Endangered Species Act.

SC = Special Concern. Any species of wild animal native or once-native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring but which may be taken under regulations adopted under the provisions of Article 25 of Chapter 113 of the General Statutes.

SR = Significantly Rare. Any other species which has not been determined as an Endangered, Threatened, or Special Concern species, but which exists in North Carolina in small numbers and has been determined to need monitoring. This is a N.C. Natural Heritage Program designation.

SR\* = Species is a game animal, and therefore by law cannot be listed for state protection as E, T, or SC.

#### State Status - Plants.

E = Endangered. Any species whose continued existence as a viable component of the state's flora is in jeopardy. Endangered species may not be removed from the wild except when a permit is obtained for research, propagation, or rescue which will enhance the survival of the species. Sale or distribution of wild-collected Endangered species is not permitted.

T = Threatened. Any species likely to become an endangered species within the foreseeable future. Regulations are the same as for Endangered species.

SC = Special Concern. Any species which requires population monitoring, but which may be collected and sold under specific regulations. Special Concern species which are not also listed as Endangered or Threatened may be collected from the wild and sold under specific regulations. Propagated material only of Special

Concern species which are also listed as Endangered or Threatened may be traded or sold under specific regulations.

C = Candidate. Any species which, because of small numbers of populations, rare habitat, or distribution, may become threatened in the future; or a species suspected of being endangered or threatened, but for which sufficient information is not currently available to support such a status classification. This is a N.C. Natural Heritage Program designation.

SR = Significantly Rare. Any other species which has been determined to be rare in North Carolina and in need of conservation and monitoring. This is a N.C. Natural Heritage Program designation.

### Rank Codes (rangewide abundance)

Global Rank. This is based on a species' abundance rangewide, and is the best available scientific assessment of a species' rarity throughout its range.

G1 = Critically imperiled globally because of extreme rarity or because of other factors making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity or because of other factors making it very vulnerable to extinction.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G? = Unranked, or rank uncertain.

G\_Q = A "Q" following a "G" rank indicates questionable taxonomic status.

G\_T\_ = A "T" rank following a "G" rank indicates a subspecies or variety. For example, "G4T1" would apply to a subspecies or variety of a species with an overall rank of G4, but with the subspecies or variety warranting a rank of G1.

G\_G\_ = A ranking involving two "G" numbers indicates a greater uncertainty or range of ranking. For instance, a "G2G3" rank indicates that the species may be a G2 or a G3, but that existing data do not allow that determination to be made.

State Rank. This is based on a species' abundance throughout North Carolina, independently of the global rank (however, a state rank can never show a greater abundance than the global rank).

S1 = Critically imperiled in North Carolina because of extreme rarity or because of other factors making it especially vulnerable to extirpation from North Carolina.

S2 = Imperiled in North Carolina because of rarity or because of other factors making it very vulnerable to extirpation in North Carolina.

S3 = Rare or uncommon in North Carolina.

S4 = Apparently secure in North Carolina, with many occurrences.

S5 = Demonstrably secure in North Carolina and essentially ineradicable under present conditions.

S\_B = Rank of the breeding population in the state. Used for migratory animals only.

S\_N = Rank of the non-breeding population in the state. Used for migratory animals only.

SH = Of historical occurrence in North Carolina, perhaps not having been verified in the past 20 years, and suspected to be still extant.

S? = Same as "G?".

S\_S\_ = Same as "G\_G\_".

**Table 1. Federal and State-Designated Rare Animal Species Occurring in Columbus County, North Carolina.**

<u>SPECIES</u>	<u>STATUS</u>		<u>RANK</u>	
	<u>US</u>	<u>NC</u>	<u>G</u>	<u>S</u>
<b>Mammals</b>				
<u>Corynorhinus rafinesquii</u> Rafinesque's big-eared bat	C2	SC	G4	S3
<u>Ursus americana</u> black bear	SR*		G5	S3
<b>Birds</b>				
<u>Aimophila aestivalis</u> Bachman's sparrow	C2	SC	G3	S3B, S2N
<u>Ammodramus henslowii</u> Henslow's sparrow	C2	SR	G4	S2B, S1N
<u>Anhinga anhinga</u> anhinga		SR	G5	S2B, SZN
<u>Coragyps atratus</u> black vulture		SC	G5	S3
<u>Egretta caerulea</u> little blue heron		SC	G5	S3B, S3N
<u>Egretta thula</u> snowy egret		SC	G5	S3B, S3N
<u>Picoides borealis</u> red-cockaded woodpecker	E	E	G2	S2
<b>Reptiles</b>				
<u>Alligator mississippiensis</u> American alligator	T	T	G5	S3
<u>Crotalus adamanteus</u> eastern diamondback rattlesnake		SR	G5	S1
<u>Ophisaurus mimicus</u> mimic glass lizard	C2	SC	G3	S2

**Freshwater fishes**

<u>Elassoma boehlkei</u> Carolina pygmy sunfish	C2	T	G1G2	S1S2
<u>Etheostoma perlongum</u> Waccamaw darter		T	G1Q	S1
<u>Fundulus waccamensis</u> Waccamaw killifish	C2	SC	G1	S1
<u>Menidia extensa</u> Waccamaw silverside	T	T	G1	S1
<u>Noturus sp. 2</u> broadtail madtom			SC	G2 S2

**Marine and estuarine fishes**

<u>Acipenser brevirostrum</u> shortnose sturgeon	E	E	G3	S1
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**Mollusks -- freshwater bivalves**

<u>Elliptio folliculata</u> pod lance		SC	G3	S2
<u>Elliptio sp. 5</u> Waccamaw lance pearlymussel	C2	SR	G1G3Q	S1S3
<u>Elliptio waccamawensis</u> Waccamaw spike	C2	T	G1	S1
<u>Lampsilis crocata</u> Waccamaw lampmussel			SC	G1Q S2
<u>Lampsilis fullerkati</u> Waccamaw fatmucket	C2	T	G1	S1
<u>Leptodea ochracea</u> tidewater mucket			SC	G4 S2
<u>Toxolasma pullum</u> savanna lilliput	C2	T	G3	S2

**Mollusks -- freshwater gastropods**

Amnicola sp. 1 SC G? S1  
Waccamaw snail

Cincinnatia sp. 1 SC G? S1  
Waccamaw siltsnail

**Mollusks -- terrestrial gastropods**

Catinella waccamawensis T G5 S1  
Waccamaw ambersnail

Triodopsis soelneri C2 T G2 S2  
Cape Fear threetooth

**Crustaceans**

Procambarus leptodactylus C2 SR G2G3 S2?  
Pee Dee lotic crayfish

**Insects -- butterflies**

Problema byssus SR G3G4 S2?



**Table 2. Federal and State-Designated Rare Plant Species Occurring in Columbus County, North Carolina.**

<u>SPECIES</u>	<u>STATUS</u>		<u>RANK</u>	
	<u>US</u>	<u>NC</u>	<u>G</u>	<u>S</u>
<b>Vascular plants - trees, shrubs, and herbs</b>				
<u>Adiantum capillus-veneris</u> Venus hair fern	C		G5	S1
<u>Agalinis aphylla</u> scale-leaf gerardia		C	G3G4	S2
<u>Agalinis linifolia</u> flaxleaf gerardia		SR	G3G4	S2
<u>Amorpha georgiana</u> var. <u>confusa</u> C2 savanna indigo-bush	T		G2T1	S1
<u>Andropogon mohrii</u> bog bluestem		C	G3?	S1
<u>Arnoglossum ovatum</u> savanna indian-plantain		SR	G4G5	S1
<u>Bacopa caroliniana</u> blue water-hyssop		SR	G4G5	S1
<u>Carex chapmanii</u> Chapman's sedge	C2	C	G2G3	S2
<u>Carex crus-corvi</u> crowfoot sedge		SR	G5	S1
<u>Carex socialis</u> running roseate sedge		SR	G3	S1
<u>Carex verrucosa</u> warty sedge		SR	G3G4	S1
<u>Chrysoma pauciflosculosa</u> woody goldenrod		E	G4G5	S1
<u>Cladium mariscoides</u> twig-rush		SR	G5	S2
<u>Dichanthelium erectifolium</u> erectleaf witch grass		SR	G4	S2
<u>Dionaea muscipula</u> Venus flytrap	C2	C-SC	G3	S3

<u>Drosera filiformis</u> threadleaf sundew	SR		G5	S1
<u>Epidendrum conopseum</u> green fly orchid	SR		G3G4	S2
<u>Eriocaulon aquaticum</u> seven-angled pipewort	SR		G5	S2
<u>Fimbristylis perpusilla</u> Harper's fimbry	C2	T	G2	S1
<u>Gelsemium rankii</u> swamp jessamine	SR		G5	S2
<u>Helenium pinnatifidum</u> dissected sneezeweed	SR		G4	S2
<u>Helenium vernale</u> spring sneezeweed	SR		G3G4	S1
<u>Ilex amelanchier</u> sarvis holly	SR		G3G4	S3
<u>Lachnocaulon beyrichianum</u> southern bogbutton	C		G2G3	S1
<u>Lipocarpha micrantha</u> small-flowered hemicarpha	SR		G4	S1
<u>Lophiola aurea</u> golden crest	E		G4	S1
<u>Ludwigia linifolia</u> flaxleaf seedbox	SR		G4	S1
<u>Ludwigia ravenii</u> Raven's seedbox	SR		G2?	S2?
<u>Ludwigia sphaerocarpa</u> globe-fruit seedbox	SR		G5	S1
<u>Luziola fluitans</u> southern water grass	SR		G4G5	S1S2
<u>Lysimachia asperulifolia</u> rough-leaf loosestrife	E	E	G3	S3
<u>Macbridea caroliniana</u> Carolina bogmint	C2	C	G2G3	S1

<u>Oldenlandia boscii</u> Bosc's bluet			SR		G5	S1
<u>Panicum tenerum</u> southeastern panic grass			SR		G4	S2
<u>Parnassia caroliniana</u> Carolina grass-of-parnassus			C2	E	G2	S2
<u>Parnassia grandifolia</u> large-leaved grass-of-parnassus			C		G2G3	S1
<u>Peltandra sagittifolia</u> spoonflower			SR		G3G4	S2
<u>Pityopsis graminifolia</u> var. <u>graminifolia</u> silkgrass			SR		G5T5	S1?
<u>Plantago sparsiflora</u> pineland plantain	C2	E			G2	S1
<u>Platanthera integra</u> yellow fringeless orchid				T	G5	S1
<u>Platanthera nivea</u> snowy orchid				T	G5	S1
<u>Polygala hookeri</u> Hooker's milkwort				C	G3	S2
<u>Rhexia cubensis</u> West Indies meadow-beauty			SR		G5	S1
<u>Rhynchospora breviseta</u> shortbristled beaksedge				C	G3G4	S1
<u>Rhynchospora decurrens</u> swamp forest beaksedge			C2	C	GH	S1
<u>Rhynchospora divergens</u> whiteseeded beaksedge				SR	G4	S1
<u>Rhynchospora globularis</u> var. <u>pinetorum</u> Small's beaksedge				SR	G5T3?	S1
<u>Rhynchospora oligantha</u> feather-bristle beaksedge				C	G4	S2
<u>Rhynchospora scirpoides</u> long-beak baldsedge				SR	G4	S2

<u>Sabatia kennedyana</u> Plymouth gentian	T-SC		G3	S1
<u>Sagittaria stagnorum</u> water arrowhead	SR		G4G5	S1
<u>Sarracenia minor</u> hooded pitcher plant	SR		G4G5	S2
<u>Schoenoplectus etuberculatus</u> Canby's bulrush	SR		G3G4	S3
<u>Scleria baldwinii</u> Baldwin's nutrush	C		G3G4	S1
<u>Scleria georgiana</u> Georgia nutrush	SR		G4	S2
<u>Scleria verticillata</u> savanna nutrush	C		G5	S1
<u>Solidago gracillima</u> graceful goldenrod	SR		G4?	S1S2
<u>Solidago verna</u> spring-flowering goldenrod	C2	E	G3	S3
<u>Spiranthes laciniata</u> lace-lip ladies'-tresses	C		G4G5	S1
<u>Sporobolus teretifolius</u> wireleaf dropseed	C2	T	G2?	S1
<u>Thalictrum cooleyi</u> Cooley's Meadowrue	E	E	G1	S1
<u>Tofieldia glabra</u> Carolina asphodel	C2	C	G3	S3
<u>Torreyochloa pallida</u> pale mannagrass	SR		G5?	S1
<u>Utricularia resupinata</u> northeastern bladderwort	SR		G4?	S1
<u>Xyris brevifolia</u> short-leaf yellow-eyed grass	SR		G4G5	S2

**Nonvascular plants - mosses, liverworts, and lichens**

<u>Cheilolejeunea rigidula</u> a liverwort	SR	G5	S2
<u>Cylindrocolea rhizantha</u> a liverwort	C	G3?	SH
<u>Lejeunea bermudiana</u> a liverwort	SR	G3G4	SH
<u>Lopholejeunea muelleriana</u> a liverwort	C	G4G5	SH



Table 3. Rare Animals and Plants in Columbus County Currently Restricted to the County or North Carolina.

**ANIMALS**

**RANGE**

**Freshwater fishes**

<u>Elassoma boehlkei</u>	Lake Waccamaw and vicinity
<u>Etheostoma perlongum</u>	Lake Waccamaw and vicinity
<u>Fundulus waccamensis</u>	Lake Waccamaw, Lake Phelps
<u>Menidia extensa</u>	Lake Waccamaw and vicinity

**Mollusks -- freshwater bivalves**

<u>Elliptio sp. 5</u>	Lake Waccamaw
<u>Elliptio waccamawensis</u>	Lake Waccamaw and vicinity
<u>Lampsilis crocata</u>	Lake Waccamaw and vicinity
<u>Lampsilis fullerkeri</u>	Lake Waccamaw and vicinity

**Mollusks -- freshwater gastropods**

<u>Amnicola sp. 1</u>	Lake Waccamaw and vicinity
<u>Cincinnati sp. 1</u>	Lake Waccamaw and vicinity

**Mollusks -- terrestrial gastropods**

<u>Catinella waccamawensis</u>	Lake Waccamaw
<u>Triodopsis soelneri</u>	southeastern North Carolina

**PLANTS**

**RANGE**

**Vascular plants**

<u>Amorpha georgiana</u> var. <u>confusa</u>	Columbus and Brunswick cos.
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## NATURAL AREAS INVENTORY OF COLUMBUS COUNTY, NORTH CAROLINA

### DISCUSSION

#### Summary of Results

#### Natural Areas - Priority Clusters of Sites

According to their size, natural areas are referred to in this report as "megasites," "macrosites," or "standard sites." **Megasites** are large, cohesive areas generally of a size greater than 100 square miles (64,000 acres). **Macrosites** are smaller areas, generally of 5 to 100 square miles (3,200 to 64,000 acres). **Standard sites** typically are smaller than 3,200 acres. Standard sites are usually referred to as "sites" unless greater clarification is needed. Frequently, sites occur in clusters. The occurrence of a site in association with other sites increases its potential long term viability and ecological significance. Such clusters are designated as macrosites or megasites, with standard sites nested within them. These macrosites and megasites may contain lower quality lands that are not included in a standard site, but which provide ecologically important buffers and corridors.

A list of identified natural areas of national, statewide, or regional significance is contained in Table 4. A total of 29 standard sites, two macrosites, and one megasite are described in the "Inventory of Sites" section of this report (Fig. 3). Seven of the standard sites were first identified during 1994 survey work: Winnie Moore Bay Flatwoods, Meares Millpond, Hoy Savanna Remnant, Crusoe Island Savanna, Highway 905 at Seven Creeks, Parkers Landing Sand Ridge, and Highway 130 at Waccamaw River.

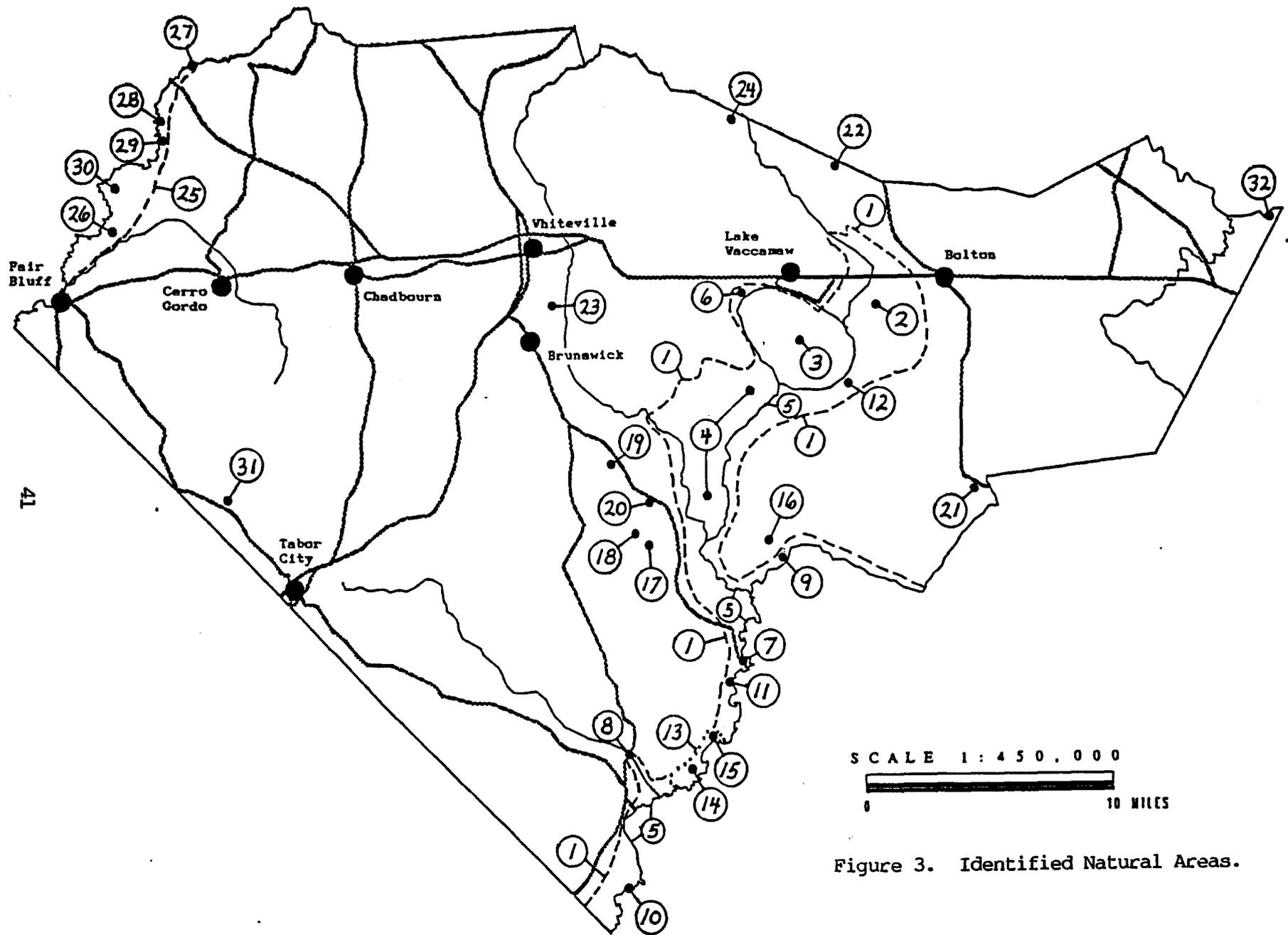
Three site clusters are of particular significance: the Waccamaw River Wetlands Megasite, the Old Dock area Pine Savannas, and the Lumber River Macrosite. These three clusters contain 20 of the county's 28 identified standard sites, plus the two macrosites and one megasite.

#### Waccamaw River Wetlands Megasite

In Columbus County, this megasite contains one macrosite and 13 standard sites (Fig. 4). The megasite includes Friar Swamp, Lake Waccamaw, Lake Waccamaw State Park, and the Waccamaw River floodplain south from Lake Waccamaw to the South Carolina border. Of critical importance are the four nationally ranked standard sites nested within the megasite: Lake Waccamaw, Friar Swamp, Upper Waccamaw River Swamp, and Waccamaw River Aquatic Habitat. Each of these sites supports populations of some or all of the 10

## Identified Natural Areas

- 1-Waccamaw River Wetlands Megasite
- 2 - Friar Swamp
- 3 - Lake Waccamaw
- 4 - Upper Waccamaw River Swamp
- 5 - Waccamaw River Aquatic Habitat
- 6 - Cove Swamp
- 7 - Highway 130 at Waccamaw River
- 8 - Highway 905 at Seven Creeks
- 9 - Juniper Creek Floodplain
- 10 - Waccamw River Oxbow Site
- 11 - Ward's Lake
- 12 - Lake Waccamaw River Eleocharis Backwater
- 16 - Crusoe Island Savanna
- 17 - Old Dock Savanna
- 18 - Schulkens Savanna
- 19 - Cypress Creek Bay
- 20 - Mark Pine Bay Cooley's Meadowrue Site
- 21 - Hoy Savanna Remnant
- 22 - Meares Millpond
- 23 - White Marsh
- 24 - Winnie Moore Bay Flatwoods
- 25 - Lumber River Macrosite
- 26 - Big Sandy Ridge and Swamp
- 27 - Net Hole--Buck Landing Swamp
- 28 - Bluff Swamp
- 29 - Parkers Landing Sand Ridge
- 30 - Princess Anne Swamp
- 31 - Cross Bay Savanna
- 32 - Neils Eddy Landing



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Figure 3. Identified Natural Areas.



**Table 4. Natural Areas of National, Statewide, or Regional Significance in Columbus County, North Carolina.**

Natural areas include megasites, macrosites, and standard sites. Standard sites can be included within macrosites or megasites, or they can stand alone. The natural areas are grouped by watershed, and then by megasite or macrosite where applicable.

**RANK**

- A = national significance
- B = statewide significance
- C = regional significance

	<u>RANK</u>
<b>WACCAMAW RIVER WATERSHED</b>	
Crusoe Island Savanna	A
Old Dock Savanna	A
Schulkens Savanna	A
Cypress Creek Bay	B
Mark Pine Bay Cooley's Meadowrue Site	B
Hoy Savanna Remnant	C
Meares Millpond	C
White Marsh	C
Winnie Moore Bay Flatwoods	C
<b>WACCAMAW RIVER WETLANDS MEGASITE</b>	
Friar Swamp	A
Lake Waccamaw	A
Upper Waccamaw River Swamp	A
Waccamaw River Aquatic Habitat	A
Cove Swamp	B
Highway 130 at Waccamaw River	B
Highway 905 at Seven Creeks	B
Juniper Creek Floodplain	B
Waccamaw River Oxbow Site	B
Ward's Lake	B
Lake Waccamaw/Council Ridge	C
<b>Middle Waccamaw River Macrosite</b>	
Reeves Area Floodplain	B
Waccamaw River Eleocharis Backwater	C
<b>LUMBER RIVER WATERSHED</b>	
<b>Lumber River Macrosite</b>	
Big Sandy Ridge and Swamp	B
Net Hole--Buck Landing Swamp	B
Bluff Swamp	C
Parkers Landing Sand Ridge	C
Princess Anne Swamp	C
<b>LITTLE PEE DEE RIVER WATERSHED</b>	
Cross Bay Savanna	C
<b>CAPE FEAR RIVER WATERSHED</b>	
Neils Eddy Landing	C

## Waccamaw River Wetlands Megasite

- 1-Waccamaw River Wetlands Megasite
- 2 - Friar Swamp
- 3 - Lake Waccamaw
- 4 - Upper Waccamaw River Swamp
- 5 - Waccamaw River Aquatic Habitat
- 6 - Cove Swamp
- 7 - Highway 130 at Waccamaw River
- 8 - Highway 905 at Seven Creeks
- 9 - Juniper Creek Floodplain
- 10 - Waccamaw River Oxbow Site
- 11 - Ward's Lake
- 12 - Lake Waccamaw/Council Ridge
- 13 - Middle Waccamaw River Macrosite
- 14 - Reeves Area Floodplain
- 15 - Waccamaw River Eleocharis Backwater

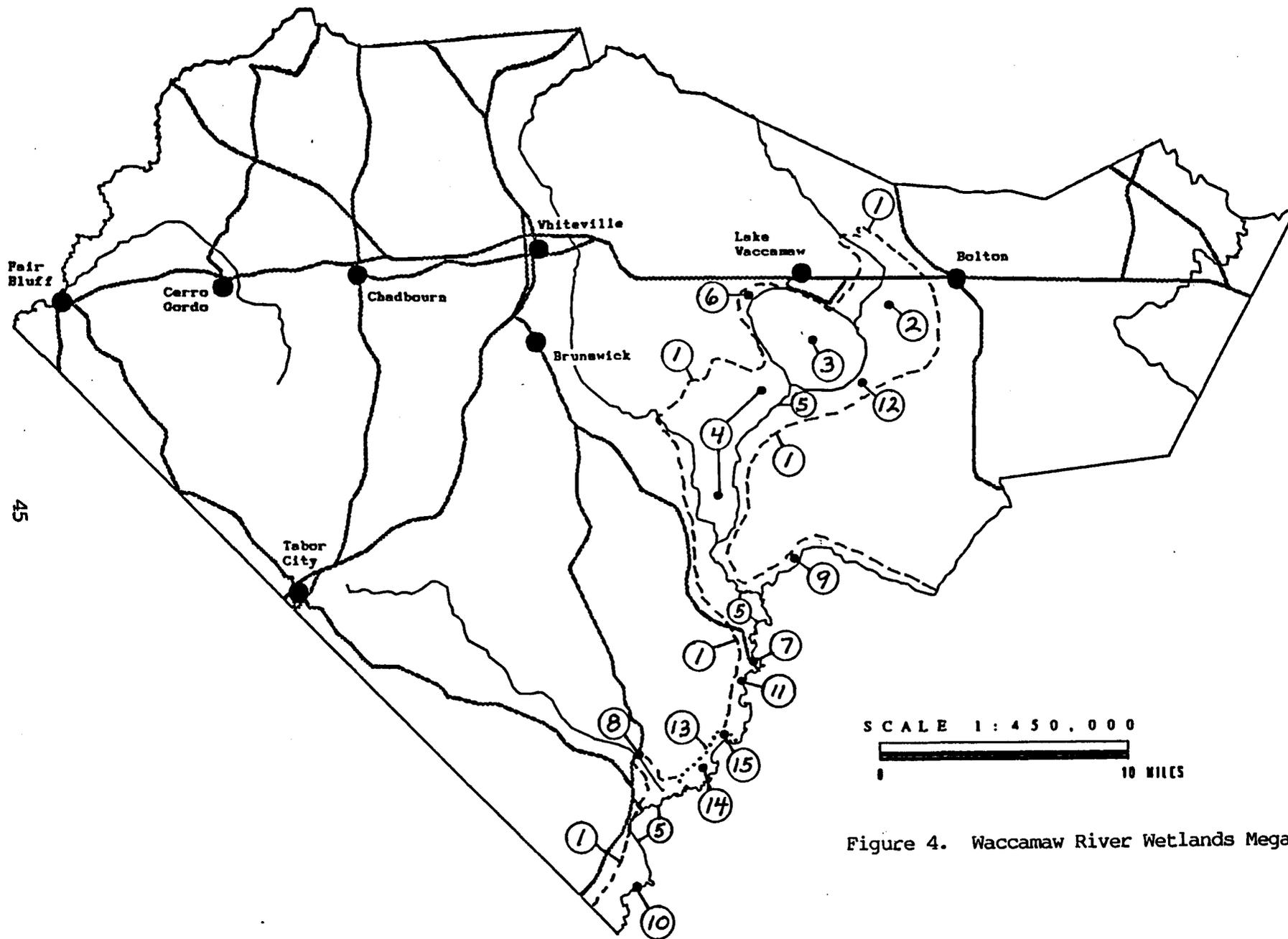


Figure 4. Waccamaw River Wetlands Megasite.

animal species globally restricted to Lake Waccamaw and adjacent waters, including Waccamaw River and Big Creek. Altogether, 18 rare animal species and 22 rare plant species have been recorded from these sites, including 10 federally designated animals and two federally designated plants. These sites also contain extensive areas of natural habitat in good to excellent condition. Of interest are upland rises within Friar Swamp and Upper Waccamaw River Swamp supporting natural community types that are very rare in Columbus County, and which may represent new (unclassified) community types or variants.

Several other important sites occur within the Waccamaw River Wetlands Megasite. Lake Waccamaw/Council Ridge supports sandhill communities that are very rare in the county. Cove Swamp contains critical habitat for rare animals and plants in swamp forest behind the shore of Lake Waccamaw. An important drainage and extensive swamp habitat is contained in Juniper Creek Floodplain. Critical rare plant species occur in apparent remnant savanna habitat in the Highway 130 at Waccamaw River site. Striking landforms associated with river meanders are contained in the Ward's Lake site and Waccamaw River Oxbow Site, and in the two sites nested within the Middle Waccamaw River Macrosite: Reeves Area Floodplain and Waccamaw River Eleocharis Backwater. These meander landforms support several distinctive natural community types and 10 rare plant species. Highway 905 at Seven Creeks provides habitat for two Federal Candidate and one State threatened plant species. Among these sites, Lake Waccamaw/Council Ridge and Waccamaw River Eleocharis Backwater are ranked of regional significance, and the others of statewide significance.

#### Old Dock Area Pine Savannas

Three nationally ranked Pine Savannas are located within a 4-mile radius of the village of Old Dock: Schulken's Savanna, Old Dock Savanna, and Crusoe Island Savanna (Fig. 5). These savannas contain the globally rare Pine Savanna Very Wet Clay Variant, and support populations of 20 rare plant species and three rare animal species. Among these are five federally designated plants and two federally designated animals. The Pine Savanna Very Wet Clay Variant is known only from the Old Dock area (including adjacent area in Brunswick County) and along the Pender/Onslow county line.

Mark Pine Bay Cooley's Meadowrue Site, a roadside/powerline savanna near Old Dock, is related to these Pine Savannas by proximity, soil type, and species composition. It appears to be a remnant of Pine Savanna habitat once occurring at or adjacent to the roadside. It supports populations of seven rare plant species, and is ranked of statewide significance.

### Lumber River Macrosite

In Columbus County, this macrosite contains five standard sites: Net Hole--Buck Landing Swamp, Big Sandy Ridge and Swamp, Bluff Swamp, Parkers Landing Sand Ridge, and Princess Anne Swamp (Fig. 6).

The first two are ranked of statewide significance, the others of regional significance. These sites contain landforms and natural communities associated with river meanders and floodplains. Additionally, Big Sandy Ridge and Swamp and Parkers Landing Sand Ridge contain aeolian sand ridges, which are very rare in blackwater river floodplains in North Carolina, and support sandhill communities more typical of coastal areas. In general, the natural communities at these sites are extensive and in good to excellent condition. Four rare plants and one rare animal are known from these sites.

### Other Natural Areas

Another seven standard sites occur in Columbus County: five in the Waccamaw River watershed, one in the Little Pee Dee River watershed, and one in the Cape Fear River watershed (Fig. 7). All of these sites are ranked of regional significance except Cypress Creek Bay, which is of statewide significance.

### Waccamaw River Watershed Sites

Winnie Moore Bay Flatwoods, located along the Bladen County line near Slap Swamp, supports the only Columbus County occurrence of Mesic Pine Flatwoods, an uncommon natural community type. Meares Millpond is located along the Bladen County line north of Lake Waccamaw. It contains a high quality occurrence of the Coastal Plain Semipermanent Impoundment community type, plus five rare plant species. The White Marsh site is located near the town of Whiteville, and provides important marsh habitat for migrating waterfowl. Cypress Creek Bay is located southeast of the village of Pleasant Plains. It contains pine flatwoods and pocosin swamp, and provides habitat for five rare plants and one rare animal, including one of only two county populations of savanna indigo-bush, a plant known only from Columbus and Brunswick counties. Hoy Savanna Remnant is located near the Brunswick County line south of Bolton. It contains an unusual Pine Savanna community and supports three rare plant species.

### Little Pee Dee River Watershed Site

The Little Pee Dee River watershed only covers 8 square miles in Columbus County, but it includes the Cross Bay Savanna site northwest of Tabor City. This site contains remnant Pine Savanna, and provides habitat for five rare plants and one rare animal.

Old Dock Area Pine Savannas

- 16 - Crusoe Island Savanna
- 17 - Old Dock Savanna
- 18 - Schulken's Savanna
- 20 - Mark Pine Bay Cooley's Meadowrue Site

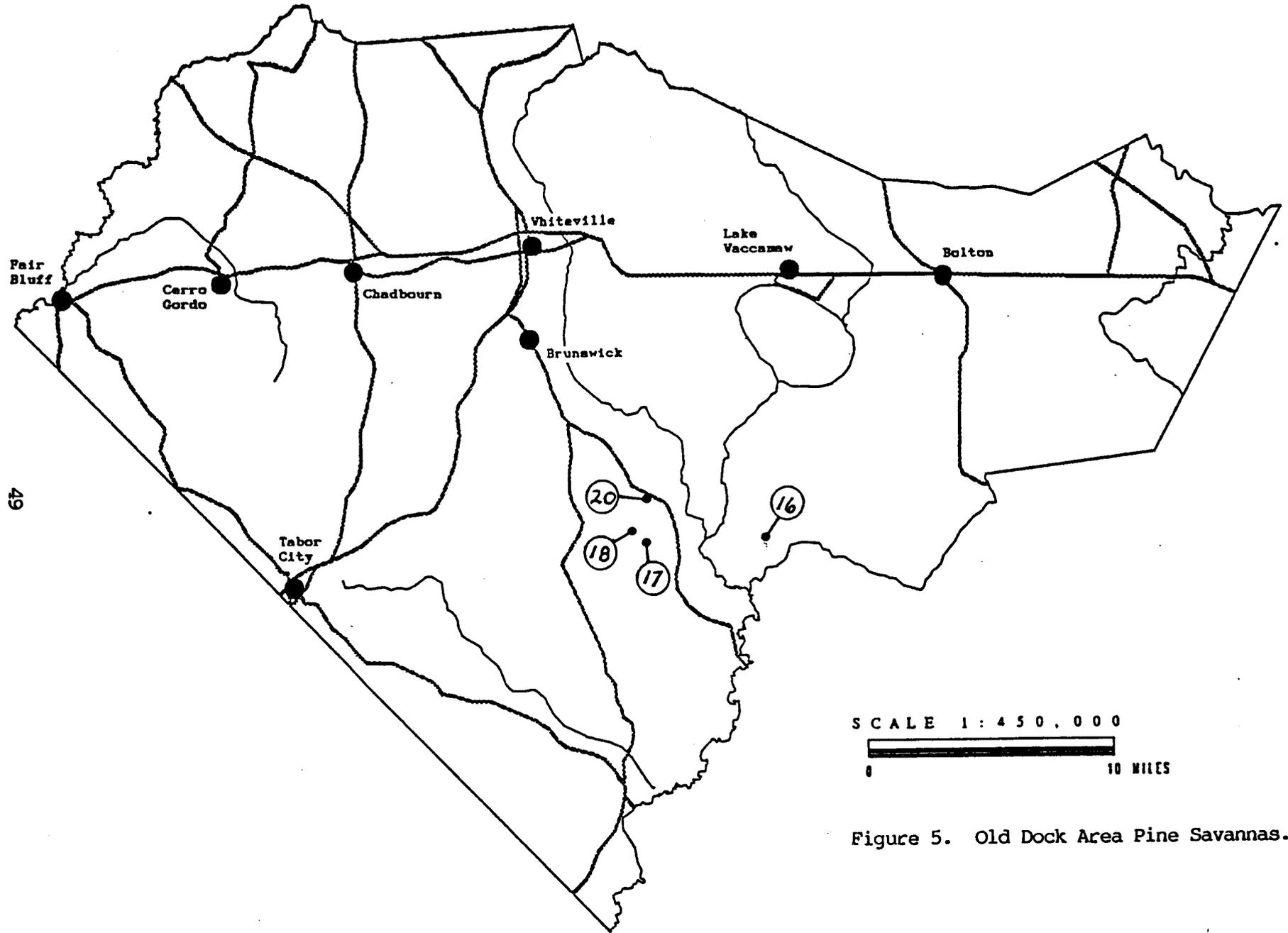
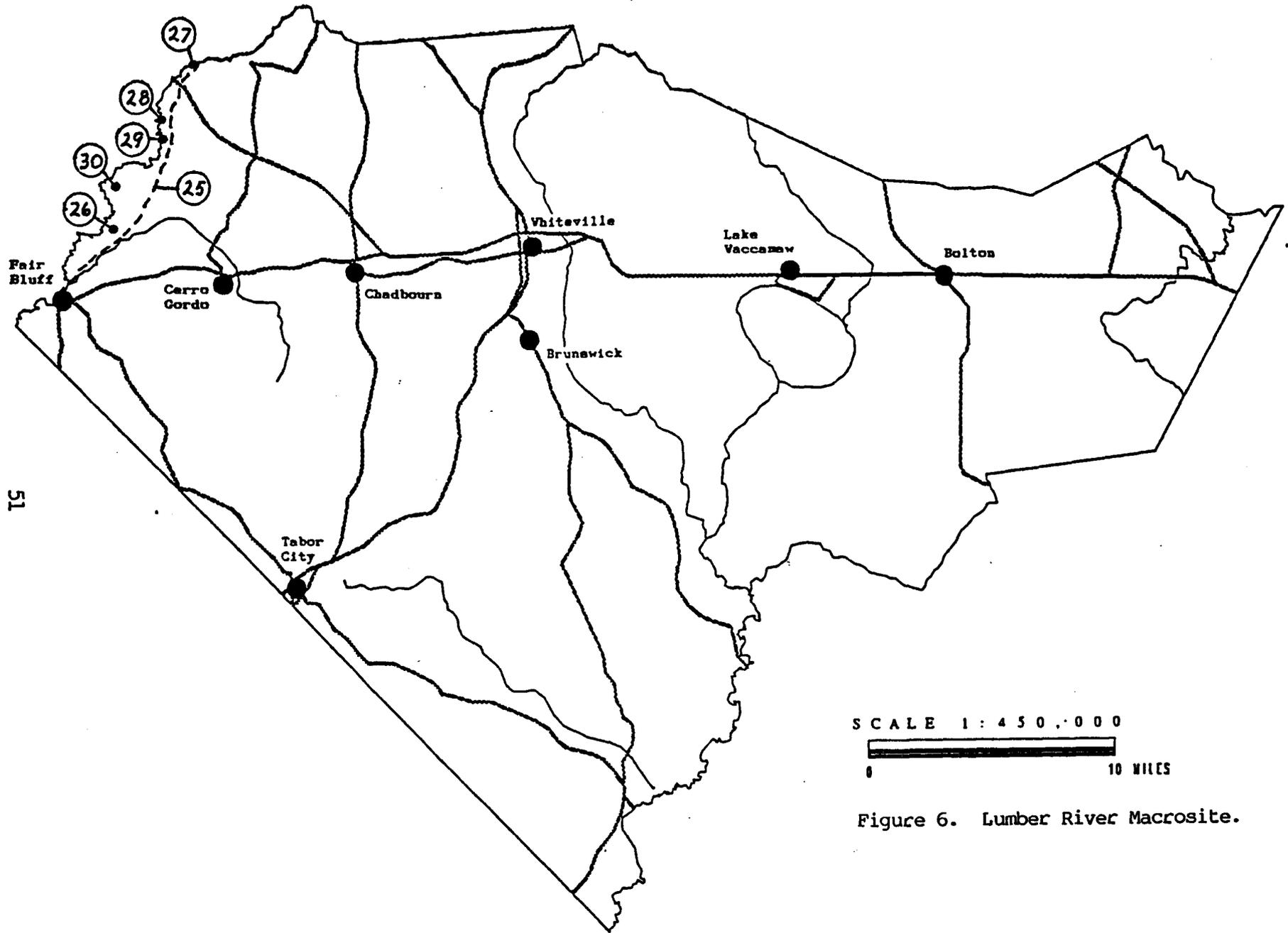


Figure 5. Old Dock Area Pine Savannas.

## Lumber River Macrosite

- 25 - Lumber River Macrosite
- 26 - Big Sandy Ridge and Swamp
- 27 - Net Hole--Buck Landing Swamp
- 28 - Bluff Swamp
- 29 - Parkers Landing Sand Ridge
- 30 - Princess Anne Swamp



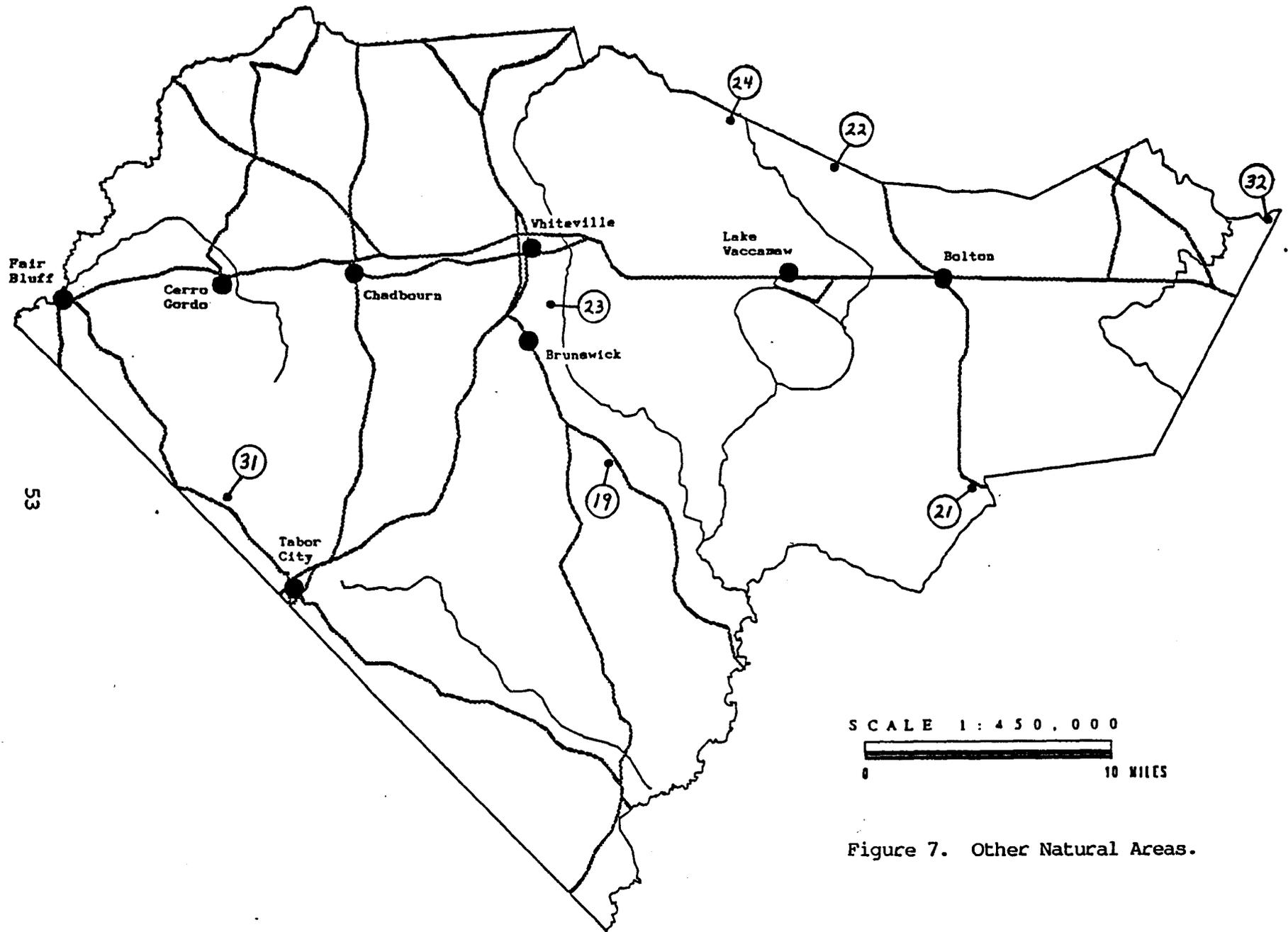
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Figure 6. Lumber River Macrosite.

## Other Natural Areas

- 19 - Cypress Creek Bay
- 21 - Hoy Savanna Remnant
- 22 - Meares Millpond
- 23 - White Marsh
- 24 - Winnie Moore Bay Flatwoods
- 31 - Cross Bay Savanna
- 32 - Neils Eddy Landing



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Figure 7. Other Natural Areas.

## Cape Fear River Watershed Site

The Neils Eddy Landing site is located along the Cape Fear River near the Brunswick County line. It supports the only Columbus County occurrence of the Piedmont/Coastal Plain Acidic Cliff community, plus two rare plant species.

### Rare Species

A total of 31 rare animal species and 69 rare plant species are known from Columbus County (Tables 1 and 2). Of these, 15 rare plant species were first discovered in the county during the 1993 and 1994 surveys, including one species new to North Carolina, running roseate sedge (Carex socialis). Three rare plant species known historically from the county were relocated, including a species that was believed to be extinct throughout its range, swamp forest beaksedge (Rhynchospora decurrens). In all, 55 new rare plant species occurrences were found (e.g., three rare species at one site constitute three species occurrences).

### **Threats to Natural Areas**

#### Impacts to Forest Communities

Clearcuts and conversion of native forests to pine or hardwood plantations severely impact or eliminate natural communities. However, the impact varies with intent. Clearing forests for cropland or land development obviously eliminates natural communities. Clearcuts of native forests that are allowed to regenerate may eventually succeed to the original natural community type, depending on such factors as degree of ground surface disturbance and invasion by opportunistic species. Clearcuts followed by site preparation for plantations can have severe impacts on the ability of natural communities to eventually recover. Plantation bedding is particularly disruptive, as soils and hydrology are heavily disturbed for long periods. In pinelands, plantations and controlled regeneration usually result in a closed canopy, which shades out the herbaceous ground cover typical of naturally open longleaf pine communities. In hardwood forests, a dense canopy is natural, but clearcutting usually leads to a shift in dominant species, with loblolly pine particularly opportunistic. Soil disturbances associated with logging can be very destructive to native forests. Heavy equipment on wet soils causes long-lasting ruts. Impacts from roller chopping and disking vary with intensity and natural community type. The importance of the herb layer and restricted reproductive requirements of wiregrass (Aristida stricta) make longleaf pine communities particularly susceptible to these practices.

Ditching and draining of low-lying forests "can change the hydrology of an area and significantly increase the rate and flow of stormwater runoff" (NCWQS 1994). By channeling surface runoff and groundwater away from an area, ditches greatly reduce the floodwater storage function of low-lying forests. The filtering function of these forests is also aborted, and sediment, nutrients, and toxins are directly channeled into lakes, streams, and rivers.

Fire suppression has a significant impact on longleaf pine communities (e.g., Pine Savannas, Wet Pine Flatwoods). These forests are naturally fire-adapted, and many species are dependent on fire for regeneration, particularly the dominant grasses. Lack of fire leads to the development of unnaturally dense shrub layers, and hardwood competition in the canopy. Plow lines in the ecotone between longleaf pine communities and adjacent wetlands alter soils and hydrology, and lead to changes in community structure and composition.

### **Impacts to Waterbodies**

"Sediment is the most widespread cause of impairment to stream water quality and biological integrity" in the Lumber and Waccamaw river watersheds (*ibid.*). Sediment can gradually fill lakes and rivers, causing changes in shoreline configuration and impacting water flow in channels and adjacent floodplains. Sediment directly impacts aquatic populations, such as by clogging fish gills and altering the habitat of food sources. Sediment can also lead to increased drinking water treatment costs. "Sediment also serves as a carrier for other pollutants including nutrients (especially phosphorus), toxic metals and pesticides" (*ibid.*). The leading cause of sedimentation is runoff from agricultural land, ditched forest land, and urban areas.

### **Protection Priorities**

#### **General Comments**

A variety of options exist for protecting natural areas and endangered species, ranging from private landowner initiatives to acquisition by private or public conservation agencies. In all cases, conservation works best when citizens are well-informed about the value of natural habitat and take an active role in its protection. In this spirit, governmental acquisition of natural areas by right of eminent domain is not a recommended option. Because land use problems usually cross property and political boundaries, planning, zoning, and land-use regulations can play an important protection role if supported by local citizens.

Conservation efforts should focus on the most significant areas. The highest priority areas in Columbus County are the Waccamaw River

Wetlands Megasite, the Old Dock area Pine Savannas, and the Lumber River Macrosite. Portions of these areas are already protected for their natural values. Lake Waccamaw is owned by the state up to the high water mark, and managed by the N.C. Division of Parks and Recreation. The Lake Waccamaw/Council Ridge site and the northern portion of the Upper Waccamaw River Swamp site are included in Lake Waccamaw State Park. Most of Old Dock Savanna is owned by The Nature Conservancy and managed for the protection and enhancement of natural values. A voluntary management agreement between landowners and the N.C. Natural Heritage Program protects portions of Schulken's Savanna, Mark Pine Bay Cooley's Meadowrue Site, and Cypress Creek Bay. That portion of the Lumber River Macrosite occurring in Columbus County is included within Lumber River State Park, and portions of the Net Hole--Buck Landing Swamp site are owned by the state.

### **Land Owner Protection Initiatives**

The great majority of Columbus County's natural areas are privately owned and are likely to remain so. Protection of these sites will require not only the good will but the active participation of landowners. Although in many cases the sites have remained in a natural state because of landowner actions to protect their values, owners may not be aware of the many options that can make conservation management more effective and less financially burdensome. This includes the continued management of forests for timber value.

### **Forest Stewardship Program**

One state program that offers assistance in achieving forest management goals is the Forest Stewardship Program sponsored by a number of different state and federal agencies. This program is available to non-industrial private forest landowners holding a minimum of ten acres of forested land, and offers assistance in achieving three or more of the six following stewardship goals: (1) maintenance of forest health and productivity, (2) improvement of fish and wildlife habitat, (3) protection of water quality, (4) enhancement of soil productivity and minimalization of erosion, (5) maintenance and enhancement of aesthetic values, and (6) support for recreational activities. Examples of the management plans this program encourages include controlled burning, re-forestation in natural vegetation, and maintenance of vegetative buffer strips along watercourses.

Each Forest Stewardship Program management plan is tailored to the individual desires of the landowner. Enrollment is entirely voluntary and consists of a pledge by the landowner to abide by the plan. The landowner is also recognized and honored for participation in the program, and may receive property tax benefits

if current use is reduced to the base level. Although certain tracts of forest may be left in a completely natural state under a Forest Stewardship Program plan, enrollment in the program assumes that at least part of the property will continue to be used for timber production, hunting leases, recreation, or some other use.

For more information, write to: Forest Stewardship Coordinator, Division of Forest Resources, P.O. Box 27687, Raleigh, NC 27611-7687.

### Registry of Natural Areas Program

For owners who wish to preserve their entire tract in a natural state, another option is to register the site under the North Carolina Registry of Natural Areas Program administered by the N.C. Natural Heritage Program (NHP). There is no minimum acreage required for this program, and the land can be forested or open. However, the land must possess rare species, significant natural communities, or other exceptional natural values. Registry is open to all landowners, including timber companies, governments, civic groups, schools, and other institutions.

The registry program relies solely on voluntary agreements by landowners to preserve the registered area in a natural state. The landowner is recognized and honored for protection of significant elements of the state's natural heritage. Management advice may also be provided by the staff of the NHP. Registered sites additionally receive some degree of statutory protection from pipelines and transmission lines. Although there are currently no tax benefits available for registration alone, the registry program has proven quite successful, and there are now several hundred registered natural areas throughout the state.

For more information, write to: N.C. Natural Heritage Program, Division of Parks and Recreation, P.O. Box 27687, Raleigh, NC 27611-7687.

### Conservation Easement

The preceding options depend on voluntary, and thus changeable agreements with the landowner. Another flexible but more permanent option--one that can be transferred along with the property deed--is the conservation easement. In this increasingly popular conservation option, the owner retains the title to the property and continues to exercise certain property rights, including control of access to the public. Other rights, such the right to develop, log, or mine the site, are deeded over to a recognized conservation organization established to preserve such tracts in a natural state. Provisions of the conservation easement are enforceable in civil court, and legally specify certain rights and responsibilities of

both the landowner and the recipient of the easement. Each easement is tailored to suit the unique characteristics of individual properties and the needs and desires of the landowner.

Although more restrictive than the Forest Stewardship Program and the Registry of Natural Areas Program, there are several reasons why this option may be preferred. It represents a greater degree of partnership between the landowner and a conservation group. Any costs involved in formulating and implementing management plans for the natural area can be shared, or even made the prime responsibility of the conservation organization. The easement is permanently attached to the property title, and passed along from one owner to another, from generation to generation. This may be the greatest benefit to an owner who desires to preserve a tract in its natural state in perpetuity. There may also be tax benefits. Limits on development and other uses of the tract may result in a reduction of estate, inheritance, and property taxes. Conservation easements are either sold or donated, depending on the circumstances of the landowner, the tract, and the receiving organization. If the easement is donated, it can also constitute a charitable contribution, allowing a deduction to be made on state and federal income taxes.

For more information, write to: North Carolina Coastal Land Trust, 313 N. Front St., Suite A, Wilmington, NC 28401. The Coastal Land Trust is a private non-profit organization.

### Transfer of Ownership

When an owner of a high quality natural area does not wish to maintain an active involvement in its management and is willing to part with the tract, transfer of ownership through sale or donation to a conservation organization or agency is the simplest way of assuring permanent protection. As with the conservation easement, there may be several state and federal tax benefits associated with the transfer of property. The benefits vary depending on whether the transfer takes the form of a donation, bargain sale, or sale at fair market value. Title restrictions can be added, allow the transferring owner to contribute to the permanent management plans for the tract.

Two private conservation organizations that acquire natural areas either by donation or purchase are the North Carolina Coastal Land Trust (see "Conservation Easement" above for address) and the North Carolina Nature Conservancy, Carr Mill, Suite D12, Carrboro, NC 27510.

## **Areas for Additional Survey Work**

This report provides as complete a picture as possible of the significant natural areas of Columbus County. It combines past knowledge of the county with information gathered during the 1993 and 1994 surveys. Additional survey work is needed for rare animal populations, to monitor the condition through time of known significant sites, and to locate potential new sites. The scope of the current inventory did not permit a complete survey of areas with limited or difficult access. Areas that should be investigated in future surveys include:

- White Marsh from the Bladen County line to Hallsboro Road southeast of Whiteville;
- Cove Swamp forest off the northwest side of Lake Waccamaw;
- the Waccamaw River floodplain away from the river between known standard sites, from highway NC 130 to the South Carolina border;
- Grissett Swamp/Seven Creeks swamp complex northwest from the Waccamaw River;
- Porter Swamp north and west from highway US 76;
- Bush Island in the Lumber River floodplain near Fair Bluff;
- and floodplain forests along Cape Fear River west (upstream) of Neils Eddy Landing.



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## INVENTORY OF SITES

This section contains a description of all megasites, macrosites, and standard sites identified during the inventory. Because of their nature, megasites and macrosites are described in general terms. The descriptions of standard sites are more detailed, and include the following:

**SITE NAME:** name assigned to the site by the N.C. Natural Heritage Program.

**GEOGRAPHIC SIGNIFICANCE:** whether a site is of national, statewide, or regional significance.

**SITE SIGNIFICANCE:** whether the site is of national, statewide, or regional geographic significance. Sites of countywide or lesser significance are not described.

**SIZE:** in acres when known, usually estimated.

**QUADRANGLE:** U.S.G.S. topographic quadrangle map(s) on which the site occurs.

**LOCATION:** placement of the site in relation to a known landform, such as a road, town, river, etc.

**SIGNIFICANT FEATURES:** biological and geophysical features that give the site its significance.

**GENERAL DESCRIPTION:** a description of the biological and topographical features of the site, focusing on the natural communities.

**OWNERSHIP:** name of owner given only when publically owned, or privately owned by a conservation organization.

**PROTECTION STATUS:** type of protection provided, if any.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** brief discussion of threats and impacts, and recommendations for maintenance or restoration of natural conditions.

**REFERENCES:** literature and reports specific to the site.

### **Waccamaw River Wetlands Megasite**

The Waccamaw River Wetlands Megasite consists of the entirety of the Waccamaw River floodplain from Lake Waccamaw to the South Carolina border, and also includes, Lake Waccamaw State Park, Friar Swamp, Juniper Creek Floodplain, and the lower reaches of White Marsh. The river and its floodplain possess several significant features. The

landforms created by the present-day river channel appear to be superimposed on landforms created by a much larger, ancient river. The waters and adjacent wetlands of the river support many rare animal and plant species, including several fish, mussels, and snails globally restricted (endemic) to the Waccamaw River system. In the Columbus County portion of the system, 21 rare animals and 30 rare plants are known from Lake Waccamaw and the Waccamaw River floodplain, including 10 animals and three plants that are federally designated. Several other rare species are known from the Brunswick County portion of the river floodplain. But it is in Columbus County where the most significant biological feature is found: the endemic animal species confined to Lake Waccamaw and adjacent waters.

The physiography of the river and its floodplain varies considerably as it courses downstream from Lake Waccamaw. From the headwaters dam at Lake Waccamaw to near the confluence with White Marsh creek (a distance of about 10 river miles), the river flows through a large swamp complex with little topographic relief. The river bank is low along this stretch, and floodwaters quickly overflow and spread out in the floodplain swamp. The floodplain in this area does not exhibit the ridge-and-swale pattern characteristic farther downstream. It is possible that these ancient fluvial patterns are buried beneath the gradual buildup of peat deposits in the swamp, which may be influenced by input from Green Swamp to the east.

Downstream from the confluence with White Marsh creek, the bank becomes more prominent and the river begins a complex series of meanders that continues into South Carolina. River width, depth, and flow rate become more variable, and flooding of adjacent habitat requires higher flood levels than in the swampy area upstream of White Marsh creek. The floodplain is characterized by terraces formed of ridge-and-swale systems associated with large meanders apparently made by a larger Waccamaw River during a theorized ancient phase as a brownwater river. These older ridge-and-swale systems extend as much as a mile or more away from the river. The present, smaller river continues to create new meanders and smaller ridge-and-swale systems, with these superimposed on the older system. The result is a complex mix of new and old landforms.

Nested within the megasite are one macrosite and thirteen standard sites, each of which contains significant biological and/or geomorphic features. Areas within the megasite not included within a standard site have been determined to be of lesser significance, but important to the overall integrity of the area, such as by providing corridors for animal populations and insuring the integrity of the active river channel. Each of the standard sites within the megasite is briefly summarized here, and more fully described in the following pages.

**Friar Swamp.** Located off the northeast shore of Lake Waccamaw, Friar Swamp contains large swamp forests, small stream swamps, and

floodplain islands supporting unusual forest communities. Big Creek, the swamp's central drainage channel, supports several populations of animals endemic (restricted) to the Lake Waccamaw vicinity.

**Lake Waccamaw.** This includes all of Lake Waccamaw to mean high water. The lake and adjacent waters contain more endemic animal species than any other site in North Carolina, and more than a dozen rare plant species occur along the shore. Lake Waccamaw is the largest known water-filled Carolina bay.

**Upper Waccamaw River Swamp.** This site includes all of the Waccamaw River floodplain from Lake Waccamaw south to Juniper Creek Road, plus portions of Bogue Swamp and lower White Marsh. The area is dominated by large swamp forests, but also supports upland forests on floodplain islands. Waccamaw River and other water features in the site support several animal populations endemic to the Lake Waccamaw vicinity.

**Waccamaw River Aquatic Habitat.** This site includes the active river channel from Lake Waccamaw to the South Carolina border. It supports several animal species endemic to the river and Lake Waccamaw, and the seasonally exposed shoreline supports a few very rare plant species. Much of the river below the confluence with White Marsh is characterized by geomorphic features associated with active meanders.

**Cove Swamp.** This site lies off the northwest shore of Lake Waccamaw. It includes swamp forest and Cove Canal, which is separated from the lake by a sandy barrier strand. The swamp and canal support populations of one rare plant and five rare animals, including two animals endemic to Lake Waccamaw and adjacent waters.

**Highway 130 at Waccamaw River.** This site occurs where highway NC 130 crosses a relict ridge-and-swale system in the river floodplain. The cleared road shoulder/powerline corridor contains a savanna plant association that supports plant species very rare in North Carolina.

**Highway 905 at Seven Creeks.** This site is located along highway NC 905 where it crosses Seven Creeks north of Pireway. It provides critical habitat for two Federal Candidate and one State Threatened plant species.

**Juniper Creek Floodplain.** The Juniper Creek Floodplain is an important corridor connecting Green Swamp to Waccamaw River. The floodplain is dominated by swamp forest, and the creek supports an animal species endemic to the Waccamaw River drainage.

**Waccamaw River Oxbow Site.** This site is located along the lower river about three air miles south of highway NC 904. It contains the greatest concentration of backwaters, active sloughs, and oxbow

lakes along Waccamaw River in North Carolina. The site supports populations of five rare plant species.

**Ward's Lake.** This site is located about one mile south of highway NC 130. It contains an excellent example of a river feature called a backwater, plus an active slough, channel bars, and a natural levee. The site supports populations of very rare plant species.

**Lake Waccamaw/Council Ridge.** This site lies off of the southeast shore of Lake Waccamaw within Lake Waccamaw State Park. It includes all of Council Ridge, the low ridge adjacent to the shore of the lake, and wetlands between Council Ridge and the lakeshore ridge. The ridges support natural communities that are uncommon in Columbus County, and unusual in relation to typical occurrences of the community types.

**Middle Waccamaw River Macrosite.** This macrosite includes Waccamaw River and floodplain features from the confluence with Gore Creek south to highway NC 904. It contains numerous landforms supporting most of the natural community types found in the river floodplain. Most prominent are the large, relict ridges and swales formed by the ancient, larger Waccamaw River. The following two standard sites are nested within the macrosite.

**Reeves Area Floodplain.** This large site is located southwest of Reeves Landing. It contains the greatest natural community diversity of any identified site along the Waccamaw River floodplain. There are good to excellent examples of virtually all of the landforms associated with the meander sections of the river, and with the relict ridge-and-swale terraces. The site supports populations of three very rare plant species.

**Waccamaw River Eleocharis Backwater.** This site is located between Gore Creek and Reeves Landing. The site contains good examples of several landforms and natural community types associated with both the active river channel and a relict ridge-and-swale system formed by the ancient, larger river. The site supports populations of two very rare plant species.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Friar Swamp

**SITE SIGNIFICANCE:** National

**SIZE:** est. 6650 acres

**COUNTY:** Columbus

**QUADRANGLE:** Lake Waccamaw East

**LOCATION:** Extending about five miles northeast from the southeast end of Lake Waccamaw, including Big Creek, Hickory Island, and the lower reaches of Slap Swamp.

**SIGNIFICANT FEATURES:**

1. Big Creek supports populations of five globally restricted animal species.
  - a. Among fishes, the Carolina pigmy sunfish (Elassoma boehlkei) is found only in the streams and canals adjacent to Lake Waccamaw, Upper Waccamaw River, and Juniper Creek. The Waccamaw killifish (Fundulus waccamensis) is found only in Lake Waccamaw and Phelps Lake in Washington County. The Carolina pigmy sunfish and Waccamaw killifish are Federal Candidates.
  - b. The Waccamaw fatmucket (Lampsilis fullerkati), a freshwater bivalve mollusk, is known only from Lake Waccamaw and adjacent waters. The Waccamaw fatmucket is a Federal Candidate.
  - c. Among freshwater gastropod mollusks, the Waccamaw snail (Amnicola sp. 1) and the Waccamaw siltsnail (Cincinnatia sp. 1) are known only from the lake and adjacent Big Creek. Both are species of Special Concern in North Carolina.
2. The American alligator (Alligator mississippiensis), is known to occur in the waters of Big Creek. The alligator is Federally Threatened. The black bear (Ursus americana) occurs in the extensive forests of Friar Swamp. The black bear is significantly rare in North Carolina.
3. Floodplain islands in Friar Swamp support two recently identified and highly unusual natural communities that may be new variants of known community types, or they may be new undescribed community types. One is related to the Nonriverine Wet Hardwood Forest community, and the other is related to the Coastal Fringe Evergreen Forest community.
4. Friar Swamp comprises one of the largest uninterrupted swamp systems in Columbus County. Its size, and the presence of remote upland islands, make this area very important for wildlife.

**GENERAL DESCRIPTION:** Most of this site is a broad floodplain and wet bottomland with muck soils. Several small creeks with mineral soil floodplains enter the swamp in its upper half. These small creek floodplains support the Coastal Plain Small Stream Swamp

(Blackwater Subtype). The largest part of the swamp, centered along Big Creek, supports the Cypress--Gum Swamp (Blackwater Subtype). An extensive swamp dominated by swamp red maple (Acer rubrum var. drummondii) is located in the southeastern part of the site, and has been tentatively classified as Nonriverine Swamp Forest. A series of sandy islands (floodplain islands) in the southeastern part of the site support two very distinctive and unusual communities tentatively classified as Nonriverine Wet Hardwood Forest and Coastal Fringe Evergreen Forest.

The Coastal Plain Small Stream Swamp occurs on mineral soil along the narrower floodplains at the upper end of the site. Both Slap Swamp and the narrowed arm of Friar Swamp have only a moderately well-defined main creek channel with intermittent flow. The canopy is a variable mix of swamp tupelo (Nyssa biflora), baldcypress (Taxodium distichum), Carolina red maple (Acer rubrum var. trilobum), laurel oak (Quercus laurifolia), swamp chestnut oak (Q. michauxii), and loblolly pine (Pinus taeda). The understory is similarly variable, with Carolina ash (Fraxinus caroliniana), ironwood (Carpinus caroliniana), swamp red bay (Persea palustris), American holly (Ilex opaca), and canopy species prominent. Shrubs include swamp doghobble (Leucothoe racemosa), Virginia sweetspire (Itea virginica), black highbush blueberry (Vaccinium fuscatum), fetterbush (Lyonia lucida), and dwarf palmetto. Vines are abundant and diverse, and herbs are patchy. Prominent herbs include ferns, lizard's-tail (Saururus cernuus), and whorled pennywort (Hydrocotyle verticillata var. triradiata). This appears to be a very good example of the community type, and baldcypress has successfully regenerated after logging.

The Cypress--Gum Swamp occurs on organic soil over most of the central and western part of the site, expanding in breadth north of highway US 74/76. The canopy is dominated by swamp tupelo and Carolina red maple, with water tupelo (Nyssa aquatica) and baldcypress codominant along Big Creek. Prominent understory trees are swamp red bay, Carolina ash, and ironwood. Vines are abundant and diverse, but herbs are fairly sparse, with netted chainfern (Woodwardia areolata) and sedges (Carex spp.) most common. Peatmoss (Sphagnum sp.) is abundant. Canopy trees are small and presumed young, averaging only 6-8 inches in diameter at breast height. Baldcypress stumps measuring 3-8 feet in diameter are evidence of the former stature of this forest.

The Nonriverine Swamp Forest is found in the southeastern part of the site. The organic soil is less wet than in the Cypress--Gum Swamp, perhaps rarely or only shallowly flooded, but often saturated during wet seasons. The dense canopy is dominated by swamp red maple, with tuliptree (Liriodendron tulipifera) a codominant in places. Swamp tupelo is abundant, but baldcypress is absent. The moderately dense understory is strongly dominated by swamp red bay. Muscadine (Vitis rotundifolia) and greenbrier (Smilax rotundifolia) vines are common, but shrubs and herbs are sparse. The

classification of this community is uncertain, and may represent a new natural community type known only from this site, Upper Waccamaw River Swamp, and possibly a few sites on the Lumber River.. Red maple dominance normally would be interpreted as successional for the Nonriverine Swamp Forest, but there is no evidence that other trees (e.g., baldcypress, pines, or oaks) ever dominated in this area. A patch of Atlantic white cedar (Chamaecyparis thyoides) and a few loblolly bays (Gordonia lasianthus) support the nonriverine classification.

The Nonriverine Wet Hardwood Forest occurs on loamy sand or sandy soil of low floodplain islands (upland rises) in the southeastern part of the swamp, apparently out of reach of floodwaters. The canopy is dominated by water oak (Quercus nigra) and swamp red maple, with loblolly pine prominent. The well-developed understory is dominated by swamp red bay and wild olive (Osmanthus americana). The moderately dense shrub layer is dominated by blue huckleberry (Gaylussacia frondosa), inkberry (Ilex glabra), and fetterbush. Muscadine is a patch dominant. Herbs are sparse. The classification of this community is uncertain. The low rises appear not to flood but are probably saturated during wet seasons. The presence of wild olive is unprecedented for the community type, and relates these low islands to the higher, drier swamp islands discussed below. Were they not naturally isolated from fire, these low rises might support the Wet Pine Flatwoods community.

The Coastal Fringe Evergreen Forest occurs on sandy soil on islands several feet higher in elevation than the surrounding swamp. The canopy is dominated by sand laurel oak (Quercus hemisphaerica), and generally codominated by hickory (Carya ovalis?), beech (Fagus grandifolia), loblolly pine, or water oak. Wild olive, American holly, and swamp red bay are prominent in the understory. Small-flower pawpaw (Asimina parviflora) and blue huckleberry are dominant in the patchy shrub layer. Muscadine vine and bracken form patches in the ground layer. This community belongs to a set of dry sandy swamp islands within the Waccamaw and Lumber river drainages. It is currently classified as Coastal Fringe Evergreen Forest, because it shares dominants within more typical examples of that type. However, further study may indicate that it should be treated as a separate community type.

Friar Swamp is the primary water source for Lake Waccamaw and undoubtedly plays a critical role in protecting the lake's water quality. The large size of the site and the presence of remote upland islands make this area very important for wildlife.

**OWNERSHIP:** Georgia-Pacific Corp. (6619 acres).

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The extensive Cypress--Gum Swamp is reported to have been logged in the 1940's, and traces of

the tram lines are still visible. Baldcypress has not regenerated following logging, thus the community has been altered. The maple swamp (Nonriverine Swamp Forest) is even-aged and presumably logged at the same time, but it is unclear whether its composition has been altered. The Small Stream Swamp and swamp islands appear to have been selectively logged, and thus are less altered. These forests should be allowed to reach maturity, for which no special management is needed. The presence of globally rare animals, the importance of the site to water quality in Lake Waccamaw, and the unusual natural communities make this a prime site for conservation.

**REFERENCES:**

- Adams, W. (ed.). 1990. Report on the conservation status of North Carolina's freshwater and terrestrial molluscan fauna. Scientific Council on Freshwater Mollusks report to N.C. Wildlife Resources Commission.
- Roe, C.E. 1983. Evaluation report, Lake Waccamaw Natural Area, proposed National Natural Landmark. N.C. Natural Heritage Program, DPR, DEHNR. Contains extensive reference list of biological studies in Lake Waccamaw and adjacent waters.
- Schafale, M.P., and C. Smith. 1995. Site survey report: Friar Swamp. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Lake Waccamaw

**SITE SIGNIFICANCE:** National

**SIZE:** 8,934 acres

**COUNTY:** Columbus

**QUADRANGLE:** Lake Waccamaw West  
Lake Waccamaw East

**LOCATION:** South of the town of Lake Waccamaw, between Friar Swamp to the northeast, and Waccamaw River to the south.

**SIGNIFICANT FEATURES:**

1. Lake Waccamaw contains the largest concentration of endemic animal species of any site in North Carolina. Ten species are globally restricted to the lake and/or its immediately adjacent waters. Another species is found only at Lake Waccamaw and at one site outside of the Waccamaw River drainage.
  - a. Among fishes, the Waccamaw darter (Etheostoma perlongum) and the Waccamaw silverside (Menidia extensa) are found only in Lake Waccamaw and adjacent waters, and nowhere else in the world. The Carolina pigmy sunfish (Elassoma boehlkei) is found only in the streams and canals adjacent to Lake Waccamaw, Upper Waccamaw River, and Juniper Creek. The Waccamaw killifish (Fundulus waccamensis) is found only in and adjacent to Lake Waccamaw, and in Lake Phelps in Washington County. The Waccamaw silverside is Federally Threatened. The Waccamaw killifish and Carolina pigmy sunfish are Federal Candidates. The Waccamaw darter is a species of Special Concern in North Carolina.
  - b. Among freshwater bivalve mollusks, the Waccamaw lance pearlymussel (Elliptio sp. 5) is found only in Lake Waccamaw. Three other bivalves are known only from the lake and adjacent waters: the Waccamaw spike (Elliptio waccamawensis), the Waccamaw lampmussel (Lampsilis crocata), and the Waccamaw fatmucket (L. fullerkerati). The Waccamaw spike, Waccamaw lance pearlymussel, and Waccamaw fatmucket are Federal Candidates. The Waccamaw lampmussel is a species of Special Concern in North Carolina.
  - c. Among freshwater gastropod mollusks, the Waccamaw snail (Amnicola sp. 1) and the Waccamaw siltsnail (Cincinnatia sp. 1) are known only from the lake and adjacent Big Creek. Both are species of Special Concern in North Carolina.

- d. Among terrestrial gastropod mollusks, the Waccamaw ambersnail (Catinella waccamawensis) is known only from the shore of Lake Waccamaw. It is a State Threatened species.
2. Six other animal species recognized as rare occur in Lake Waccamaw and/or adjacent waters: American alligator (Alligator mississippiensis), broadtail madtom (Noturus sp. 2, a fish), the pod lance (Elliptio folliculata, a bivalve mollusk), tidewater mucket (Leptodea ochracea, a bivalve mollusk), savanna lilliput (Toxolasma pullum, a bivalve mollusk), and Cape Fear threetooth (Triodopsis soelneri, a terrestrial gastropod). The American alligator is Federally Threatened, and the savanna lilliput and Cape Fear threetooth are Federal Candidates. The broadtail madtom, pod lance, and tidewater mucket are species of Special Concern in North Carolina.
  3. The near-shore waters of Lake Waccamaw, particularly at the southeast shore adjacent to Lake Waccamaw State Park, support one of the most diverse and best developed natural lake shoreline plant communities in the state. Twelve plant species recognized as rare in North Carolina occur in this habitat: blue water-hyssop (Bacopa caroliniana), twig-rush (Cladium mariscoides), erectleaf witch grass (Dichantherium erectifolium), green fly orchid (Epidendrum conopseum), seven-angled pipewort (Eriocaulon aquaticum), globe-fruit seedbox (Ludwigia sphaerocarpa), southern water grass (Luziola fluitans), southeastern panic grass (Panicum tenerum), West Indies meadow-beauty (Rhexia cubensis), water arrowhead (Sagittaria stagnorum), lace-lip ladies'-tresses (Spiranthes laciniata), and northeastern bladderwort (Utricularia resupinata). Lace-lip ladies'-tresses is a State Candidate. All of the other species are significantly rare in North Carolina. Blue water-hyssop is not currently known from any other site in the state, and Lake Waccamaw is the only known Columbus County site for twig-rush, erectleaf witch grass, seven-angled pipewort, globe-fruit seedbox, West Indies meadow-beauty, and northeastern bladderwort. Northeastern bladderwort is known from only one other site in North Carolina, and globe-fruit seedbox is known from only two other sites in the state.
  4. Limestone outcrops along the shoreline support the only naturally-occurring population of Venus hair fern (Adiantum capillus-veneris) in North Carolina, and are the historical site of two rare liverwort species (Cylindrocolea rhizantha) and Lejeunea bermudiana). Venus hair fern and the Cylindrocolea liverwort are State Candidates. Pale mannagrass and the Lejeunea liverwort are significantly rare in North Carolina.
  5. Lake Waccamaw is the largest of all water-filled Carolina bays, and is the largest Carolina bay (with or without water) in North Carolina.

**GENERAL DESCRIPTION:** Lake Waccamaw is a naturally-occurring lake within a geomorphic feature known as a Carolina bay. Carolina bays are found along the Atlantic Coastal Plain from the Delmarva Peninsula to Georgia, and are most common in southeastern North Carolina. They are elliptically-shaped depressions usually oriented along a northwest/southeast axis and surrounded by a low sand ridge called a bay rim. Lake Waccamaw, covering an area of 14 square miles (8,934 acres), is the third largest natural lake in North Carolina (after Lake Mattamuskeet and Lake Phelps). The lake is shallow for its size, with a maximum depth of 11 feet and an average depth of five feet.

The lake is fed primarily by springs (groundwater) and drainages from swamps above the northeast shore. Big Creek is the largest of the swamp drainage streams entering the lake. The lake water is essentially clear but tea-colored, the result of tannic acids leached from decaying vegetation, a natural feature of Coastal Plain waters. Unlike most Coastal Plain waterbodies, which generally have a low (acidic) pH, the waters of Lake Waccamaw have a neutral pH. This is likely caused by contact with surface and subsurface limestone ("marl") deposits. The spectacular aquatic animal diversity of Lake Waccamaw is due in part to this natural "sweetening" of lake waters. The lake serves as headwaters of Waccamaw River, which outflows at a small dam located along the south shore of the lake.

The shoreline of Lake Waccamaw is characterized by a shallowly submerged broad sandy shelf that rises shoreward to a low sandy ridge in most places. This low ridge is residentially developed except along the southeast shore adjacent to the state park. The shallow near-shore waters support the Natural Lake Shoreline natural community. It is characterized by a broad zone of emergent grasses, sedges, and wildflowers. Although this zone is essentially permanently flooded, lake waters are often very shallow, periodically exposing some offshore sand bars and permitting a greater diversity of plant life. A few larger sand bars are more-or-less permanently exposed--small islands supporting a few trees and shrubs. Prominent tall herbs include maidencane grass (Panicum hemitomon), twig-rush sedge (Cladium mariscoides), white doll's-daisy (Boltonia asteroides), and globe-fruit seedbox (Ludwigia sphaerocarpa). Prominent low herbs include bright-green spikerush (Eleocharis olivacea), one-flower hardscale (Sclerolepis uniflora), and spadeleaf (Centella erecta). The Lake Waccamaw natural lake shoreline community supports 12 plant species recognized as rare in North Carolina, and supports many of the rare animal species during at least a part of their life cycles. Pond cypress (Taxodium ascendens) is also present, forming a sparse and scattered canopy of trees typically only six feet high. Larger cypress trees are found elsewhere in the shallow waters of the lake, such as near the Waccamaw River outlet, where the lake is bordered by swamp.

A Coastal Plain Marl Outcrop natural community occurs along the north shore of the lake. This community is characterized by vertical and overhanging low limestone ("marl") cliffs within the wave spray zone of the lake. Portions of the foot of the cliffs are within the high water mark, but all of the cliff area above high water is privately owned. The cliffs extend for about 1000 feet along the lake shore, and are notable for supporting the only natural population of Venus hair fern (Adiantum capillus-veneris) in North Carolina. The moist cliff faces are mostly exposed rock except for prominent patches of mosses and liverworts.

Terrestrial habitat adjacent to the southeastern portion of the lake is described in the site description for Lake Waccamaw/ Council Ridge. Swamp and riverine communities located near the headwaters of Waccamaw River along the south shore of the lake are described in the site descriptions for Upper Waccamaw River Swamp and Waccaamw River Aquatic Habitat.

**OWNERSHIP:** State of North Carolina.

**PROTECTION STATUS:** The lake, a registered heritage area, is state-owned to the high water mark, and is managed by the NC Division of Parks and Recreation. Although the lake is managed in conjunction with Lake Waccamaw State Park, the two units legally are separate entities.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Lake Waccamaw is a state-owned Registered Heritage Area, but the adjacent shoreline is privately owned except for that portion in Lake Waccamaw State Park. Most of the residentially developed portion of the lake shoreline is connected to a public sewer system, but a section of residences along the northeast shore is equipped with on-site spetic systems, which pose a threat to lake water quality. It is recommended that public sewerage be extended to this area. Yard waste and yard maintenance chemicals (fertilizers, pesticides, herbicides) also pose a threat to lake water quality, and residents should do all they can to prevent runoff and erosion. There are localized direct impacts to the shore and near-shore waters from pier construction and boat landings, and these may affect water flow patterns and sediment distribution. Recreational beach use impacts vegetation growth (and thus aquatic animal habitat), thereby increasing the potential for shoreline erosion. It is recommended that no additional recreational beaches, landings, or piers be constructed along the shoreline fronting the state park.

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- Cape Fear threetooth snail (Triodopsis soelneri, a terrestrial gastropod), and Pee Dee lotic crayfish (Procambarus leptodactylus, a crustacean). The American alligator is Federally Threatened. The Cape Fear threetooth snail and Pee Dee lotic crayfish are Federal Candidates. The broadtail madtom, pod lance, and tidewater mucket are Special Concern in North Carolina. The black bear is significantly rare in North Carolina. A rare bird, the black vulture (Coragyps atratus), likely breeds in the floodplain swamps of the Waccamaw River, but this has not yet been documented.
3. Four rare plant species are known from the Upper Waccamaw River Swamp habitat: swamp forest beaksedge (Rhynchospora decurrens), Plymouth gentian (Sabatia kennedyana), swamp jessamine (Gelsemium rankii), and sarvis holly (Ilex amelanchier). Swamp forest beaksedge is a Federal Candidate. Plymouth gentian is State Threatened-Special Concern. Swamp jessamine and sarvis holly are significantly rare in North Carolina.
  4. Floodplain islands in the Upper Waccamaw River Swamp habitat support three highly unusual natural communities that may be new variants of known community types, or they may be new undescribed community types. They are related to the Nonriverine Wet Hardwood Forest, Mesic Mixed Hardwood Forest, and Coastal Fringe Evergreen Forest community types.
  5. The Upper Waccamaw River Swamp comprises the largest uninterrupted swamp system in Columbus County. Its size, and the presence of remote upland islands, make this area very important for wildlife. A special habitat called Wading Bird Rookery occurs at two areas in the site.

**GENERAL DESCRIPTION:** The Upper Waccamaw River swamp includes the Waccamaw River floodplain and adjacent swamps south from the headwaters of the river at the south shore of Lake Waccamaw to Juniper Creek Road (SR 1928). The great majority of the site lies west of the river. It is approximately bordered by Lake Waccamaw and Betsy Burgh Island along the north, Hallsboro Road (SR 1001) and the upland edge of White Marsh swamps along the west, Juniper Creek Road along the south, and Crusoe Island and Green Swamp along the east. In the northern and central portions of the site, the river channel is characterized by long straight stretches as it courses through the relatively featureless broad swampy floodplain. In the southern portion of the site, downstream from the confluence with White Marsh, the fluvial landforms become more prominent, and the river enters the meander system that characterizes it to and beyond the South Carolina border. Although most of the area is dominated by swamp forest, several community types and different landforms are present. The levee along the river edge supports the Coastal Plain Natural Levee Forest (Blackwater Subtype). The broad floodplain extending away from the river in the northern and central portions of the site is dominated by Cypress--Gum Swamp (Blackwater Subtype). Upland rises within the swamp known as floodplain islands support

Nonriverine Wet Hardwood Forest, Mesic Mixed Hardwood Forest, and Coastal Fringe Evergreen Forest. Low alluvial ridges along lower White Marsh creek near its confluence with Waccamaw River support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). The Aquatic and Sand and Mud Bar communities occurring within the Waccamaw River channel are discussed in the site description for Waccamaw River Aquatic Habitat.

The Coastal Plain Levee Forest occurs on wet sandy or mucky soil along the edge of the river on low rises formed by floodwater sediment deposition. Because floodwater spreads out over the broad swamps away from the river, flooding on the levee is shallower and of a shorter duration. The composition of the levee community differs between the area near the headwaters of the river, and the area to the south above Juniper Creek Road. Near the headwaters of the river, the levee is very low, usually only one or two feet higher than the river at mean water level. Southward, the levee is higher, often several feet above mean water. In the headwaters area, the levee canopy is dominated by baldcypress (*Taxodium distichum*) and a mix of hardwoods, the most common of which are red maple (*Acer rubrum*), water tupelo (*Nyssa aquatica*), American elm (*Ulmus americana*), and sweetgum (*Liquidambar styraciflua*). On the back slope of the levee, where it grades to the adjacent swamp, the canopy is dominated by water tupelo and red maple. Southward, baldcypress and water tupelo become less prominent, and laurel oak (*Quercus laurifolia*), overcup oak (*Q. lyrata*), and river birch (*Betula nigra*) become more prominent. Red maple, Carolina ash (*Fraxinus caroliniana*), and American holly (*Ilex opaca*) are prominent in the understory. Shrub layer density is variable, and includes mayberry (*Vaccinium elliotii*), titi (*Cyrilla racemiflora*), Virginia sweetspire (*Itea virginica*), and coastal sweet-pepperbush (*Clethra alnifolia*). Vines are frequently diverse and can reach a large size. The herb layer commonly is well-developed, with violets (*Viola* spp.) and sedges (*Carex* spp.) prominent in the spring.

The Cypress--Gum Swamp is extensive at this site, dominating much of the broad floodplain. Over large areas, the peaty muck soils are flooded to a depth of one or two feet for much of the year. In addition to occurring on the broad floodplain flats, the Cypress--Gum Swamp also occurs in active sloughs associated with the current river channel, where it differs somewhat. In the broad floodplain flats, the moderately dense canopy is dominated by water tupelo, with baldcypress, swamp tupelo, and laurel oak prominent. Carolina ash and red maple dominate the understory. The shrub layer is typically sparse to absent, but the herb layer can be dense. When the soil is exposed, such herbs as Virginia buttonweed (*Diodia virginiana*), climbing hempvine (*Mikania scandens*), marsh dayflower (*Murdannia keisak*), and sedges (*Carex* spp.) are prominent. The canopy is moderately mature near the river, but the trees are smaller over most of the area, the result of logging. The community also occurs in active sloughs along the river. These are elongate, former sections of the river channel in the active meander areas.

The sloughs tend to flood for longer periods than the adjacent floodplain, and can carry flowing water during high water levels. The moderately open canopy is dominated by water tupelo, and baldcypress is a frequent codominant. Carolina ash, water-elm (Planera aquatica), and red maple are prominent in the moderately dense subcanopy. Prominent shrubs include Virginia sweetspire, sarvis holly, titi, and fetterbush (Lyonia lucida). The herb layer is sparse.

Located within the swamp forest are two Wading Bird Rookery Special Habitats. These are documented breeding sites for herons, and occur in Bogue Swamp 1-2 miles northwest and southwest of the head of Waccamaw River at Lake Waccamaw.

The Nonriverine Wet Hardwood Forest occurs on wet loamy sand or sandy soil of low floodplain islands (upland rises) in the broad floodplain swamps. The moderate canopy is dominated by loblolly pine (Pinus taeda), water oak (Quercus nigra), laurel oak, and red maple. The dense understory is dominated by wild olive (Osmanthus americana) and swamp red bay (Persea palustris). Prominent in the moderately dense shrub layer are sassafras (Sassafras albidum), sweet azalea (Rhododendron canescens), witch-alder (Fothergilla gardenii), and blue huckleberry (Gaylussacia frondosa). Vines are dense, with briars (Smilax spp.) dominating. The herb layer is very sparse. The classification of this community is uncertain, and may represent a new natural community type known only from this site, Friar Swamp, and possibly a few sites on the Lumber River. The low rises appear not to flood but are probably saturated during wet seasons. The presence of wild olive is unprecedented for the community type. Were they not naturally isolated from fire, these low rises might support the Wet Pine Flatwoods community.

The Mesic Mixed Hardwood Forest occurs on moderate elevation floodplain islands with mesic sandy or loamy sand soil. The canopy is dominated by loblolly pine, beech (Fagus grandifolia), laurel oak, and sweetgum. Canopy trees are large, reaching 2-3 feet in diameter. In the understory, ironwood (Carpinus caroliniana), sassafras, American holly, and swamp red bay are frequent. Muscadine (Vitis rotundifolia) and brier (Smilax spp.) vines often occur in dense tangles. Herbs are sparse. The classification of this community occurrence is uncertain. It appears to represent the Swamp Island Variant of the Mesic Mixed Hardwood Forest, but it is a highly unusual and perhaps unique assemblage.

The Coastal Fringe Evergreen Forest occurs on drier sandy soils of the highest floodplain island. The canopy is dominated by loblolly pine and sand laurel oak (Quercus hemisphaerica). Prominent in the understory are American holly, swamp red bay, sassafras, and persimmon (Diospyros virginiana). Muscadine vine is abundant, and herbs are sparse. This community belongs to a set of dry sandy swamp islands within the Waccamaw and Lumber river drainages. It is currently classified as Coastal Fringe Evergreen Forest, because it

shares dominants within more typical examples of that type. However, further study may indicate that it should be treated as a separate community type.

The Coastal Plain Bottomland Hardwoods occurs on wet mineral soils of low ridges associated with a relict ridge-and-swale system along lower White Marsh creek near its confluence with Waccamaw River. The ridges typically are only 1-2 feet higher than the adjacent swampy swales. The canopy is dominated by laurel oak, and water tupelo, baldcypress, sweetgum, and red maple are prominent. Important understory and shrub layer plants include Carolina ash, swamp red bay, Virginia sweetspire, and coastal sweet-pepperbush. Prominent vines include poison ivy (Toxicodendron radicans), Virginia creeper (Parthenocissus quinquefolia), and American wisteria (Wisteria frutescens). Some of the forest has been logged, but portions are mature, and overall the forest is in good condition.

**OWNERSHIP:** The area in the vicinity of the headwaters of Waccamaw River is within Lake Waccamaw State Park and owned by the State of North Carolina. Most of the site south of the state park to Juniper Creek Road is owned by Georgia-Pacific Corp.

**PROTECTION STATUS:** Only that portion within Lake Waccamaw State Park is protected.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The Upper Waccamaw River Swamp comprises one of the largest uninterrupted swamp systems in Columbus County. Its size, and the presence of remote upland islands, make this area very important for wildlife. The condition of the river is critical for the rare species that occur at the site, since almost all are aquatic or stream-side inhabitants. These species depend on high water quality and natural fluctuations of water levels for survival. To protect water quality and natural flow levels, the swamp forests on both sides of the river need to be protected, as well as areas along the river itself. An extensive tract of protected forest will additionally protect animals that have large territories and home ranges, such as bears, hawks, and owls.

**REFERENCES:**

- Adams, W. (ed.). 1990. Report on the conservation status of North Carolina's freshwater and terrestrial molluscan fauna. Scientific Council on Freshwater Mollusks report to N.C. Wildlife Resources Commission, Raleigh.
- Lynch, J.M. 1980. North Carolina natural areas preserve design study: Lake Waccamaw. N.C. Nature Conservancy, Carrboro.
- Roe, C.E. 1983. Evaluation report, Lake Waccamaw Natural Area,

proposed National Natural Landmark. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh. Contains extensive reference list of biological studies.

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design: Sites 1, 2, 5, 6, 7, and 23. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Schafale, M.P., and R.S. Marty. 1987. Natural area reconnaissance: Bogue Swamp Islands. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Smith, E.L.V. 1978. Memorandum to Bob Buckner: Waccamaw River preliminary analysis. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Soots, R.F., Jr., and J.F. Parnell. 1979. Inland heronries of North Carolina. Chat 43:10-16.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Waccamaw River Aquatic Habitat

**SITE SIGNIFICANCE:** National

**SIZE:** Variable and undeterminable due to constant change in site's geomorphology.

**COUNTY:** Columbus / Brunswick

**QUADRANGLE:** Lake Waccamaw West / Old Dock / Juniper Creek / Freeland / Pireway / Longs

**LOCATION:** Active channel of Waccamaw River from its headwaters in Lake Waccamaw to the South Carolina border.

**SIGNIFICANT FEATURES:**

1. The site supports populations of seven animal species endemic (globally restricted) or nearly endemic to the Waccamaw River drainage: four fishes, two freshwater bivalve mollusks, and one freshwater gastropod mollusk.
  - a. Among fishes, the Waccamaw silverside (Menidia extensa) and Waccamaw darter (Etheostoma perlongum) are found only in Lake Waccamaw and upper Waccamaw River, and nowhere else in the world. The Carolina pigmy sunfish (Elassoma boehlkei) is found only in the streams and canals adjacent to Lake Waccamaw, Upper Waccamaw River, and Juniper Creek. The Waccamaw killifish (Fundulus waccamensis) is found only in and adjacent to Lake Waccamaw, and in Lake Phelps in Washington County. The Waccamaw silverside is Federally Threatened. The Waccamaw killifish and Carolina pigmy sunfish are Federal Candidates. The Waccamaw darter is Special Concern in North Carolina.
  - b. Among freshwater bivalve mollusks, the Waccamaw spike (Elliptio waccamawensis) and Waccamaw fatmucket (Lampsilis fullerkati) are known only from Lake Waccamaw and adjacent waters. Both are Federal Candidates.
  - c. The Waccamaw snail (Amnicola sp. 1), a freshwater gastropod mollusk, is known only from Lake Waccamaw and adjacent waters. It is Special Concern in North Carolina.
2. Five other rare animal species are known to occur in the river channel: the American alligator (Alligator mississippiensis), broadtail madtom (Noturus sp. 2, a fish), pod lance (Elliptio folliculata, a freshwater bivalve mollusk), tidewater mucket (Lampsilis ochracea, a freshwater bivalve mollusk), and Pee Dee lotic crayfish (Procambarus leptodactylus). The American alligator is Federally

- Threatened, and the Pee Dee lotic crayfish is a Federal Candidate. The broadtail madtom, pod lance, and tidewater mucket are Special Concern in North Carolina.
3. Six rare plant species occur within the active channel or in transitional habitat between the channel and adjacent developing swamp or levee forest.
    - a. Four rare plant species occur within the active channel of the river: Harper's fimbry (Fimbristylis perpusilla), small-flowered hemicarpha (Lipocarpha micrantha), Bosc's bluet, (Oldenlandia bosci), and Plymouth gentian (Sabatia kennedyana). Harper's fimbry is a Federal Candidate. Plymouth gentian is State Threatened-Special Concern. Small-flowered hemicarpha and Bosc's bluet are significantly rare in North Carolina.
    - b. Two rare plant species occur in transitional (ecotonal) habitat: sarvis holly (Ilex amelanchier), and swamp forest beaksedge (Rhynchospora decurrens). Swamp forest beaksedge is a Federal Candidate. Sarvis holly is significantly rare in North Carolina.
  4. The channel bars when exposed support an unusually diverse herb community containing many species not found along other blackwater rivers.

**GENERAL DESCRIPTION:** The Waccamaw River Aquatic Habitat includes the permanently inundated portion of the river channel plus the seasonally exposed shoreline. The upland border of the shoreline is more-or-less determined by where tree growth begins. The inundated portion of the channel contains poorly known but highly significant aquatic communities supporting several animal species endemic to the Waccamaw River drainage. When exposed, the shoreline provides habitat for the Sand and Mud Bar community, which supports a diverse herb community, including a few very rare plant species. During extreme drawdowns, limestone beds are exposed near the bottom of the river channel.

The active river channel contains several landforms: fishponds, meanders, backwaters, channel bars, and point bars. Point bar ridges and levees, although formed by the active channel, support forested communities and thus are not part of the aquatic habitat (they are described at other Waccamaw River sites). Unlike the other channel landforms, the ridges and levees are not inundated when river water levels are below flood-stage.

The aquatic communities are at least in part distinguished by river flow rates. Current velocity varies among the normal channel, fishponds, meanders, and backwaters. Fishponds are wide, deep, slow-flowing sections of river often a half-mile or more long. They are located along relatively straight stretches, primarily where the river flows through broad swamps in the upper river. Meanders are looping bends in the river that slow the current and cause sediment to be deposited on the inside (concave shore) of the meander.

Backwaters are lobes in the channel located at the downstream end of active sloughs. The sloughs are former channel segments subsequently sealed off by sedimentation at the upstream end. Except during flooding, there is no flow in backwaters even though they are part of the river. The shallow margins of backwaters usually grade into Cypress--Gum Swamp.

These variable flow rates result in differing nutrient and sediment loads in river water, and in the composition of the channel bottom, which can be sandy, silty, or peaty. In areas with continuous flow, there is essentially no aquatic vegetation, but submersed vegetation may take hold in quiet waters. All of these factors are critical for the river's rare animal populations.

The Sand and Mud Bar community occurs on seasonally exposed channel bars and point bars. Because channel bars occur in straight river stretches with minimal resistance to current flow, they do not receive as much sediment as the point bars do. In fishponds, channel bars tend to become silty because the slow flow rate allows fine sediment to settle out. Point bars are formed on the inside of meanders (convex shore of the river). Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. The landward portions of point bars are thus higher in elevation than channel bars, and these higher portions undergo succession to the Coastal Plain Levee Forest community type.

During periods of low water levels (drawdowns) in the river, the exposed channel and point bars are quickly vegetated by fast-growing and often very small, annual flowering plants (quickness and smallness are adaptations to the brief periods of exposure). Because of the long periods of inundation, woody plants are unable to persist at these sites. A few large perennial herbaceous plants have been able to adapt to the bars because of well-developed underground storage systems. Red top panic grass (Panicum rigidulum var. rigidulum) is frequently the dominant large herb on both channel bars and point bars. Water smartweed (Polygonum punctatum), another large herb, can also form large patches. Frequent small herbs include Baldwin's spikerush (Eleocharis baldwinii), whorled pennywort (Hydrocotyle verticillata var. triradiata), creeping rush (Juncus repens), yellowseed pimpernel (Lindernia dubia var. anagallidia), and many-spiked flatsedge (Cyperus polystachyos var. texensis). Although point bars are higher than channel bars, the areas exposed during drawdowns tend to be more sparsely vegetated with fewer species than channel bars. This is probably due to the greater accumulation of sediment on point bars and the burial of vegetation. Quicker evaporation, lower fertility, and poorer stability of the sandy substrate of point bars may also be factors.

Among the rare plants, Harper's fimbry, small-flowered hemicarpha, and Bosc's bluet are essentially restricted to the channel bars. Plymouth gentian occurs on both channel and point bars. Sarvis

holly and swamp forest beaksedge can occur in the transition zone (ecotone) between the upper shoreline and adjacent forest.

**OWNERSHIP:** Private except for the headwaters area within Lake Waccamaw State Park.

**PROTECTION STATUS:** None except for the portion within Lake Waccamaw State Park.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The condition of the river is critical for the rare species that occur at the site, since almost all are aquatic or stream-side inhabitants. These species depend on high water quality and natural fluctuations of water levels for survival. To protect water quality and natural flow levels, the swamp forests on both sides of the river need to be protected, as well as areas along the river itself. Water quality in Lake Waccamaw, and in waters flowing into the lake, directly bears on water quality in Waccamaw River. Elevated mercury concentrations have been found in largemouth bass and several other species in the river, but there is no known point source or past cause for this contamination (NCWQS, 1994).

**REFERENCES:**

Adams, W. (ed.). 1990. Report on the conservation status of North Carolina's freshwater and terrestrial molluscan fauna. Scientific Council on Freshwater Mollusks report to N.C. Wildlife Resources Commission.

NCWQS. 1994. Lumber River basinwide water quality management plan. N.C Water Quality Section, DEM, DEHNR, Raleigh.

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Schafale, M.P., and C.E. Roe. 1987. Notes on a visit to the lower Waccamaw River in North Carolina. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Cove Swamp

**SITE SIGNIFICANCE:** Statewide                   **SIZE:** est. 300 acres

**COUNTY:** Columbus                                   **QUADRANGLE:** Lake Waccamaw West

**LOCATION:** Adjacent to northwest shore of Lake Waccamaw.

**SIGNIFICANT FEATURES:**

1. The site supports populations of two animal species globally restricted to Lake Waccamaw and adjacent waters: the Waccamaw spike (Elliptio waccamawensis), a freshwater bivalve mollusk; and the Waccamaw snail (Amnicola sp. 1), a freshwater gastropod mollusk. Also occurring at the site is the Cape Fear threetooth (Triodopsis soelneri), a terrestrial gastropod mollusk restricted to southeastern North Carolina. The Waccamaw spike and Cape Fear threetooth are Federal Candidate and State Threatened species. The Waccamaw snail is a State Special Concern species.
2. Also known from the site are the American alligator (Alligator mississippiensis), Federally and State Threatened; and the tidewater mucket (Lampsilis ochracea), a State Special Concern freshwater bivalve mollusk.
3. Pale mannagrass (Torreyochloa pallida), significantly rare in North Carolina, has been documented from the site.

**GENERAL DESCRIPTION:** Cove Swamp occupies a crescent-shaped depression adjacent to the northwest shore of Lake Waccamaw. It is separated from the lake by a residentially developed barrier strand. Cove Canal occurs at the perimeter of the swamp along the strand. The swamp appears to occupy the extreme northwest end of the original Carolina bay containing Lake Waccamaw, which was apparently cut off from open water by the littoral development of the barrier strand. The swamp appears to be dominated by the Cypress--Gum Swamp community type, but the area inland from the canal has not been investigated. The uplands bordering the site along the northwest side have been converted to cropland.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Site should be passively managed for maintenance of the swamp forest community. Of particular importance is water quality in Cove Canal, which supports the rare species populations. Canal waters should be protected from runoff sediments, nutrients, and chemicals associated with the roadbed and residences on the barrier strand.

**REFERENCES:**

Adams, W. (ed.). 1990. Report on the conservation status of North Carolina's freshwater and terrestrial molluscan fauna. Scientific Council on Freshwater Mollusks report to N.C. Wildlife Resources Commission.



**OWNERSHIP:** NC Department of Transportation; powerline easement.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Maintenance mowing of the powerline corridor promotes herb dominance of the site by cutting back woody growth, a condition maintained by fire in natural circumstances. Mowing during the growing season can interfere with plant flowering and seed production, and inhibit a plant's ability to photosynthesize and store nutrients. These impacts can be avoided by mowing during winter dormancy, or mitigated by not mowing every year. Ideally, roadside and powerline microsites should be burned instead of mowed.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Highway 130 at Waccamaw River. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.



production, and inhibit a plant's ability to photosynthesize and store nutrients. These impacts can be avoided by mowing during winter dormancy, or mitigated by not mowing every year.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Highway 905 at Seven Creeks. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Juniper Creek Floodplain

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 7000 acres, roughly equally divided between Columbus and Brunswick counties

**COUNTY:** Columbus / Brunswick      **QUADRANGLE:** Old Dock /  
Juniper Creek

**LOCATION:** Along boundary between Columbus and Brunswick counties from confluence of Honey Island Creek to Waccamaw River.

**SIGNIFICANT FEATURES:**

1. Juniper Creek provides habitat for the Carolina pygmy sunfish (*Elassoma boehlkei*), which is endemic (globally restricted) to the upper Waccamaw River drainage. The Carolina pygmy sunfish is a Federal Candidate/State Threatened freshwater fish.
2. The site supports populations of two rare plant species: sarvis holly (*Ilex amelanchier*) and Plymouth gentian (*Sabatia kennedyana*). Plymouth gentian is State Threatened-Special Concern. Sarvis holly is significantly rare in North Carolina.
3. Juniper Creek Floodplain is an extensive, mostly uninterrupted swamp system connecting Green Swamp to the Waccamaw River drainage.

**GENERAL DESCRIPTION:** Juniper Creek Floodplain, along with its major tributary, Honey Island Swamp, drains much of the northern half of Green Swamp westward into the Waccamaw River. The floodplain soils are deep muck from Honey Island Swamp downstream to near Juniper Creek Road (SR 1928) where the soil becomes wet to periodically inundated sandy loam. Explored areas support Cypress--Gum Swamp, with tupelo (*Nyssa* sp.) dominant and cypress (*Taxodium* sp.) prominent in the canopy. The moderately dense shrub layer is dominated by swamp red bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), and titi (*Cyrilla racemiflora*). The swamp forest has been logged in recent decades, and most of the canopy is young, but small areas with mature canopy persist.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Juniper Creek Floodplain forest should be allowed to mature to protect this important natural corridor between Green Swamp and Waccamaw River, and to protect the

critical habitat the creek provides for the endemic Carolina pygmy sunfish.

**REFERENCES:**

Schafale, M.P., and A.S. Weakley. 1988. Preliminary site reconnaissance survey: Juniper Creek. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Waccamaw River Oxbow Site

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 600 acres, about equally divided between Columbus and Brunswick counties.

**COUNTY:** Columbus / Brunswick      **QUADRANGLE:** Longs / Calabash

**LOCATION:** Lower part of Waccamaw River, approximately three air miles south of highway NC 904.

**SIGNIFICANT FEATURES:**

1. The site provides habitat for five rare plant species: green fly orchid (Epidendron conopseum), Harper's fimbry (Fimbristylis perpusilla), Bosc's bluet (Oldenlandia boscii), swamp forest beaksedge (Rhynchospora decurrens), and Plymouth gentian (Sabatia kennedyana). Harper's fimbry and swamp forest beaksedge are Federal Candidates. Plymouth gentian is State Threatened-Special Concern. Green fly orchid and Bosc's bluet are significantly rare in North Carolina. Harper's fimbry, swamp forest beaksedge, and Plymouth gentian are known only from the Waccamaw River drainage in North Carolina.
2. The site contains the greatest concentration of backwaters, active sloughs, and oxbow lakes along Waccamaw River in North Carolina.

**GENERAL DESCRIPTION:** The site contains several landforms associated with the active river channel: backwaters, channel and point bars, active sloughs, and oxbow lakes. Low elevation relict ridges and swales occur back from the river. The channel and point bars support the Sand and Mud Bar community. Cypress--Gum Swamp (Blackwater Subtype) occurs in the shallow parts of backwaters, in the active sloughs, and in swales (relict sloughs) away from the active channel. Relict floodplain ridges support Coastal Plain Bottomland Hardwoods (Blackwater Subtype).

Channel bars and point bars are depositional features within the active river channel that are exposed during water level drawdowns.

Sandy to silty channel bars are formed along straight stretches of the river. Sandy point bars are formed on the inside of meanders (convex shore of the river). Both support the Sand and Mud Bar community, which is characterized by the absence of woody species, and dominance by small herbs that can reproduce quickly during the often brief drawdown periods. Baldwin's spikerush (Eleocharis baldwinii), yellowseed pimpernel (Lindernia dubia var. anagallidea), many-spiked flatsedge (Cyperus polystachyos var. texensis), and one-flowered bluet (Oldenlandia uniflora) are common to locally

dominant. Harper's fimbry, Plymouth gentian, and Bosc's bluet also occur in the Sand and Mud Bar community. The higher elevations of point bars often support colonies of red top panic grass (Panicum rigidulum var. rigidulum).

The Oxbow Lake community occurs on flooded peaty to mucky soil near active river meanders. Oxbow lakes are found in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped water body. Although oxbow lake waters are still, they are periodically flushed by floodwaters. Over time, the lake will eventually fill in and succeed to Cypress--Gum Swamp. Still waters of oxbow lakes may support rooted and floating aquatic plants, and emergent cypress and gum trees.

Cypress--Gum Swamp is found on wet to periodically inundated loamy or mucky soil in shallow backwaters, active sloughs, and low elevation relict swales at the site. Backwaters are located at the downstream end of active sloughs, and form lobes of still water in the river channel. Active sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. Lower elevation swales (relict sloughs), although farther from the active river channel, can also carry flood waters. The Cypress--Gum Swamp canopy is dominated by various mixtures of baldcypress (Taxodium distichum), pondcypress (T. ascendens), and swamp tupelo (Nyssa biflora). Carolina ash (Fraxinus caroliniana), water-elm (Planera aquatica), buttonbush (Cephalanthus occidentalis), and black willow (Salix nigra) are prominent in the understory. Spanish-moss (Tillandsia usneoides) and mistletoe (Phoradendron serotinum) are common epiphytes. The usually sparse herb layer includes swamp forest beaksedge. On low ridges between backwater swamps and the river channel, green fly orchid occurs as an epiphytic on overcup oak (Quercus lyrata) with resurrection fern (Pleopeltis polypodioides var. michauxiana).

Coastal Plain Bottomland Hardwoods occurs on wet to infrequently flooded loamy soil on low relict ridges back from the river. The canopy is dominated by laurel oak (Quercus hemisphaerica) and loblolly pine (Pinus taeda), with overcup oak, water oak (Q. nigra), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and Atlantic white cedar (Chamaecyparis thyoides) locally prominent. The understory is dominated by canopy species, plus American holly (Ilex opaca), ironwood (Carpinus caroliniana), and swamp red bay (Persea palustris). Chainferns (Woodwardia spp.) and sedges (Carex spp.) are occasional in the sparse herb layer.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Some past logging is evident at the site, but overall the landforms and natural communities are in good condition. To protect the site's natural values, it should be left in its present condition.

**REFERENCES:**

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design: Site 19. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Schafale, M.P., and C.E. Roe. 1987. Notes on a visit to the lower Waccamaw River in North Carolina. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.





The Sand and Mud Bar community develops on sandy to silty channel bars that are exposed during water level drawdowns. Red top panic grass (Panicum rigidulum var. rigidulum) dominates the higher areas of the bars. Smaller, quick-growing species such as creeping rush (Juncus repens) and yellowseed pimpernel (Lindernia dubia var. anagallidia) are prominent in lower areas. The channel bars and exposed shores of the backwaters are the primary habitats of Harper's fimbry and Plymouth gentian.

Coastal Plain Levee Forest occurs on the wet sandy to mucky levee formed by flood water sedimentation above the channel bars. Prominent in the narrow canopy are loblolly pine (Pinus taeda), laurel oak, Atlantic white cedar (Chamaecyparis thyoides), and water oak (Quercus nigra). Swamp red bay (Persea palustris) is prominent in the understory.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The channel bars, backwaters, and active slough are in good condition. Because of the deep water level fluctuations, the large backwater contains an excellent though unusual example of the Cypress-Gum Swamp. Much of the Natural Levee Forest has been clearcut in the past, but the community has a high potential for recovery. The site is compromised by destruction of the surrounding forest and the small size of the remaining natural area. The site should be protected from further logging, and previously logged areas should be allowed to recover.

**REFERENCES:**

Mansberg, L. 1987. Site (preserve) summary: Ward's Lake.  
N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design: Site 11. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.



through the pocosin slough and the low lake-side sand ridge to a pier extending into the lake.

Council Ridge, along with Tar Barrel ridge to the north, appears to be a remnant of the original sand rim created during the formation of the Carolina bay containing Lake Waccamaw (a brief description of Carolina bays is contained in the site description for Lake Waccamaw State Lake). Coastal Fringe Sandhill is the dominant natural community type on the ridge, occurring on excessively drained dry sandy soil along the higher portions of the ridge, and grading downslope to poorly drained black sand. It is transitional to Xeric Sandhill Scrub at the northeast end of the ridge. The community is characterized by an open to moderate canopy dominated by longleaf pine (*Pinus palustris*), a subcanopy dominated by sand laurel oak and turkey oak (*Quercus laevis*), and an open to sparse shrub and herb layer. Blue huckleberry (*Gaylussacia frondosa*) and staggerbush (*Lyonia mariana*) are subdominants in the shrub layer, and inkberry (*Ilex glabra*) and dwarf wax-myrtle (*Myrica cerifera* var. *pumila*) form patches. Wiregrass (*Aristida stricta*) is the dominant herb, and bracken (*Pteridium aquilinum*) is a patch dominant, particularly on the middle and lower slopes. Lichens (*Cladina evansii*, *Cladonia* spp.) form large patches in drier areas, and little bluestem (*Schizachyrium scoparium*) is prominent. Spanish-moss (*Tillandsia usneoides*) is a prominent epiphyte (attached to trees, but not parasitic). The lower slopes near the edges of the ridge have damper soils, and support species associated with the Wet Pine Flatwoods natural community, such as pyxie-moss (*Pyxidantha barbulate*) and the rare southern bogbutton. The presence of Spanish-moss and wild olive (*Osmanthus americana*) on the ridge suggest that fire is infrequent or rare, possibly due to the isolation of the ridge within large wetland features, or to the management of adjacent areas for timber production. Longleaf pine is regenerating on the ridge without benefit of fire.

The low sand ridge immediately adjacent to the lake supports a natural community most closely aligned with the Coastal Fringe Sandhill, but differs from typical occurrences of the community type. This excessively drained dry sandy ridge rises to an elevation of five-to-six feet above the lake level, and averages about 50 to 60 feet in width. Sand laurel oak forms a sparse to moderate canopy and dense subcanopy over a sparse to moderate ground layer of shrubs and herbs. Sand laurel oak reaches a height of 30 feet in the canopy, and pond pine is an important component of the canopy on the ridge slopes. Turkey oak is an important component of the subcanopy. Prominent shrubs include wax-myrtle and deerberry (*Vaccinium stamineum*). Wiregrass is a prominent herb.

The pocosin slough between Council Ridge and the low ridge adjacent to the lake supports the Pond Pine Woodland natural community. The Pond Pine Woodland occurs on very poorly drained soil with a layer of humus over fine black sand. The community is characterized by an open canopy dominated by pond pine (*Pinus serotina*), a moderate

subcanopy dominated by loblolly bay (Gordonia lasianthus) and swamp red bay (Persea palustris), and a dense understory of tall shrubs dominated by gallberry (Ilex coriacea) and wax-myrtle (Myrica cerifera var. cerifera). Blaspheme-vine (Smilax laurifolia) is prominent in the understory. Herbs are sparse except where the boardwalk through the slough has created an artificial opening.

**OWNERSHIP:** State of North Carolina.

**PROTECTION STATUS:** Site is included within Lake Waccamaw State Park, and is managed by the NC Division of Parks and Recreation.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site is state-owned and managed, occurring entirely within Lake Waccamaw State Park. Council Ridge has been impacted by past logging, borrow pits, scrapes, and roadbeds, and more recently by construction of the state park access road, parking area, trails, and park maintenance and public use structures. The Xeric Sandhill Scrub natural community is best developed and least impacted along the northeastern half of the ridge. It is recommended that no additional construction or artificial disturbances occur in this area, except for the possible location of a nature trail along old roadbeds. Future studies of the natural communities at this site should attempt to determine its fire history and the natural role of fire. It is recommended that no additional egresses be constructed through the pocosin slough and lakeshore ridge to Lake Waccamaw.

**REFERENCES:**

- LeBlond, R.J. 1994. Site survey report: Lake Waccamaw/Council Ridge. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.
- Roe, C.E. 1983. Evaluation report, Lake Waccamaw Natural Area, proposed National Natural Landmark. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.
- Schafale, M.P. 1991. Natural community notes on Lake Waccamaw State Park. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.
- Schafale, M.P. & A.S. Weakley. 1987. Preliminary site reconnaissance survey: Bella Coolla tract (Lake Waccamaw State Park). N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

## **Middle Waccamaw River Macrosite**

The Middle Waccamaw River Macrosite, located in both Columbus and Brunswick counties, includes Waccamaw River and floodplain features from the confluence with Gore Creek south to highway NC 904. It comprises about 3500 acres, and includes a large array of landforms and associated natural communities. Most prominent are the numerous and large ridge-and-swale systems. The macrosite also contains winding, interconnecting active sloughs, and the river in this area has a large number of meanders, channel bars, point bars, and backwaters. Because of this geomorphic diversity, most of the natural community types found in the Waccamaw River floodplain occur at this macrosite.

The most striking and critical feature in the macrosite is the large array of relict ridges and swales formed by the ancient, larger Waccamaw River. These ridge-and-swale systems now occur on terraces elevated above the floodplain of the present river, and support natural community types not found elsewhere along the river. Although much of the area has been logged, extensive natural habitat in good condition persists.

Nested within the Middle Waccamaw River Macrosite are several standard sites, two of which are mostly within Columbus County: Waccamaw River Eleocharis Backwater and Reeves Area Floodplain. The Waccamaw River Aquatic Habitat site, encompassing the active river channel, is shared by Columbus and Brunswick counties. The other sites are located exclusively in Brunswick County.

Portions of the macrosite outside of standard sites have been determined to be of lesser significance, but important to the overall integrity of the area, such as by providing corridors for animal populations and insuring the integrity of the active river channel.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Reeves Area Floodplain

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 760 acres, most of which occur in Columbus County.

**COUNTY:** Columbus / Brunswick

**QUADRANGLE:** Freeland

**LOCATION:** Active channel and floodplain of Waccamaw River downstream from Reeves Landing towards Beech Island.

**SIGNIFICANT FEATURES:**

1. The site supports populations of three very rare plant species: Harper's fimbry (Fimbristylis perpusilla), Plymouth gentian (Sabatia kennedyana), and dwarf burhead (Echinodorus parvulus). Harper's fimbry is a Federal Candidate. Plymouth gentian is State Threatened-Special Concern, and dwarf burhead is a State Candidate. All of the North Carolina occurrences of Harper's fimbry and Plymouth gentian are restricted to the Waccamaw River drainage. Dwarf burhead occurs at one place along the the Brunswick County shore of the river at this site.
2. Reeves Area Floodplain contains the greatest natural community diversity of any identified site along the Waccamaw River floodplain. There are good to excellent examples of virtually all of the landforms associated with the meander sections of the river, and with the relict ridge-and-swale terraces.

**GENERAL DESCRIPTION:** Reeves Area Floodplain consists of an irregularly meandering stretch of the active river channel, and a large ridge-and-swale system on terraces associated with the ancient, larger river. The active meander system is superimposed on the relict system. Channel and point bars along the river support the Sand and Mud Bar community. A former meander section of the river has been cut off from the active channel, and now supports the Oxbow Lake community. Active sloughs and low elevation swales (relict sloughs) support Cypress--Gum Swamp (Blackwater Subtype). Less frequently flooded swales and low ridges away from the river support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). The highest ridges in the relict ridge-and-swale system appear to rarely or never flood, and these support Wet Pine Flatwoods (Wet Spodosol Variant) and Coastal Fringe Sandhill.

Channel bars and point bars are depositional features within the active river channel that are exposed during water level drawdowns.

Sandy to silty channel bars are formed along straight stretches of the river. Sandy point bars are formed on the inside of meanders (convex shore of the river). Both support the Sand and Mud Bar

community, which is characterized by the absence of woody species, and dominance by small herbs that can reproduce quickly during the often brief drawdown periods. Baldwin's spikerush (Eleocharis baldwinii) and creeping rush (Juncus repens) are the dominant small herbs, and yellowseed pimpernel (Lindernia dubia var. anagallidea) is common. Harper's fimbry and Plymouth gentian also occur in the Sand and Mud Bar community. The higher elevations of point bars often support colonies of red top panic grass (Panicum rigidulum var. rigidulum).

The Oxbow Lake community occurs on flooded peaty to mucky soil near an active river meander. Oxbow lakes are found in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped water body. Although oxbow lake waters are still, they are periodically flushed by floodwaters. Over time, the lake will eventually fill in and succeed to Cypress--Gum Swamp. Still waters of oxbow lakes may support rooted and floating aquatic plants, and emergent cypress and gum trees.

Cypress--Gum Swamp is fully developed on wet to periodically inundated loamy or mucky soil in active sloughs and low elevation relict swales at the site. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. The relict swales are associated with meanders created by the ancient, larger river. Lower elevation relict swales, although farther from the active river channel, can also carry flood waters. In active sloughs, the Cypress--Gum Swamp canopy is dominated almost exclusively by baldcypress (Taxodium distichum). The understory is dominated by Carolina ash (Fraxinus caroliniana), water-elm (Planera aquatica), and buttonbush (Cephalanthus occidentalis), with occasional hawthorn (Crataegus aestivalis). Herbs are sparse to absent. In the low elevation relict swales, the Cypress--Gum Swamp canopy is dominated by pondcypress (Taxodium ascendens) and swamp tupelo (Nyssa biflora). The understory is dominated by Carolina ash, with lesser amounts of titi (Cyrilla racemiflora), myrtle dahoon (Ilex myrtifolia), fetterbush (Lyonia lucida), coastal sweet-pepperbush (Clethra alnifolia), and Virginia sweetspire (Itea virginica). Common vines include briars (Smilax spp.) and Carolina supplejack (Berchemia scandens). Spadeleaf (Centella erecta), sedges (Carex spp.), Virginia buttonweed (Diodia virginiana), and peatmoss (Sphagnum sp.) are occasional in the sparse herb layer.

Low elevation floodplain ridges in the modern floodplain and on the relict ridge-and-swale terraces support Coastal Plain Bottomland Hardwoods. The community occurs on wet to infrequently flooded loamy soil. The canopy is dominated by loblolly pine (Pinus taeda), laurel oak (Quercus laurifolia), and Atlantic white cedar (Chamaecyparis thyoides). Water oak (Q. nigra), overcup oak (Q. lyrata), and red maple (Acer rubrum) are also prominent in the

canopy. The understory is composed of young canopy trees, plus American holly (Ilex opaca), swamp red bay (Persea palustris), and sweetbay (Magnolia virginiana). The dense shrub layer is dominated by mayberry (Vaccinium elliotii), titi (Cyrilla racemiflora), fetterbush (Lyonia lucida), coastal sweet-pepperbush (Clethra alnifolia), and Virginia sweetspire (Itea virginica). Common vines include briars (Smilax spp.) and muscadine (Vitis rotundifolia). The herb layer is essentially absent, with occasional partridgeberry (Mitchella repens).

Wet Pine Flatwoods occur on higher elevation ridges that probably never, or rarely, flood. These wet sandy ridges are located on a relict ridge-and-swale terrace away from the modern river floodplain. The canopy is dominated by longleaf pine (Pinus palustris) and loblolly pine. Prominent shrubs and small trees include live oak (Quercus virginiana), persimmon (Diospyros virginiana), sweetgum (Liquidambar styraciflua), inkberry (Ilex glabra), wax-myrtle (Myrica cerifera var. cerifera), blue huckleberry (Gaylussacia frondosa), and coastal sweet-pepperbush. The ground layer is dominated by wiregrass (Aristida stricta), with bracken (Pteridium aquilinum) and creeping blueberry (Vaccinium crassifolium) prominent at the higher elevations. The community is in fair condition, with lack of fire having resulted in canopy invasion by loblolly pine, and an increase in shrub density and ground litter. Lower, wetter portions of the community appear transitional to Pine Savanna.

An unusual Coastal Fringe Sandhill community example occurs on a high, dry sand ridge near the center of the site. The open canopy is dominated by loblolly pine, and live oak dominates the understory. Pine stumps that appear to have been boxed for turpentine are present, suggesting that the site was once dominated by longleaf pine. Prominent shrub layer species include American holly, fetterbush, inkberry, mayberry, and creeping blueberry. Species unusual for the community type include southern red oak (Quercus falcata) and wild olive (Osmanthus americana). The ground surface is bare sand except for patches of lichens and mosses. Spanish-moss (Tillandsia usneoides) and resurrection fern (Pleopeltis polypodioides var. michauxiana) are prominent epiphytes. The vegetation composition is not typical of Coastal Fringe Sandhill as it occurs elsewhere, and may be transitional to Coastal Fringe Evergreen Forest.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Most of the site has been impacted by previous logging, mainly for cypress. This earlier logging reduced the dominance of cypress in the wetter communities, but did not greatly alter the land or natural communities. Modern logging has had greater impact, with much of the higher relict ridge

areas converted to dense, young pine stands. Forests on lower portions of the terrace vary in maturity, often with invasive canopy tree species. Logging roads are present in the northern and northeastern areas, along with deep drainage ditches that transport sediment into the river during low water levels. Despite the damage from logging, this site appears to be the least disturbed area in the middle part of the river, and most of its natural communities are intact. The site should not be logged if the natural communities, rare species populations, and river water quality are to be protected. Management for protection of natural values should also consider the blocking of ditches to restore natural hydrology, and to prevent erosion and river siltation impacts.

**REFERENCES:**

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design: Site 15. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Waccamaw River Eleocharis Backwater

**SITE SIGNIFICANCE:** Regional

**SIZE:** est. 400 acres, the majority of which is in Columbus Co.

**COUNTY:** Columbus / Brunswick      **QUADRANGLE:** Freeland

**LOCATION:** About halfway between highways NC 130 and NC 904, extending southwest from the confluence of Gore Creek with Waccamaw River toward Reeves Landing.

**SIGNIFICANT FEATURES:**

1. Two very rare plant species have been documented from the site: Carolina bogmint (Macbridea caroliniana) and Plymouth gentian (Sabatia kennedyana). Carolina bogmint is a Federal Candidate, and is known historically from the site. Plymouth gentian is State Threatened-Special Concern, and in North Carolina is known only from the Waccamaw River drainage.
2. The site contains good examples of several landforms and natural community types associated with both the active river channel and a relict ridge-and-swale system formed by the ancient, larger river.

**GENERAL DESCRIPTION:** The site is bordered by Gore Creek and Gore Lake, a fishpond, along the northeast side, and by landforms associated with the active river channel along the southeast side. Active channel landforms include channel bars, point bars, point bar ridges, active sloughs, and oxbow lakes. Northwest of the river, and southwest of Gore Creek, is a relict ridge-and-swale system formed by the ancient river. Each of these landforms supports distinctive natural community types. The Sand and Mud Bar community occurs on channel and point bars. Point bar ridges support Coastal Plain Levee Forest (Blackwater Subtype). Isolated, water-filled meanders support the Oxbow Lake community. Cypress--Gum Swamp (Blackwater Subtype) occurs in active sloughs and low elevation relict swales. Coastal Plain Bottomland Hardwoods (Blackwater Subtype) occurs on relict floodplain ridges.

Channel bars and point bars are depositional features within the active river channel that are exposed during water level drawdowns.

Sandy to silty channel bars are formed along straight stretches of the river. Sandy point bars are formed on the inside of meanders (convex shore of the river). Both support the Sand and Mud Bar community, which is dominated by small herbs that can reproduce quickly during the often brief drawdown periods. Baldwin's spikerush (Eleocharis baldwinii) and creeping rush (Juncus repens) are the dominant small herbs. Plymouth gentian also occurs in the

Sand and Mud Bar community. The higher elevations of point bars often support colonies of red top panic grass (Panicum rigidulum var. rigidulum).

Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. The landward portions of point bars are thus higher in elevation than channel bars, and these higher portions undergo succession to Coastal Plain Levee Forest. The levee forest canopy is dominated by overcup oak (Quercus lyrata), laurel oak (Quercus laurifolia), and baldcypress (Taxodium distichum).

The Oxbow Lake community occurs on flooded sandy peat to mucky soils in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped water body. Although oxbow lake waters are still, they are periodically flushed by floodwaters. Over time, the lake will eventually fill in and succeed to Cypress--Gum Swamp. Still waters of oxbow lakes may support rooted and floating aquatic plants, and emergent cypress and gum trees.

Cypress--Gum Swamp is fully developed on periodically flooded sandy peat to mucky soils in active sloughs and low elevation relict swales at the site. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. The relict swales are associated with meanders created by the ancient, larger river. Lower elevation relict swales, although farther from the active river channel, can also carry flood waters. The Cypress--Gum Swamp canopy is dominated by swamp tupelo (Nyssa biflora), baldcypress (Taxodium distichum), and pondcypress (T. ascendens). The understory is dominated by Carolina ash (Fraxinus caroliniana) and water-elm (Planera aquatica).

Coastal Plain Bottomland Hardwoods occurs on wet soil of higher floodplain ridges away from active sediment deposition, and on relict ridges of the ancient river floodplain. These ridges are flooded only by the highest floods, if at all. The sand or loamy sand ridges are long and arcuate. The forest canopy is dominated by loblolly pine and laurel oak. Atlantic white cedar (Chamaecyparis thyoides), red maple (Acer rubrum), and overcup oak are prominent to sometimes dominant.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site contains good examples of natural communities associated with active and relict river and floodplain landforms. The site is vulnerable to logging, and roadbeds are present along the inland edges. The site should

not be logged if the natural communities, rare species populations, and river water quality are to be protected.

**REFERENCES:**

Schafale, M.P., H.E. LeGrand, and R.S. Marty. 1986. Waccamaw River natural areas inventory and preserve design: Site 14. The Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.





community variant habitat, but standing water is present in the adjacent savanna flats as well as in the ditches following rainfall, indicating that the ditches incompletely or very slowly drain the savanna. Charred trunks of canopy trees provide evidence of past fire.

The Pine Savanna Wet Spodosol community variant at Crusoe Island Savanna occurs on poorly drained sandy soil found on low flats with a seasonally high water table. The vegetation is characterized by an open to sparse canopy of small pines over an open subcanopy and understory, and dense ground layer of wiregrass (Aristida stricta) and shrub patches. Longleaf pine (Pinus palustris) is the dominant canopy and subcanopy tree, with loblolly pine (P. taeda) dominating the small eastern lobe of the habitat. Sweetbay (Magnolia virginiana) and swamp red bay (Persea palustris) are prominent in the understory, and inkberry (Ilex glabra) forms shrubby patches. Wiregrass is the dominant herb. This community variant contains the population of the rare Carolina grass-of-parnassus.

The Pine Savanna Very Wet Clay community variant occurs on poorly drained soil with a fine sandy loam surface layer over a subsoil of sandy clay loam. This clayey soil is found on low flats with a seasonally high water table. Because clayey soils are less permeable, the Very Wet Clay community variant tends to be wetter during the growing season than the Wet Spodosol variant, and shallow standing water is often present. There is some evidence that these clayey soils are underlain by limestone ("marl"). The vegetation is characterized by an open low cypress canopy over a sparse understory and dense grass and sedge ground layer. Pond cypress (Taxodium ascendens) is the dominant canopy tree, and the very rare wiregrass dropseed dominates the ground layer. Other rare species present in this community variant are scale-leaf gerardia, flaxleaf gerardia, bog bluestem, and graceful goldenrod. Compared to the few other sites containing this community variant, this site has a low sedge diversity and a high wildflower (forb) diversity.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site occurs on privately owned, unprotected land. Its national significance adds another dimension to the value of the property, and the owner(s) should be contacted regarding their plans for the site, and informed of available protection options. To protect and enhance the site's natural values, controlled burns should be conducted every three-to-five years to prevent shrub dominance, and to provide nutrients for the fire-adapted and fire-dependent species that dominate the site. The shallow ditches in the Very Wet Clay community variant habitat should be blocked to prevent artificial surface water loss.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Crusoe Island Savanna.  
N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.





**GENERAL DESCRIPTION:** Old Dock Savanna occurs on poorly drained fine sandy loam that is wet to saturated throughout most of the year. The habitat is dominated by the Pine Savanna Very Wet Clay natural community variant, with small canopy trees and clumps of tall shrubs interspersed with openings of dense herb vegetation. The grass-dominated herb openings are hummocky, and the flat ground surface is composed of hydric soils exhibiting a calcareous influence from subterranean limestone ("marl") deposits. The savanna is bordered on the east, south, and west by pocosin forest, and on the north by a logging road and clear-cuts. An abandoned roadbed bisects the savanna southward from the logging road.

The savanna habitat is characterized by an open pine canopy over an open and patchy shrub understory and dense herb ground layer. Scattered small pond pines (*Pinus serotina*) dominate the canopy. Myrtle dahoon (*Ilex myrtifolia*) and titi (*Cyrilla racemiflora*) are prominent shrubs. The dense herb layer is dominated by grasses and sedges: wireleaf dropseed (*Sporobolus teretifolius*), toothache grass (*Ctenium aromaticum*), savanna muhly (*Muhlenbergia expansa*), Carolina dropseed (*Sporobolus sp. 1*), and beaksedges (*Rhynchospora* spp.). The savanna habitat is of excellent quality, but the condition is somewhat impacted by prior fire suppression and logging. Plowlines and a ditch along the access logging road likely impact the site's hydrology.

**OWNERSHIP:** The Nature Conservancy

**PROTECTION STATUS:** Site owned and managed for protection and enhancement of natural values.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Old Dock Savanna is owned by The Nature Conservancy, and managed for protection and enhancement of natural values and processes.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Old Dock Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Weakley, A.S., M.P. Schafale, & H.E. LeGrand. 1991. Site survey report: Old Dock Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Schulkens Savanna

**SITE SIGNIFICANCE:** National

**SIZE:** 208 acres

**COUNTY:** Columbus

**QUADRANGLE:** Nakina / Old Dock

**LOCATION:** About three-quarters of a mile southeast of the intersection of Ward Town Road (SR 1925) and Juniper Creek Road (SR 1928).

**SIGNIFICANT FEATURES:**

1. The site contains one of the few global occurrences of the Pine Savanna Very Wet Clay natural community variant, known only from two small areas in southeastern North Carolina.
2. The site provides critical habitat for one rare animal species. A nesting season occurrence has been documented for Bachman's sparrow (*Aimophila aestivalis*), a Federal Candidate. This bird has been documented at only one other site in Columbus County.
3. Schulkens Savanna supports populations of 11 rare plant species.
  - a. Four Federal Candidates occur at the site: Venus flytrap (*Dionaea muscipula*), Carolina grass-of-parnassus (*Parnassia caroliniana*), pineland plantain (*Plantago sparsiflora*), and wireleaf dropseed (*Sporobolus teretifolius*). The Schulkens Savanna population of wireleaf dropseed, which is known from fewer than 20 global sites, is one of the largest in the range of the species. Pineland plantain is known from only four sites in the North Carolina, and this is the only population in Columbus County. The population of Carolina grass-of-parnassus is one of the largest known in its restricted range.
  - b. Seven plant species recognized as rare in North Carolina occur at the site: scale-leaf gerardia (*Agalinis aphylla*), bog bluestem (*Andropogon mohrii*), spring sneezeweed (*Helenium vernale*), flaxleaf seedbox (*Ludwigia linifolia*), yellow fringeless orchid (*Platanthera integra*), shortbristled beaksedge (*Rhynchospora breviseta*), and hooded pitcher plant (*Sarracenia minor*). Yellow fringeless orchid is State Threatened. Scale-leaf gerardia, bog bluestem, and shortbristled beaksedge are State Candidates. Flaxleaf seedbox, spring sneezeweed, and hooded pitcher plant are significantly rare in North Carolina. Schulkens Savanna contains the only populations in Columbus County of flaxleaf seedbox and yellow fringeless orchid.

4. Thirteen plant species on the watch list maintained by the Natural Heritage Program occur at the site.

**GENERAL DESCRIPTION:** The savanna occurs on flat, poorly drained upland soils with a calcareous influence from subterranean limestone ("marl") deposits. The savanna is bordered along the north and northeast by pocosin and swamp communities, and by pine plantations elsewhere.

The site supports remnants of the Pine Savanna Very Wet Clay natural community variant, totaling about 20 acres on poorly drained fine sandy loam which is wet to saturated throughout most of the year. The community is of high quality, but is only in fair condition due to impacts from ditches, plowlines, prior canopy clearing, and the introduction of slash pine (*Pinus elliotii*). The savanna is characterized by an open pine canopy over a patchy shrub and dense herb layer. The canopy is dominated by small pond pine (*P. serotina*) and slash pine trees. Sweetbay (*Magnolia virginiana*) is dominant in the shrub layer. Shrub patches are formed by Carolina red maple saplings (*Acer rubrum* var. *trilobum*), coastal sweet-pepperbush (*Clethra alnifolia*), blue huckleberry (*Gaylussacia frondosa*), dwarf huckleberry (*G. dumosa*), and southern blueberry (*Vaccinium tenellum*). Wireleaf dropseed is the dominant grass. Other prominent herbs include sandbog death-camus (*Zigadenus glaberrimus*), Carolina yellow-eyed-grass (*Xyris caroliniana*), Carolina grass-of-parnassus (*Parnassia caroliniana*), Carolina dropseed (*Sporobolus sp. 1*), beaksedges (*Rhynchospora* spp.), and toothache grass (*Ctenium aromaticum*).

**OWNERSHIP:** Georgia-Pacific Corp.

**PROTECTION STATUS:** Registered Heritage Area.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** To protect and enhance natural values and processes, the site should be prescribed burned every three-to-five years. Consideration should be given to the removal of slash pine (an alien canopy tree), and to blocking the ditches to prevent artificial loss of surface water during rainfall.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Schulkens Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Schafale, M.P., A.S. Weakley, & R.J. LeBlond. 1991. Site survey report: Schulkens Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Cypress Creek Bay

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 250 acres

**COUNTY:** Columbus

**QUADRANGLE:** Nakina

**LOCATION:** Southwest side of highway NC 130 northwest of Mark Pine at Ward Town Road (SR 1925).

**SIGNIFICANT FEATURES:**

1. Cypress Creek Bay provides critical habitat for the red-cockaded woodpecker (Picoides borealis), which is Federally Endangered.
2. The site supports populations of five rare plant species: savanna indigo-bush (Amorpha georgiana var. confusa), Venus flytrap (Dionaea muscipula), threadleaf sundew (Drosera filiformis), Hooker's milkwort (Polygala hookeri), and hooded pitcher plant (Sarracenia minor). Savanna indigo-bush and Venus flytrap are Federal Candidates, and Hooker's milkwort is a State Candidate. Threadleaf sundew and hooded pitcher plant are significantly rare in North Carolina. The global range of savanna indigo-bush is currently restricted to Brunswick and Columbus counties, and is known from only one other site in Columbus County. The population of threadleaf sundew is the largest in North Carolina.

**GENERAL DESCRIPTION:** The site occurs on broad upland and swampland flats, the general area dominated by pocosin swamp, pine plantations and large clear-cuts. Remnant Wet Pine Flatwoods Wet Ultisol natural community variant occurs along the main logging road south from NC 130, and along a spur road to the west, just south of NC 130. Portions of the flatwoods area have open understories, and other portions are characterized by dense shrub undergrowth. Species-rich savanna habitat occurs along the shoulders of the main logging road, and along the shoulder and adjacent small powerline of NC 130 in an area formerly known as Cypress Creek/Highway 130 Bog and Savanna. The Pond Pine Woodland community type dominates the pocosin swamp habitat.

The Wet Pine Flatwoods Wet Ultisol community variant occurs on low, somewhat poorly drained loamy soil at Cypress Creek Bay, and consists of areas with open and overgrown understories. Areas with open understories appear to have burned at least occasionally in the past, although some microsites may have been mechanically opened (e.g., during canopy thinning). One microsite burned in 1994, with very little ground vegetation recovery and with several canopy trees having been killed, suggesting that a dense woody understory was present prior to the fire, providing a heavy fuel load. The open flatwoods are characterized by a moderately open pine canopy and

sparse oak subcanopy over a moderate to dense low shrub layer and sparse to moderate herb layer. Longleaf pine (Pinus palustris) is the dominant canopy tree, and water oak (Quercus nigra) is prominent in the subcanopy. Coastal sweet-pepperbush (Clethra alnifolia) is a prominent to dominant shrub, and Carolina dropseed is a prominent grass in the herb layer. Rare species present in the open flatwoods areas are red-cockaded woodpecker and savanna indigo-bush.

Flatwoods areas with overgrown understories are characterized by a moderately dense pine canopy over an open subcanopy and dense shrub layer. Pond pine (P. serotina) is the dominant canopy tree, and longleaf pine is prominent. Blue huckleberry (Gaylussacia frondosa) is a dominant shrub, and Carolina red maple seedlings (Acer rubrum var. trilobum) are subdominant in the shrub layer. Inkberry (Ilex glabra) forms patches, and cane (Arundinaria tecta) is prominent in the dense shrub layer. Carolina dropseed and bracken (Pteridium aquilinum) form patches in the otherwise sparse herb layer.

The roadside shoulder and powerline savanna habitat is characterized by a diverse mix of grasses, sedges, and wildflowers. Rare species found in this habitat are Venus flytrap, threadleaf sundew, Hooker's milkwort, and hooded pitcher plant.

The Pond Pine Woodland swamp community is characterized by a pond pine canopy over a dense shrub layer of inkberry, coastal sweet-pepperbush, gallberry (Ilex coriacea), titi (Cyrilla racemiflora), fetterbush (Lyonia lucida), and blaspheme-vine (Smilax laurifolia). Large portions of this community have been logged

**OWNERSHIP:** Georgia-Pacific Corp.; NC Department of Transportation.

**PROTECTION STATUS:** None, except for portion within the area formerly known as the Cypress Creek/Highway 130 Bog and Savanna, which is a Registered Heritage Area.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** For protection of rare species along NC 130 and the main logging road, mowing should be restricted to the dormant winter season, or not occur every year. Ideally, roadside and powerline microsites should be burned instead of mowed. Flatwoods microsites with open understories should be prescribed burned every three-to-five years. Microsites with dense understories should have the fuel load reduced mechanically, followed by prescribed burns.

#### **REFERENCES:**

Carter, J.H., III. 1991. Longleaf pine survey of the Sandhills and southwestern Coastal Plain. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

- LeBlond, R.J. 1994. Site survey report: Cypress Creek Bay.  
N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.
- NC NHP. 1979. NHP field visit notes: savannah on NC 130. N.C.  
Natural Heritage Program, DPR, DEHNR, Raleigh.
- \_\_\_\_\_. 1979. Savannah along NC hwy 130. Compiled from  
information in the N.C. Natural Heritage Program files, DPR,  
DEHNR, Raleigh.
- Nifong, T.D. 1979. Site report: Cypress Creek Bog Natural  
Area. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.





**OWNERSHIP:** NC Department of Transportation; Georgia-Pacific Corp.; powerline easement.

**PROTECTION STATUS:** Registered Heritage Area.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Maintenance mowing of the powerline corridor promotes herb dominance of the site by cutting back woody growth, a condition maintained by fire in natural circumstances. Mowing during the growing season can interfere with plant flowering and seed production, and inhibit a plant's ability to photosynthesize and store nutrients. These impacts can be avoided by mowing during winter dormancy, or mitigated by not mowing every year. Ideally, roadside and powerline microsites should be burned instead of mowed.

**REFERENCES:**

LeBlond, R.J. 1995. Site survey report: Mark Pine Bay Cooley's Meadowrue Site. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.



and eastern Sampson's-snakeroot (Orbexilum pedunculatum var. psoralioides). These suggest that the community is transitional to the rare Pine Savanna Lumbee variant.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site occurs on privately owned, unprotected land. The owners should be contacted regarding their plans for the site, and informed of available protection options. To protect and enhance the site's natural values, controlled burns should continue to be conducted every three-to-five years to prevent shrub dominance, and to provide nutrients for the fire-adapted and fire-dependent species that dominate the site. Two roadbeds transect the savanna habitat, and a plowline is located in the shrubby ecotone along the southwest side of the site, but the impacts from these disturbances appear to be localized.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Hoy Savanna Remnant.  
N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Meares Millpond

**SITE SIGNIFICANCE:** Regional

**SIZE:** est. 75 acres

**COUNTY:** Columbus

**QUADRANGLE:** Council

**LOCATION:** On the Columbus/Bladen county line about 5.5 miles north of Lake Waccamaw town.

**SIGNIFICANT FEATURES:**

1. The site provides critical habitat for five rare plant species: Carolina bogmint (Macbridea caroliniana), flaxleaf gerardia (Agalinis linifolia), southern water grass (Luziola fluitans), southeastern panic grass (Panicum tenerum), Canby's bullrush (Schoenoplectus etuberculatus), and lace-lip ladies'-tresses (Spiranthes laciniata). Carolina bogmint, which is found only in the Bladen County portion of the habitat, is a Federal Candidate. The other five rare species all occur in Columbus County. Lace-lip ladies'-tresses is a State Candidate. Southern water grass, southeastern panic grass, Canby's bullrush, and flaxleaf gerardia are significantly rare in North Carolina. Southern water grass, southeastern panic grass, Canby's bullrush, and lace-lip ladies'-tresses are found at only one other site in the county (Lake Waccamaw). The site also contains one of nine known global occurrences for a seedbox hybrid, Ludwigia pilosa X suffruticosa.
2. The site contains a high quality example of the Coastal Plain Semipermanent Impoundment natural community in excellent condition. The broad, shallowly submersed shoreline shelf supports a species-rich plant association somewhat transitional to the Cypress Savanna natural community.

**GENERAL DESCRIPTION:** Meares Millpond is located on the Columbus/Bladen county line about 5.5 miles north of Lake Waccamaw town. Approximately the northern third of the impoundment is in Bladen County, and the southern two-thirds is in Columbus County. The site is an artificial impoundment created by the damming of a tributary of Boggy Branch, which flows southward into Friar Swamp and Lake Waccamaw. The ponded area is about 75 acres in size, including the shallowly flooded shoreline shelf. The impoundment is surrounded by managed timberland. The earthen dam along the north shore maintains relatively constant water levels in the millpond. The west and south shores are characterized by extensive, broad, shallowly flooded shelves supporting the Coastal Plain Semipermanent Impoundment community type. The plant community is diverse, considering that the shelf is probably semipermanently shallowly flooded. The shelf supports an open canopy of small pond cypress

(Taxodium ascendens) and swamp tupelo (Nyssa biflora) trees. The large central pond body has scattered emergent pond cypress trees. Wax-myrtle (Myrica cerifera var. cerifera) and titi (Cyrilla racemiflora) are prominent shrubs on the flooded shelf. Prominent herbs include horsetail spikerush (Eleocharis equisetoides), peatmoss (Sphagnum sp.), redroot (Lachnanthes caroliana), threadleaf beaksedge (Rhynchospora filifolia), longspur creeping bladderwort (Utricularia biflora), rosy camphorweed (Pluchea rosea), sugarcane plume grass (Saccharum giganteum), flaxleaf gerardia, and the seedbox hybrid.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site occurs on privately owned, unprotected land. The owners should be contacted regarding their plans for the site, and informed of available protection options. Species diversity and number of rare species suggest a long period with minimal disturbance. Only a single, shallow ditch was observed in the habitat, possibly marking the Columbus/Bladen county line. An earthen dam, ditches, and a roadbed are adjacent to the north shore. The condition of the outlet channel in the dam should be investigated. To protect and enhance the site's natural values, a no-cut buffer zone should be established around the perimeter of the habitat.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Meares Millpond. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.



**REFERENCES:**

Peacock, D.H., and F.T. McBride. 1972. Ecological study of White Marsh. N.C. Natural Areas Survey, Department of Natural and Economic Resources.



moderately well drained sandy soil in the central and northern portion of the site. It is characterized by a moderate pine canopy over an open subcanopy and understory of scattered oaks, with a moderate to dense herb/low shrub ground layer. Longleaf pine (Pinus palustris) is the dominant canopy tree, with loblolly pine (P. taeda) prominent. Staggerbush (Lyonia mariana) is a prominent low shrub. Among herbs, silkgrass (Pityopsis graminifolia var. latifolia) dominates large patches of habitat. Wiregrass (Aristida stricta) and members of the aster family (Asteraceae) and legume family (Fabaceae) are prominent components of the community, providing a showy late summer floral display.

The higher, gently rolling terrain in the southwestern portion of the site supports the Pine/Scrub Oak Sandhill Mixed Oak community variant on well drained sandy soil. It is characterized by an open pine canopy over a moderately open oak subcanopy and moderately sparse ground cover. Longleaf pine is the dominant canopy tree. The dominant subcanopy oaks are bluejack oak (Quercus incana) and turkey oak (Q. laevis). Lichens (Cladonia spp.) cover large patches, and wiregrass is prominent in the herb layer.

Low terraces adjacent to the mesic flats support a small area of Wet Pine Flatwoods Wet Spodosol community variant on poorly drained black sand with a seasonally high water table. It is characterized by an open to moderately open pine canopy over a sparse hardwood subcanopy and a moderate to dense herb and shrub ground layer. Longleaf pine dominates the canopy, and black gum (Nyssa sylvatica) is a sparse dominant in the subcanopy. Coastal sweet-pepperbush (Clethra alnifolia) and blue huckleberry (Gaylussacia frondosa) dominate shrubby thickets. Creeping blueberry (Vaccinium crassifolium) and lichens are ground layer dominants. Bracken (Pteridium aquilinum) forms large patches.

A two-acre depression within the mesic flatwoods terrace supports the Small Depression Pocosin community on poorly drained peaty sand. Water seasonally ponds in this depression. The vegetation is characterized by a low pine/hardwood canopy over a dense shrub understory surrounding a temporarily inundated herb/moss zone. The pocosin shrub zone occupies about 85% of the depression. Pond pine (Pinus serotina), sweetbay (Magnolia virginiana), and swamp red bay (Persea palustris) are prominent in the low canopy. Prominent shrubs include Carolina sheepl laurel (Kalmia carolina), evergreen bayberry (Myrica heterophylla), zenobia (Zenobia pulverulenta), blue huckleberry, and swamp doghobble (Leucothoe racemosa). The seasonally ponded central opening is dominated by Virginia chainfern (Woodwardia virginica).

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The site occurs on privately owned, unprotected land. The owners should be contacted regarding their plans for the site, and informed of available protection options. To protect and enhance the site's natural values, controlled burns should continue to be conducted every three-to-five years to prevent shrub dominance, and to provide nutrients for the fire-adapted and fire-dependent species that dominate the site.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Winnie Moore Bay Flatwoods. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

## **Lumber River Macrosite**

The Lumber River Macrosite comprises the river floodplain and adjacent or included sand ridges south from near Wagram in Scotland County to the South Carolina border near Fair Bluff in Columbus County. The macrosite is dominated by swamp forests typical of blackwater rivers. South (downstream) of the confluence with Big Swamp near Boardman in Columbus County, the character of the river itself changes dramatically. Upstream of the confluence, the river is narrow and frequently overhung by trees, and shoreline sandbars are uncommon. Big Swamp nearly doubles the volume of flow in the Lumber River, and the downstream river and floodplain are much broader. The river channel is more exposed, and characterized by landforms associated with meanders: point bars, levees, sloughs, and oxbows. The meander section of the river downstream from Big Swamp occurs entirely within Columbus and Robeson counties, with the river forming the county line.

Adjacent to or included within the river floodplain are sand ridges believed to be of aeolian origin. These ridges are uncommon landforms, and support inland occurrences of natural communities more typical of coastal areas. Two significant sand ridges--Big Sandy Ridge and Parkers Landing Sand Ridge--occur entirely within Columbus County.

Nested within the macrosite are several smaller (standard) sites, each of which contains significant biological and/or geomorphic features. Areas within the macrosite not included within a standard site have been determined to be of lesser significance, but important to the overall integrity of the area, such as by providing corridors for animal populations and insuring the integrity of the active river channel. Each of the standard sites occurring partly or wholly within Columbus County is briefly summarized here, and more fully described in the following pages.

**Net Hole--Buck Landing Swamp.** This site includes the Lumber River floodplain from Phillips Road (SR 2121) in Robeson County south to just above the crossing of highway US 74. Only a small portion of the site--downstream from The Net Hole and the confluence with Big Swamp--occurs within Columbus County. The site contains good examples of landforms and natural communities associated with blackwater river meanders. One rare animal and one rare plant are known from the site.

**Bluff Swamp.** This site, shared with Robeson County, includes the river floodplain in the vicinity of Parkers Upper and Lower landings, south of highway US 74. It contains good examples of landforms and natural communities associated with blackwater river meanders. One rare animal and one rare plant are known from the site.

**Parkers Landing Sand Ridge.** This site comprises a sand ridge at the edge of the river floodplain between Parkers Upper and Lower landings, and is located entirely within Columbus County. It contains good examples of sandhill communities, and is the only sand ridge within the macrosite known to have longleaf pine (Pinus palustris) as a significant component of the canopy. The site also supports Wet Pine Flatwoods and a pocosin community. One rare plant is known from the site.

**Princess Anne Swamp.** This site, shared with Robeson County, is located south of the confluence of Lumber River with Flowers Swamp. The natural communities associated with the floodplain and river channel in this area are among the highest quality within the macrosite, and the site includes one of the most scenic stretches of the river. One rare animal is known from this site.

**Big Sandy Ridge and Swamp.** This site is located northwest of Fair Bluff, and includes floodplain, river channel, and sand ridge landforms and natural communities. The floodplain and river channel are shared with Robeson County, but the sand ridge--about four miles long--occurs entirely within Columbus County. The site contains good examples of natural communities associated with the floodplain and river channel. Big Sandy Ridge contains extensive examples of sandhill communities, along with Wet Pine Flatwoods and pocosin communities. The site contains one rare animal and three rare plant species, including the largest North Carolina population of woody goldenrod (Chrysoma pauciflosculosa).



**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Big Sandy Ridge and Swamp

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 1400 acres in Columbus County

**COUNTY:** Columbus / Robeson

**QUADRANGLE:** Fair Bluff / Cerro Gordo / Evergreen

**LOCATION:** Lumber River floodplain north for about two miles from highway NC 904 bridge at Fair Bluff, and sand ridge in the Lumber River floodplain from 1.5 to 5.5 miles northeast of the town of Fair Bluff. Portions of the floodplain are located in Robeson County.

**SIGNIFICANT FEATURES:**

1. One rare animal species, the American alligator (Alligator mississippiensis), has been documented from the Lumber River floodplain in this area. The alligator is Federally Threatened.
2. The site supports populations of three rare plant species: woody goldenrod (Chrysoma pauciflosculosa), southern bogbutton (Lachnocaulon beyrichianum), and thread-leaved sundew (Drosera filiformis). Woody goldenrod is State Endangered, southern bogbutton is designated as a State Candidate, and thread-leaved sundew is significantly rare in North Carolina. The population of woody goldenrod is the largest of only three in the state. In Columbus County, thread-leaved sundew is known from one other site, and southern bogbutton is known from four sites. Other uncommon species occurring at the site include oak toes lichen (Cladina evansii) and sandy-field beaksedge (Rhynchospora megalocarpa), both of which are on the watch list maintained by the N.C. Natural Heritage Program, and each occurs at only one other site in the county.
3. Big Sandy Ridge, about four miles long, is the largest sand ridge in the Lumber River floodplain. The dry sandhill communities supported by the sand ridge are uncommon in Columbus County, and the Xeric Sandhill Scrub community is known from only two other sites. The Coastal Fringe Sandhill community is also uncommon, and differs from typical examples near the coast.

**GENERAL DESCRIPTION:** Big Sandy Ridge is an elongate sand ridge located within the Lumber River floodplain, and averaging about 0.2 mile in width. It is presumed to be of aeolian origin (Ash, 1990), and lies along a southwest/northeast axis southeast of the river. The ridge is bordered along the northwest by River Swamp and Lumber River, and on the southeast by Porter Swamp and Middle Swamp. The

ridge is comprised of two sections separated by a narrow swamp depression near the midpoint of its approximate four-mile length. The ridge section southwest of the intersecting swamp is referred to as "southwest ridge," and the section to the northeast is referred to as the "northeast ridge." The higher, central portion of the ridge supports Xeric Sandhill Scrub (Sand Barren Variant). Gradual slopes and low upland terraces along the sides of the ridge support Coastal Fringe Sandhill. Wetter terraces near the bordering swamp ecotone support Wet Pine Flatwoods (Wet Spodosol Variant) and pocosin communities classifiable to Small Depression Pocosin and Bay Forest. The river floodplain adjacent to the southwest end of the ridge is included within the site. Higher elevations of the floodplain support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). Three community types are associated with the active river channel: Cypress--Gum Swamp (Blackwater Subtype) occurs in backwaters, shallow oxbows, and active sloughs; Coastal Plain Levee Forest (Blackwater Subtype) occurs on natural levees along the edge of the river; and the Sand and Mud Bar community occurs on point bars associated with river meanders.

Xeric Sandhill Scrub is the dominant community type on the sand ridge, covering about 350 acres. It occurs in xeric sand on the higher elevations, and is best developed and least impacted on the northeast ridge. The sparse canopy is dominated by loblolly pine (*Pinus taeda*), and longleaf pine (*P. palustris*) is occasionally a codominant on the northeast ridge. Turkey oak dominates throughout the sparse to moderate understory, and becomes the canopy tree where pines are absent. On the northeast ridge, woody goldenrod frequently dominates the sparse shrub layer, and dwarf huckleberry (*Gaylussacia dumosa*), blue huckleberry (*G. frondosa*), and Carolina october-flower (*Polygonella polygama* var. *croomii*) are prominent. The ground surface is mostly exposed sand, with lichens (*Cladonia* spp.) forming patches. Sand spikemoss (*Selaginella arenicola*) and wireplant (*Stipulicida setacea*) are frequent. Spanish-moss (*Tillandsia usneoides*) is a prominent epiphyte on the oaks. Much of the community has been impacted by recent (1994) logging on the southwest ridge. The presence of longleaf pine suggests that it may have once dominated the canopy and was subsequently logged.

Coastal Fringe Sandhill occurs in dry sand along the slopes and low terraces of the ridge. The moderate to open canopy is dominated by loblolly pine or sand laurel oak (*Quercus hemisphaerica*). Where pine forms the canopy, sand laurel oak dominates the understory. Turkey oak is prominent. Woody goldenrod and blue huckleberry are locally dominant in the sparse to moderate shrub layer, and Carolina october-flower is prominent. Lichens (*Cladonia* spp.) are locally dominant in the ground layer, and sand spikemoss is prominent. Spanish-moss is a prominent epiphyte on the oaks. This community type has been heavily impacted by logging on the southwest ridge.

Wet Pine Flatwoods occurs in wet sand on low terraces along the edge of the ridge. The open to moderately dense canopy is dominated by

loblolly pine, with pond pine (Pinus serotina) and water oak (Quercus nigra) locally prominent. Titi (Cyrilla racemiflora), black highbush blueberry (Vaccinium fuscatum), fetterbush (Lyonia lucida), and staggerbush (L. mariana) are prominent in the moderate to moderately dense shrub layer. Wiregrass is a subdominant in the ground layer, and southern bogbutton is prominent. Scattered longleaf pine suggests that it once may have dominated the Wet Pine Flatwoods canopy and was subsequently logged.

Two pocosin community types occur along or near the edges of the sand ridge on wet to saturated sandy peats. Small depressions within the sand ridge support the Small Depression Pocosin community. The canopy is dominated by pond pine or loblolly pine. The dense understory and shrub layer is dominated by fetterbush, zenobia (Zenobia pulverulenta), and inkberry (Ilex glabra), with blue huckleberry, Carolina sheeplaurel (Kalmia carolina), and black highbush blueberry prominent. Flat ecotonal areas between the base of the ridge and the adjacent floodplain support a pocosin community classifiable to Bay Forest. The canopy is dominated by loblolly bay (Gordonia lasianthus), and the subcanopy is dominated by sweetbay (Magnolia virginiana). The moderate to dense shrub layer is dominated by gallberry (Ilex coriacea), with blue huckleberry, Carolina sheeplaurel, and fetterbush prominent.

Coastal Plain Bottomland Hardwoods occurs on wet to infrequently flooded loamy soil in higher reaches of the floodplain away from the river. The canopy is very diverse with several hardwood tree species present. Most prominent are laurel oak (Quercus laurifolia), water oak, red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), swamp tupelo (Nyssa biflora), water tupelo (N. aquatica), and loblolly pine. The understory is dominated by canopy trees, plus swamp red bay (Persea palustris), sweetbay, and American holly (Ilex opaca). The patchy shrub layer is dominated by mayberry (Vaccinium elliotii), titi, coastal sweet-pepperbush (Clethra alnifolia), and swamp doghobble (Leucothoe racemosa). Vines are fairly abundant and diverse, with poison ivy (Toxicodendron radicans) prominent. Herbs are sparse, with ferns (Osmunda spp., Woodwardia virginica) and sedges (Carex spp.) most prominent.

Cypress--Gum Swamp occurs on wet to periodically inundated black loam soil in active sloughs and shallow backwaters and oxbows associated with the river channel. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. Backwaters are lobes of the river located at the downstream end of active sloughs. Oxbows are found in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped depression. The Cypress--Gum Swamp canopy is dominated by baldcypress (Taxodium distichum), with swamp tupelo prominent. The understory is dominated by young canopy trees

and Carolina ash (Fraxinus caroliniana). The shrub and herb layers are sparse.

Coastal Plain Levee Forest occurs on the wet sandy to mucky levee formed above the shoreline of the river by flood water sedimentation. The levee floods more shallowly and for shorter periods than the adjacent swamps. The levee canopy is dominated by laurel oak, overcup oak (Quercus lyrata), loblolly pine, and red maple. The understory is dominated by young canopy species and Carolina ash and American holly. The well-developed shrub layer is dominated by mayberry and titi. Vines are abundant and diverse, and herbs are sparse.

The Sand and Mud Bar community occurs on sandy point bars in the active river channel. Point bars are formed on the inside of meanders (convex shore of the river). Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. Point bars are exposed only during periods of low river levels (drawdowns). Woody plants cannot establish because of the long periods of submergence. The bars are herb-dominated, mostly by small plants that are able to mature quickly during the brief periods of exposure. Prominent herbs include panic grass (Panicum sp.), whorled pennywort (Hydrocotyle verticillata var. triradiata), false nettle (Boehmeria cylindrica), smartweeds (Polygonum spp.), and flatsedges (Cyperus spp.).

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Both the southwest and northeast ridges are used by a hunt club. It is probable that improved access associated with recent logging of the southwest ridge, and construction of a bridge between the two ridge sections, will lead to increased off-road vehicle use and impacts to the woody goldenrod population. The site needs protection from off-road vehicle use, and arrangements should be made to at least protect the woody goldenrod populations. The Xeric Sandhill Scrub community should be managed for protection from logging, particularly since timber values are low due to the sparse canopy. Protection efforts should be concentrated on the northeast ridge, which is in much better condition than the southwest ridge, and has the great majority of woody goldenrod. This ridge section would be an appropriate and important inclusion within the proposed state park along the Lumber River. On the southwest ridge, protection may lead to recovery of large areas of the Xeric Sandhill Scrub community. Within the Lumber River floodplain, preservation of floodplain forest communities will protect water quality and flow dynamics in the Lumber River.

The northeast ridge of Big Sandy Ridge and the adjacent Princess Anne Swamp site together comprise one of the most important natural

areas along the Lumber River. They contain almost all of the natural community types found within the river system south of Lumberton, including some of the best examples of floodplain and sand ridge communities. The river possesses exceptional scenic value in this area, and the large population of the very rare woody goldenrod on the northeast ridge is very showy in late summer. This area should be given a high priority for acquisition within the state park.

**REFERENCES:**

Ash, A.N. 1990. A preliminary natural areas inventory of the Lumber River floodplain. N.C. Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Gillis, E.B., and T.K. Hughes. 1986. Evaluation of wildlife and habitat quality for the Great Sandy Ridge tract, Columbus Co. N.C. Wildlife Resources Commission, Raleigh.

LeBlond, R.J. 1994. Site survey report: Big Sandy Ridge. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

NCWQS. 1994. Lumber River basinwide water quality management plan. N.C Water Quality Section, DEM, DEHNR, Raleigh.



**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Net Hole--Buck Landing Swamp. This description covers only that portion of the site occurring within Columbus County (less than 5% of the site).

**SITE SIGNIFICANCE:** Statewide

**SIZE:** est. 40 acres in Columbus County

**COUNTY:** Columbus / Robeson

**QUADRANGLE:** Evergreen

**LOCATION:** Lumber River floodplain and sand ridges south from the Phillips Road (SR 2121) crossing in Robeson County to about half of a river mile northeast of the highway US 74 crossing at the Columbus/Robeson county line. Only the area along the southeast side of the river southwestward from the confluence with Big Swamp is within Columbus County.

**SIGNIFICANT FEATURES:**

1. One rare animal species, the American alligator (Alligator mississippiensis), has been documented from the Lumber River floodplain in this area. The alligator is Federally Threatened.
2. The site provides habitat for one rare plant species, sarvis holly (Ilex amelanclhier), which is significantly rare in North Carolina.
3. The site in its entirety contains the largest stretch of Cypress--Gum Swamp along the Lumber River, including some old stands. The site has outstanding wildlife habitat value.

**GENERAL DESCRIPTION:** Southwest from The Net Hole and the confluence with Big Swamp, the Lumber River is characterized by a complex series of interconnecting channels and meanders. Point bars within the river channel support the Sand and Mud Bar community. Levees along the river edge support Coastal Plain Levee Forest (Blackwater Subtype). Active sloughs and oxbows support Cypress--Gum Swamp (Blackwater Subtype). Higher parts of the floodplain away from the river support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). The majority of the site is dominated by the Bottomland Hardwoods community. Most of the site appears to have been logged in the past, but large canopy trees are still present, at least locally. The overall condition and ecological function of the forest appears to be good.

The Sand and Mud Bar community occurs on sandy point bars in the active river channel. Point bars are formed on the inside of meanders (convex shore of the river). Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. Point bars are exposed only during periods of low river

levels (drawdowns). Woody plants cannot establish because of the long periods of submergence, although small trees like river birch (Betula nigra) and water-ash (Planera aquatica) may overhang the point bar. The bars are herb-dominated, mostly by small plants that are able to mature quickly during the brief periods of exposure. Prominent herbs include panic grass (Panicum sp.), whorled pennywort (Hydrocotyle verticillata var. triradiata), false nettle (Boehmeria cylindrica), smartweeds (Polygonum spp.), and flatsedges (Cyperus spp.).

Coastal Plain Levee Forest occurs on the wet sandy to mucky levee formed above the shoreline of the river by flood water sedimentation. The levee floods more shallowly and for shorter periods than the adjacent swamps. The levee canopy is dominated by laurel oak (Quercus laurifolia), overcup oak (Q. lyrata), loblolly pine (Pinus taeda), and red maple (Acer rubrum). The understory is dominated by young canopy species and Carolina ash (Fraxinus caroliniana) and American holly (Ilex opaca). The well-developed shrub layer is dominated by mayberry (Vaccinium elliotii) and titi (Cyrilla racemiflora). Vines are abundant and diverse, and herbs are sparse.

Cypress--Gum Swamp occurs on wet to periodically inundated black loam soil in active sloughs and oxbows associated with the river channel. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. Oxbows are found in recently abandoned river channel meanders where sediment deposits have closed off the former channel meander at both ends, leaving a crescent-shaped or horseshoe-shaped depression. Water-filled oxbows are called oxbow lakes. The Cypress--Gum Swamp canopy is dominated by baldcypress (Taxodium distichum), with swamp tupelo (Nyssa biflora) prominent to occasionally dominating. The understory is dominated by young canopy trees and Carolina ash. The shrub and herb layers are sparsely vegetated.

Coastal Plain Bottomland Hardwoods occurs on wet to infrequently flooded loamy soil in higher reaches of the floodplain away from the river. The canopy is very diverse with several hardwood tree species present. Most prominent are laurel oak, water oak (Q. nigra), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and loblolly pine (Pinus taeda). The understory is dominated by canopy trees, plus swamp red bay (Persea palustris), sweetbay (Magnolia virginiana), and American holly (Ilex opaca). The patchy shrub layer is dominated by mayberry (Vaccinium elliotii), titi, coastal sweet-pepperbush (Clethra alnifolia), and Virginia sweetspire (Itea virginica). Vines are fairly abundant and diverse, and herbs are sparse.

**OWNERSHIP:** Private (in Columbus Co.).

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Net Hole Swamp has been designated as a priority acquisition area for Lumber River State Park. To preserve and enhance the site's natural values, it should be protected from logging and impacts from adjacent land uses. Protection of the forest communities also protects water quality and flow dynamics in the Lumber River.

**REFERENCES:**

Ash, A.N. 1990. A preliminary natural areas inventory of the Lumber River floodplain. N.C. Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR.

NCWQS. 1994. Lumber River basinwide water quality management plan. N.C Water Quality Section, DEM, DEHNR, Raleigh.



**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Bluff Swamp

**SITE SIGNIFICANCE:** Regional

**SIZE:** est. 1300 acres, of which about 500 acres are in Columbus County

**COUNTY:** Columbus / Robeson

**QUADRANGLE:** Evergreen

**LOCATION:** Lumber River floodplain south of highway NC 74, beginning about one air mile south of the highway crossing, and extending southward for another 2.5 miles. Parkers Upper and Lower landings centrally located along the site.

**SIGNIFICANT FEATURES:**

1. One rare animal species, the American alligator (Alligator mississippiensis), has been documented from the Lumber River floodplain in this area. The alligator is Federally Threatened.
2. The site provides habitat for one rare plant species, sarvis holly (Ilex amelanchier), which is significantly rare in North Carolina.
3. Site contains an extensive example of the Lumber River floodplain, including good examples of natural community types associated with the river and floodplain landforms.

**GENERAL DESCRIPTION:** Bluff Swamp comprises a long meander section of the Lumber River and adjacent floodplain swamp. Point bars within the river channel support the Sand and Mud Bar community. Levees along the river edge support Coastal Plain Levee Forest (Blackwater Subtype). Active sloughs and oxbows support Cypress--Gum Swamp (Blackwater Subtype). Higher parts of the floodplain away from the river support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). The majority of the site is dominated by the Bottomland Hardwoods community. Most of the site appears to have been logged in the past, but large canopy trees are still present, at least locally. The overall condition and ecological function of the forest appears to be good.

The Sand and Mud Bar community occurs on sandy point bars in the active river channel. Point bars are formed on the inside of meanders (convex shore of the river). Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. Point bars are exposed only during periods of low river levels (drawdowns). Woody plants cannot establish because of the long periods of submergence, although small trees like river birch (Betula nigra) and water-ash (Planera aquatica) may overhang the point bar. The bars are herb-dominated, mostly by small plants that are able to mature quickly during the brief periods of exposure.

Prominent herbs include whorled pennywort (Hydrocotyle verticillata var. triradiata), false nettle (Boehmeria cylindrica), smartweeds (Polygonum spp.), and grasses, sedges, and rushes.

Coastal Plain Levee Forest occurs on the wet sandy to mucky levee formed above the shoreline of the river by flood water sedimentation. The levee floods more shallowly and for shorter periods than the adjacent swamps. The levee canopy is dominated by laurel oak (Quercus laurifolia), overcup oak (Q. lyrata), loblolly pine (Pinus taeda), and red maple (Acer rubrum). The understory is dominated by young canopy species and Carolina ash (Fraxinus caroliniana) and American holly (Ilex opaca). The well-developed shrub layer is dominated by mayberry (Vaccinium elliotii) and titi (Cyrilla racemiflora), with Virginia sweetspire (Itea virginica) and coastal sweet-pepperbush (Clethra alnifolia) prominent.

Cypress--Gum Swamp occurs on wet to periodically inundated black loam soil in active sloughs associated with the river channel. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. The Cypress--Gum Swamp canopy is dominated by baldcypress (Taxodium distichum) and swamp tupelo (Nyssa biflora). The understory is dominated by young canopy trees and Carolina ash. The shrub and herb layers are sparsely vegetated.

Coastal Plain Bottomland Hardwoods occurs on wet to infrequently flooded loamy soil in higher reaches of the floodplain away from the river. The canopy is very diverse with several hardwood tree species present. Most prominent are laurel oak, water oak (Q. nigra), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and loblolly pine (Pinus taeda). The understory is dominated by canopy trees, plus swamp red bay (Persea palustris), sweetbay (Magnolia virginiana), and American holly (Ilex opaca). The patchy shrub layer is dominated by mayberry (Vaccinium elliotii), titi, coastal sweet-pepperbush (Clethra alnifolia), and Virginia sweetspire (Itea virginica).

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Bluff Swamp has been designated as a priority acquisition area for Lumber River State Park. To preserve and enhance the site's natural values, it should be protected from logging and impacts from adjacent land uses. Protection of the forest communities also protects water quality and flow dynamics in the Lumber River.

**REFERENCES:**

Ash, A.N. 1990. A preliminary natural areas inventory of the Lumber River floodplain. N.C. Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR.

NCWQS. 1994. Lumber River basinwide water quality management plan. N.C Water Quality Section, DEM, DEHNR, Raleigh.





(Dichanthelium sp. =Panicum lancearium) and wiregrass are patch dominants, and southern bogbutton is prominent.

A small area of Bay Forest is found on wet to seasonally saturated black sandy soil with a shallow organic surface layer. It occurs in a Carolina bay at the southwest edge of the site. The low canopy is dominated by sweetbay (Magnolia virginiana), and loblolly bay (Gordonia lasianthus) is prominent. Carolina sheeplaurel is a subdominant in the dense shrub layer, where gallberry (Ilex coriacea), fetterbush (Lyonia lucida), Carolina red maple (Acer rubrum var. trilobum), and swamp red bay (Persea palustris) are prominent. Herbs are very sparse.

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** The northeast and central two-fifths of the ridge has been impacted by logging within the past five years, with large but patchy disturbances to the ground layer. A large 10 feet deep and 40 feet wide ditch running north/south transects the ridge from the north end towards the center, and another large ditch borders the ridge along its south edge. The western and southern portions of the ridge remain in essentially natural condition, and the prominence of longleaf pine in the canopy make this site exceptional among Lumber River floodplain sand ridges. To protect the natural values of the site, logged areas should be allowed to recover, the ditches should be filled in, and vehicle trails should be abandoned. The site abuts the Bluff Swamp site, and should be included within any state park land acquisition effort for the area.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Parkers Landing Sand Ridge. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

**SITE DESCRIPTION:** Columbus County Inventory Report, 1995

**SITE NAME:** Princess Anne Swamp

**SITE SIGNIFICANCE:** Regional

**SIZE:** est. 850 acres, of which about 600 acres are in Columbus County

**COUNTY:** Columbus / Robeson

**QUADRANGLE:** Fairmont / Evergreen / Cerro Gordo / Fair Bluff

**LOCATION:** Lumber River and floodplain south for about 1.75 air miles from the confluence with Flowers Swamp at Griffin Whirl.

**SIGNIFICANT FEATURES:**

1. One rare animal species, the American alligator (Alligator mississippiensis), has been documented from the Lumber River floodplain in this area. The alligator is Federally Threatened.
2. The site contains high quality Bottomland Hardwoods forest, probably the best example along the Lumber River. Good examples of other natural communities and landforms associated with the river and floodplain are also present. This is one of the most scenic stretches along the river, as well as one of the most ecologically sound.

**GENERAL DESCRIPTION:** Princess Anne Swamp comprises a meander section of the Lumber River and adjacent floodplain swamp. Point bars within the river channel support the Sand and Mud Bar community. Levees along the river edge support Coastal Plain Levee Forest (Blackwater Subtype). Active sloughs and oxbows support Cypress--Gum Swamp (Blackwater Subtype). Higher parts of the floodplain away from the river support Coastal Plain Bottomland Hardwoods (Blackwater Subtype). The majority of the site is dominated by the Bottomland Hardwoods community. Most of the site appears to have been logged in the past, but large canopy trees are still present, at least locally. The overall condition and ecological function of the forest appears to be good. The condition of the Bottomland Hardwoods community is equal or superior to any area along the Lumber River.

The Sand and Mud Bar community occurs on sandy point bars in the active river channel. Point bars are formed on the inside of meanders (convex shore of the river). Because the meander (bend) obstructs flow, point bars are the sites of the most active sediment deposition. Point bars are exposed only during periods of low river levels (drawdowns). Woody plants cannot establish because of the long periods of submergence, although small trees like river birch (Betula nigra) and water-ash (Planera aquatica) may overhang the

point bar. The bars are herb-dominated, mostly by small plants that are able to mature quickly during the brief periods of exposure. Prominent herbs include whorled pennywort (Hydrocotyle verticillata var. triradiata), false nettle (Boehmeria cylindrica), smartweeds (Polygonum spp.), and grasses, sedges, and rushes.

Coastal Plain Levee Forest occurs on the wet sandy to mucky levee formed above the shoreline of the river by flood water sedimentation. The levee floods more shallowly and for shorter periods than the adjacent swamps. The levee canopy is dominated by laurel oak (Quercus laurifolia), overcup oak (Q. lyrata), loblolly pine (Pinus taeda), and red maple (Acer rubrum). The understory is dominated by young canopy species and Carolina ash (Fraxinus caroliniana) and American holly (Ilex opaca). The well-developed shrub layer is dominated by mayberry (Vaccinium elliotii) and titi (Cyrilla racemiflora), with Virginia sweetspire (Itea virginica) and coastal sweet-pepperbush (Clethra alnifolia) prominent.

Cypress--Gum Swamp occurs on wet to periodically inundated black loam soil in active sloughs associated with the river channel. Sloughs are former segments of the river channel that have been cut off by sediment deposition at the upstream end of the slough. Active sloughs carry flowing water during flood events. The Cypress--Gum Swamp canopy is dominated by baldcypress (Taxodium distichum) and swamp tupelo (Nyssa biflora). The understory is dominated by young canopy trees and Carolina ash. The shrub and herb layers are sparsely vegetated.

Coastal Plain Bottomland Hardwoods occurs on wet to infrequently flooded loamy soil in higher reaches of the floodplain away from the river. The canopy is very diverse with several hardwood tree species present. Most prominent are laurel oak, water oak (Q. nigra), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and loblolly pine (Pinus taeda). The understory is dominated by canopy trees, plus swamp red bay (Persea palustris), sweetbay (Magnolia virginiana), and American holly (Ilex opaca). The patchy shrub layer is dominated by mayberry (Vaccinium elliotii), titi, coastal sweet-pepperbush (Clethra alnifolia), and Virginia sweetspire (Itea virginica).

**OWNERSHIP:** Private.

**PROTECTION STATUS:** None.

**MANAGEMENT/PROTECTION RECOMMENDATIONS:** Princess Anne Swamp has been designated as a priority acquisition area for Lumber River State Park. To preserve and enhance the site's natural values, it should be protected from logging and impacts from adjacent land uses. Protection of the forest communities also protects water quality and flow dynamics in the Lumber River.

**REFERENCES:**

Ash, A.N. 1990. A preliminary natural areas inventory of the Lumber River floodplain. N.C. Nature Conservancy and N.C. Natural Heritage Program, DPR, DEHNR.

NCWQS. 1994. Lumber River basinwide water quality management plan. N.C Water Quality Section, DEM, DEHNR, Raleigh.





pine canopy is dense and might require thinning. The large recent clearcut area to the north of the site has been impacted by heavy ground surface disturbance, but some areas in the clearcut may have restoration potential. The red-cockaded woodpecker, Carolina grass-of-parnassus, and dissected sneezeweed have not been reported from the site since 1981.

**REFERENCES:**

- LeBlond, R.J. 1994. Site survey report: Cross Bay Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.
- Lynch, J.M., J.H. Moore, and S.L. Peacock. 1981. Preliminary site reconnaissance survey: Cross Bay Longleaf Pine Savanna. N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.



the river has been impacted by a roadbed. The river and stream floodplains also have been impacted by recreational use of the landing. To protect the natural values of the site, forests on the river and stream slopes and slope summits should be allowed to regenerate. Recreational use of the area should be limited to the immediate vicinity of the landing.

**REFERENCES:**

LeBlond, R.J. 1994. Site survey report: Neils Eddy Landing.  
N.C. Natural Heritage Program, DPR, DEHNR, Raleigh.

Nifong, T.D., and J.B. Taggart. 1981. Vegetation of the Pee Dee formation along the Cape Fear River corridor, North Carolina. Dept. of Botany, University of North Carolina, Chapel Hill.