

II. Refuge Overview

INTRODUCTION

National wildlife refuges provide important habitat for native plants and many species of mammals, birds, fish, insects, amphibians, and reptiles. They also play a vital role in preserving endangered and threatened species. Wolf Island NWR, a designated wilderness area, will play an integral role in preserving vital south Atlantic coastal habitat for migratory birds and such endangered and threatened species as the loggerhead turtle and the piping plover.

REFUGE HISTORY AND PURPOSE

Wolf Island's recorded history began on March 7, 1769 when the King George III of England granted Christopher DeBrake title to 150 acres (the upland portion) of Wolf Island. Early diaries record that locals used the island for hunting, and as quarantine for sick sailors with yellow fever, as it was "a solitary spot washed by the waves of the Atlantic and miles from any human habitation." In 1828, part of the island (538 acres) was conveyed to the U.S. Government.

The strategic location of Wolf Island made it an important identification point on early navigational charts, and the U.S. Coast Guard erected a lighthouse at the northern end. That old Coast Guard light, which stood on the northern tip of Wolf Island, has long since disappeared into the ocean. No navigational lights or other structures now exist anywhere on the refuge.

In 1819, the Georgia legislature ceded jurisdiction of Wolf Island to the United States for the purpose of building a 55-foot high beacon light to complement the lighthouse across Doboy Sound on Sapelo Island. The structure was built, along with a keeper's house, and was in operation by the summer of 1822. The beacon light was pounded by periodic hurricanes and blown up during the Civil War by Confederate soldiers who didn't want the light to aid the Union Navy. After the Civil War, a larger, grander structure was built. The beacon light was 38 feet tall, with a sixth order light that could be seen 11.5 miles away. The lighthouse had several keepers over the years, until the terrible hurricane of 1898, which destroyed the structure and killed several people on Wolf Island. A clubhouse built by hunters in 1891 on the southern end of the island belonged to the Wolf Island Club. The 1898 hurricane swept the structure away and killed a caretaker. An account of the storm in the *Darien Gazette* said the Wolf Island light keeper, Mr. James Cromley, "had a terrible time of it and says that in the future the high land will be good enough for him." The light beacon was deactivated and the remaining structures were moved to the Sapelo lighthouse.

The refuge was established by Executive Order No. 5316 on April 3, 1930, when the 538 acres already in government ownership were set aside as a sanctuary for migratory birds. In 1969, the protection of Wolf, Egg, and Little Egg islands became the goal of Jane Hurt Yarn, a prominent Atlanta environmentalist with the Nature Conservancy in the 1970s. She bought an option on Egg Island in 1969. This was followed by the purchase of Wolf and Little Egg. Her purchase of Egg Island was one of the first actions taken by environmentalist to protect the coast. On October 3, 1972, an additional 4,071

acres were purchased from The Nature Conservancy. The balance of the refuge (517 acres) was added December 8, 1972, by a Declaration of Taking determined by The U.S. District Court, Southern District of Georgia (Civil No. B/1147). The refuge was closed to hunting of migratory birds on April 17, 1973, and was designated a National Wilderness Area on January 3, 1975. The refuge consists of a long narrow strip of oceanfront beach backed by a broad band of salt marsh. Over 75% of the refuge's 5,126 acres are composed of saltwater marshes (see Figure 1). It is located in McIntosh County, Georgia, 12 miles east of Darien (by boat).

Wolf Island NWR, as designated National Wilderness Area, is maintained as such, with its primary purpose being to provide protection for migratory birds and such endangered and threatened species as the loggerhead sea turtle and piping plover. Due to its status as a wilderness area, no public use facilities exist or are planned on the refuge. Though the refuge's saltwaters are open to a variety of recreational activities, all beach, marsh, and upland areas are closed to the public. Visitors must make their own arrangements to reach the refuge. Marinas in the Darien, Georgia area may offer transportation to the refuge.

Wolf Island NWR is one of seven refuges administered by the Savannah Coastal Refuges Complex. This chain of national wildlife refuges extends from Pinckney Island NWR near Hilton Head Island, South Carolina, to Wolf Island NWR near Darien, Georgia. Between these lie Savannah (the largest unit in the complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island refuges. Together they span a 100-mile coastline and total over 56,000 acres. The Savannah Coastal Refuges are administered from headquarters located in Savannah, Georgia.

SPECIAL DESIGNATIONS

As noted above, the entire refuge is designated as a wilderness area, therefore resource values are maintained by natural processes. The refuge is monitored to ensure that these values have not been compromised. Law enforcement and education/interpretation are the primary management tools.

A wilderness area, in contrast with those areas where man and his own works dominate the landscape, is recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor and does not remain. An area of wilderness is further defined as an area of undeveloped Federal land retaining its primal character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which:

1. Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
3. Has at least 5000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and
4. May also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

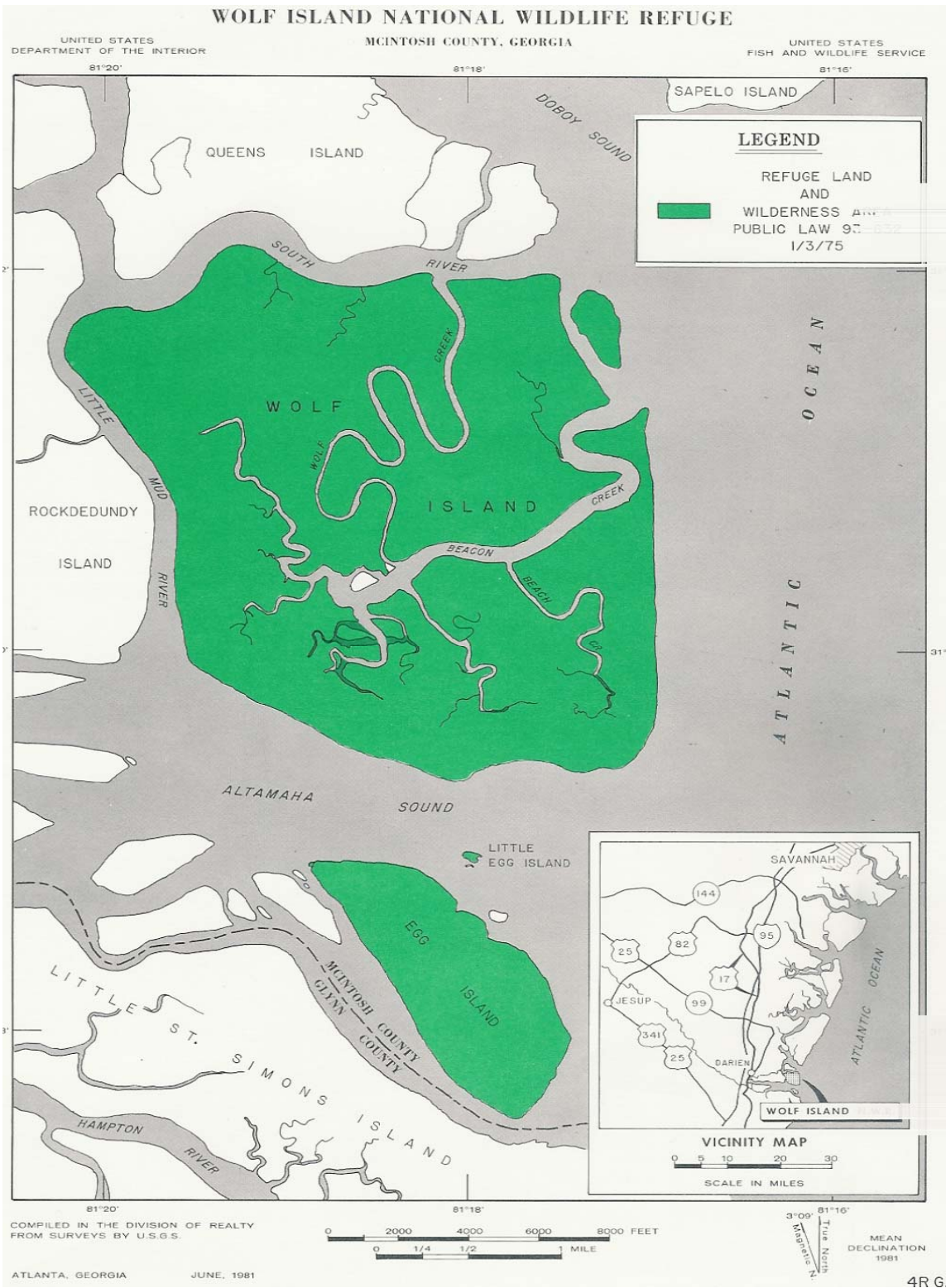


FIGURE 1

ECOSYSTEM CONTEXT

This three-island wildlife refuge in the mouth of the Altamaha River consists mainly of salt marsh and provides critical sanctuary for rare migrating birds and nursery habitat for sea turtles. Wolf Island, the largest island in the refuge, is defined by South River to the north, Little Mud River to the west, Altamaha Sound to the south, and the Atlantic Ocean to the east. The island consists of 4,519 acres, with only 300 acres of dune and beach along its narrow, 4-mile long eastern shoreline. The island fronts the sea in the Altamaha River delta, and is a physical barrier between Dobby Sound to the north and Altamaha Sound to the south. Tucked into the mouth of Altamaha Sound directly south of Wolf Island are Egg and Little Egg islands, the two other islands in the refuge. They comprise 593 and 14 acres respectively, and support extensive salt marsh with only 70 acres of upland.

The Wolf Island NWR is at the southeast boundary of the Altamaha Watershed ecosystem, designated Unit 31 (see Figure 2).

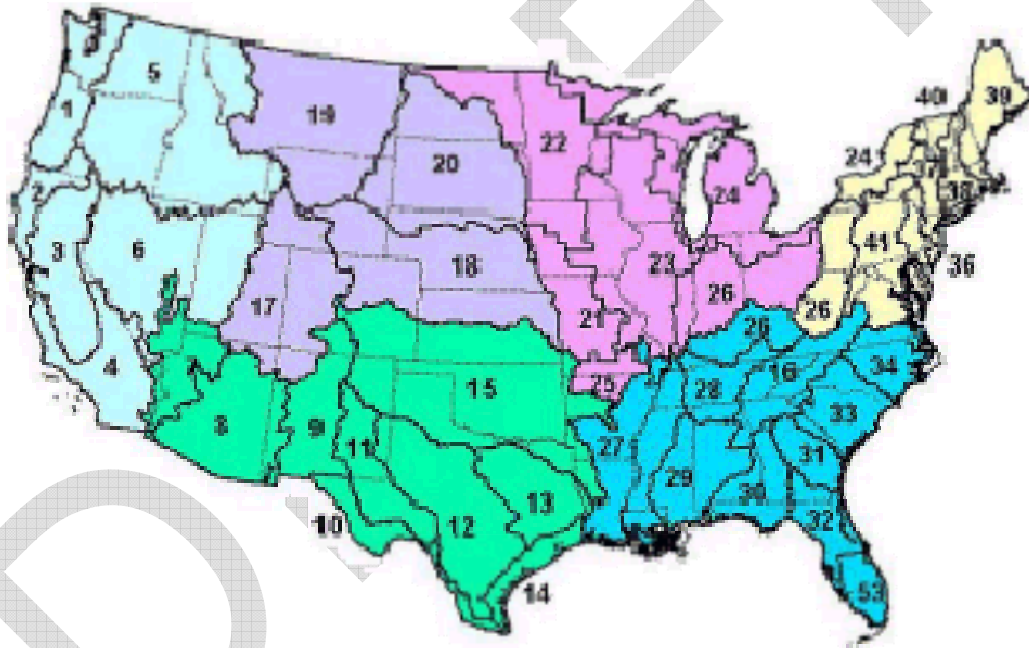


FIGURE 2

An ecosystem is a geographic area including all the living organisms (people, plants, animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural cycles that sustain them. All of these elements are interconnected. Managing any one resource affects the others in that ecosystem. Ecosystems can be small (a single stand of aspen) or large (an entire watershed including hundreds of forest stands across many different ownerships).

The U.S. Fish and Wildlife Service has adopted an ecosystem approach to conservation because we can't just look at a single animal, species, or piece of land in isolation from all that is around it. We all realize that we are not going to achieve conservation within the boundaries of a National Wildlife Refuge, that we are not going to restore aquatic

resources with a National Fish Hatchery, and that listing an endangered species is not going to conserve the system. All of these are interconnected. If we disturb or manage one, all of the others will be affected.

REGIONAL CONSERVATION PLANS AND INITIATIVES

Initiative for watershed excellence: upper Altamaha pilot project: This new initiative, funded by the US EPA and Georgia EPD through Section 319 of the Clean Water Act, will serve as the model for developing watershed support centers across the country. The River Basin Center will work with faculty and students from other colleges and universities in the Upper Altamaha basin to provide technical, organizational and legal assistance to stakeholder groups to increase their capacity to enhance and protect water quality. The Upper Altamaha watershed was selected as the location for this pilot project for many reasons. Because a wide range of land uses, ranging from urban development to agriculture and silviculture, occur within the watershed, a variety of best practices may be appropriate to protect and restore water quality, and therefore lessons learned here are likely to be applicable to many different watersheds.

ECOLOGICAL THREATS AND PROBLEMS

In order to prepare a Comprehensive Conservation Plan that will establish goals and objectives on how to manage this Refuge over the next 15 years, a number of planning steps were followed. One of those steps was an internal review of known ecological threats and problems that may hinder the ability of refuge personnel to fulfill the objectives of the Refuge. That review developed the following list of concerns:

- Beach erosion/accretion;
- Control of nuisance wildlife; and
- Protection of the natural function of the Altamaha river system.

BEACH EROSION/ACCRETION:

Coastal Georgia is home to about one-third of the viable salt marsh left on the Atlantic coast and where the public owns 10 of the 18 major islands. Unlike many other areas of the East Coast, approximately two-thirds of Georgia's islands are parks, refuges, or preserves. The population of coastal Georgia is growing at approximately 20% per decade. Along with this increased population growth comes the pressure to develop environmentally sensitive areas such as wetlands, floodplains, and barrier islands. The South Carolina-Georgia Coastal Erosion Study is a collaborative effort between researchers from the USGS, Coastal Carolina University, University of South Carolina, College of Charleston, and the South Carolina Sea Grant Consortium aimed at understanding the process of coastal erosion and the factors that affect erosion rates along the SC/GA coasts. Georgia meets the Atlantic Ocean along the beaches of the offshore islands, popularly known as the Sea Islands or the Golden Isles. The Georgia islands are several miles offshore and are separated from the mainland by extensive marshland, tidewater streams, and sounds. Other islands, in addition to the barrier islands, are scattered throughout the estuarine systems. These islands are of various origins. Some of the hammock (forested) islands are remnants of old barrier islands formed in the past during periods of higher sea level (Hoyt et al. 1964). The beaches and dunes are constantly being resculptured by the action of waves, currents, and wind, which interact to keep the beaches and dunes in a dynamic state.

Refuge concern regarding erosion and accretion will require input from the Army Corps of Engineers to evaluate the long-term impact to the refuge of nearby sea sand diversion and nourishment programs such as the one at Savannah harbor.

CONTROL OF NUISANCE WILDLIFE:

Sand crabs and raccoons are the principal natural nest predators for sea turtles in Georgia and in many other areas. Both have an uncanny ability to locate sea turtle nests. Usually, sand crabs are the first to arrive at a nest. They normally dig small holes down into the nest cavity and bring several eggs to the surface. The eggs are then eaten at the nest or transported to the nearby burrow of the crab.

Raccoons are the most common natural vertebrate predators of turtle nests. They are common even on the most isolated of the barrier beaches. Raccoons patrol the beaches during the nesting season singly or in family groups to hunt for sea turtle eggs. It has been found that relatively few individuals are responsible for nest depredation. These individuals covered the same area throughout the summer.

Sand crabs and raccoons are natural inhabitants of the islands of the refuge and efforts to control their population may seem at odds with the character of a Wilderness Area; yet many sea turtles are endangered and need active management protection. The resolution of management conflicts such as these a part of this CCP process.

PROTECTION OF THE NATURAL FUNCTION OF THE ALTAMAHA SYSTEM:

The name Altamaha is from an immigrant Yamassee Indian group descended from an interior chiefdom originally known as the Altamaha or Tama, located on the Oconee River just below Milledgeville, GA, an area visited by Hernando do Soto in 1540. It is also known as Georgia's little Amazon.

The Altamaha has been declared the 7th most endangered river in the United States due to the loss of water flow that has resulted from reservoirs and power plants along its banks. The river is 137 miles long and runs from central Georgia to the southern coast of the state. The Altamaha Watershed drains about one forth of the state of Georgia, making it one of the three largest river basins on the Atlantic Seaboard. The estimated population in the watershed is about 180,000.

While there are currently no dams along the river, proposals to build five dams will have severe environmental effects including loss of important habitat areas, reduced populations of aquatic species, increased pollutant concentrations, and reduced recreational opportunities. The continued growth of Atlanta puts a strain on the amount of freshwater demanded and extracted from the river. Each day, approximately three million gallons of water are taken from the Altamaha River for the public sector alone. Chemical seepage of many contaminants including Mercury from LCP Chemicals-Georgia, Inc. for 15 years immediately placed the building and its surroundings on the federal Superfund list. In the Altamaha River Basin, there are approximately 19 rivers and streams listed on the 2002 303(d) federal list as waters not meeting designated uses.

What comes out of the Altamaha River (the amount of water, and the quality of the water) have an effect on the refuge. Lower water discharge will have yet to be determined impacts of the erosion and accretion concerns noted above. Contaminated waters will impact habitat quality on the refuge.

PHYSICAL RESOURCES

CLIMATE

The coastal region of Georgia has a relatively moderate climate. Average temperatures of the islands are slightly lower than on the mainland. Sea breezes offer relief from intense summer heat. Daily maximum temperatures in July and August (the warmest months) are usually in the 80s and low 90s. The islands are the only part of the state south of Atlanta that has mean daily maximum temperatures below 90°F in July and August (Carter 1967). Winters are relatively mild and short. The average minimum temperature for December and January (the coldest months) is about 43°F. On the average, there are 305 freeze-free days at Brunswick and 267 at Savannah (Carter 1970b).

The coastal islands have an average annual rainfall of about 53 inches. Rain is most abundant in the summer and early fall, with half of the annual precipitation occurring between June and September. The driest period is November through February (Carter 1967). Most precipitation in late fall and winter is of the frontal type, but most rain in the spring and summer comes as afternoon thundershowers. Heavy rainfall in September commonly is associated with hurricane conditions.

The first recorded hurricane to cause significant damage to the Georgia coast struck the Charleston, S.C., area on 15 September 1752 (Carter 1970a). Since that time, numerous hurricanes have passed along the Georgia coast, but surprisingly few have caused serious damage. Hurricanes off the east coast tend to follow the path of warm, lighter air above the Gulf Stream, which is flanked on both sides with heavier, cooler air. Brunswick, Ga., is farther (80 miles) from the Gulf Stream and the accompanying warm air than any other place on the southeastern coast. Consequently, the Georgia coastal area is less exposed to hurricanes than areas farther north or south (Gibson 1948).

GEOLOGY AND TOPOGRAPHY

The mainland rivers that flow into the Atlantic Ocean along the Georgia coast drain three major physiographic provinces: the Blue Ridge Mountains, the Piedmont Plateau, and the Atlantic Coastal Plain. The geology of these provinces greatly influences the amount and characteristics of surface water, groundwater, and sediments transported to the marshes, estuaries, and continental shelf.

Many sedimentary strata tilted toward the sea overlay the Coastal Plain. These deposits were formed during the many changes in sea level associated with glaciation during the Tertiary and Quaternary periods. The thickest deposits are in the coastal area, tapering to a thin edge where the oldest (Cretaceous) sediments are exposed. Progressively more recent strata occur at the surface toward the coast, and relict coastal features, such as barrier islands and lagoons are still evident in many places.

The region is generally one of low seismic activity. However, a major earthquake, having its epicenter at Charleston, S.C., occurred in 1886. This earthquake, registering 10 on the Richter scale, caused 150 human deaths and damaged buildings in the Savannah area.

Elevations on the barrier islands typically range from sea level to about 25 ft, although individual dunes may be higher. Broad, nearly level areas interspersed with low, gently sloping ridges typically characterize topography of the islands. On beaches in other areas there are major seasonal changes in beach profiles. During the summer, when wave energies are lowest, many sand grains are not moved out with the backwash and there is a net movement of sand landward. This results in the gradual buildup of sand on the backshore. A horizontal bed of sand (a berm) extends from the foot of the dunes to a pronounced beach ridge at the high-tide mark. The berm area serves as a source of sand for replenishment and growth of the dunes. In the fall and winter wave energy is greater, the berm erodes, and there is a net movement of sand from the beach to the breaker zone where it is deposited as an offshore bar.

SOILS

Soils of the Blue Ridge and Piedmont provinces are derived from crystalline rocks dating to pre-Cambrian time. The two major river systems of the Atlantic drainage in Georgia have their origins in these provinces. The headwaters of the Savannah River are in the Blue Ridge province and the Altamaha River originates in the Piedmont.

Upland soils are mostly porous sands derived from recently deposited marine sediments that are resistant to weathering (Regosols). These soils have a distinct "A" horizon (surface layer) with significant accumulations of organic matter that accounts for most of the exchange capacity (Byrd et al. 1961). They are subject to moderate to severe leaching, and many are excessively drained. Principal soil series include Blanton, Galestown, Klej, Lakeland, and Palm Beach (Byrd et al. 1961). Lower, poorly drained sites are characterized by intrazonal soils of the following series: Leon, Ona, Plummer, Rutlege, and St. Johns (Byrd et al. 1961 and unpublished soil survey information). Most of these soil series are characteristically very acid, but locally on the islands they may be neutral to slightly alkaline due to the presence of oyster shells in the profile. Dunes along Georgia beaches contain relatively few shell fragments.

The principal sources of heavy minerals and sands on the Georgia coast are (1) the Altamaha and Savannah watersheds which originate in the Piedmont and mountain areas of the state; (2) the smaller Coastal Plain watersheds that are of more recent origin; and (3) suspended material from the continental shelf.

Heavy minerals of the beaches and dunes more closely resemble assemblages from the Piedmont rivers than they do assemblages from Coastal Plain rivers (Giles 1966). This suggests that Coastal Plain rivers are not important contributors to present beach sediments (Giles 1966). There is also an apparent relationship between the composition of beach sands and the mineralogy of the adjacent continental shelf, and continental shelf material is another important sediment source (Giles and Pilkey 1965; Giles 1966; Levy 1968).

HYDROLOGY

The Georgia beaches occur in a region of moderate wave energy—the lowest recorded along the southeastern Atlantic coast (Tanner 1960). The average height of breaking waves on the Georgia coast is 9-12 inches (Helle 1958).

Limestones of Tertiary and Quaternary age underlying the Coastal Plain form one of the most productive aquifer systems in the country. The Tertiary limestone is several thousand feet thick, ranging in age from Paleocene to Pliocene. The hydrologic unit of this limestone, deposited in the period from mid-Eocene to mid-Miocene, is the principal artesian or Coastal Plain aquifer. It slopes gently to the coast and appears on the continental slope as freshwater springs in the ocean.

Low areas between dune ridges on the islands commonly form sloughs containing fresh or slightly brackish water. These ponds and sloughs play a major role in maintaining some of the more interesting wildlife of the islands, notably alligators and wading birds.

The sloughs vary considerably in size and depth. Some dry up completely in summer; others contain water throughout the year. The water is usually acid and stained so that light penetrates only 2 or 3 ft below the surface. Consequently, if the sloughs are deep, there may be relatively little growth of submersed aquatics and an abundance of emergent plants, rooted plants with floating leaves, and unrooted floating plants.

AIR QUALITY

In 1970, Congress passed the Clean Air Act, establishing a national policy toward protecting and enhancing air quality. Amendments passed in 1977 and 1990 strengthened the Act, making it a more effective tool for protecting air quality in national parks and national wilderness areas. Sections of the Act established a Prevention of Significant Deterioration of Air Quality permitting process. As a result, Wolf Island (one of 21 refuges designated throughout the entire refuge system) was selected and remains a Class I Air Quality Area as defined by the criteria of the Act. This means that the EPA or the state permitting authority must notify the federal land manager if emissions from a proposed project may impact the air quality of a Class I area, which includes all major facilities located or proposing to locate within 100km (62 miles) of the refuge.

WATER QUALITY AND QUANTITY

Please see the section above “Protection of the natural function of the Altamaha river system” for information on this topic.

BIOLOGICAL RESOURCES

HABITAT

Dunes form as a result of windblown sand piling up behind minor obstacles. Once started, the dune itself becomes an obstacle to windblown sand, and the lodgment of more sand causes the dune to grow. Dunes and dune ridges along the Georgia coast normally grow to 10 or 12 ft in height (occasionally much higher) and acquire a distinct

morphology characterized by gentle windward and steeper leeward slopes. Surface ripples parallel the dune ridge at right angles to the wind.

Vegetation plays an important part in the formation and stabilization of dunes. Salt-resistant beach plants trap windblown sand, forming little mounds of sand or dunelets that grow as the plants respond with increased growth and trap more sand. These foredune plants must have the ability to withstand salt spray, roots that will endure exposure, and stems that will withstand burial by shifting sands. They must be perennials able to keep above the sand, spread laterally, and withstand drought (Cowles 1899).

Few species of vascular plants can survive the extremely harsh physical environment of the beaches and dunes. In order to inhabit this area, plants must possess characteristics enabling them to withstand the combined effects of salt spray, constant wind, full light intensity, high evaporation, and high temperatures. They must be capable of becoming established in and keeping above the shifting sands. Distance from the surf and location relative to dunes or protective vegetation on the seaward side will determine the exposure of a site to these limiting factors. Thus there is a gradient or, more commonly as a result of the modifying effect of the dunes, a zonation of vegetation from mean high tide toward the interior of the island.

Plants occurring on the beach include sea rocket (*Cakile* spp.); beach hogwort (*Croton punctatus*); beach sandspur (*Cenchrus tribuloides*); salt meadow cordgrass (*Spartina patens*); salt wort (*Salsola kali*); sea-purslane (*Sesuvium* spp.); beach-spurge (*Euphorbia polygonifolia*) and seashore-elder (*Iva imbricata*). Principal plants of the foredunes are sea oats, sea beach panic grass, railroad vine (*Ipomoea stolonifera*), beach pennywort (*Hydrocotyle bonariensis*), Spanish-bayonet (*Yucca* spp.), and some of the plants of the beach (e.g., seashore elder, beach spurge, and sea rocket). Annuals such as camphorweed (*Heterotheca subaxillaris*) may temporarily colonize dunes until killed out by salt spray.

The foreslope and the crest of the foredunes are subject to the greatest intensity of salt spray. Little salt is deposited on the lee slope of the foredunes or in the interdune area. In these areas principal species include, in addition to some of the species previously mentioned, little bluestem (*Andropogon scoparius*), prickly pear (*Opuntia* spp.), seaside goldenrod (*Solidago sempervirens*), beach primrose (*Oenothera humifusa*), juniper (*Juniperus virginiana*), yaupon (*Ilex vomitoria*), wax myrtle (*Myrica cerifera*), and live oak (*Quercus virginiana*).

Bluestem occupies the drier sites. Low, flat areas behind breaks in the fore dunes that are periodically inundated by unusually high tides may be occupied by stands of salt meadow cordgrass (Oosting and Billings 1942; Oosting 1945).

Salt spray, after passing over the interdune area, next contacts the windward slope of the rear dunes and is deposited on the vegetation that occurs there. Consequently, sea oats and other salt-tolerant plants of the windward slope of the foredunes are also dominant there. Behind the crest of the rear dunes, sites are more protected and vegetation is more diverse. Shrubs and trees may dominate this area. Trees and shrubs most commonly occurring in this zone are live oak, red bay (*Persea borbonia*), wax

myrtle, juniper, yaupon, cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*), and groundselbush (*Baccharis halimifolia*).

Shrubs and trees are commonly pruned by the wind and salt spray, producing a sloping, sheared appearance. Studies by Boyce (1954) have shed light on the mechanism by which the salt spray produces this effect. Salt enters the leaves through abrasions caused by the lashing of wind action. High chloride ion concentration produces necrosis and death of exposed leaves and branches. They are not translocated to the leeward side of the tree in injurious quantities, so only the windward sides of the plants are killed, producing an asymmetrical form. Pruning stimulates vigorous sprouting which results in the rapid formation of a dense canopy that reduces the efficiency of deposition on the plant and on the individual stems. Most dune plants have a uniformly closed crown.

Wolf Island contains 300 acres of uplands (6.6%) including a long, narrow four-mile strip of oceanfront beach and several small (less than 20 acres) spoil sites along the Little Mud River. The highest elevation recorded in the island is 10.57 feet above mean low water and is located on one of the spoil sites. The remainder of the island (4,219 acres) is salt marsh, small marsh hammocks, and tidal creeks that flood daily with lunar tides of five to nine feet. Tidal action constantly influences the physical shape of the island. Each high tide flows across low-lying portions of the northern dunes, and has resulted in a wide mud flat through the central marsh. High spring and flood tides inundate most of the refuge.

Vegetation on the upland portions of the refuge consists of sea oats, sand spurs, and other beach-dune perennials. The only woody growth consists of wax myrtle and cedars on the highest elevations. The salt marsh is dominated by salt marsh cord grass and sea ox-eye, needle grass, and grasswort in a narrow band around the spoil sites and higher elevations.

Egg Island contains 200 acres of uplands (33.7%) ranging from six to 10 feet above mean low water. Approximately 70 acres of this island are above nine feet. This acreage has a dense growth of cedar, greenbrier, and blackberry, along with a small number of oak and pine. The remaining upland acres are dominated by wax myrtle except a long narrow stretch (one and one-half miles) of ocean front beach, which is dominated by sea oats, sand spurs, and other beach-dune perennials. The balance of the island (393 acres) is salt marsh dominated by salt marsh cord grass.

Little Egg Island (14 acres) is a low salt marsh dominated by salt marsh cord grass. This island is completely inundated during high tides with only the tops of the tallest grasses exposed.

WILDLIFE

Brown pelicans, loggerhead sea turtles, and diamondback terrapins are significant species that utilize the refuge. Loggerhead sea turtles occasionally nest on the beaches, but rarely are successful due to tidal inundation or predation, while diamondback terrapins use the higher dunes for nesting. Raccoon predation of turtle nests is heavy along the entire southeast coast. Shorebirds and marsh birds utilize the refuge extensively. Migratory waterfowl winter on the refuge and surrounding waters.

Scaup, scoters, black ducks, mergansers, and buffleheads are the most common species.

Saltwater fishing and crabbing are popular activities during the summer and fall along the creeks that intertwine through the refuge.

CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act provides the framework for federal review and consideration of cultural resources during federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been promulgated by the Advisory Council on Historic Preservation (ACHP). The Secretary of the Interior maintains the NRHP and sets forth significance criteria (36 CFR Part 60) for inclusion in the register. Cultural resources may be considered “historic properties” for the purpose of consideration by a federal undertaking if they meet NRHP criteria. The implementing regulations at 36 CFR 800.16(v) define an undertaking as “a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency.” Historic properties are those that are formally placed in the NRHP by the Secretary of the Interior, and those that meet the criteria and are determined eligible for inclusion.

Like all federal agencies, the USFWS must abide by Section 106 of the NHPA. Cultural resources management in the USFWS is the responsibility of the Regional Director and is not delegated for the Section 106 process when historic properties could be affected by USFWS undertakings, for issuing archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of the several cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO (early in the process) about FWS undertakings, by protecting archeological sites and historic properties on FWS managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Wolf Island National Wildlife Refuge follows these procedures to protect the public's interest in preserving any cultural legacy that may potentially occur on the Refuge. Because this refuge is designated as a Wilderness Area, no construction activity is expected and certainly none requiring any excavation with heavy earth-moving equipment like tractors, graders, and bulldozers. If, for any reason, such activity were required in the future, the Refuge would contract with a qualified archaeologist/cultural resources expert to conduct an archaeological survey of the subject property prior to such activity. The results of this survey would be submitted to the RHPO as well as the Georgia State Historic Preservation Officer (SHPO). The SHPO would review such surveys and determine whether cultural resources will be impacted, that is, whether any properties listed in or eligible for listing in the NRHP will be affected. If cultural resources are actually encountered during construction activities, the Refuge is to notify the SHPO immediately. To date, two properties on the refuge have been identified as possibly eligible for the NRHP: the remains of an old lighthouse and old canoe pieces.

SOCIOECONOMIC ENVIRONMENT

Agricultural development of the Altamaha delta began soon after the founding of the Georgia Colony in 1733. About 25 plantations were located on the low-lying islands and shores by the 19th century, taking advantage of the rich alluvial flow and annual inundation of water required by some crops. The first major crop was indigo; when demand for that faded, rice and cotton took its place. A major storm in 1824 destroyed much of the town of Darien and put many of the islands under 20 feet of water. The Civil War ended the plantation system, and many of the island plantations disappeared under heavy brush and new growth of pine forests.

Today, in McIntosh County, retail trade is the largest employment sector providing 37.7% of the jobs. The other predominant employment sectors are Services and Government. Statewide, the service industry is the largest employment sector, contributing 25.6% of the state's jobs. In the year 2000, the average weekly wage for all the employment sectors in the county was \$334. This amount was less than the statewide average of \$622. The county per capita personal income in 1999 was \$16,450, as compared with \$27,324 for Georgia and \$28,546 for the United States. McIntosh County's median household income in 1997 was \$24,357. This amount was less than the state's median household income of \$36,372 in that same year. Nationally, the median household income in 1999 was \$37,005.

According to the Census, in McIntosh County, 61.3% of the residents were white and 36.8% were black. Hispanics, who can be identified as either white or black in the Census data, made up 0.9% of the county's population. Statewide, 65.1% of residents were white, 28.7% were black and 5.3% were Hispanic. In McIntosh County, 28.0% of the county's residents were age 18 or younger, while 11.8% were age 65 or older. Statewide, 26.5% were age 18 or younger and 9.6% were age 65 or older.

The Census reports 7.8% of McIntosh County's households were headed by females with children under 18 years of age, compared with 9.0% statewide. Total households with children under 18 comprised 31.0% of all households in the county and 35.0% of those in the state. Between 1996 and 2000, McIntosh County school system reported an average high school dropout rate of 10.1%, for students in grades 9 to 12. Statewide, this rate is 6.8% for the same period of time. Based on the 2000 graduating class for McIntosh County school system, 56.4% of the students were eligible for the HOPE Scholarship Program. The scholarship is available to eligible students to attend a post-secondary school in Georgia. Statewide, 57.9% of the graduating students were eligible for the HOPE scholarship.

Between 1996 and 2000, McIntosh County's annual unemployment rate was higher than the state's rate, averaging 5.6% compared with the state's average of 4.2%. Nationally, the unemployment rate for the same period averaged 4.8%. During 1997, 22.2% of the county's population lived below the poverty level, compared with Georgia's rate of 14.7% and the national rate of 13.3%. In addition, 35.1% of the children under the age of 18 lived below the poverty level in McIntosh County. Nationally, 19.9% of the population under the age of 18 years lived below the level of poverty.

Data provided by the latest National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USDI et al. 2003) show that for the year 2001, 1.2 million people participated in fishing, hunting, and wildlife-watching activities in Georgia. This group

comprised of 1.1 million anglers (88% of all outdoor sports enthusiast) and 417 thousand hunters (34%) – the percentage is greater than 100% because many participated in both activities.

Anglers spent \$544 million on fishing expenses in Georgia in 2001. Trip related expenditures including food and lodging, transportation, and other related expenses totaled \$246 million (45% of all their fishing expenditures). They spent \$106 million on food and lodging and \$71 million on transportation. Other trip related expenses such as equipment rental, bait, and cooking fuel totaled \$70 million. Each angler spent an average of \$236 dollars on trip-related costs in 2001. Anglers spent \$262 million on equipment in Georgia in 2001, 48% of all fishing expenditures. Fishing equipment (rods, reels, line, etc.) totaled \$105 million (40% of the equipment total). Auxiliary equipment expenditures (tents, special fishing cloths, etc.) and special equipment expenditures (boats, pickups, etc.) amounted to \$156 million, 60% of the equipment total. The purchase of other items such as magazines, membership dues, license, permits, stamps, and land leasing and ownership amounted to \$35 million (6% of all fishing expenditures).

Hunters spent \$504 million on hunting expenses in Georgia in 2001. Trip related expenditures including food and lodging, transportation, and other related expenses totaled \$192 million (38% of all their hunting expenditures). They spent \$93 million on food and lodging and \$45 million on transportation. Other trip related expenses such as equipment rental, bait, and cooking fuel totaled \$54 million. Each hunter spent an average of \$459 dollars on trip-related costs in 2001. Hunters spent \$200 million on equipment in Georgia in 2001, 40% of all hunting expenditures. Hunting equipment (guns, ammunition, etc.) totaled \$146 million (73% of the equipment total). Auxiliary equipment expenditures (tents, special hunting cloths, etc.) and special equipment expenditures (boats, pickups, etc.) amounted to 27% of the total equipment expenditure for hunting. The purchase of other items such as magazines, membership dues, license, permits, stamps, and land leasing and ownership amounted to \$112 million (22% of all fishing expenditures).

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

The refuge consists of the three named islands: Wolf, Egg, and Little Egg. There are no current plans for refuge expansion; however, there are additional islands in the near vicinity that may be considered for acquisition at some future date.

VISITOR SERVICES

Due to its status as a wilderness area, no public use facilities are planned on the refuge. Though the refuge's saltwaters are open to a variety of recreational activities such as fishing and crabbing, all beach, marsh, and upland areas are closed to the public. Wildlife observation and photography are possible from boats.

PERSONNEL, OPERATIONS AND MAINTENANCE

Wolf Island NWR is one of seven refuges administered by the Savannah Coastal Refuges Complex. This chain of national wildlife refuges extends from Pinckney Island

NWR near Hilton Head Island, South Carolina, to Wolf Island NWR near Darien, Georgia. Between these lie Savannah (the largest unit in the complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island refuges. Together they span a 100-mile coastline and total over 56,000 acres. The Savannah Coastal Refuges are administered from headquarters located in Savannah, Georgia.

Because Wolf Island NWR is a designated Wilderness Area there is little active management of the facility. Natural processes are allowed to take their course in the maintenance of the refuge, its habitat, and wildlife. The only significant management tool used is law enforcement, required to keep the public off the island.

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