

II. The Refuge

INTRODUCTION

Bon Secour National Wildlife Refuge is located on the Gulf Coast, 8 miles west of the city of Gulf Shores, Alabama, in Baldwin and Mobile counties. The planning study area is divided into five separate management units along the Fort Morgan Peninsula and Little Dauphin Island (Figure 2). Although the refuge was established in 1980, to date, only 6,978 acres have been acquired within the 12,570-acre acquisition boundary, including the 575 acres leased from the State of Alabama. The Service has management jurisdiction along the shoreline above mean high tide, except on the Little Dauphin Island Unit which contains 560 acres of submerged bottoms managed by the Service. The potential wildlife habitat values of beach/dune, maritime forests, and estuarine habitats provided the impetus to purchase the properties for the refuge.

Management efforts since 1980 have emphasized acquiring land, securing staff to operate the refuge, and initiating conservation programs that benefit endangered wildlife species. However, Service acquisition of key properties, such as inholdings and beach/dune habitat, may not be realized within the 15-year planning period due to budget constraints and landowner preferences. The five units within the acquisition boundary have a significant "edge," which contributes to the predation of birds, sea turtles, and beach mice. Edge effect is the tendency of a transitional zone between communities to contain a greater variety of species and higher population densities of species than surrounding communities.

Current conservation management projects for the refuge include:

- Recruiting and training staff;
- Improving existing facilities;
- Managing habitats to reduce the threats and problems associated with species of concern;
- Acquiring land to complete refuge boundaries;
- Assisting in sea turtle and Alabama beach mouse recovery; and
- Defining research within the beach/dune area and involving partners and volunteers to accomplish this research.

HISTORY AND PURPOSES OF THE REFUGE

Bon Secour National Wildlife Refuge was established through both legislative and administrative authorities.

The purposes of the refuge are listed as:

"... to ensure the well-being of these (nationally endangered and threatened species, such as the brown pelican, bald eagle, and several species of sea turtles, as well as many more species identified by the state to be of special concern) and other species, to serve as a living

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The Refuge



Neotropical migrant
USFWS Photo

laboratory for scientists and students and to provide wildlife-oriented recreation for the public."

94 Stat. 483, dated June 9, 1980 (Act to establish the Bon Secour National Wildlife Refuge)

"...to conserve an undisturbed beach/dune ecosystem which includes a diversity of fish and wildlife, and their habitat."

94 Stat. 484, dated June 9, 1980 (Act to establish the Bon Secour National Wildlife Refuge)

"...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants..."

16 U.S.C. 1534 (Endangered Species Act of 1973)

"...for the development, advancement, management, conservation, and protection of fish and wildlife resources..."

16 U.S.C. 742f(a)(4) (Fish and Wildlife Act of 1956)

"...for the benefit of the United States Fish and Wildlife Service in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..."

16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

"...for conservation purposes..."

7 U.S.C. 2002. (Consolidated Farm and Rural Development Act)

REFUGE ENVIRONMENT

Biological Environment

Fish, Wildlife, and Plant Populations

Bon Secour National Wildlife Refuge was established for the protection of neotropical migratory songbird habitat and threatened and endangered species. These species are given priority when implementing management activities.

Neotropical migratory songbirds and shorebirds. Bon Secour Refuge represents the best remaining stopover and staging habitat for neotropical migratory songbirds during the fall and spring migration along the Alabama coastline. Migrants utilize this area for resting and building fat reserves critical to successful migration (Moore and Woodrey 1993, and Moore and Woodrey 1997). The refuge also provides crucial habitat for beach nesting birds, such as snowy and Wilson's plovers, American oystercatchers, least terns and black skimmers; secretive marshbirds, such as rails; and migratory and wintering shorebirds on beaches, especially the federally threatened piping plover. Shorebirds use beaches and washover sites, which support high quality food sources during migration and winter.

Alabama beach mouse. This federally listed species inhabits the beach dune and scrub/shrub habitats found along the Fort Morgan



Adult loggerhead sea turtle
USFWS Photo

Peninsula. Beach mice have experienced a two-thirds reduction in available habitat, primarily due to coastal development. Bon Secour National Wildlife Refuge protects the last remaining undisturbed beach mouse habitat found in Alabama, consisting of several key plant communities that form a mosaic of micro-habitats. Management focus is on protecting sufficient space to support populations, including movement corridors, which serve as conduits for genetic exchange. Beach mouse recovery depends on efforts from federal, state, and private partners to ensure that refuge populations do not become genetically isolated.

Alabama beach mice are intensively managed at Bon Secour Refuge. Critical habitat for beach mice is currently listed as 500 feet landward to the mean high tide line, which includes the beach dunes; however, the mice also occur in scrub/shrub habitats north of these dunes. New research findings have therefore led the Service to revisit critical habitat for the mouse to include these interior habitats. Figure 3 depicts the distribution of mouse habitat on the Fort Morgan Peninsula based on the most recent information available to the Service. It clearly shows the high degree of habitat fragmentation by coastal development outside of refuge boundaries and the importance of the refuge in securing the continued survival of the species. The Perdue Unit of the refuge represents the largest and best remaining example of beach mouse habitat protecting approximately 4 miles of beach with well-developed dune and scrub/shrub/swale habitat. The Fort Morgan Unit, while differing in topography, also supports substantial numbers of beach mice.

Sea turtles. Loggerhead, green, and Kemp's ridley sea turtles have been documented to nest on the refuge. Refuge beaches support nest densities as high or higher (4.5-5.0 nests/mile) than many areas along the Gulf Coast (Figure 4). While the overall numbers of nests for loggerheads are not great relative to Atlantic coast nesting beaches, it is believed that the northern Gulf nesting population may significantly contribute to the male segment of the overall sea turtle population (Thane Wibbles, pers. comm., University of Alabama, Birmingham). This increases the importance of protecting the nesting beaches of the refuge.

Green and loggerhead sea turtles have long been a focus of management concern. Conservation strategies to protect these turtles under the Endangered Species Act include on-site nest monitoring and protection, as well as fostering a public ethic through educational programs. Negotiating with local governments and communities to eliminate or control artificial beachfront lighting, which is known to deter females from nesting and to disorient hatchlings, is also a strategy used to protect these turtles. In 2000, emergent success rate of hatchlings along the Alabama coast was less than 25 percent, as hatchlings were prone to disorientation by artificial light sources. Poor hatching success on the refuge has also been attributed to predation (e.g., ghost crabs, foxes, and coyotes), inundation, and moist sand from low beach elevation. Disorientation due to lights from surrounding developments has been documented on the Perdue and Fort Morgan units. Refuge personnel patrol the beach for sea turtle nests on areas between these units, some of which include private lands.

In 2001, the Service initiated a sea turtle volunteer program called Share the Beach, in an effort to involve local residents, tourists, and businesses in sea turtle conservation. The program was under the management of the Fish and Wildlife Service's Daphne Ecological Services Field Office until 2003, when responsibility shifted to the refuge, primarily for logistical concerns.

Hatching success has increased to 85 percent along the Alabama coast as a result of increased monitoring efforts and public support of conservation measures. The refuge will continue to administer this program until 2005, when Share the Beach will incorporate as a non-profit organization funded by individuals, corporations, grants, and the "Adopt-A-Nest" program of the Friends of Bon Secour National Wildlife Refuge. The State of Alabama will become the lead agency and will permit the program. However, due to the refuge's location and proximity to nesting areas, it is expected that refuge staff will continue to manage sea turtle nests on refuge property, and most strandings on and off refuge property.

Piping plover. Piping plovers winter along the southern Atlantic Coast and the entire Gulf Coast. Those wintering on the refuge are likely to be a mixture of the threatened Atlantic Coast and the endangered Great Lakes populations. The Fish and Wildlife Service is proposing critical habitat designation for wintering piping plovers. This designation includes the Fort Morgan and Little Dauphin Island units of the refuge. These properties are frequented by refuge visitors who may disrupt foraging or resting plovers and other wintering bird species. The amount of visitor use, however, is unknown. Monitoring disturbance to plovers and their wintering habitat use on the refuge is a critical need.

Other species. Other threatened and endangered species found on the refuge include the bald eagle, the wood stork, and the eastern indigo snake. Species of conservation concern that exist on the refuge include the gopher tortoise, Gulf salt marsh snake, Mississippi diamondback terrapin, black pine snake, eastern coachwhip, northern yellow bat, mimic glass lizard, eastern diamondback rattlesnake, and the Gulf coast tiger beetle.

The refuge includes large and diverse populations of lizards, snakes, toads, and frogs. Bountiful fisheries and oyster grounds are adjacent to the refuge. Bobcats, opossums, eastern cottontails, raccoons, red foxes, coyotes, and armadillos are commonly found in the woodlands. Black bears and red-cockaded woodpeckers historically occurred on the refuge, but have been extirpated.

Ongoing research includes studies on neotropical migratory songbirds on the Fort Morgan Unit, Alabama beach mice on the Perdue Unit, post-hurricane dune restoration on both the Perdue and Fort Morgan units, and sea turtle monitoring and insect surveys in various locations.

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Purdue Unit habitat
USFWS Photo

This exceptional area supports several critically imperiled and federally listed species including the Alabama beach mouse, piping plovers, sea turtles, and a host of other state-listed rarities.

The following is a brief description of each refuge unit with accompanying maps depicting the respective acquisition boundaries and current status of land ownership and management within and adjacent to these boundaries.

Perdue Unit. (2,628 acres acquired out of 2,835 acres in the acquisition boundary, Figure 5) The Perdue Unit is the largest unit on the refuge. It is bordered on the east and west by high density residential development (Laguna Key Subdivision and Martinique on the Gulf, respectively), to the south by the Gulf of Mexico, and to the north by State Highway 180. A portion of the predominately land-locked, saltwater Little Lagoon also forms a large portion of the eastern refuge boundary.

Habitats range from a well-developed beach/dune ecosystem to maritime forests and pine woodlands. There is an extensive scrub/shrub/swale habitat characterized by alternating low, relict dune ridges and wet swale habitats. There are many extensive permanent and semi-permanent wetlands with emergent vegetation found throughout the unit. Also found within the Perdue Unit is the freshwater/brackish water Gator Lake (40 acres).

Sand Bayou Unit. (998 acres acquired and 289 acres in acquisitions or leases pending out of 2,208 acres in the acquisition boundary, Figure 6) This unit is bordered on the north by the Gulf intracoastal canal and on the east and west by Oyster Bay and Bon Secour Bay. Southern portions of the unit are bordered by predominately low density residential development and undeveloped properties; however, in recent years, the trend has been towards higher density residential development. A major portion of the land within the acquisition boundary is privately owned with high potential for further development and habitat fragmentation. Habitats include wet pine flatwoods, mixed pine hardwoods, and freshwater marshes composed of black needlerush and smooth cord grass.

Little Point Clear Unit. (1,990 acres acquired or managed out of 2,529 acres in the acquisition boundary, Figure 7) The Little Point Clear Unit is bordered on the east, west, and north by Mobile Bay. The southern boundary is undeveloped private lands, Highway 180, and low density residential development. Habitats within this unit consist of scrub/shrub, pine flatwoods, saltwater marsh, and tidal creeks. There are many permanent and semi-permanent wetlands scattered across the unit, which is characteristic of dune and swale topography.

Fort Morgan Unit. (510 acres acquired or managed, unit complete, Figure 8) The Fort Morgan Unit is found at the western terminus of the Fort Morgan Peninsula. It is bordered on the south by the Gulf

Figure 6. Sand Bayou unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama

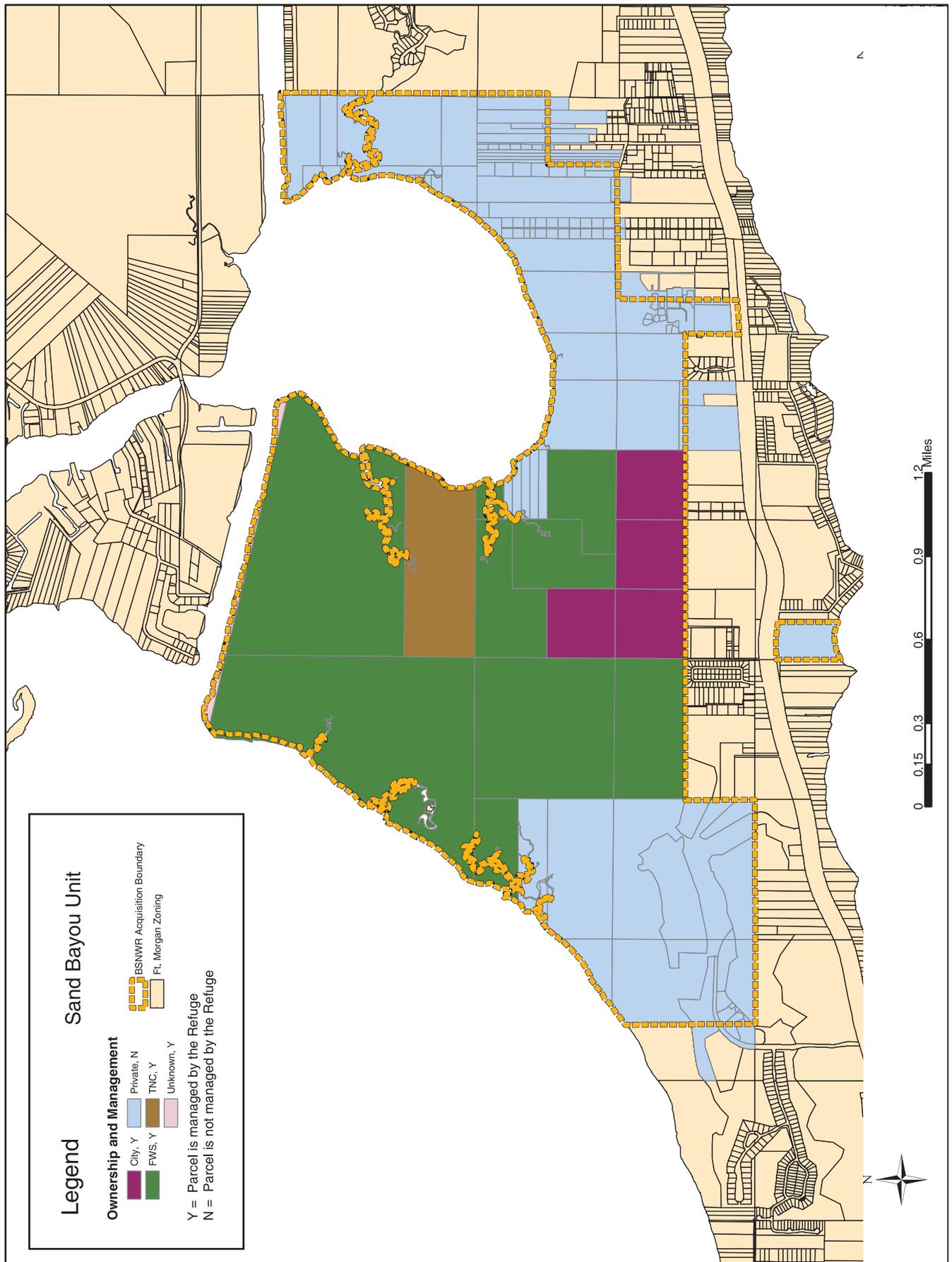


Figure 7. Little Point Clear unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama

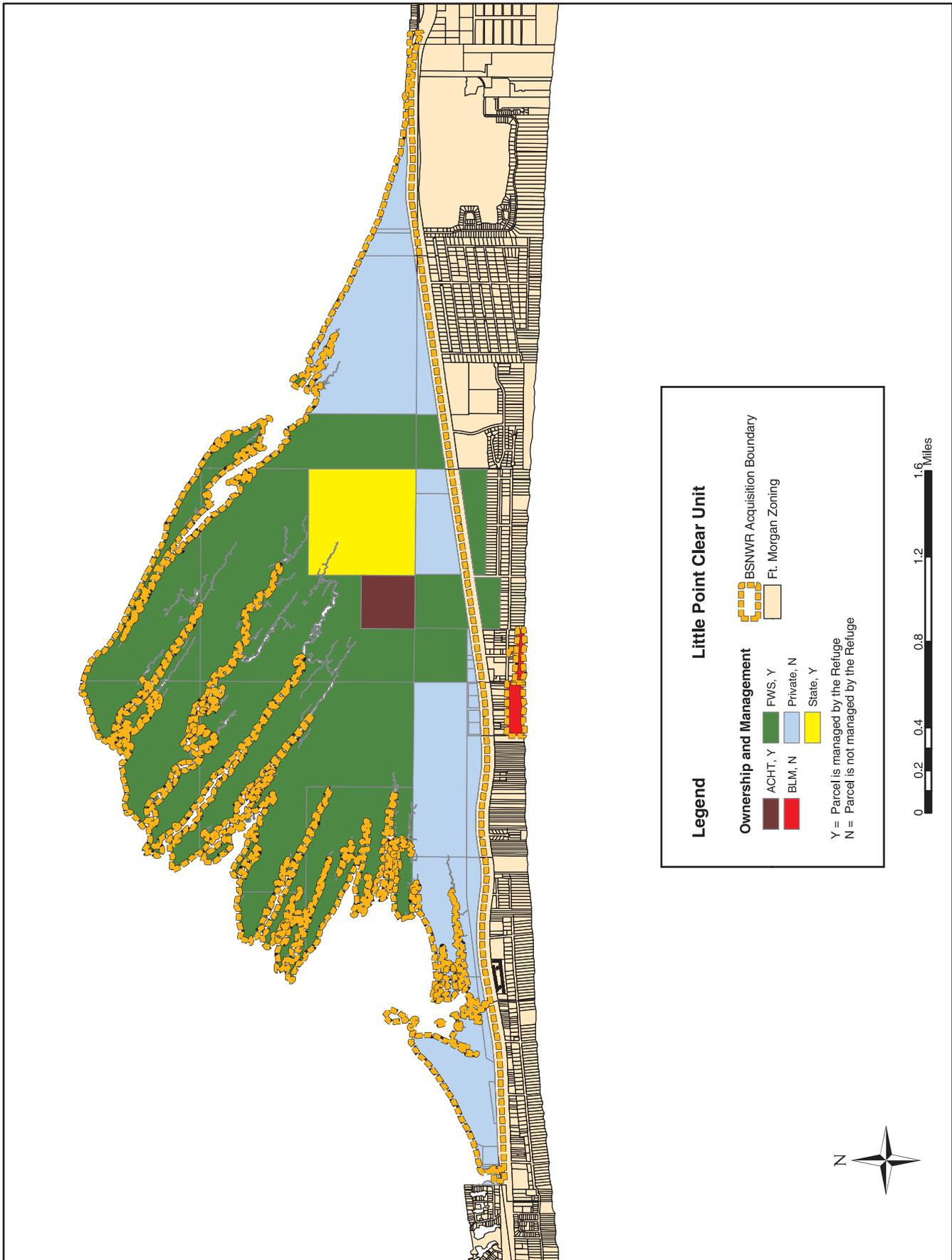
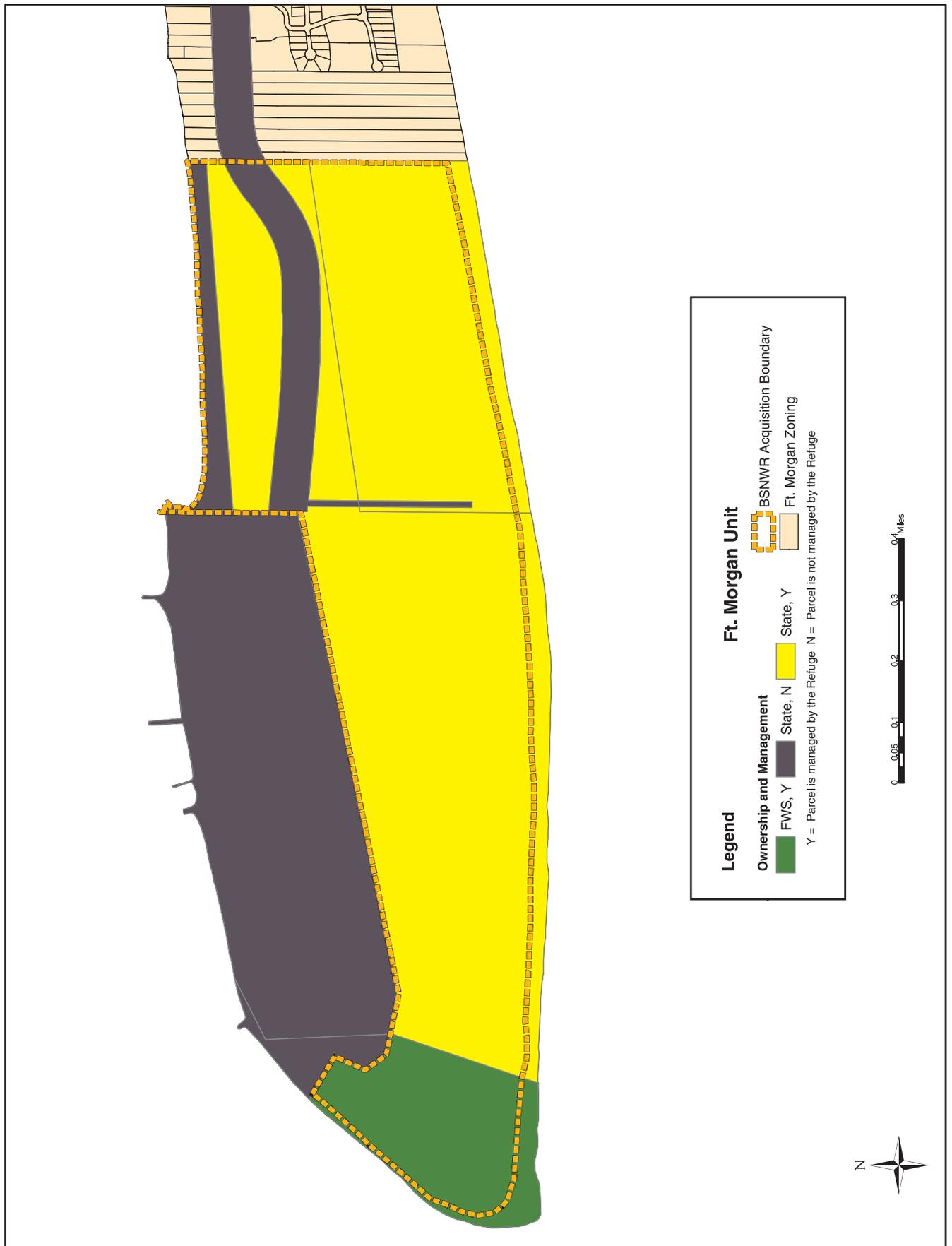


Figure 8. Fort Morgan unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama



of Mexico, on the north by Mobile Bay, on the west by Mobile Pass, and on the east by low to medium density single-family and multi-family residences. Habitats in this unit consist of beach dunes, brackish water marshes, scrub/shrub, and pine woodlands. The land within this unit is owned by the State of Alabama, and managed by the Alabama State Historical Commission. The natural areas are managed by the Fish and Wildlife Service under a cooperative agreement with the state.

Little Dauphin Island Unit. (850 acres, unit complete, Figure 9). Little Dauphin Island is located just north of the eastern end of Dauphin Island. Access to this island is by water craft only and there is no development. Due to the topography of this sand spit, the habitat is mainly saltwater marsh with low dunes and a small amount of pine savanna. The northwestern tip consists of open mudflats. Of the 850 acres managed, 290 acres are upland and 560 acres are submerged bottoms. The Fish and Wildlife Service has deeded jurisdiction over these bottoms from the State of Alabama.

Skunk Bayou Unit. (no acreage within the 3,831-acre acquisition boundary has been acquired, Figure 10). This unit falls within the planning boundary of the Weeks Bay National Estuarine Research Reserve. Initially, one tract was acquired for this unit, but it was later transferred to the Weeks Bay Reserve when it was established in 1986. From the date legislation was signed to establish the refuge through the present, lands within this unit remain a low priority for meeting the purposes of Bon Secour Refuge.

Management

The Service manages refuge resources and, where possible, coordinates with neighboring land managers, agencies, and landowners to conserve biological diversity.

Public land management is playing a key role in developing quality bird habitat at Bon Secour Refuge. Bird habitat priority areas are identified on the refuge and when restored, will serve as important "anchors" for biological diversity. Priorities identified for the refuge include a stronger management emphasis on migratory songbirds. Focal species are managed according to refuge size and location, which also contributes to the overall health of the ecosystem.

Mapping and typing of plant communities has not been accomplished for the refuge. The refuge may lie at or near the western range for some plant communities, such as those containing sand pine and scrub oaks. The Little Point Clear Unit contains dunes/swales that are not observed west of the Fort Morgan Peninsula. In addition to community typing, the fire history of the Fort Morgan Peninsula is also unknown.

The only two freshwater ponds on the refuge are Little Gator Lake and Gator Lake. Gator Lake is connected to the Little Lagoon via a small channel. During high tides, the salt water from the Little Lagoon flows into Gator Lake, where a variety of freshwater and saltwater species occur.

Figure 9. Little Dauphin Island unit, Bon Secour National Wildlife Refuge, Mobile County, Alabama

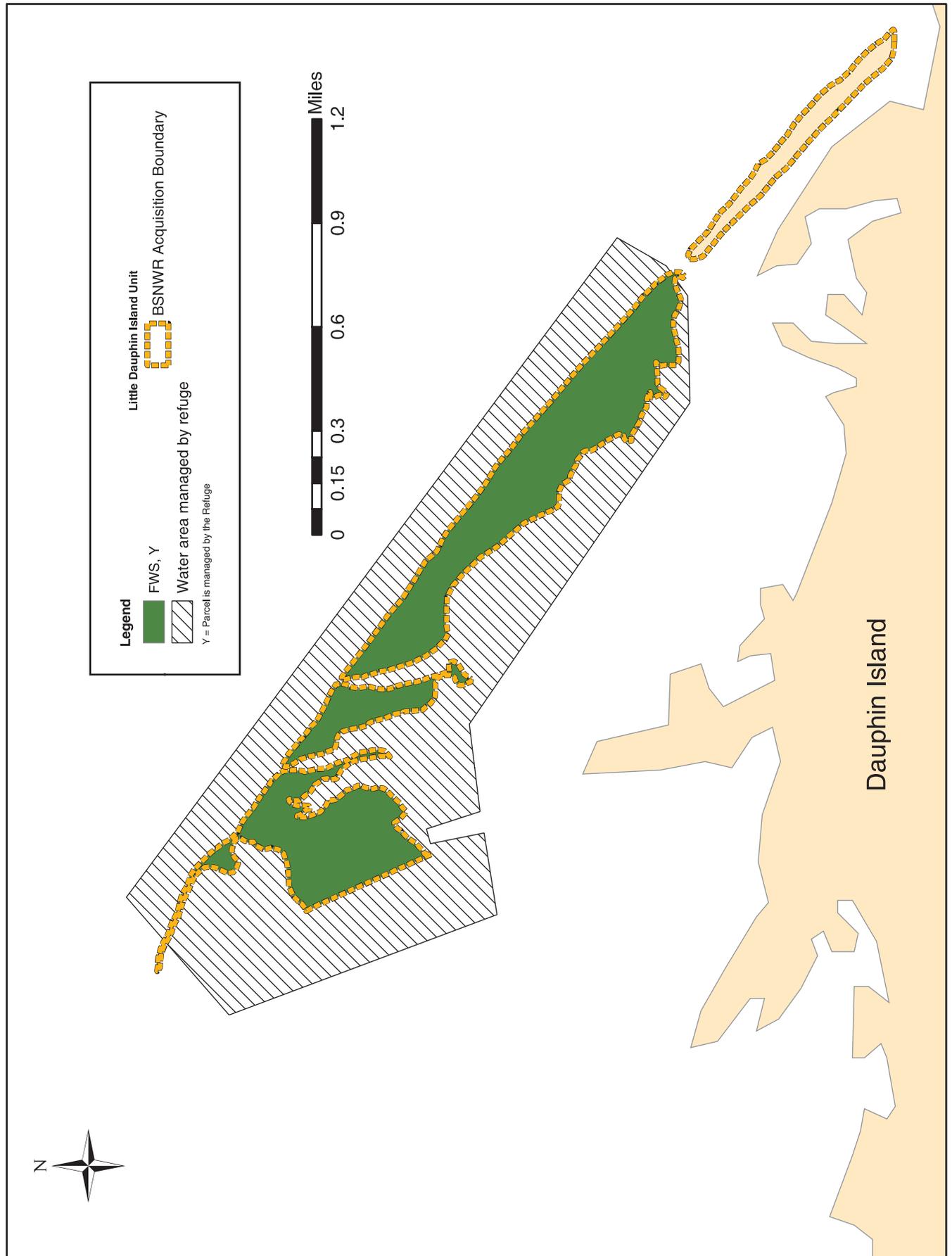
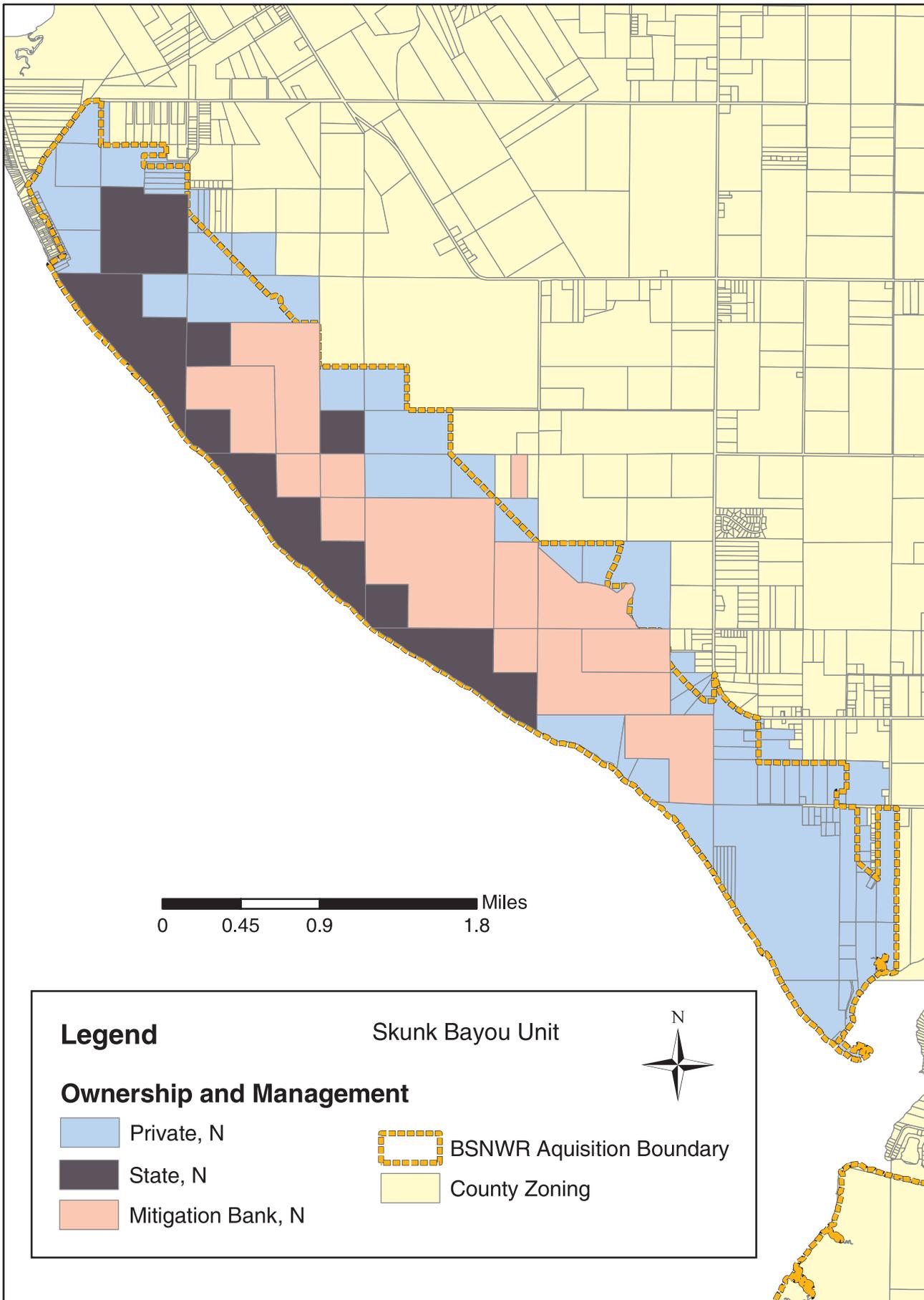


Figure 10. Skunk Bayou unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama



Coastal habitats of Bon Secour Refuge include uplands such as beach/dune, grassland, strand, and maritime hammocks, as well as wetlands such as tidal marshes. Each habitat is shaped by strong and consistent winds, saltwater spray, and sun. Typical beach/dune vegetation includes sea oats, cordgrass, sand spur, dune panic grass, and morning glory. Coastal grasslands include muhly grass, bluestem grasses, and sea oats, as well as occasional shrubs such as wax myrtle and groundsel. Coastal strands and maritime hammocks include shrub and tree species that are tolerant of wind and salt spray, such as saw palmetto, sand live oak, cabbage palm, yaupon, sea grape, and prickly pear. Tidal marsh habitats include grasses, rushes, and sedges along low wave-energy wetlands and river mouths. Typical species include black needle rush, smooth cordgrass, and saw grass.

With the exception of a few species, no data exist relative to many species' occurrence, status, and distribution on the refuge. A need exists for basic biological surveys and monitoring for rare taxa and plant communities.

PHYSICAL ENVIRONMENT

The refuge is located along the Gulf Coast of Alabama and the Mobile Bay Estuary. The Mobile Bay watershed includes 65 percent of the State of Alabama, and portions of Mississippi, Georgia, and Tennessee.

Refuge lands are a fragile combination of barrier islands, low-lying marshes, and highly erodible mainland shores. In addition to sea-level rise, winter storms, and altered sediment supplies, hurricanes frequently damage or destroy the human developments and infrastructure that line the coast. In 1992, Hurricane Andrew, and in 1995, Hurricane Opal, caused billions of dollars in losses. Even with more accurate predictions of large storm events, people continue to build homes within the flood plain and along the coastline. Between 1990 and 2000, the population in Baldwin County increased by more than 50 percent (Mobile Bay National Estuary Program 1999).

Frequent and large storms rejuvenate the barrier ecosystem. The refuge is part of an unstable land mass, constantly shifting and moving due to the frequent hurricanes that pummel the coastal area of the Fort Morgan Peninsula. Ecological forces of the Gulf Coastal Plain include disturbances such as fires, winds, tornadoes, and floods.

Rivers and important estuaries including the Mobile River Basin are bisected by levees and flow is restricted by flood control projects and agricultural diversion. Water quality is significantly impacted by agricultural and municipal runoff. Rivers and water bodies throughout this area support a small fraction of the once abundant aquatic resources.

The climate of the refuge is characterized by warm, humid summers and relatively mild winters. Average maximum summer temperatures vary from the high 80s to low 90s Fahrenheit. During winter months, freezing is not uncommon, and temperatures less than 19 degrees Fahrenheit can occur. Annual precipitation ranges from 52



Development near Bon Secour
USFWS Photo

to 64 inches along the coast. The central Gulf Coast also has one of the highest frequencies of hurricane landfalls in the nation. The bay is additionally influenced by tidal changes that average a little less than 1½ feet throughout the year. All of these factors, combined with highly variable river flows, contribute to a hydrology that is dynamic, complex, and necessary to support the variety of plants and animals existing in the Mobile Bay Estuary.

Refuge Administration and Management

Land Protection and Conservation

In the 1970s, development along the sugar sand beaches of Alabama rapidly expanded. What was once considered nothing but sand became prime real estate as venture capitalists began marketing the Gulf Coast as a tourist destination. In 1979, Hurricane Frederic slammed into Gulf Shores and destroyed 80 percent of existing residential development, facilitating the advent of high density residential development in the form of condominiums. A proposal to develop 1,200 acres with 8,000 feet of Gulf frontage and 22,000 feet of lagoon frontage was met with substantial resistance by the local community, local government officials, environmental activists, and the scientific community. In 1980, Congressman Jack Edwards introduced legislation to establish Bon Secour National Wildlife Refuge which would protect a total of 10,000 acres. Additional legislation was passed to add what would become the Sand Bayou Unit, increasing the refuge acquisition boundary by approximately 2,000 acres. The first two tracts identified for inclusion in the refuge were the Perdue (1,290 acres) and Little Dauphin Island (850 acres) tracts. Table 1 presents the acquisition history of Bon Secour National Wildlife Refuge.

Table 1. Acquisition history for Bon Secour National Wildlife Refuge, Baldwin and Mobile counties, Alabama

Year	Acreage Acquired	Year	Acreage Acquired
1981	2060.86	1993	137.99
1982	107.23	1994	1698.67
1983	323.00	1998	150.00
1984	1330.18	1999	52.33
1985	251.95	2000	123.06
1986	14.47	2001	10.30
1987	16.67	2002	34.23
1988	386.52	2003	144.00
1990	136.62		
			Total 6978.08

Throughout its history, the refuge has repeatedly emphasized land acquisition as a conservation priority, depending on available acquisition funding. There have been two major periods of acquisition in the early 1980s and mid-1990s. Since the original Land Protection Plan

was adopted in 1985, three boundary expansions have been approved in 1990 (37 acres), 2001 (587 acres), and in 2003 (14 acres). The current acquisition boundary is 12,570 acres. To date, only 6,978 acres within the acquisition boundary have been acquired. This represents a significant shortfall. Table 2 presents current refuge acreages and the methods used to protect the properties.

The remaining inholdings have been classified into five priority categories. Per policy, the Service will acquire land within the acquisition boundary from willing sellers. Subject properties will be appraised by a Service-contracted independent appraiser and are subject to review

Table 2. Land acquisition figures and acquisition strategies employed for Bon Secour National Wildlife Refuge through October 2003.

Protection Strategy	Acres
Land Transfer	32
Donation	135
Fee Title Purchased	6,236
Lease Agreements	575
	Total 6,978

by the Service's Regional Office Realty Review Appraiser before a fair-market offer can be made. Table 3 presents priority properties targeted for inclusion in Bon Secour National Wildlife Refuge. The priorities were set based on: 1) critical habitat for the Alabama beach mouse; 2) secondary habitat for beach mouse; 3) large, contiguous, undeveloped tracts; and 4) wetlands. The importance of wetlands lies not only in the variety of fish and wildlife depending on them, but also in the vital functions they provide for the benefit of the ecosystem, as well as the human population. Examples of these functions are floodwater storage and flood protection for downstream areas, water purification through removal of suspended sediments and pollutants, and groundwater recharge. Three different types of wetlands have been identified within the refuge acquisition boundaries: depressional (located in a depression in the landscape and generally draining only a small area); fringe (located near a large body of water and receiving regular two-way flow); and riverine (primarily fed by a river or stream). Figures 11-14 show the distribution of those wetlands in relation to refuge boundaries. This information is not currently available for the Little Dauphin Island Unit.

Table 3. Prioritized acquisition acreage (habitat) and estimated values for Bon Secour National Wildlife Refuge.

	Type	Acreage	Estimated Value
Priority 1	Alabama beach mouse Critical Habitat (fee title and transfer from BLM)	50	\$4,000,000
Priority 2	Alabama beach mouse Secondary Habitat	10	1,500,000
	Large, contiguous tracts	1,356	5,800,000
Priority 3	Wetlands/Other	130	430,000
	Total	1,546	\$11,730,000

Figure 11. Wetland Resources, Perdue unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama

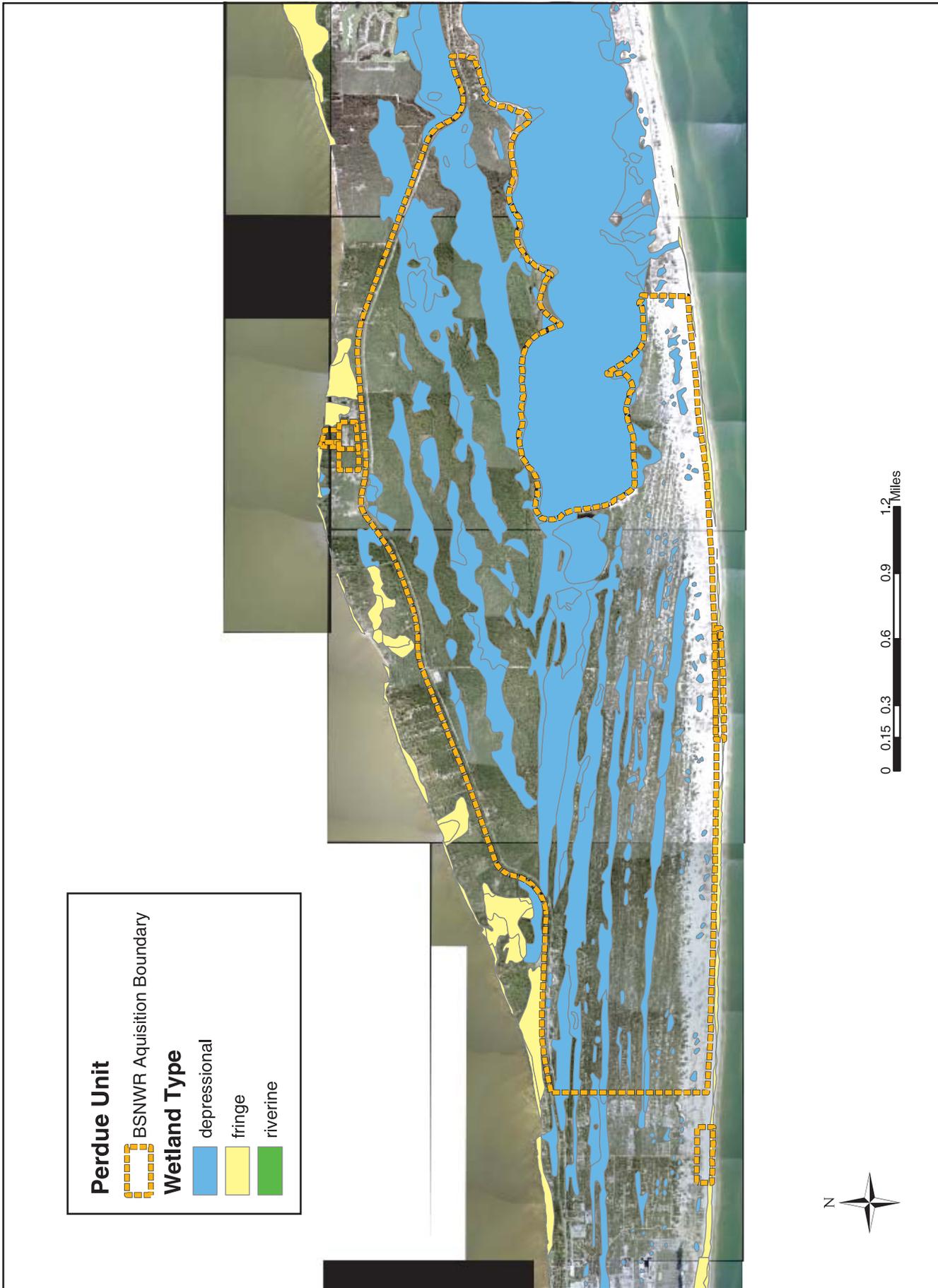


Figure 12. Wetland Resources, Sand Bayou unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama

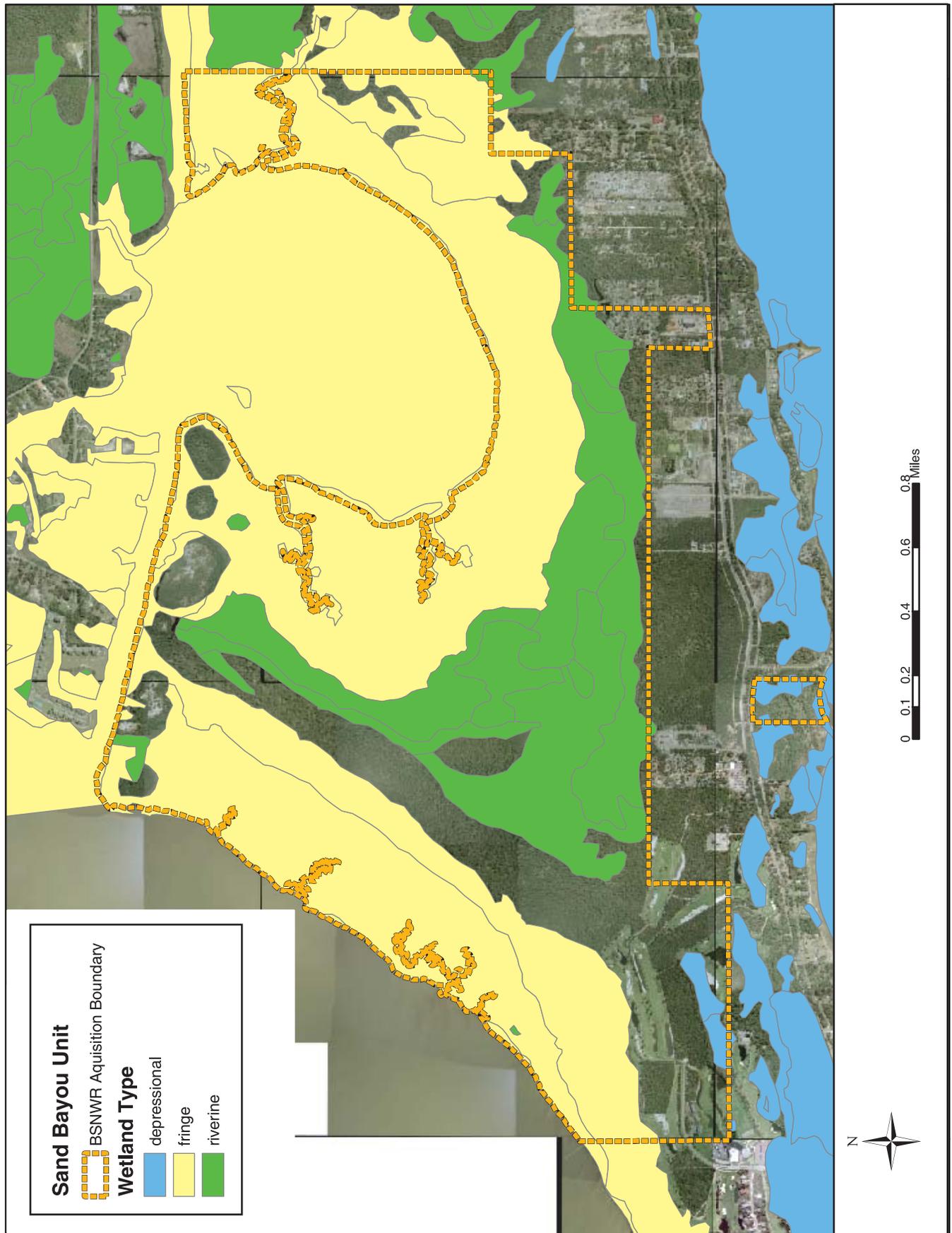


Figure 13. Wetland Resources, Little Point Clear unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama

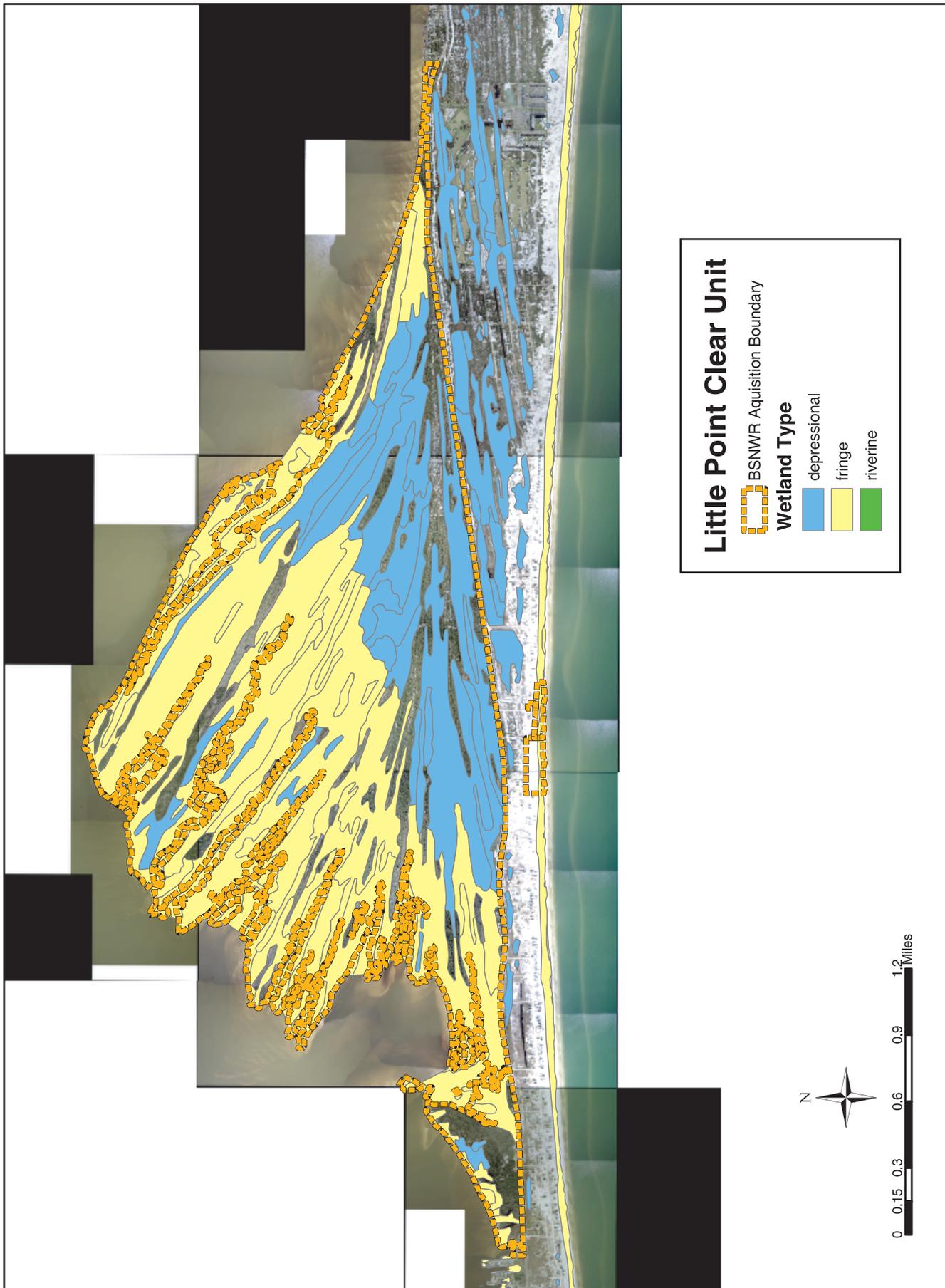
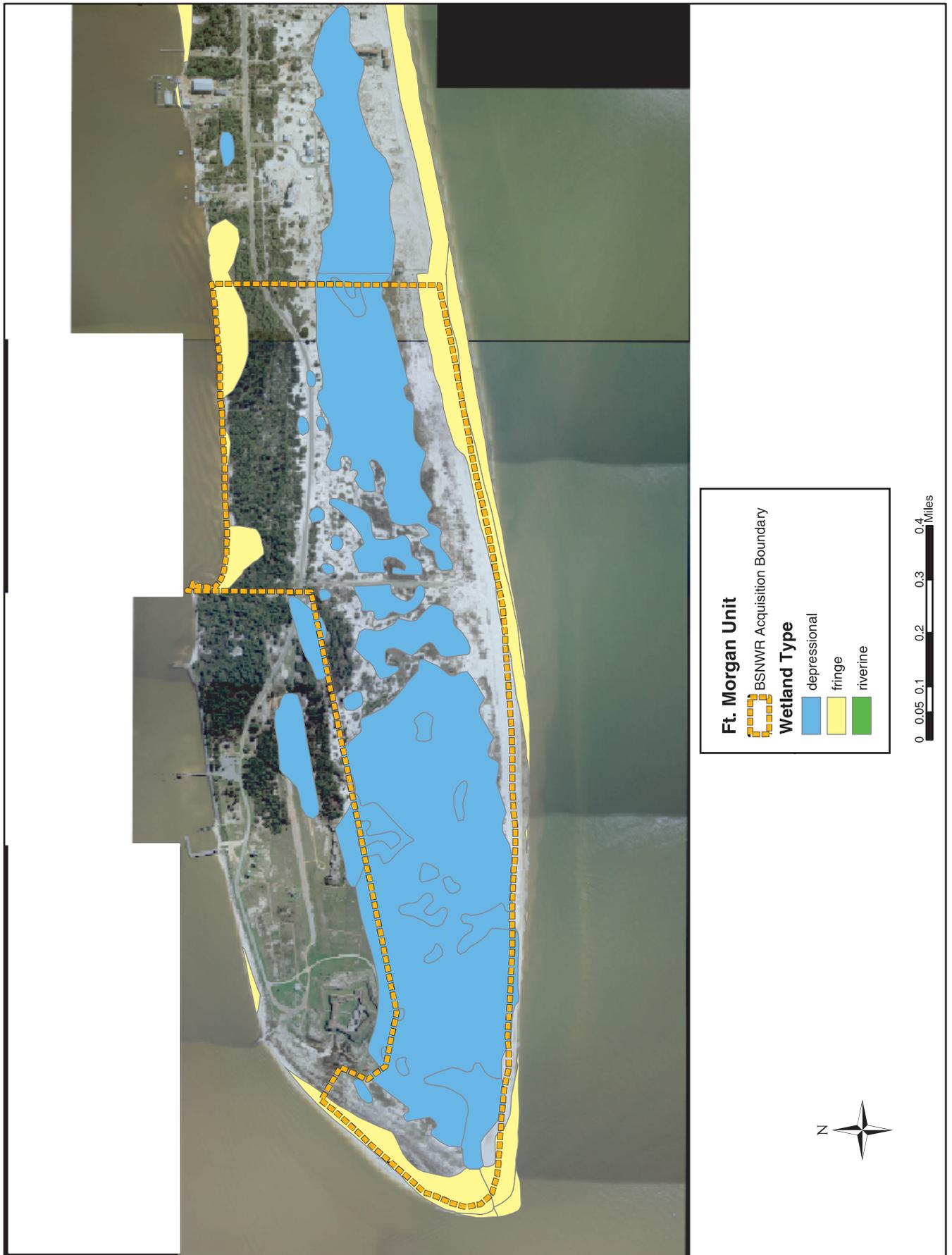


Figure 14. Wetland Resources, Fort Morgan unit, Bon Secour National Wildlife Refuge, Baldwin County, Alabama



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Bon Secour outreach
USFWS Photo



**Environmental education
at Bon Secour**
USFWS Photo

Key partnerships have facilitated the refuge's acquisition thus far. The first tract (Perdue) was acquired with the assistance of The Nature Conservancy. To date, the Conservancy has assisted with the acquisition of more than 3,000 acres. Other organizations that have been instrumental in land protection efforts include The Conservation Fund, Alabama Coastal Heritage Trust, Sierra Club, and Tonsmeier Properties. Relationships with these individuals and organizations need to be expanded if acquisition goals are to be met. Escalating land prices and speculative high density development are impediments to the refuge achieving its acquisition goals and being able to provide quality habitat for many wildlife species.

In addition to fee title acquisition, the Service needs to explore non-traditional protection strategies, such as lease agreements and conservation easements. With land prices currently at \$70,000/acre for small lots, \$15,000-\$20,000/acre for large parcels, and \$6,000/foot for beach front lots, these strategies may represent the only viable options to protect the remaining tracts.

Education and Visitor Services

Bon Secour Refuge supports five of the six priority public uses identified for refuges: wildlife observation, wildlife photography, environmental education, interpretation, and fishing (Figure 15). Due to the fragmented habitat, endangered species issues, high visitation, lack of big game species, and proximity to densely populated areas, hunting is not appropriate for these lands and waters. Environmental education efforts on the refuge have been minimal at best due to staff size and higher priority projects. However, recent management emphasis was shifted to providing more outreach and educational programming for students. Currently, the main environmental education programs occur during the sea turtle nesting season. Approximately 200 volunteers are trained each summer. Throughout the year, scout troops and boys and girls clubs visit the refuge on a sporadic basis. Staff respond to requests, but do not advertise student programs due to a lack of facilities and staff to support such visits on and off the refuge.

In 2003, programming for winter visitors known as "snowbirds" began and was extremely popular and successful. With minimal advertisement, refuge volunteers, who led interpretive tours, were overwhelmed by the response. An average of 40 people attended each tour. The key to being able to provide these programs is the availability of trained volunteers to lead them. In the future, refuge staff should expand these opportunities.

The refuge hosts more than 98,000 visitors annually (Alabama Gulf Coast Convention and Visitors Bureau, unpubl. data, 2002). Visitor services include a visitor contact station with a small educational display area. The displays are "homemade" and lack consistency with the Service's design standards. Approximately 25,000 people visit the refuge office annually. Three developed trails are available in the Perdue Unit, highlighting dune, swale, wetland, maritime forest, and scrub habitats. Unmarked trails in the Sand Bayou and Little Point Clear units are sporadically used by birders and nature enthusiasts

*Bon Secour
National Wildlife Refuge*

**Draft Comprehensive
Conservation Plan**

The Refuge



Surf fishing on Bon Secour
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who know about them. Kayaking is becoming a popular activity in the Little Lagoon, Gator Lake, and the many bays and finger sloughs that surround the Sand Bayou and Little Point Clear units of the refuge. There are no boat launching points in these units. To access Little Lagoon, kayaks and canoes must be portaged 1/4-mile, while access to Gator Lake requires a portage of 1 mile.

Interpretive displays include small kiosks at the Jeff Friend Trailhead and at Gator Lake. A larger kiosk with newer displays is located at the Pine Beach Trailhead. Parking facilities are located at both trailheads and at the Mobile Street Dune Walkover. Additionally, there is an overflow parking lot near Mobile Street. Additional parking is needed for the Gator Lake Trail and seasonally for beach access, but may not be feasible since this is occupied, undisturbed Alabama beach mouse habitat.

Saltwater surf fishing is available in the Perdue and Fort Morgan units of the refuge. Target species include bluefish, redfish, Spanish mackerel, speckled trout, and flounder. Saltwater species also occur in the Little Lagoon and Gator Lake (40 acres), and wading these areas is a popular past time. Gator Lake also contains freshwater species, such as bluegill and bass, but fishing success is limited. Fishing opportunities in Gator Lake need to be improved if this resource is to be available to visitors. Refuge staff have fielded many complaints in the past as the lake is relatively inaccessible due to phragmites and other emergent vegetation crowding the banks. Anglers are reluctant to wade in the murky water of a pond named "Gator" Lake.

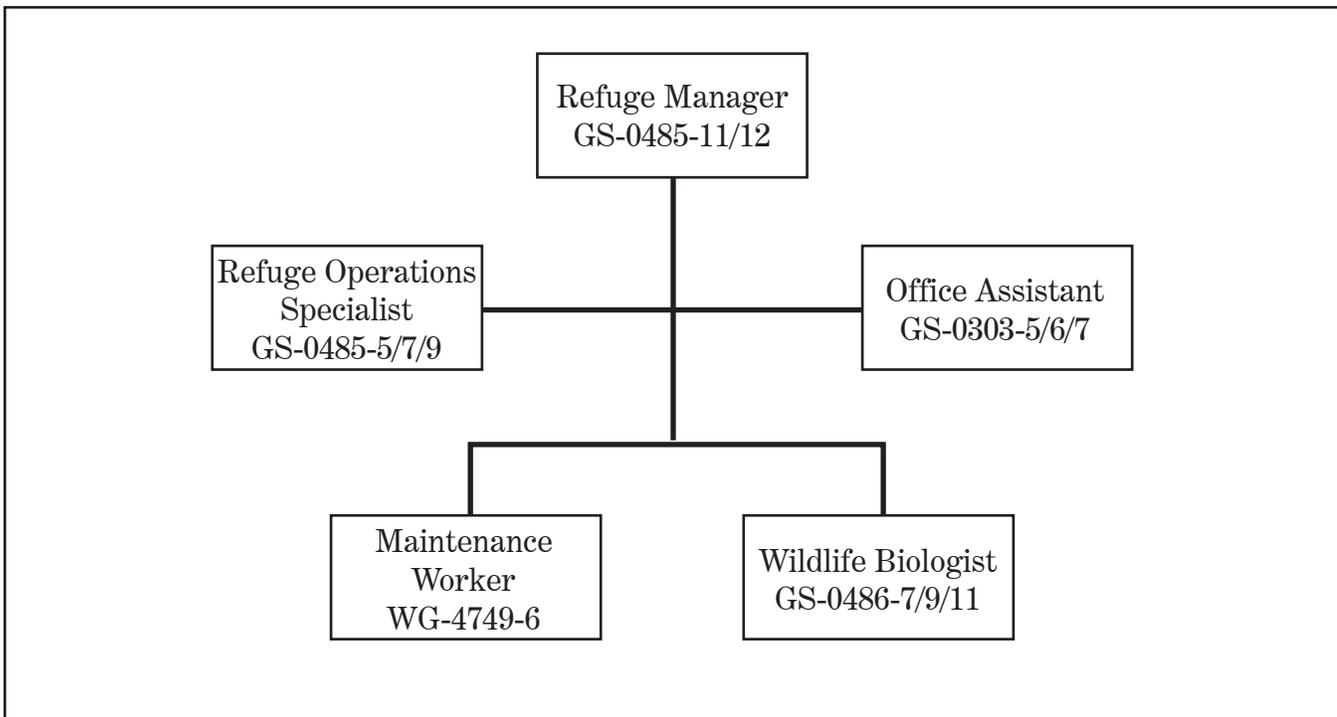
Personnel, Operations, and Maintenance

Refuge administration refers to the operation and maintenance of refuge programs and facilities, including construction. The refuge has five permanent employees and receives substantial assistance from volunteers, interns, and Student Conservation Associates (Figure 16). Since its establishment, the refuge's staff has fluctuated between zero and five employees. During tight fiscal years, positions were left vacant in order to save operational expenses. At other times in its history, the refuge was complexed, mainly for administrative reasons, with Mississippi Sandhill Crane and Grand Bay National Wildlife Refuges. Table 4 summarizes the operating and maintenance funding received for 1999-2003. Periodically, special funding for endangered species recovery projects is available.

Table 4. Funding for Bon Secour National Wildlife Refuge, Fiscal Years 1999-2003.

Category	FY1999	FY2000	FY2001	FY2002	FY2003
Operations	122,800	102,300	226,000	257,300	269,900
Maintenance Endangered	79,300	10,300	48,700	118,300	106,300
Species	2,000	3,000	0	0	20,000
Restoration	0	73,700	0	0	0
Quarters	0	0	0	0	11,400
Construction	93,800	58,700	33,400	0	0
Total	297,900	248,000	308,100	375,600	407,600

Figure 16. Organizational chart, Bon Secour National Wildlife Refuge



Maintenance on Bon Secour
USFWS Photo

The major management activities on the refuge include sea turtle nest monitoring and wildlife surveys, facility maintenance and boundary posting, and visitor services. The refuge has several key partnerships that support management objectives, including: Audubon Society, Fort Morgan Historic Site, Baldwin County Museum Society, Alabama Gulf Coast Convention and Visitors Bureau, Gulf State Park, Share the Beach Sea Turtle Volunteers, and Friends of Bon Secour National Wildlife Refuge.

One type of facility that is often overlooked when thinking about refuge operations is living quarters. Because the refuge is located in a resort area, affordable housing is not easily available. However, the refuge has four residences and one bunkhouse that are available for refuge employees or for visiting students, interns, and professors. While this has enabled the refuge to host hundreds of students and several interns each year, as well as house refuge employees, it takes a significant amount of time and operational dollars to maintain these facilities. In addition to living quarters, Figure 15 shows other facilities that must be maintained for refuge management and visitor services programs. Currently, all constructed facilities and improvements are located in the Perdue Unit.

Social and Economic Environment

The refuge currently consists of 6,978 acres within an approved acquisition boundary of 12,570 acres. The remaining 5,592 acres are in a combination of private-ownership and state-ownership lands as part of the Weeks Bay National Estuary Research Reserve. The refuge is located in unincorporated areas of Mobile and Baldwin

counties. The nearest towns in Baldwin County include Gulf Shores (8 miles), Orange Beach (12 miles), and Foley (17 miles). The town of Dauphin Island is the nearest community to the Little Dauphin Island Unit in Mobile County. Mobile, the largest metropolitan area in either county, is 50 miles from the refuge.

Much of the growth in these Gulf Coast counties traces to retirees who have migrated to the "southern shore" (Alabama Gulf Coast Chamber of Commerce 2003). This movement has catapulted Orange Beach to the fourth fastest growing city in Alabama during the 1990s, with a growth rate of more than 200 percent from 1980 to 1990, and 68 percent from 1990 to 2000. In unincorporated Fort Morgan, where the refuge is located, the population has grown from 3,732 seasonal residents in 1988 to 4,876 seasonal residents in 1998. The projection for 2008 is 5,808 seasonal residents (Alabama Gulf Coast Chamber of Commerce 2003).

In both counties, the economies of the coastal areas are driven by tourism. While the permanent population of the Gulf Shores/Orange Beach area hovers around 10,000, it swells to 50,000 during peak tourist seasons. The area is home to more than 9,000 hotel rooms and condominium units. In Baldwin County, the area boasts 32 miles of sugar sand beaches and 15 golf courses. The coastal area of Mobile County contains 18 miles of beaches, but 9 miles are privately owned and closed to the public. Dauphin Island has one golf course and is characterized by single family rental homes and a few 4-story condominium towers. The average yearly temperature of 75 degrees Fahrenheit and average water temperature of 70 degrees Fahrenheit help to characterize the area as "perfect" for many tourists.

Demographics of refuge visitors reveal that 82 percent are college educated; there is a 1:1 ratio of males to females; 60 percent are couples between the ages of 35 and 54; and the average length of stay is 8-10 days, which translates into \$34 million in spending annually for the local economy (Alabama Gulf Coast Convention and Visitors Bureau 2003).

The refuge has three peak visitation periods: January-March; March-April; and June-August. From November through March each year, an estimated 280,000 "snowbird" visitors descend on Gulf Shores and Orange Beach to spend a mild winter on the shore. The resident population of these two cities and unincorporated Fort Morgan hovers around 10,000, so the influx of these visitors is a major contributor to the economy. On a marketing survey, nearly 14 percent of these visitors indicated that they visited Bon Secour Refuge. These visitors are generally Midwestern couples who are educated, financially comfortable, and have identified wildlife and environmental values as some of the reasons for choosing this area for their winter home (Alabama Gulf Coast Convention and Visitors Bureau 2003).

During March and April each year, there are two types of visitors: Spring break revelers and birders. The number of visitors to the area during these three months is 240,000 and 13 percent of these

visitors visit the refuge. Most of the visitors are families from southeastern states. During the summer, while the commercial beach areas host nearly 500,000 visitors, only 3 percent visit the refuge. In a 1995 survey, the refuge was not considered an attraction by visitors. The 2002 data (growth of 3 percent in summer visits and 13 percent in spring visits) exemplify the growing popularity of refuges and other natural areas, and clearly demonstrate that nature-based tourism is one of the fastest growing niche markets in the industry (Alabama Gulf Coast and Visitors Bureau 2003).

The refuge provides numerous benefits including prevention of pollution in area waterways, improvement in air quality, protection of habitat for animal species, and recreational opportunities. If the Gulf Coast area is to remain a highly desirable destination for seasonal residents and tourists, the unique mix of nature-based attractions and golf courses, which together form "green space," needs to be maintained. Refuge visitation needs to be carefully monitored and controlled to ensure that serious degradation of resources does not occur.

Cultural Environment

Very few systematic archaeological and historical investigations have been conducted on Bon Secour National Wildlife Refuge. Since its establishment in 1980, all archaeological investigations and historic building assessments have been conducted primarily to ensure compliance with Section 106 of the National Historic Preservation Act (Kanaski 1998; R Christopher Godwin and Associates, in prep.). An exception is the Baldwin County Archaeological Preservation Committee's investigation of the Ivanhoe, a 19th century Confederate blockade runner wreck (Franklin 1999 and Thompson 1997). Earlier investigations were conducted by C.B. Moore, Walter Jones, and David DeJarnette. Moore examined sites at Seymour's Bluff, Shell Bank, and Bottle Creek in 1905. Jones recorded a number of pre-columbian sites along Bon Secour Bay and Little Lagoon in the late 1930s and early 1940s (Alabama State Site Files n.d.). DeJarnette tested the Strong Bayou Site (1Ba81) in 1941-1942 (Kanaski 1998). Landforms that appear to have a high to moderate potential for archaeological sites include the shorelines of Bon Secour Bay and Little Lagoon. The archaeological potential of the beach ridges, or ridge and swale systems seen in the Perdue Unit, would appear to be moderate. However, recent archaeological investigations by Neilsen (2000a & b) and R. Christopher Goodwin and Associates (in prep.) did not identify any archaeological sites on the ridges. The active beach and dune zone along the Gulf Coast possesses very little potential for intact archaeological sites, except for shipwrecks, such as the Ivanhoe.

Curren (1976) noted the lack of evidence for Paleoindian-Middle Archaic occupations in the Gulf Shores area. Late Archaic groups sporadically used the area. Their sites appear to be limited to the higher elevations east and west of the delta and Mobile Bay. Curren suggested that geomorphic processes, such as sea-level fluctuation and a gradually sinking coastline, may have masked earlier sites. Considerable investigations have been conducted at more than 300 Woodland-Early Historic Period sites in the Mobile Bay and Delta

region. The sites range from shell middens consisting of oyster (*Cassostrea virginica*) or marsh clam (*Rangia cuneata*), sand mounds, village middens accompanied by mounds, and 18th- and 19th-century forts. In the delta region, Woodland Period sites are located above the 50-foot contour and along the Gulf Coast's shore on the southwest side of the bay. Mississippian sites are located predominately on sand spits at the bay's mouth and on the Gulf Coast. In such estuarine habitats, fresh water is a critical variable for site location. A number of large sites are found near or by a river or small creek.

Soil fertility is another critical variable. Small floodplains along streams flowing into the bay offered fertile land for agriculture. Along the Gulf Coast proper, sites whose major occupations date to the Mississippian Period are found clustered on the long and narrow freshwater lakes. The Mississippian groups exploited shellfish, fishes, aquatic reptiles, and white-tailed deer in the rich marine and estuarine habitats. The most frequent invertebrates seen in shell midden sites are oyster and marsh clam. Shell midden sites in the central and lower bay areas, including those on the sand pits at the mouth of the bay, consist primarily of oyster. Shell midden sites comprised primarily of marsh clam occur in the central bay and the delta region. In the southeast section of the bay, marsh clams were collected from the freshwater/brackish water lakes.

At the time of European contact, Mobile Bay was the home of the Tomeh (Tohome) and Mobile Indians. Knight (1984) believes these historic groups descended from the local, late prehistoric Pensacola complex groups. The groups' subsistence strategies included deltaic horticulture and seasonal hunting, fishing, and gathering. Seasonal movement of villages and farmsteads occurred in conjunction with flooding of the delta. The Tomeh and Mobile Indians relied on isolated farmsteads with small tracts of arable soils where they grew maize, beans, and squash. The farmsteads were apparently associated with larger permanent villages located on the bluff which flanked the delta. Critical variables for site selection included access to arable and renewable delta soils, access to nearby flood-protected areas suitable for permanent habitation, access to tidal bays with tidal ranges suitable for fish weir technology, access to shellfish beds, and access to mast-bearing forests (Knight 1984). Waselkov and Gums (2000) provide a detailed description of historic Indians in the Mobile Bay area.

In the early 16th century, Alonso Alvarez de Pineda reported a large town near the mouth of Mobile Bay and 40 villages along the bay and river (Swanton 1946). By 1700, there were five villages associated with the Mobile, a sixth to the Little Tomeh. Refugee groups from northwest Florida (Apalachee, Chatot, and Tawasa) and west of the Bay (Taensa, Chitimacha, and Choctaw) fled to communities around the bay in the 18th century. This is reflected in the archaeological record by the diverse ceramic styles (Knight 1984).

Fort Morgan, a brick masonry fort, was constructed between 1819 and 1834, as part of Mobile Bay's defenses. The lighthouse, near the fort, was constructed in 1822. The 55-foot conical brick tower

**Draft Comprehensive
Conservation Plan**

The Refuge



**The national historic landmark;
Fort Morgan**

USFWS Photo

marked the entrance to the bay (Holland 1994). Mobile was one of the few major Gulf coast harbors remaining under Confederate control by 1864. The Union fleet, under the command of Admiral David G. Farragut, had blockaded the Gulf Coast, including Mobile, since 1860. Blockade runners, such as the Scottish built *Ivanhoe*, provided munitions and staple supplies to the Confederacy. The *Ivanhoe*, a clincher-plate ironhulled, steam-powered side-sheeler, ran aground southeast of Fort Morgan on her maiden voyage in June 1864. Troops from the nearby fort salvaged much of her cargo despite heavy bombardment from the USS *Glasgow*, USS *Metacomet*, and USS *Mongahela*. Union troops boarded the *Ivanhoe* on July 6, 1864, and set fire to the vessel, in an unsuccessful attempt to destroy her (Thompson 1997, Franklin 1999, and Wise 1988). On August 5, 1864, Farragut's squadron sailed past Fort Morgan and engaged the *Tennessee*, a Confederate ironclad, and three gunboats. Within less than three hours, Farragut controlled the lower portion of Mobile Bay. However, Fort Morgan, Fort Powell, and Fort Gaines remained in Confederate hands and controlled the bay's entrance. Farragut landed troops under the command of General Granger approximately three miles east of Fort Morgan on August 9. By August 21, the Union troops and artillery were in position to begin their siege of the fort. On August 22, a coordinated bombardment of Fort Morgan began, breaching the fort's walls at several locations, setting its wooden buildings on fire, and disabling all but two of the Confederate guns. The fort was unconditionally surrendered to the Union forces on August 23 (Anderson 1962; Neilsen 2000a). The light tower was seriously damaged during the Union bombardment and a temporary light was placed on the fort's southwest bastion in 1864. The Lighthouse Board erected a 35-foot iron skeleton tower on the bastion in 1873. This tower was replaced in 1966 by the current steel skeleton tower (Holland 1994). A Taft-Endicott period battery was constructed adjacent to the fort between 1890-1910 (Lewis 1979). Pilot Town, which is located at Navy Cove on Bon Secour Bay, is the site of a middle 19th to early 20th century settlement. Navy Cove served as a resupply depot for American ships during the War of 1812, and later as a supply point for the Union's siege of Fort Morgan in 1864. A permanent settlement developed following the Civil War, but was destroyed by a storm surge from the Hurricane of 1906 (Warner 2003). Extensive archaeological and historical investigations have recently been conducted, but technical reports describing the fieldwork and its results are not yet available (Neilsen 2000b).

Neilsen (2000b) notes that post-bellum settlement of the Gulf Shores area was sparse. The Dixie Graves Parkway, also known as Fort Morgan Road, was opened in 1934. Sporadic residential development occurred primarily along the north side of the parkway. Today, much of southern Baldwin County's economy focuses on the recreational and resort industry.

Significant Resource Threats and Problems

The greatest challenges posed for managing Bon Secour Refuge are declining populations of fish and wildlife species and loss of habitat to development, which accelerates species' decline. To date, only 6,978

acres have been acquired by the refuge within the 12,570-acre acquisition boundary. Excepting state lands that fall within the Skunk Bayou Unit, that leaves more than 1,700 acres on the Peninsula that fall within the acquisition boundary, but are privately owned. This is considered a significant shortfall to fully implement the purposes legislated by Congress.

Coastal development, habitat fragmentation, introduction of exotics, recreation use, and suppression of natural fire represent the trends along the Gulf Coast and Fort Morgan Peninsula. Most of the lands outside, and some within the refuge's acquisition boundary, have been zoned as Two or Multiple Family Districts, or Local Business Districts (Figures 17 and 18), allowing for construction of not only private housing but also tourist accommodations, condominiums of up to 20 stories, and other facilities. The zoning designation indicates the number of units allowed per acre. For example, an R6 zoning would allow up to six residential units per acre, while an R4 zoning would allow up to four residential units per acre. A significant portion of the undeveloped land on the Fort Morgan Peninsula is zoned at these higher residential densities. Encroaching development has already led to significant declines in fish and wildlife populations, habitat degradation and elimination, wildlife/people conflicts, pesticide- and petroleum-based product accumulations in the water, pest management problems, and a need for increased law enforcement to administer recreation programs and habitat protection. The few areas that remain still in a relatively natural state, including those in private ownership within the refuge's acquisition boundary, are basically open to future development under the pressure of a rapidly growing tourist industry, resulting in further enhancement of present problems and conflicts.

Many of the refuge's significant resource problems and management challenges are reflected on a larger scale within the lower Mobile Bay watershed and Fort Morgan Peninsula. These problems, both individually and cumulatively, play a significant role in determining future conditions on the refuge. These resource problems and management challenges are briefly summarized in Table 5.

One of the biggest hurdles facing the refuge is managing for the effects of habitat loss and fragmentation on a landscape scale. In the State of Alabama, there are 99 listings of threatened or endangered species (81 animal and 18 plant) of which 19 occur in Mobile and Baldwin counties. During the past two centuries, the Mobile Bay basin experienced biotic extinctions at a rate unparalleled elsewhere in the continental United States, almost 50 percent of these extinctions occurred during the last century in the Mobile Bay basin. On the Fort Morgan Peninsula, one of the primary causes of the precarious status of beach mice is habitat fragmentation. In 1985, the Fish and Wildlife Service listed the Alabama beach mouse as endangered. Encroachment of refuge boundaries from residential beach development and the subsequent increases in habitat fragmentation, human use of the beach, feral cats (pets), and exotic plant introductions (landscaping) continue to jeopardize Alabama beach mice, resulting in "island" populations existing primarily on public lands. Therefore,

elucidation of this species' habitat needs, viable dune management techniques, and potential visitor impacts on the dune system are vital for long-term conservation (Fish and Wildlife Service unpublished report 2001).

The Bon Secour Refuge is an important site for contributing to sea turtle recovery. Removing impediments such as derelict sand fencing, managing coastal lighting, implementing measures to protect nesting females, nests, and hatchlings, and educating the public are important conservation tools used by the Service. The number of sea turtles that successfully nest on refuge beaches is influenced by

Table 5. Summary of ecological threats and problems facing Bon Secour National Wildlife Refuge.

Management Area	Management Issue or Concern
Upland Habitats	<p>Changes in habitat composition and species diversity due to fire suppression;</p> <p>Management for the Alabama beach mouse comes at the expense of other species;</p> <p>Increase in exotic pest plant and animal species;</p> <p>Fragmentation due to ownership and zoning patterns;</p> <p>Increase in number and density of developments adjacent to the refuge and within the refuge boundary.</p>
Wetland and Coastal Habitats	<p>Loss of submerged aquatic vegetation;</p> <p>Increase in exotic pest plant species;</p> <p>Accumulation of contaminant runoff due to increased use of pesticides and herbicides;</p> <p>Increased use of boats and personal water craft in Little Lagoon;</p> <p>Coastal armoring and improper use of sand fence or other dune building materials (e.g., hay bales).</p>
Recreation	<p>Increase in public use of refuge without adequate staff and facilities to accommodate or manage that increase;</p> <p>Pressure to provide more facilities for the visiting public;</p> <p>Pressure to conduct more outreach to various parts of the community.</p>
General Administration	<p>Maintenance of numerous entrance points and facilities;</p> <p>Lack of a constant law enforcement presence;</p> <p>Lack of staff to conduct baseline surveys and monitoring;</p> <p>Pressure to support conservation measures off-refuge.</p>

various factors, including managing for reduced disturbance to nesting females and increasing survivorship of hatchlings until they enter the Gulf of Mexico.

Common problems associated with sea turtles include all-terrain vehicles, sunbathers disturbing nests, predation of eggs by feral pets, ghost crabs, foxes, and coyotes, and disorientation of hatchlings due to beachfront lighting.

The loss of habitat and wildlife to development and coastal encroachment, predation, off-road vehicles, invasive species, and natural as well as human disturbance, poses a serious threat to migratory birds and resident species. Beach development has decimated migratory land bird populations throughout the Fort Morgan Peninsula. More than 30 species of breeding migratory songbirds are found in this region. Some of these species, such as prairie warblers, have declined significantly and need the benefits of secluded successional scrub habitat to recover and sustain their existence.

Factors such as hydrology, age class of trees, vegetative types, and proximity to residential and commercial development, require that planning at Bon Secour Refuge must be site specific, thus complicating the implementation of management practices. Recovery of longleaf pine and pine savanna communities via protection and management, as well as acquisition of private lands within the refuge's acquisition boundary, is a high priority for the Service. The two primary management methods associated with these habitats are hydrologic restoration and prescribed burning.

The refuge's coastal habitats and management units are five areas separated by residential homes, high rises, golf courses, and municipal development on the Fort Morgan Peninsula. Homes and high rise structures have mostly been developed after the establishment of the refuge. The Fort Morgan Peninsula is one of the fastest developing areas in the region. This growth has led to increasing wildland-urban interface challenges such as smoke management problems and reduced application of prescribed fire near urban areas due to public misperceptions. The altered fire regime due to inadequate and incompatible fire management, incompatible development, habitat destruction, and habitat succession continues to be a conservation threat to trust species and their viability.

Coastal armoring includes structures such as sea walls, rock revetments, and sandbags that are installed in an attempt to protect waterfront property from erosion. This hardening of the shoreline actually accelerates waterfront erosion, necessitating that adjacent properties also be armored to prevent further scouring and undercutting of those properties. Incompatible sand fencing for dune restoration is a common method of armoring along the Gulf side of the peninsula. These structures are located along the shoreline at nearby developments and if not constructed properly, block female turtles from reaching suitable nesting habitat.

Beach renourishment consists of pumping, trucking, or otherwise depositing sand on a beach to replace what has been lost to erosion.

While it is preferable to coastal armoring, it can negatively impact sea turtles if the sand is too compacted for turtles to nest, or if the sand imported is drastically different from native beach sediments, thereby potentially affecting nest-site selection, digging behavior, incubation temperature, moisture content of nests, and gas exchange within nests. If renourishment is allowed to proceed during the nesting season, nests can also be buried far beneath the surface or run over by heavy machinery.

Bon Secour Refuge is faced with the challenge of contributing substantially to off-refuge ecosystem objectives, such as migratory bird and threatened and endangered species management. These ever-increasing responsibilities, coupled with the current low levels of funding, make it difficult to meet the demand for biological services on and off the refuge. The refuge staff is also facing the challenge of managing an active and increasing visitor services program. The refuge provides limited recreation opportunities, but the demand makes it difficult to develop quality wildlife-dependent recreation opportunities involving the priority uses of fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Heavy use of beaches by the public, during a period broadly overlapping the breeding season of several species, results in one of the most serious natural resource management challenges that managers must work to resolve. Predicted increases in human use of the refuge lead to increased disturbance of beach nesting birds and sea turtles. Shorebird use of beaches during migration on the Little Dauphin Island and Fort Morgan units should be monitored to determine present status and the effect of recreational use on population levels.

Related to the increase in popularity of refuge beaches by residents and tourists is the observed trend of increased dog-related activities on refuge beaches and trails. According to the website www.dogfriendly.com, Bon Secour Refuge beach is the only public beach in Alabama that allows dog use. As other public lands in the area have prohibited pets from areas under their jurisdiction, more tourists and residents rely on refuge trails and beaches to exercise their pets. Coinciding with the increase in dog-use is a marked decline in the number of shorebirds utilizing refuge beaches for foraging, loafing, and nesting activities. While there is no direct evidence to suggest a correlation between these two trends, it is well-described in the literature that dogs can negatively affect shorebird use of areas where they are permitted. Dog-use of the refuge is a historic use and the appropriateness of this activity has never been addressed, nor have the effects on the endangered Alabama beach mouse, nesting sea turtles, and sea turtle hatchlings been determined. Public concern about the increase of canine feces on refuge trails, beaches, and boardwalks has grown, as well as concern about the number of unrestrained dogs since the majority of people using the refuge for this purpose choose to ignore the leash law. If left unchecked, this use may materially interfere with the purposes of the refuge and prevent implementation of several management objectives.

The development of baseline data is a task expected to take years for present staff to accomplish. The refuge system policy requires inventories of plants, fish, wildlife, and habitats. Monitoring of critical parameters and trends of selected species and species groups, as well as the subsequent basing of management on sound data, continues to be a problem due to staffing constraints. No standard inventory and monitoring method is in place to monitor conditions and impacts. Fish, reptile, and amphibian conservation is overlooked because of lack of information and limited funding to manage these resources.

The coastal habitats, long growing season, abundant rainfall, and geographical proximity to the Mobile Bay and the Gulf of Mexico are critical to migratory birds, threatened and endangered species, and other wildlife. The refuge location and habitat features are a significant ecological niche for the conservation of many trust and resident species. The refuge is home to a wide variety of amphibians, reptiles, mammals, and birds and is well known locally and nationally for its wildlife. Conservation of the Alabama beach mouse, loggerhead sea turtle, nongame migratory birds, and several other species of management concern are the primary focus of the current refuge staff.

Bon Secour
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