US Fish and Wildlife Service

Merritt Island National Wildlife Refuge
Visitor Services Plan

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Visitor Services Plan

I. Introduction

The purpose of Merritt Island National Wildlife Refuge's (NWR's) Public Use Program is to foster understanding and instill appreciation of the fish, wildlife, and plants and their conservation by providing the public with safe, high quality, appropriate, and compatible wildlife dependent recreational and educational programs and activities. In 1997 Congress passed the National Wildlife Refuge Improvement Act (Improvement Act) which clearly states, that on national wildlife refuges, wildlife comes first. The 1997 Improvement Act also identified six wildlife dependent public use activities and programs that are compatible with the mission of the National Wildlife Refuge System. These uses include: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. The Visitor Services Plan was prepared based upon these guidelines. With the adoption and implementation of the Comprehensive Conservation Plan (CCP) and this step-down plan, all public use activities and programs on the refuge would be in conformance with national guidelines and would insure that all visitor activities are compatible with the refuge's overarching wildlife mission and purposes.

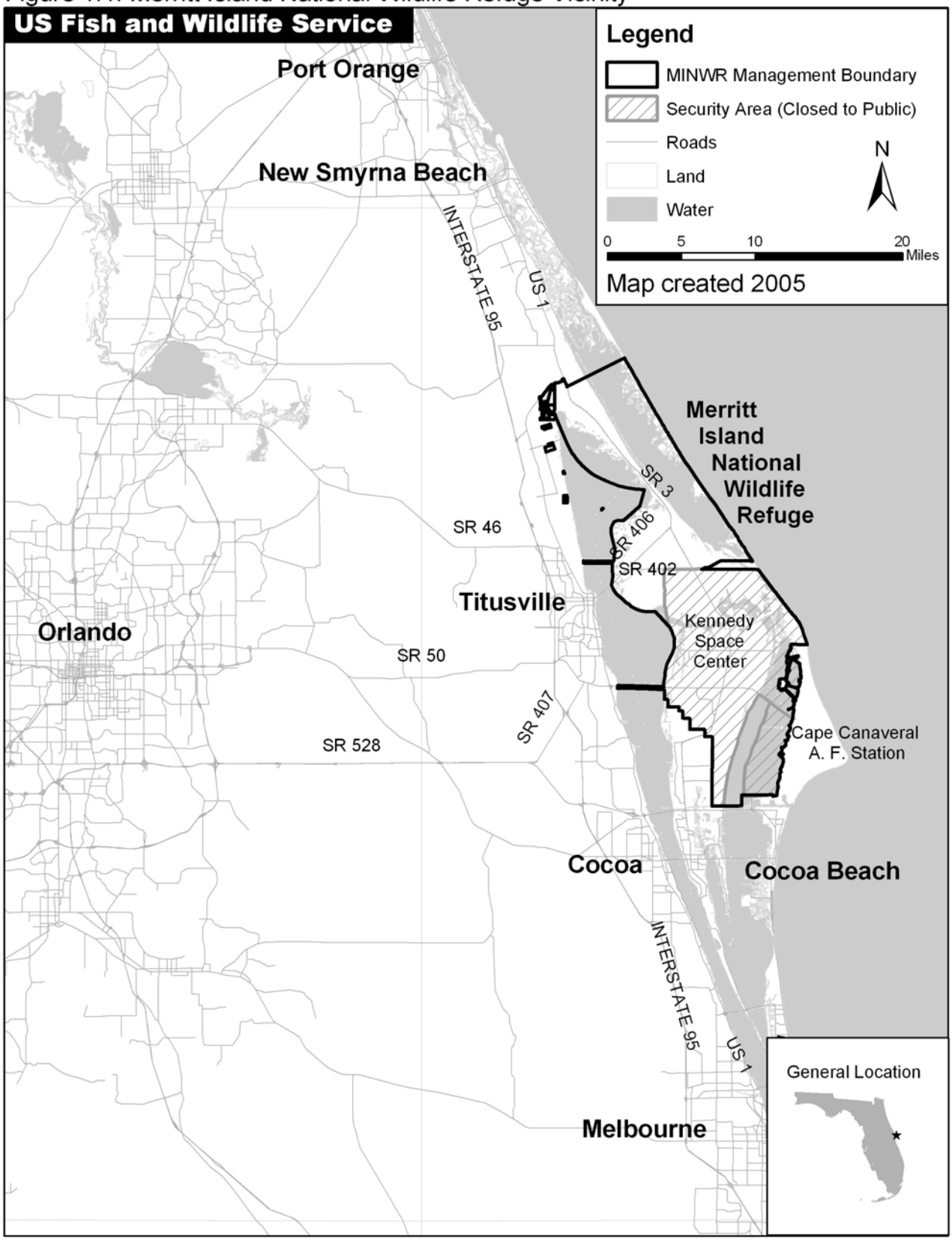
1. BRIEF HISTORY

Merritt Island NWR was established in 1963 as an overlay of the National Aeronautics and Space Administration's (NASA's) John F. Kennedy Space Center (KSC). The refuge was initially established to provide habitat for migratory birds. In later years, with the establishment of the Endangered Species Act, the management of federally listed species became another primary aim. Currently, the refuge provides habitat for 10 regularly occurring federally listed species and for 93 species of federal or state management concern. Merritt Island NWR also has the distinction of being one of the most visited refuges in the National Wildlife Refuge System (Refuge System); therefore, another aim for the refuge is managing for appropriate and compatible recreational use.

Merritt Island Refuge contains ~23,000 acres of impounded marsh. This represents 60% of the impounded wetlands on Florida's east coast. Managing water levels within this network of impoundments is one of the tools that the refuge uses to provide food, water, and cover for migratory birds, threatened and endangered species, and resident wildlife. The refuge also manages ~46,000 acres of upland habitats, mostly pine flatwoods and scrub. The primary management tool in upland habitats is prescribed fire, which enhances and improves the landscape for wildlife, such as bald eagles and Florida scrub-jays. The U.S. Fish and Wildlife Service (Service) is a proactive land management agency. That is, the Service actively manages and manipulates habitats to benefit wildlife. Habitat management is a wildlife management tool used to maintain and enhance wildlife populations. One of the purposes of the Visitor Services Program at Merritt Island NWR is to help the public understand how and why the refuge is managing its lands and waters for wildlife.

The refuge is located 40 miles east of Orlando (see Figure 1.1). Not only is the Orlando area the number one U.S. destination for tourists (currently 43 million annually), but it is becoming one of the most rapidly developing urban areas in the country (Orlando/Orange County Convention and Visitors Bureau, Inc. 2004a). The growth of both tourism and residents is

Figure 1.1. Merritt Island National Wildlife Refuge Vicinity



increasing at an alarming rate and this is pushing the demand for quality outdoor recreational activities in central Florida. More and more, this growing population is looking to the refuge to meet its demand for outdoor recreation. The National Wildlife Refuge System Improvement Act is clear, wildlife comes first. The challenge is to accommodate a rising demand for outdoor, wildlife-dependent recreation, while at the same time, protecting the values for which the refuge was established. It is a balancing act and this plan will outline strategies to meet projected demand for visitor services while fulfilling the primary mission of wildlife management.

2. **REFUGE ISSUES**

1. The refuge is charged with the wise stewardship of wildlife and plant resources, while at the same time allowing appropriate and compatible wildlife-dependent visitor activities. The guiding principal that directs the Visitor Services Program is the National Wildlife Refuge System Improvement Act which identifies six priority wildlife oriented uses for refuge lands. These Big Six uses include: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. Non-wildlife uses are not compatible with the mission of the U.S. Fish and Wildlife Service. All current and future uses should support one of the Big Six or be phased out from the Refuge System.

2. Several recreational activities have been identified that are not appropriate for the refuge. These uses would be phased out or modified. They include jogging and bicycling. Some priority wildlife activities also need to be modified to protect the refuge's primary wildlife purpose. These include flats fishing and wildlife viewing and photography. With the adoption of the CCP and this step-down plan, several new programs would be implemented, including establishing a quota hunt for deer and feral hogs in cooperation with the Florida Fish and Wildlife Conservation Commission, implementing a fee for Black Point Wildlife Drive, charging a fee for the Sports Fishing Permit, and expanding wildlife viewing opportunities for canoe and kayak enthusiasts.

3. Merritt Island NWR is located 40 miles east of Orlando and the central Florida attractions. The area hosted 43 million visitors in 2003 (Orlando/Orange County Convention and Visitors Bureau, Inc. 2004a). The refuge is also positioned six miles off I-95, one of the main north/south traffic corridors for visitors entering Florida from the northeast. Florida has one of the fastest growth rates in the nation. The population of the four-county area surrounding the refuge stands at roughly two million (Orlando/Orange County Convention and Visitors Bureau, Inc. 2004a). By 2015 this population is expected to grow to 2.9 million (Lenze 2002). It is anticipated that with increased growth of Florida's population and tourist industry, visitation to the refuge would continue to grow.

4. Visitation and recreation is expanding at a rapid pace and staff levels and budgets have not kept pace with the increasing demand. Most visitor facilities are old and over used. In some cases, the increasing use is impacting wildlife and conflicts between user groups have occurred. The demand by commercial operators is increasing. With urban growth come new, non-wildlife law enforcement issues. Educating the next generation of users is a priority, but it would be a challenge considering the list of issues facing refuge staff.

3. **PURPOSE OF VISITOR SERVICES PLAN**

The purpose of this plan is to establish priorities and identify improvements which will guide the refuge's Visitor Services Program and facility development over the next 15 years. The 1997

Improvement Act set specific guidelines for the National Wildlife Refuge System and a Public Use Review was completed in 2002 to evaluate the Program in light of the new legislation, as part of the CCP process and to make recommendations to bring the Program into compliance with the new directives. This plan would implement many of the recommendations made during the 2002 Public Use Review and update the existing Interpretive and Recreation Management Plan developed in 1983. Finally, the Visitor Services Plan would be one component of the refuge's Comprehensive Conservation Plan, which would integrate the Visitor Services Program with the refuge's wildlife, wetlands, upland, fire, exotic, administrative, and other management components.

4. **BRIEF SUMMARY OF PLANNING HIGHLIGHTS**

- Implement deer and feral hog hunting in cooperation with the Florida Fish and Wildlife Conservation Commission.
- Establish fees for hunting and fishing, along with a fee for wildlife viewing at Black Point Wildlife Drive within five years of plan approval.
- Improve wildlife viewing opportunities on Black Point Wildlife Drive and establish several new trails at other locations.
- Expand environmental education opportunities for area schools.
- Establish an experimental pole/troll zone in a portion of Mosquito Lagoon.
- Establish a partnership to expand freshwater fishing opportunities on the refuge.
- Redirect bicycling on Black Point Wildlife Drive and other marshland locations to more appropriate locations and eliminate jogging from the refuge.
- Establish six canoe/kayak trails and develop a wildlife viewing blind near a bird rookery.

II. Local Setting

The refuge was established in 1963 as an overlay of the John F. Kennedy Space Center and is located 40 miles east of Orlando on Florida's Atlantic Coast. The barrier island refuge is 35 miles long and extends from the Barge Canal near Port Canaveral at the south to the Gomez Grant Line near the community of Oak Hill at the north. Just west of the refuge is the gateway community of Titusville. To the south, are the communities of Merritt Island and Cocoa Beach, and to the north, Port Orange and New Smyrna. Interstate I-95 is located 6 miles west of the refuge and the Bee Line Expressway (recently renamed to the Beach Line) is a major artery connecting the refuge to the tourist complex of the greater Orlando area. As an overlay of KSC, roughly half of the refuge falls within the KSC restricted area and is not open to the public. However, a great opportunity exists to expand the refuge's outreach program by contacting KSC's employees and visitors.

Nearly the entire southern half of the refuge is closed to public entry. Except for a portion of the Banana River and a highway corridor (SR 405 and SR 3) that allows public access to KSC's Visitor Center and Research Park, the southern half of the refuge is permanently contained with KSC's Security area and is closed to public access. The portion of the Banana River south of NASA Causeway (SR 405) and north of the SR 528 Causeway is open throughout the year to non-motorized boats. See Figure 1.1 for the location of the refuge and the KSC Security Area.

The northern half of the refuge is open to the public except during the countdown period before Space Shuttle launches and during landings and during any KSC closures. Generally, these closures are short-lived and have a minimal impact on public use activities. However, on

occasion, these closures continue for several days or longer and can have profound impacts on the visitation and the public use programs. For example, for several months following September 11, 2001, nearly the entire refuge was closed to provide added security for KSC and Cape Canaveral Air Force Station. The area north of old Haulover Canal is unaffected by KSC's launch closures and always remains open to the public.

Three major paved roads pass through the refuge: SR 402, SR 406 and SR 3. These are former state roads, but now are owned by NASA. They are connected to two major arteries: I-95 and US 1. Directional signs are located at I-95 and US 1 guiding visitors to the refuge.

Most visitor facilities are clustered around the triangle, which is the area contained between SR 402, SR 406, and SR 3 north to Haulover Canal (see Figure 1.1). By containing most visitor facilities within this zone, visitor impacts are concentrated and disturbance to wildlife is minimized outside of this area. Clustering facilities also makes it easier for visitors to orient to the facilities; helps the refuge zone consumptive and non-consumptive recreation activities; and from a maintenance and logistic stand point, is more efficient and economical to service and maintain. Visitors can make the circuit around the triangle and sample most major habitats and experience what makes Merritt Island NWR special. The listed developed, public use facilities are located in the triangle area.

-Visitor Center	-Black Point Wildlife Drive
-Visitor Center Trail	-Oak Hammock and Palm Hammock Trails
-Cruickshank Trail	-Scrub Ridge Trail
-Manatee Observation Deck	-West Information Kiosk
-BioLab Road	-BioLab Boat Ramp
-Haulover Canal Boat Ramp	-Bair's Cove Boat Ramp

Most, but not all, visitor facilities are contained within the triangle area. Several boat ramps, key fishing areas, waterfowl and upland game hunting areas, canoe/kayak areas, and additional wildlife viewing sites are located outside the primary public use zone. With the exception of fishing and canoeing, these activities are seasonal by nature and are compatible with refuge purposes. However, as visitation increases it would be important to monitor these uses to insure wildlife impacts are acceptable. Public use activities outside the triangle are not highlighted on the general map and brochure except for the boat ramps and canoe/kayak routes, therefore, most visitors do not venture outside the triangle area.

The only public use facility south of SR 402 is an exhibit located at KSC's Visitor Center. Annual visitation to NASA's Visitor Complex is several times greater than the combined total of all visits to the northern half of the refuge. Consequently, a distinct advantage exists to having a presence at KSC's Visitor Complex. But to date, the refuge has not had the opportunity to capitalize on this. One of the priorities for expanding outreach opportunities is developing new programs at KSC's Visitor Complex. This program alone could reach an untapped and rapidly expanding audience of several million domestic and international visitors annually.

1. ECONOMICS

Merritt Island National Wildlife Refuge has become a destination for visitors. First and foremost, the refuge is known internationally as a birding hotspot. The Visitor Center is designated as a Welcome Center and is the Eastern Gateway for the Great Florida Birding Trail. The refuge has also become a world famous destination for flats fishing, especially for redfish. With

approximately 500,000 direct annual visitors (measured in 2003), the local economy benefits greatly from the refuge.

Portions of Mosquito Lagoon, Banana River, and the Indian River Lagoon are contained within the refuge and each body of water offers world-class fishing. An estimated $54 million was spent on recreational fishing in the Indian River Lagoon in 1990 with an anticipated escalation to $87 million by 2010 (Milon and Thunberg 1993). In 1995, residents and tourists valued the Indian River Lagoon at more than $733 million, including spending on recreational activities, commercial fishing, and Lagoon-front property (Apogee 1996). The seagrass beds of the Indian River Lagoon act as a nursery ground that supports an $800 million dollar industry to the local economy (Apogee 1996). Fishing activity in the Indian River Lagoon system comprises 50% of Florida's east coast catch and Brevard County's Office of Tourism estimated that more than 650,000 anglers fished in these waters in 2001 (Brevard Nature Alliance 2001).

Wildlife viewing has emerged as an important economic value to the State of Florida, generating an estimated $477 million in retail sales in Florida from birdwatching (Florida Fish and Wildlife Conservation Commission 2000). The Florida Fish and Wildlife Conservation Commission (FWC) estimates that the economic impact of wildlife viewing in the State of Florida is nearly $1.8 billion and that out-of-state visitors spend $192 per day on wildlife viewing activities (Harding 2004a and 2004b). Brevard County pulls in more than $56 million from wildlife viewing activities (Florida Fish and Wildlife Conservation Commission 2004). This new trend brings in substantial dollars for the State of Florida, and the FWC has developed birding cards that visitors can leave at area businesses that state they have come to that community specifically to birdwatch. The FWC also developed the Great Florida Birding Trail, a 2,000-mile trail that links the premier bird watching sites in Florida. In 2001, the FWC selected Merritt Island NWR as the Eastern Gateway for this trail.

The wetlands of the refuge draw thousands of waterfowl every winter, which in turn attracts waterfowl hunters from all over the southeastern United States. Hunters annually spend almost $11 million in Brevard County, generating $657,634 in state tax dollars (Florida Fish and Wildlife Conservation Commission 2004). The refuge offers 36,000 acres for waterfowl hunting, half of which is managed by issuing a $12.50 refuge quota hunting permit, which can generate up to $16,500.

2. DEMOGRAPHICS

Merritt Island NWR is situated in northern Brevard and southern Volusia counties, adjacent to Orlando, the most visited region in Florida (VISIT FLORIDA 2003). Representing 26.1% of Florida visitors in 2001, the Central Florida region offers' traditional tourism activities such as Walt Disney World, Sea World, and Universal Studios in the Orlando area (VISIT FLORIDA 2003). In 2002, the Orlando area hosted 43 million visitors and is expected to reach 51.9 million in 2006 (Orlando/Orange County Convention and Visitors Bureau, Inc. 2004). Just 45 minutes from Orlando, the refuge receives many visitors from Orange County. Volusia County sees 4.4% and Brevard County 2.9% of all Florida visitors (VISIT FLORIDA 2003).

Nature-based activities are becoming a primary activity of Florida visitors. Outdoor recreation (e.g., hunting, fishing, and hiking) ranked fourth as a preferred activity of domestic visitors to Florida, representing 11.8% of activities in 2002 (VISIT FLORIDA 2003). Residents also enjoy outdoor-related activities, with one out of every six over the age of 16 participating in some form of wildlife watching (Southwick 2003). A VISIT FLORIDA survey reports that over two-thirds

(66.4%) of respondents say they've enjoyed a nature-based activity when they traveled to Florida in the past year (Santos 2003). Three in ten (30.2%) did not plan these activities before they left on their vacations to Florida (Santos 2003). Although 2002 showed a decrease of U.S. residents and Florida residents taking vacations, nature-based travel showed an increase (Santos 2003). Clearly, activities such as hiking, birdwatching, fishing, and hunting are becoming more popular, but aren't necessarily planned activities. Therefore, actions such as continually promoting the refuge through fliers, press releases, and web-site updates are warranted.

Since 1969, Brevard County's population has grown 117% to 476,230 people in 2000; this occurred much faster than the United States growth of 40% (Market Street Services 2001). However, the population of Brevard County is aging, with over 43% of the population in 1999 aged 45 and older (Market Street Services 2001) and 19.9% of the population over the age of 65 (U.S. Census Bureau 2000a). The refuge receives much of its support from this growing demographic group, as retirees can dedicate time to hobbies, such as hunting, fishing, and wildlife viewing. The refuge's volunteer program is largely supported by individuals aged 45 and older.

3. RMIS ANALYSIS

In 2003 Merritt Island NWR had roughly 500,000 visitors who specifically came to visit the refuge. The five-year annual average (Fiscal Year [FY] 1999 - 2003) is 485,429. Another 400,000 - 500,000 visit the refuge's Nature and Technology exhibit at Kennedy Space Center's Visitor Complex. The refuge is renowned for excellent birdwatching, and refuge visitation totals reflect this. Table 1 shows the Fiscal Year (October 1 - September 30) 2003 visitation data.

Table 1: FY 2003 Visitation

Visitor Center	51,043
Kiosks	102,086
Hiking	30,626
Black Point Wildlife Drive	126,845
Observation Towers	80,142
Hunting	985
Fishing	163,670
Kennedy Space Center Exhibit*	(336,089)
Total Visitation	**459,140**

* The Kennedy Space Center Exhibit is not included in total visitation.

The counts for each activity reflect the number of times that activity was performed, while the total visitation number only reflects the number of visitors that come to the refuge. For instance, the typical person will visit several facilities. They may begin at the Visitor Center, then tour Black Point Wildlife Drive, and also climb an observation tower to get a better view of the habitat. Each activity is counted, but only one visitor performed them.

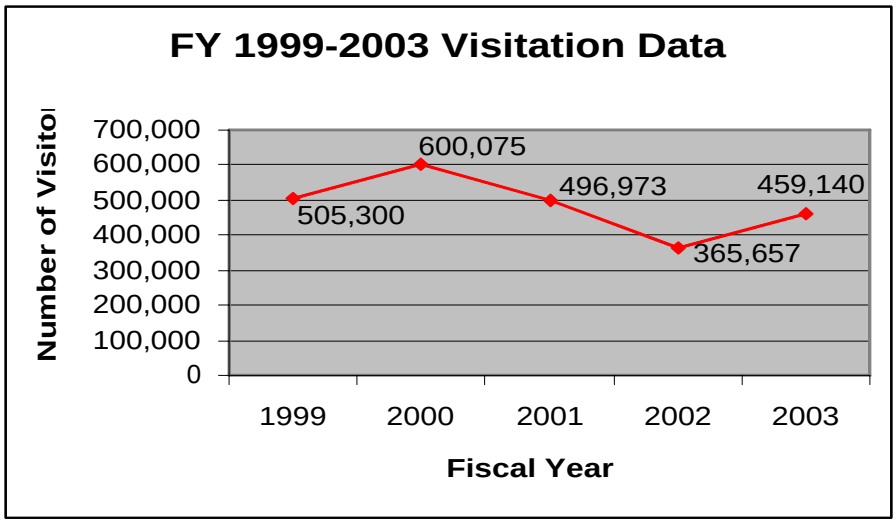
The visitation data is collected via several methods. A hand counter is kept at the Visitor Center, and each visitor is clicked in by the desk volunteer. This is the refuge's most reliable data. Car counters are located at key parking areas and entrance roads, and formulas are used to determine how many people each car holds. Hunting information is collected from voluntary hunter check stations and inserted into a formula to account for people who did not stop or when check stations were not operational. Overall, the formulas used to calculate visitation data are unchanged over time and can be used to determine trends.

Table 2 and Figure 1.2 show refuge visitation trends from FYs 1999 - 2003. Fiscal Year 2000 displays higher visitation than the remaining four years included in the trend. Most of the activities are comparable to other years except hunting and the Kennedy Space Center exhibit, which show higher numbers than the five-year average. Hunting data were higher for FY 1999 and 2000, but a quota hunting permit program was instituted for the 2000-2001 which limited the number of hunters. This is reflected in the lower hunting data for later years.

Table 2: Visitation Trends FY 1999 - 2003

	1999	**2000**	**2001**	**2002**	**2003**	**Five-year average**
Visitor Center	57,309	58,050	56,794	49,458	51,043	**54,531**
Kiosks	114,618	108,100	113,588	98,916	102,086	**107,462**
Hiking	42,120	36,690	34,075	32,680	30,626	**35,238**
Black Point Wildlife Drive	126,055	117,875	140,301	123,445	126,845	**126,904**
Towers	57,916	40,921	88,796	69,179	80,142	**67,391**
Hunting	2,339	3,472	1,705	347	985	**1,770**
Fishing	215,396	214,888	177,424	97,116	163,670	**192,893**
KSC Exhibit	415,756	552,440	447,428	402,682	336,089	**430,879**
Total # of Visitors	**505,300**	**555,115**	**496,973**	**365,657**	**459,140**	**485,429**

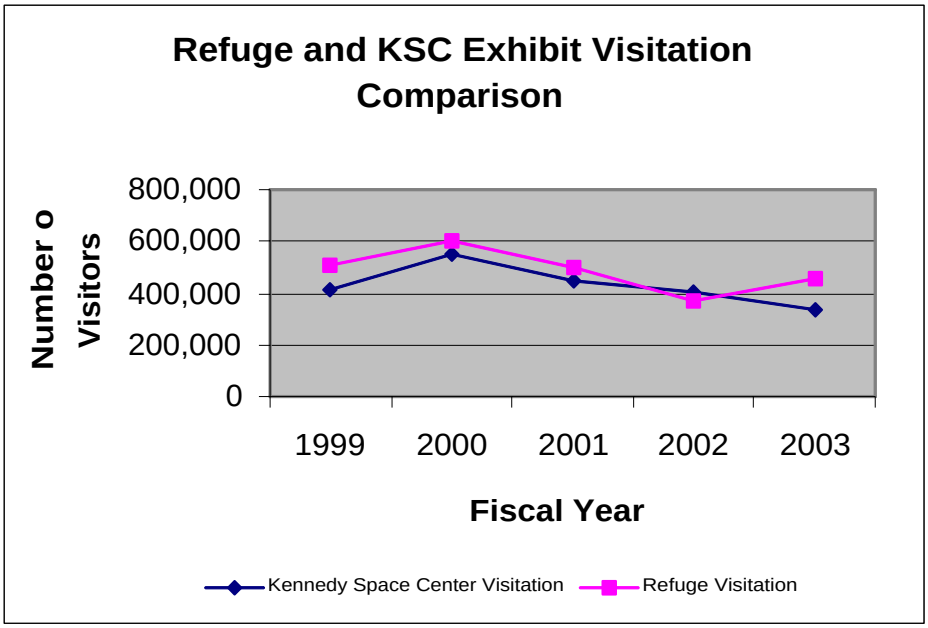
Figure 1.2: FY 1999 - 2003 Visitation Data



The trend information represented in Table 2 and Figure 1.2 shows the substantial decline in visitation in FY 2002. September 11, 2001 fell just a couple weeks before the start of FY 2002. The effects of September 11 were felt throughout the Florida tourism industry, and the refuge suffered as well. Substantial portions of the refuge were closed to the public for many weeks due to KSC security concerns, and visitation dropped to non-existent during this time. This period came during the refuge's busiest season: November through March. Most of the refuge was re-opened to public activity by the beginning of calendar year 2002, but several facilities remained closed or restricted, including many dikes and unpaved roads used for wildlife observation. Hunting was not allowed for most of the hunt season because the hunt areas were included in KSC's expanded closed zone. Fishing was also affected greatly because the southern portion of Mosquito Lagoon was closed, which is a popular fishing area. However, by the first anniversary, almost the entire public use area was reopened, and visitation returned to more normal levels.

The refuge receives visitation that parallels Kennedy Space Center. Kennedy Space Center also saw a sharp drop in visitation at the end of 2001 and for 2002. Unlike KSC, however, the refuge visitation rebounded in 2003 and has returned to normal levels. Figure 1.3 shows the visitation to the refuge's Kennedy Space Center Nature and Technology exhibit, which is 24% of KSC's total visitation.

Figure 1.3: Refuge and KSC Exhibit Visitation Comparison



4. OTHER VISITOR DATA

Visitor Center The Guest Registry in the refuge's Visitor Center provides some insights into the origins of the Merritt Island NWR visitors. The registry indicated that one third (33%)of the visitors to the Visitor Center are from Florida, 52% from states outside Florida and fifteen percent (15%) from other countries. Of the thirty percent (33%) from Florida, 19% are from outside the local counties, while 14% are from Brevard or Volusia counties. More than half of the refuge's visitors come from other states. Fully 15.3% of the visitors come from the Northeast, followed by 11.5% from the Midwest, 10.2% from Southeast, and 15% from other states. Fifteen percent are from foreign countries. Of the foreign visitors, more than half come from either the United Kingdom (28%) or Canada (28%), followed by Germany (15%), Netherlands (7%), and France (4%). Other countries make up 1% or less of the total visitation.

In 2002, during the busiest months (January, February, and March), the Merritt Island Wildlife Association (MIWA), the friends group, conducted an informal visitor survey to evaluate the effectiveness of paying a vendor to stock hotel lobbies and rest stops on I-95 with refuge leaflets. The survey provides some insight into how Merritt Island NWR visitors find the refuge.

Twenty six percent of the visitors indicated they found the refuge by word of mouth (i.e., from friends, neighbors, or relatives that recommended the refuge). Twenty-four percent were return visitors. Six percent found the refuge from the paid leaflet distribution network in hotel lobbies and Florida welcome centers. The same percentage (6%) found the refuge on a Florida map. Five percent found the refuge through a newspaper or magazine article. About 4% found the refuge through the Great Florida Birding Trail literature and signs. Other responses included: they found the refuge because they lived in the community (4%), through road signs (4%) on the internet (2%), through the MIWA website (2%), from tour books (2%), and by visiting KSC (2%). This data suggests 81% of visitors found the refuge from word of mouth; returned on their own;

or discovered it from an article, brochure, or sign. Half of the sample was satisfied with the refuge, since they returned themselves or recommended it to others. This indicates a large percentage of the visitors are loyal and/or are satisfied with their experience. Advertisements seem to be effective since 20% of this sample found the refuge through brochures, state maps, and signs, while 11% discovered it through a newspaper, magazine article, or the internet. This data can be misleading, since it samples only the visitors that come through the Visitor Center. This would include most first time visitors. However, many of the return visitors do not hit the Visitor Center, but have a destination or activity in mind. In these cases, they go directly to their predetermined destinations (e.g., Balck Point Wildlife Drive, boat or canoe/kayak launch ramp, bank fishing site, or waterfowl hunting destination). Therefore, the data from this study under samples local and repeat visitors.

Fishing Exit Survey In 2002, Dynamac Corporation was funded to conduct exit surveys at refuge boat ramps to sample fishing success and to ask questions relative to the quality of the fishing experience. The survey indicated that the typical fisherman was male, between the ages of 41 and 55; fished for 4.6 hours; and operated a boat 16'4" in length that was powered by a 71.1 HP, 2 stroke engine. Sports fishermen made up 87.5% of the interviews with commercial fishermen or guides making up the remaining 12.5%. During the week, commercial and charter fishing activity increased, while sport fishing increased on weekends. More than 55% of the fishermen visited more than 13 times per year and had been fishing the refuge six or more years. The majority had traveled between 50 and 100 miles and lived in Central Florida counties. Fishermen were asked to rank their experiences on a scale of 1 to 10. Eighty-percent rated it five or greater with higher ratings on weekdays. When asked what they liked best, the two most frequent replies were “just getting out” and favorable remarks about the fishing experience. When asked what they liked least, the most frequent responses related to fishing: “Fish weren’t biting”, “Fish weren’t big”, “Didn’t catch any fish”, or the weather (it was too hot or too windy). Seventy seven percent of fishermen said the fishing experience was “okay” and not too overcrowded. When asked to compare the environmental conditions (e.g., water quality, pollution, and noise) to past years, 50% said conditions had not changed and 18% felt they had improved. Replies concerning wildlife were similar, with 37% believing there was no change and 40% said wildlife resources had improved. However, 66% indicated there were more people using the area than in the past. Most comments elicited were positive about the refuge.

5. SCORP TRENDS

Florida’s Statewide Comprehensive Outdoor Recreation Plan (SCORP) was developed to analyze outdoor recreation demands for the State of Florida and display the facilities, programs, and funding needed to support these demands today and in the future. The results from SCORP will help dictate priority needs for Merritt Island NWR over the next 15 years.

SCORP reports that although hunting opportunities are declining, enough places are still available to hunt throughout most of Florida. The trend is for landowners to lease to private hunt clubs that are willing to pay high lease fees. Waterfowl hunting opportunities declined, due to the drainage and reclamation of wetlands. Based on SCORP data, it is likely Merritt Island NWR would play an increasingly larger role to waterfowl hunters in the future. (See Florida Department of Environmental Protection 2002.)

Fishing opportunities are in great abundance in Florida due to the vast freshwater and saltwater resources and convenient access from almost any point in the state. Fishing opportunities are available for all who desire to participate, with the Gulf of Mexico, Atlantic Ocean, and 12,000

miles of rivers and streams providing enough resources that it is unlikely demand will exceed supply in the foreseeable future. While fishing opportunities abound, SCORP reports that facilities supporting the sport are insufficient. A clear need exists for the development of more boat ramps, canoe launches, docks, restrooms, and parking areas to support fishing activities. A Florida State University study showed that almost 53% of respondents were somewhat or very dissatisfied with overall parking and waiting time on weekends at boat ramps in Brevard County (Bell 1995). This study also showed that 31-37 more boat ramps would be needed by 2010 for Brevard County to support demand (Bell 1995). In addition, the City of Titusville reports that providing ample boat ramps to meet current and future demand is a primary strategy in its Comprehensive Plan (City of Titusville 2001). The refuge offers four boat ramps, and numerous kayak and canoe launches. In addition, Canaveral National Seashore offers two boat ramps and Brevard County's Parrish Park, located just west of the refuge, offers a newly-renovated boat ramp with ample parking. Several boat ramps on the south side of the refuge are offered by KARS Park (available to KSC badged employees), the Port Canaveral area, and north Merritt Island. With the exception of the north Banana River, these boat ramps provide sufficient access to refuge waters.

Wildlife observation and photography are becoming increasingly popular activities throughout the nation and SCORP addresses this particular group by reporting that abundant opportunities for nature study are available in Florida. SCORP states that walking is the most popular of all outdoor recreation activities, with nearly 67% of those surveyed participating. By 2010, SCORP estimates that an additional 774 miles of hiking trails would be needed in Brevard County to meet demand. It also identified a need to connect cities and towns to conservation lands through a network of single- and multi-use trails. In addition to hiking trails, SCORP addresses the need for biking trails. Developing more bike trails, specifically in Brevard County, is the 10th highest resource need in the State of Florida. SCORP estimates that 1,030 miles of biking trails would be needed by 2010 to meet demand. It suggests including safe parking structures; bike lanes on roadways; paved and unpaved paths; and trails separate from roadways and trailheads that include automobile and bicycle parking, restrooms, and maps. Biking may conflict with the refuge's wildlife-oriented priorities and is not one of the Big Six priority public uses identified by Congress in the 1997 Improvement Act. The facilities set aside on the refuge are for wildlife viewing and education. Biking may not support these activities and has the potential to disturb wildlife in the area. However, bike paths located adjacent to highways or upland locations would have few wildlife impacts and could be accommodated, where appropriate and compatible.

Interpretation and environmental education are not directly addressed in SCORP. Education is directly addressed in myregion.org's Environment Issues Summary report for Central Florida (myregion.org 2002). Here, it is stated that promotion of environmental stewardship in this region is not strong enough. It suggests promoting generational thinking - what will the actions today mean to future generations - and involving adults as well as children in education strategies (myregion.org 2002).

Outdoor recreation should be available to everyone who wishes to participate, regardless of physical ability. SCORP recommends all governments should evaluate disabled access and make improvements where needed. This includes training on how to make land and facilities more accessible, and consulting with the Florida Disabled Outdoor Association when setting or revising policies. Facilities, such as trails and observation towers, and activities such as fishing and hunting, should provide ample opportunity for everyone to enjoy them.

III. Description of Refuge Resources

1. HABITAT AND WILDLIFE

Merritt Island NWR is a special place for wildlife. It is located near the southern end of the Atlantic flyway in a place that overlaps two ecological regions, the Temperate and Subtropical zones. Consequently it attracts species from both ecological areas. The Island itself provides great habitat diversity with seven distinct habitat types. The refuge's Atlantic location, overlapping ranges, and habitat diversity all contribute to the support of over 500 species of wildlife. Of these, 10 regularly occurring species are federally listed as threatened or endangered.

The most productive and diverse wildlife area on the refuge are the marshes, which provide a home for crabs, worms, fish, and turtles that attract wildlife higher in the food chain. Tens of thousands of migratory birds settle here in winter months to feast in the saltwater estuaries, freshwater impoundments, and mud flats. It is not unusual to see 50 bird species in a single trip along Black Point Wildlife Drive, a premier wildlife viewing location. The most prominent winter migrants are the waterfowl, including teal, scaup, shoveler, widgeon, pintail, and merganser, along with a diverse array of shorebirds and wading birds.

Refuge uplands account for several other habitat types important to wildlife. Hardwood hammocks host dozens of songbird species, some stay for the winter and others just rest for the night on their long migratory journeys. Frogs, snakes, lizards, and owls are commonly seen in hammocks as well. Pine flatwood habitat commonly contain the nation's most well-known bird of prey, the bald eagle. Eagles use the mature slash pines for nesting, while feeding in adjacent lagoon waters or in one of 76 managed impoundments. Ecotones between the hammocks and pine flatwoods or hammocks and marsh further contribute to the diverse landscape of Merritt Island Refuge. Scrub habitat is another important habitat, supporting the Florida scrub-jay, eastern indigo snake, and gopher tortoise. The refuge's natural beaches provide for thousands of sea turtle nests every summer. These beaches and their dunes support shorebirds, southeastern beach mice, bobcats, snakes, and more. This diverse landscape provides habitat for over 330 species of birds, 31 species of mammals, 117 species of fish, 68 species of amphibians and reptiles and over 1,000 species of plants.

2. CULTURAL RESOURCES

From its gradual emergence from the sea about a quarter million years ago to the space age, Merritt Island has remained a unique natural area, attracting a diverse array of wild creatures and human occupants. The forces of wind, wave action, and fluctuating levels of the sea formed the alternating ridges, swales, and marshes of Merritt Island. The land continues to change as the dynamic natural forces of the barrier island constantly shape and sculpt the Island. (This section was summarized from U.S. Fish and Wildlife Service 1978 and Adams 1997.)

INDIAN PERIOD Over the millennium, human occupation of the Island has ebbed and flowed. Archaeologists tell us the Island was occupied by seven distinct native American cultures dating back to 4,000 BC, or 6,000 years ago. The first human visitors were probably small bands of nomadic hunters and gatherers that wandered in from the St. Johns River basin. At this time, sea levels were much lower than present and the shoreline could have been miles eastward. Consequently, most evidence of their culture was lost with sea level rise. While they left few

artifacts, it is known that they used spears with chipped flint tips for weapons. Shellfish formed an important part of the indigenous peoples' diets, as evidenced by the numerous shell middens that exist today, which have provided archaeologists with important information concerning their societies. Beginning about 2,000 B.C. the Indians developed clay pottery and this event marked the beginning of the Orange Period, which lasted about 1,000 years. This was followed by the Transitional, St Johns I, and St Johns II periods and finally, after 1565, the St. Augustine Period.

Each period of Native American culture was marked by a distinctive type of pottery and shards of these various utensils are found in many of the middens. Evidence indicates that early indigenous people spent their winters on the barrier island in and around Mosquito Lagoon and Banana River, moving inland to the St. Johns River basin during the summer months to escape the intolerable salt marsh mosquitoes.

By the time the first European explorers arrived, the refuge formed the line between two distinctive Indian cultures. The Timucuan, a peaceful agrarian people, occupied the area along Mosquito Lagoon northward to Jacksonville. To the south, beginning at Cape Canaveral and the Banana River, the coast was inhabited by the fierce Ais Indians. Most of what is known of the Ais culture comes to us from the Jonathan Dickinson Journal of 1696. Both the Timucuan and the Ais tribes disappeared in historical times, having succumbed to war, disease, and slavery at the hands of the Spanish and English. Following early English raids, some of the Ais moved to Cuba with the Spanish. Other than occasional incursions by the Seminoles, Indian occupation of the Cape area ended after the early 1700s.

FIRST SPANISH PERIOD (1513-1763) Some of the earliest records of the Indians came from the Spaniards. The first contact with the Ais was probably in 1513 when Ponce de Leon visited the Cape. Written records of the contact are scant, but following the visit, the Spaniard referred to the Banana River as the Great Bay of Ais. For nearly 300 years, during the 16th, 17th, and 18th centuries, the Cape area was on the fringe of Spanish activity. Records show that Pedro Menendez de Aviles sailed to the Cape and captured the French Huguenots who had taken refuge here after the destruction of Fort Caroline. One of the best records of the area comes from Mexia in 1605 when he sailed from St. Augustine to St. Lucie Inlet. He referred to Mosquito Lagoon as Lake Surruque, after the Indian tribe living in the area. Within the vicinity of the refuge, Mexia discovered four villages: Surruque somewhere north of Haulover, Urruya near Haulover, Suyagurchi around Pad B, and Ulumay between Banana Creek and the Banana River. Neither Spanish settlements nor missions were known to have occurred in the area of the refuge, though evidence of their occasional passage through the region was indicated by the presence of wild orange groves.

BRITISH PERIOD (1763-1784) Following the Spanish occupation, British settlers moved into the area for a brief period. The best organized group was the Turnbull Colony from New Smyrna which established a settlement of 3,000. A small settlement of the Turnbull Colony was formed at Ross Hammock at the north end of the refuge. They are believed to have dug the drainage canal which exists today. The American Revolution brought an end to British occupation.

SECOND SPANISH PERIOD (1784-1821) The population of East Florida during the second Spanish period was mixed. It included Spanish, Minorcan, Indian, Anglo settlers, and African Americans (both freed and slaves). Among those settling land were several individuals who were issued Spanish land grants that were established within the refuge during this era. The Reyes and Lucas Creyon grants were located near the headwaters of the Indian River Lagoon. It is unclear if the origin of the Sugar Mill ruins is associated with one of these grants or with the

earlier Turnbull colony. The Gomez Grant was located along Mosquito Lagoon and forms the current northern boundary of the refuge.

During this period, the United States was anxious to acquire Florida. This vast undeveloped area presented problems for the U.S., as it was a haven for runaway slaves and a source of slave smuggling and contraband trade between the British in the Bahamas and the Seminole Indians residing along the Indian River Lagoon. Because of these problems and the strategic importance of Florida, Andrew Jackson invaded Florida in 1818 during the First Seminole War. It became clear that Spain could no longer hold Florida and it was forced into signing the Adams-Onis Treaty in 1819 that lead to the transfer of Florida to the United States in 1821.

AMERICAN PERIOD (1821-present) Florida was established as a Territory in 1821 with Andrew Jackson serving as the first territorial governor. He divided the state into two subdivisions: Escambia County in the west and St. Johns County which encompassed all of Florida east of the Suwannee River, including the area that today forms the refuge.

With its territorial status came new settlement to Florida. Real estate speculation fueled a boom during the early years of the territorial period, but transportation and health issues limited its effects. By 1825, the year of the first census, there were 5,077 people in east Florida, but settlement did not extend as far south as the refuge until the 1830s. In 1830 the refuge was included in the new Mosquito County and the census from that year listed 15 heads of families plus slaves, for a total population of 733. In 1835, the Second Seminole War broke out and all plantations and settlements south of St. Augustine in east Florida were destroyed. The Second Seminole War stimulated the first substantial modern development of transportation and fortifications on the refuge. From November of 1837 to April of 1838 Fort Anne, near present day Haulover Canal, was constructed and occupied. The Fort guarded the haulover, between Mosquito Lagoon and the Indian River Lagoon, where shallow draft vessels were portaged. It was garrisoned by a naval unit and three companies of artillery and formed the original American settlement in north Brevard County.

During this era, because of the absence of roads, all commerce depended on waterway traffic. As early as 1828 stock was offered to construct a canal connecting Mosquito Lagoon with the Indian River Lagoon, but it was not until 1854 that construction was finished. The canal was used for 30 years (1854-1884) until the new canal was dug at the present location. The canal was a positive factor in opening the Indian River Lagoon to settlement, as it served to bring settlers and goods into the area and sent produce to northern markets.

In 1842, Congress enacted the Armed Occupation Act which gave a quarter section of land to all men over 18 to encourage the settlement of Florida. The Act produced the first concentrated settlement of the Indian River Lagoon region and between 20 and 35 families settled in the area. Douglas Dummitt was one individual to take advantage of the Act. He served in the Florida Militia and was stationed at Fort Anne. At the end of the Seminole War, his previous holdings in ruins, Dummitt settled on a piece of land south of the Fort. Over the next 36 years he established a 1,700-tree orange grove that was reported to be the largest in the state. The importance of Dummitt's grove lies not in being the first commercial grove in Florida, it was not. (Orange groves were established as early as 1717). The importance lies in its position following the freeze of 1835. In this respect, Dummitt's grove was the forerunner of the citrus industry in Florida and the origin of the famous Indian River Fruit industry. Dummitt used the wild orange that the Spaniards had established and that had naturalized on the Island as the root stock for his groves. This technique of grafting a sweet variety to the sour orange root stock proved to be

an effective technique in the Indian River lagoon area where the water table was high. Dummitt's grove lasted until after his death in 1873, but in December of 1894 and February 1895 two successive freezes destroyed them.

By 1854 Volusia and Brevard counties were established and had a combined population of 618 (300 white family members and 318 slaves). By 1860 the population grew to 1,200. The same year, Sir Francis Sykes sent back to England 168 roseate spoonbills he shot from the refuge vicinity. It was said he shot over 500 spoonbills to get the best specimens. This was the beginning of the feather wars and, in 1871, only 100 spoonbills were left in the area. That number dwindled to 7 by 1873. By 1875 several families lived on the Island and a post office existed at Sand Point. The economy was based largely on subsistence fishing and farming, The most marketable commodities were citrus, sea turtles, and live oaks for ship building. In 1879, Henry Titus donated land for a courthouse and Titusville was established. In 1890, a local add promoted this area as a "Sportsman Paradise where one could average a deer a day, hunt bear on the beach by moonlight, where duck shooting was unsurpassed, turkey quite thick, and channel bass weighed as much as 48 pounds abound" (historic quote, unknown source). By 1896, the lower portion of Mosquito Lagoon was the property of the Canaveral Shooting Club and the land was spared from development. Around the same period, the Indian River Club acquired the marshes around Banana River and Banana Creek, having the same positive results in maintaining the natural values of the area. These efforts by conservationists proved beneficial to NASA, some sixty years later when it acquired the property for the Kennedy Space Center.

In 1903 Pelican Island, located seventy miles south of Merritt Island, was established as the nation's first national wildlife refuge. However, despite efforts to protect the nesting brown pelican colony, the birds abandoned Pelican Island in the mid-1920s. Paul Kroegel, the Refuge Manager, discovered that the birds had moved to an island in Mosquito Lagoon. In 1928 that island was designated as the North Brevard National Wildlife Refuge. The birds eventually returned to Pelican Island, but the designation as a refuge remained. From 1930 to the end of 1950 Merritt Island was devoted primarily to cattle grazing, citrus harvesting, and hunting leases. Several small residential communities were becoming better established, but the ever present salt marsh mosquito remained a factor, limiting large scale residential land use on Merritt Island.

Across the Banana River on Cape Canaveral was the site where America began its exploration of space. The early focus of these launch operations was at the Cape, but by the end of the 1950s it became evident that additional lands were needed for the future of the space program. In the late 1950s and early 1960s NASA acquired 83,894 acres of land in fee simple title and acquired another 22,600 acres of submerged land from the State of Florida. The property cost was $72,872,000. During the acquisition stage, NASA approached the Service to include the lands of the North Brevard NWR into the Kennedy Space Center. A local naturalist and photographer by the name of Allan Cruickshank and others lobbied NASA to preserve some of the area for its wildlife values. NASA was under intense pressure from the citrus industry and others to retain some of the established uses of the Space Center and viewed the establishment of the refuge as a means to appease these interests.

In 1962, the John F. Kennedy Space Center was established. On August 28, 1963, NASA entered into an agreement with the U.S. Fish and Wildlife Service to manage a portion of the Space Center as a refuge and Merritt Island National Wildlife Refuge was established. The original refuge was 25,300 acres and included the marshes outside of Titusville north and south of SR 402 and SR 406. In subsequent years, additional lands were turned over to the refuge, including management of about 2,500 acres of orange groves. In 1975, Congress established

Canaveral National Seashore (Seashore), which withdrew a portion of the refuge and turned it over to the National Park Service. A joint refuge/Seashore area was established in Mosquito Lagoon where duties and responsibilities were divided, but the refuge retained management of wildlife and most public use activities, including hunting and fishing. Today most of NASA's lands at KSC are managed by the Department of Interior as a National Seashore and National Wildlife Refuge. NASA has retained title to the property and the agreement allows NASA to withdraw lands required for Space related purposes. Today the refuge manages over 136,000 acres of NASA lands with responsibilities for an additional 4,415 acres of lands and waters at KSC. And the refuge owns and manages an additional 926 acres of land along the headwaters of the Indian River Lagoon in the Turnbull Creek area that the refuge began acquiring in 1995 in fee title, as well as 321 acres under agreements with the State of Florida.

Up through the 1970s the refuge operated a small visitor contact point in a converted residential home. Commitments had been made by the Service to Allen Cruickshank that when a Visitor Center was established, it would named in his honor. However, on June 8, 1981 two refuge fire fighters tragically lost their lives fighting a wildfire. During the ensuring Congressional investigation the Service was criticized for not providing adequate training and equipment or participating in the National Interagency Fire Program. Following the deaths at Merritt Island Refuge and another fire-related fatality at Okeefenokee Refuge in 1979, the Service took steps to bring the fire program into national compliance with the other land management agencies. The same investigation uncovered a need for visitor facilities, and in 1983 Congress funded construction of the Scott Maness and Beau Sauselein Visitor Center, named for the two firefighters who lost their lives at Merritt Island Refuge. Having ignored the previous commitment to Allen Cruickshank, the refuge worked with the wife of the deceased ornithologist to recognize Cruickshank's contributions to the refuge. It was settled that a new walking trail would be named in his honor and some of his wildlife photographs would be hung in the new Visitor Center. In 1984, the Cruickshank Trail was dedicated.

3. EXISTING VISITOR SERVICES

The refuge has a well developed Visitor Services Program, which promotes the Big Six Priority Public Use activities. Existing facilities include those listed.

- Beau Sauselein/Scott Maness Visitor Center
- Black Point Wildlife Drive
- Allen Cruickshank Memorial Trail and Observation Tower
- Oak Hammock Trail
- Palm Hammock Trail
- Scrub Ridge Trail
- Visitor Center Trail
- Information Kiosk on SR 402 and Observation Tower
- Sendler Educational Outpost and Restrooms
- Manatee Observation Deck
- BioLab Boat Ramp
- Bair's Cove Boat Ramp
- Beacon 42 Boat Ramp
- WSEG Boat Ramp
- Kennedy Space Center Exhibit (with Canaveral National Seashore)

Two full time refuge rangers are assigned to work in the Visitor Services Program. Their main duties include running the Visitor Center; managing and training volunteers; planning, conducting and training others to provide interpretive programs; develop interpretive materials and brochures; planning, conducting, coordinating, and training others to provide environmental education programs; writing news releases; planning, coordinating, and conducting special events; running the sales area; working with the refuge's cooperating association, the Merritt Island Wildlife Association; leading tours; planning new public use facilities; scheduling maintenance of public use facilities; managing the waterfowl quota hunt program; managing the sports and commercial fishing program; issuing public use special use permits; conducting off-site outreach programs; and managing and directing the refuge's law enforcement program.

The Visitor Services Program relies heavily upon volunteers to assist in manning the Visitor Center; orienting visitors to the refuge; operating the sales register; showing the refuge movie; conducting interpretive programs; conducting environmental education programs; helping with special events; and supporting the maintenance workers with trail maintenance, gardening, carpentry, and other duties. In 2003 75 refuge volunteers contributed 5,682 hours to the Visitor Services Program, which adds up to 2.73 man-years of service.

MIWA, the Refuge's support organization has a membership of over 1,100 and runs the sales outlet in the Visitor Center. In 2004, MIWA conducted over $160,000 in sales. MIWA employs one full-time business manager and three part-time sales workers. In addition to running the sales outlet, MIWA employees perform many of the duties of volunteers in supporting operation of the Visitor Center, providing visitor information and orientation, starting the movie, and supporting the refuge.

IV. Goals and Objectives

1. WELCOME AND ORIENT VISITORS

GOAL 1: VISITORS WILL FEEL WELCOME AND FIND ACCURATE, TIMELY, AND APPROPRIATE ORIENTATION MATERIAL AND INFORMATION ON VISITOR FACILITIES, PROGRAMS, AND MANAGEMENT ACTIVITIES.

1.a. Information

Objective 1.a(1): Within two years of plan approval, at least 75% of sampled adult visitors who stop at the Visitor Center or entrance kiosks will find appropriate and sufficient information to guide themselves to refuge facilities as determined by regular sampling.

Objective 1.a(2): Within two years of plan approval, at least 75% of sampled adult visitors who stop at the Visitor Center will indicate, through regular sampling, that they received the information they needed and were treated in a courteous and friendly manner.

Objective 1.a(3): Within five years of plan approval, at least 25% of adult visitors who stop at Kennedy Space Center's Visitor Center will indicate through regular sampling that they received information about the refuge and could find refuge facilities.

Strategies:

- With plan approval, develop and deliver customer service training to all volunteers who work the information desk.
- Within two years of plan approval, update exhibits in the Visitor Center, make improvements at the SR 402 entrance kiosk, add one new kiosk at the north entrance on SR 3, and provide after hour information outside the gate at the Visitor Center.
- Within two years of plan approval, develop a survey to test visitors' abilities to find key refuge facilities and sample visitor satisfaction.
- By 2010, develop a new information kiosk and wildlife viewing area on SR 405 to contact KSC's visitors who go to the Visitor Complex at the Kennedy Space Center.
- Seek funding to expand the Visitor Center parking lot from 20 to 40 spaces.
- Regularly update the refuge's website to keep welcome and orientation information current.
- Develop a refuge training and information link at KSC's Visitor Center.

Current Program

a. Primary Contact Points

The primary point of contact for information and orientation is the Visitor Center. The Visitor Center is open seven days per week during the high season (November to March) and is closed on Sundays from April to October. Most first-time visitors stop at the Visitor Center to obtain information and orientation to refuge facilities. In addition to staff, the refuge has trained volunteers and MIWA employees to welcome all visitors in a warm and friendly manner and to patiently answer questions. Oftentimes, this is the only personal contact visitors have and the impression they form may well be influenced by how they are treated, the accuracy of the information, and courtesy and friendliness of the person with whom they speak. Customer service is stressed as a high priority to all volunteers, MIWA employees, and refuge staff.

To reinforce this point, customer service training is included during a volunteer's initial orientation training and reinforced during annual refresher training. On a daily basis, volunteers are under close supervision and are monitored to insure they greet all visitors in a friendly manner and provide clear and accurate information.

The primary printed handout is an 11-inch by 17-inch tear map. The tear map provides visitors with basic orientation information needed to find major facilities and general information on the refuge. In addition, visitors are provided with the general brochures, bird check list, Wildlife Drive leaflet, hunting and fishing information, and other printed material relative to their interests and needs or purposes of visits. The Visitor Center also provides exhibits, an orientation video, a sales area, drinking water, and restrooms. Outside of the Visitor Center is a half-mile interpretive boardwalk, a Great Florida Birding Trail Kiosk, trash cans, and picnic tables.

Proposed Change

The 20-year old exhibits in the Visitor Center are being replaced. The refuge also plans to expand the 20-car parking lot to 40 cars. The lot is currently beyond capacity most days during the high season (November to March) and visitors must park on the road shoulder and walk down the road to the Visitor Center, which presents a safety hazard.

Monitoring and Evaluation

Adult visitors would be sampled after leaving the Visitor Center to determine how they were treated and the effectiveness in orienting to key facilities.

b. Secondary Contact Points

Current Program

The refuge would continue to use unmanned kiosks at all major entrances to provide information for visitors. The primary information kiosk for both the Seashore and refuge is located at the SR 402 entrance. It provides an orientation map, general refuge/Seashore information and most refuge leaflets (e.g., general leaflet, bird check list, fishing regulations, and seasonal hunting regulations). The site also serves as NASA's expanded security perimeter post during the countdown period preceding Space Shuttle launches and landings.

Proposed Change

To improve the aesthetics of the site, NASA has agreed to replace the permanent guard post with a mobile guard station that would be moved in when the Security Area is expanded. NASA has also agreed to move a large sign that blocks the view of the kiosk. These two changes would help reduce congestion, improve the visibility of the kiosk, and address some aesthetic concerns. By 2006, the refuge would replace the old kiosk, develop new signage, move the refuge's entrance sign, and make parking improvements at this site.

To improve service, several additional kiosks are planned at other locations. By 2006, a new kiosk would be constructed on SR 3 near the intersection of US 1 at the northern entrance. The kiosk would provide an orientation map and general refuge information for visitors entering from the north. A third information kiosk is planned for SR 405 that targets visitors exiting KSC's

Visitor Center. The kiosk is part of a larger wildlife observation facility located at the south end of Moore Creek. This would be included as a Refuge Operation Needs System (RONS) project.

c. After Hour Information

Current Condition

The gate to the Visitor Center closes at 4:30 p.m. during the week and at 5:00 p.m. on weekends. Visitors who arrive after hours currently need to return to the Entrance Kiosk to obtain orientation information or brochures.

Proposed Change

A small after hour information kiosk would be installed outside the Visitor Center's gate.

Monitoring and Evaluation

As improvements are completed, surveys would be developed to determine the visitors' abilities to find information and orient themselves to their desired destinations.

2. PROVIDE HIGH QUALITY HUNTING OPPORTUNITIES

GOAL 2: HUNTERS WILL ENJOY QUALITY HUNTING EXPERIENCES THAT LEAD TO SUPPORT FOR REFUGE MANAGEMENT.

2.a. Waterfowl Hunting

Objective 2.a(1) : At least 75% of the sampled waterfowl hunters who go through the waterfowl check station annually will understand and support refuge wetland management and waterfowl hunting programs.

Objective 2.a(2): Through annual critiques of the waterfowl hunting program, improvements will be made where waterfowl hunters will have minimal conflicts with other visitors, experience no hunting-related safety incidents, experience hunter densities not exceeding one party per 40 acres, and regularly have the opportunity to see and harvest waterfowl.

Strategies:

- Structure the quota hunt program to encourage more youth hunting.
- Change the fee structure to eliminate the $12.50 fee for weekend quota hunt permits and charge a fee of $15.00 for both Saturday and Sunday quota permits.
- Open the newly acquired marshes in the Turnbull area to waterfowl hunting.
- Enhance the handicapped hunt program by developing portable blinds and designating an area for this special group of hunters.
- To reduce waterfowl disturbance, consider limiting pre-hunt scouting to the day before and the day of the hunt.

Current Program

Waterfowl hunting currently is the only hunting opportunity available to the public. Waterfowl hunting has a long tradition at Merritt Island Refuge and has been permitted since 1964. Even

before the refuge was established, the Canaveral Shooting Club and the Indian River Club had most of the wetlands and marshes of the refuge tied up in hunt leases. This was a positive factor when NASA began acquiring lands, as large blocks were undeveloped and were under fewer owners. During the negotiations for land purchases, NASA made commitments to retain hunting and the original interagency agreement between NASA and the refuge made provisions to continue this use.

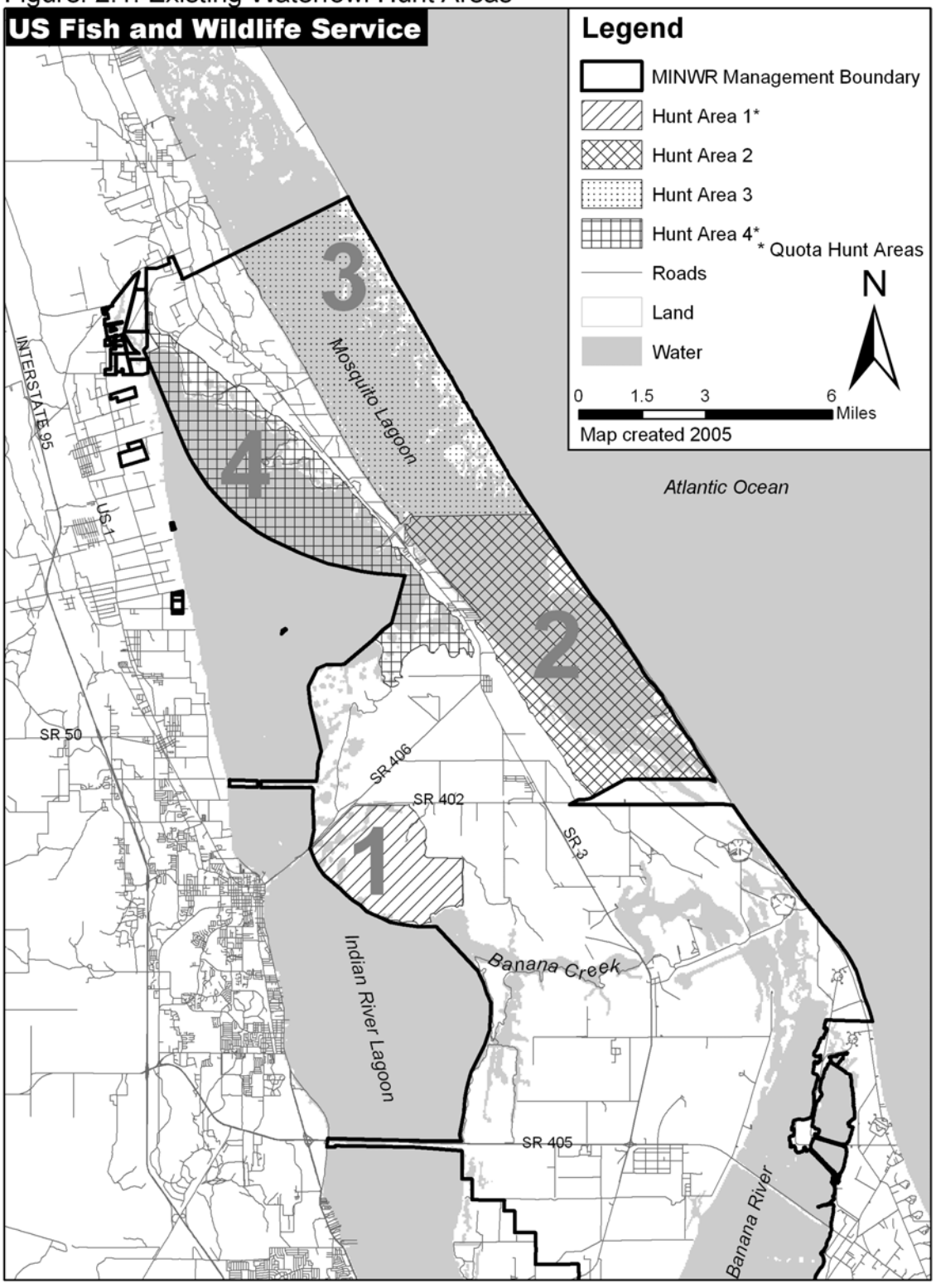
Over the years the waterfowl hunt program has evolved. Currently, waterfowl hunting is allowed on approximately 36,000 acres of the refuge. Half-day hunts are allowed on Wednesdays, Saturdays, Sundays, and designated federal holidays during the State Waterfowl Season. Quota permits are required in half of the hunt areas during the months of November and December. The quota system was implemented to improve the quality of the hunt and feedback from hunters indicate they are satisfied with the system. Quotas are based on one hunting party per 40 acres of available habitat. See Figure 2.1 for the existing waterfowl hunt areas.

The number of waterfowl hunters has remained relatively constant over the years, but since 2000 the numbers have been decreasing. The downward trend in waterfowl hunting relates to two factors. First, in 2000 the refuge implemented a Quota Hunt Permit System, allowing fewer hunters to the refuge. Second, national trends show a decline in the number of waterfowl hunters. If this trend continues, the acreage devoted to waterfowl hunting is adequate to meet future demands. Over the last five years, the mean number of waterfowl hunters per year was 3,418. In 2005, an estimated 4,372 waterfowl hunters used the refuge.

Hunting, more than other public use programs, must be carefully integrated with other visitor programs and activities. The strategy is to clearly mark all hunting areas with signs and separate waterfowl hunting from other public areas by providing closed hunting zones around the perimeter and along highway corridors of the hunting areas. This provides advance notice to non hunters and a safety zone for the public. The closed areas also provide a sanctuary for waterfowl. The refuge allows waterfowl hunting between 25 and 30 days per year. Because of the limited number of days the refuge is open to hunting and the relatively small number of hunters, few conflicts exist between waterfowl hunting and other visitor programs and activities.

The quality of the waterfowl hunting experience is pegged to success of hunters, density of hunters, the lack of negative interactions between hunters, and safety of hunters. In 2000, the refuge implemented quota waterfowl hunts in hunt areas 1 and 4, leaving hunt areas 2 and 3 under a General Hunt Permit (where no fee is required and where hunter numbers are not restricted). In establishing hunter densities for the quota hunt areas, the refuge used the standard of one hunting party per 40 acres. Regarding hunter success, historic data shows that waterfowl hunters average 2 ducks per hunter. The refuge uses this as a benchmark to gauge hunter success. The refuge would continually monitor the quality of the hunters' experiences, as well as safety and, if either diminish, quota permits would be issued in the non-quota areas. Another tool the refuge would use to address problems and maintain the quality of the waterfowl hunt is updating the refuge hunt regulations. Over the past forty years, Merritt Island's hunt regulations have evolved and numerous changes have been made. This is an effective and efficient means to address changing conditions and would continue as a tool to manage the waterfowl hunting program.

Figure. 2.1. Existing Waterfowl Hunt Areas



Proposed Change

Several changes are planned for the waterfowl hunt program. The first is to structure the quota system to encourage more hunting by youth (i.e., younger than 18). To accomplish this, a subset of the quota permits would be set aside for adult/youth hunts.

For example, during the week of Christmas,15% of the permits would be available for adults who hunt with youth hunters. A provision would be made that if the adult/youth permits do not sell, then they would be converted to a normal quota permit and sold as a left-over permit.

Another change in the quota permit would be to change the fee structure. Currently all permits are priced at $12.50, whether it is a one- or two-day permit. Starting in 2006, the permits would be priced at $15.00 per day to be consistent with Regional Policy. Provisions would be made so hunters can still obtain a two-day permit for a weekend hunt, but they would be charged at a rate of $15.00 per day.

Another change concerns redrawing the boundary of the hunt areas. Since the mid 1990s the refuge has acquired 926 acres near the headwaters of the Indian River Lagoon adjacent to Hunt Area 4. Some of this acreage is marsh and is suitable for waterfowl hunting. Waterfowl hunting occurred in the Turnbull Creek area prior to acquistion and the refuge would amend the Hunt Plan to incorporate the huntable acreage into the hunt area. The Turnbull area is not impounded, so it would not fall into the current quota program, but other refuge regulations would apply. See Figure 2.2 for the proposed hunt areas.

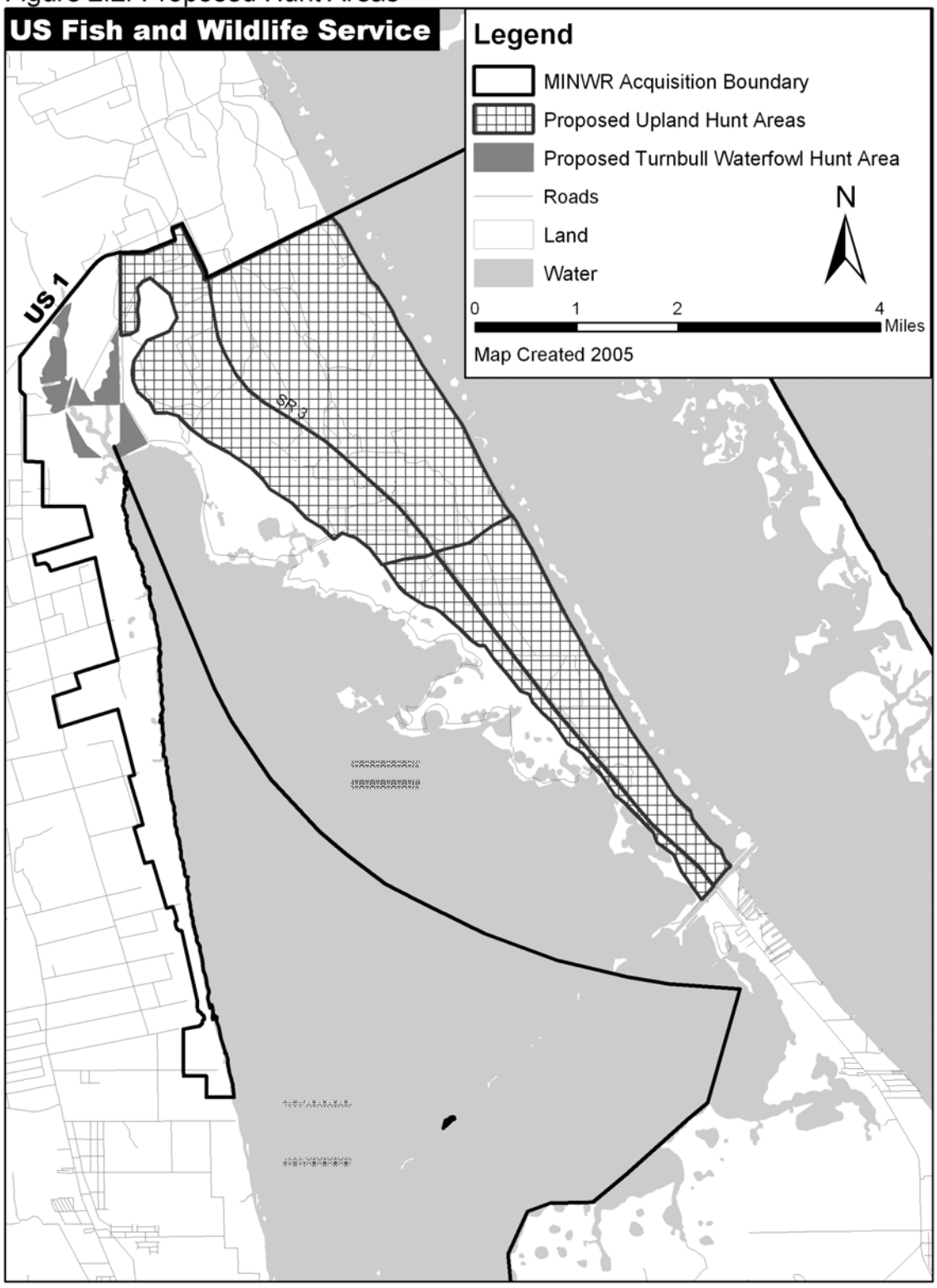
Pre-hunt scouting is an important aspect of waterfowl hunting, but it can also lead to disturbance of waterfowl, causing birds to leave an area. Pre-hunt scouting would be monitored and the refuge would have the latitude to restrict scouting to specific times, such as the day before and day of the hunt.

Finally, to make waterfowl hunting more accessible, provisions would be made to accommodate handicapped hunters. If demand exists, hunting would be allowed from a dike in one of the hunt areas and the refuge would provide portable blinds. Input would be solicited from handicap organizations and others that have experience with handicapped hunters. The program would be evaluated and, if demand warrants, the program would be expanded.

Monitoring and Evaluation

Hunter check stations are currently used on 20 percent of hunt days to collect data on the hunt success, hunter densities, safety incidence, and negative interactions between hunt parties This monitoring program would continue. These data, combined with other sources hunters use to communicate to the refuge, such as letters and phone calls, would be used to monitor the quality of the hunt program. If hunter densities rise above the threshold of one party per 40 acres, if hunt success decreases below an average of 2 birds per person per day for a hunt area (and this trend does not relate to large flyway problems or other factors outside of the refuge's control), or if safety issues and hunter complaints become a problem, the quota permit system can be expanded or modified.

Figure 2.2. Proposed Hunt Areas



2.b. Upland Game Hunting

Objective 2.b(1): Within two years of plan approval, the refuge will work with the Florida Fish and Wildlife Conservation Commission to develop a deer and feral hog hunt program.

Objective 2.b(2): At least 75% of the sampled upland hunters who go through the upland hunt check station annually will understand and support the refuge's fire, forestry, and upland game hunting programs.

Objective 2.b(3): Annually, deer and feral hog hunters will have minimal conflicts with other visitors, will have no hunting-related safety incidents, will average hunter densities not exceeding one hunting party per 100 acres, and will have an opportunity to see and harvest deer and feral hogs.

Current Program

None

Proposed Change

There has always been a demand for upland game hunting, but opening the refuge to upland hunting has been resisted by the refuge because of the low white-tailed deer population and contractual agreements with trappers to remove feral hogs. In recent years several changes have occurred that now makes upland hunting feasible. First, because of a more aggressive prescribed fire program, deer habitat has improved and population numbers are now high enough to sustain hunting. Second, changes have been made in the new feral hog removal contract which would allow for public hunting. The goal of the refuge is to eliminate all feral animals, including hogs, and hunting could help achieve this goal.

By 2006, the refuge plans to implement a quota hunt on cooperation with the Florida Fish and Wildlife Conservation Commission (FWC) in the area north of Haulover Canal for white-tailed deer and feral hogs. The methods under consideration include primitive weapons, archery, and guns. The length and timing of the hunt, number of quota permits issued, and other issues would be detailed in the Upland Hunt Plan when the plan is developed. The goal is to have a limited opportunity hunt for deer based on the population and a more liberal hunt for feral hogs where hog populations may be reduced. See Figure 2.2 for the proposed hunt areas.

Monitoring and Evaluation

Check Stations would be established to monitor the quality of the upland game hunting program. Details of the monitoring program would be discussed in the Hunt Plan when it is developed but would be based on hunter success, hunter densities, safety and negative interactions between hunt parties.

2.c. Alligator Hunting

Objective 2.c(1): Within the 15-year life of this plan, evaluate the feasibility of developing a limited alligator hunt program in cooperation with the Florida Fish and Wildlife Conservation Commission.

Current Program

None

Proposed Change

The Florida Fish and Wildlife Conservation Commission provides special opportunity hunts for alligators in designated areas of the state. The Commission has requested consider offering a special alligator hunt within the refuge under the state system. The refuge would evaluate the request and balance it within the context of other public programs.

Monitoring and Evaluation

A Hunt Plan must be developed and a monitoring program would be detailed the Plan when and if the program is established.

3. PROVIDE HIGH QUALITY FISHING OPPORTUNITIES

GOAL 3: MEMBERS OF THE FISHING PUBLIC WILL ENJOY THEIR FISHING EXPERIENCES, DISPLAY ETHICAL BEHAVIOR, AND SUPPORT REFUGE MANAGEMENT.

3.a. Estuarine Flats Fishing
Objective 3.a(1): Within five years of plan approval, a quality flats fishing program will be developed that is supported by at least 75% of the regularly sampled fishing public, allows users to see and harvest fish, and ensures that minimal conflicts occur between fishermen or with other users of the lagoon system.

Strategies:
- Implement a Pole and Troll Zone in two locations of Mosquito Lagoon: around Tiger Shoals and near WSEG boat ramp.
- Evaluate the success of the Pole Troll Zone concept within five years of implementation to determine if it is having the desired results of reducing habitat impacts and improving the quality of fishing.
- Hire one additional Law Enforcement Officer to achieve better compliance of refuge fishing regulations.
- Work with the partners in developing signs and messages to educate boaters of Lagoon issues and place signs at all refuge ramps.
- Work with the organizers of fishing tournaments to reduce conflicts and insure that tournaments do not originate on the refuge.
- Use prop scars as one means to measure fishing impacts in Lagoon waters.
- Use boat ramp and aerial surveys to collect data on fisherman densities.
- Use boat ramps surveys to collect data on fishing success and the quality of the fishing experience.
- Within15 years of plan approval, determine the carrying capacity of Mosquito Lagoon for fishing.

Current Program

Most Lagoon waters of the refuge are open to fishing during daylight hours. Night fishing is allowed from a boat in the open waters of the Indian River Lagoon, Mosquito Lagoon, Haulover

Canal, and Banana River with a self-issuing Refuge Sports Fishing Permit. See Figure 3.1 for the existing fishing areas and facilities. Five boat ramps provide access to Mosquito Lagoon and the Indian River Lagoon. Improvements were made to thee ramps in 2000 (i.e., BioLab, Beacon 42 and WSEG) and to Bair's Cove in 2004. Other than the boat ramp at KARS Park (open only to members of the Kennedy Athletic and Recreation Society), no public boat ramps provide direct access to the Banana River. As demand increases, overcrowding at the ramps is likely. On busy days a half-hour wait is common to launch at Bair's Cove and parking is limited. Over the life of this plan it is likely that additional boat ramp and parking improvements would be required.

With the exception of the Banana River, this demand would be handled by making improvements to the existing ramps, rather than adding new ramp locations.

Fishing is a classic example of the need to balance a priority public use activity with the refuge's wildlife objectives. Over the last 20 years, fishing has been the fastest growing public use category. Twenty years ago, about 25,000 fishermen a year used the Lagoon waters of the refuge for sports fishing. Today, some estimates show the number has increased to 151,000 annual fishermen. Over the last 10-years alone, fishing pressure has more than doubled. In 1991, the refuge conducted aerial surveys of the Lagoon twice a week to count fishing boats. In 1991 the average number of boats per survey was 46. In 2002 the aerial surveys was repeated and showed an average of 82 boats per survey. This count swelled to 253 boats on one weekend day during an October fishing tournament (see Figure 3.2). These aerial surveys are instantaneous counts and underestimate the actual number of fishermen, since the average number of fishermen is 2.2 people per boat and the average fishing trip lasts 5 hours and 18 minutes. The surveys were flown randomly throughout daylight hours and only took one hour to complete. Therefore, each survey could miss half or more of the daytime fishermen and all evening and after dark use. See Figure 3.3 for all boats observed during the one-hour overflights surveys in 2002.

The surveys provide long-term trend information and serve as an insight into current fishing patterns. The 2002 aerial survey revealed that the highest concentration of use occured in the shallow flats on the east and west side of the Lagoon and the majority of the fishing pressure is north of Haulover Canal. An analysis of survey data from the boat ramps indicated that the largest segment of fishermen (52%) travel 51-100 miles to fish the refuge and come from the rapidly expanding metropolitan area of Central Florida. This is followed by local residents (45%) from Brevard and Volusia Counties. In 2000 the population of the four county area surrounding the refuge stood at 2.2 million (U.S. Census Bureau 2000b). By 2015, the population growth in this area is expected to increase to 2.9 million residents (Lenze 2002). With this growth, it is expected that the demand for quality fishing opportunities would similarly increase.

The increase in fishing pressure has resulted in habitat impacts to Mosquito Lagoon. Aerial surveys of Mosquito Lagoon conducted by the refuge in 2004 revealed that virtually all shallow water grass flats are affected by prop scarring. The Florida Department of Environmental Protection (FDEP) also surveyed coastal waters throughout the state and used three classifications to categorize scarring intensity as slight, moderate, or severe. As early as 1993 FDEP revealed scarring on many flats in Mosquito Lagoon. The most recent survey in 1999 indicated the most severe scarring occurred in the northern portion of the Lagoon and around Tiger Shoals.

Figure 3.1. Existing Fishing Areas and Facilities

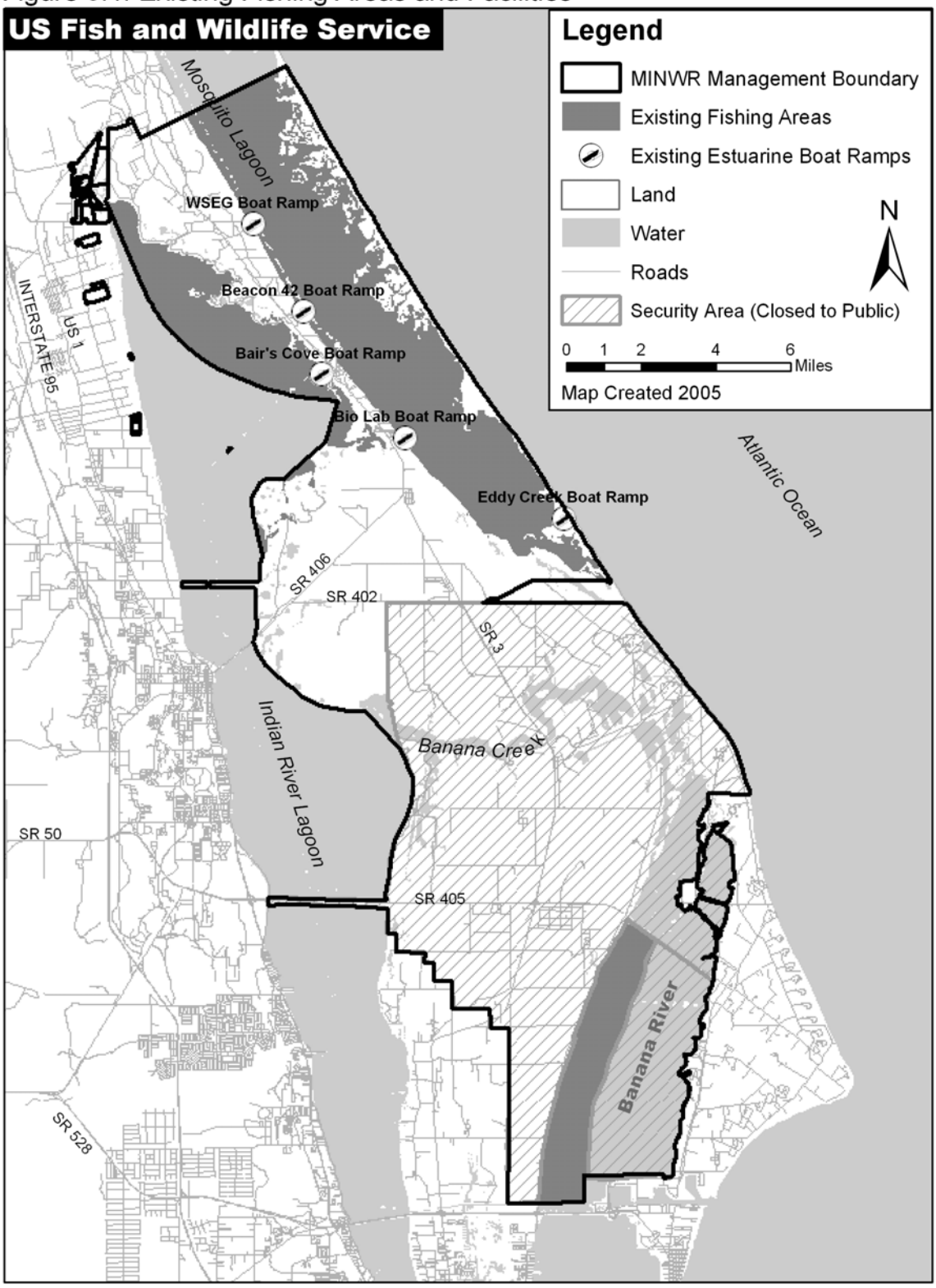


Figure 3.2. All Boats Observed in a 1-hour Overflight
during the Hunt for Reds Fishing Tournament in 2002

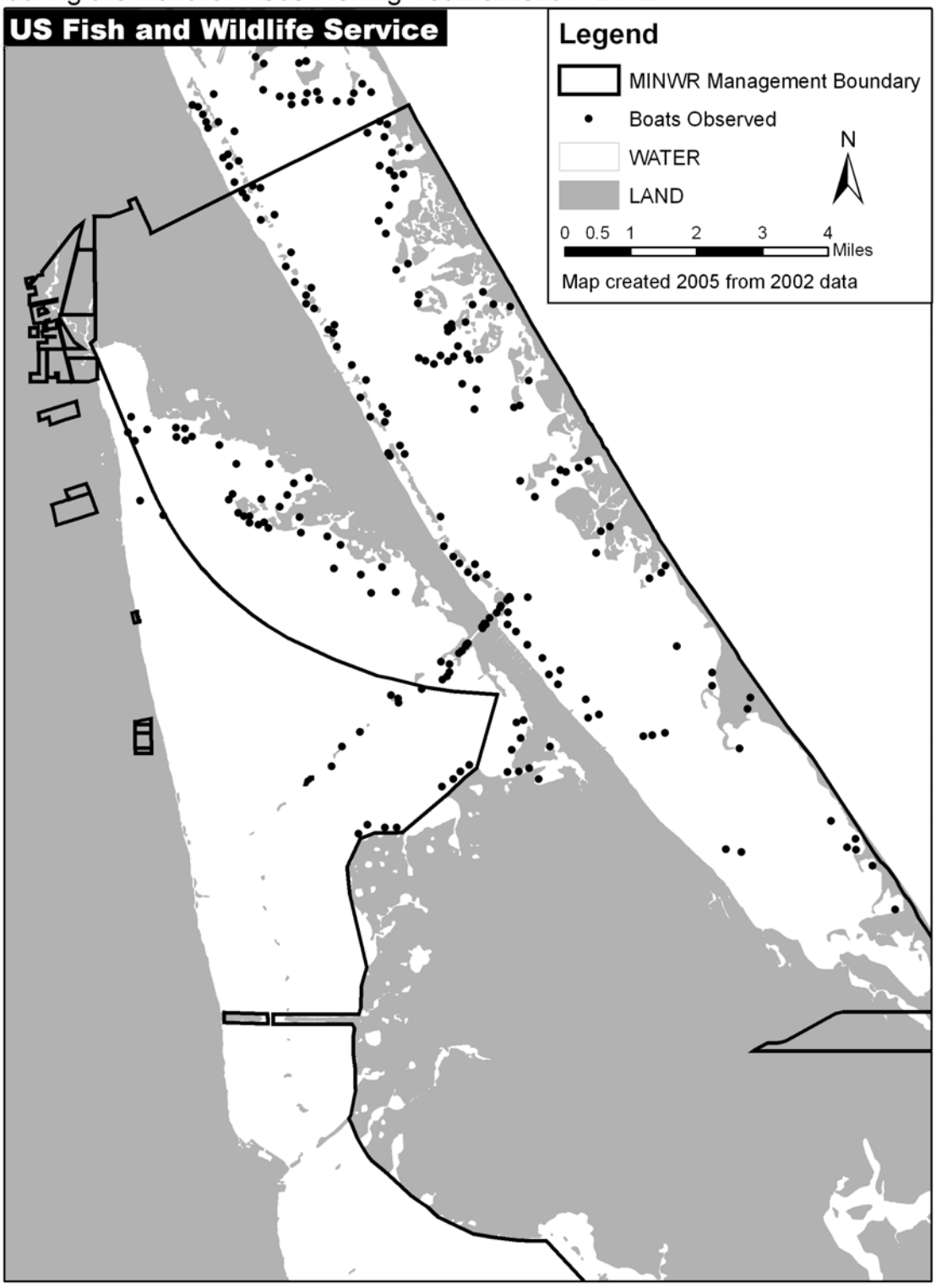
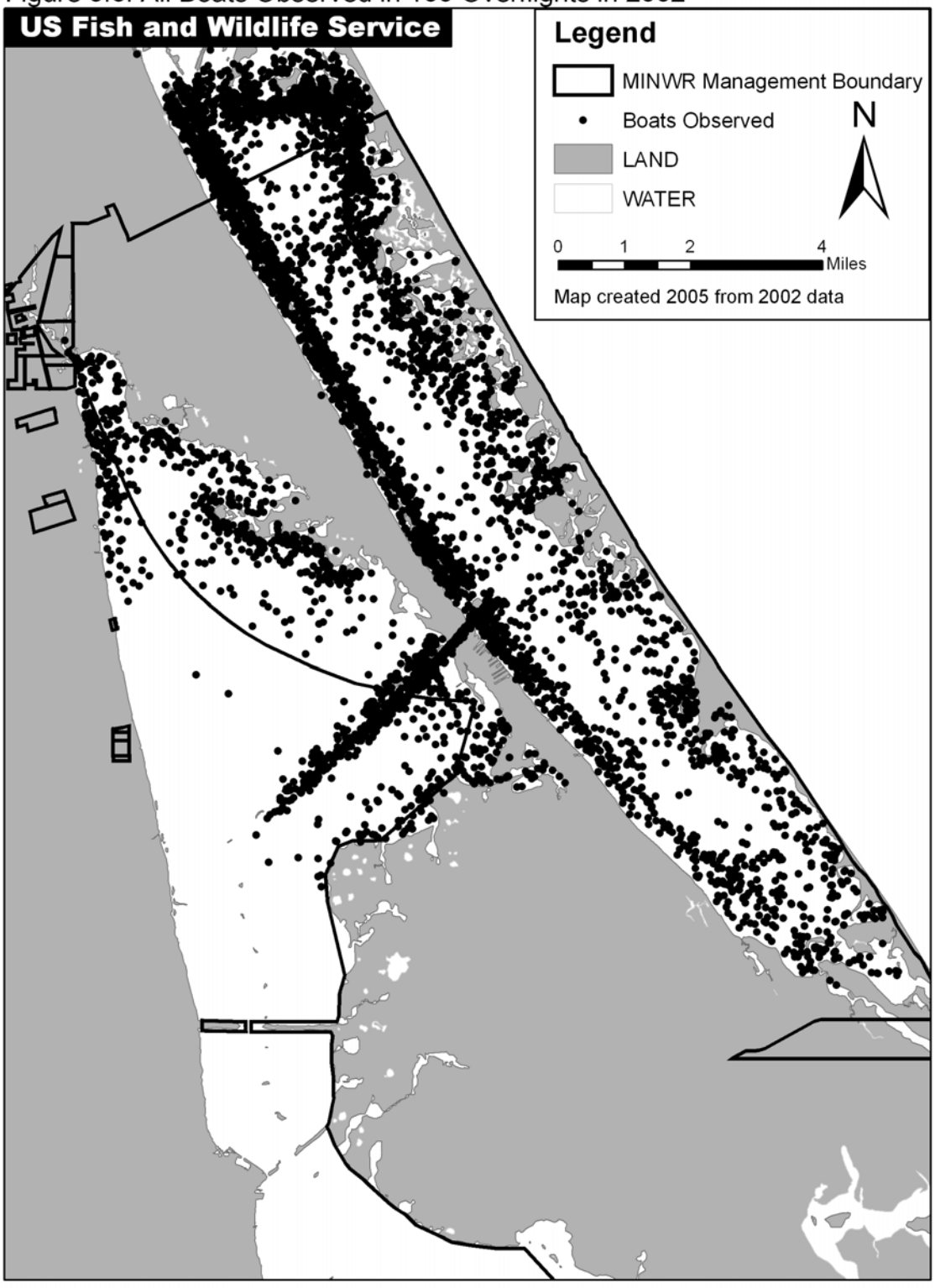


Figure 3.3. All Boats Observed in 100 Overflights in 2002



Seagrass beds can be scarred by many activities, but in Mosquito Lagoon most scarring is caused by small power boats operating on shallow flats. Prop scarring occurs when the propeller and lower unit of a power boat tears, cuts, and/or uproots a linear strip of submerged aquatic vegetation producing a long narrow furrow through the seagrass. These prop scars can take three to ten years to heal, depending upon their severity. Boats operating in some sections of the Lagoon have denuded virtually 100% of the seagrass beds.

FDEP suggest that scars result when:

- boaters misjudge water depth and accidentally scar seagrasses;
- boaters lack charts or knowledge of the local area and stray into shallow waters;
- boaters intentionally take a short cut through the shallow seagrass beds knowing that the seagrass beds are being damaged;
- boaters think the boat design would prevent damage to the seagrasses;
- boaters intentionally prop-dredge to create channels; and
- inexperienced boaters, ignorant of the value of seagrasses, ignore the damage (Sargent et al 1995).

Seagrasses are vital components of the lagoon ecosystem, providing food and shelter for most lagoon fishes and many other forms of marine life. A direct link exists between the health of the seagrass beds in the lagoon and the abundance of fish. Seagrasses are also an important food resource for many species of wildlife, including waterfowl. Many other wildlife species, such as wading birds, osprey, and bald eagle indirectly depend on seagrass as they feed on species that use seagrasses for cover. Seagrasses also release oxygen into the water. Protecting seagrass beds is linked to many of the wildlife resources of the Lagoon; therefore, protecting seagrass beds is an important priority for the refuge.

Other than the direct impacts to seagrasses, boating is linked with other wildlife disturbances. The speed and manner in which a boat approaches wildlife can influence wildlife responses. Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995; Rodgers and Schwikert 2002). Dahlgren and Korschgen (1992), categorized human activities in order of decreasing disturbance to waterfowl:

1) rapid overwater movement and loud noise (e.g., power-boating, and water skiing),
2) overwater movement with little noise (e.g., sailing, wind surfing, and canoeing),
3) little overwater movement or noise (e.g., wading and swimming), and
4) activities along shorelines (e.g., fishing, birdwatching, hiking, and traffic).

Jahn and Hunt (1964, as cited by Korschgen et al 1985) suggested that even the best habitats would be lightly used, if at all, by migrant ducks if human disturbance is excessive. Likewise, on numerous occasions Thornburg (1973) observed boaters causing mass flights of diving ducks on Keokuk Pool of the Mississippi River. He believed that increased hunting activity and boating could pose a serious threat to the continued use of the area by great numbers of migratory waterfowl. Thornburg concluded that eventually restrictions on boating activity may be necessary and that establishment of a sanctuary should be considered.

Studies conducted on the refuge show that increasing levels of boating activity are negatively impacting populations of waterfowl and other water birds. A study by Herring completed at Merritt Island in 2002 showed lesser scaup were changing their feeding habits from day to night, which was probably associated with the increases in boat activity (Herring 2003). Bird nesting on historic nesting islands has also declined. Bird Island, once a major colonial bird nesting island in

the Lagoon, is no longer an active rookery. Numerous studies demonstrate that nesting birds tolerate human activity at a distance, but when boats get too close the birds leave. A study of flushing distances for nesting birds in Florida recommends that a 100 meter setback be established around bird rookeries (Rodgers and Schwikert 2002; Rodgers and Smith 1997; Rodgers and Smith 1995).

Increasing use by fishermen may also result in a decline in the quality of the fishing experience. One example of this comes from the different fishing styles. Many flats fisherman pole or troll the flats with electric trolling motors while stalking schools of redfish. When they find a school, they quietly maneuver into casting range without spooking the school. The key to this style of fishing is having the skill to sight the school by identifying the tell-tale signs of schooling redfish and mastering a quiet approach to avoid spooking the fish. If fishermen are quiet and respectful of one another, it is not uncommon to see more than one boat fishing on the same school. Compare this style with another fishing technique known as bumping the school. This technique calls for a flats boat capable of running in shallow water of 18 inches or less. Fishermen would run the flats on a slow plane until they intersect a school of redfish. When they come on the school, the fish spook and move en masse. When startled, the water over the school humps up, marking the location of the school. Fisherman look for this tell tale bump in the water and shut off their motor. After the school settles down they begin poling to maneuver into casting position. Fishermen using the bumping technique often make numerous passes back and forth across a flat.

The two different fishing styles clash and result in conflicts and/or negative interactions between fishermen. The noise from the outboard motor and/or speed of the boat spook the fish in a radius of several hundred feet around the school and can affect other fishermen on the same flat. Conflict between the two groups result in harsh words and, occasionally, open threats. In most cases, these encounters occur with no interactions between fishermen, but a sense of frustration results from being disturbed and the fishing experience is diminished. The refuge staff sometimes hears of these interactions at the boat ramp or at the Visitor Center. Five public meetings were held in the spring and fall of 2004 to discuss the issue of flats fishing and an overwhelming number of participants supported efforts to protect the quality of flats fishing in the lagoon and efforts to regulate motorized use on selected flats.

Overcrowding of popular fishing locations is another result of increasing use. Aerial surveys indicate use is highest on weekends and holidays and lower on weekdays. When this data is displayed on a map, use patterns appear. The picture shows hot spots where fishing pressure is greatest. The survey showed use of the flats is highest in the northern part of the Lagoon near Tiger Shoals and west of the spoil islands west of Tiger Shoals. This was followed by the flats between Preachers and Pardon islands, the flats around Cucumber Island and Whales Tale, and most of the shallow flats north of Beacon 42 behind the spoil islands west of the Intracoastal Waterway (ICW). This data correlates with areas of the most severe prop scarring.

Fishing tournaments are another recent phenomenon in the Lagoon. Service policy on tournaments does not permit the refuge to sponsor, endorse, or permit fishing tournaments that originate in refuge waters. However, in Mosquito Lagoon, tournaments officials get around this policy by originating their tournament outside the refuge's boundary and having fishermen enter through Haulover Canal or from Oak Hill north of the refuge. Although no data on the number of tournaments that use Mosquito Lagoon exist, anecdotal evidence suggests that the number is increasing. Two well advertised tournaments are headquartered in Titusville each year. The Hunt For Reds in October drew over 1,300 fisherman in 2003. The second is the Redbone Fishing Tournament, which attracts over 200 professional fishermen from a broad geographic area. Outside of the highly advertised tournaments, other tournaments also exist. Often flyers appear on windshields of vehicles parked in the refuge's boat ramps announcing the dates and prizes of tournaments or fishermen would innocently stop at the Visitor Center to inquire of a tournament.

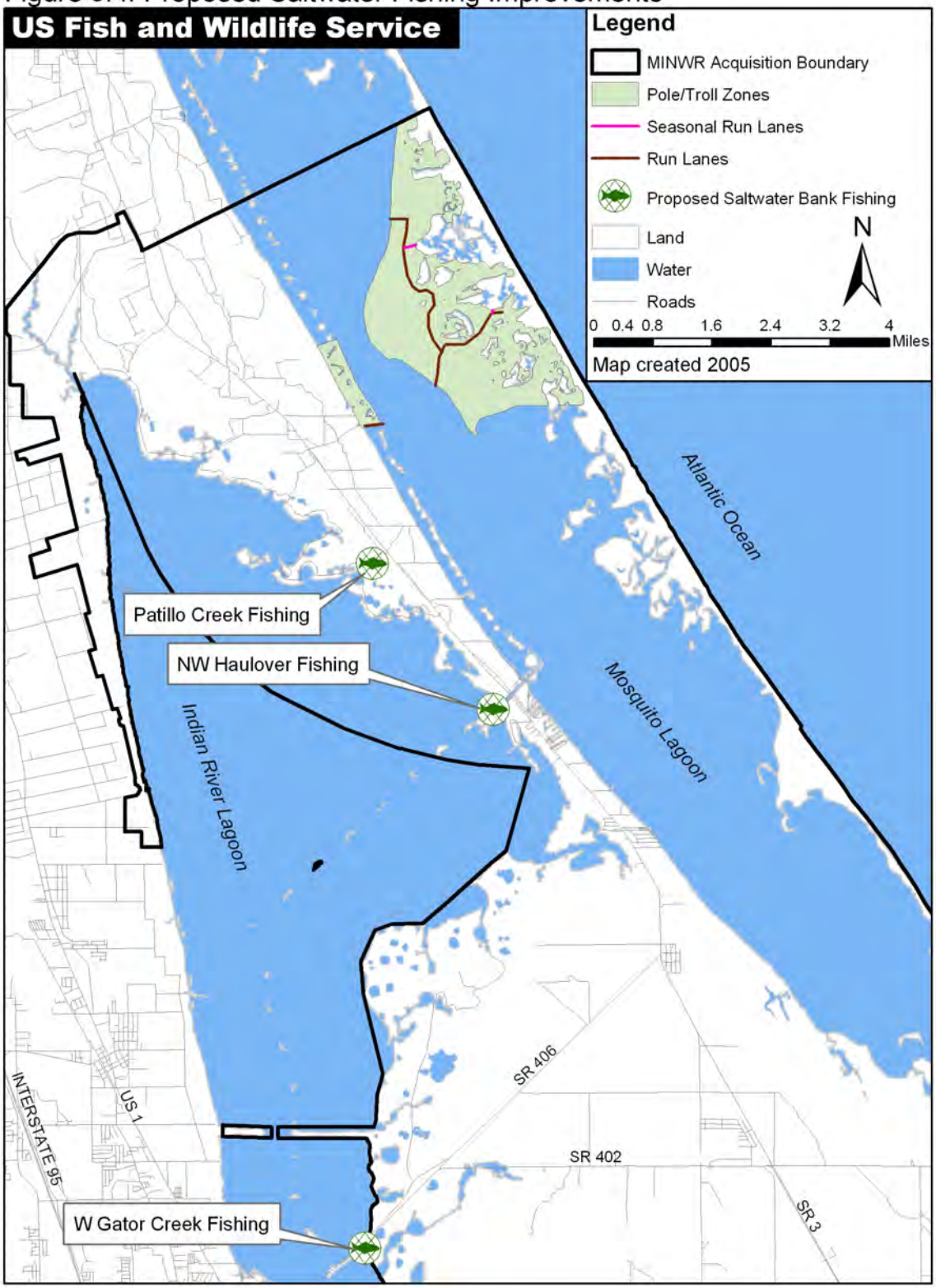
Tournament fishermen are motivated by cash or prizes and seem to exhibit less courteous fishing behavior than fishermen who fish for sport. The more aggressive style of tournament fishermen often clashes with the style of sportsmen, which further diminishes the quality of the fishing experience for the sportsmen.

In summary, flats fishing is the fastest growing public use activity with use tripling in the last 20 years. The increasing use is having impacts on seagrass beds and may be disturbing wildlife, while the different styles of fishing result in conflicts between user groups. Commercial guides and fishing tournaments are two relatively new uses in the Lagoon and each are increasing. Individually, each issue or use can diminish the quality of the sports fishing experience, but collectively the problem has reached a level such that it must be addressed. Providing a quality fishing experience and minimizing wildlife and/ habitat impacts are challenges the refuge must address through this plan.

Proposed Change

To maintain the quality of the fishing experience an experimental adaptive Pole and Troll Zone was established in a section of Mosquito Lagoon in 2005. The Zone would be voluntary the first year and become permanent the second year. To be in compliance, fishermen and other boaters entering the Zone would be required to shut off their internal combustion engines and operate by a non-motorized power source, such as drifting, push pole, or paddles. Electric trolling motors would be allowed. Where sufficient deep water exists to prevent prop scarring, channels would be posted to allow ingress and egress points through the zones with outboard motors. However, boats under power must remain within the designated channel while running. Boats drafting more than 12 inches at rest would not be permitted to enter the Zone. The experimental Zone would be established in a 2,949-acre flat know as Tiger Shoals near the north end of the Lagoon and a 194-acre flat area west of the spoil islands west of Tiger Shoals, near WSEG boat ramp (see Figure 3.4). Both of these areas are experiencing heavy fishing pressure and prop scarring.

Figure 3.4. Proposed Saltwater Fishing Improvements



Over several years the refuge would measure the quality of the fishing experience within the zones and compare it to the areas outside the zones to see if the objectives of improving the quality of fishing are being achieved. At the same time, the refuge would measure prop scarring to determine if the Zone is achieving the desired results of reducing prop scarring. If changes are required to meet fishing quality standards and prop scarring goals, adjustments within the Zone would be made. If the pole and troll zones prove to be successful, the zones may be expanded to other flats that are experiencing similar problems.

Over the life of the plan, the refuge intends to protect the wildlife resources in the Lagoon, while maintaining a quality fishing experience. The implementation of the Pole and Troll Zone is an adaptive management tool to address two measurable manifestations of increasing fishing pressure: an increase in prop scarring and a decline in the quality of fishing experience. One is physiological, while the other is sociological, but both can be measured to determine success. The refuge feels the Pole and Troll Zone may also benefit wildlife due to the anticipation of less wildlife disturbance. Although it would be hard to quantify, it is expected that populations of waterfowl and other water birds may improve as a result of less motorized boat use on the flats.

Within one year of plan approval, a web-based, self-study boating and fishing ethics course would be developed that would be a condition of the fishing permit. Hard copies of the course would be available for those without internet access. All fishermen must certify they have completed the course as a condition of the permit.

To enforce the Pole and Troll Zone, the Zone must be posted and additional law enforcement staff is needed. To generate additional revenues to pay for the improvements the refuge would implement a fee for the Sports Fishing Permit ($5/week or $20/year) within 2 years of plan approval. Funds generated by the permit would be used to support refuge management activities, including to post and maintain the Pole and Troll Zone, make improvements at boat ramps, surface access roads and parking areas, collect trash at boat ramps and other fishing locations, install solar lights at night launching locations, build restrooms at Bair's Cove, and help fund one additional law enforcement position.

Education is another important component of the plan. Within one year of plan approval, signs would be established at boat ramps to address prop scarring, boat-related wildlife impacts, fishing ethics, trash, and other subjects which affect the Lagoon.

To address the growing number of fishing tournaments, staff would take a more proactive approach in working with the organizers of fishing tournaments. The goal would be to reduce user conflicts and educate the organizations about the Service's policy regarding originating tournaments on the refuge, the implementation of the Pole and Troll Zone, and fishing ethics.

Monitoring and Evaluation

The refuge routinely counts vehicles at boat ramps to provides long-term trend and season data on fishermen. On several occasions the refuge has initiated aerial and boat ramp surveys to collect more specific data on fishing pressure and fishing success. Sampling would continue to gather data to evaluate the level of use and visitor satisfaction.

3.b. Estuary Bank Fishing

Objective 3.b(1): Within five years of plan approval, bank fishing improvements will be made at three locations, which will allow users of all abilities to enjoy saltwater fishing on the refuge.

Strategies:

- Enhance bank fishing by construction fishing platforms at Haulover Canal, Patillo Creek, and West Gator Creek.
- Install trash receptacles and monofilament line recycling stations at each improved bank fishing locations and other locations as needed.
- Coordinate with other partners (e.g., Florida Inland Navigation District, U.S. Army Corp of Engineers, and Brevard County) to fund the development of bank fishing enhancements.
- Coordinate with Brevard County for the development of a fishing platform near West Gator Creek on the Titusville Causeway.
- Close problem areas to fishing if littering continues in those areas.

Current Condition:

Currently bank fishing occurs from most dike roads accessible by car and at Haulover Canal, Patillo Creek. and numerous finger canals in the vicinity of Haulover Canal. This dispersed pattern of use is difficult to manage and contributes to one of the biggest problems, litter. A Refuge Fishing Permit is required and bank fishing is not permitted after dark when the refuge is closed.

Proposed Changes

To enhance bank fishing opportunities for all users, improvements would be made at three locations: along the northwest side of Haulover Canal, on Patillo Creek. and on West Gator Creek. At each location, a dock or other hard surface fishing platform would be constructed, along with signs, trash receptacles, and other improvements.

In general, bank fishermen at Merritt Island Refuge are chronic litters, impacting the appearance of the refuge. Bank fishing enhancements, such as installing trash receptacles in problem areas and implementing other items discussed under Goal 14 of this plan, would help address the litter problem.

Certain areas would be closed to sports fishing if the above strategies are not effective in resolving the litter problem. These areas include: the northeast corner of Haulover Canal, the maze of roads south of Haulover Canal, all side roads north of 406 to L Pond Road (except Pump House Road), and all the dead end roads east and west of SR 3 that connect to the Indian River Lagoon or Mosquito Lagoon. An alternative to closing the maze of roads south of Haulover Canal is to restrict vehicular access and open it only to pedestrian use.

3.c. Freshwater Fishing

Objective 3.c(1): Within five years of plan approval, enter into a partnership to enhance freshwater fishing opportunities, improving four freshwater ponds that will allow members of the fishing public to harvest fish and minimize conflicts with other users.

Strategies:

- Find partners to assist the refuge in evaluating and managing four ponds for freshwater fishing.
- Pond management by the partners would include ensuring trash cleanup, monitoring water quality, adding chemical supplements to achieve optimum water conditions for freshwater fish development, and maintaining access.
- The refuge would provide guidelines and technical assistance in managing the ponds.
- Provide law enforcement to monitor compliance with state regulations.
- Consider providing fish if stocking if necessary.

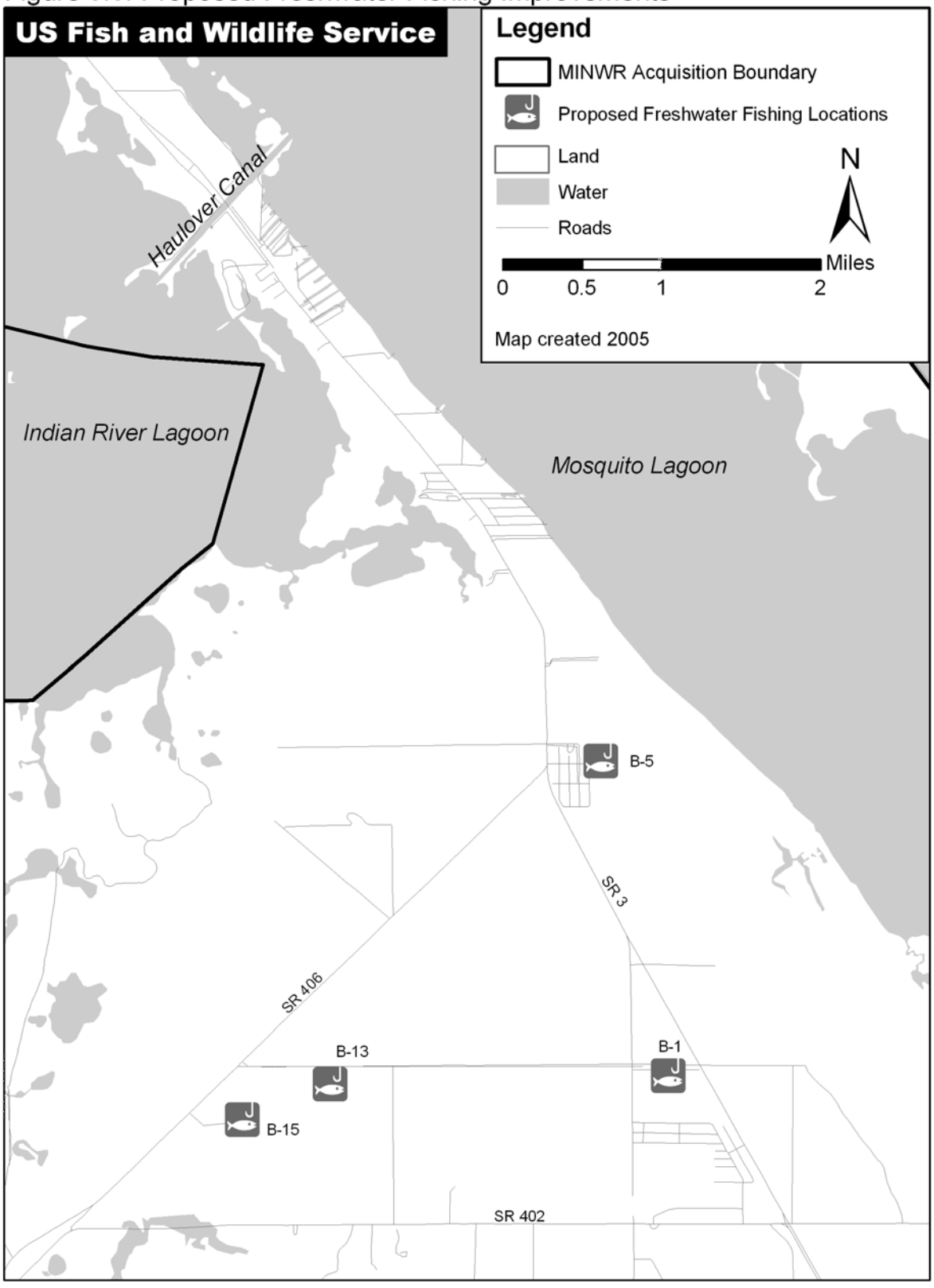
Current Program

Limited opportunities exist for freshwater fishing at Merritt Island. Several mosquito control impoundments, such as Peacocks Pocket and Gator Creek, may have salinities low enough to support freshwater fish, but these impoundments are periodically flooded with saltwater, which affects the freshwater fisheries. The only consistent sources of freshwater for fish are the 19 borrow pits, which are scattered around the refuge. These borrow pits were created when the network of roads were constructed and typically they have straight sides with sharp slopes and little cover for fish. Some are too deep to grow submerged aquatic grasses and some are so shallow they dry up during droughts. Some have good water quality and clarity and some have poor water quality. Most borrow pits are nutrient poor and need management (e.g., supplemental additions of nitrogen and phosphorus) to improve the fisheries. Surveys of the borrow pits were conducted to evaluate their potential for fishery management and only four were found suitable. They include B-1, a 3.7-acre pond on the east end of Center Road near SR 3; B-13, a 4.9-acre pond on the west end of Center Road near SR 406; B-15, a 12.3-acre pond on the south side of SR 406 near the entrance to Black Point Wildlife Drive; and B-5, a 0.7-acre pond east of SR 3 near the east end of SR 406.

Proposed Change

Each of the ponds needs some form of management to improve fishing opportunities and management plans have not been implemented due to budget and manpower shortages. Management of one or more of these ponds could be a project that a fishing club or service organization could take on with some guidance and oversight from the refuge. An effort would be made to seek one or more organizations to take on this challenge.

Figure 3.5. Proposed Freshwater Fishing Improvements



4. PROVIDE HIGH QUALITY WILDLIFE OBSERVATION AND PHOTOGRAPHY OPPORTUNITIES

GOAL 4: WILDLIFE OBSERVERS AND PHOTOGRAPHERS OF ALL ABILITIES WILL ENJOY AND VALUE THE DIVERSITY OF REFUGE WILDLIFE AND WILL SUPPORT EFFORTS TO MAINTAIN HIGH QUALITY WILDLIFE HABITAT.

4.a. Wildlife Viewing Improvements

Objective 4.a(1): To improve wildlife viewing on Black Point Wildlife Drive, within three years of plan approval, develop and maintain two 10-person wildlife viewing observation blinds with two spotting scopes and create needed vegetative buffers.

Objective 4.a(2): To improve accessibility, within 10 years of plan approval, develop and maintain ADA approved restrooms and a viewing tower on Black Point Wildlife Drive.

Strategies:

- Establish viewing blinds to reduce human impacts.
- Use or create vegetative screens to shield visitors from wildlife to reduce wildlife disturbance.
- Establish stay in your vehicle zones along Black Point Wildlife Drive.
- Hire one additional maintenance worker to care for the existing and planned wildlife viewing facilities.
- Include photography guidelines in updates to the Black Point Wildlife Drive publications and post signs to reinforce proper wildlife viewing etiquette.
- Establish a user fee for Black Point Wildlife Drive to help pay for improvements.
- Establish procedures to sell annual passes at the Visitor Center and daily passes through a self-serve pay station at the Black Point Wildlife Drive trailhead.
- Develop an active prioritized list of wildlife viewing enhancement projects.
- Identify partners agreeable to match refuge fee funds or contribute materials, labor, and/or services to help make needed wildlife viewing improvements.
- MIWA would work with partners to make wildlife viewing capital improvements including: funding the develop of two wildlife viewing blinds, expanding parking areas, acquiring two spotting scopes, funding ADA restrooms, and funding an ADA accessible tower.
- Work with MIWA in developing a partnership to landscape Black Point Wildlife Drive with native plants to attract songbirds and to help screen visitors from wildlife.
- Expand the existing parking lot at Cruickshank Trail and address the wetland impacts by removing an existing dike.

Current Program

Wildlife observation is the fastest growing outdoor recreational activity in the nation. In the past two decades, the U.S. Fish and Wildlife Service reports that track refuge visitation show that overall, wildlife viewers outnumber hunters and anglers many fold (U.S. Fish and Wildlife Service 1997). Wildlife viewers offer important opportunities to cultivate a conservation ethic and develop support for the Service; however, due to their shear numbers, some may also unintentionally place refuges in danger by “loving them to death” (DeLong 2002).

Wildlife viewing is one of the most popular activities on the refuge and in 2003, 206,987 visitors participated in this activity. To provide opportunities to see the widest variety of wildlife, a system of trails and viewing facilities have been established through the major habitats, except for the pine flatwoods habitat. The marshes of Merritt Island Refuge provide the best wildlife viewing locations and Black Point Wildlife Drive and the Allen D. Cruickshank Trails are the most popular wildlife viewing areas. In addition to the marshes, several other viewing locations have been established including the Manatee Observation Deck, Hammock trails, and Scrub Ridge Trail.

Black Point Wildlife Drive is the primary destination for most visitors and wildlife enthusiasts. Cruickshank Trail is located mid-way around the Drive, but the parking lot is operating near capacity during the busy season. The refuge is working with MIWA and other partners to fund improvements that would enhance wildlife viewing opportunities and reduce wildlife disturbances along Black Point Wildlife Drive. Funding is required for annual maintenance on the established trails and to make improvements.

Studies indicate that, with high levels of use, wildlife disturbance increases. At Ding Darling NWR, Klein (1993) tested waterbird behavior to five human disturbance treatments:

- driving by the birds;
- stopping the vehicle within sight of the bird and remaining in the vehicle;
- stopping the vehicle within sight of the bird and getting out of the vehicle to look at the bird;
- stopping the vehicle within sight of the bird, getting out, and slowly approaching the bird; and
- stopping the vehicle within sight of the bird, remaining in the vehicle, and playing a noise tape.

Klein (1993) found that out-of-vehicle activity is more disruptive than vehicle traffic followed by noise. Klein et al (1995) reported that half the waterbirds shifted away from the drive as visitation levels increased higher than 450 cars in 24 hours. Levels higher than 600 cars were even more disruptive. Klein recommended public education and changes in management to reduce disturbance. Photography from wildlife drives may be one of the more disruptive activities. Klein (1993) found that wildlife photographers at Ding Darling NWR along the Wildlife Drive were the most likely to stop, leave their vehicles, and approach wildlife and, therefore, were the most disruptive of all the visitor activities. Another study conducted by Pease, Rose, and Butler (2005) at Back Bay NWR looked at the effects of human disturbance on wintering ducks. The study compared responses of ducks to five different human activities (i.e., pedestrian, bicyclist, slow trucks, fast trucks, and trams). People walking and biking disturbed ducks more than vehicles (Pease et al 2005).

Proposed Change

To keep pace with the projected growth in visitation and to reduce wildlife disturbance, several improvements are planned on Black Point Wildlife Drive, including: establishment of stay in your vehicle zones, two new wildlife viewing blinds, additional viewing scopes, vegetative screening, parking improvements, developing an ADA accessible tower, and installing ADA restrooms and trash receptacles. The parking lot at Cruickshank Trail would be expanded to accommodate the new improvements. To

enhance viewing opportunities for song bird species and to help screen visitors from wildlife, native plants would be used to landscape the Drive. Landscaping would also be used to help screen individuals walking from their vehicles to the wildlife blinds.

To help provide a more consistent revenue source to fund wildlife viewing enhancements, a $20 annual fee or a $5.00 weekly fee would be charged visitors using Black Point Wildlife Drive. Establishing a refuge-wide entrance fee is not feasible; however, a fee to Black Point Wildlife Drive provides a feasible alternative. Eighty percent of the revenue generated from this fee can be retained by the refuge and directed to the Visitor Services Program. The fee for Black Point Wildlife Drive would be collected at the Visitor Center and at the trailhead and the pass would cover all occupants of the vehicle. The proposed fees are comparable to fees charged at other national wildlife refuges.

4.b. Other Viewing Enhancements

Objective 4.b(1): To enhance wildlife viewing and photography opportunities, by 2014, three new trails will be developed and one expanded, including: a connecting road between the Visitor Center and Black Point Wildlife Drive, Pine Flatwoods Trail, Huntington Road Trail, and an extension of the Visitor Center Trail.

Strategies:

- Expand parking at the Visitor Center from 20 to 40 cars.
- Improve an existing road north of the Visitor Center and Center Road to link the Visitor Center with Black Point Wildlife Drive.
- Shift the entrance to Black Point Wildlife Drive east about 1/10 mile to align with Center Road and address impacts by removing a dike road in the vicinity of Black Point Wildlife Drive.
- Reduce traffic speed in front of the Visitor Center, add striping, and implement other traffic calming improvements to address safety issues associated with the new connecting road to Black Point Wildlife Drive.
- Extend the Visitor Center Trail west to Gator Creek marsh and develop an elevated overlook.
- Develop an observation tower on Scrub Ridge Trail.
- Develop a trail in the pine flatwoods by developing a parking lot and signs off SR 3 that would tie into several fire lanes north of Haulover Canal.
- Develop an agreement with the Scottsmoor Homeowners' Association to develop a trail on the Huntington Road Tract in the Turnbull Creek area.

Current Program

Demand by wildlife viewing enthusiast to use the refuge is increasing and most current facilities are run down and are operating beyond their designed capacity. The Visitor Center parking lot is a good example. During the winter season on most days, visitors must park on the road shoulder and walk on the access road because the parking lot is full. Before some elements of this plan can be implemented, the capacity of the parking lot must be doubled. Black Point Wildlife Drive is also operating near its capacity on weekends during the high season; therefore, design changes are needed to spread out the use along the Drive or divert the use elsewhere. To a lesser extent, some refuge trails are experiencing crowded conditions during the winter season. Faced with a steady increase in visitation, the choice for the refuge is either expand the capacity of

the current facilities or develop additional wildlife viewing facilities at other locations. Several new hiking trails are being planned, along with some upgrades to the Wildlife Drive. The refuge is proceeding carefully with these plans to minimize wildlife disturbance and avoid conflicts with other refuge objectives.

Planned Changes

Several new trails or trail extensions are planned over the next 15 years in the listed locations (see Figure 4.1)

Black Point Wildlife Drive/Visitor Center Connecting Road

A new connecting road between the Visitor Center and Black Point is planned. This one-mile road, for all practical purposes, would become the new or alternate entrance to Black Point Wildlife Drive and would provide better connectivity between the Visitor Center and the Drive, reduce traffic on state roads 402 and 406, and provide access to upland habitats not found on the Drive. The route would utilize a portion of Center Road and a little used road south of Center Road that intersects SR 402 directly across from the Visitor Center. Center Road connects with SR 406 just east of the Black Point Wildlife Drive entrance; therefore, the Drive's entrance needs to be shifted eastward to align with Center Road. This would require some filling of wetlands. To address these impacts, one or more dikes would be removed and the wetlands restored.

Extension of Visitor Center Trail

Another enhancement over the next 10 to 15 years, is an extension of the Visitor Center Trail westward to an elevated overlook of East Gator Creek. This trail extension would require the construction of about one mile of boardwalk and would terminate at an elevated overlook on Gator Creek mash. This trail would provide better exposure to the diverse habitats of the refuge, but extend the time visitors stay at the Visitor Center and add to an existing parking problem. A prerequisite to the trail's development is expansion of the parking lot from 20 to 40 cars.

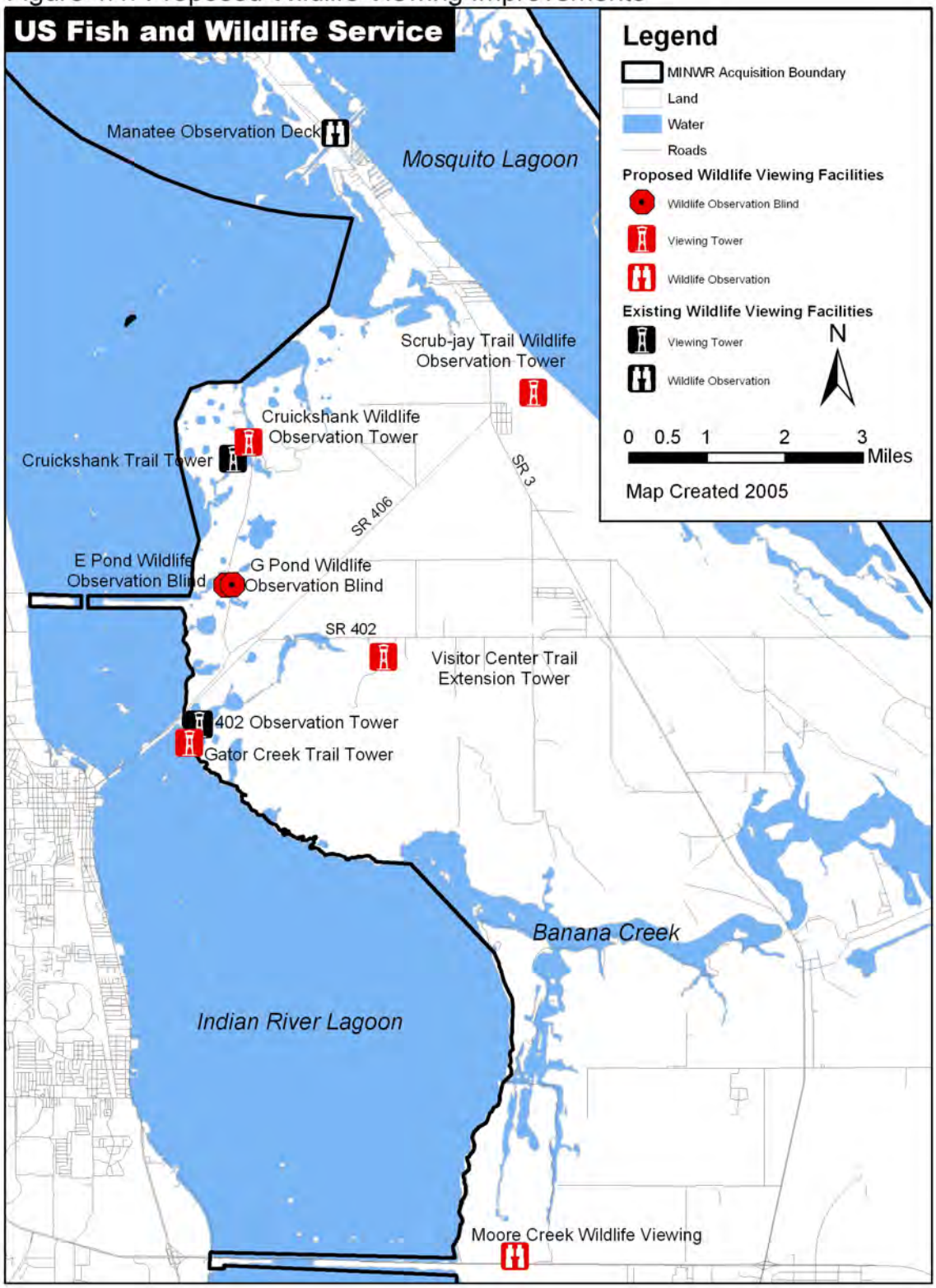
Pine Woodland Trail

Pine flatwoods make up a large portion of the refuge's uplands, but no trail has been established in this habitat. Over the next one to three years, a loop trail would be established off SR 3 using existing woodland roads/firebreaks in this habitat. The best example of this plant community is located north of Haulover Canal, outside the primary public use area. Use of the trail is expected to be light, with few planned improvements; therefore, sighting the trail in this location meets the criteria for facility development outside the Primary Public Use Zone outlined in Objective 7.b(1). The trail would afford a better opportunity to interpret the role fire plays in the management and the ecology of the southern pine forest. Since the trail would utilize existing fire breaks, other than developing a parking lot and acquiring signs, few improvements would be needed to establish this trail.

Scrub Ridge Tower

The Scrub Ridge Trail is located through scrub habitat and adjoins a marsh. An elevated observation tower would provide a better platform to view the diverse habitats in this area.

Figure 4.1. Proposed Wildlife Viewing Improvements



Huntington Road Trail

The refuge has acquired numerous parcels of land on the west side of the Indian River Lagoon in the Turnbull Creek area near the community of Scottsmoor. These lands offer additional opportunities for wildlife viewing. The homeowners in the vicinity have requested that a trail and parking lot be established in a hardwood hammock on Huntington Road. A partnership would be developed between the refuge and the Homeowners' Association to establish a trail and parking lot at this site. Under the agreement the Homeowners' Association would be responsible for trail development and maintenance.

4.c. Non-motorized Boating Improvements for Wildlife Viewing

Objective 4.c(1): Within five years of plan approval, wildlife viewing and fishing access will be enhanced by developing canoe/kayak trails or launch sites in ten locations.

Objective 4.c(2): Within five years of plan approval, enhance wildlife viewing of a wading bird rookery through the development of a viewing complex that includes a kiosk and canoe/kayak launch facility on the northwest corner of Haulover Canal and a dock and observation blind near Mullethead Island.

Strategies:

- Direct canoeing and kayaking to designated trails and specific locations.
- Obtain additional input from canoeing and kayaking enthusiasts and fishermen who utilize non-motorized boats regarding the trail layout, launch facilities designs, and locations.
- Review the canoe/kayak trail routes and select the best locations to minimize wildlife disturbance.
- Clearly post trail routes and require visitors to stay on the trail to minimize wildlife disturbances.
- Determine and implement appropriate buffer distances around rookeries and other sensitive areas.
- Close trails seasonally or move trail locations, if wildlife disturbances become a problem.
- Incorporate an educational message on wildlife viewing etiquette in literature and signs.
- Develop a leaflet providing details and a description of each trail and launch location.
- Develop a kiosk at the northwest corner of Haulover Canal with educational messages on ethical wildlife viewing.
- Develop and test the effectiveness of educational signage posted around the boundary of Mullethead Island and other sensitive wildlife areas.
- Obtain permits for docks, piers, and wildlife viewing blinds near Mullethead Island.
- Fund and develop the Mullethead Island wildlife viewing facilities.

Current Program

The refuge currently allows canoeing and kayaking, but has no designated trails. Instead, the refuge directs users to waters that are sheltered and have little boat traffic. Although the refuge does not keep statistics, another group of visitors that are increasing

in numbers are fishermen who use non-motorized boats to access Lagoon fishing locations. Wildlife disturbance associated with non-motorized use has not been fully evaluated.

Non-motorized boats can enter areas normally inaccessible to motorized boats and have the potential to cause additional wildlife disturbance. Buffer zones can be established around sensitive wildlife areas such as rookeries. Rodgers and Smith (1995, 1997) recommended, in general, a 100-meter buffer be established around wading bird colonies, but recognized each colony is different and the distances may need to be developed on an individual colony basis. Rodgers and Schwikert evaluated the impact of approaching boats and PWC on birds and recommended minimum buffer distances for a variety of species (Rodgers and Schwikert 2002). Other factors that affect viewing distance include time of day, noise level, and predictability (Oberbillig 2000). If visitors follow a trail, for example, the approach routes of visitors become more predicable and wildlife are likely to be more inclined to accept human presence.

Proposed Changes

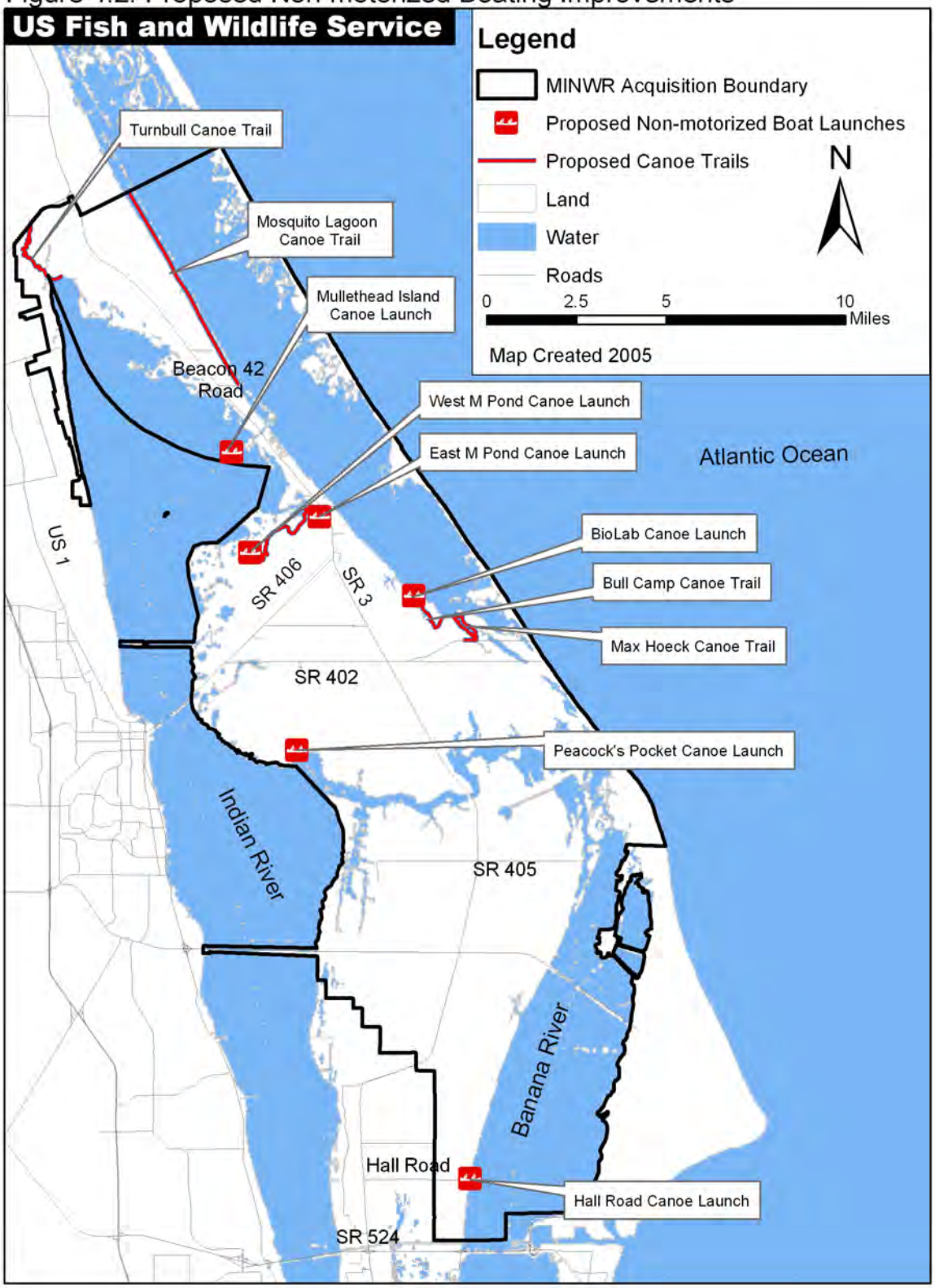
Canoe/Kayak Trails and Launch Sites

If left unchecked canoeing and kayaking have the potential to grow and could contribute to additional wildlife disturbance. These activities would be carefully monitored over the life of the plan and modifications to these activities may be required if wildlife disturbance occurs. With the approval of this plan, all open waters of the Lagoon would remain open to canoeing and kayaking, but this activity would be restricted to four designated impoundments due to the conflict with wildlife management activities. Three impoundments would be open year round for non-motorized boating, including M Pond, T-27-A, and T-27-B. One impoundment, T-24-D, would be open seasonally during the summer months when the likelihood of wildlife impacts are less. All of the impoundments that are open to waterfowl hunting would be closed to recreational canoeing on hunting days until after 1:00 p.m.

To enhance ethical wildlife viewing and support fishing, several canoe trails and launch sites would be developed. The criteria for sighting trail routes is 1) to afford some protection from wind and isolation from power boats, 2) to provide exposure to a wide variety of wildlife and habitat types, and 3) to minimize wildlife disturbances and interference with other refuge activities. The demand by fishermen exists for non-motorized access, and a fourth criteria would be to include the needs for fishermen access. Four impoundment and four Lagoon sites have been selected for wildlife viewing and four sites for fishing access improvements are listed. Few site improvements are needed at Dummitt Cove, Eddy Creek, Beacon 42, or M Pond, but some minor facility development is required at the other locations. See Figure 4.2 for proposed non-motorized boating improvements.

Wildlife Viewing Trails	Fishing Access Sites
Dummitt Creek	Dummitt Cove
Bull Camp	Eddy Creek
M Pond (2 locations)	BioLab Road
Peacocks Pocket (seasonal)	Hall Road (near KARS)
Turnbull Creek	West End of L Pond Road
Mosquito Lagoon	

Figure 4.2. Proposed Non-motorized Boating Improvements



Rookery Viewing Site

In addition to the trails, a kayak launch area would be designated at the northwest corner of Haulover Canal to provide better access to Mullethead Island, a popular island rookery viewing location of kayakers and ecotourism guides. To better accommodate wildlife viewing and lessen disturbance to the nesting island, several improvements would be made. First, a kiosk would be established at the launch site on the northwest corner of Haulover Canal with information on appropriate wildlife viewing etiquette for the rookery. This is an important first step, since this site is already used by organized guides and individuals who paddle about one half mile to view a colonial nesting bird island. The Island is posted as a Closed Area, but on occasion boats are seen inside the Closed Area, which causes disturbance to the nesting birds. To better educate boaters and kayakers of the impacts they can have on the rookery, additional signs would be designed and tested to reinforce the need to stay away from the Island. Another proactive way of addressing the problem of boats getting too close is by developing a viewing blind at a safe distance off the Island. A docking platform for kayaks and other boats and a viewing blind would be constructed outside the Closed Area. This would reinforce the Closed Area designation around the rookery, provide a convenient location to observe and photograph the birds, and help direct use to outside of the Closed Area and off the Island. Interpretive signs would be located on the docking platform to reinforce the viewing protocol message.

Monitoring and Evaluation

A monitoring program would be established to evaluate wildlife impacts from the new trails, kayak routes, and viewing area, as well as canoeing and kayaking in the open lagoon waters. Negative wildlife disturbances would be recorded. The staff would evaluate the disturbances, and if problems are identified, find ways to minimize or eliminate the problem. If necessary, a canoe route, viewing facility, or open water area can be closed seasonally or the use can be modified or moved.

5. PROVIDE HIGH QUALITY ENVIRONMENTAL EDUCATION PROGRAMS

GOAL 5: PROVIDE HIGH QUALITY, APPROPRIATE, AND COMPATIBLE WILDLIFE DEPENDENT ENVIRONMENTAL EDUCATION OPPORTUNITIES TO PROMOTE UNDERSTANDING AND AWARENESS OF THE VALUE OF THE REFUGE, ITS NATURAL RESOURCES, AND THE HUMAN INFLUENCES ON ECOSYSTEMS.

5.a. Environmental Education

Objective 5.a(1): Within two years of plan approval, provide two teacher workshops per year for north Brevard County teachers to acquaint them with refuge environmental educational curriculums.

Objective 5.a(2) : Within two years of plan approval, recruit and train 5-10 volunteers to independently assist teachers in conducting the environmental education programs.

Objective 5.a(3): Within five years of plan approval, at least 30% of north Brevard grades 4-9 will participate in curriculum-based environmental education programs that focus on the importance of habitat diversity.

Objective 5.a(4): Within five years of plan approval, develop four curriculum-based environmental education programs that are geared to four habitats of the refuge: lagoon waters, wetlands, scrub, and pine flatwoods.

Strategies:

- Establish an Environmental Education Advisory Committee to assist in the development of the program and in writing curriculums which meet the Florida Comprehensive Assessment Test (FCAT) standards.
- Obtain additional environmental education training and certification for staff.
- Recruit and train volunteers to assist in delivering environmental education programs.
- Network with Canaveral National Seashore, Brevard Zoo, MIWA, and others to develop, coordinate, and provide educational programs.
- Hire a Ranger to manage the environmental education program.

Current Program

With the assistance of MIWA and other partners, the refuge has developed the Sendler Education Outpost. The facility is located at Dummitt Cove and includes a 20-foot by 40-foot covered pavilion and restrooms. The intended purpose is to provide an on site facility to accommodate school groups visiting the refuge. The target audience is 4th through 8th grade schools in north Brevard County, however, all groups (youth and adult) that are conducting environmental educational programs may use the facility. The refuge is working with the local school board to develop a curriculum-based program that meets state standards and incorporates the refuge's education messages and programs into its teaching curriculum.

Planned Change

Over the next three to five years the refuge would work with the school board in developing standard based curriculums for targeted grade levels between 4th through 8th grades which meet FCAT standards. The purpose is to introduce students to different refuge, wildlife, and ecosystem issues. By the time the students move on to high school they would have developed the skills to serve as mentors and coaches for younger students. The refuge would recruit graduates of the program who need community service credits or others to work in the program.

The refuge would work with teachers in developing curriculum and student materials, provide equipment, and make facility improvements to grow the program. The refuge would host at least two teacher in-service workshops per year to familiarize and train teachers in the program. Volunteers and interns would be used to assist teachers in conducting the program. Within five years the refuge hopes to add one additional Ranger that would have environmental education duties. The refuge would continue to network with Canaveral National Seashore, Brevard Zoo and other organizations that are conducting environmental education programs and promote use of the Sendler facility.

Monitoring and Evaluation

An Environmental Education Advisory Committee would be established to provide feedback on the programs. It would critique the programs, provide feedback on ways to

enhance and improve the programs, develop new programs, and keep all programs current with state curriculum standards and guidelines.

6. INTERPRET KEY RESOURCES

GOAL 6: VISITORS OF ALL ABILITIES WILL ENJOY THEIR VISITS AND INCREASE THEIR KNOWLEDGE, UNDERSTANDING, AND SUPPORT FOR THE REFUGE AND THE NATIONAL WILDLIFE REFUGE SYSTEM.

6.a. Visitor Center

Objective 6.a(1): Within five years of plan approval, at least 75% of adult visitors regularly sampled at the Visitor Center will be able to identify that they are visiting a National Wildlife Refuge where wildlife comes first.

Strategies:

- Incorporate a wildlife first message into the refuge's leaflets when revisions are made.
- Revise volunteer orientation training to incorporate a wildlife first message.
- Volunteers would sample visitors to determine the success of interpretive messages.

Current Program

Roughly 60,000 visitors a year come through the Visitor Center. This includes most first time visitors who begin their visit there to ask questions, obtain basic orientation to refuge facilities, and/or attend a program. The Visitor Center was opened in 1984 and was named after Beau Sauselein and Scott Manness, two refuge employees who were killed while fighting a refuge wildfire in 1981. The Visitor Center has 1,742 square feet of exhibit space, a 550 square foot auditorium, and 312 square feet dedicated as a sales area.

Proposed Changes

The interpretive program would help all visitors understand and appreciate the purpose of the refuge, the value the refuge provides to wildlife, and the importance of the habitats protected by the refuge. Several over arching interpretive themes would be stressed in the interpretive program and would be incorporate into exhibits, brochures, and programs. The interpretive themes include:

- the National Wildlife Refuge System,
- wildlife come first on national wildlife refuges,
- the importance of habitat diversity in maintaining wildlife populations,
- the role the refuge plays for migratory birds and endangered and threatened species,
- habitat management is wildlife management (e.g., water level management and fire management,
- the uniqueness of the refuge and the relationship to KSC and the Seashore, and
- the human history.

The Visitor Center would remain the focal point for visitor information and interpretation. In 2005, several improvements were planned to renovate the 20-year old exhibits and

make additional improvements in the Visitor Center. To improve circulation, the information and sales counter wase moved to the east wall of the Visitor Center. To accommodate this move, the east wall was moved out six feet to occupy a portion of the former porch. The sales area has been moved out of the main part of the Visitor Center and occupies its own separate space. Each of the existing exhibits was rehabilitated or replaced and a children's' discovery area was added. Other improvements included continuous-play PowerPoint presentations in the auditorium, remote controls for the A/V equipment, adult learning centers, and more. An increased emphasis would be placed on the National Wildlife Refuge System and wildlife first themes in the redesign of exhibits.

Monitoring and Evaluation

Surveys would be used to measure the success in achieving these objectives.

6.b. Interpretive Programs
Objective 6.b(1): Within five years of plan approval, increase the number of interpretive programs by 25% over 2005 levels.

Objective 6.b(2): After attending a program, at least 75% of adult visitors sampled will be able to successfully identify one wildlife management technique used by the refuge or identify the connection between managing habitat and wildlife populations.

Strategies:
- Develop interpretive programs centered on an interpretive theme, such as water level management programs or habitat requirements of wildlife.
- Train volunteers and interns to deliver interpretive programs centered on the one of the interpretive themes.
- Volunteers would survey visitors to determine effectiveness of the interpretive messages.
- Hire a Ranger to manage the interpretive program.

Current Program

The Visitor Center serves as the departure point for most refuge interpretive tours. The emphasis of the interpretive programs are in two general areas: 1) informing the public on management activities and 2) educating the visiting public on wildlife needs and habitat requirements. The over-arching purpose of the programs is building better understanding and support for Merritt Island NWR and the Refuge System.

Proposed Change

An emphasis would be placed on increasing the number and diversity of the interpretive programs centered on the outlined interpretive themes. Programs would be increased by recruiting and training volunteers and interns. Over the next five to ten years, the refuge would fill a full time interpretive position.

Monitoring and Evaluation

A monitoring program would be established to determine the effectiveness of interpretive programs in communicating the themes of the program.

6.c. Interpretive Trails

Objective 6.c(1): Within five years of plan approval, at least 75% of adult visitors sampled at Black Point Wildlife Drive will be able to successfully identify water level management as a positive factor in managing for migratory birds.

Objective 6.c.(2): Within five years of plan approval, at least 75% of adult visitors sampled at Black Point Wildlife Drive, Scrub Ridge Trail, or Pine Flatwoods Trail will be able to successfully identify the positive wildlife and habitat values of prescribed burning in the coastal ecosystem.

Strategies:

- Expand the water management interpretive theme on signs and in the Black Point Wildlife Drive leaflet.
- Volunteers would survey visitors to determine success in delivering messages.
- Develop interpretive fire messages for Black Point Wildlife Drive, Scrub Ridge Trail, and the Pine Flatwoods Trail.

Current Program

Black Point Wildlife Drive is the most heavily used interpretive facility. (See the Wildlife Viewing Section for details on use.) The Drive is routed through impounded wetlands, restored marsh, and pine upland habitats and provides an opportunity to interpret the refuge's primary management tools of water level management and fire. In addition to Black Point Wildlife Drive, five interpretive trails are maintained: Oak Hammock, Palm Hammock, Scrub Ridge, Allan Cruickshank, and the Visitor Center trails. Each is used to interpret different refuge themes.

Site	Interpretive Theme(s)
Black Point Wildlife Drive	Water Level Management, Habitat Management, and Prescribed Fire
Scrub Ridge Trail	Prescribed Fire, Habitat Management, and Endangered Species
Oak Hammock Trail	Habitat Diversity and Human History
Palm Hammock Trail	Habitat Diversity
Cruickshank Trail	Water Level Management, Habitat Management, and Migratory Birds
Manatee Deck	Endangered Species

Proposed Change

The use of prescribed burns is the most misunderstood management practice and an increased emphasis would be placed on interpreting this important management tool. A new fire stop is planned for Black Point Wildlife Drive and interpretive panels on fire

management have been installed on Scrub Ridge Trail. When the Pine Flatwoods trail is developed, fire would be the featured interpretive theme.

The interpretive theme of the Visitor Center Trail and Hammock Trails would continue to emphasize the importance of habitat diversity and fire with a sub-theme of human history. The interpretive emphasis on the Cruickshank Trail would remain water level management and migratory birds. See Figure 6.1 for the existing and proposed interpretive trails and facilities.

Monitoring and Evaluation

Visitor response cards would be developed to measure the success in delivering these interpretive messages to the visiting public.

6.d. Manatee Observation Deck

Objective 6.d(1): Within five years of plan approval, at least 75% of the adult visitors regularly sampled at the Manatee Observation Deck will be able to successfully identify the positive benefits and importance of manatee protection.

Strategies:

- Replace interpretive signs at the Manatee Observation Deck.
- Resurface the access road to the Manatee Observation Deck.
- Install an underwater hydrophone or camera.
- Train volunteers or interns to conduct interpretive programs.
- Volunteers would survey visitors to determine the success of interpretive messages.

Current Program

The Manatee Observation Deck is becoming one of the most popular interpretive destinations. Few locations exist where the non-boating public can see these endangered mammals, so this site provides a great opportunity for interpretive programs. On most days when temperatures are above 70 degrees, manatees are present at this site.

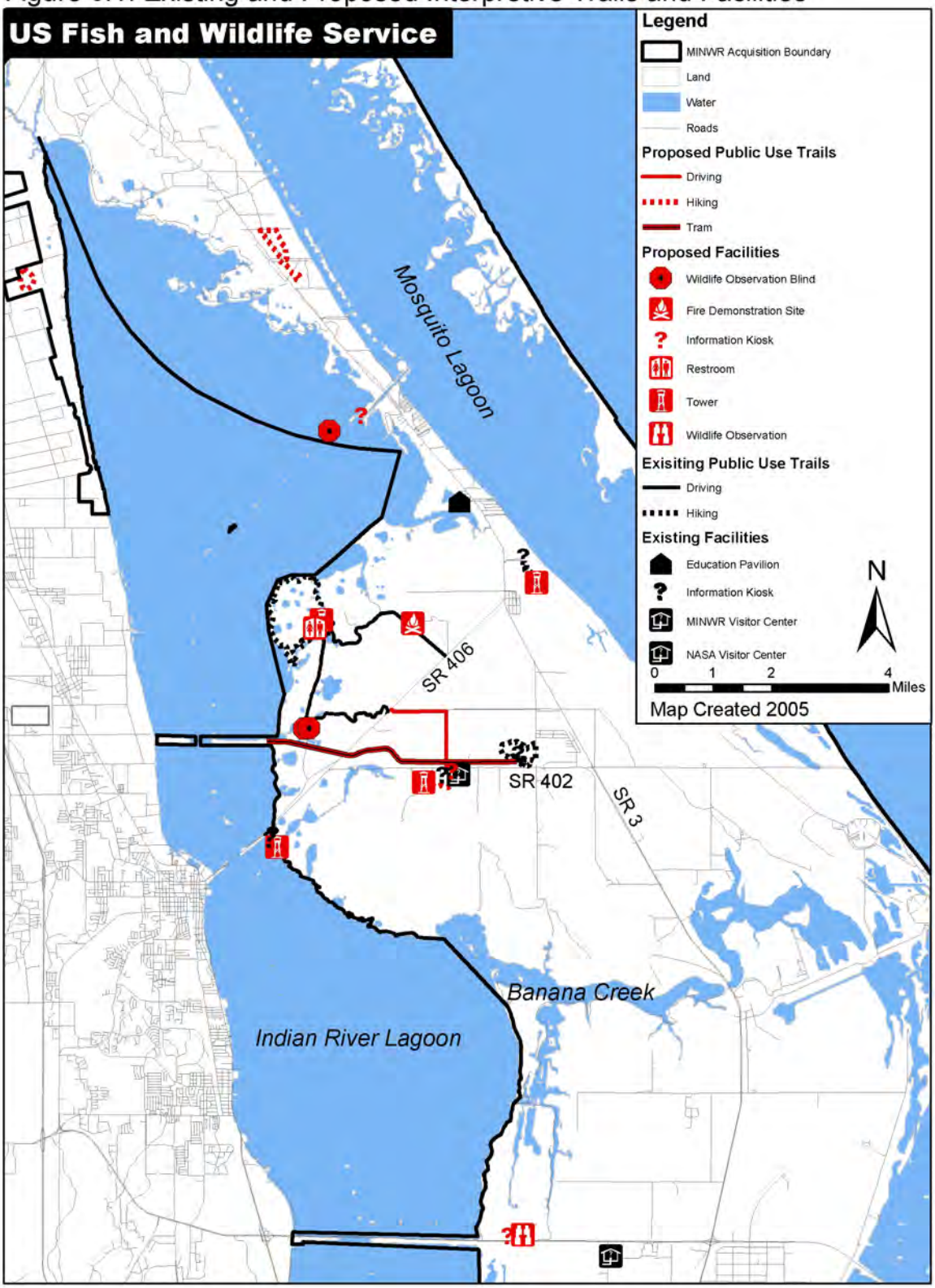
Proposed Change

The Manatee Observation Deck provides an excellent location to build understanding, appreciation, and support for this endangered species. With all the controversy surrounding the Service's efforts to protect manatees, the refuge would place an increased emphasis on building support for manatee protection. A number of improvements at the Manatee Observation Deck are called for, including replacing the interpretive signs, resurfacing the access road, and developing underwater hydrophones and/or cameras to allow visitors to better see and hear manatees. During the high season, on days when manatees are present, the refuge would develop an interpretive program and staff the Manatee Observation Deck. See Figure 6.1 for the existing and proposed interpretive trails and facilities.

Monitoring and Evaluations

Visitor surveys would be developed to determine success in delivering this message.

Figure 6.1. Existing and Proposed Interpretive Trails and Facilities



6.e. Guided Interpretive Tours

Objective 6.e(1): Within 10 years of plan approval, increase interpretive opportunities by providing a guided tour using an alternative transportation system, such as a tram or train.

Proposed Change

One of the best means of controlling and delivering interpretive messages is providing guided tours. Tram tours are used on some refuges with great success. Although trams are the standard vehicle, another possible tour vehicle is a train. On most refuges, this may not be an option, but at MINWR it may be a better option than a tram. NASA maintains a railroad line that parallels 402 just north of the Visitor Center and traverses several good wildlife viewing areas. (The railroad is the preferred option. but use of the line is contingent upon NASA's approval.) The development of a railroad car tour has several advantages. It takes pressure off the Wildlife Drive since it does not add additional use to the current Drive route as a tram would, provides exposure to other wildlife habitats not experienced on the drive, links to the Hammock trail network, links to planned wildlife observation blinds proposed for the wildlife drive and is convenient to the Visitor Center where tickets could be sold. However, the main advantage, is that it provides a delivery system where the refuge can craft, change or control the message based on the audience and changing conditions. For many visitors a guided tour is preferred over a self-guided tour since the tour leader can point out wildlife and explain management programs. Either a tram or railroad tour could be run by MIWA or a concessionaire with a portion of the proceeds coming back to the refuge. See Figure 6.1 for the existing and proposed interpretive trails and facilities.

Monitoring and Evaluations

Visitor surveys would be developed as a means of providing feedback regarding the success in delivering the messages.

6.f. Kennedy Space Center Visitor Complex

Objective 6.f(1): Within five years of plan approval, at least 75% of sampled adult visitors who have taken NASA's KSC bus tour will be able to identify that Merritt Island NWR is a part of the National Wildlife Refuge System where wildlife comes first.

Strategies

- Create a new Ranger position to manage the outreach program and to develop visitor facilities and programs at KSC's Visitor Center.
- Develop bus driver training and handouts.
- Revise the bus tour video.
- Improve the refuge/Seashore exhibit.
- Develop a wildlife viewing area at Moore Creek.
- Develop better signage that would direct KSC's visitors to the refuge.

Current Program

Visitors to KSC's Visitor Center represent a largely untapped refuge audience. Over the years the refuge has developed various approaches to contact KSC's visitors and deliver the refuge's message, from a six-projector slide show to an exhibit with animatronics

figures and special effects. Currently the refuge shares an exhibit with Canaveral National Seashore that was developed by NASA's concessionaire, Delaware North, with little input from the refuge. The exhibit depicts several habitat types found on the refuge and receives roughly 400,000 annual visits. This is the third attempt in developing a KSC exhibit. Experience has shown that an exhibit is not an effective means to deliver the refuge's story at the KSC Visitor Complex.

Most visitors take a bus tour of NASA's launch facilities and are, therefore, exposed to the refuge. An onboard video program explains the relationship the refuge shares with NASA at KSC. The refuge does not monitor the bus tour or exhibit to obtain feedback on the effectiveness in delivering key messages. Each program (exhibit and bus tour) has its place, but a good way to reach these visitors is by developing a wildlife viewing facility that allows visitor to see and experience the resource on a more personal level.

Proposed Change

Most of KSC's visitors come from out of town for the day and do not drive the extra 15 miles to visit the portion of the refuge open to the public. To combat this, the refuge needs to take the message to these visitors and be more proactive in providing information for the concession-operated bus tour. This can be done by providing handouts and training to bus drivers, encouraging NASA to develop special opportunity concession wildlife tours, providing refuge interpretive programs at KSC's Visitor Center, and developing new wildlife viewing facilities.

With only two staff in the Visitor Services Program, the refuge cannot currently expand programs at KSC. The refuge would continue to be opportunistic and, if funds become available from a partner, the existing exhibit should be updated.

A number of short and long term actions exist that the refuge can undertake to enhance wildlife viewing and interpretation. Over the short term, the refuge can improve signage that would direct KSC visitors to the refuge. With one new staff member, the refuge could work with KSC and its concessionaire to improve wildlife viewing and refuge interpretation at the KSC Visitor Center and on the bus tours of KSC. NASA has also expressed interest in conducting Green Tours as a specialty wildlife tour that the concessionaire would sell. A new staff person could cooperate with NASA in developing these tours.

Without additional staff, the development of the Moore Creek Wildlife Viewing facility off SR 405 may be the most cost effective means of exposing KSC's visitors to the refuge. Over the next 10 years, the refuge would pursue the development of a wildlife viewing area for visitors exiting the Kennedy Space Center. The refuge has identified a potential location on Moore Creek off SR 405, but this plan is contingent on NASA approval. Capital cost for the facility would be high and would include acceleration and deceleration lanes, paved parking, boardwalks, an ADA accessible tower, restrooms, a kiosk, and interpretive signs. Once developed, other than maintenance, the refuge would not need to staff the facility and, in the long run, it may be the most cost effective approach. The refuge would seek partnerships in developing and funding this new facility.

Monitoring and Evaluation

Develop an evaluation for visitors exiting exhibit and bus tours to obtain feedback on the effectiveness of refuge messages.

7. MANAGE FOR APPROPRIATE RECREATIONAL OPPORTUNITIES

GOAL 7: ALL PUBLIC USE ACTIVITIES WILL BE APPROPRIATE AND COMPATIBLE AND VISITORS WILL SUPPORT PRIORITY PUBLIC USE ACTIVITIES THAT MINIMIZE WILDLIFE AND HABITAT DISTURBANCES.

7.a. Ethical Wildlife Viewing – Delivering the Message and Correcting Problems

Objective 7.a(1) : Over the life of the plan, the Visitor Center will provide current information related to appropriate and compatible recreational activities and help visitors understand that their behavior can reduce wildlife disturbance.

Objective 7.a(2): Within two years of plan approval, work a wildlife viewing etiquette message into the interpretive materials for Black Point Wildlife Drive.

Objective 7.a(3): Within two years of plan approval, and periodically thereafter, develop signs and update brochures to inform the public of wildlife disturbances and prohibited activities.

Objective 7.a(4): Within five years of plan approval, evaluate the wildlife impacts of the most common recreational activities occurring on Black Point Wildlife Drive and make modifications to reduce or eliminate the disturbances.

Objective 7.a(5): Within seven years of plan approval, at least 50% of sampled visitors on Black Point Wildlife Drive will display ethical wildlife viewing behavior, as determined through observational surveys.

Objective 7.a(6): Within seven years of plan approval, wildlife/visitor and visitor/visitor conflicts on Black Point Wildlife Drive will be reduced by 50% from 2006 levels, as determined through observational surveys.

Objective 7.a(7): Within ten years of plan approval, develop three bicycle trails and make other facility improvements to move bicycle riders into appropriate areas where wildlife disturbance and visitor impacts will be reduced.

Objective 7.a(8): With plan approval, eliminate jogging.

Strategies:

- Update the wildlife first theme in the Visitor Center.
- Promote proper wildlife viewing etiquette on Black Point Wildlife Drive.
- Develop a monitoring program to identify wildlife disturbances on Black Point Wildlife Drive and in other visitor areas.
- Develop signs and revise leaflets to inform the public of all prohibitions and provide explanations on why certain activities are banned.
- Educate visitors concerning wildlife disturbances.
- Create stay in your vehicle zones on Black Point Wildlife Drive.

- Encourage the use of binoculars and spotting scopes to view wildlife from a safe distance.
- Encourage visitors to move slowly and quietly.
- Educate visitors to recognize and respect alarm signals from wildlife.
- Educate visitors to recognize and respect changes in animal behavior as a result of being too close.
- Educate visitors to never flush or make deliberate noises that stresses wildlife.
- Educate visitors to leave their pets at home.
- Encourage improved behavior (e.g., be courteous and wait your turn to view or photograph animals when sharing a viewing location and ask before joining others already photographing in an area).
- Establish a survey to monitor wildlife populations and measure and observe negative human/wildlife interactions on Black Point Wildlife Drive through volunteer conducted surveys.
- Establish a survey to monitor and observe visitor versus visitor conflicts on Black Point Wildlife Drive.
- Through observations, document detailed information on different types of disturbance.(e.g., speed of vehicle, noise level of vehicle, behavior of occupants, comparison of visitors who remain in vehicle v. visitors who get out of vehicles, differences of reactions of different species, and other information).
- Analyze the data on disturbance and develop strategies to reduce or eliminate the wildlife impacts.
- Eliminate jogging as a use on the refuge.
- Divert bike riding from the Black Point Wildlife Drive and develop bike paths in more suitable locations.
- Prohibit bike riding on walking trails.

Current Program

The Refuge System's vision for the future includes a strong people component, where visitors will "find national wildlife refuges welcoming, safe, and accessible, with a variety of opportunities to enjoy and appreciate American's fish, wildlife, and plants" (U.S. Fish and Wildlife Service 1999). The National Wildlife Refuge System Improvement Act of 1997 sets forth hunting, fishing, wildlife viewing, wildlife photography, environmental education, and interpretation as priority uses of the Refuge System. These priority uses are to be accommodated when and where appropriate and compatible with the purpose of the refuge, in support of the wildlife comes first theme. The intent of the Act is to provide uniform guidelines for the Refuge System's Visitor Services Program, insure that all activities are wildlife oriented, and insure that these activities do not interfere with the purposes of the refuge. Given such a strong people and wildlife component, it is not surprising that conflicts sometimes arise.

Merritt Island NWR has always been open to certain public use activities. NASA specifically named hunting and fishing as activities that would continue in the original agreement with the Service. Today, about half of the refuge is open to the general public. Therefore, a natural buffer exists where wildlife can retreat to minimize human contact. (However, NASA maintains space support facilities and operations within the closed Security Area.) The refuge currently has established regulations to minimize wildlife disturbance, including a prohibition on the use of personal watercraft and air boats that have been shown to cause unacceptable water-oriented wildlife disturbances.

Certain other activities that disturb wildlife viewing on Black Point Wildlife Drive have also been identified and eliminated.

Black Point Wildlife Drive is the primary wildlife viewing destination and receives the highest concentration of visitors. Because the primary purpose for visiting the Drive is wildlife observation and photography, it makes sense to take measures to decrease wildlife disturbance and to educate visitors on their impacts. In 2002, fishing, crabbing, and boat launching, as well as fast moving vehicles, buses, and other large vehicles over 29 feet were eliminated from the Drive as steps to reduce impacts. In 2004, the Black Point Wildlife Drive leaflet was revised to include tips on wildlife viewing with the goal of teaching visitors proper viewing etiquette. Currently, signs are being developed to further reinforce the wildlife viewing etiquette message. With this plan other adaptive strategies would be implemented to minimize wildlife impacts by 50% over current levels, including establishing stay in your vehicle zones, planting native plants to screen wildlife from the Drive, and developing wildlife viewing blinds. Steps would be taken to monitor disturbances and, when wildlife impacts are observed, the level and type of disturbance would be identified. Special attention would be directed at evaluating the effect of out-of-vehicle activity, noise levels, speed of vehicles, and the other human behavior on wildlife. The intent is to maintain a quality wildlife viewing experience on Black Point Wildlife Drive, Cruickshank Trail, and other viewing and photography areas as needed. Identifying and minimizing wildlife impacts may help sustain quality wildlife viewing and photography opportunities on the Drive and reduce wildlife disturbance.

In 1999 Bennett and Zuelke summarized the effects of recreation on birds and developed the listed recommendations regarding wildlife disturbance.

- **Presence**: Birds avoided places where people were present and when visitor activity was high (Burger 1981, Klein et al 1995: Burger and Gochfeld 1998).
- **Distance**: Disturbance increased with decreased distance between visitors and birds (Burger 1986).
- **Approach Angle**: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approach may cause more disturbance than tangential approaches (Burger and Gochfeld 1991; Burger 1995: Knight and Cole 1995; Rodgers and Smith 1995; Rodgers and Smith 1997).
- **Photographers**: Photographers were more likely to approach birds and thus were more likely to disturb them (Klein 1993).
- **Type and Speed of Activity**: Joggers caused birds to flush more than fishermen, clammers, sunbathers, and some pedestrians, possibly because the former group move quickly. The latter groups tend to move more slowly or stay in one place for longer periods, and thus birds likely perceive these activities as less threatening (Burger 1981, 1986; Burger et al 1995; Knight and Cole 1995). People walking or biking disturbed birds more than vehicles (Pease et al 2005). Alternatively, birds may tolerate vehicles passing by with unabated speed, whereas if the activity stops or slacks, the birds may flush (Burger et al 1995). People walking and biking disturb ducks more than vehicles do (Pease et al 2005).
- **Noise**: Noise caused by visitors resulted in increased levels of disturbance (Burger 1981, 1987; Klein 1993, Bowles 1995; Burger and Gochfeld 1998).
- **Migrants v. Residents**: Migrants, including waterfowl, herons, egrets, and shorebirds tend to be more sensitive to disturbance than resident birds (Burger

1981; Klein 1993; Burger 1995; Klein et al 1995; Burger and Gochfeld 1998). Migrants are particularly sensitive to reduced or lost feeding opportunities, because it is critical for them to increase energy reserves to complete migration and initiate breeding (Burger 1986; Burger 1995).

- **Feeding**: Feeding time decreased and vigilance increased when people were present and with increased noise levels (Burger and Gochfeld 1998). Increased use of paths near foraging and loafing habitats caused birds to feed further from path or leave the area. Once disturbed, birds tended to stay farther from the path (Burger 1981, Klein et al 1995, Burger and Gochfeld 1998).
- **Cover**: Birds tend to retreat to vegetation, if available, while people were present and returned to forage as visitors left the area (Burger and Gochfeld 1998).
- **Habituation**: Depending on the species, some birds may habituate to some types of recreation disturbance and either are not disturbed or would immediately return after the initial disturbance (Hill et al 1997; Burger 1995; Knight and Temple 1995; Madsen 1995; Fox and Madsen 1997).
- **Buffer Zones**: Rodgers and Smith (1997) calculated buffer distances that minimize disturbance to forage and loafing birds based on experimental flushing distances for 16 species of waders and shorebirds. They recommended 100 meters as an adequate buffer against pedestrian traffic, however, they suggest that this distance may be reduced if physical barriers (e.g. vegetation screening) are provided, noise levels are reduced, and traffic is directed tangentially rather than directly toward birds. Specific guidance on minimum buffer distances are recommended by various species in Rodgers and Schwikert (2002).
- **Screening**: Vegetation that effectively conceals visitors and provides cover for birds would help minimize impacts of people using trails adjacent to habitat (Hill et al 1997; Rodgers and Smith 1997; Burger and Gochfeld 1998). Impacts from wildlife viewing and photography can be reduced by providing observation blinds (Boyle and Samson 1985; Klein 1993).
- **Restrict Noise Levels**: Screening may not effectively buffer noise impacts, thus visitors should be educated on the effects of noise and noise restrictions should be enforced (Burger 1981, Klein 1993; Bowles 1995; Burger and Gochfeld 1998).
- **Education**: Education is critical for making visitors aware that their actions can have negative impacts on birds, increasing the likelihood that visitors would abide by restrictions in their actions. For example, Klein (1993) demonstrated that visitors who spoke with refuge staff or volunteers were less likely to disturb birds.
- **Enforcement**: Increased surveillance and imposed fines may help reduce visitor caused disturbance (Knight and Gutzwiller 1995).
- **Monitoring**: Monitoring is recommended to adjust management techniques over time, particularly because it is often difficult to generalize about the impacts of specific types of recreation in different environments. Local and site-specific knowledge is necessary to determine effects on wildlife and to develop effective management strategies (Hill et al 1997).

Studies are useful in making decisions on appropriate activities, but making the determination if an activity is compatible is not always easy. Operating personal watercraft (PWC) is a good example. PWC users argue that they operate PWC to engage in wildlife-oriented activities, such as wildlife viewing or fishing, therefore, operating a PWC is a wildlife-oriented experience and should be allowed under the Improvement Act. However, in reviewing the literature and the marketing of PWC for high speed fun, the nature of the activity itself causes unacceptable disturbance to wildlife. Therefore, it is not considered appropriate, given with the refuge's larger wildlife

purposes, vision, mission, goals, and objectives. The operator could choose a more compatible form of transportation, such as a boat or kayak, therefore the PWC is not necessary to view wildlife and/or fish and other modes of transportation are available that are compatible. Further, areas are available nearby, outside of the refuge where users can operate PWC.

Some land-based activities may cause similar wildlife disturbances, but have not been addressed through regulations. Jogging and bike riding are two terrestrial uses that are relatively common on the refuge and may cause similar disturbance to wildlife. A study conducted at Back Bay NWR (Laskowski et al 1993) indicates that pedestrians and biking activity along the dike system caused substantial behavior difference for greater yellowlegs as compared to when no humans were present. The studies suggest birds perceive humans as threats because the person is moving quickly and is highly visible (Burger 1981, Laskowski et al1993). Another study conducted at Back Bay NWR indicated that people walking quickly and biking on dikes in impounded wetlands disturbed seven species of wintering ducks more than vehicles (Pease et al 2005). Wildlife apparently receive different cues from different modes of transportation, since wildlife do not flee as readily from cars, perhaps because the person is hidden in the vehicle and not perceived as a threat (Klein 1983). Currently, joggers and bike riders use most trails on the refuge, including Black Point Wildlife Drive. In addition to disturbing wildlife, both activities disrupt other individuals using the trail and in the case of biking, may present a safety hazard to pedestrians on the trails. The two most popular locations for biking and jogging are Black Point Wildlife Drive and Cruickshank Trail.

Over the last five years the refuge has been pressured by Brevard County, the City of Titusville, and private groups to designate bike paths on the refuge. Bike riding is prohibited on SR 402 during peak traffic hours for KSC's commuters for the safety of the bike riders. Responding to the State Comprehensive Outdoor Recreation Plan (SCORP), which identifies the need for additional bike paths, the County has discussed funding the development of several bike paths on the refuge: one from Titusville to Canaveral National Seashore and another around several impoundments. The refuge has agreed in principal to the Canaveral path, but has resisted routing bike paths through wetlands based on the above mentioned studies and the related disturbance to birds in open marsh habitats.

Another activity where demand is growing is wildlife viewing by canoe and kayak enthusiasts. These activities can provide additional wildlife viewing opportunities to a new group of refuge users and supporters, but it must be carefully planned so as not to conflict with migratory bird and/or endangered species goals. (See section 4.D.)

Proposed Change:

Inappropriate uses are clearly not wildlife oriented and would be directed away from the refuge.

Jogging and Bicycle Ridding

<u>Jogging</u>
Jogging is an aerobic activity, not a form of wildlife viewing, and it does not support a priority use of the Refuge System. Like personal watercraft, a jogger could argue s/he prefers jogging on the refuge because s/he sees more wildlife. Jogging, however, is

disturbing to wildlife and is not considered by conventional definitions a wildlife oriented activity. Therefore, jogging does not support a Big Six use and would not be permitted to continue on the refuge.

Bicycle Riding

Bicyclee riding is not as clear cut. Some individuals use bike riding as a mode of transportation to view wildlife, while others use it a sport. When the use is aimed at wildlife viewing, the use may be compatible with a Big Six priority use. However, based on anecdotal information, research, and best professional judgment of staff, bicycling in open marsh habitats appears to cause more wildlife disturbances than bicycle riding in upland locations. Therefore, a rule of thumb of this plan is to steer wildlife oriented bicycle riding into more upland locations or wetland locations where vegetative screens exist and wildlife disturbance can be reduced. Over the next few years wildlife disturbance from bicyclist on Black Point Wildlife Drive and the Cruickshank Trail would be monitored and, as bicycle trails are developed in other locations, this use would be phased out from Black Point Wildlife Drive. This action, combined with other actions outlined in this plan, would help preserve a high quality wildlife viewing experience for bird watchers and photographers on Black Point Wildlife Drive and in the marshes of Cruickshank Trail.

With the adoption of this plan, refuge policy regarding bike riding for the purpose of wildlife viewing would be to contain the activity to established paved or unpaved roads or tree-lined dikes where it does not present a safety hazard to the bicyclist or motorist and where wildlife disturbances can be eliminated or reduced. The refuge would work with KSC, the Seashore, Brevard County, and others in selecting locations for bike paths which support their plans and provide quality wildlife viewing opportunities, while minimizing wildlife impacts.

Not all bicycle riding is appropriate. Bicycling for exercise or for sport, like jogging, is not a wildlife oriented activity. Mountain biking enthusiast seek out back roads of the refuge and hiking trails for their sport. This presents a safety issue for other trail users and is clearly not a wildlife oriented activity. With the adoption of this plan, bike riding on established hiking trails and biking for sport at other locations would not be permitted.

To provide guidance for bicycle groups, the refuge decision for bicycling activities would be based on two factors, as listed.

- Does the activity support a priority public use and the wildlife purposes of the Refuge?
- Is the activity located in an area where the use would not cause wildlife disturbance?

For example, if a request was made by a birding club that wanted to bike on a dike road through a marsh for wildlife viewing purposes, the request would probably be denied because of the anticipated wildlife disturbance in this location. However, if the wildlife disturbance was reduced or eliminated by moving the location to a wood-lined road where the wildlife disturbance was eliminated, it could be made compatible and approved. The key to making the decision is the intended use and the level of disturbance. Biking can support a Big Six use, wildlife viewing, and can be determined to be compatible by locating the activity in an area where few wildlife disturbances would be anticipated. But, bicycling as an activity that is not connected to wildlife viewing or another Big Six use is not wildlife oriented and not appropriate.

Three bike paths would be approved with this plan: Gator Creek Bike Trail, Visitor Center Bike Loop, and Beach Bike Trail. See Figure 7.1 for the proposed bicycle trails.

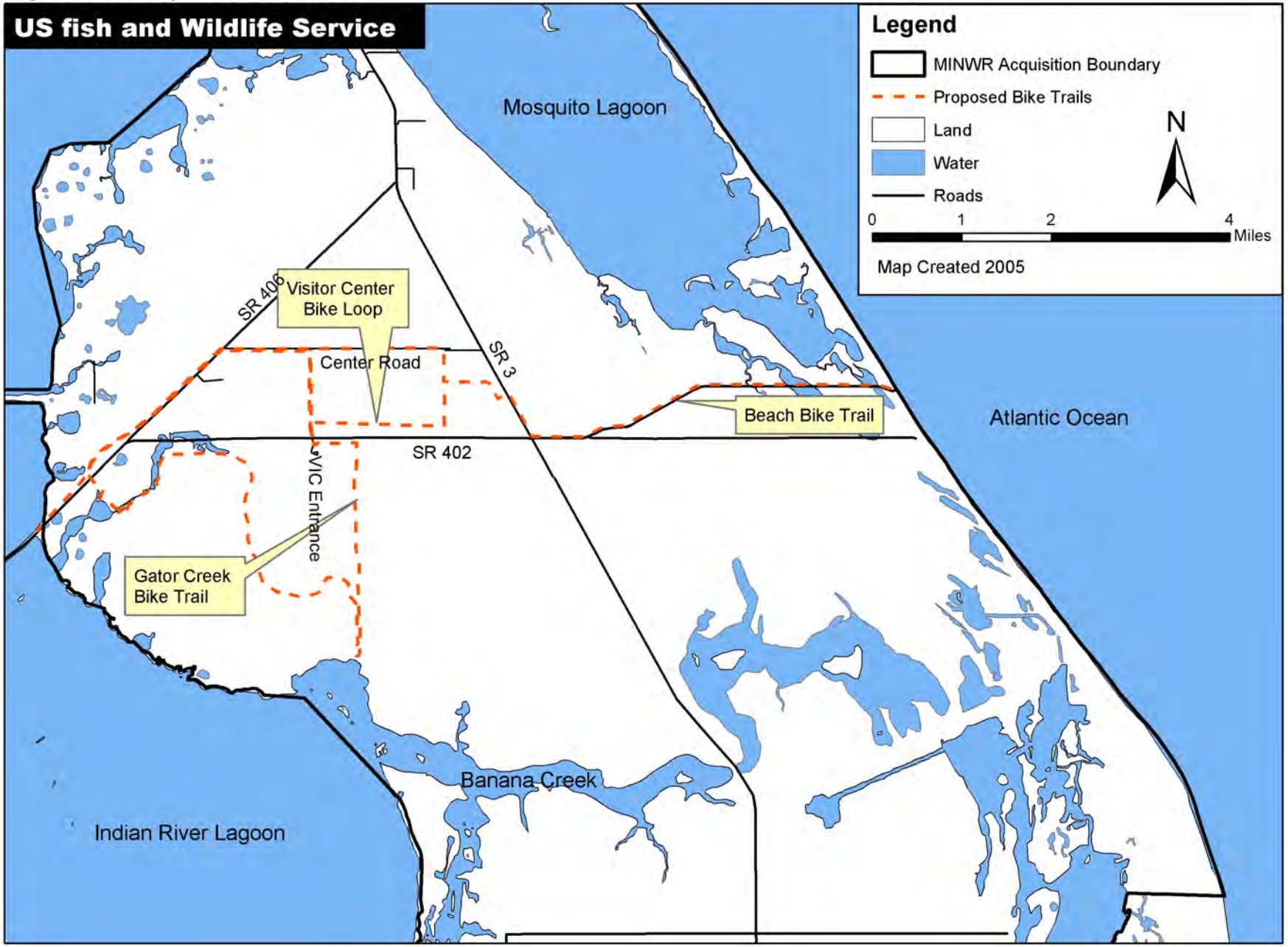
Beach Bike Trail
The proposed path would follow SR 406 across the Indian River Lagoon. Once on the refuge, it would follow the abandoned SR 406 highway road grade to SR 406, then follow SR 406 northeast to Center Road, then east on Center Road to SR 3, then south on SR 3 to the intersection with SR 402 at Wilson Corner,, and finally follow SR 402 east to Playalinda Beach. A paved bike path would be required where it parallels SR 406, SR 3, and Beach Road. The path is not anticipated to cause significant wildlife disturbance, since the route is on or adjacent to paved roads where a high volume of road traffic already exists and/or routed through uplands where minimal wildlife impacts are anticipated. The path would overlay a section of the proposed Visitor Center to Black Point Wildlife Drive Road; therefore, the Visitor Center would provide a convenient mid-point rest stop for bicyclists. The refuge would coordinate with Brevard County, NASA, and Canaveral National Seashore to accomplish this project. The refuge would also work with the County, Federal Highway Administration, and Seashore to try to obtain funding or grants for the project.

An alternative to the above described bike path, is the development of a paved bike path that would be located adjacent to SR 406 from Titusville bridge to SR 402 to Playalinda Beach. Like the above route, this path would require close coordination with the Canaveral National Seashore, Kennedy Space Center, Brevard County, and other agencies that may provide a potential for grants or other financial assistance.

Visitor Center Bike Loop
A second bike path would be part of the new access road between Black Point Wildlife Drive and the Visitor Center [see Objective 4.b(1)]. This road would be routed through upland habitat and would not result in impacts to marsh birds. When this bike path opens, bicycling on Black Point Wildlife Drive would be phased out since the Drive is routed through marsh habitat. Instead, bicyclist could leave the Visitor Center, continue east on Center Road, connect with PAPI Lights Road, go south to the railroad right-or-way, turn west along the railroad right of way then reconnect with the new access road for a return to the Visitor Center. This round-trip route would be about 4.5 miles in length. The Center Road portion of the path would overlay a section of the Titusville to Playalinda Bike Path and the PAPI Lights section would overlay a portion of Palm Hammock Trail. The trail at this location overlays an abandon 20-foot road grade on Palm Hammock Trail. The trail width is adequate here to minimize impacts with other trail users and would be an exception to the policy of banning bikes on hiking trails.

Gator Creek Bike Trail
The third bike path would utilize Timberline Road, a dike road that currently is not open to the public. This bike path would originate at the Entrance Kiosk on SR 406 and follow the Titusville to Playalinda Path roughly one half mile to Pump House Road, then turn south and cross SR 406 where the road changes to Gator Creek Road. The path would follow Gator Creek Road to Timberline Dike Road, a distance of about one mile. From this point the path would follow Timberline Dike Road about five miles to Peacocks Pocket Road and go north about two miles to a point just north of SR 402. A new connecting path would be constructed to connect Peacocks Pocket Road to the Visitor Center. From this point, bikers could return to the starting point via the new connecting road and the Titusville to Playalinda Path. Once on Timberline Dike Road the path

Figure 7.1. Proposed Bike Trails



would follow the road to Peacocks Pocket Road and return to the Visitor Center. This ten-mile loop is routed through mostly wetlands and would provide excellent wildlife viewing. The difference at this location is the trail is mostly confined to a tree-lined dike, therefore wildlife disturbance is anticipated to be minimal.

With the development of these three paths, a bicyclist could: 1) Originate in Titusville and peddle to either the Visitor Center or Playalinda Beach; 2) begin at the refuge's entrance kiosk where s/he could park and travel to Playalinda Beach, the Visitor Center or Timberline Dike Path; or 3) start at the Visitor Center and take any of the three paths. Expansion of the parking lot at the Visitor Center is a prerequisite before the Center Road or Timberline bike paths can be implemented. Other improvements are needed along the paved portions of SR 3 and SR 406, along with acquiring and intalling appropriate signage.

Other Use

Currently the refuge prohibits the use of air boats and personal watercraft. However, on occasion both occur on the refuge. The refuge needs to develop new signs and post them in conspicuous locations to advise air boaters and jet ski users that these activities are not permitted. The same message would be articulated in brochures and at the kiosks.

Biking and jogging and the occasional PWC and air boat are the only known activities that are currently out of compliance. However, other activities could become an issue at any time. Roller blading, horse back riding, off-road use by all terrain vehicles, sail boarding, kite sailing, segways, or other similar activities may become an issue at any time. By policy, in order for any activity to be approved on the refuge, it would have to pass a Compatibility Determination test and support one of the Big Six priority public uses. Only appropriate and compatible uses are allowed on national wildife refuges.

Future request for activities not previously mentioned, would be reviewed in accord with current policy. Specific questions to be considered are listed.

- Does the activity support one of the Big Six priority public uses?
- Is the activity appropriate and compatible with the purposes and goals of Merritt Island NWR?
- Is the activity covered by an existing compatibility determination?

Before a new activity or use that is not addressed by this plan can be allowed, each of these questions must be answered in the affirmative.

Monitoring and Evaluation

With the approval of the plan, jogging would be eliminated from the refuge. Bicycling would be eliminated on all established trails as a strategy to reduce wildlife disturbance, preserve the quality of wildlife viewing, and eliminate a safety hazard for other trail users. Bicycling would be eliminated on Black Point Wildlife Drive when any of the planned bike paths become operational. Changes are planned in the Black Point Wildlife Drive leaflet to interpret the importance of proper wildlife viewing etiquette. Surveys would be developed to determine how successful the interpretive materials are in delivering these messages.

As use escalates, which is inevitable given the growth in the population and visitation to Florida and the refuge, adaptive approaches would be taken to change the behavior of the user and eliminate activities that disturb wildlife. As new user guidelines evolve, the interpretive materials would be updated to help the public understand the reasons for these changes, stressing that each individual plays a role in preventing wildlife impacts through proper behavior.

7.b. Establishing Visitor Zones

Objective 7.b(1): With plan approval, two visitor use zones will be established to concentrate the most intensive visitor use activities and facilities within an identified primary zone and disperse other less intensive uses in a secondary zone.

Proposed Change

In an effort to provide guidance for the development of future visitor facilities, programs and activities, it would be refuge policy to direct all public use programs, activities and facilities to defined sections of the refuge. By zoning public use activities, the refuge can concentrate facilities and better manage wildlife impacts. To that end two zones would be established (see Figure 7.2)

Primary Zone

The Primary Public Use Zone is the area where the majority of public use facilities would be concentrated. Most facilities, programs, and wildlife dependent recreation activities would be clustered here. Generally, the more intense public use activities would occur in the Primary Zone. Capital improvements for visitor amenities and improvements would be devoted almost exclusively in the Primary Zone. Facilities such as the Visitor Center, walking trails, Wildlife Drive, observation towers, photo blinds, and wildlife viewing areas, essentially most public use facilities, would be located in the Primary Zone.

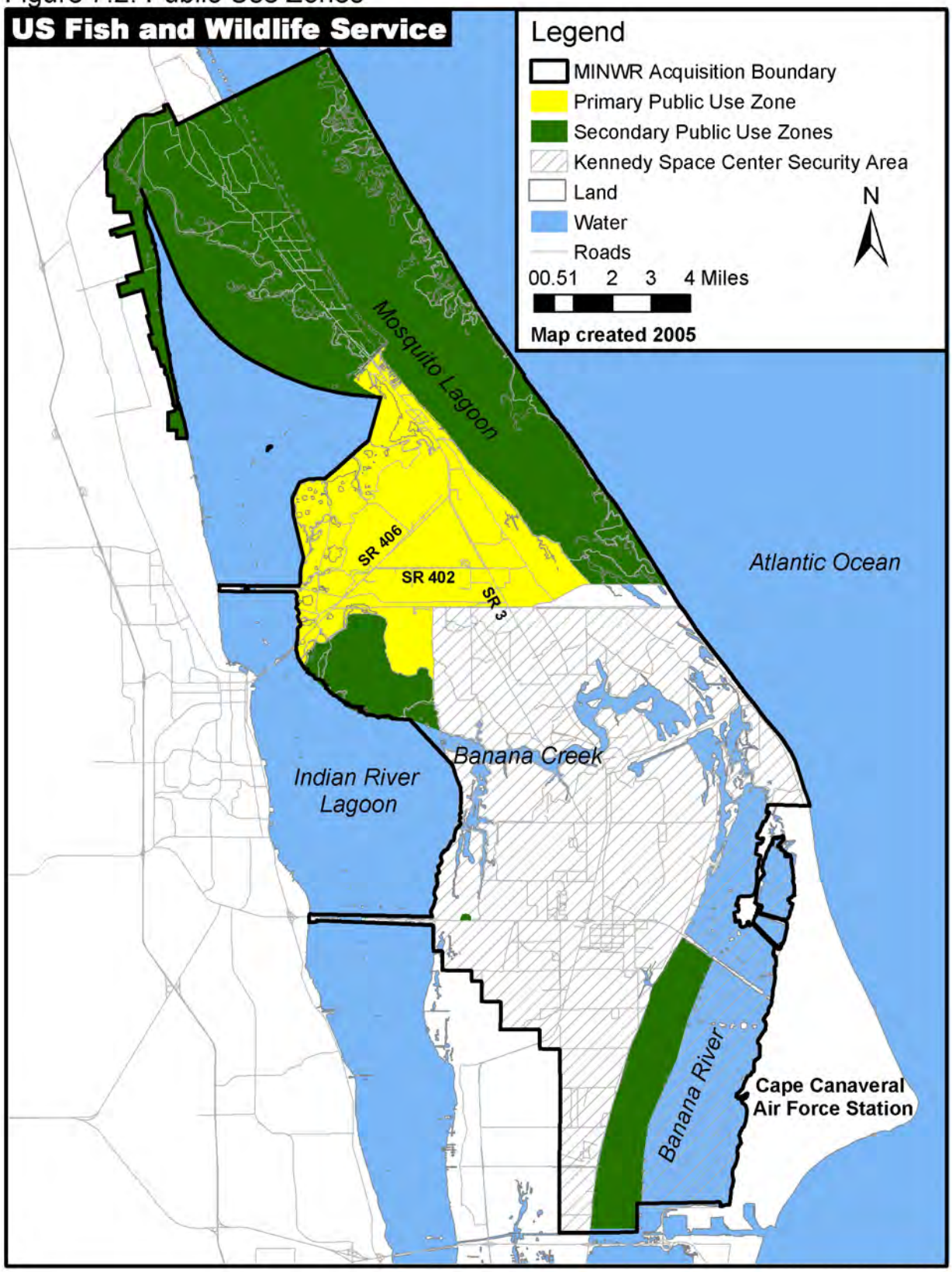
Secondary Zone

The Secondary Public Use Zone is the area where less intensive public use activities may occur. In some instances, when required to support a priority public use activity, facilities may be built, but only after it has been determined that it cannot be sited within the Primary Zone. Activities that require more space or that depend upon dispersed use to maintain the quality of the wildlife experience may fall into the Secondary Zone. Activities such as canoeing, wildlife observation, photography, hunting, and fishing may be appropriate uses in the Secondary Zone. Few improvements or visitor amenities would be provided. When not required or needed for a priority public use, some or all of the Secondary Zone may be closed. For example, a portion of the Zone may be opened for a single event, such as a field trip, and closed after the event is completed. Similarly, only a specific portion of the area could be opened, such as a designated road for wildlife observation, but the surrounding area would remain closed. Some uses may be seasonal, such as a hunt, and when not required for the hunt program, the area could be closed or use restricted to protect wildlife habitat or other refuge resources.

The two public use zones would be located as listed.

The Primary Zone begins at the northwest corner of Haulover Canal and runs east to the northeast corner of Haulover Canal. It then turns south following the west shore of Mosquito Lagoon and the BioLab Road to Beach Road. From here the Primary Zone

Figure 7.2. Public Use Zones



turns west and follows Beach Road and SR 402 to the intersection of Peacocks Pocket Road. From this point the Primary Zone turns south on Peacocks Pocket Road to the Indian River Lagoon shoreline, and then following the shoreline a short distance west to Timberline Dike Road. The Zone then follows Timberline Dike Road north and northwest to Gator Creek and follows Gator Creek and West Gator Creek to the refuge's western boundary at SR 406. From this point the Zone heads northward following the east shoreline of the Indian River Lagoon and/or the western refuge boundary back to the northwest corner of Haulover Canal, the beginning point.

The main portion of the Secondary Zone begins at the northwest corner of Haulover Canal and runs westward where it intersects the refuge boundary and then runs northward following the western boundary to US 1 (including the scattered and non contiguous refuge parcels on the west side of the Indian River Lagoon). From this point, it follows the northern refuge boundary eastward to SR 3, then south on SR 3 to the Gomez Grant Line, then east following the Gomez Grant Line across Mosquito Lagoon to the eastern edge of the Lagoon or eastern edge of the mosquito control impoundments. Following the impoundments eastern edge, the boundary would go south to Beach Road, then following Beach Road west to BioLab Road. From this point the Secondary Zone would turn north and follow the east side of BioLab Road or the west shoreline of Mosquito Lagoon to the northeast corner of Haulover Canal and continues west along the north shore of Haulover Canal to the beginning point.

Three additional non-contiguous secondary zones would be established south of the above described zone.

A secondary zone would be established in the open portion of the Banana River, which includes only the waters between the NASA Causeway and the southern boundary of the refuge located just north of the 528 Causeway. This zone is only open to non-motorized boats. A small secondary zone would be established on the north side of SR 405 at Moore Creek. This would be restricted to wildlife viewing and is subject to conditional approval by NASA Security as it falls within an area that is currently closed. Finally, another zone would be established in two impoundments, T-24-D and T-24-C. These impoundments would open primarily to wildlife viewing and fishing, as well as open seasonally for waterfowl hunting

Monitoring and Evaluations

Additional zoning within the Primary and Secondary zones may be required to meet refuge objectives and provide buffer areas where wildlife can retreat from the public. For example, the impoundments between SR 406 and Black Point Wildlife Drive, although open to the public, do not receive much visitor use and currently serve as a sanctuary area. A cable prevents visitors from driving into this area; however, on occasion, birdwatchers or fishermen walk into this area. L Pond Road, located in the Primary Zone, and Shiloh Marsh Road. located in the Secondary Zone. are closed seasonally to vehicles, but are open to walk in use. These uses would be monitored to determine if additional restrictions are needed.

8. COMMUNICATE KEY ISSUES WITH OFF-SITE AUDIENCES

GOAL 8: KENNEDY SPACE CENTER WORKERS AND LOCAL RESIDENTS WILL RECOGNIZE THE REFUGE AND SUPPORT ITS PURPOSES.

8.a. Kennedy Space Center Workers

Objective 8.a(1): Within five years of plan approval, at least 75% of regularly sampled members of the Kennedy Space Center's workforce will be able to recognize that the refuge overlays NASA lands and will understand the importance of the refuge to migratory birds, threatened and endangered species, and other wildlife.

Strategies:

- Conduct four programs or two special events each year that target KSC's employees**.**
- Include NASA senior management at KSC in various refuge special events and staff functions.
- Educate key personnel about NASA's impact on wildlife at KSC (e.g., lighting issues related to sea turtles and dredging activities impacting manatees).
- Submit two articles per year for publication in KSC Bulletin or Spaceport News.
- Increase participation in Energy and Environmental Awareness Week by providing tours and manned displays by staff or volunteers.
- Target key KSC staff for outreach messages (e.g., external affairs staff, launch staff, and executive staff) on key issues (e.g., fire and lighting).
- Increase participation in KSC's Open House.
- Develop a web site to address those frequently asked questions posed by KSC employees.
- Play a coordinated role in the KSC new employee orientation.
- Fill the Ranger position that would work in outreach.

Current Program

Merritt Island NWR is an overlay refuge where the majority of the lands and waters are owned by another agency, NASA. The refuge would not have been established if it were not for the mission and resources of NASA. Likewise, NASA's mission and operations have the greatest potential to disrupt the refuge's Visitor Services Program. At any time lands can be withdrawn from the refuge and turned back to NASA for space related purposes. It is incumbent upon the refuge to educate NASA's management and workforce of the values of the refuge and seek support for refuge programs.

Proposed Change

The two most important outside populations (i.e., the groups that the refuge depends upon for support) are the Kennedy Space Center (i.e., upper level management, contractors, and work force) and local residents. The refuge should target these two populations and develop outreach strategies to build their support of the refuge. A goal for outreach is building support among stakeholders and one means is through education. From education comes understanding, through understanding comes appreciation, and from appreciation comes support. The refuge needs to increase understanding, appreciation, and support for the refuge with targeted audiences. This is especially true for decision makers and individuals in leadership positions who can have influence over refuge programs.

8.b. Local Residents

Objective 8.b(1): Within five years of plan approval, at least 50% of regularly sampled local residents will be able to recognize the location of the refuge and will understand the importance of the refuge to migratory birds, threatened and endangered species, and other wildlife.

Strategies:

- Increase participation in the Tourist Development Council.
- Develop paper on the economic impact/value of refuge to the local community.
- Develop a speakers' bureau with staff and volunteers to better respond to requests from civic organizations.
- Acquire a laptop computer and projector for the Visitor Services Program and develop a series of PowerPoint presentations on targeted subjects.
- Develop a weekly column in the local newspapers.
- Survey local residents to determine the effectiveness of outreach activities in delivering the refuge's messages.
- Develop a trail and fishing dock on the south side of Titusville Causeway on West Gator Creek.

Proposed Change

Continue to work with and co-sponsor the annual Space Coast Birding and Wildlife Festival to help the event grow and to promote the refuge. Continue to work with the Chamber of Commerce, City Council, and Tourist Development Council to market the environmental amenities of the refuge and demonstrate that "birds mean business" for area merchants.

Over the next 5-10 years, the refuge would develop a trail on the south side of the Titusville Causeway on West Gator Creek. The development of the Gator Creek Trail and Observation Tower would help connect the refuge with the community, since it is located just outside the City limits and would likely receive heavy use by local residents. The trail could be developed in concert with improvements planned for the new causeway or completed separately as a stand alone project. Either way, the trail would provide a convenient location for Titusville residents to connect with the refuge, while at the same time providing additional wildlife viewing for all visitors. The trailhead for the Gator Creek Trail would be co-located at the entrance kiosk where an existing 15 car parking lot exists. The trail would follow the dike south about one-quarter mile and terminate at the mouth of Gator Creek at an elevated observation tower. To the west is the Indian River Lagoon and Titusville and on all other sides are the marshes and tidal creeks of the refuge. Wildlife viewing would be the featured use, but fishing would also be accommodated. A fishing dock into the Indian River Lagoon would be an added feature. Access to the fishing facility would be located off the causeway and managed by the City (which is the preferred option) or from West Gator Creek Road. A high demand for fishing exists at this location. Litter associated with the bank fishermen is a problem, so trash receptacles and periodic clean ups would be needed. A partnership with Titusville or Adopt a Shore Program may be developed to help address the trash problem at this location.

9. BUILD VOLUNTEER PROGRAMS

GOAL 9: A SUFFICIENT NUMBER OF SKILLED AND TRAINED VOLUNTEERS WILL BE AVAILABLE TO SUPPORT THE REFUGE IN MEETING ITS MISSION AND PURPOSES.

9.a. Volunteer Training

Objective 9.a(1): Within five years of plan approval, at least 75% of needed volunteer positions will be filled and each individual will receive adequate training to proficiently perform assigned duties with minimal supervision.

Strategies:

- Work with MIWA to develop a strategy for funding a Ranger position to serve the Visitor Center and coordinate volunteers, separate from education, interpretation, and outreach activities.
- Develop an active list of needed volunteer positions.
- Develop a job description for each volunteer position.
- Recruit capable volunteers to fill the needed positions.
- Train volunteers to perform positions with minimal supervision.
- Monitor the volunteers to insure that they are performing at an acceptable level.
- Provide the volunteers frequent feedback and praise.
- Reward volunteers through various events and include them in staff functions.
- Provide RV pads for volunteers and/or work out a partnership with an off-site campground.
- Recruit volunteers online through Earth Watch and other similar programs.

9.b. Volunteer Job Satisfaction

Objective 9.b(1): Within five years of plan approval, at least 75% of volunteers will annually report that they are highly satisfied with their positions.

Strategies:

- Develop a feedback system where volunteers can provide input to improve job satisfaction.
- Implement changes to continually improve volunteer job satisfaction.
- Develop an evaluation for volunteers and administer it annually.

Current Program

The refuge has an active volunteer program with about 75 volunteers. In 2004, volunteers contributed 5,682 hours, which amounts to about 2.75 man years of labor. Volunteers perform a wide variety of duties primarily in the Visitor Services and Biology programs.

Volunteers are managed and trained by the Visitor Services staff. Managing a program of this size is a full time job, but it is handled by one of the two Visitor Services staff who also manages the Visitor Center and conducts environmental education, interpretation, and outreach. The refuge would benefit from expanding the program, but it takes time to write job descriptions and recruit, train, and supervise new volunteers. Under current staffing, the refuge cannot allow the program to grow beyond the current level. Additional staff is needed to properly manage the program (e.g., set-up schedules, supervise, recruit, train, reward, correct behavior, and plan events).

Proposed Change

Volunteer are already contributing almost three man years of labor to the refuge each year. The refuge could benefit from recruiting and training new volunteers, but without additional staff, the program cannot be allowed to grow. The refuge would seek funding for one new Visitor Services staff. A reliable source for additional funding is through implementing a day use fee.

Monitoring and Evaluation

The Volunteer Coordinator would provide annual training for volunteers and establish an evaluation to obtain feedback from each volunteers on how they are treated, how satisfied they are with their jobs, and how adequate their training is.

10. BUILD SUPPORT OF FRIENDS GROUP

GOAL 10: THE MERRITT ISLAND WILDLIFE ASSOCIATION WILL BE AN ADVOCATE FOR THE REFUGE, SUPPORTING ALL REFUGE GOALS AND OBJECTIVES AND PROVIDING FINANCIAL AND IN-KIND SUPPORT OF REFUGE PROGRAMS.

10.a. MIWA Membership

Objective 10.a(1): Over the 15-year life of the plan, the refuge will continue to maintain a close working relationship with MIWA, assisting in promoting the growth in membership and financial revenues, providing input on refuge needs, and working to align interests.

Strategies:

- Continue to dedicate a staff person to serve as a liaison to the MIWA Board. The liaison would communicate refuge needs to MIWA and MIWA needs to refuge management.
- Assist MIWA in expanding its membership.
- Dedicate a portion of the Visitor Center to MIWA as a sales area.
- Assist MIWA in marketing its products and membership.
- Develop a PowerPoint program for off-site speaking engagements.
- Recruit and train one or more MIWA members for a speakers' bureau.
- Continue to work with MIWA in promoting special events, such as photography workshops and wildlife art exhibits, as a means of growing membership.
- Assist MIWA in the development of a website.
- Encourage the Book Store Committee to continue to find and market new refuge-oriented products.
- Work with MIWA in continuing to find and try new ways to generate funds.
- Work with MIWA in finding and forming new partnerships for funding refuge projects.
- Continue to assist MIWA in applying for grants.

10.b. MIWA Employment

Objective 10.b(1): Over the 15-year life of the plan, encourage MIWA in its hiring practices to hire employees who will assist the refuge in running the Visitor

Center and the Visitor Services Program by assisting with visitor information and orientation, interpretive activities, and environmental education programs.

Strategies:

- Continue to work closely with MIWA employees to find ways to assist each other in the operation of the Visitor Center and sales area.
- Help MIWA develop a position description that outlines the philosophy of supporting MIWA and refuge programs and needs.
- Make MIWA employees feel like they are part of the staff.
- Include MIWA employees in all refuge social functions.
- Work with MIWA in recruiting and hiring employees who have good people skills and who are willing to assist the refuge in the daily operations of the Visitor Center and with interpretive and educational programs.
- Work with MIWA in identifying grant sources and applying for grants to fund Ranger positions to support environmental education, volunteer coordination, and/or interpretation.
- Make sure all refuge staff understand the important role MIWA employees play in the operation of the Visitor Center and in running the Visitor Services Program.

10.c. MIWA Outreach

Objective 10.c(1): Over the 15-year life of the plan, encourage MIWA to become proactive in assisting the refuge in reaching new visitors and expanding the Visitor Services Program.

Strategies:

- Work with MIWA to find new ways to expand the Visitor Services Program.
- Find ways MIWA can assist in developing interpretive programs.
- Find ways MIWA can assist in the daily operations and maintenance of visitor facilities.
- Find ways MIWA can assist in the recruitment, training, and supervision of volunteers.
- Work with MIWA on the development of tram/train tours.
- Encourage MIWA to seek funding to purchase and operate a train or tram tour.
- Seek funding for capital improvements to match MIWA's funding.
- Recruit and train interpretive volunteers to assist MIWA in delivering tours.

Current Program

The Merritt Island Wildlife Association was formed in 1994 and, in ten years, has grown to about 1,100 members. MIWA runs the sales outlet in the Visitor Center and in 2004 conducted $184,659 in sales and more than $20,000 in membership dues. "The purpose of MIWA is to promote conservation, awareness, and appreciation for the Merritt Island NWR and to provide assistance to refuge programs." Under the refuge's guidance, MIWA has successfully funded a number of refuge projects. In recent years, it has taken on several high profile projects. In 2002 it raised $50,000 to build the Sendler Educational Outpost to fulfill a need the refuge had in building an environmental education program. In 2003 it provided another $45,000 to develop restrooms at the site. Then in 2004 it initiated a Pathways To Nature project for $50,000 to make wildlife viewing improvements on Black Point Wildlife Drive. The establishment of MIWA has been an unequivocal success and has benefited and advanced the Visitor Services Program and other refuge programs in more ways than can be identified in this plan.

Proposed Changes

Over the life of this plan, the refuge would assist MIWA in growing membership and revenue and the refuge would engage MIWA in the challenging issues facing the refuge. MIWA has an established track record for success and the challenge for the refuge is to keep it engaged in meeting the refuge's needs. The two most pressing needs going forward are staff and budget shortfalls and MIWA has demonstrated that it can assist in both arenas.

In terms of staff, MIWA employs one full-time book store manager, whose primary responsibility is selecting, ordering, and stocking sales items; keeping the financial records; training volunteers to run the sales register; and running the register when a volunteer is not available. For all practical purposes, this position serves as an extra staff person for the refuge and assists the Visitor Services staff in running the Visitor Center. When a Visitor Services employee is out sick, on travel, or on vacation, the MIWA employee fills in and performs many of their duties. Over the next 15 years as the sales and membership grow, the refuge would work with MIWA and encourage them to fill new positions. Building on past experience, the refuge has learned that the MIWA position can serve the refuge in running the Visitor Center. Unless funding is available to fill needed Visitor Services positions, the next best approach is hiring additional MIWA employees who are willing and able to perform collateral duties and serve as back up to Visitor Services staff. Another approach is to work with MIWA in finding grants that would provide funding for key Visitor Services staff, such as the environmental education position. Cape Romain NWR uses this approach and has been successful in filling two positions that work with refuge staff in running its environmental education program. The refuge would continue to work with MIWA, encouraging it to use its employees to support refuge needs and/or finding funds to fill needed refuge positions. Hopefully it would never come to pass, but during austere times, it is conceivable that MIWA employees could be pressed to do even more in managing the Visitor Center. Therefore it is incumbent on the refuge to continue to work closely with MIWA, training its employees in running the Visitor Center and finding ways to assist each other in performing respective duties.

Another area in which MIWA could help is funding projects that help to enhance the Visitor Services Program. MIWA has shown a keen willingness to help fund new initiatives. One idea that has been promoted is establishing a tram for guided tour as described under Objective 6.e(1). The train or tram tour could be run by MIWA and the tickets prices scaled to offset operating cost with a modest profit to support future refuge projects. This could be a revenue producer for MIWA, provide a means of expanding interpretive tours, and help increase visitation.

These are but a few ways MIWA can help the refuge. The main challenge for the refuge is to provide guidance and direction to MIWA on refuge needs, then get out of the way and let MIWA help the refuge accomplish goals and objectives.

V. Other Visitor Services Programs

11. LAW ENFORCEMENT

GOAL 11: THE REFUGE WILL HAVE A SUFFICIENT LAW ENFORCEMENT STAFF TO PROTECT THE VISITING PUBLIC, REFUGE FACILITIES, AND WILDLIFE RESOURCES AND ALL OFFICERS WILL HAVE ADEQUATE TRAINING AND EQUIPMENT TO PERFORM THEIR DUTIES.

11.a. Law Enforcement

Objective 11.a(1): Within five years of plan approval and through random annual survey, at least 90% of visitors will report they feel safe and can affirm that law enforcement personnel and refuge regulations are adequately protecting visitors and wildlife.

Strategies:

- Maintain all entrance, boundary, information, guide, and interpretive signs that reinforce the identity of the refuge and National Wildlife Refuge System.
- Keep all kiosks stocked with appropriate brochures that provide current and accurate information on rules and regulations.
- Complete the development of two new informational kiosks.
- Maintain a high law enforcement profile in high traffic areas.
- Have rapid law enforcement response to crimes committed against visitors.
- Acquire and utilize the most up to date law enforcement training and equipment.
- Have all law enforcement officers obtain state or national certification for operating radar and administering field sobriety tests.
- Acquire cellular modems for all laptop law enforcement computers.

Objective 11.a(2): Within five years of plan approval, law enforcement officers will contact 10% of visitors participating in consumptive recreation activities (i.e., hunting and fishing).

Strategies:

- Acquire signs for the Pole and Troll Zone and new upland hunt areas.
- Post regulations and other pertinent fishing information at boat ramps.
- Develop an online fishing education course.
- Require hunter safety training as a condition of upland hunt permits.
- Acquire night surveillance equipment to monitor visitors who enter the refuge after dark.
- Acquire a flats boat capable of operating in all weather conditions to monitor fishermen operating in the Pole and Troll Zone and other lagoon waters.
- Acquire a go devil-type motor to monitor and check waterfowl hunters.
- Install a sufficient number of vandal-resistant gates to prevent ingress into closed areas of the refuge and to protect refuge facilities.
- Install signs which educate and inform visitors on prohibitions (e.g., against personal watercraft and airboats).

Objective 11.a(3): Within two years of plan approval, law enforcement officers will spend at least 75% of their work time in the field.

Strategies:

- Acquire cellular modems for all laptop law enforcement computers. Law enforcement officers would write violation notices, check email, and complete most administrative paper work in the field. Law enforcement officers would have the capability to conduct background checks on suspects and obtain BOLOS and other real-time information in the field.

Objective 11.a(4): Within five years of plan approval, there will be a 50% reduction over 2004 levels in the number of reported boat-related manatee deaths or injuries in and around the refuge.

Strategies:

- Acquire a flats boat capable of operating in all weather conditions to monitor manatee zones.
- Acquire night surveillance equipment to monitor visitors who enter the refuge after dark.
- Work with the state and other partners in obtain an adequate number of signs to post all manatee zones. A standard of one sign per half mile should be used to post all state Manatee Slow Speed Zone around the refuge.
- Add one additional Law Enforcement Officer to the staff with the primary responsibility of marine patrol to include manatees and the pole and troll zones.
- Routinely patrol all manatee zones in and around the refuge.
- Plan manatee law enforcement details during high boat traffic events, such as the July 4th weekend, Hunt for Reds Fishing Tournaments, and other holidays and events as needed.
- Enlist the support and cooperation of other agencies in enforcing manatee regulations on the refuge.
- Work with NASA in establishing a slow speed zone in the restricted waters of KSC.
- Continue with the policy of requiring mandatory Manatee Awareness Training for all of NASA's personnel and contractors who operate boats in the Banana River.
- Increase manatee outreach efforts during special events.
- Increase manatee awareness to youth through environmental education programs.

Objective 11.a(5): Within 10 years of plan approval, there will be a 50% reduction over 2004 levels in reported drug violations, vehicle break-ins, and illicit sexual offences in the primary public use zone of the refuge.

Strategies:

- Increase law enforcement staff to patrol during the times the offences are occurring.
- Acquire surveillance equipment, including night surveillance equipment to monitor visitors who enter the refuge after dark.
- Maintain a close working relationship with collaborating agencies and enlist their cooperation in preventing and solving refuge visitor-oriented crimes.
- Create an Award Program for individuals who report crimes.

Objective 11.a(6): Within 15 years of plan approval, the Refuge Manager other law enforcement agencies, and the public will be able to contact a refuge Law Enforcement Officer 24 hours a day, seven days a week to respond to law

enforcement emergencies, search and rescues operations, and other law enforcement situations.

Strategies:

- Maintain a law enforcement communication system (i.e., radio or cellular phone system) capable of communicating with refuge management staff and collaborating law enforcement agencies.
- Maintain a current law enforcement call out list with all collaborating agencies and key refuge staff.
- Provide emergency law enforcement phone numbers in appropriate publications, kiosks, and key refuge locations.
- Update Standard Operating Procedures for law enforcement emergencies every year.
- Conduct patrols for new planned hunts, provide law enforcement oversight of the fee program, and protect the growing numbers of visitors.
- Use fee revenue to help fund one new law enforcement position and seek funding from the Endangered Species Program to fund a manatee officer.

Current Program

Law Enforcement is a critical function of the Visitor Services Program. Since the beginning of the National Wildlife Refuge System, law enforcement has been one of the primary tools in protecting the plant and wildlife resources of the refuge. Over time, crimes have changed and the role and emphasis of the law enforcement program has evolved. Merritt Island is no exception, and today, protecting the natural resources is important, but increasingly more of the officers' time is spent dealing with or protecting the public. The program is adjusting to increasing visitation, shifts in criminal activities and public use trends, and a smaller law enforcement staff. Currently, the refuge has two full-time law enforcement officers to support the refuge and its two satellite refuges, as well as to support the Zone Officer and nearby refuges.

With increasing visitation comes increases not only in the amount, but in the types of crime. The days when the refuge law enforcement officers enforced primarily hunting and fishing regulations are gone. Instead, the refuge is experiencing more urban crime, such as vehicle break-in, drug use and drug trafficking, traffic stops and traffic accident investigations, stolen vehicles, illicit homosexual activity (which is affecting the visiting public), criminal investigations, suicide, and more serious crimes. It is interesting to note that the aforementioned crimes, for the most part, are occurring to the visitors and not against wildlife. This criminal activity is negatively affecting the public's perception of Merritt Island NWR and the Refuge System. Therefore, it is incumbent on the refuge to maintain a suitable number of officers to do their job and to insure that the officers are well trained and equipped.

Over the last 10 years, population growth in the surrounding counties has affected use patterns on the refuge. Two examples of this are in fishing and boating and both illustrate how public uses affect refuge resources and impact the Law Enforcement Program. Personal watercraft, flats boats, and commercial fishing guides are uses which have appeared over the last decade or so. This increase in water-oriented recreation has forced the refuge to ramp up manatee protection efforts. In 1990 a 10,000-acre no-motor zone to protect manatee habitat was established in the Banana River. At the same time, refuge officers have been tasked with enforcing manatee

zones off the refuge. To address these issues, the refuge is required to devote more time to on-water law enforcement patrol and acquire boats and other equipment necessary to perform this work.

Population growth has resulted in an increased emphasis in other types of crime. More and more, the refuge is becoming a recreational destination for Central Florida residents and tourists. With this visitation comes a host of urban issues. Drug use is an ongoing and growing problem. Another new and growing problem is homosexual activity in public areas. Several trails and public fishing areas seem to serve as rendezvous points for illicit sexual activity. These individuals seem to prefer locations that are somewhat remote, but on some occasions, when a refuge visitors surprises them, they often continue their illicit activity. The refuge conducts surveillance and sting operations to discourage this activity, but to eliminate it takes more staff effort than is currently available. The same is true for prostitution. Some back roads of the refuge attract prostitutes who show up with their clients. Fortunately this occurs mostly at night after the refuge is closed, therefore it does not affect visitors as much as the illicit homosexual activity. Vehicle break-ins are yet another growing law enforcement issue. This activity can be sporadic and normally centers on trailheads and remote fishing and boat launch sites. Again, at current staff levels, the refuge can only work this problem when it becomes chronic.

Proposed Change

Changes outlined in this plan, such as the implementation of the fee program, upland hunting, and Pole and Troll Zone in Mosquito Lagoon, as well as other changes would place additional burden on the law enforcement staff. However, over the last 15-years the number of officers on this station has declined from nine to two. (This is a result of the loss of collateral duty law enforcement officers). Based on the size of the refuge, the level of visitation, manatee patrol responsibility, levels of commercial activity, and other factors, the International Association of Chiefs of Police Deployment Model suggests that Merritt Island Refuge should have 13 law enforcement officers. At a time when law enforcement needs are increasing, the refuge needs to add additional law enforcement staff. Instead the reverse has occurred.

To keep pace with the added responsibilities and to offset loss in officers, the addition of two officers is proposed for the Law Enforcement Program for a staff of four: a lead officer and three other officers. One new officer is needed to support the fee program, the pole and troll zones, and manatee zones. Brevard County often leads the state in manatee mortality and with the increasing level of boat traffic one additional officer is required. This would bring the total to four full-time officers, but even at this level the refuge could only provide marginal law enforcement coverage. As visitation and population growth in Central Florida increases, so should the law enforcement staff. The addition of one new law enforcement position would be the highest priority for the Visitor Services Program and would be funded through the implementation of a fee program.

12. CONCESSION OPERATIONS

GOAL 12: THE REFUGE WILL EVALUATE A CONCESSION AGREEMENT TO IMPROVE VISITOR SERVICES AND STREAMLINE ADMINISTRATION OPERATIONS.

12.a. Concession

Objective 12.a(1): Within the 15-year life of the plan, prepare a written evaluation regarding the establishment of a concession operation to bring all commercial operations under a single point of contact.

Strategies:

- Evaluate the potential for establishing a concession operation for water-oriented recreation, such as fishing guides, canoe rentals, and other uses.
- Evaluate the potential for establishing a concession operation for tram tours. Compare the establishment of a concessionaire with using MIWA to provide visitor services.
- Evaluate the need for facilities to support all commercial operations.

Current Program

None

Proposed Change

At this point, a concession operation is not warranted, although within the 15-year life span of this plan, it may be. A concession operation could benefit the refuge in several areas.

The best fit for a concession operation seems to be in the area of water-oriented recreation. Guided fishing trips, commercial boat tours, and kayak rentals could be rolled under a single concession operation and consolidate management of these commercial operations, providing a single point of contact for the refuge's staff. A concession operation could be combined with Canaveral National Seashore, where a single concessionaire would serve both agencies. The concessionaire would be selected on criteria established by the refuge and the Seashore and operate and perform under specific guidelines. Thus, the refuge would have better control than currently exists under the Incidental Business Permit system. Under a concession agreement some of the revenue generated by selling these services and equipment would come back to the refuge. Ideally, the concessionaire would operate the business on-site, but the biggest obstacle is the lack of facilities to serve as an on-site base of operations. It is possible to structure the concession operation where the concessionaire would provide the capital to construct the buildings and infrastructure, which would eventually become the property of the government. Another approach would be to seek outside funding sources to construct the structure and lease it to the concessionaire.

Another potential fit for a concessionaire is operating tram tours. Like the above, the concessionaire may be required to provide capital to buy and operate the tram and construct buildings and a infrastructure, saving the government and/or MIWA this expense. This could be a stand alone concession operation or combined with the water-oriented concession operation previously mentioned. Other land based tours could also be rolled into a concession agreement.

13. FEE PROGRAM

GOAL 13: THE REFUGE WILL IMPLEMENT A FEE PROGRAM TO ENHANCE VISITOR SERVICES AND THE VISITOR EXPERIENCE.

13.a. Quota Hunt Permits

Objective 13.a(1): Within two years of plan approval, the refuge will charge fees for quota hunt permits sufficient to defray administrative and maintenance costs to operate the program.

Strategies:

- Restructure the fee schedule for waterfowl hunt quota permits by charging a fee of $15.00 for each hunt, rather than $12.50 for a two-day (weekend) hunt.
- Periodically poll other refuges that have quota hunts to insure that the quota fee charged at Merritt Island NWR is consistent with other national wildlife refuges.
- Evaluate the need to implement Quota Permits for other waterfowl hunting areas.
- Implement quota permits for upland hunts and any future hunt, when they are established.

Current Program

To help support the program, the refuge generates less than $10,000 annually from the sale of quota waterfowl hunting permits. The fee for a quota permit is $12.50 and the permit is good for a one-day hunt (Wednesday) or two-day hunt (Saturday and Sunday). In 2003, the refuge was open to quota hunts on 19 days, but because weekend hunts were sold as a single permit, quota permits were sold for only 11 days. Under this system, the refuge had the potential to generate $9,075. This amount could increase to $15,675, an increase of about 40%, by restructuring the permit system to charge for each hunt day.

$12.50 x 11 days x 66 permits sold per day = $9,075
$12.50 x 19 days x 66 permits sold per day = $15,675

Proposed Change

In the fall of 2007, the refuge would begin charging a fee of $15.00 for each hunt day the permit is issued. The $2.50 increase is consistent with the new guidelines for quota fees provided in the Service's Southeast Region. When the refuge begins the upland hunt, additional revenue to support the program could be generated through the sale of deer and hog quota permits. This hunt would be conducted in cooperation with the Florida Fish and Wildlife Conservation Commission and details regarding how revenues would be split would be worked out between the respective agencies through the development of the Hunt Plan and interagency agreements.

13.b. Sports Fishing Permits

Objective 13.b(1): Within two years of plan approval, the refuge will implement an annual fee for sports fishing permits sufficient to defray administrative and maintenance costs to operate the program.

Strategies:

- Implement a fee of $5.00 for a weekly permit or $20.00 for an annual sports fishing permit to defray administrative and maintenance costs.
- Develop an online application.
- Fee revenues generated from this program would be used to enhance the sports fishing program, control litter, and hire additional law enforcement staff.

Current Program

The sports fishing program is one of the fastest growing programs on the refuge and there is no end in sight for the demand for quality saltwater flats fishing. The refuge currently requires all fishermen to obtain a free, self-issuing Fishing Permit annually. The refuge maintains four boat ramps to support the program.

Proposed Change

Numerous improvements are outlined in the fishing section of this plan which are intended to enhance and sustain a high quality sports fishing experience. The most notable changes include implementing a Pole and Troll Zone in Mosquito Lagoon, installing restrooms at Haulover Canal, installing trash receptacles at all ramps, and improving bank fishing opportunities at several locations.

To recover some of the costs of maintaining and improving the fishing program, additional revenues are required. The most equitable means to generate additional revenue is to implement an annual fee for the Sports Fishing Permit. The proposed annual fee is $20 or $5.00 for a weekly permit. The permit would be renewed annually in January through several means. The primary method would be by downloading an online application and mailing in a check or money order to the refuge. Accommodations would be made for walk-in customers. Revenue generated by the fee would be targeted to implementing elements outlined in the fishing and law enforcement sections of this plan.

13.c. Black Point Wildlife Drive

Objective 13.c(1): Within two years of plan approval, the refuge will implement a fee for Black Point Wildlife Drive to help defray the administration and maintenance costs.

Strategies:

- Implement a fee of $5.00 for a weekly pass or $20.00 for an annual Black Point Wildlife Drive Pass.
- Fees generated from this program would be used for routine maintenance, to help fund enhancement projects, and partially cove the cost of hiring Visitor Services staff.
- Hire a part time fee collector.

Current Program

Most national wildlife refuges in Florida that maintain major visitor service facilities charge an entrance fee (e.g., J.N. Ding Darling NWR, Loxahatchee NWR, and St. Marks NWR). Here at Merritt Island this is not possible due to the fact that the refuge road network is owned by NASA and used by its work force. Many of the refuge's visitor facilities are rundown. At the same time, visitation is increasing and refuge budgets are projected to remain flat or decline over the next several years. Voluntary donations are currently collected on Black Point Wildlife Drive through a self-serve fee tube which generates roughly $6,000 annually. To maintain and enhance the program additional revenues are needed.

Proposed Change

The refuge would initiate a fee on Black Point Wildlife Drive. Revenue from the program would be used to help pay for restrooms and wildlife viewing improvements on the Drive as outlined in this plan. Although Black Point Wildlife Drive is the only site designated for a fee, leftover revenues generated at this site may be used to maintain other visitor facilities, such as the Allan Cruickshank Memorial Trail, Oak and Palm Hammock trails, Scrub Ridge Trail, and the Manatee Observation Deck. The fee is for the vehicle and would be good for all the occupants of a single vehicle. Visitors would have the option to purchase a weekly ($5.00) or annual pass ($20.00). The fee could be purchased at the trailhead through a self-serve pay envelope or at the Visitor Center. An estimated $250,000 could be generated from this program annually. In addition to making facility improvements, the revenue generated by the Black Point Wildlife Drive fee may be used to partially fund one or more staff positions called for in this plan.

For entrance to Black Point Wildlife Drive, the refuge would also honor a Duck Stamp, a Golden Eagle Passport, a Golden Age Passport, and a Golden Access Passport.

REVENUE ESTIMATES

The five year average use on Black Point Wildlife Drive is about 127,000 visitors per year. Assuming use drops 20% with the implementation of a fee, visitation could decline to around 100,000 visitors per year (101,600). With a weekly fee of $5.00 per car or $20.00 per year, Black Point Wildlife Drive could generate about $250,000 per year (2 people per car). This estimate may be high, since the pass is good for one week or a year and a single user may make repeat visits to the Drive. It is likely that many local and/or regular users would opt for the annual pass. Canaveral National Seashore charges an entrance fee of $3.00 per person or $35 per year where roughly 65% of their users buy day passes and 35% buy the annual pass. If the percentages were similar for Black Point Wildlife Drive, the Drive may generate an estimated $200,00 per year.

[(65,000 ÷ 2 people per car x $5.00 per vehicle) + (35,000 ÷ 2 people per car x $20.00 x 0.10 visits per year) = $197,500]

Estimating revenue from sports fishing permits is a bit more difficult. The five year estimated average for saltwater fishing is about 193,000 visits per year. However, in 2003 and 2004 aerial surveys were used to estimate the number of boats using Mosquito Lagoon, providing a much lower estimate of annual fishermen (at about 52,195 using Mosquito Lagoon). According to the exit surveys conducted in 2003/2004, one third (33.2%) of the fishermen launch their boats off refuge and the average fishing party is about 2 people per boat (2.2). Using the lower estimate of 52,000; if use declines by 20% after the fees are implemented; and if 65% buy day passes, rather than annual passes, somewhere around $426,000 may be generated from the permit fees annually. Since a third of the fishermen launch off site, it may be difficult to collect the permit fees enforcing the permit fee would be a challenge.

[(52,000 * 0.80 * 0.65 * $5.00) + (52,000 * 0.80 * 0.35 * $20.00) = $426,400]

An additional $15,000 per year could be generated from the change in the quota waterfowl hunt permits.

Another factor in estimating revenue from fees is honoring other types of passes, such as Golden Age, Golden Eagle, and Golden Access Passports. Also it is policy within the National Wildlife Refuge System to honor Duck Stamps in lieu of an entrance fee. Duck Stamp revenue is used by the Service to purchase wetlands, therefore the purchase of a Duck Stamp would also be honored on the Wildlife Drive. Roughly 10% of the users are expected to meet the requirements of these national programs and would be exempt from the Black Point Wildlife Drive Fee.

Between the three programs (Black Point, sports fishing fees, and quota hunt program) an estimated $639,000 per year may be generated from the fee program. Under the Refuge Fee Program, the refuge would retain 80% of this or an estimated $511,000 per year. To collect the fees the refuge would hire a part-time Fee Collector and fund the salary of one Law Enforcement Officer. This would cost approximately $85,000 in salaries per year. Another full time Ranger position is required to implement the environmental education and interpretive program, costing another $60,000 per year. To maintain the public facilities one new maintenance worker is needed adding another $45,000 to the cost of the program. Excess revenue would be used to fund other visitor improvements and staff called for in the plan.

To collect the fees the refuge would install fee tubes at Black Point Wildlife Drive. Typically, to collect the fees, the user would enclose the fee in an envelope, remove the stub, and deposit the envelope in the fee tube. The stub would serve as proof of paying the fee. The fee tube would be checked regularly and citations issued to offenders. Fees for the quota hunt and sports fishing permits would be handled primarily by mail and the permit would serve as proof of payment. Annual Black Point Wildlife Drive fees could be obtained at the Visitor Center.

13.d. Commercial Guide Permits

Objective 13.d(1): Within five years of plan approval, commercial guide permits will be capped at no more than 70 permits and the fees will be sufficient to defray the program costs.

Strategies:

- Establish a moratorium on issuing new Fishing Guide Permits for five years.
- Cap commercial guides at or below 70 permits.
- Determine the appropriate number of guides for the Lagoon.
- Implement a lottery system to fill any vacant guide slots.
- Implement orientation training for fishing guides and require guides to deliver key refuge/Seashore messages.
- Increase the fee charged for commercial guides, as necessary.
- Increase law enforcement and monitoring of guides.

Current Program

The refuge works in cooperation with Canaveral National Seashore to issue Incidental Business Permits to fishing guides, kayak outfitters, and other commercial businesses operating in Mosquito Lagoon. The two-year permits cost $250 and in 2005 68 fishing guides, two kayak outfitters, and one boat guide were under permit, generating an estimated annual $8500 in fishing guide permit fees. The refuge and the Seashore evenly split the revenues from this program.

Proposed Changes

With the approval of this plan, a moratorium would be placed on the program and no new commercial fishing guides would be allowed to purchase Incidental Business Permits for five years while the program is evaluated. All guides who purchased permits from October 1, 2003 to September 30, 2005 would be allowed to renew their permit, but no new permits would be issued until the number of permits drops below 70 total permits. When permits are not renewed and the number falls below 70, permits may be issued to new guides to bring the total back to 70. At the end of five years, the program would be evaluated to determine if additional modifications are necessary. The refuge would work with Canaveral National Seashore to increase the price of the permits to $250 per year and implement an orientation course for guides who could serve as ambassadors for the agencies.

Currently the revenue received from this program is used to pay Canaveral National Seashore to empty trash cans at Bair's Cove Boat ramp. Additional revenues would be used to expand the trash removal at three additional refuge ramps. As revenues increase, excess revenue can be used to pay for maintaining the Pole and Troll Zone, making boat ramp improvements, installing restrooms at Bair's Cove, completing other Lagoon-oriented improvements, and hiring additional law enforcement positions.

14. IMPROVE THE REFUGE APPEARANCE

GOAL 14: THE LANDSCAPE OF THE REFUGE WILL BE FREE OF LITTER AND VISITORS WILL REPORT HOW CLEAN THE REFUGE APPEARS.

14.a. Litter

Objective 14.a(1): **Decrease litter on the refuge by 50% within five years of plan approval and by 75% within ten years of plan approval through a phased approach to address litter and to change user behavior.**

Strategies:

- Develop an Adopt-a-Trail Program.
- Hire a maintenance worker and buy a trash truck to assign to trash removal.
- Place trash receptacles at improved bank fishing locations and other trouble spots.
- Place monofilament recycling stations at key bank fishing locations.
- Organize clean-up events where the trash would be picked up, separated, and returned to the place of origin. Alert the media to the event to increase public awareness.
- Develop an award program for individuals reporting those who are littering.
- Establish regulations prohibiting glass bottles on the refuge to be consistent with Canaveral National Seashore.
- In lieu of paying for an annual fishing permit, hunting permit, or Black Point Wildlife Drive pass, individuals could pick up a set amount of litter from a designated location to receive an annual permit.
- Temporally or permanently close chronic litter areas.

Current Condition

Trash is one of the biggest problems facing the appearance of the refuge. Routinely, visitors complain about how much trash they see. The image of a litter-filled refuge does not create a good impression with visitors and does not reflect well on the Refuge System. Trash removal is a full-time job. Over the years, the refuge has hosted numerous clean-up events to remove trash and volunteers have spent weeks removing trash from problem areas, only to have the trash re-appear within days of the clean-up. The refuge also uses weekend community service crews to pick up trash. On several occasions, the refuge has closed areas until the litter was removed, but the litter was not removed and the staff had to picked up the trach. Each and every program attempted has failed to reduce the litter problem. Trash is a chronic problem and must be addressed in a more comprehensive manner.

Trash comes from a variety of users, but the most serious problems to date result from bank fishermen. Bank fishermen display a propensity to eat and drink heavily and seem to display little remorse in leaving their beer bottles and cans, food wrappers and bait containers, monofilament line, and other fishing paraphernalia where they fish.

Proposed Change

The refuge plans a multi-pronged approach to address the trash problem. First, the refuge would do its part by installing trash receptacles at all trailheads, at boat ramps, and at the most prominent bank fishing locations; adding a GS 4 Maintenance Worker whose primary responsibility is trash removal; and acquiring a trash truck to service the trash receptacles. Second, the refuge would develop a public outreach effort with signs, an Adopt-a-Trail Program, rewards for turning in violators, and other strategies to resolve the trash problem. Third, the refuge would implement a $20.00 annual fishing permit. Finally, the refuge would implement a regulation banning glass bottles.

Developing and installing the proper signage would be key. Signs that solicit public involvement, such as: “This is your Refuge, Keep it Clean”, along with other signs advertising rewards for individuals who turn in someone who is littering. Another strategy is to host a clean-up event where the trash is picked up and sorted by the place of origin, (i.e., all the products from a certain business would be segregated) and where the trash returned to the place of origin. An important element of this strategy is having press coverage at the event which would put negative publicity on the businesses that generates the trash and may help make them part of the solution instead of the problem.

Another strategy is banning glass bottles. It is a fact that many bank fishermen are consuming alcohol. Whether they are visiting the refuge to fish or drink is an open question, but one thing is clear: beer bottles are one of the biggest sources of litter. The broken discarded glass bottles present a safety hazard to other visitors and wildlife and bottles stay in the environment for many years. Making littering cases is difficult, since the officer has to observe the person throw the litter and then leave the scene before a case can be made. Canaveral National Seashore has a glass bottle prohibition, which works to keep glass off the beach. Banning glass bottles would go a along way toward achieving the goal of a litter-free refuge and would make it easier for law enforcement to monitor.

Another strategy is implementing a $5.00 weekly or $20.00 annual sports fishing permit. Implementation of a fee for the fishing permit would serve as an additional deterrent to littering, since law enforcement can write citations for individuals not in permit compliance. The mere fact that an individual has to pay to fish may be enough of a deterrent to steer some litter problems away from the refuge. The refuge is sensitive that some individuals may not be able to afford the fishing permit. Therefore, an individual could pick up a set amount of trash from a problem area in lieu of buying a fishing permit.

15. CAMPING

CURRENT PROGRAM

The refuge is closed to all camping except Scout camping. The U.S. Fish and Wildlife Service has a nationwide agreement with Boy Scouts and Girl Scouts of America, which allows troops associated with these organizations to camp on national wildlife refuges. The refuge has designated Dummitt Cove as a camp site for scout troops. Troop leaders must contact the refuge in advance of their outings and the refuge reviews the requests and issues special use permits. A permit is issued for a single camping event.

PROPOSED CHANGE

None

16. COMMERCIAL OPERATIONS

CURRENT PROGRAM

The refuge receives numerous request annually to conduct commercial operations on the refuge. Service Policy delegates the authority to approve these request to the Refuge Manager. By policy, all uses allowed on a refuge, including commercial operations, must successfully pass the compatibility determination test. That is, the commercial operation must be wildlife oriented and must not interfere with the refuge's purposes. The Refuge Manager, through the permit process, determines the extent to which the commercial activity would impact refuge operations or the public and approves or disapproves the request, provides restrictions to operation/implementation of the use to ensure compatability, and sets the appropriate fee, if any.

The refuge routinely permits fishing guides, canoe and kayak outfitters, and bus tour operators and the refuge occasionally issues permits to hunting guides, commercial still photographers, and commercial video for film companies that produce nature documentaries.

All commercial permits are handled in one of two ways. If the request for the commercial activity is outside of the overlay area with Canaveral National Seashore and solely within the refuge, the refuge issues the Special Use Permit. If the request falls within the overlay area (i.e., east of SR 3 and north of the KSC restricted area), an Incidental Business Permit is issued by the Seashore. The permit arrangement worked out with the Seashore is designed to benefit the permit holder by eliminating the requirement to obtain permits from both the Seashore and the refuge.

PROPOSED CHANGE

None

17. STAFFING NEEDS

CURRENT VISITOR SERVICE PROGRAM

The Visitor Services staff has two full time refuge rangers who work in the Visitor Services Program. To implement changes outlined in this plan additional staff is needed.

PROPOSED CHANGES

With two employees, the Visitor Services Program can maintain the status quo, but cannot advance the program. The plan calls for numerous improvements in environmental education, interpretation, and volunteer programs. Over and above these changes, the refuge plans to implement an upland hunting program, implement fees, and make other changes in the sports fishing program. Another position is needed to provide Visitor Services at KSC's Visitor Complex and expand outreach to the community. These changes cannot be accomplished with current staff. The staff is already experiencing a strain with the addition of the new educational facilities and the need to develop education programs which meet curriculum standards of the state educational system. To accomplish many of the projects detailed in the plan, the listed staff positions are needed (where maintenance staff needed to support the Visitor Services Program is under the Maintenance Program).

Table 3. Current and Proposed Staff in the Visitor Services Program

Current Staff	Additional Staff Needed
GS 12 Supervisory Refuge Ranger	GS 9 Environmental Education
GS 9 Visitor Center Operation/Volunteer Coordinator	GS 9 Interpreter
	GS 9 KSC Outreach
	GS 5 Fee Collector (half-time)

LAW ENFORCEMENT PROGRAM

Current Program

The refuge currently has two full-time law enforcement officers.

Proposed Changes

The proposed law enforcement staff is four: one lead and three other officers. With the development of the Pole and Troll Zone, new fee program, addition of upland hunting, one additional full-time Law Enforcement Officer position is needed. With the level and amount of Manatee cases increasing and new Manatee Protection Areas in and around the refuge increasing, a Manatee Officer is also needed.

18. BUDGET

The Visitor Services Program does not have a budget separate from the refuge's budget. Salaries, day-to-day expenses, and maintenance of public use facilities are paid out of the refuge's annual budget. New capital improvement or large maintenance projects come out of a special funding programs known as Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS). Both RONS and SAMMS funds are for specific projects and are not used for salaries or refuge operation expenses. Outside of these project-specific funds, all operating expenses for facility maintenance or new construction come out of the refuge's discretionary account and compete with other refuge programs.

Revenues generated from the new fee program have the potential to generate about $639,000 annually. Of this total, the refuge may retain 80% or $511,000. The salaries for several new positions would come out of this total and are anticipated to cost $254,000 annually. This would leave a balance of approximately $257,000 to use for improvements outlined in this plan.

Table 4. Positions Targeted to be Funded by Fee Program

1 GS 9 Ranger – Law Enforcement Officer	63,000
1 GS 9 Ranger – Environmental Education	63,000
1 GS 9 Ranger – Interpretor	63,000
½ GS 5 Ranger – Fee Collector	21,000
1 WG 4 Maintenance Worker	44,000
Total	254,000

Table 5. Table of Projects and Costs

Funding Source	Project Description	Priority*	Estimated Project Cost
MMS/MIWA	Expand Visitor Center Parking	H	90,000
RONS	Install Dec. Lane, Strip Parking at Entrance Kiosk	L	75,000
RONS	Develop After Hour Information at VIC Gate	M	2,000
RONS	Post Pole/Troll Zones in Mosquito Lagoon	H	20,000
MMS	Fishing Improvements	M	100,000
RONS	ADA Bank Fishing Improvements at 3 locations	M	100,000
RONS	Viewing Tower at Scrub Ridge Trail	M	40,000
RONS	Establish Viewing Blind and Dock (Mullethead Island)	M	50,000
RONS	Establish kiosk at rookery viewing site	H	10,000
RONS	Develop Connecting Road to BPWLD	M	100,000
RONS/MIWA	Implement Train Tour	L	100,000

Funding Source	Project Description	Priority*	Estimated Project Cost
RONS	Develop Pine Flatwoods Trail	M	20,000
MMS	Improve Manatee Deck (road, signs equip.)	L	75,000
RONS/MIWA	Develop 2 Wildlife Observation Blinds on BPWLD	H	64,000
RONS/MIWA	Develop ADA Tower and Restrooms on BPWLD	M	80,000
RONS	Develop Self-Serve Fee Station on BPWLD	M	10,000
RONS	BPWLD Wildlife Viewing Signs (viewing etiquette)	H	10,000
RONS/WUI	Develop Fire Stop on BPWLD	L	5,000
MMS	Replace Board Walk Palm Hammock Trail	L	30,000
RONS	Develop Wildlife Viewing Area on Moore Creek	M	100,000
RONS	Install Directional Signs from NASA's VIC to Refuge	H	10,000
RONS	Develop Gator Creek Trail and Viewing Area	L	50,000
RONS	Develop ADA Hunting Blind	H	5,000
		Total	1,146,000

*Note:

H = To be completed in 1-3 years
M = To be completed in 4-6 years
L = To be completed in more than 6 years

19. SOCIAL IMPACTS

VISITOR PROGRAMS AFFECTS ON HABITAT, WILDLIFE, AND CULTURAL RESOURCES

Growth in the visitation at Merritt Island NWR is inevitable. This plan recognizes that wildlife oriented recreation is appropriate and can build support for the refuge and the National Wildlife Refuge System. On the other hand, all visitor programs have some negative consequences for habitat, wildlife, and/or and cultural resource. Therefore, constant tension exists to balance the growth in visitor programs and development of facilities with the protection of the natural and cultural resources of the refuge. An overarching goal of this plan is to identify existing or potential conflicts or threats and take steps to eliminate or reduce them. With that said, the Visitor Services Program must change. The plan calls for the listed new facilities or programs changes.

Proposed Changes	Potential Impacts
Welcome and Orient Visitors	Three new kiosk would result in minor loss of wildlife habitat. Expanding parking lot at Visitor Center would result in loss of a half acre of flatwoods habitat.
Hunting	Upland hunt for deer and feral hogs would cause other wildlife disturbances. Establishing parking area for upland hunts could result in minimal loss of habitat. Development of portable ADA hunting blind should have no impacts.
Fishing	Installing trash receptacles and making other bank fishing improvements would have a positive impact by reducing trash and glass bottles. Establishing pole and troll zones would require the installation of signs and buoys, but would result in many positive wildlife and habitat improvements. Improving four access roads and boat ramps with gravel should have no negative impacts. Improving three bank fishing locations to meet ADA standards would have minimal impacts
Wildlife Observation	Development of two new elevated wildlife sites and two new blinds could result in minimal loss of habitat and some wildlife disturbance. Development of ADA accessible restrooms on Black Point Wildlife Drive would result in a loss of 1/10 acre of habitat, but this would be offset through restoration of .5 acres of wetlands. Establishment of six canoe trails could result in additional wildlife disturbance. Establishment of a viewing blind near the Mullethead Island rookery would require installing a dock-like structure, but would reduce wildlife disturbance at the rookery. Development of five new trails could result in minimal loss of habitat and result in additional wildlife disturbance. Making improvements at the Manatee Observation Deck could result in some

	additional disturbance to manatees (a Section 7 Consultation would be completed). Installation of a self-serve pay station on Black Point Wildlife Drive should have no impacts. Development of wildlife viewing etiquette signs should result in positive changes in human behavior and no wildlife impacts. Development of a fire stop on Black Point Wildlife Drive would require the establishment of about one mile of new fire breaks and the clearing of some vegetation. Replacement of the signs and boardwalk at Oak and Palm Hammock trails should have no impacts. Development of a new wildlife viewing area near Moore Creek could result in some loss of habitat and wildlife disturbance. Development of the West Gator Creek wildlife viewing area could result in some wildlife disturbance.
Environmental Education	Development of programs for each grade level (4^{th} - 8^{th}) and expansion of teacher workshops should have no impacts. Utilizing new locations around the Sendler Outpost for programs could result in some additional wildlife disturbance.
Interpretation	Changing the themes of the interpretive messages should result in positive behavioral changes. Appropriate recreation would result in positive changes.

20. MEASURES TO RESOLVE IMPACTS

The listed actions are planned to reduce impacts.

Proposed Change	Measures to Minimize Impacts
Welcome and Orientation	Restrict the placement of wayside kiosks to improved road right-of-ways. The expanded Visitor Center parking area would be contiguous to the existing parking lot to minimize impacts. Consider using paving blocks, rather than pavement to reduce runoff.

Hunting	Reducing the numbers of days and hours open to hunting. Open only specific locations to hunting. Control hunting pressure through quota permits. Require hunter safety training for all new hunts. All hunter access improvements would be confined to existing roads. Attach the Hunt Regulations to the permit so that hunters are aware of all current rules and regulations.
Fishing	Bank fishing improvements should reduce bank erosion and sediment transport/turbidity to surrounding waters. Signs and buoys would be kept to a minimum for the establishment of the Pole and Troll Zone. Implementation of Sports Fishing Permit would insure fishermen are familiar with current rules and regulations. Implementation of online fishing etiquette course would educate fishermen of current issues and management problems. Developing educational materials for boat ramps would provide additional education material and result in positive environmental change. Retain the current slow speed zones and No Motor Zone to maintain the current level of manatee protection. Attach Fishing Regulations to permits to insure that fishermen are aware of current rules and regulations
Wildlife Observation	Developing Wildlife Viewing etiquette messages would provide educational material and reduce wildlife impacts Monitoring Wildlife Impacts on Black Point Wildlife Drive would provide feedback on the effectiveness of management and identify areas in need of change (adaptive management). Developing viewing blinds would reduce wildlife impacts to the rookery. Existing roads would be used for pine flatwoods trail. Manatee Observation Deck improvements would help educate the public regarding

	current issues facing the species and help build support for manatee protection efforts. The new fire stop on Black Point Wildlife Drive would help educate the public of the positive benefits of prescribed fire.
Environmental Education	Conduct programs in a well defined area to minimize impacts to surrounding areas. Conduct teacher workshops to train teachers to minimize impacts to wildlife. Train volunteers in techniques which minimize wildlife impacts.
Interpretation	Incorporate wildlife first message as an interpretive theme to help change behavior and minimize impacts. Make the connection that wildlife requires habitat and management practices can benefit wildlife to help change behavior and minimize impacts. Help the public understand the connection between mans' activities and the plight of endangered and threatened species. Expand interpretive programs to reinforce these messages to help change behavior and minimize impacts.
Appropriate Recreation	Confining all public use to two zones would prevent scattered uncontrolled expansion of uses and help concentrate wildlife impacts. Restricting bicycling to upland areas would reduce wildlife disturbance and impacts. Banning jogging would help eliminate wildlife disturbance. Establishing a review procedure for all new uses can help identify problems before they become established. Periodic reviews of the interpretive materials and program would make sure messages are addressing current problems and wildlife impacts. Periodic review of refuge regulations would help insure that regulations are addressing current wildlife, habitat, and cultural resource problems.

This plan calls for numerous changes to the current program, with the majority of these changes considered minor. Changes, such as adding new kiosk, upgrading exhibits, adding canoeing trails and a new upland trail, expanding several existing trails and parking areas, adding new positions, expanding and targeting outreach efforts, and

expanding volunteer and friends programs would fall into this category of minor. These changes would result in few habitat, wildlife, and cultural resource impacts.

Other changes ultimately would have positive affects. Expanding the environmental education and interpretive programs would help educate others on pressing habitat and wildlife issues facing the refuge, the Central Florida area, and the larger landscape. Zoning the refuge to concentrate public use would result in fewer wildlife and habitat impacts. The establishment of the polling and trolling zone on the flats of Mosquito Lagoon would help improve the quality of saltwater fishing and would result in positive habitat and wildlife improvements. Many of the facility upgrades, such as adding wildlife viewing blinds and wildlife viewing towers, are intended to reduce wildlife impacts. Finally, eliminating trash from the refuge would be positive benefit for wildlife and the public.

Some aspects of the plan may be controversial. These included adding upland hunting for deer and feral hogs, evaluating the establishment of an alligator hunt, restricting bicycling to paved roads and upland locations, eliminating jogging, implementing fees, limiting the number of fishing guides, and raising fees for guides and commercial harvest permits.

Hunting supports one of the Big Six priority uses of the Refuge System and provides additional opportunities and seasons for a new group of visitors. These hunts provide opportunities to connect with new users and supporters of the refuge and Refuge System and allow escape from urban pressures.

The restriction of bicycling and the elimination of jogging and other similar non-wildlife uses, although potentially controversial, would result in positive wildlife benefits. Without making other improvements, moving bicyclist to established paved roads would remove a safety issue for trail users, but could result in safety issues for the bicyclist on the paved road. Therefore this proposal is dependent upon obtaining funding to establish bike trails in upland locations or to establish well-designed bike paths adjacent to the paved roads, such as SR 406 and SR 3. The elimination of joggers and other non-wildlife oriented uses would result in a short term adjustment for the small group of users. But they would find off-refuge locations to pursue their hobby and would adjust. There would be a one-year grace period before tickets would be issued to violators.

Use fees could result in a financial burden to some users, but the tiered fee program for weekly and annual permits and the ability to pick up trash in lieu of paying a fee would allow visitors to select the most economical package to fit their use and visitation pattern. The proposed fee schedule is similar to fees used by many other refuges and is less than nearby Canaveral National Seashore. Raising fees for commercial users would affect a relatively small group of about 100 individuals.

Collectively these changes and improvements would ultimately increase visitation and have a positive economic impact on the local community. A survey on the economic impact of ecotourism on communities surrounding national wildlife refuges, highlights the substantial benefits visitors bring to the local economy. In 1994, the economic impact on the communities surrounding each of the refuges in the nation ranged from over a half-million to several million dollars annually (U.S. Department of Interior 1994). These positive economic benefits included lodging, meals, gasoline, and ancillary purchases. Generally, most refuge visitors average 50 years of age, with incomes and education

levels above the national average (Kerlinger 1993). More than half of the visitors cited refuges as their primary destination (Caudill and Henderson 2003). Research shows that a "...wildlife refuge in an increasingly urbanized and congested region can generate community benefits for regional inhabitants" (Kerlinger 1993). "This community amenity can be reflected in higher land values, particularly for properties nearby" (Kerlinger 1993). With the expected continual loss of natural areas in Central Florida, the refuge becomes more important as a visitation destination for the segment of society wanting release from the urban environment. The continued presence of the refuge is anticipated to increase property values in the area, which would provide economic benefits to nearby communities.

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