

V. PLAN IMPLEMENTATION

Introduction

The future of this and most national wildlife refuges is dependent upon a public constituency that is knowledgeable of refuge resources and mandates, as well as environmental issues, and that is willing to work toward resolving them. To build and maintain this needed constituency, this plan not only provides actions to protect, restore, and conserve wildlife habitat, but also provides expanded educational and appropriate, compatible, wildlife-dependent recreational opportunities. Developing partnerships among our constituencies is the common theme to implement these actions and opportunities. Promoting the refuge as an asset of Martin County will enhance its image and help expand local support. To achieve the proposed management plan for the refuge, this section identifies 18 projects, staff development and equipment needs, staffing and funding needs, partnership opportunities, step-down management plans, and a biological monitoring and evaluation plan.

Project Summaries

Listed below are project summaries and their associated costs for facility development and maintenance; biological baseline data collection, manipulation and interpretation; exotic plant control; habitat restoration; and land acquisition over the next 15 years. The cost for each project is shown in Figure 26. While this project list is not intended to be all inclusive, it does reflect the basic needs supporting the outlined goals and identified by the public, planning team members, and refuge staff, based upon available information.

Wildlife Habitat and Population Management

Project 1. Control Invasive Exotic Plants

To protect the biological integrity of the refuge, exotic plants must be reduced and controlled. They threaten to change the landscape to a degree that imperils the ecosystem. Although it is impractical to believe that all exotics could be completely removed from the refuge, it is possible to curtail their spread and to reduce their populations to a maintenance level that an expanded refuge staff could control through an aggressive program.

The first step is to develop a restoration plan feasible for private contractors, agency partners, private landowners, and volunteers to implement and accomplish within 10 years. With the help of an effective environmental education program, partnerships could be developed with the community and other natural resource agencies to accomplish this goal.

Many areas of the refuge are heavily infested with monoculture stands of Australian pines and Brazilian peppers. Several other Category I invasive exotic plants are spreading so quickly that they

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rival these two traditional nemeses. This plan would include wholesale removal of these stands followed by the planting of native species. It is imperative to plant native species a short time after the removal of exotics; otherwise, the area would soon become reinfested.

Follow-up treatments are vital to keep invasive plants from outgrowing the newly established native plants. Each area of treatment will need to be monitored and re-treated as needed every few years.

Among the more popular methods of exotic plant control are mechanical clearing, chemical treatment, and prescribed fire. None of these methods would be entirely successful if used alone. However, a combination of all three have a good chance of success with follow-up monitoring and spot re-treatment as needed.

To provide funding and equipment for this project, there are many opportunities to partner with various agencies and organizations; thus the Service would not solely bear the burden of the expense. The estimated first-year cost of this project is \$280,000, with a recurring cost of \$180,000 per year.

Project 2. Monitor Habitat and Wildlife Populations

There is a great need to inventory and map vertebrate, invertebrate, and plant communities on the refuge. Focusing on indicator and/or trust species, inventory data are essential to developing detailed step-down management plans. To gather these data, the refuge is proposing to add additional biological staff.

Collecting and mapping inventory data for trust species is a high priority task for this refuge. Inventories of other species would follow as funding becomes available. Habitat management strategies will be formulated based on the requirements of candidate and trust species and sensitive habitats. Inventories will be carried out periodically to monitor changes in biological populations in response to habitat management strategies. All inventorying, mapping, and monitoring will be accomplished using standard data gathering and monitoring techniques.

Information generated from monitoring efforts will be incorporated into a geographic information system database. Coordination with other natural resource agencies and universities will be necessary to accomplish this task. Many opportunities for research assistance are available through cooperative agreements with universities and nonprofit conservation organizations.

In addition to monitoring biological responses to habitat management actions, long-term monitoring of visitor impacts to the natural community will be emphasized. These data will allow the refuge manager to determine whether or not the refuge's resources can support additional recreational opportunities and in which locations. The estimated first-year cost of this project is \$75,000, with a recurring cost of \$20,000 per year.

Project 3. Implement Sand Pine Scrub Habitat Management Plan

Many of the native forest communities in the southeastern United States have evolved in response to natural catastrophic disturbances, such as fires, hurricanes, and tornados. The sand pine scrub community of the refuge is one such community. However, human settlement of the region has served to minimize the frequency and duration of wildfire. When wildfires occur, they are usually suppressed and quickly extinguished to prevent loss of life and property. To preserve the unique balance of this disturbance-dependent community, the refuge will implement a management plan to mimic these catastrophic events keeping public safety utmost in mind.

The sand pine scrub community is unique in comparison with other pine dominated communities, since it tends to burn very hot, very fast, and completely to the ground. As a result, succession is usually set back to a very early stage with little ground cover and no canopy. The sand pine scrub habitat on the refuge is bordered to the north and south by residential communities. For this reason, the refuge, in partnership with the Florida Park Service, The Nature Conservancy, Martin County, and others, has developed a plan to reset succession to its earliest stage and continue to do so on intervals mimicking natural processes. The full implementation of this scrub restoration management plan will provide a mosaic of optimal habitat for native species and reduce the threat of catastrophic wildfire. This newly crafted plan will incorporate mechanical disturbance followed by prescribed fire to treat sand pine scrub in an urban interface. If this technique is successful, it may be used across the state to manage thousands of acres of sand pine scrub.

Prescribed fire is also a useful tool for eliminating large monocultures of exotic plants which threaten native ecosystems. Implementation of the fire management plan will contribute to achieving the objectives of the South Florida Multi-Species Recovery Plan for several threatened and endangered species. The project will require continual monitoring of threatened and endangered species, maintenance of mechanical clearing machinery, and the use of fire crews. The estimated first-year cost of this project is \$30,000, with a recurring cost of \$30,000 per year.

Project 4. Restore and Monitor Mangrove Wetland Impoundments

As part of wetlands restoration, the refuge will partner with the town of Jupiter Island, the Hobe Sound Land Company, and Martin and St. Lucie counties' mosquito control districts to reconstruct and manage former mosquito control impoundments to create 125 acres of improved mangrove and tidal wetlands. The project will require a biological inventory, construction of water control structures, improvements to existing levees and dikes, long-term monitoring, and seasonal water level manipulation.

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The project, which has already been embraced by refuge partners, will facilitate tidal flushing; increase dissolved oxygen levels; provide fisheries' breeding grounds and subsequent wading bird foraging areas; and provide biological control of biting insects. The estimated first-year cost of this project is \$125,000 per impoundment, with a recurring cost of \$10,000 per year, per impoundment.

Project 5. Restore and Monitor Coastal Dune System

In partnership with the Florida Department of Environmental Protection, Bureau of Invasive Plant Management, and possibly the Jupiter Island Garden Club, the refuge will restore the coastal strand community. The project will require the complete removal of all invasive exotic plants including Australian pine, Brazilian pepper, beach naupaka, carrot wood, wedilia, and others, followed by successive re-treatments. While some natural recruitment of native plant species is expected, this effort would be facilitated by replanting native species. The schedule for replanting will be coordinated with beach renourishment projects to provide the

greatest benefit for dune accretion. This project will significantly support sea turtle nesting efforts, prevent the extirpation of threatened and endangered plant populations, and facilitate shorebird use and nesting. The estimated first-year cost of this project is \$25,000, with a recurring cost of \$25,000 per year.

Project 6. Control Shorebird and Sea Turtle Predators

For species such as sea turtles and least terns, the refuge, due to its limited nesting habitat, can only play a limited role in their

conservation and recovery. The beach area on the Jupiter Island Tract provides nesting habitat for sea turtles, where eggs are deposited and hatchlings emerge to move into international waters of the Atlantic Ocean, Gulf of Mexico, and/or Caribbean. For the short time span when the female comes ashore to dig the nest and lay her eggs, the refuge will provide protection from human depredation. For the subsequent 2 to 3 months that the eggs need to incubate and hatch, the refuge will provide protection not only from human depredation but also from wildlife such as racoons and armadillos. While refuge officers provide the necessary protection from poachers, contractors like the U.S. Department of Agriculture, Animal Plant Health Inspection



*Hobe Sound beach and sky
USFWS Photo*

Service, will implement current mammalian predator control techniques to achieve a 75 percent hatchling success rate. The refuge will focus on reducing and maintaining the natural predation rate (as incurred from native predators) to 10 percent or less, and will focus eliminating nest depredation by any exotic species. The estimated first-year cost of this project is \$15,000, with a recurring cost of \$15,000 per year.

Resource Protection

Project 7. Conserve Indian River Lagoon

The Indian River Lagoon is regarded as the most productive and biologically diverse estuary in the United States. The portion of the lagoon near the refuge is known for manatees, river otters, sea-grass beds, mangrove shorelines, great fishing, and great birding.

Presently, the two sections of the Intracoastal Waterway that allow boat wake and vessel speeds of 25 mph border the refuge. All other sections are limited to minimum wake and slow speeds. The high energy wakes produced by large, fast moving vessels result in significant shoreline erosion on the refuge. The high energy wakes produce degraded mangrove communities along the shoreline. The mangrove propagules are unable to take root in the turbulent waters, severely hindering regeneration. In an attempt to halt shoreline erosion, a planting procedure developed by the Environmental Learning Center of Vero Beach is currently being tested on the refuge. If successful, a large-scale planting will be conducted to preserve these mangrove communities of the refuge.

In addition to shoreline erosion, high energy wakes result in high populations of exotic plants along the shoreline. Large stands of exotic Australian pine line the lagoon shoreline at the refuge. Removal of these pines would allow for recovery of the mangrove community. However, these trees provide a visual buffer for the residents of Jupiter Island, as well as provide nesting sites for numerous osprey. Replacement trees, such as native palms, would serve to replace the visual buffer and osprey nesting platforms could supplement native trees for nesting habitat.

In recent years the lagoon has lost a tremendous amount of seagrass and benthic habitats; the very communities that make it so unique. The seagrass and hard bottom habitats provide food and shelter to many interjurisdictional species of fish, crustaceans, and mammals. The refuge will provide support to other agencies, as well as to other divisions within the Fish and Wildlife Service to promote the recovery of this ecosystem. As part of the increased role of protecting the lagoon, the refuge will implement an active water quality monitoring program, expand its mangrove restoration efforts and invasive species control, and provide aquatic species and bird survey information. The estimated first-year cost of this project is \$150,000, with a recurring cost of \$25,000 per year.

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Project 8. Control Beach Foredune Erosion

Since the construction of the St. Lucie Inlet to the north of the refuge, over 1/2-mile of beach has been forfeited to the Atlantic Ocean. Erosion is so great that it threatens to breach the narrow strip of land and create an inlet into the Intracoastal Waterway, as briefly occurred in 1963. On the refuge, the entire 3.5 miles of dune are in need of some degree of restoration.

Erosion can only be slowed by sound dune stabilization management in concert with beach renourishment and sand transfer projects. In recent history, efforts have been made to protect the shoreline from further erosion by using jetties or concrete walls. These "shoreline hardening" projects have long-term detrimental impacts, especially for nesting sea turtles.

Associated with beach renourishment is the need to replant native species on the foredune and backdune areas. Species, such as sea oats, act as sand nets and trap the substrate as it is washed over by the incoming tide. Aside from the benefits of dune stabilization, replanting is labor intensive and involves a tremendous supply of nursery raised plants. To address this situation, partnerships could be developed with local nurseries and volunteers. A dune and coastal strand restoration plan will be developed for this project. The estimated first-year cost of this project is \$250,000, with a recurring cost of \$50,000 per year.

Project 9. Protect and Interpret Cultural Resources

The refuge contains many culturally significant areas within its boundaries. In the past, one of the most significant areas, the Joseph Reed Mound, was severely degraded by erosion due to storms and tidal fluctuations. Thus, an immediate need exists to identify all sites, define their cultural significance, and stabilize them before further erosion or degradation occurs. In partnership with the Southeast Florida Archaeological Society, appropriate trails can be created to allow public viewing of some of the sites. As required by the Archaeological Resources Protection Act and others, it is the duty of each land management agency to identify, research, protect, and provide cultural interpretation for the public. The estimated first-year cost of this project is \$150,000, with a recurring cost of \$25,000 per year.

Project 10. Acquire Land to Protect Unique Plant and Wildlife Habitats

The refuge recently expanded its boundary to include the potential to acquire four tracts of land, including an 11-acre sand pine scrub site that contains the second largest population of the federally endangered Lakela's mint, a 7-acre stretch of very productive sea turtle nesting beach on Hutchinson Island; a 65-acre parcel of sand pine scrub nearly adjoining the northern refuge boundary and owned by The Nature Conservancy; and a 4-acre site of Atlantic

beach and dune, also located very near the refuge's current boundary on property owned by the U.S. Coast Guard. All are ecologically significant and have been determined to be valuable additions to the refuge. Additional efforts are underway to consolidate the boundary by acquiring selected in-holdings. Many partners have been identified to share acquisition costs and/or management collaboration, including donation of property, fee purchase, refuge overlay, and direct transfer. The estimated cost of this project, excluding any potential partnerships, is \$15,000,000.

Wildlife-Dependent Recreation and Environmental Education

Project 11. Develop Beach/Lagoon Trails and Observation Platforms

To accommodate the increasing demand for compatible wildlife-dependent visitor opportunities, the refuge will expand its existing trail network to include a beach/lagoon trail with elevated observation platforms. If possible, the platforms will be situated so that visitors can view the three biotic communities on the island: mangrove wetland, coastal strand, and Atlantic beach. The platforms would have interpretive signs and a fix mounted telescope.

One trail would originate at the beach parking lot and another at the Lake Frances mosquito impoundment. Both would enter the coastal strand community and wind through the mangrove swamp to the Indian River Lagoon. Turning back through the coastal strand, the trails would extend east, eventually leading the visitor out to the beach. There, the visitor would emerge from the vegetation, choose to either walk north along the beach to the St. Lucie Inlet Preserve State Park, or south to the refuge parking area. Informational signs would be positioned along its length to guide and inform the visitor. Boardwalks and bridges would be installed in sensitive areas to minimize the negative effects of high foot traffic. The trails would not be longer than 3 miles and would function simultaneously as an access for refuge staff to conduct exotic plant control activities. Developed in partnership with the community of Jupiter Island, these trails can be created without negatively affecting the residents of the island. The estimated first-year cost of this project is \$125,000, with a recurring cost of \$25,000 per year.

Project 12. Expand and Enhance Sand Pine Scrub Trail

The 1/2-mile sand pine scrub trail, originating from the headquarters area, is very popular with bird watchers, naturalists, and school groups. In fact, many requests have been received to lengthen the trail along the coastal ridge. To meet the public's need, the existing trail would be extended 3 miles. To extend the trail in a southerly direction would cause minimal disturbance to the scrub community. A relatively concealed overlook of the Indian River Lagoon would be constructed at a natural contour along the trail. Along the trail, there would be an opportunity to interpret an Indian Shell Midden. Informational signs would be positioned along its length. As with

the beach/lagoon trail, this extension would facilitate exotic plant control efforts. The estimated first-year cost of this project is \$125,000, with a recurring cost of \$25,000 per year.

Project 13. Develop and Install Informational Signs

To increase refuge exposure, road signs are needed along Interstate 95, Bridge Road (Martin County 708), and U.S. Highway 1. Further, directional signs are needed to lead the visitor to the refuge. Wildlife crossing signs (e.g., Gopher tortoise) are desperately needed to alert drivers of the potential to injure wildlife.

Many of the informational signs on the refuge are in a state of disrepair and need to be replaced. In particular, new signs are needed at the refuge headquarters; at the beach; and along several areas of the refuge, including the Peck Lake entrance. The estimated first-year cost of this project is \$100,000, with a recurring cost of \$10,000 per year.

Project 14. Provide Running Water and Restroom Facilities at the Beach Access Area

An overwhelming majority of the public has requested that the Service install better restroom facilities at the refuge beach. Currently, the restroom facilities are portable toilets positioned on a concrete slab and are concealed by a privacy fence. No running water exists at the refuge beach. The decision to supply running water to the beach parking lot is at the discretion of the South Martin Regional Utility and the town of Jupiter Island; if either are favorable to supplying water, deed restrictions may have to be renegotiated. Even if only non-potable water could be supplied at the refuge beach, a single standing shower/rinsing structure could be positioned outside the restroom facility for hikers, swimmers, fishers, and surfers. The refuge will install improved restroom facilities with a changing area and covered entrance for public use. The estimated first-year cost of this project is \$100,000, with a recurring cost of \$25,000 per year.

Project 15. Step Into the Computer Age

Currently, the refuge's web site contains a written narrative of basic refuge facts. The refuge can expect to more effectively reach the public and advance environmental education with an upgraded, interactive web page. In addition to the narrative, the web site would contain several color photos. The text would be expanded to include current refuge and Nature Center interpretive programming schedules, up-to-date information on threatened and endangered species conservation, and linkages to related information.

One of the more exciting programs to post on the upgraded website would be a video, taken with a digital camera, showing sea turtle nesting and the subsequent hatchling emergence and scramble to

the surf. In addition, a nest "cam" could be installed to monitor young osprey. In either case web viewers would be provided a real-time link from the refuge. The estimated first-year cost of this project is \$20,000, with a recurring cost of \$10,000 per year.

Administration

Project 16. Develop New Environmental Learning Center and Headquarters Facility

An immediate need exists to construct a new environmental education/headquarters facility. The new structure would contain a learning center with a reception area, gift shop, small auditorium, and interpretive displays, as well as office space for refuge and Nature Center staff and volunteers.

The existing facility, which served as a motel in the 1950s, has not functioned very well for environmental education, nor has it functioned well as a headquarters for the Service and the Hobe Sound Nature Center. The electrical wiring is outdated and the physical structure has been severely damaged by carpenter ants, termites, and wood rot. The building has aged to the point that it can no longer provide a safe staff or visitor experience. Attracting more than 100,000 visitors annually, the refuge and Nature Center desire a facility that conveys the vision of the refuge, brings pride to the organizations that educate a growing public, and reflects the issues that will advance the cause of conservation. The current building would be demolished and replaced. The estimated first-year cost of this project, excluding any potential partnerships, is \$1,200,000, with a recurring cost of \$50,000 per year.

Project 17. Meet/Fulfill Heavy Equipment Needs

Perhaps the single greatest threat to the integrity of the refuge is the spread of invasive exotic plants. While chemical treatment is an effective means to control exotic plants, obtaining access to treatment areas is extremely difficult. Thus, a small tractor with a set of attachments (e.g., bucket, backhoe, root rake, and bushhog) is needed to cut trails into heavily infested areas and also to remove the thick tangles of biomass that remain after treatment. In addition to providing access to treatment areas and removing biomass, the tractor could maintain and extend existing trails, as well as create new trails and boardwalks for non-consumptive wildlife uses. A tractor could also be used for day-to-day refuge maintenance and provide needed support for many construction projects. The estimated cost of this project is \$75,000, with a recurring maintenance cost of \$25,000.

The acquisition of relatively new types of equipment, such as the "Brontosaurus™" or other similar mulching equipment, would enable the refuge to significantly increase its ability to reduce both exotic vegetation and aging scrub pine to mulch. These machines

are similar to an excavator, but contain a mulching/mowing head. With a machine of this type, the refuge could greatly reduce monocultural stands of exotic plants and prepare tracts of sand pine scrub for prescribed fire in a fraction of the time required by conventional means. Providing easy access for follow-up herbicidal treatments, native recruitment is fast and complete. The estimated first-year cost of this project is \$180,000, with a recurring cost of \$80,000 per year.

Project 18. Renovate Shop

The limited maintenance staff has been supported in a pre-fab metal shop building that abuts the headquarters facility. Inadequate space prevents the storage of all equipment that warrants protection from the elements. Poor airflow has resulted in higher temperatures, limiting the amount of time workers can utilize their workplace. A renovated facility is needed to correct these problems and to allow for storage of new heavy equipment associated with invasive species control identified in other projects. The estimated cost of this project is \$250,000, with a recurring cost of \$10,000 per year.

Staffing and Funding

The Hobe Sound National Wildlife Refuge is a satellite of A.R.M. Loxahatchee National Wildlife Refuge, which is located in Boynton Beach, Palm Beach County, Florida. The refuge shares its budget with its parent refuge and relies on it for partial staffing and administrative support. However, for the refuge to realize its full potential as a community leader in environmental education and threatened and endangered species management, it will need to re-evaluate this management status and add a significant number of new positions.

The refuge is currently approved for three permanent positions: a refuge manager (GS-0485-11/12); refuge law enforcement officer (GS-025-7); and a maintenance worker (WG-4749-7). An additional temporary maintenance worker, and two seasonal fee clerks are also presently employed. The annual cost for the refuge, including the salary of these six positions is approximately \$200,000. With the additional support from Loxahatchee Refuge, this annual cost is actually closer to \$350,000.

This budget, and the associated constraints that it places on staffing levels, has been inadequate to advance the vision of the refuge. As operations and emphasis have increased, the budget has been insufficient to meet refuge needs. Receiving nearly 140,000 visitors per year, coupled with growing visitor inquiries via telephone and in writing, accumulating administrative duties, and increasing need to address a myriad of environmental issues raised by the public have caused management to have little time to accomplish the bulk of basic refuge tasks, let alone be proactive within the community.

Figure 26. Summary of project costs for Hobe Sound National Wildlife Refuge

PROJECTS	INITIAL PROJECT COST	RECURRING BASE COST
1. Control Invasive Exotic Plants	\$280,000	\$180,000
2. Monitor Habitat and Wildlife Populations	75,000	20,000
3. Implement Sand Pine Scrub Management Plan	30,000	30,000
4. Restore and Monitor Mangrove Wetland Impoundments (3 total)	375,000 <i>(125,000 per impoundment)</i>	30,000 <i>(10,000 per impoundment)</i>
5. Restore and Monitor Coastal Dune System	25,000	25,000
6. Control Shorebird and Sea Turtle Predators	15,000	15,000
7. Conserve Indian River Lagoon	150,000	25,000
8. Control Beach Foredune Erosion	250,000	50,000
9. Protect and Interpret Cultural Resources	150,000	25,000
10. Acquire Land to Protect Unique Plant and Wildlife Habitats	15,000,000	---
11. Develop Beach/Lagoon Trails and Observation Platforms	125,000	25,000
12. Expand and Enhance Sand Pine Scrub Trail	125,000	25,000
13. Develop and Install Informational Signs	100,000	10,000
14. Provide Running Water and Restroom Facilities at the Beach Access Area	100,000	25,000
15. Step Into the Computer Age	20,000	10,000
16. Develop New Environmental Learning Center and Headquarters Facility	1,200,000	50,000
17. Meet/Fulfill Heavy Equipment Needs	75,000	25,000
18. Renovate Shop	250,000	10,000
<i>Grand Totals:</i> without land acquisition	\$3,345,000	\$580,000
with land acquisition	\$18,345,000	

In light of this administrative environment, the refuge needs 6 additional staff: a refuge operations specialist or assistant refuge manager; an office assistant; a wildlife biologist; a refuge ranger; a heavy equipment operator; and a maintenance helper. The annual cost of each of these positions is shown in Figure 27.

A refuge operations specialist or assistant refuge manager is needed to address private landowner requests, maintain agency partnerships, provide supervision, address safety issues, and conduct daily refuge operations. This additional staff member would free up the refuge manager to seek outside funding and grants, develop additional partnerships, and enhance communications.

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An office assistant is needed to handle the tremendous number of administrative duties (namely phone calls, correspondence, regional office requests, and daily walk-ins) so that the refuge manager can focus on strategic refuge activities.

A biologist is crucial to the accomplishment of the objectives outlined in this plan. This person would collect key data, monitor critical wildlife populations and habitat conditions, take a lead role in the control of exotic plants, and both draft and implement resource management

Figure 27. Annual cost of existing and proposed staff positions for Hobe Sound National Wildlife Refuge.

TITLE	GRADE	STATUS	ANNUAL COST ¹
Refuge Manager	GS-0485-11/12	Existing	\$67,500
Refuge Operations Specialist (Assistant)	GS-0485-7/9/11	Proposed	51,200
Office Assistant	GS-0303-7	Proposed	46,400
Wildlife Biologist	GS-0486-7/9/11	Proposed	62,000
Refuge Officer	GS-0025-5/7	Existing	46,200
Refuge Ranger (Public Use)	GS-0025-5/7/9	Proposed	41,900
Heavy Equipment Operator	WG-4749-10	Proposed	45,100
Maintenance Mechanic (Facilities)	WG-4749-8	Existing	42,300
Maintenance Helper	WG-4749-5	Proposed	31,200
Fee Clerk (Seasonal)	GS-0025-3 T	Existing	11,800 *
Fee Clerk (Seasonal)	GS-0025-3 T	Existing	11,800 *
Annual Staff Costs			\$433,800
Annual Fixed Costs (e.g., phone, waste disposal, fuel, and electric)			55,000
Miscellaneous expenses (Equipment repair and replacement [e.g., trucks, ATV's, boat, power equipment, office equipment], predator control, facilities maintenance, small re-construction projects, and biological support equipment.)			220,000
Total Annual Costs When Plan is Fully Implemented			\$708,800 **

¹Salary and benefits paid by the Service

T=Temporary or Seasonal Position

*Funding generated from fee collection

**Figure does not reflect start-up costs (administrative) associated with new employees.

plans. In the past, a biologist and temporary seasonal biological technicians from Loxahatchee Refuge conducted daily surveying and monitoring activities of selected resources and provided oversight of wildlife issues, including sea turtle nest surveys during the summer months. Recently, sea turtle monitoring has been contracted out to Ecological Associates, Inc., through a partnership with the U.S. Department of Agriculture and Martin County. However, many significant issues, especially those related to threatened and endangered species, have gone unattended due to the lack of an on-site biologist.

Currently, the maintenance worker is charged with the duties of facility, equipment and grounds maintenance, as well as exotic plant control. These tasks have proven overwhelming for one person, even with the assistance of a term maintenance worker. The refuge is in need of two permanent maintenance positions and a term position maintenance worker who would help greatly in reducing the backlog of maintenance projects, operate heavy equipment, and help control the spread of invasive exotic plants.

The refuge ranger (public use) would assist the Hobe Sound Nature Center staff with environmental education and outreach programs, as well as coordinate other volunteer programs. The primary responsibility of the position would be to operate the newly constructed visitor center, develop and continuously update the refuge website, and provide volunteer coordination and ranger-guided activities.

The fee clerks are often the only Service representatives that greet the public at the fee booth located at the beach parking lot. These two individuals provide visitor information, handle complaints, answer questions, manage the parking lot, accept fees, sell passes, monitor visitor concerns, and provide passive law enforcement. Part-time coverage at the fee booth still enables the refuge to collect approximately \$50,000 a year in fees

Partnership Opportunities

To achieve the goals and objectives of this plan, maintaining existing partnerships and developing new ones with a variety of resource agencies, organizations, and individuals are essential (for a list of existing and potential partners see Appendix VIII). Partnerships would not only enable the refuge to fulfill plan objectives, but would also help minimize costs.

To address its single greatest threat, invasion of exotic plants into native communities, the refuge will need to foster existing relationships with the Florida Department of Environmental Protection, Bureau of Invasive Plant Management; Bureau of State Parks; Treasure Coast Upland Invasive Plant Working Group, and Archie Carr and Merritt Island National Wildlife Refuges. In addition, the refuge will seek new partnerships with the town of Jupiter Island, the Marine Resources Council, and the Florida Inland Navigation District, and will develop a volunteer restoration work force. Exotic plant control and native community restoration will benefit all refuge programs and facilitate the achievement of many refuge goals and objectives.

To develop a regionally significant environmental education program, assistance will be sought primarily from the Hobe Sound Nature Center, as well as from others such as The Nature Conservancy, the Audubon Society, and Martin County. The new environmental learning center will require input and assistance from many such organizations and individuals from the local community.

The refuge has a very rich cultural heritage which can be described and showcased using partnerships with the National Park Service, the Southeast Florida Archaeological Society, and area universities. Preservation, education, and interpretation of archaeological resources will be a primary focus of the refuge, as outlined in national policies.

The sand pine scrub community is fast disappearing from the south Florida landscape. The refuge will take a proactive role in managing its small stand and take the lead on developing partnerships with public land management agencies, housing and commercial developments, and private property owners to manipulate isolated tracts off the refuge for the maintenance of the community and recovery of its 15 to 20 protected endemic species.

As land is quickly developed to meet the needs of the growing south Florida population, many local municipalities, counties, and state agencies, as well as private non-profit organizations, are actively acquiring land parcels with unique or imperilled habitats in an attempt to prevent their destruction. More and more frequently, the refuge is approached by these organizations to aid in managing these parcels. To these ends, the refuge will create partnerships to acquire environmentally sensitive lands and provide guidance, technical expertise, and when possible, hands-on assistance to manage these tracts.

Step-Down Management Plans

While a comprehensive conservation plan is a strategic plan that guides the direction of the refuge, a step-down management plan provides specific guidance on such activities as habitat, fire, and public use management. As with a comprehensive conservation plan, step-down plans are developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review prior to their implementation.

By 2008, the refuge will have completed step-down plans for law enforcement; mangrove community and mosquito impoundment management; cultural resource protection; coastal dune management; land protection; environmental education; biological inventory and monitoring; and exotic plant control. Two additional plans—the sand pine scrub and predator control—having received previous public review, will be updated (Figure 28). To assist in preparing and implementing the step-down plans, refuge staff will develop partnerships with local agencies and organizations.

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Law Enforcement

Completion 2004

The purpose of this plan is to provide a ready reference to Service, regional and local police regarding refuge policies, procedures, and programs concerning refuge law enforcement. It will describe the refuge from a law enforcement perspective and discuss the primary law enforcement objectives of the refuge. It will address the type(s) of jurisdiction on the refuge and procedures for operating within those jurisdictions. It will describe the legal limitations and how they are related to other federal, state, county, and local law enforcement agencies. Topics included will be preventive law enforcement, boundary and other signing, reporting of incidents and suspicious activity, routine law enforcement patrols, procedures for normal vehicle stops and night patrols, burglar alarm responses, drug interdiction or eradication procedures, cooperation with other agencies, search and rescue, and crowd control.

Sand Pine Scrub Management (Update)

Completion 2004

This plan, completed in 1999, will be updated to outline the maintenance of a healthy sand pine scrub community. The plan will incorporate new information acquired since its implementation and include a fire regime, rotations, and mechanical applications. The plan will be updated to include neighboring scrub sites and provide technical assistance to other agencies and organizations.

Mangrove Community and Mosquito Impoundment Management

Completion 2005

This plan will address three strategies, namely hydrology restoration, exotic plant removal, and replanting, for restoring the mangrove community within the three mosquito impoundments on the refuge. Prior to restoration of the impoundments, the plan will describe inventory and surveying protocols, water level management for native species and biting insect control, and monitoring. This plan will be prepared in collaboration with the town of Jupiter Island.

Cultural Resource Protection

Completion 2006

This plan will build on the information gathered by researchers from the National Park Service, Southeast Florida Archaeological Society, and local universities to protect and interpret the cultural resources on the refuge. The plan will emphasize protection of significant sites and include inventory, research, and interpretation.

Predator Control (Update)

Completion 2006

This plan, completed in 1999, will be updated to re-evaluate current control techniques to include lethal and non-lethal methods. The plan will describe the process to achieve less than 10 percent depredation of sea turtle and shorebird nests and protocols for monitoring effectiveness, and will relate to the ongoing sea turtle nest monitoring program.

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Visitor Services

Completion 2007

This plan will address appropriate, compatible, and wildlife-dependent recreational opportunities including facility upgrades, handicapped accessibility, pets, types of recreation, and other visitor services.

Coastal Dune Management

Completion 2007

This plan will include the inventory, management, and follow-up monitoring for a healthy native dune community. The plan will outline exotic plant control, native species recruitment and planting, dune conservation and renourishment, and sea turtle and shorebird nesting.

Land Protection Plan

Completion 2007

As indicated earlier, sand pine scrub and other environmentally sensitive habitats, which were once prevalent in the landscape surrounding the refuge, are rapidly being eliminated through development. These habitats are important for trust species such as indigo snakes and other threatened and/or endangered wildlife.

In collaboration with partners such as Florida State Parks, The Nature Conservancy, Martin and St. Lucie counties, town of Jupiter Island, and adjacent private landowners, the Land Protection Plan will identify lands needing protection outside of the refuge boundary, identify the most appropriate owner, establish priorities for acquisition, and method of acquisition (e.g., fee title and easement). This region-wide collaborative approach to land protection will not only create sufficient blocks of habitat to meet wildlife needs, but also create wildlife corridors by linking environmentally sensitive habitats. During the course of the planning process, planning team members identified approximately 3,300 acres of imperiled environmentally sensitive habitats outside of the acquisition boundary.

Exotic Plant Control

Completion 2008

This plan will identify current infestation levels of the major exotic or invasive plants and outline methods for control and monitoring. It will also address minor infestations and less invasive exotic plant species. It will address the complex issue of bringing exotic plants to a maintenance control level as quickly as possible, and will include the use of chemical herbicides, mechanical eradication, and prescribed fire.

Environmental Education

Completion 2008

This plan, prepared in collaboration with the Nature Center, will reflect the objectives and strategies of the comprehensive conservation plan and address environmental education guidelines following Sunshine State standards. As a part of this plan, an educational curriculum will be created that follows the plan and Fish and Wildlife Service guidelines for environmental education.

Biological Inventory and Monitoring

Completion 2008

This plan will describe inventory and monitoring techniques and time frames. All plant communities and associations on the refuge, as well as all trust species (e.g., migratory birds including shorebirds and neotropical passerines), listed species (e.g., federal and state threatened, endangered, and species of concern, as well as plants listed by the state as commercially exploited), and key species shall be inventoried, and population trends will be monitored. These data are essential to guide wildlife habitat management on the refuge.

Figure 28. Step-down management plans/completion dates.

<i>Step-Down Plan</i>	<i>Completion Date</i>
Law Enforcement	2004
Sand Pine Scrub Management (Update)	2004
Mangrove Community and Mosquito Impoundments	2005
Cultural Resource Protection	2006
Predator Control (Update)	2006
Visitor Services	2007
Coastal Dune Management	2007
Land Protection	2007
Exotic Plant Control	2008
Environmental Education	2008
Biological Inventory and Monitoring	2008

Monitoring an Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources that is directed over time by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for the refuge. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem team and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects will be made. Subsequently, the refuge's comprehensive conservation plan will be revised.

Specific monitoring and evaluation activities will be described in the step-down management plans.

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Plan Review and Revision

This comprehensive conservation plan will be reviewed every 5 years to determine the need for revision. A revision would occur if and when significant information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan would be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuge's goals and objectives. Revisions to the comprehensive conservation plan and the step-down management plans would be subject to public review and NEPA compliance.