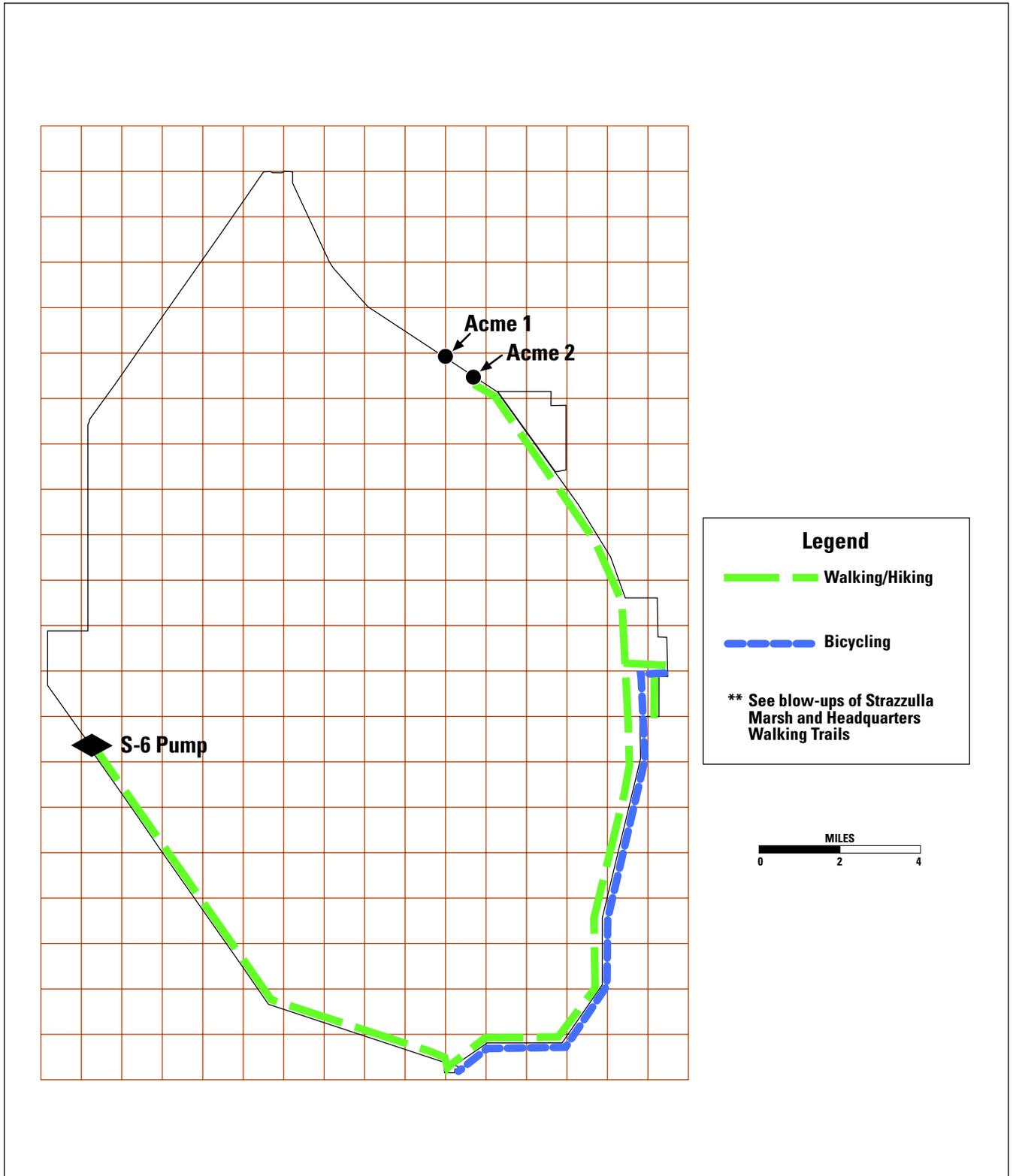


Figure 24. Alternatives 2 and 4: Public use opportunities and land use zones on the L-40 and L-39 Levees, A.R.M. Loxahatchee National Wildlife Refuge.



Alternative 2. Ecosystem Emphasis (Preferred Alternative- This was the preferred alternative before public comment and input was incorporated.)

Appropriate water quality, quantity, timing, and delivery are critical to achieve refuge objectives and Everglades ecosystem objectives. Water management will rely upon developing progressive partnerships with South Florida Water Management District and the Army Corps of Engineers. Another crucial element of this plan is controlling exotic and invasive plants and aggressively pursuing funding to eliminate these threats to the refuge (see Section V, Plan Implementation, Project Summaries, of the Draft Comprehensive Conservation Plan, and Table 8). An Integrated Pest Management Plan will be developed to attack this extensive problem. This alternative enhances biological and research programs, including extensive inventorying, Geographic Information System mapping, and monitoring of wildlife and habitat. Prescribed fire will be used to simulate the historical Everglades ecosystem and as an important tool for managing wildlife habitat and controlling exotic plant growth. All of the compartments (2,030 acres) will be actively managed to enhance wildlife habitat. The refuge will adjust the acquisition boundary to include the lands immediately east of the Headquarters Area to potentially buffer the refuge from development. A wide range of partnering opportunities will be actively pursued and fostered to protect natural and cultural resources.

The previously closed Strazzulla Marsh will be opened to the public on a limited basis. Visitor services will be enhanced or established at the Headquarters Area and Strazzulla Marsh and will include interpretive trails, a boardwalk (or extension), and observation towers. A new pole-boat trail across from Strazzulla Marsh (depending on water quality improvement in the perimeter canal) may be constructed. A concession will be developed at the Hillsboro Recreation Area to expand appropriate, compatible, wildlife-dependent recreational opportunities. The canoe trail will be extended and include overnight platforms (depending on logistics and administrative needs). This plan will increase hunting accessibility and the number of huntable species to include feral hog and alligator by limited permit (if periodic surveys are favorable for hunts). The environmental education program will be enhanced to showcase the northern Everglades ecology and human influence on the southeast Florida ecosystem.

Goal 1. Wildlife Habitat and Population Management

Objectives:

1. Continue to partner with the South Florida Water Management District and the Corps of Engineers to restore and maintain healthy water regimes for 143,238 acres of the refuge as part of the northern Everglades.
2. Expand water quality monitoring to include pesticide, herbicide, fertilizer, and elemental contaminant levels in the cypress swamp, all compartments, Strazzulla Marsh, and the refuge interior by 2005, with the Water Quality Monitoring Plan written by 2002.
3. Reduce exotic melaleuca and Old World climbing fern to a level that requires minimal maintenance in 15 years and restore treated areas with native plants as needed. Develop a Draft Integrated Pest Management Plan by 2002, incorporating the Exotic Plant Control Plan.
4. Monitor and eradicate other exotic or invasive animal threats by 2008. Complete writing the Exotic Animal Control Plan by 2002 and add to the Draft Integrated Pest Management Plan.
5. Implement a fire management program to simulate the historical Everglades ecosystem fire regime where appropriate, enhancing native plants and deterring invasive and exotic plant spread by January 2004. Re-write the Fire Management Plan by 2002.

6. Inventory, map, and monitor wildlife and habitats of the northern Everglades. Compile, collect, and analyze these data to guide refuge management and to contribute to Everglades restoration evaluations. Write the Biological Inventory/Monitoring Plan by 2003.
7. Manage the compartments (A,B,C and D), cypress swamp, and Strazzulla Marsh for trust species such as neotropical migrant landbirds, shorebirds, waterfowl, and wading birds.
8. Manage and maintain diverse native habitats and viable wildlife populations consistent with sound biological principles and other objectives of this plan.

Goal 2. Resource Protection

Objectives:

1. Protect water resources and develop partnerships to ensure an appropriate water regulation schedule (water quality, quantity, delivery, and timing) for the benefit of wildlife and wildlife habitat. Participate in committees associated with the Comprehensive Everglades Restoration Plan and Water Preserve Areas by providing input on water quality, quantity, and timing issues.
2. Protect other natural biological resources on or near the refuge by encouraging communication and developing partnerships with interest groups, landowners, and with the law enforcement division of other natural resource agencies.
3. Adjust the refuge acquisition boundary to include the lands immediately east of the Headquarters Area (approximately 680 acres; see Figure 23). The refuge recognizes the lands adjacent to the refuge and east to SR 441/7 as "Areas of Concern" or buffer lands.
4. Protect species from exposure to contaminants by following applicable regulations.
5. Protect refuge resources (147,392 acres), facilities associated with three visitor use areas, and the visiting public using law enforcement.
6. Develop and implement a cultural resource protection plan in accordance with federal and state historic preservation legislation by 2003.
7. Diminish the looting and vandalism of known or newly discovered archaeological sites.
8. Encourage partnerships to protect cultural resources.
9. Update the Law Enforcement Management Plan by 2002.

Goal 3. Public Use

Objectives:

1. Expand appropriate, compatible, wildlife-dependent recreational opportunities at the Headquarters Area by repairing trails, extending the boardwalk, creating an observation tower in the cypress swamp, raising an existing observation tower, creating a photo blind in Compartment C-8, and improving public support services (*Figure 24*). Extend the existing canoe trail at the Headquarters Area and include two overnight platforms (depending on logistics, administrative needs and funding). (*See Figure 25.*)
2. Provide public access into the Strazzulla Marsh and develop hiking trails, a boardwalk with an observation tower, photo blinds, and interpretive signage. Possibly create a poleboat trail across from Strazzulla Marsh (depending on water quality improvement in the perimeter canal). (*See Figure 26.*)

3. Develop a multi-use trail and waterway system. Continue bicycling and hiking access on the eastern perimeter canal levee (*Figure 27*). Bicyclists will use the levee from the Headquarters Area south to the Hillsboro Recreation Area only. Hiking will be allowed from the S-6 pump station on the western perimeter levee, through Hillsboro Recreation Area to ACME 2 pump station (just north of Strazzulla Marsh). A designated waterway system for motorboats will be implemented on refuge waterways (*Figure 25*).
4. In cooperation with state and county natural resource agencies, expand recreational opportunities at Hillsboro Recreation Area. Develop the use of a concession which may include motorboat, bicycle and fishing gear rentals, fishing guides, interpretive exhibits, and a seasonal pontoon boat shuttle between the Hillsboro Recreation Area, and Strazzulla Marsh and Headquarters Areas.
5. The refuge will provide appropriate, compatible, wildlife-dependent fishing and hunting opportunities. Feral hog and alligator hunting will be initiated. The waterfowl hunt area will be modified to create easier access and to include better habitat (*Figure 25*). Create access trails into the waterfowl hunt area from the east and southeast perimeter canal (depending on water quality improvement in the perimeter canal). Four fishing tournaments per year will continue to be allowed by permit. Hunt and Fishing Plans will be updated or written by 2004.
6. Develop an environmental education curriculum by 2002, for use on and off the refuge that centers on providing an understanding and appreciation of the Everglades, the refuge's ecology, and the human influence on ecosystems of southeast Florida. This plan will follow guidelines from the National Outreach Strategy (Fish and Wildlife Service 1997e), and be part of a strategy to reach key community leaders such as teachers, school board members, elected officials, as well as the news media (Fish and Wildlife Service 1997e). Upgrade the visitor center to include a larger auditorium/classroom with an adjoining wetlab. Build an outdoor teaching pavilion near the Marsh Trail. The Environmental Education Plan will be completed by 2002.
7. Upgrade and expand the interpretive program, portraying the significance of the refuge and threats affecting the refuge and the south Florida ecosystem. The interpretive program will be updated using the guidelines from the National Outreach Strategy. The General Public Use Plan and Sign Plan will be updated by 2005 and 2004 respectively.

Goal 4. Administration

Objectives:

1. By October 1, 2000, work with South Florida Water Management District to sign a new license agreement.
2. Expand current staff to accomplish additional priority refuge operations and maintenance.
3. Continue employee productivity through recognition and training.
4. Continue developing internal and external partnerships to share equipment and manpower.

Table 12. Annual cost of proposed staff positions for A.R.M. Loxahatchee National Wildlife Refuge under Alternative 2, "Ecosystem emphasis"

* Law enforcement enhanced pay (6c retirement)

Salary including benefits (calculated at the highest potential wage possible, using FY-2000 wage scales).

T- temporary or seasonal

<i>Management</i>	<i>Grade</i>	<i>Annual Cost*</i>
Project Leader	GS-0485-14	\$104,400
Deputy Project Leader	GS-0485-13	\$88,400
Refuge Operations Specialist	GS-0485-11/12	\$74,300
Refuge Operations Specialist (trainee)	GS-0485-5/7/9	\$51,200
<i>Everglades Program Team</i>		
Hydrologist	GS-1315-13	\$88,400
Wetlands Ecologist	GS-0408-13	\$88,400
Office Clerk (EP Team only)	GS-0318-6	\$37,700
<i>Administrative Staff</i>		
Office Assistant	GS-0303-8	\$46,400
Office Clerk	GS-0318-6	\$37,700
Receptionist	GS-0318-4	\$30,200
<i>Law Enforcement</i>		
Lead Refuge Officer	GS-0025-9/11*	\$62,000
Refuge Officer	GS-0025-7*	\$46,200
Refuge Ranger	GS-0025-7	\$41,900
Refuge Ranger (Fees)	GS-0025-5/6	\$37,700
Refuge Ranger	GS-0025-4 T	\$13,200
Refuge Ranger	GS-0025-4 T	\$13,200
Fee Collector	GS-0025-3 T	\$ 11,800
Fee Collector	GS-0025-3 T	\$ 11,800
<i>Wildlife/Habitat Management</i>		
Senior Wildlife Biologist	GS-0486-12/13	\$88,400
Wildlife Biologist	GS-0486-11	\$62,000
Biologist (Botanist)	GS-0486-9/11	\$62,000
Biologist (Water Quality & Contaminants)	GS-0486-9/11	\$62,000
Ecologist (Exotic Control)	GS-0486-9/11	\$62,000
Wildlife Biologist	GS-0486-9	\$51,200
Wildlife Biologist	GS-0486-7 T	\$18,400
Wildlife Biologist	GS-0486-7 T	\$18,400
Biological Technician	GS-0404-7	\$41,900
GIS/Data Management Specialist	GS-0404-9	\$51,200
Fire Management Officer	GS-0486-9/11	\$62,000
Fire Technician	GS-0462-5	\$33,800
<i>Maintenance Operations</i>		
Wage Leader	WL-4749-11	\$52,700
Engineering Equipment Operator	WG-5716-10	\$45,100
Tractor Operator	WG-5716-8	\$39,600
Maintenance Mechanic	WG-4749-10	\$45,100
Maintenance Mechanic (Facilities)	WG-4749-9	\$42,300
Automotive Worker	WG-5823-8	\$39,600
Maintenance Mechanic Helper	WG-4749-5	\$31,200
Maintenance Mechanic Helper	WG-4749-5	\$31,200
Boat Operator	WG-5786-5	\$31,200
<i>Public Use</i>		
Supervisory Interpretive Specialist	GS-0025-12	\$74,300
Environmental Education Specialist	GS-0025-9/11	\$62,000
Refuge Ranger	GS-0025-9	\$51,200
Refuge Ranger	GS-0025-7	\$41,900
Park Guide	GS-0025-5	\$33,800
Park Guide	GS-0025-4 T	\$13,200
Volunteer Services Coordinator	GS-0025-7/9	\$51,200
Subtotal (annual staff costs)		\$2,183,800
Annual fixed costs (phone, gas, diesel, electric, travel, equipment repair, equipment and building maintenance, etc.)		\$185,000
Total Annual Cost		\$2,368,800

Alternative 3. Biological Emphasis

Similar to Alternative 2, this alternative would provide emphasis on restoring and maintaining healthy water regimes, reducing all exotic plants and animals especially melaleuca and Old World climbing fern and extensive inventorying and monitoring of wildlife and habitats. Also similar to Alternative 2, the refuge will adjust the acquisition boundary to include the lands immediately east of the Headquarters Area. A wide range of partnering opportunities will be actively pursued and fostered to protect other natural and cultural resources.

A key feature of this alternative is the restoration of 1,100 acres to native cypress swamp and other appropriate habitats through the removal of the dikes between Compartments A, B and C and the cypress swamp. With the removal of the dikes, recreational opportunities and accessibility would be reduced in the Headquarters Area. Educational and interpretive opportunities at the headquarters visitor center would not be enhanced, Strazzulla Marsh would not be opened and no concession would be developed in Hillsboro Recreation Area. The level of service provided to the public would be the same level as Alternative 1. A public feral hog hunting program would be initiated to reduce the habitat damage caused by feral hogs at Strazzulla Marsh.

Another key feature is that a greater number of biologists would be hired and the public use staff would be reduced. The increased complexity of the biological program would contribute greater understanding of the ecosystem to management decisions.

Goal 1. Wildlife Habitat and Population Management

Objectives:

1. Restore and maintain healthy water regimes for 143,238 acres of the northern Everglades in partnership with South Florida Water Management District and the Army Corps of Engineers.
2. Expand water quality monitoring to include pesticide, herbicide, fertilizer, and elemental contaminant levels in the cypress swamp, all compartments, Strazzulla Marsh, and the refuge interior.
3. Reduce melaleuca and Old World climbing fern to a level that requires minimal maintenance within 15 years and restore treated areas with native plants where applicable. Other exotic plants will be controlled as they are encountered. Create a draft Integrated Pest Management Plan including Exotic Plant and Animal Management Plans.
4. Monitor and eradicate other exotic or invasive animal threats.
5. By January 2002, implement a fire management program to simulate the historical Everglades ecosystem fire regime where appropriate, enhancing native plants and deterring invasive and exotic plant spread.
6. Inventory, monitor, and map important representative taxa of most wildlife on the refuge.
7. Restore A, B, and C Impoundments to cypress swamp and other appropriate Everglades habitat according to historical occurrence. Restoration will be accomplished by removing levees, placing culverts, and re-planting native vegetation.
8. Manage and maintain viable populations of most wildlife and habitat, consistent with sound biological principles and other objectives of this alternative.
9. Actively manage Compartment D to provide habitat for Everglades habitat and species, given the physical constraints of this compartment.

Goal 2. Resource Protection

Objectives:

1. Protect water resources on the refuge by developing communication and partnerships to ensure an appropriate water regulation schedule (quality, quantity, delivery, and timing) for the benefit of wildlife and wildlife habitat of the Everglades ecosystem.
2. Protect other natural biological resources on the refuge by encouraging communication and developing partnerships with the law enforcement offices of other natural resource agencies, natural resource interest groups, and landowners.
3. The refuge recognizes the lands east of the refuge up to SR 441/7 as “Areas of Concern,” and as potential buffer zones. The refuge will adjust the acquisition boundary to include the lands immediately east of the Headquarters Area (approximately 680 acres, Figure 23).
4. Protect refuge resources, facilities, and the public using law enforcement.
5. Develop and implement a Cultural Resource Protection Plan in accordance with federal and state historic preservation legislation.

Goal 3. Public Use

Objectives:

1. Restoration of Compartments A, B, and C and the removal of connecting dikes will reduce wildlife observation opportunities at the Headquarters Area (Figure 28).
2. Continue walking and biking along the perimeter levee (Figure 29).
3. Reduce waterfowl hunting and accessibility by limiting the size of the hunting area and the number of hunting days (Figure 29).
4. Implement a feral hog hunting program in Strazzulla Marsh to reduce detrimental effects of hogs on wildlife habitat.
5. Continue to use the visitor center to maintain the refuge educational program.

Goal 4. Administration

Objectives:

1. By October 1, 2000, work with the South Florida Water Management District to sign a new license agreement.
2. Provide a full staff complement to accomplish refuge goals, operations, and maintenance with an emphasis on biological personnel.

Alternative 4. Public Use Emphasis

Similar to Alternative 1, this Alternative would follow the current water regulation schedule used to protect the refuge interior, allow only limited inventorying and monitoring of high profile wildlife species, and minimal control of invasive and exotic plants would be carried out by staff, contractors, or volunteers as funding permits. A wide range of partnering opportunities will be actively pursued and fostered to protect natural and cultural resources.

The key element of this alternative would be to provide an increase in recreational opportunities that are constrained by the compatibility of these recreational uses with refuge purposes and the mission and goals of the National Wildlife Refuge System. All the described public use

Figure 28. Alternative 3: Public use opportunities with removal of levees, A.R.M. Loxahatchee National Wildlife Refuge.

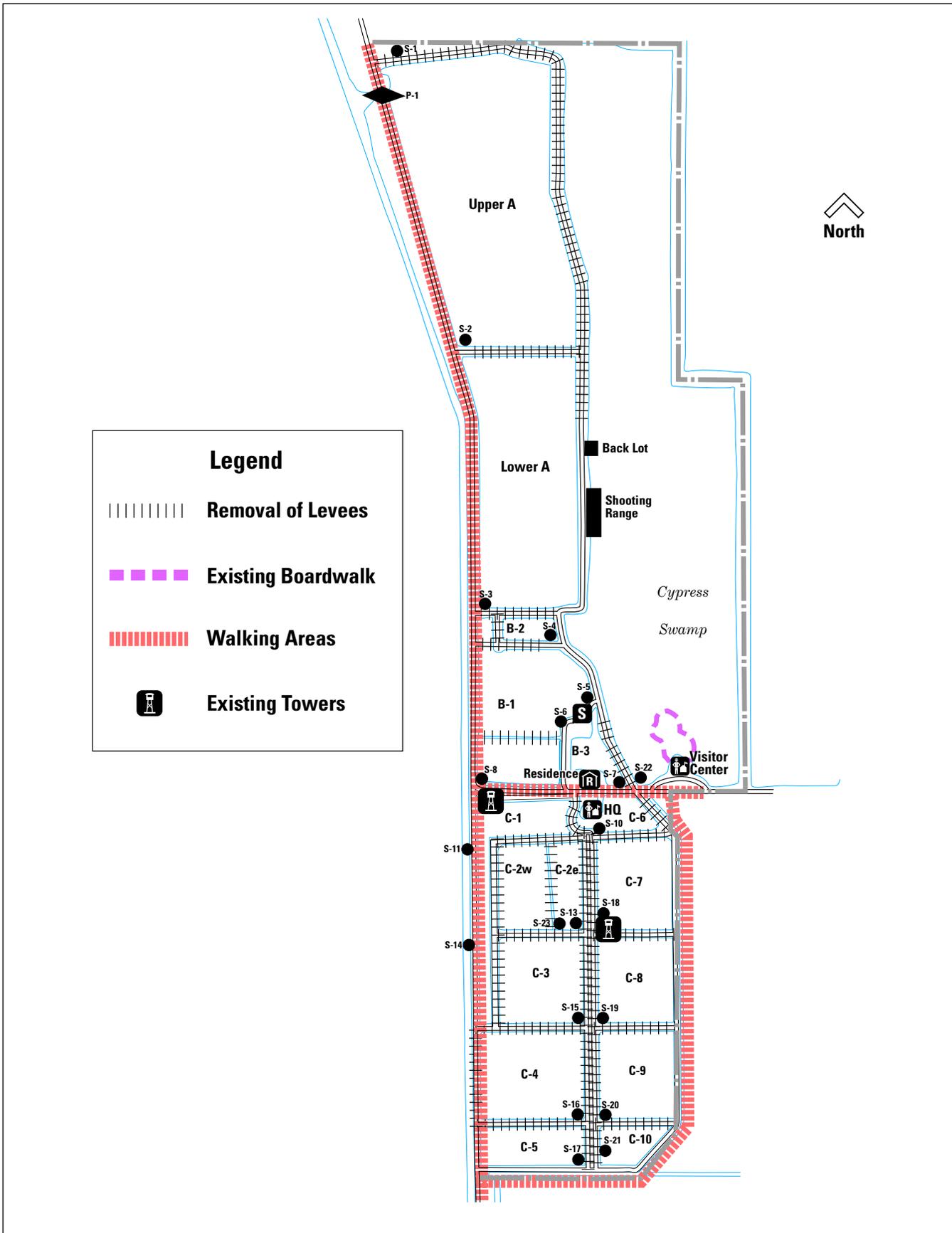


Figure 29. Alternative 3: Reduced public use access, A.R.M. Loxahatchee National Wildlife Refuge.

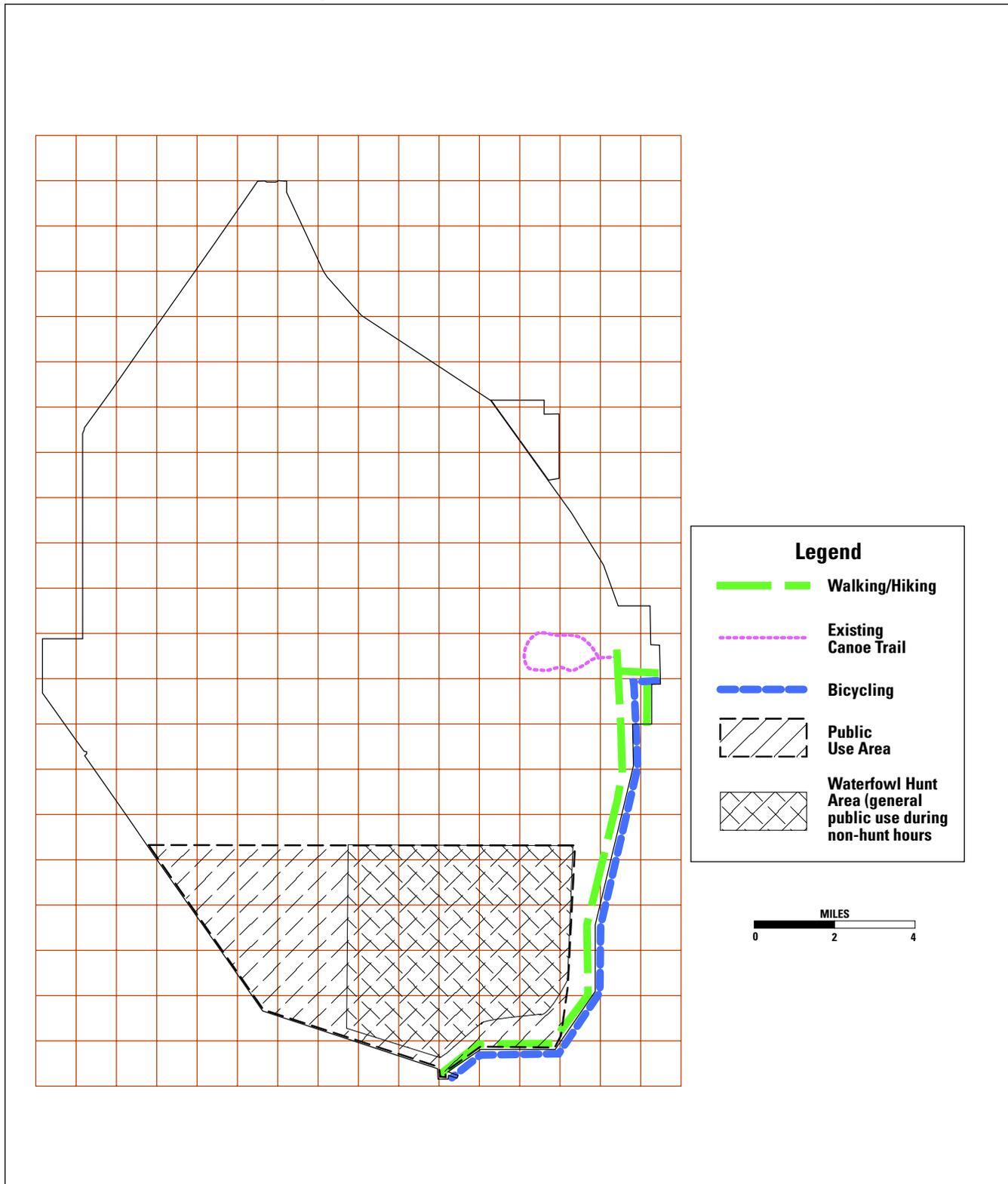


Table 13. Annual cost of proposed staff positions for A.R.M. Loxahatchee National Wildlife Refuge under Alternative 3 "biological emphasis"

<i>Management</i>	<i>Grade</i>	<i>Annual Cost*</i>
Project Leader	GS-0485-14	\$104,400
Deputy Project Leader	GS-0485-13	\$88,400
Refuge Operations Specialist	GS-0485-11/12	\$74,300
Refuge Operations Specialist (Trainee)	GS-0485-5/7/9	\$51,200
<i>Everglades Program Team</i>		
Hydrologist	GS-1315-13	\$88,400
Wetlands Ecologist	GS-0408-13	\$88,400
Office Clerk (EP Team only)	GS-0318-6	\$37,700
<i>Administrative Staff</i>		
Office Assistant	GS-0303-8	\$46,400
Office Clerk	GS-0318-6	\$37,700
Receptionist	GS-0318-4	\$30,200
<i>Law Enforcement</i>		
Refuge Officer (Lead)	GS-0025-9/11*	\$62,000
Refuge Officer	GS-0025-7*	\$46,200
<i>Wildlife/Habitat Management</i>		
Senior Wildlife Biologist	GS-0486-12/13	\$88,400
Wildlife Biologist	GS-0486-11	\$62,000
Biologist (Botanist)	GS-0486-9/11	\$62,000
Biologist (Water Quality & Contaminants)	GS-0486-9/11	\$62,000
Ecologist (Exotic Control)	GS-0486-9/11	\$62,000
Wildlife Biologist	GS-0486-9	\$51,200
Wildlife Biologist	GS-0486-7	\$41,900
Wildlife Biologist	GS-0486-7	\$41,900
Biological Technician	GS-0404-7	\$41,900
Biological Technician	GS-0404-7	\$41,900
GIS/Data Management Specialist	GS-0404-9	\$51,200
Fire Management Officer	GS-0486-9/11	\$62,000
Fire Technician	GS-0462-5	\$33,800
<i>Maintenance Operations</i>		
Engineering Equipment Operator	WG-5716-10	\$52,700
Maintenance Mechanic (Facilities)	WG-4749-9	\$51,200
Automotive Worker	WG-5823-8	\$39,600
Maintenance Mechanic Helper	WG-4749-5	\$31,200
Boat Operator	WG-5786-5	\$31,200
Laborer	WG-4749-3	\$25,600
<i>Public Use</i>		
Supervisory Interpretive Specialist	GS-0025-9	\$51,200
Refuge Ranger	GS-0025-7	\$41,900
Subtotal (annual staff costs)		\$1,677,700
Annual fixed costs (phone, gas, diesel, electric, travel, equipment repair, equipment and building maintenance, etc.)		\$153,000
Total Annual Cost		\$1,830,700

* Law enforcement enhanced pay
(6c retirement),

Salary including benefits (calculated at the highest potential wage possible, using FY-2000 wage scales).

T- temporary or seasonal

activities in Alternative 2 apply to this Alternative. More employees will be hired for public use activities and to assist with environmental education and the biological staff will be reduced. Volunteers will conduct most of the biological surveys.

Goal 1. Wildlife Habitat and Population Management

Objectives:

1. Protect 143,238 acres of refuge habitat with the current water regulation schedule.
2. Continue to monitor water quality in the refuge interior, as in Alternative 1.
3. Control invasive and exotic plants on a limited basis with staff, contractors, or volunteers as minimal funding allows.
4. Perform the limited biological inventory and monitoring program with volunteers (a biologist will oversee the program).
5. Manage the compartments, cypress swamp, and Strazzulla Marsh for public viewing.

Goal 2. Resource Protection

Objectives:

1. Conserve natural and cultural resources through partnerships and protection, and implement a cultural resource interpretive and educational program.
2. Protect water resources on the refuge by participating in committees associated with the Comprehensive Everglades Restoration Project and Water Preserve Areas by providing input on water quality, quantity, and timing issues.
3. Adjust the acquisition boundary to include the lands immediately east of the Headquarters Area (approximately 680 acres, see Figure 20). Lands east of the refuge up to SR 441/7 will be recognized as “Areas of Concern.” Develop partnerships to establish wildlife corridors and buffer lands in south Florida.
4. Develop partnerships for research and monitoring of biological and natural resources and control exotic and invasive species.
5. Protect wildlife and plant communities on the refuge and minimize species exposure to contaminants by following applicable regulations. Follow current contaminant response plans.
6. Enhance law enforcement to protect refuge resources.

Goal 3. Public Use

Objectives:

1. Expand appropriate, compatible, wildlife-dependent recreational opportunities at the Headquarters Area by improving trails, extending the cypress swamp boardwalk, adding a new observation tower and raising an existing one, creating a photo blind in Impoundment C-8, and improving public support services (*Figure 24*).
2. Allow limited public access into the Strazzulla Marsh and develop a hiking trail, a boardwalk with an observation tower over the sawgrass marsh, and photo blinds (*Figure 26*).
3. Extend the existing canoe trail at the Headquarters Area and include two overnight platforms depending on logistics, administrative needs, and funding. Possibly create a new pole-boat trail across from Strazzulla Marsh (depending on water quality improvement in the perimeter canal).

4. Continue bicycling and hiking on the perimeter levee (*Figure 27*). Bicyclists will use the levee from the Headquarters Area south to Hillsboro Recreation Area only. Hiking will be allowed on the levee from the S-6 pump station on the west side, through Hillsboro Recreation Area and north to the ACME 2 pump station.
5. Provide appropriate, compatible, wildlife-dependent fishing and hunting opportunities. Feral hog and alligator hunting will be initiated. The waterfowl hunt area will be modified to create easier access and to include better habitat (*Figure 25*). Eventually create access trails into the waterfowl hunt area from the east and southeast perimeter canal (depending on water quality improvement in the perimeter canal). Four fishing tournaments per year will continue to be allowed by permit.
6. Expand recreational opportunities at Hillsboro Recreation Area through the use of a concession. The concession could include motorboat, bicycle and fishing tackle rental, fishing and interpretive guides, interpretive exhibits, food and gift shop, and an interpretive pontoon boat shuttle between the Hillsboro Recreation Area, Strazzulla Marsh, and Headquarters Areas.
7. Expand the environmental education program, take the Everglades curriculum to sites off the refuge and improve outreach opportunities.
8. Build a covered shelter (teaching pavilion) near the Marsh Trail, expanding the environmental education program to reach more visitors and school groups.
9. Enlarge the visitor center to handle the projected increase in visitors to the refuge, the Everglades, and south Florida.

Goal 4. Administration

Objectives:

1. By October 1, 2000, work with South Florida Water Management District to sign a new license agreement.
2. Expand the staff to accomplish refuge goals, operation, and maintenance with an emphasis on public use personnel.

Table 14. Annual cost of proposed staff positions for A.R.M. Loxahatchee National Wildlife Refuge under Alternative 4 “public use emphasis”

	<i>Management</i>	<i>Grade</i>	<i>Annual Cost*</i>
	Project Leader	GS-0485-14	\$104,400
	Deputy Project Leader	GS-0485-13	\$88,400
	Refuge Operations Specialist	GS-0485-11/12	\$74,300
	Refuge Operations Specialist (Trainee)	GS-0485-5/7/9	\$51,200
	<i>Everglades Program Team</i>		
	Hydrologist	GS-1315-13	\$88,400
	Wetlands Ecologist	GS-0408-13	\$88,400
	Office Clerk (EP Team only)	GS-0318-6	\$37,700
	<i>Administrative Staff</i>		
	Office Assistant	GS-0303-8	\$46,400
	Office Clerk	GS-0318-6	\$37,700
	Receptionist	GS-0318-4	\$30,200
	<i>Law Enforcement</i>		
	Lead Refuge Officer	GS-0025-8/9*	\$52,500
	Refuge Officer	GS-0025-7*	\$46,200
	Refuge Ranger	GS-0025-7	\$41,900
	Refuge Ranger (Fees)	GS-0025-5/6	\$37,700
	Refuge Ranger	GS-0025-5	\$33,800
	Fee Collector	GS-0025-3 T	\$ 11,800
	Fee Collector	GS-0025-3 T	\$ 11,800
	<i>Wildlife/Habitat Management</i>		
	Senior Wildlife Biologist	GS-0486-12/13	\$88,700
	Wildlife Biologist	GS-0486-11	\$62,000
	Biologist (Water Quality & Contaminants)	GS-0486-9/11	\$62,000
	Ecologist (Exotic Control)	GS-0486-9/11	\$62,000
	Biological Technician	GS-0404-7	\$41,900
	Fire Technician	GS-0462-5	\$33,800
	<i>Maintenance Operations</i>		
	Wage Leader	WL-4749-11	\$52,700
	Engineering Equipment Operator	WG-5716-10	\$45,100
	Maintenance Mechanic	WG-4749-10	\$45,100
	Maintenance Mechanic (Facilities)	WG-4749-9	\$42,300
	Tractor Operator	WG-5716-8	\$36,900
	Automotive Worker	WG-5823-8	\$36,900
	Maintenance Mechanic Helper	WG-4749-5	\$31,200
	Maintenance Mechanic Helper	WG-4749-5	\$31,200
	Boat Operator	WG-5786-5	\$31,200
	<i>Public Use</i>		
	Supervisory Interpretive Specialist	GS-0025-12	\$74,300
	Environmental Education Specialist	GS-0025-9/11	\$62,000
	Refuge Ranger	GS-0025-9	\$51,200
	Refuge Ranger	GS-0025-7	\$46,200
	Park Guide	GS-0025-5	\$33,800
	Park Guide	GS-0025-5	\$33,800
	Park Guide	GS-0025-4 T	\$13,200
	Volunteer Service Coordinator	GS-0025-7/9	\$51,200
	Subtotal (annual staff costs)		\$1,956,900
	Annual fixed costs (phone, gas, diesel, electric, travel, equipment repair, equipment and building maintenance, etc.)		\$167,000
	Total Annual Cost		\$2,123,900

* Law enforcement enhanced pay (6c retirement), Salary including benefits (calculated at the highest potential wage possible, including for each position, using FY-2000 wage scales).

T- temporary or seasonal

Table 15. A comparison of alternatives by management goals

Goal 1. Wildlife Habitat and Population Management

<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Protect 143,238 acres of the refuge interior under the current water regulation schedule and continue existing water quality monitoring activities in the interior.	Continue same water schedule, but improve communications on timing and delivery, expand monitoring to include contaminants and to include the cypress swamp and compartments.	Same as Alt. 2.	Same as Alt. 1
Control exotic plants as funding becomes available.	Aggressively pursue funding to remove exotic plants. Physically reduce exotic plants to a minimal maintenance level and control exotic animals.	Same as Alt. 2.	Same as Alt. 1.
No active fire management program, with no prescribed burning.	Implement a fire management program for all applicable areas of the refuge, including controlling invasive exotic plants.	Same as Alt. 2.	Same as Alt. 1.
Monitor high- profile species such as the Florida snail kite, wood stork and waterfowl.	Develop a comprehensive biological inventorying, monitoring and mapping program. This program would encompass plant communities to assess trends, wildlife and habitat responses to management techniques and Everglades restoration efforts, as well as trust species (listed, umbrella or keystone species).	The comprehensive biological program as described in Alt.2 will be fully implemented, but will also include most invertebrates, vertebrates, flowering and non-flowering plants, and algae in the refuge as well as trust species.	Same as Alt. 1 but surveys would be conducted by volunteers.
Continue limited wildlife/vegetation enhancement in Compartment C, (Impoundment C-7 only).	Actively and aggressively manage compartments for trust species. Use many different techniques, including prescribed burning to reduce accumulated biomass.	Restore Compartments A, B and C to cypress swamp. Remove most levees separating them from the existing cypress swamp and add culverts where necessary. Manage Compartment D for listed species.	Manage Compartment C, cypress swamp and Strazzulla Marsh for increased viewing of wildlife. Use prescribed burning to reduce accumulated biomass.

Table 15. A comparison of alternatives by management goals (continued)

Goal 2. Resource Protection

<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Continue participation on Everglades restoration committees.	Encourage communications and develop partnerships with natural resource agencies to ensure appropriate water scheduling, and continue to participate on a host of committees committed to Everglades restoration.	Same as Alt. 2.	Same as Alt. 2
Limited partnerships with groups listed in Alt. 2.	Develop and renew partnerships with interest groups, landowners, and law enforcement divisions of county, state and other agencies.	Same as Alt. 2	Same as Alt. 2
No changes to acquisition management boundary or participation in buffer lands project.	Adjust the refuge acquisition boundary to include approximately 680 acres east of Headquarters Area. Enter into management agreements with agencies that own nearby public lands. Participate in the East Coast Buffer Lands Effort and identify lands along SR 441/7 as “Areas of Concern.”	Same as Alt.2	Same as Alt.2
Use existing cultural resource management protection plan.	Update the cultural resource management protection plan.	Same as Alt. 2.	Same as Alt.2.
Follow minimal regulations to minimize wildlife/habitats to contaminant exposure.	Same as Alt. 1, plus begin contaminant monitoring in the cypress swamp, all compartments and the refuge interior as funds become available.	Same as Alt. 2.	Same as Alt. 1.

Table 15. A comparison of alternatives by management goals (continued)

Goal 3. Public Use

<i>Alternative 1. Maintain Current Management</i>	<i>Alternative 2. Ecosystem Emphasis</i>	<i>Alternative 3. Biological Emphasis</i>	<i>Alternative 4. Public Use Emphasis</i>
Maintain existing visitor facilities, interpretive exhibits and signage.	<p>Improve trails, extend cypress boardwalk and erect an observation tower, raise existing boat ramp observation tower and create a photo-blind.</p> <p>Update interpretive exhibits, interpretive signs and literature.</p>	Same as Alt. 1., with a reduction in areas to observe wildlife for the visiting public in Compartment C.	Same as Alt. 2.
Maintain existing levels of environmental education.	<p>Enlarge the visitor center with an auditorium/classroom and wet lab. Construct an open air teaching pavilion near the Marsh Trail for visiting school groups. Update and redesign the teaching curriculum. Update the outreach program.</p>	Same as Alt. 1	Same as Alt. 2.
No access to Strazzulla Marsh.	<p>Open portions of Strazzulla Marsh to visitors, provide a walking trail, a boardwalk with an observation tower and interpretive signs. A parking lot will be placed on nearby existing high ground pending partnership development.</p>	Same as Alt 1.	Same as Alt.2
No concession at Hillsboro Recreation Area.	<p>Build a concession building that includes office space and interpretive exhibits at Hillsboro Recreation Area.</p> <p>Develop a contract with a concessionaire who may provide motorboats, bicycles, fishing tackle rentals, fishing guides, and a seasonal interpretive pontoon shuttle between Hillsboro Recreation Area, Strazzulla Marsh and Headquarters Area.</p>	Same as Alt. 1.	Same as Alt. 2

Table 15. A comparison of alternatives by management goals (continued)

Goal 3. Public Use (continued)

<i>Alternative 1. Maintain Current Management</i>	<i>Alternative 2. Ecosystem Emphasis</i>	<i>Alternative 3. Biological Emphasis</i>	<i>Alternative 4. Public Use Emphasis</i>
Continue current canoe trail.	<p>Improve canoe trail maintenance, expand the trail into the marsh and create two overnight platforms. Canoe and kayak access to all public use waters in the refuge.</p> <p>Possibly develop a poleboat trail across from Strazzulla Marsh.</p>	Same as Alt. 1.	Same as Alt. 2.
Continue hiking access on the perimeter levee from the S-6 pump station on the western perimeter levee, through Hillsboro Recreation Area north to ACME 2 pump station. Continue bicycling access from Hillsboro Recreation Area to the Headquarters Area.	Hiking and bicycling access are the same as Alt. 1.	Same as Alt. 1	Same as Alt. 2.
No change in motorboat boat access.	Motorboats will be limited to 'slow speed - minimum wake' in all waters of the refuge except in the perimeter canal northwest of Hillsboro Recreation Area.	Same as Alt. 2.	Same as Alt. 2.
Continue with existing hunting and fishing opportunities.	Redefine the waterfowl hunt area boundary to be more motorboat accessible and in better quality habitat. Allow a limited alligator hunt as well as a primitive arms feral hog hunt.	Reduce waterfowl hunt areas and hunt days. Allow primitive arms feral hog hunt in Strazzulla Marsh.	Same as Alt. 2.

Table 15. A comparison of alternatives by management goals (continued)

Goal 4. Administration

<i>Alternative 1. Maintain Current Management</i>	<i>Alternative 2. Ecosystem Emphasis</i>	<i>Alternative 3. Biological Emphasis</i>	<i>Alternative 4. Public Use Emphasis</i>
Sign a new license agreement with South Florida Water Management District.	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Maintain current staff levels.	Expand the staff to accomplish refuge goals and objectives established in this plan.	Same as Alt. 2., with emphasis on expanding the biological staff and reducing the public use staff .	Same as Alt. 2. with emphasis on expanding the public use staff and reducing the biological staff.

Table 16. A comparison of the annual cost of proposed staff positions, including operational and project costs, for A.R.M. Loxahatchee National Wildlife Refuge under four alternatives

General Administration Expenditures	<i>Alternative 1. Maintain Current Management</i>	<i>Alternative 2. Ecosystem Emphasis</i>	<i>Alternative 3. Biological Emphasis</i>	<i>Alternative 4. Public Use Emphasis</i>
+ Annual Staff Costs	24 positions \$1,151,700	46 positions \$2,183,800	34 positions \$1,677,700	40 positions \$1,956,900
Annual Fixed Costs	\$120,000	\$185,000	\$153,000	\$167,000
* Annual Operating Costs	\$1,271,700	\$2,368,800	\$1,830,700	\$2,123,900
Recurring Base Project Costs	\$204,200	\$4,060,600	\$3,648,000	\$1,022,600
**Total Annual Costs	\$1,475,900	\$6,429,400	\$5,478,700	\$3,146,500
^ Initial Project Costs	\$144,100 without land acquisition	\$7,367,300 without land acquisition	\$5,268,300 without land acquisition	\$1,022,600 without land acquisition
Fleet	---	15 vehicles	10 vehicles	12 vehicles
Heavy Equipment	---	1 excavator 2 bulldozers 1 road grader 1 backhoe	1 bulldozer 1 backhoe	1 excavator 2 bulldozers 1 road grader
New Facilities	---	3 buildings 4 trails 1 obs. tower 3 pumps/wcs	1 pump/wcs	3 buildings 4 trails 1 obs. tower

+ Annual Staff Costs calculated at year 2000 federal scale rates including complete benefits (see Tables 11,12, 13 and 14 respectively).
 * Annual Staff Costs + Annual Fixed Costs = Total Annual Operating Costs
 ** Total Annual Operating Costs + Recurring Base Project Costs = Total Annual Costs.
 ^ Initial Project Costs are the beginning costs incurred to get specific projects underway (see Table 8).

Alternatives Considered but Rejected

Based upon a review of the comments about issues/concerns expressed at the public scoping meeting and responses to the comment sheets, the planning team generated a list of ideas that reflected these issues/concerns. These ideas were grouped into eleven alternatives. Of these alternatives, four were evaluated; two were rejected because of a limited scope, but many of the ideas were incorporated into the final four alternatives; and five were rejected. The following alternatives were rejected: “No Public Refuge;” “Open as Much as Possible to Public Access or Completely Open;” “Function as a Wildlife Sanctuary, with Limited or No Public Access;” “Maximize Water Protection;” and “Purchase Remaining Conservation Lands in Palm Beach County.”

Responsiveness to Issues, Concerns, and Opportunities

Following the guidelines of the National Environmental Policy Act, a planning team identified issues and concerns by holding a public scoping meeting and by fielding written comments from the public. Table 18 reflects how each of the alternatives addresses the major issues and concerns. In other words, “What actions does the Service plan to take in response to these issues and concerns?” As the reader will note, while most alternatives are responsive to the issues and concerns, others provide little improvement in the actions to address identified needs.

After considering the responsiveness of the alternatives to the issues and concerns, the environmental consequences of the alternatives, and legal mandates for managing national wildlife refuges, it is the opinion of the planning team and the Service that the preferred alternative (Ecosystem Emphasis) best balances wildlife and public use and meets the intent of the National Wildlife Refuge System Improvement Act.

Table 17. Alternatives considered but rejected and the rationale for rejection

<i>Alternatives Rejected</i>	<i>Rationale for Rejection</i>
<p>“No Public Refuge” (private management, state management, don’t support Comprehensive Everglades Restoration Plan or the Water Preserve Areas)</p>	<p><i>Deviates from Legislative Mandates.</i> In keeping with the Refuge Improvement Act of 1997, the Service is charged with developing comprehensive conservation plans for all national wildlife refuges within 15 years.</p> <p>The Service desires to continue as an active partner in Everglades restoration and protection. The majority of lands are managed through a license agreement with the South Florida Water Management District and the Service and its legislative mandates. The return of the refuge interior to State management or to private management would require the dissolution of the agreement. The refuge is an important part of the Comprehensive Everglades Restoration Plan in that it protects some of the most pristine Everglades habitat left in the system and is an important area for wildlife use, especially while southern components are being restored.</p> <p>The Service response to other issues associated with access and recreation are addressed in Appendix J.</p>
<p>“Open as much as possible to public access or completely open” (all sections-all hours).</p>	<p><i>Deviates from Service Policy.</i> The fundamental mission of the National Wildlife Refuge System is wildlife conservation: wildlife must come first in the management of refuges. The Service will allow and provide for public use of a refuge-- to the extent possible--as long as these uses are compatible with this mission and the purposes for which the refuge was established. In the development of public use opportunities, appropriate, compatible wildlife-dependant recreation uses will be emphasized. However, to open the entire refuge to public use would cause unreasonable harm to wildlife populations and habitat.</p> <p>The Service response to other issues associated with access and recreation are addressed in Appendix J.</p>
<p>“Function as a wildlife sanctuary, with limited or no public access” (closed refuge to all public, no public use, ecosystem management with low impact by human interaction)</p>	<p><i>Deviates from Legislative Mandates.</i> The Refuge Improvement Act of 1997 recognizes the importance of a close connection between fish and wildlife and the American character, and of the need to preserve America’s wildlife for future generations to enjoy. In the planning and management of national wildlife refuges, appropriate, compatible wildlife-dependent recreational uses will be emphasized when it is determined that these uses are compatible with the mission of the National Wildlife Refuge System and refuge purposes.</p>
<p>Maximize water protection (status quo on habitat management, fix water by 2006)</p>	<p><i>No Jurisdiction.</i> The State of Florida surface water quality standards have been or are being set by the Florida Department of Environmental Protection. Waters discharged into the refuge under permits issued to the South Florida Water Management District must meet the requirements established in the permits by the Department of Environmental Protection and as set out in the Consent Decree. The Service can review and comment on permit requirements and encourage the District to improve water quality but it has no legal jurisdiction over the District; rather, legal jurisdiction lies with the Department of Environmental Protection.</p>
<p>Purchase remaining conservation lands in Palm Beach County.</p>	<p><i>Not Feasible.</i> While the Service has the authority to acquire appropriate lands from willing sellers to fulfill its mission, those lands must support the Everglades Restoration effort or be lands used by federally threatened or endangered species. Although this refuge may wish to acquire more lands, and support the East Coast Buffer Initiative, Water Preserve Area, and Ag Reserve Initiatives, the refuge is one of more than 520 national refuges requesting funds from Congress for land purchases. It is not feasible to think funds would be allocated for the refuge to purchase the remaining lands in the county.</p>

Table 18. Responsiveness of the alternatives to issues and concerns expressed at the public scoping meeting or through written comments

Issue or Concern	<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Wildlife and Habitat: 1. The increasing number of exotic plant and animal species are negatively impacting the refuge's native wildlife and habitat.	Maintain a limited effort of exotic plant removal.	Aggressively bring exotic and invasive plants to a maintenance control level. Actively seek funding for plant removal. Create an Integrated Pest Management Plan which includes the exotic and invasive plant and animal removal plans. Use prescribed fire to remove biomass and to stunt exotic and invasive plant regrowth. Support public hunting opportunities to remove exotic animals. Support sound bio-control efforts.	Same as Alt. 2	Same as Alt. 1
2. There is a need to improve the management of species and habitats to enhance the native biodiversity and integrity of the refuge.	Continue to follow the consent decree regarding water regulation.	Implement a fire management plan to simulate the historical Everglades ecosystem. Extensive exotic plant control efforts will reduce exotics to minimal presence. Management efforts will include restoration of cleared land to cypress swamp, water level manipulation and fishery management to provide a mosaic of habitats to compliment the refuge interior. Intensely managing Compartments A,B,C and D and impoundments will provide good quality habitat for migratory, wintering and resident wildlife.	Same as Alt. 2 , however Compartments A,B and C will be re-joined and restored to native cypress swamp. Active management of Compartment D will provide good quality habitat for migratory, wintering and resident wildlife.	Same as Alt.1
3. The degraded water quality and past water management practices (e.g. water quantities and schedules) are negatively impacting the refuge's ecosystem.	Follow consent decree.	Follow consent decree. Increase monitoring of water quality and assess wildlife and habitat response to the 1995 water quantity, timing and delivery schedule. Administratively support the Comprehensive Everglades Restoration Plan and Water Preserve Areas. Increase public awareness on these projects through environmental education. See that state and federal water quality laws are followed in accordance with legal mandates.	Same as Alt. 2	Follow consent decree. Support the Comprehensive Everglades Restoration Plan with environmental education. Conduct minimal monitoring of water quality and assess wildlife and habitat response to the water quantity, timing and delivery. See that state and federal water quality laws are followed in accordance with legal mandates.

Table 18. Responsiveness of the alternatives to issues and concerns expressed at the public scoping meeting or through written comments (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Refuge Protection:				
1. The refuge is threatened by rapid development of residences, planned communities, strip malls or golf courses near its boundary.	Little change will be made to augment the refuge boundaries.	Partnerships will be explored and developed to acquire additional lands or assist in the East Coast Buffer effort to protect undeveloped or agricultural areas around the refuge, especially along State Road #7/441 and the Headquarters Area.	Same as Alt. 2	Same as Alt. 2
2. The wildlife and habitats are not protected enough.	The consent decree will be followed to improve water quality and therefore passively enhance habitat. Few species will be monitored.	A comprehensive biological program including extensive inventory, monitoring, research and GIS mapping of trust, key and umbrella species will be implemented. This information will assist management activities seeking to protect, maintain and enhance wildlife populations and native habitats on the refuge. Law enforcement effort will be increased to reduce poaching and harassment.	A comprehensive biological program as described in Alt.2 will be implemented, but will include most invertebrates, vertebrates, flowering and non-flowering plants, and algae in the refuge. This information will assist management activities seeking to protect, maintain and enhance wildlife populations and native habitats on the refuge. Law enforcement efforts will be increased and public accessibility reduced.	Same as Alt. 1
Public Use:				
1. There are not enough opportunities to observe wildlife and its habitat in a quiet, natural, non-developed environment.	Continue existing opportunities for passive recreation such as wildlife observation, painting and photography.	Expand or update the Headquarters Area visitor center, interpretive trails. Continue Alt. 1 activities. Open Strazzulla Marsh to the public with an interpretive trail, a boardwalk and an observation tower. Establish a concession for Hillsboro Recreation Area with an interpretive pontoon shuttle between main access points.	No new opportunities would be developed over Alt. 1. Levees between impoundments and the cypress swamp would be removed resulting in fewer walking trails at the Headquarters Area.	Same as Alt. 2
2. There is a need for increased access to the refuge for active recreational uses such as hiking, camping, bicycling, horseback riding, canoeing, and airboating.	Continue walking and bicycling access on the perimeter levee. Increase efforts to maintain the existing canoe trail effectively.	Continue Alt. 1 opportunities and extend existing canoe trail and provide overnight opportunities on the canoe trail. Consider creating a pole boat trail across from Strazzulla Marsh. Establish a concession for Hillsboro Recreation Area with motorboat, bicycle and fishing gear rentals. Assign areas of waterways	Same as Alt. 1.	Same as Alt. 2. Recreational airboating cannot be allowed because it is incompatible with primary refuge purposes of providing habitat for migratory birds.

Table 18. Responsiveness of the alternatives to issues and concerns expressed at the public scoping meeting or through written comments (continued)

Issue or Concern	<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
<p>Public Use: 3. There is a need to provide increased access to the refuge for hunting waterfowl, deer, alligator, turkey, bear and frogs.</p> <p>The habitat needs better management for fishing and hunting activities.</p>	<p>Continue existing hunting and fishing opportunities.</p>	<p>Redefine waterfowl hunt area to allow greater accessibility to motorboats by expanding existing interior hunt boundaries to the west.</p> <p>Prescribed burning will be used to open habitat and create waterfowl and coot loafing and foraging areas. Prescribed burning shall also open more area for fishing accessibility.</p> <p>Strazzulla Marsh will be opened to feral hog hunting at specified times. A limited alligator hunt will be instituted. Habitat improvements will be made (see Refuge Protection 2.)</p>	<p>Initiate feral hog hunting on Strazzulla marsh to reduce resource degradation. Reduce waterfowl hunting days and accessibility to hunt areas.</p>	<p>Same as Alt. 2.</p>
<p>4. Don't allow air boating/ allow airboating.</p>	<p>Recreational airboating will not be allowed, however, staff will use airboats for necessary biological operations, habitat management, research and law enforcement.</p>	<p>Same as Alt. 1</p>	<p>Same as Alt. 1</p>	<p>Same as Alt. 2. Recreational airboating can not be allowed because it is incompatible with primary refuge purposes of providing habitat for migratory birds</p>
<p>5. There is a need to improve access and improve/provide public use facilities at the Hillsboro Recreation Area and at Strazzulla Marsh.</p>	<p>No improvements will be made to the Hillsboro Recreation Area except upgrading the existing boat ramps.</p> <p>Strazzulla Marsh will remain closed to the public.</p>	<p>Partner with other agencies to award full concession contract, including establishment of buildings with interpretive displays, public restrooms and telephones, plus docks, improved boat ramps, rental motorboats and bicycles, fishing guides and pontoon boat tours at Hillsboro Recreation Area.</p> <p>Limited areas of Strazzulla Marsh will be opened to the public and feature a boardwalk, an observation tower and interpretive signs. A pole boat trail may be developed. A parking lot will be placed nearby on existing high ground.</p>	<p>Same as Alt. 1.</p>	<p>Same as Alt. 2.</p>

Table 18. Responsiveness of the alternatives to issues and concerns expressed at the public scoping meeting or through written comments (continued)

Issue or Concern	<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Public Use:				
6. There is a need to expand environmental education and interpretation, highlighting the Everglades ecosystem.	Environmental education will be minimally addressed. The current interpretive system will be maintained but not improved.	The visitors center area will be expanded with an additional building constructed for schools and college classes and in-service teacher education classes. An open-air teaching pavilion will be built near the marsh trail for field instruction. The current refuge curriculum will be expanded and improved. Interpretive exhibits and signs will be improved or added to all access points.	Environmental education will not be stressed. The current interpretive system will be amended to explain the rejoining of the compartments.	Same as Alt. 2.
Partnerships:				
1. There is a need for the refuge to develop partnerships with state, county and community agencies, universities and other educational institutions, natural resource based organizations and other entities.	Limited partnership efforts will continue.	Extensive efforts will be made to work with these groups. Efforts will be made to cooperate by sharing information, skill, manpower and equipment with partners.	Same as Alt. 2	Same as Alt.1
2. Give the refuge land back to the state.	Sign a new License Agreement with South Florida Water Management District and continue refuge operations.	Same as Alt 1., see Alternatives Considered but Rejected (Table 17).	Same as Alt 1, see Alternatives Considered but Rejected (Table 17).	Same as Alt 1, see Alternatives Considered but Rejected (Table 17).
3. Many of the public wish to develop ecotourism connections with the business community.	The refuge will continue to allow people to visit, and explore limited partnerships.	Support increasing partnerships and recognize that greater refuge awareness will enhance ecotourism and resource protection in the area.	Same as Alt. 2	Same as Alt. 2

V. Affected Environment

See Section III, Refuge Environment, of the Draft Comprehensive Conservation Plan.

VI. Environmental Consequences

Section IV described the four alternatives for achieving the vision for the refuge. These alternatives are Alternative 1, Maintain Current Management; Alternative 2, Ecosystem Emphasis; Alternative 3, Biological Emphasis; and Alternative 4, Public Use Emphasis. This section discusses the environmental impacts expected to occur from the implementation of each alternative. Alternative 1 (Maintain Current Management) is used as the baseline from which the other three alternatives are compared.

The planning team selected the following impact topics to analyze: (1) Physical Environment, (2) Biological Environment, (3) Cultural and Historic Resources, (4) Recreation, Environmental Education and Interpretation, (5) Socioeconomic Environment and (6) Unavoidable Impacts.

Direct, indirect, and cumulative impacts are described where applicable for each alternative. Direct impacts are those that occur immediately or occur at the same place and time. Indirect impacts are those that are foreseeable and occur later in time. Cumulative impacts are a series of individual, seemingly minor ones that may accumulate to create major problems over a period of time. The effects of the alternatives on the impact topics are summarized in Table 19.

Effects on the Physical Environment

Soils

Under Alternatives 1, 2, 3 and 4, the soils of the interior would not be impacted differently by the current water management schedule initiated in May 1995. With the minimum water level measured at marsh station 1-8c set at 14 feet (National Geographic Vertical Datum), the refuge interior would not become dry and subside as readily as it has in the recent past. By keeping some water over the peat, mercury would not be activated as readily with the re-flooding of summer rains. Also the possibility of peat fires would not be as great a threat as it has been in the past.

Under Alternative 1, no active or intense wildlife habitat management would occur on any impoundment, except C-7. To provide habitat for wading birds, waterfowl and shorebirds, unwanted vegetation would be managed using moist soil management techniques (draining, rollerchopping, discing, re-flooding) and occasional applications of herbicides. These techniques would have a negative effect on the soils in C-7, since peat soils would compact and subside under drainage and compress under the weight of heavy equipment. Re-flooding could also re-activate mercury in the soil and cause contamination of wildlife foods.

Under Alternative 2, intensive wildlife habitat management would occur in all compartments (A, B, C and D). Instead of drainage and the use of heavy equipment, prescribed fire would be used to reduce unwanted vegetation. By limiting soil exposure to air for long periods and eliminating heavy equipment, subsidence should not be as pronounced and the potential for mercury contamination should be reduced. To determine if the proposed impoundment treatments would imperil wildlife, routine soil samples would be taken and tested for mercury and contaminants as part of the inventory/monitoring process.

Under Alternative 3, a select number of levees around Compartments A, B, and C would be removed. Dismantling the levees may, in the short run, have a negative impact on the peat marshes, but the habitat restoration to a cypress swamp would be beneficial to the soils and to wildlife in the long run.

Under Alternatives 2 and 4, actual construction of boardwalks, observation towers, and improving public support services at the Headquarters Area and Strazzulla Marsh would have negative, but minimal effects on soils and vegetation. However minimal wetland effects may be, they would be mitigated to comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. Parking areas would be constructed to allow storm water to percolate into the soil rather than allowing it to run directly into the adjacent wetlands. Short-term negative effects to air, noise quality, and soils within the project site would be expected, and measures to protect the environment would be taken.

Under Alternatives 2, 3 and 4, hunting of feral hogs would help alleviate soil disturbance and decrease exotic plant establishment in the Strazzulla Marsh.

In all of the alternatives, staff airboat use will cause limited soil erosion to the wetlands. (See Airboat Impacts.)

Hydrology

Under Alternatives 1 and 4, there would be little change from the current conditions. However, under Alternatives 2 and 3, hydrologic conditions in the refuge interior should improve as greater efforts to enhance communications and partnerships between the refuge, South Florida Water Management and Army Corps of Engineers would result in better day-to-day water management.

Also under Alternatives 2 and 3, extensive monitoring and modeling would be conducted that would allow refuge staff to recommend changes to the current regulation schedule. This would result in a cumulative, long-term benefit to refuge habitats and wildlife. In addition, under Alternative 2, hydrologic conditions in the compartments would benefit targeted trust species such as wading birds, wood storks, shorebirds, and Florida snail kites. Non-targeted species may not benefit as much from specific management actions. While managing small impoundments such as Compartments A, B, or C, draining, burning, or discing can temporarily displace and cause minimal benefit to fish, small mammals, and invertebrates. However, the hydrologic conditions in a few impoundments would change on a rotational schedule, allowing the remaining 15+ impoundments to provide habitat for “non-target species.” Under Alternative 3, the hydrologic conditions in the impoundments would be returned to a more natural Everglades condition (by the removal of levees), and wetland-dependent species would benefit.

Water Quality

Water issues such as quality, quantity, delivery, and timing, directly and cumulatively, affect the nesting and foraging success of many species. Because of the significant water issues affecting the refuge, staff would continue to monitor these issues and continue to dialogue with the South Florida Water Management District and the Army Corps of Engineers under all alternatives. Direct and indirect efforts to reduce nutrient loads (phosphorous) from agricultural and residential runoff into the refuge would also continue under all alternatives.

Because of actions outside of the refuge and specifications under the Consent Decree, water quality in the refuge should improve over the next 15 years. The difference in the alternatives would be seen in the extent of improvement above what is already mandated. Under Alternatives 1 and 4, a cumulative increase in the water quality in the interior of the refuge would be observed; however, with no additional monitoring, the identification of problem areas and their ultimate clean-up would not be accomplished.

Under Alternatives 2 and 3, water quality, quantity, delivery, and timing throughout the refuge would improve. Monitoring would be expanded to include pesticides, fertilizers, herbicides, and elemental contaminants in the refuge interior, all the compartments, and cypress swamp. The number of water quality monitoring stations would be increased so that problem sites could be identified. Subsequent clean-up of problem sites would be beneficial for most species. Water quality problems in the cypress swamp would be specifically addressed resulting in a positive cumulative impact on water quality. Increased communication and coordination with agencies such as the South Florida Water Management District and the Army Corps of Engineers regarding water quality monitoring would assist the refuge in comprehensive monitoring of its resources and would allow quicker responses to timing of water delivery or removal which is especially important to wildlife populations.

The cumulative effects of long-term herbicide use for exotic and invasive plant control under Alternatives 2 and 3 would diminish surface water quality in localized areas. Only wetland approved herbicides would be used. Leaching could cause chemicals used in refuge operations to enter the aquifer in a very dilute form. No health or safety concerns are expected; however, water quality testing would be used to keep contamination below allowable levels.

Improving water quality would directly improve the vegetation and habitat conditions within refuge impoundments. Most of the water currently received by the refuge and diverted into refuge impoundments is laden with nutrients, causing an explosion of noxious vegetation. The impoundments then become covered in dense vegetation and unsuitable for many species of wildlife that once used them. This also has a direct effect on the numbers of visitors who come to the refuge to view wildlife.

New facility construction of any of the structures in the alternatives would have little effect on water quality. Any or all fill operations would comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. Parking areas would be constructed to allow storm water to percolate into the soil rather than allowing it to run directly into the adjacent wetlands. Short-term negative effects to air, noise quality, and soils within the project site would be expected, and measures to protect the environment would be taken. (See section on Airboat Impacts regarding water quality issues.)

Air Quality

Under Alternatives 1 and 4, no impacts are anticipated. Under Alternatives 2 and 3, sporadic times of air pollution would increase on a short-term basis, since fire would play a much larger role in refuge management than under the first alternative. For example, more than 100 acres of impoundments could be burned each year; a number of treated melaleuca sites could be burned each year; and portions of the interior could be treated with prescribed fire each year.

Smoke pollution generated by prescribed fire could effect, in the short term, vehicular traffic safety and respiratory problems in the urbanized areas east of the refuge. To minimize the amount of smoke, fire prescriptions would be conducted with predominately easterly winds.

Noise pollution

The refuge strives to maintain the natural quiet and sounds associated with the refuge's environment. Artificial and mechanical noise has the potential to disturb wildlife and human visitation. As stated in an Environmental Assessment for Big Cypress National Preserve, artificial noise, specifically airboats, may cause resident, migratory, and wintering wildlife to flush from nests, dens, cover, foraging areas, or cause avoidance of habitat (Department of the Interior, National Park Service 1999a, 1999b). (See *Airboat Impacts and Appendix J*.)

Under Alternatives 1 and 4, a helicopter would be used two days a month to collect water samples by the staff of the refuge and South Florida Water Management District. Additional helicopter flights may be used to gather technical information on the refuge as well as inspect other areas (e.g., Everglades Nutrient Removal Project, Storm Water Treatment Areas, and Water Conservation Areas). To minimize negative impacts to wildlife, all flights must exceed 500 feet, unless in accordance with a special use permit. All aircraft flying below 500 feet would be investigated by refuge law enforcement.

Under Alternatives 1 and 4, very limited noise impacts are anticipated except at Hillsboro Recreation Area, where a nearby commercial airboat operator works out of Water Conservation Area 2.

Under Alternatives 2 and 3, additional wildlife or habitat research and inventory/monitoring surveys conducted with the use of helicopters, airplanes, or airboats would have the potential of increasing noise impacts. The cost of helicopter and airplane rental would limit their use to the most important trips over the refuge. All airboat use in the refuge interior would be based on specific project needs (See *Airboat Impacts*).

Under Alternatives 2 and 4, the concession at Hillsboro Recreation Area would generate more noise impacts than described in Alternatives 1 and 3, because of increased motorboat use, guided fishing tours, and potentially an interpretive pontoon boat tour (See *Airboat Impacts*).

With all the alternatives, gunfire associated with the hunting seasons would contribute to local noise pollution; however, this impact is thought to be minimal and distant from the most heavily visited section of the refuge.

Under Alternatives 2 and 4, there would be increased noise in the Headquarters Area from pumps, which move water in and out of the impoundments to enhance wildlife habitat. This periodic engine noise would negate the 'natural quiet' some visitors seek at the refuge.

Aesthetics

The refuge is a scenic wonder, filled with outstanding Everglades marsh, tree island, and cypress swamp habitats. The managed impoundments can also be pleasing to the eye. Under Alternative 1, invasive cattail, floating exotic plants, exotic trees, and vines would continue to prevent a naturalist's appreciation of the refuge. There would be minimal attempt to place native plants around facilities and residences under Alternative 1.

Under Alternatives 2 and 3, a great effort would be made to control and manage the invasive and exotic plants on the refuge. Initially, the control efforts would not be pleasing to visitors. Treatments vary with kinds of exotic plants; melaleuca is cut down or pulled out and allowed to lay in the water to die; Old World climbing fern is sprayed, causing cascades of dead vine debris to hang from shrubs and trees; Brazilian pepper is cut or uprooted; and other exotic or invasive plants would be chemically treated and would remain on site to decompose. These treated areas may appear unsightly until native plants fill in the areas.

Fire would be used to reduce melaleuca biomass after treatment, where applicable. Further research is needed to know if burning treated Old World climbing fern is a safe and effective method to reduce biomass and not spread its spores. Under these alternatives, strict guidelines would be followed for planting site-appropriate native plants around facilities and residences.

Under Alternatives 2 and 3, prescribed fire would be used to enhance wildlife habitat in the interior. Fire would also be used in the impoundments under Alternatives 2 and 4. Some may consider this management tool to be aesthetically unpleasing, since these marsh areas would be temporarily blackened; however, new vegetative growth would rapidly become green.

Under Alternative 3, a short-term decrease in the aesthetics in the Headquarters Area would occur as numerous levees are removed and the impoundments are restored to cypress swamp and Everglades-type conditions.

Generally, under Alternatives 2 and 4, the increase in the number of access points and associated visitor use escalates the potential for litter. Litter would not only be unsightly, but also it may result in increased wildlife ingestion of plastics and entanglements in trash.

Facilities

Under Alternatives 1 and 3, no new facilities would be created. Existing buildings would be maintained. No additional impacts are expected. Under Alternatives 2 and 4, a concession building would be constructed at the Hillsboro Recreation Area. It would be built on a former structure site that was prepared with fill so no archaeological restrictions would apply. A dock area may be built when the concession building is approved. Initial construction would directly impact the area. However, the proposed area is already heavily impacted from boat use and a dock would decrease the impact to banks and decrease erosion problems. Existing boat ramps would be replaced with little or no damage to the site. Under Alternatives 2 and 4, an additional building for classroom education/auditorium would be constructed near the present visitor center at the Headquarters Area and a teaching pavilion will be constructed near Impoundment C-7. Because the proposed sites for these additional structures are the edge of an existing filled area (parking lot or grassy area), no archaeological sites exist in this area, and no existing wetlands would be lost. Constructing the overnight platforms along the canoe trail would cause minimal direct negative impacts, but little other impacts would be expected. Parking facilities would be created on existing high ground near Strazzulla Marsh under Alternatives 2 and 4.

Effects on the Biological Environment

Vegetation and Exotic Plants

Sloughs and Wet Prairies:

Under Alternatives 1 and 4, wet prairies and possibly sloughs would continue to fill in with vegetation because of the loss of fire in the ecosystem. This would result in the possible loss of thousands of acres of native plant communities and diminish the biological heterogeneity of the northern Everglades. Under Alternatives 2 and 3, the use of prescribed fire would mimic the natural role of wildfire and continue to provide the open habitat, which would benefit many wildlife species.

Sawgrass:

Under Alternatives 1 and 4, sawgrass would continue to fill in open spaces especially in the south, southwestern, and western portion of the refuge. With the abnormally high nutrient content of the water, the sawgrass stands around the edges of the refuge have grown taller, more numerous, and more dense than historically. As the water quality improves, sawgrass would grow more slowly and less densely. However, the existing biomass would continue to convert wet prairies to sawgrass.

Under Alternatives 2 and 3, prescribed fire (*Fire Impacts section*) would be used to reduce the impinging sawgrass and recreate wet prairies. Fire would also assist in re-creating the rich mosaic of sawgrass and wet prairie which provides both cover and foraging opportunities for wildlife species. The effects of Alternatives 2 and 3 would be beneficial to wildlife.

Tree Islands and the Cypress Swamp:

Under Alternatives 1 and 4, wildfire would eventually destroy tree islands which are covered by Old World climbing fern; likely assist in spreading the exotic fern (although studies are needed to verify this); and assist in spreading exotic melaleuca seed. Without exotic plant treatment and control, the largest remaining cypress strand along the eastern edge of the Everglades would probably be lost to the infestation of exotics and/or wildfire.

Under Alternatives 2 and 3, control efforts would halt the spread of exotic and invasive plants and permit the restoration of these degraded habitats. Alternatives 2 and 3, would have some direct impacts on nearby non-targeted plants related to treatment techniques but would provide substantial positive effects on these native vegetative communities in the long run.

Cattail:

Much of the habitat found along the perimeter of the interior is reduced in value and serves no useful purpose to wildlife, as sawgrass marsh and wet prairies have been replaced by dense cattail. Under the current management program and Alternative 4, dense cattail would continue to expand from the refuge perimeter canals inward toward the more pristine interior. Under Alternatives 1 and 4, waterfowl and fish habitat would continue to decline as open portions of the refuge fill in with cattail in the south, southwest, and western portions of the refuge.

Generally, as water quality improves under all the alternatives, cattail in the perimeter canal is expected to decline very slowly as it loses its supply of high nutrients. However, the residual large area of biomass would still preclude wildlife use.

In Alternatives 2 and 3, prescribed fire in cattail would reduce biomass in the areas mentioned as well as other cattail-infested areas and provide better wildlife habitat.

Exotic Plant Impacts to Native Vegetation:

Vegetation components of the refuge would continue to exist under Alternatives 1 and 4, albeit in a different form than the original Everglades. Major portions of the refuge vegetation would continue to be replaced by invasive and exotic plants.

Under Alternatives 1 and 4, controlling invasive exotics such as melaleuca, Old World climbing fern, and Brazilian pepper would not receive the level of attention given in Alternatives 2 and 3; thus, there would be continued degradation of native habitats unique to the northern Everglades. Current levels of refuge funding for treatment of exotics, using temporary laborers and private contractors, would result in very limited control. Native habitats, including sawgrass, wet prairies, sloughs, and tree islands, would continue to be replaced by monotypic stands of melaleuca at the rate of 10 acres per day.

Under Alternative 1, an additional 25 percent of the refuge interior would be lost to melaleuca within 5 years. Similar habitats in Compartment D and Strazzulla Marsh would be subjected to the same fate. Without aggressive treatment, Old World climbing fern would continue to spread at the rate of approximately 5 acres per day. Brazilian pepper would continue to overrun levees and dikes, successfully crowding out native vegetation growing along the edge of impoundments. Constant seed release from exotic plants onto neighboring private lands would further accelerate the infestation of refuge lands. The refuge, in fact, would succumb to exotic plant invasion within 15 years and the integrity of the ecosystem would be lost forever. Under all the alternatives, floating invasive exotics such as water lettuce and water hyacinth would continue to impact the perimeter canals (L-40, L-39, and L-7); these exotics cause water flow and drainage problems, cause water control structures to clog, and impede recreational boating, fishing, and waterfowl hunting. Large mats of floating vegetation reduce available dissolved oxygen and contribute to fish kills. This loss of fish has a direct impact on large predators such as wading birds and alligators.

Under Alternatives 2 and 3, invasive exotic plants would be aggressively controlled and would become one of the refuge's highest priorities. Infestations of melaleuca, Old World climbing fern, and Brazilian pepper would be reduced to "maintenance control" levels within 15 years if adequate funding is made available. All other invasive upland and aquatic plants would be eradicated or actively controlled. Native Everglades habitats including wet prairies, tree islands, sawgrass communities, and sloughs would benefit directly and would recover naturally. Other Category I and II exotics would continue to be treated on a "when encountered" basis.

Under Alternatives 2 and 3, some damage to native vegetation would be expected due to an increase in exotic plant control efforts. Increased ground efforts and large-scale aerial treatments would be needed to attack large monotypic stands of melaleuca, and tree islands completely covered with Old World climbing fern. Because species-specific herbicides are not yet available, the herbicides currently used have the potential of killing the majority of the native vegetation present in the treatment area. Large scale aerial operations to attack Old World climbing fern-infested native tree islands would most likely result in the death of native trees, shrubs, and surrounding ground cover. However, some species such as buttonbush, cocoplum, wax myrtle, red bay, and dahoon holly may be resilient to many of these non-selective herbicides. Sawgrass and willow species generally take a longer time to recover. After approximately six months of dead vegetation decomposition, these tree islands would once again become germination sites for desirable native vegetation due to the presence of a natural seed source in the soil or from neighboring un-infested tree islands.

Service funds, coupled with potential partnerships and grants, would be used to conduct exotic plant surveys, map infestation areas, map treatment areas through the use of satellite imagery, as well as to directly treat invasive and exotic plants. This increased funding would allow for several invasive exotics to be targeted at various locations throughout the refuge. Additionally, the refuge, through the Service's Partners for Fish and Wildlife Program, would join with neighboring private (agriculture) landowners to treat invasive exotics so that an "exotics-free" buffer could be established between these private lands and the refuge. This would greatly reduce the seed fallout and prevent future exotic infestations. Refuge staff would continue to participate in exotic plant working groups to ensure future funding opportunities.

Additional benefits under Alternatives 2 and 3 would be the implementation of a fire management program to restore the native fire regime that once occurred in the northern Everglades ecosystem. This would greatly improve the quality of the habitat for all refuge wildlife and would further prevent the spread of invasive exotics, if performed under controlled situations.

Improving refuge water quality is a high priority under both Alternative 2 and 3. These improvements would have a moderate impact on controlling the spread of exotic plants such as water lettuce and water hyacinth, and would reduce the spread of noxious vegetation such as cattail, a plant which thrives under high nutrient conditions associated with poor water quality.

Under Alternative 4, increasing public use would require the construction of additional nature trails into areas that were previously closed to the visiting public such as Strazzulla Marsh. This would cause limited damage to native vegetation and may increase the potential for exotic infestation. A primary characteristic of invasive exotics is their ability to quickly establish and take space over disturbed areas. This would unfortunately lead to more maintenance and control, requiring additional funds and manpower.

Wildlife and Protected Species

Under Alternatives 1 and 4, loss of native habitats to exotic and invasive plants would have a severe impact on almost all bird species, especially threatened and endangered species such as the Florida snail kite, wood stork, and species of concern including most wading bird species. These species depend heavily on a mosaic of habitats found on the refuge, especially open areas, to survive. Neither the Florida snail kite nor the wood stork would be able to forage for their preferred foods; they would most likely abandon the refuge.

Migratory shorebirds, waterfowl, and resident wading birds (most of which are species of special concern) would experience a similar fate due to the loss of quality habitat, which would be replaced by dense, impenetrable stands of invasive exotics. As previously noted, Alternatives 2 and 3 management efforts would improve conditions in the Everglades marsh.

Under Alternatives 1 and 4, native tree islands, the cypress swamp, and Strazzulla Marsh would be directly impacted by Old World climbing fern and Brazilian pepper. Loss of these native vegetative communities would adversely affect both resident and neotropical song birds as well as listed species. Migratory songbirds (*Appendix K*) depend heavily on native vegetative communities to provide insects, fruit, and cover during migration. These communities also serve as important breeding, resting, and feeding areas for resident songbirds. On the other hand, Alternatives 2 and 3 would concentrate efforts to preserve or restore areas of exotic infestation and keep these communities viable for use by migratory passerines and resident songbirds.

Waterfowl habitat would not improve under Alternatives 1 and 4. However, under Alternatives 2 and 3, open areas would be created and vegetation density would be reduced. The open areas and resulting new vegetative growth would provide better habitat and foraging conditions for ducks and coots.

Research and Monitoring

Under Alternatives 1 and 4, only high profile species such as the endangered wood stork and Florida snail kite would be monitored. This would result in spotty information, insufficient knowledge, and gaps with respect to most species on the refuge. This lack of comprehensive knowledge and the crucial role that it plays in formulating management policy, could prove detrimental to the natural ecosystem, native vegetation, and wildlife populations. Additionally, the refuge would not be able to assess the effects of the Comprehensive Everglades Restoration Plan or provide pertinent data to assess the Comprehensive Everglades Restoration Plan's adaptive management process.

Alternative 2 encompasses a comprehensive biological program to include inventory, monitoring, and GIS mapping of species on the refuge. Trust, keystone, and umbrella wildlife species and associated habitats would be evaluated; thus, this alternative is more inclusive and would be more helpful in assessing management activities than either Alternatives 1 or 4. Under Alternative 3, the biological program is more encompassing than Alternative 2, monitoring most forms of wildlife and associated habitats.

Both Alternatives 2 and 3, would have dramatic benefits for wildlife and their associated habitats. Because of the significant problems associated with key wildlife populations in the Everglades (wading birds and alligators), the proposed comprehensive biological programs and cooperative research projects would be of great importance to Water Conservation Areas, Everglades National Park, and adjoining management areas.

Under Alternatives 2 and 3, greater numbers of research projects would be allowed in the refuge than under Alternatives 1 and 4. The refuge is one of the last relatively pristine and un-impacted natural areas left in south Florida that can provide an appropriate setting for natural science research. Additionally, because a large portion of the refuge is managed for wildlife and closed to the public, expensive research equipment is relatively safe and project sites remain undisturbed-- which is a standard research requirement. The results of these projects would provide management information which can be used for all the Everglades ecosystem to improve wildlife populations and their habitats.

Wildlife in the Compartments

In Alternative 1, only Impoundment C-7 would be managed for wildlife habitat and would provide 33 acres of benefit to wildlife, predominantly for waterfowl. Under this alternative, the remainder of the compartment system (1997 acres) would be minimally managed providing little benefit for wildlife populations.

In Alternative 2, all 2,030 acres of Compartments A, B, C, and D would be actively managed for many forms of wildlife including trust, keystone and umbrella species. The impoundments (via a step-down management plan) would be managed in a mosaic, so at least one or two different impoundments would provide optimal foraging habitat throughout the year for groups of wildlife such as wading birds, waterfowl or shorebirds, and species in between these groups. This alternative would result in numerous positive impacts, both direct and cumulative, for the imperiled species mentioned above.

Under Alternative 3, the 1,102 acres of Compartments A, B, and C, and the cypress marsh would be re-joined by removing levees. The area would be restored to its historic vegetative community. This should have a positive indirect and cumulative effect on trust species and most Everglades-adapted wildlife. Compartment D (1327 acres) would be actively managed for listed species found in the Everglades marsh.

Under Alternative 4, all of Compartment C (276 ac.) would be actively managed for many forms of wildlife including trust, keystone, and umbrella species. The result would have positive impacts for species using this area, and the public would see the results of sound wildlife management practices. The remaining 1,754 acres of compartments would be minimally managed, providing little benefit for wildlife.

Research Natural Area

Under all the alternatives, the Research Natural Area portion of the refuge would not be intentionally impacted because access to it is virtually not allowed. In a sensitive marsh environment, the physical act of a person walking in the peat or airboating over the water causes changes to the substrate. The refuge staff prefers to have research occur outside this area if at all possible to retain the area's "pristine condition." Currently, the refuge offers enough non-impacted sites that the Research Natural Area does not need to be used for research. However, if research is allowed, this relatively untouched area would provide an excellent baseline to which impacted areas could be compared.

Under Alternatives 1 and 4, the exotic Old World climbing fern would not be controlled and would eventually overtake this area. As described in the Fire Impacts, Exotic Plant Control Section, the "ladder effect" would carry fire into and destroy tree islands in this area. Consequently, the Research Natural Area may be subjected to greater negative wildfire impacts and would not retain its "natural characteristics." Also, melaleuca would increase in this area without control treatment.

Under Alternatives 2 and 3, a significant effort would be made to prevent or control exotic plant invasion of this area. The removal or control of exotic plants would have a negative impact in the same way it would in other areas of the refuge (*see Exotic Plant Impacts to Native Vegetation*). However, major indirect and cumulative benefits would be realized. Without the removal or control effort, the area's plant community would eventually be lost to the detrimental effect of a wildfire.

Airboat Impacts

Airboats have been used for transportation in the Everglades since approximately the 1930s. They have provided a motorized means of transportation that allows users to access areas for fishing, hunting, or other outdoor activities that otherwise would not be accessible due to low water or dense vegetation. They also are an invaluable tool for accessing research sites and conducting law enforcement activities. Because they are ideally suited for travel in the Everglades, airboats have become very popular. The popularity of airboats combined with an increase in the number of people participating in outdoor recreational activities has resulted in an increase of human-related disturbances to wildlife and natural areas. Some land managers are prohibiting the use of airboats and swamp buggies because of the disturbance factor and to protect wildlife. The refuge is mandated by the Refuge Improvement Act to minimize or eliminate disturbances to wildlife. The following is a summary of potential airboat impacts that have been identified by south Florida biologists from the National Audubon Society, South Florida Water Management District, Big Cypress National Preserve, Everglades National Park, U.S. Fish and Wildlife Service, Florida Fish and Wildlife Conservation Commission, and other scientists. Further information on airboat impacts is presented in Appendix J.

Airboats impact flora and fauna via noise and physical disturbance. In addition, airboats can impact visitors who desire a “wilderness experience.” Studies have shown that airboats can generate noise in excess of 120dB when accelerating and 63db to 75dB while cruising. This is above the acceptable noise levels for cars and motorcycles (Florida Vehicle Noise Prevention and Control Act of 1974, Section 316.293). Noise of this magnitude disturbs both people and wildlife. In addition, the noise from airboats carries for long distances (at least one to two miles) away from the source so impacts are general and not limited to the area in which the airboat is being operated.

Physical disturbances caused by airboats can include damage and destruction to habitats and wildlife. Damages can include leaf loss and stem breakage on individual plants; changes in vegetation community types due to soil disturbance; the spread of exotic plants; and injury or death to wildlife due to collisions with airboats, displacement from nests, or stress related to noise and the presence of a large rapidly moving vehicle.

Continuous airboat operation through sawgrass and wet prairie habitats creates airboat trails, which are open areas where vegetation no longer grows due to physical disturbance, soil erosion, and compaction. Though these trails can provide dry season refugia for many wildlife, they also can change drainage patterns and provide routes for the movement of exotic fish, exotic vegetation, and nutrients into more pristine wetland areas.

Research on the effects of human disturbance on wildlife has shown that a 14-foot airboat approaching colonial waterbirds will cause behavior disruption at a greater distance than an approach on foot or by a 14 foot johnboat. In another study, visual disturbance from the presence of an airboat was found to occur in areas that were used as foraging or roosting sites. These short-term disturbances (especially if they happen frequently) may adversely impact individuals by influencing where, when, and how long they are able to forage. In addition to being displaced from an area, wildlife may be injured or killed by airboats. This is of particular concern for secretive birds, such as bitterns and rails that may flush immediately in front of a boat, or species such as apple snails (the primary food source of the endangered Florida snail kite) that lay their eggs on emergent vegetation.

Airboat Effects on Refuge Resources:

Under Alternative 1, impacts from airboats would be minimal. Refuge biologists would continue to use airboats only to conduct minimal wildlife surveys and visit established data collection sites. A limited number of researchers and special use permittees would continue to be allowed to access the interior using airboats. All staff, researchers, and permit holders are instructed to minimize airboat impacts by avoiding visible wildlife and minimizing damage to vegetation. Law enforcement activities would generally be concentrated in the Hillsboro Recreation Area. Only a small percentage of motorboat users experiencing mechanical difficulty require airboat rescue.

For Alternatives 2 and 3, airboats would be used by refuge biologists for more intense efforts to survey wildlife and habitat, and conduct inventory and mapping activities. In these alternatives, a limited number of researchers and special use permittees would be allowed to access the interior using airboats. All staff, researcher and permit holders would continue to minimize airboat impacts by avoiding visible wildlife and minimizing damage to vegetation.

In Alternatives 2 and 3 additional efforts to bring exotic plants to a minimal maintenance level would require extensive airboat operation. The detrimental effects of the contractor's airboats would be minimized by requiring them to stay on airboat trails leading to designated work sites. Extraneous movement of the airboats would be strongly discouraged to minimize the dispersion of spores from exotic plants while in the work sites.

In Alternatives 2 and 4, refuge law enforcement personnel would use airboats more to monitor an expected increase in waterfowl and alligator hunting, and an increase in emergency rescues of lost canoeists and campers.

Fire Impacts

Exotic Plant Control:

Fire has been a major factor in the development and perpetuation of the Everglades ecosystem. It is a frequent and widespread event which acts to interrupt plant succession. Sub-climax communities, which are characteristic of the Everglades, including sawgrass and wet prairies, depend on fire to establish and maintain their historical dominance. The abundant and diverse wildlife of the Everglades has evolved and thrived in a fire-adapted regime.

Unfortunately, at least two exotic plants found on the refuge can be spread by uncontrolled fire. Mature melaleuca trees burn readily but are resistant to fire because of the thick, water-laden, papery bark that protects the cambium. Mature trees release millions of seeds during a fire and those seeds fall on a fire-enriched muck that greatly increases the potential for successful germination. Another exotic, Old World climbing fern, rapidly grows into thick mats and up into the canopy of trees. It acts as a "flame ladder," introducing fire into tree canopies resulting in tree death. Furthermore, when Old World climbing fern burns, it floats off in small pieces, increasing the spread of fire, often devastatingly. Wildfire would rapidly spread untreated melaleuca and Old World climbing fern, stifling all control efforts.

Conversely, prescribed fire is the most successful method available to reduce the biomass of dead melaleuca trees and to enhance native plant recovery in treated areas. Without reducing dead melaleuca biomass, the restoration period for the site is greatly prolonged. Also, prescribed fire can kill immature melaleuca plants that are resprouting in treated areas or newly invading a relatively pristine area. Unfortunately, not enough scientific information is known regarding the fire effects on treated and dead Old World climbing fern. Studies need to be funded to identify weak points in this plant's life cycle. That information would assist managers in controlling the fern and learning if prescribed fire can be used to reduce the incredible biomass associated with this plant, without causing its spread.

Under Alternatives 1 and 4, there would be no intentionally introduced fire anywhere in the refuge interior. The "no action" proposed in these alternatives would not prohibit fire altogether because unplanned wildfire by lightning strike would result regardless of management desires. This would actually enhance the spread of untreated melaleuca and Old World climbing fern. If one waited for a random wildfire to encounter a treated melaleuca area, the most often result would be inadequate or no restoration of the area. However, a lightning strike fire in untreated exotic plant areas would surely increase the spread of their seeds or spores. Re-establishment of already treated exotic plants would occur because prescribed fire is not used under Alternative 1. Under Alternatives 2 and 3, fire would be intentionally introduced on the refuge. The natural ecosystem has been severely altered by exotic plants, and now requires the use of planned or prescribed fire to properly restore the Everglades. Because wildfire would have devastating negative effects on the exotic

plant removal programs for melaleuca and Old World climbing fern (as previously noted), prescribed fire as proposed in this alternative would only be used in areas where exotic plants have already been treated or where immature plants could be killed with no risk of spreading seeds. Prescribed fire, which accelerates habitat restoration, would be used to remove the large amounts of dead biomass and immature regrowth that results when melaleuca trees are cleared by staff or contractors. Costly exotic plant eradication efforts, and subsequent habitat restoration, would greatly benefit from a prescribed fire program under Alternatives 2 and 3. Prescribed fire would also be used to maintain healthier habitats such as areas not affected by exotic plants and overgrown, relatively pristine areas. In addition to restoring natural habitats as described above, prescribed fire would be used to minimize the chances of a more intense wildfire entering tree islands and other areas that are impacted by invasive species.

Invasive Plant Control (Cattail):

Under Alternatives 1 and 4, the perimeter of the refuge interior would continue to be rimmed by dense cattail growth. This native plant is considered an undesirable invasive species because of its explosive growth response to high nutrient laden water entering the refuge. Even when the water quality is improved, dead or reduced cattail biomass would remain and prevent native habitats from becoming reestablished. Lack of a prescribed burning program would continue to have an indirect and especially cumulative negative impact on wildlife and wildlife habitats. Under Alternatives 1 and 4, efforts to remove invasive cattail would greatly suffer from lack of a prescribed fire plan. Conversely, under Alternatives 2 and 3, the use of prescribed fire would greatly improve approximately 6,000 acres of waterfowl habitat and complement efforts to improve water quality. This action would speed up the efforts to restore the natural sawgrass stands when done in conjunction with water quality improvements.

Compartment Management:

Under Alternative 1, prescribed fire would not be used in compartment management of the refuge. The overgrown and invasive plants presently found in approximately 2,030 acres of wetland impoundments would remain and prevent optimal habitat utilization by wildlife. Under Alternative 1, only a rare wildfire would affect the impoundments, resulting in low habitat diversity and an abundance of invasive cattail. Under Alternative 2, prescribed fire would be used to help create and maintain a mosaic of habitats benefitting a wide array of migratory birds, including shorebirds, wading birds, and waterfowl. Because prescribed fire can be used in moist areas where effective water control and drainage are difficult to maintain, fire is a preferred management option for the impoundments. Where prescribed fire would be used to restore and maintain wildlife habitat, an educational effort would be made to inform the public of the benefits of prescribed burning.

Alternative 3 would not use prescribed fire as often as Alternative 2, because restoration of Compartments A, B, and C to cypress swamp is the management goal. However, fire would be used initially to remove the overriding vegetative biomass and open the wetlands up for replanting of native cypress.

Under Alternative 4, prescribed fire would not intentionally be used anywhere on the refuge except in the publicly accessible Compartment C (approximately 300 acres). The substantial negative ramifications associated with not using prescribed fire explained in Alternative 1 would also be felt in this alternative. In Compartment C, where prescribed fire would be used to restore and maintain wildlife habitat, an educational effort would be made to inform the public about the benefits of prescribed burning. Under Alternative 4, prescribed fire would enhance the habitats, thereby increasing visitor wildlife observation and photography activities.

Catastrophic Wildfire:

Without a prescribed burning program, catastrophic wildfires would result due to high fuel load buildup. Fires burning through thick vegetation on the refuge have the potential to disrupt wading bird colonies, other nesting birds, and listed species. Most vegetative habitats can change because of an excessive fuel load. Some of these changes could include: 1) muck fires that destroy the soils resulting in deep sloughs; 2) tree islands (the unique feature of the refuge) burning completely and changing into wet prairie; 3) sawgrass marsh and its peat substrate being consumed

and turning into wet prairies or sloughs; and 4) cypress heads or cypress swamps being consumed and becoming willow or Brazilian pepper thickets.

Catastrophic wildfires produce direct negative impacts on human health and safety if smoke is carried to adjacent roadways or populated areas. Negative effects are associated with wildfires that burn huge tracts of land, spread to lands off of the refuge, and threaten residential areas and croplands. Under Alternatives 1 and 4, the refuge would not be able to control much of the negative effects of wildfire. Conversely, under Alternatives 2 and 3 (and 4, regarding only the C impoundments) the chances of a catastrophic wildfire are reduced



Prescribed burn
USFWS Photo by C. Sewell

because regularly burned vegetation does not usually burn as rampantly or generate as much heat, flame height, or thermals because of reduced fuel availability. Breaking up vegetative fuels with prescribed fires would reduce the potential for such destructive fires. This reduced threat benefits all aspects of public safety, health, and property. There are less all-around negative effects associated with a prescribed burn program except for temporarily lessened air quality during the actual time of the burn.

Costs of Fire Suppression:

Catastrophic fire suppression costs include the cost of firefighting personnel and the cost of equipment and supplies. The State of Florida, Division of Forestry, can provide suppression services in the refuge interior if needed. Even without major suppression, costs may still be incurred from the replacement of items lost in a fire. Property in the interior includes permanent and temporary research facilities, boundary signs, and restroom facilities along the canoe trail. Property in the Headquarters Area includes five residences, a vehicle storage building, an office, a visitor center, a shop maintenance building, and boat building with six airboats. There are three areas of above-ground fuel tanks (shop, Compartment D and the P-1 pump) and an oil storage building in the shop area that would pose considerable threat to personal safety, property, and natural resources in a wildfire. No wildfires have been documented around refuge buildings and only a few have been recorded in the impoundments around the Headquarters Area.

Effects on Cultural and Historic Resources

Under all four alternatives, any known or found historic and archaeological sites would be protected under federal ownership as defined in the National Historic Preservation Act of 1966, as amended through 1992 (P.L. 89-665), the Archaeological Resources Protection Act of 1979 (P.L. 96-95), the Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601), and the implementing regulations authored by the Advisory Council on Historic Preservation, the Department of the Interior, and the National Park Service. However, the degree of protection as well as the opportunities to conduct scientific research and to interpret past cultures vary between each alternative.

Archaeological and related scientific investigations on the refuge have been limited to Griffin, Miller, and Fryman's 1979 project-specific archaeological survey. The lack of a comprehensive refuge-wide archaeological survey hampers the Service's ability to effectively meet its myriad cultural resource management responsibilities. Such a survey would provide a site predictive model based upon the region's cultural history, known site distribution, oral history interviews, historic documents, historic land use patterns, topography, geomorphology, soils, hydrology, and vegetative patterns.

Under Alternative 1, cultural resource management would be limited to those investigations required for compliance with Section 106 of the National Historic Preservation Act and Archaeological Resources Protection Act-related investigations of illicit looting and collecting. Data relating to the refuge's hydrological regime, geomorphology, changing vegetation patterns, and past cultural land use patterns would be garnered only through reviews of existing technical literature and not through focused scientific investigations. Other efforts, such as erosion control and interpretive and educational opportunities, would be virtually non-existent due to the lack of personnel, facilities, and funds.

A refuge-wide comprehensive archaeological survey would be conducted under Alternatives 2, 3, and 4. The rationale for such an investigation and use of its data, however, differ for these alternatives. A site predictive model would be generated from the survey. Critical variables include the region's cultural history, known site distribution, historic human land-use patterns, geomorphic processes, hydrological regimes, soils, and vegetative patterns. Alternative 2, Ecosystem Emphasis, would represent a balanced management approach to the refuge's natural and cultural resources. To accomplish the goals of this alternative, scientific investigations, such as plant and animal inventories, Geographic Information System mapping, archaeological investigations, and geomorphic studies, are necessary tools. The databases generated from these investigations would enhance the refuge's ability to monitor and protect cultural resources under their jurisdiction. The emphasis on environmental education can provide increased public awareness of the region's past cultural histories, the fragility of archaeological sites, and the nature of human-habitat interactions. Ties with the Miccosukee and Seminole Nations are further encouraged in Alternatives 2 and 4, particularly for input into the management of sites important to these groups as well as an opportunity to educate others about their history and use of resources present within the refuge. Partnerships with universities and other pertinent entities to conduct scientific archaeological research would be actively pursued and fostered.

Alternative 3 places a limit on public use and instead focuses on an intensive ecosystem management approach. Decisions would be made utilizing sound biological and wildlife principles, and past and ongoing investigations. This alternative provides an opportunity to conduct scientific archaeological investigations that incorporate a range of other disciplines. The objective would be to provide information regarding the refuge's habitats and changes due to human-habitat interactions.

Opportunities would decline for public education regarding issues of historic preservation, responsible site stewardship, and to introduce the region's past and current cultural histories. Protection for archaeological sites would improve due to active investigations as well as closure of large areas to the public.

Alternatives 2 and 4 are potentially the most destructive to cultural resources due to the construction of facilities, such as boardwalks, pavilions, docks, campsites, and restrooms that are needed to facilitate public use. Although increased visitation leads to opportunities for education about past cultures and habitats, it could also lead to an increased potential for site loss due to public use related activities, illicit looting, and un-permitted collecting. Educational opportunities should focus on responsible site stewardship that introduces the public to the region's rich cultural history via interpretive programs and panels at sites. To support increased public use, it is imperative that a comprehensive archaeological survey of the refuge be conducted. As in other alternatives, project-specific investigations and/or site assessment would still be required for the proposed construction of facilities and other management activities. The refuge's law enforcement capabilities and officer training would need to be upgraded so that recorded archaeological sites can be monitored for damage caused by looting and benign activities, such as hiking, camping, and boating, as well as to conduct Archaeological Resources Protection Act related investigations when necessary.

Effects on Recreation, Environmental Education, and Interpretation

Recreation

Under Alternative 1, there would continue to be public recreation use of existing facilities including photography, wildlife observation via canoeing and kayaking on the existing canoe trail, in perimeter canals, or in the public use area of Hillsboro Recreation Area ; via walking and hiking along access roads, on the levees of Compartment C, on the perimeter levee from the S-6 pump station through Hillsboro Recreation Area to the ACME 2 station or on the boardwalk; via bicycling on the east side of the perimeter levee between Hillsboro Recreation Area and the Headquarters Area; fishing in perimeter canals and in the Hillsboro Recreation Area public use areas; and waterfowl hunting in a designated area. Existing levels of public benefits supporting wildlife observation while engaging in relaxation, family togetherness, interacting with nature, learning-discovery, escape from work-related pressures, and exercising would be sustained. Opportunities to have solitude, observe more abundant wildlife, and have a "semi-wilderness" type experience would be limited because public use is concentrated into a limited number of sites.

Under Alternatives 2 and 4, all public recreational uses conducted in Alternative 1, and their associated benefits, would be sustained. New and additional public use opportunities are being proposed to take advantage of existing roads/levees and trails that provide excellent opportunities to observe the many species of wildlife that use the refuge. The perimeter canal offers exceptional wildlife viewing and photographic opportunities for a myriad of wading birds, waterfowl, hawks, and alligators. Furthermore, the levee offers one of the highest vistas in the refuge enabling observation of the unique Everglades habitats. Strazzulla Marsh (formerly closed to the public) would be opened, under limited access, for wildlife observation, plant community appreciation, and "interpretation." A full concession contract would be established in the Hillsboro Recreation Area to allow visitors to experience the uniqueness of northern Everglades. A number of other enhancements in facilities would be added including two new observation towers, photo-blind(s), and new and extended boardwalks. Several new recreational activities would be facilitated including an extended canoe trail with two camping platforms, feral hog and alligator hunting, and the possibility of poleboating on the northeast portion of the perimeter levee.

Under Alternatives 2 and 4, the observation towers with interpretive signs and photo-blinds (one each at Strazzulla Marsh and the cypress swamp boardwalk at the Headquarters Area) would increase opportunities for wildlife observation/photography, ultimately leading to visitor education and appreciation of wildlife and its habitat. The height of an existing observation tower at the boat ramp in the Headquarters Area would be raised. This tower faces west and overlooks the vast acreage of the refuge interior. It would provide enhanced opportunities for observing and photographing sunsets over the refuge, thus enhancing an aesthetic appreciation of this remnant of the northern Everglades. The new boardwalk and limited trails at Strazzulla Marsh, and the extension to the existing boardwalk at the visitor center cypress swamp, would not only provide opportunities to observe wildlife in previously closed areas, but also increase opportunities to escape urban congestion and find solitude in a natural setting.

There are three major user groups that heavily use trails in the south Florida area for the opportunity to experience and enjoy the outdoors and observe nature and wildlife. They are hikers, bicyclists, and equestrian groups. The existing refuge perimeter levee is the highest vantage point in the area and for 30 feet on either side it is free of vegetation. The design of the levee, including the sharp slope and deep canals along each side preclude off trail use. Because of these constraints, the levee allows excellent opportunities for wildlife observation while limiting the impact or disturbance of human use.

Because of the narrow width of the perimeter levee (16 feet at the top), it is not suited to support all three users at the same time and in fact could pose a safety hazard. For this reason, portions of the eastern side of the levee have been set aside for specific uses to enable a variety of means, i.e., foot or bicycle, to be able to observe wildlife and experience a portion of the northern Everglades habitat.

Under Alternatives 2 and 4, the canoe trail extension and overnight platforms would provide benefits such as learning about the Everglades, the unique opportunity to observe nocturnal wildlife by sight and sound, observation of celestial phenomenon somewhat away from urban light pollution, and an opportunity to recognize the uniqueness of the Everglades ecosystem. The longer trail would enable maximum exposure to the most unique feature of the northern Everglades, the numerous tree islands, and the wildlife that use them, which are more prevalent deeper into the refuge.

Under Alternatives 2 and 4, access to the interior of the refuge is limited due to the shallow water, thick vegetation, and peat that make up the Everglades. Canoeing provides one of the quietest, easiest and least impacting method to experience this unique area. The existing trail increases in use each year. The proposed poleboat trail is another opportunity to experience a different portion of the refuge via a slightly different boat. Poleboating would lead to aesthetic appreciation of the refuge, would enable the visitor to observe wildlife and the habitats they use in a method that resembles the historic means of access into the northern Everglades, and provide interpretation of the cultural history of the refuge. Poleboats pose less impact to the wetlands than canoes, as they are pushed rather than paddled. A primitive route would be marked with small flags or signs only. The only maintenance required for this project would be to cut a short pass through the perimeter vegetation to access the interior marsh. However, this opening into the marsh would not occur until low phosphorous levels are consistently found in the perimeter canal near Strazzulla Marsh.

Under Alternatives 2 and 4, allowing primitive weapon feral hog hunts and alligator hunting provides additional opportunities and seasons for hunters. These hunts also provide additional incentives to spend time in the refuge and to enjoy the variety of visual, aesthetic and natural features surrounding them, improve upon marksmanship skills, obtain food and escape urban pressures.

Under Alternatives 2 and 4, other activities (bicycling, wildlife observation from a boat, hiking, photography, fishing and interpretive shuttle rides) would also likely increase. Motorboats, bicycles and fishing gear rentals, fishing guide services, and a pontoon shuttle between Hillsboro Recreation Area, the Headquarters Area and Strazzulla Marsh may be allowed by a concessionaire at Hillsboro Recreation Area. For individuals or groups who do not have outdoor recreation equipment, the rental and guide service would not only enable access to the refuge, but also enhance the normal human benefits provided by the refuge (e.g., excitement at seeing birds and wildlife, opportunities for families to spend time together in an interesting and inexpensive location, escaping urban pressures, learning about nature, and exercise).

Under Alternatives 2 and 4, however, the addition of recreational opportunities at Hillsboro Recreation Area, Strazzulla Marsh, and Headquarters Area could result in potential user conflicts, particularly on weekends (e.g., between fast moving motorboats, wildlife observers or canoeists), concerning perceptions of crowding, diminished solitude, and quieter moments at the refuge.

Alternative 3 would provide the same recreational opportunities as Alternative 1, with the exception of the differences described below. Several levees creating the compartments in the Headquarters Area would be removed and the area would be restored to a cypress swamp. Removal of the levees would decrease visitor ability to walk, observe wildlife, photograph wildlife, appreciate nature, escape urban pressures, and enjoy family comradery around Compartment C.

Under Alternative 3, waterfowl hunting opportunities would decrease as the size of the hunting area and the length of the hunting season is reduced. These cut backs in waterfowl hunting would diminish the benefits of hunting such as nature appreciation, comradery, improving marksmanship skills, obtaining food, and escaping urban pressures and likely would increase perceptions of crowding.

The feral hog hunting program initiated in Strazzulla Marsh would assist in the management of the tract but may provide only a modest increase in hunting opportunities. However, this opportunity provides access for hunters to this previously inaccessible area and opportunities to improve marksmanship, obtain food, and escape urban pressures.

Environmental Education and Interpretation

For Alternative 1, current levels of interpretation and environmental education would continue at the visitor center, self-guided interpretive trails, and boardwalks. Although tremendous ecological changes have occurred in the northern Everglades ecosystem and agencies/organizations have responded to the challenge of restoring its hydrology, this information is not reflected in current interpretive exhibits, signs, photos, and brochures. Thus, the opportunities to educate the public about ecological changes, their causes, and restoration efforts would continue to be limited. Furthermore, interpretation provided by refuge staff would not occur, since all existing forms of interpretation are self-initiated and based on reading the text of signs or brochures. The opportunity to have questions answered is, for all practical purposes, provided by the volunteers at the visitor center.

For Alternatives 2 and 4, an auditorium/classroom building would be constructed adjacent to the existing visitor center at the Headquarters Area to assist with the planned expansion of the environmental education program and the development of a school outreach program. An open-air teaching pavilion, constructed near Impoundment C-7, would give visiting school teachers a place to conduct their lessons regarding the Everglades and the pavilion would encourage more teachers to bring their classes to the refuge. These additional facilities should provide increased opportunities for youth to experience classroom demonstrations, see videos, and ask questions.

Under Alternatives 2 and 4, a Hillsboro Recreation Area office, developed for staff members, the Natural History Association, and the concessionaire would also feature exhibits reflecting issues concerning the Everglades. Generally, interpretive resources (e.g., exhibits, signs, photos and brochures) would be revised to reflect ecological changes, their causes, and restoration efforts.

Under Alternatives 2 and 4, an improved environmental education program, developed by refuge staff for the local school system, would seek to convey the effects of human actions on the refuge and ecosystems of south Florida. It would promote low-impact strategies that recreationists could adopt to minimize their impact the ecosystem. This program would clearly increase the opportunities for learning about nature, the participant's role in the ecosystem, and the mission of the refuge system. Thus, these "hands-on" experiences with refuge staff would particularly enhance the effectiveness of the refuge's environmental education program.

Under Alternative 3, current levels of interpretation and environmental education would continue primarily at the visitor center, with limited and dated self-guided interpretive trails and boardwalks at the Headquarters Area. The ecological changes and restoration efforts in the Everglades ecosystem would not be reflected in current interpretive exhibits, signs, photos, and brochures. These interpretive resources would be updated more slowly as staff time permits and funds are available. A limited number of off-site environmental education programs, with dated and insufficient materials, would be conducted; the benefits of the programs have been described in Alternative 1.

Effects on the Socioeconomic Environment

Ecotourism

A survey on the economic impact of birding 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 millions of dollars, which included lodging, meals, gasoline, and ancillary purchases. Generally, most birding visitors average 50 years of age, with income and education levels above the national average. More than half of the visitors cited refuges as their primary destination (Laughland and Caudhill 1997).

For Alternatives 1 and 3, little negative or positive impact would be seen in the economy. However, as the refuge visibility increases under Alternatives 2 and 4, there would be substantial benefits to the local economy because of their associated development of visitor facilities and recreational activities. The additional effort to increase awareness of the refuge under Alternatives 2 and 4, would positively impact the number of local individuals, school groups and vacationers to the refuge. No anticipated increase of visitation would occur under Alternatives 1 and 3, except for a rise in visitation by the anticipated local population growth. Alternative 3 could even show a short-term decline in visitation.

Property Values

Research shows that "...a wildlife refuge in an increasingly urbanized and congested region can generate community benefits for regional inhabitants. This community amenity can be reflected in higher land values, particularly for properties nearby." (Kerlinger 1995). With the expected continual loss of natural areas in south Florida, the refuge becomes more important as a visitation site for the portion of the public wanting release from the urban environment. Hence in all alternatives, the continued presence of a national wildlife refuge would increase property values in the area, which would provide economic benefits to nearby communities.

Tax Revenue

The Service owns 2,500 acres of land (Headquarters Area, cypress swamp, Compartments A, B, C and D), and the South Florida Water Management District owns the majority of the land (144,842 acres) managed by the refuge. Because Federal lands are not subject to state or local taxes or assessments under the Refuge Revenue Sharing Act, the Fish and Wildlife Service makes annual payments to Palm Beach County to offset the loss of property tax revenues. Refuge Revenue Sharing Act payments for owned and acquired lands are based upon the greatest of the following three formulas: 1) 3/4 of 1 percent of the appraised value; 2) 25 percent of the net receipts produced from the lands; or 3) 0.75 dollars per acre. The Refuge Revenue Sharing Act also requires that Service lands be appraised every five years to ensure that payments to local governments remain equitable. Although the lands owned by the refuge are not large, the payment will continue to Palm Beach County under all alternatives.

In addition to the Revenue Sharing Act proceeds under Alternative 1, there would be no change in the estimated \$40,000 in local sales taxes generated by visitors (1993). Alternatives 2 and 4, should produce moderate increases in sales tax impacts. In a relative sense, the local impact could be significant. Again, it is important to note that increased refuge visitation would likely come from local residents (estimated 80 percent), and residents do not spend as much in the local economy on a per visit basis as out-of-town visitors. Alternative 3, would have a minor negative impact on local sales tax.

Unavoidable Impacts

Under Alternatives 1 and 4, exponential exotic plant growth would continue to threaten the overall integrity of the refuge. Additionally, the refuge would continue to be viewed as a seed source (and possibly for all of south Florida) for the establishment of additional exotic plants in nearby areas.

Under Alternatives 2 and 3, every effort would be made to preserve the native vegetation under and around Old World climbing fern while treating it, but some non-target plant damage would unavoidably occur. This negative impact would be heavily out-weighted by the benefit of this plant removal and by the restoration of affected areas by appropriate native plants. In the case of Old World climbing fern, a careful application of a chemical would minimize the effects to surrounding plants. Only a wetland-approved chemical would be used. The refuge staff would keep abreast of advancements in the areas of chemical control and use them as technology provides species-specific treatments. Techniques used to control exotics such as melaleuca, Brazilian pepper, and other, yet unidentified exotic or invasive plants also will be monitored to ensure that possible negative impacts do not outweigh the benefits. Specifically, a water quality monitoring program would be implemented to ensure that levels in the refuge do not exceed permitted amounts. The refuge staff would keep abreast of advancements in bio-controls for exotic plants and would use them, subject to federal and state permits, where applicable and effective.

Under Alternative 2, the projected increase of visitor numbers could possibly impact the foraging ability of wading birds in Compartment C of the Headquarters Area. This impact is thought to be insignificant due to the types of public use (e.g., wildlife observation, photography, and environmental interpretation allowed in this area). In addition, due to the number of impoundments in Compartments A, B, and C, access to certain impoundments could be closed if needed to benefit critical wildlife needs such as nesting.

Under Alternatives 2 and 3, direct short-term air pollution to nearby communities may be associated with the prescribed burn program. No major adverse impacts to the refuge resource or natural environment would result from the selection of Alternative 2.

Under Alternatives 2, 3, and 4, construction of boardwalks, towers, camping platforms, or buildings would cause an immediate impact to wildlife habitat around each work site. Standard conservative construction techniques would be used to minimize impacts and all construction areas would comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. Parking areas would be constructed to allow storm water to percolate into the soil rather than allowing it to run directly into the adjacent wetlands. Short-term negative effects to air, noise quality, and soils within the project site would be expected, and measures to protect the environment would be taken. Every effort would be made to use recycled materials and environmentally sensitive treated lumber in all projects.

Effects Common to Alternatives

Health and Safety Effects

The alternatives would not have a significant effect on health and safety. Under all alternatives, water resources are protected and water schedules are coordinated with other agencies. The only potential safety problems are perhaps use of watercraft in the refuge interior by staff, exotic plant control crews, or researchers; motorized vehicle accidents occurring on refuge roads; accidents occurring during the hunting season where other user groups might be affected; and the short-term presence of smoke from a prescribed burn. As indicated below in the mitigation section, time and space zoning has been used successfully on other refuges to minimize the possibility of potential conflicts between hunters and other user groups.

Regulatory Effects

As indicated in the Background Section of the Draft Comprehensive Conservation Plan, the Service must comply with a number of federal laws, executive and administrative orders, and policy in the development and implementation of management actions and programs (*See Appendix E*). The alternatives would not lead to a violation of these laws and orders.

Effects on Surrounding Lands

Land adjacent to natural areas can often provide critical habitat for wildlife species when the water conservation areas, including the refuge, have either too little or too much water. Although some areas seem insignificant to wildlife because they only appear to provide occasional foraging or roosting habitat, they are critical resting and foraging spots for wildlife. As urban expansion continues to convert agricultural and rural lands into housing tracts, malls, golf courses, or other developments, these critical wildlife habitats are lost. These losses accumulate over time and in the end, there is less land available for wildlife; thus, wildlife populations decline (Schortemeyer 1980). Only more active management of refuge lands and promotion of wildlife-compatible land uses adjacent to the refuge would maintain resources at current levels.

Uncertainty of and Future Action Effects

Although land east of the refuge is currently predominantly farmland, several subdivisions exist. As the price of land escalates, extensive areas of farm land are being bought up and developed into subdivisions and strip malls at an alarming rate. Several existing plans, proposed by local government agencies, would create permanent “buffer lands” for most of the lands adjacent to the refuge’s eastern boundary. These plans are strongly supported by the refuge management staff in order to reduce disturbance to wildlife or decrease the impact to refuge habitats. However, there is no development moratorium in areas near the refuge to ensure lands remain rural until a large-scale buffer project is decided upon. Strip malls, condos, golf courses, and neighborhoods may end up being refuge neighbors despite these plans.

Among the proposed plans is the East Coast Buffer project. This plan would, in part, create water preserve areas for storing water or groundwater recharge. Lands to be acquired as a part of this project have been identified but not secured. Lands have also been identified along the eastern boundary as part of the Comprehensive Everglades Restoration Plan and the Water Preserve Area. Palm Beach County has appropriated \$100 million to purchase lands from willing sellers in an area east of the refuge known as the Agricultural Reserve. The Florida Park Service has expressed interest in establishing a state park adjacent to or near the refuge.

The refuge would partner with the agencies involved to support creation of these buffer lands and to minimize conflicts possibly created by differing agency missions. Because of uncertainties associated with these and possibly unforeseen changes, this plan may need to be amended at an earlier than anticipated date.

Cumulative Effects

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may be viewed, as a whole, to be significant over time.

The implementation of the alternatives include actions relating to facility development, wildlife habitat and population management, resource protection, public use, and administrative programs on the refuge. These actions would have both direct and indirect effects (e.g., facility development results in increased public use, which increases littering, noise, and vehicular traffic); however, the cumulative effects of these actions over the 15-year planning period would not be significant. (See the *Environmental Consequences Section* for these effects.)

Controversy Over Effects

The Service recognizes that there are some aspects of the plan that may be controversial. These include all forms of hunting, recreational airboating, horseback riding, and water management (hydropatterns and quality). They have been addressed in the plan in the following sections: Plan Sections III - Refuge Environment; IV - Management Direction; V - Plan Implementation; Appendix J - Public Issues Addressed But Not Allowed, and Appendix R - Service Response to Public Comments, Service Response to Agency Comments.

Wood stork
USFWS Photo by J. Kleen



Table 19. A summary of the environmental consequences of all the alternatives

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Effects on Physical Environment: <i>Soils</i>	Drainage and use of heavy equipment would negatively impact soil in Impoundment C-7 due to compaction and subsidence of the peat soil.	Minimum drainage coupled with little heavy equipment use in all compartments would minimize soil subsidence.	Negative, but short-term impact to peat marshes from levee removal around A-C Compartments; however, long-term benefit to soils in the cypress swamp due to habitat restoration.	Same as Alternative 2
		Recreation facility developments at Headquarters Area and Strazzulla Marsh would have a negative but minimal effect on soils.		Same as Alternative 2
		Reduced soil disturbance from hog activity at Strazzulla Marsh due to feral hog hunting.	Same as Alternative 2	Same as Alternative 2
<i>Hydrology</i>	Minimal change from current conditions.			Same as Alternative 1
		Better water management due to improved communications and partnerships could positively impact hydrologic conditions.	Same as Alternative 2	
		Recommending changes to current regulation schedule based on monitoring and modeling would benefit refuge habitats.	Same as Alternative 2	
		Hydrologic conditions would benefit trust species, but may not benefit non-targeted species.	Returning impoundments to natural Everglades condition would benefit wetland-dependent species.	
<i>Water Quality</i>	Cumulative increase in water quality in the interior of the refuge due to consent decree.	Water quality, quantity, delivery and timing throughout the refuge would improve with better communication.	Same as Alternative 2	Same as Alternative 1
	With no additional monitoring, there would be no cleanup of additional problem sites.	Expanded monitoring and water test locations, allowing for identification and cleanup of problem sites, would have positive impacts for managing most species.	Same as Alternative 2	Same as Alternative 1
		Long-term herbicide use can potentially diminish surface water quality in exotic plant treatment areas.	Same as Alternative 2	

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Physical Environment: <i>Water Quality</i>		No health or safety concerns are expected because water quality testing would keep contamination from refuge operations below allowable levels in the aquifer.	Same as Alternative 2	
		Addressing water quality problems in the cypress swamp would have positive impact on water quality.	Same as Alternative 2	
<i>Air Quality</i>	No impacts are anticipated.	Prescribed fire projects would occur with predominately easterly winds, reducing smoke impact to residential areas east of the refuge, but the fires would create temporary, short-term smoke pollution and affect nearby traffic safety and people suffering respiratory problems.	Same as Alternative 2	Same as Alternative 1
<i>Noise Pollution</i>	Helicopter flights for management purposes would be required to stay above 500 feet thereby causing minimum negative impacts to wildlife.	Additional research and surveys would result in slightly increased noise impacts from helicopters, airplanes and airboats.	Same as Alternative 2	Same as Alternative 1
	Commercial airboat operator in Water Conservation Area 2 would continue to cause noise impact at Hillsboro Recreation Area.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
		Increased motorboat use, guided fishing tours and potential pontoon boat tour would increase noise impacts.		Same as Alternative 2
		Pumps moving water in and out of impoundments at the Headquarters Area, while enhancing habitat, would have negative impact on “natural quiet” of the area.		Same as Alternative 2
<i>Aesthetics</i>	Aesthetics of invasive cattail and exotic plants, trees and vines would have negative impact on naturalist’s appreciation of refuge	Efforts to manage and control invasive and exotic plants would initially result in unsightly areas until native plants fill in the areas.	Same as Alternative 2	Same as Alternative 1
		The use of prescribed fire would initially produce aesthetically displeasing blackened areas until new vegetative growth produces positive aesthetics.	Same as Alternative 2	Same as Alternative 2, but only in Compartment C.

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Effects on Physical Environment: <i>Aesthetics</i>			Removal of levees and restoration of impoundments in the Headquarters Area would cause short-term decrease in aesthetics.	
		Increase in access points and public use increases potential of unsightly litter which would also negatively impact biological environment as wildlife ingest plastic and become entangled in trash.		Same as Alternative 2
<i>Facilities</i>	Existing buildings would be maintained causing no additional impacts.	Recreational facility development would cause short term negative impacts to air, noise quality and soils during initial construction, but minimal direct negative impacts would occur after construction is completed.	Same as Alternative 1	Same as Alternative 2
Effects on the Biological Environment: <i>Sloughs and Wet Praries</i>	Thousands of acres of native plant communities would be lost as wet prairies and sloughs fill in with vegetation.	Prescribed fire would prevent wet prairies and sloughs from filling in with vegetation thus restoring natural heterogeneity and providing open habitat for many species of wildlife.	Same as Alternative 1	Same as Alternative 2
<i>Sawgrass</i>	Sawgrass would continue to fill in open spaces, potentially converting wet prairies into sawgrass.	Formation of a mosaic of sawgrass and wet prairie through prescribed burning would provide positive impacts for wildlife.	Same as Alternative 2	Same as Alternative 1
<i>Tree Islands and the Cypress Swamp</i>	Negative impacts caused by wildfire would destroy tree islands covered by Old World climbing fern, possibly cause spreading of the fern and would assist in spreading melaleuca seed.	Some direct negative impacts caused by control efforts to stop the spread of exotic and invasive plants, however, would provide substantial positive effects by restoring habitats.	Same as Alternative 2	Same as Alternative 1
	Loss of largest remaining cypress strand along the eastern edge of the Everglades due to infestation of exotics or to wildfire.			Same as Alternative 1
<i>Cattail</i>	Until water quality improves, growing expanses of cattail would decrease waterfowl habitat and exclude other wildlife uses.	Prescribed fire in cattail reduce the biomass and provide better habitat.	Same as Alternative 2	Same as Alternative 1

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Effects on the Biological Environment: <i>Exotic Plant Impacts to Native Vegetation</i>	Floating invasive exotics would have a negative impact causing water flow and drainage problems, clogging water control structures, impeding recreational use and reducing dissolved oxygen resulting in fish kills that directly impact the top of the food web in the Everglades ecosystem.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
	Major portions of native habitats, including sawgrass, wet prairies, sloughs, and tree islands would continue to be replaced by invasive and exotic plants. Twenty five percent of the refuge interior would be lost to melaleuca within 5 years. The refuge would succumb to exotic plant invasion within 15 years.	Native Everglades habitats would benefit directly and recover naturally with the aggressive control of invasive exotics.	Same as Alternative 2	Same as Alternative 1
		Control efforts would cause some initial damage to native vegetation including death of native trees, shrubs and ground cover but, long term, these areas would become germination sites for desirable native vegetation.	Same as Alternative 2	
		Implementation of a fire management program would greatly improve the quality of habitat and would prevent the spread of invasive exotics.	Same as Alternative 2	
		Improved water quality would benefit native vegetation communities.	Same as Alternative 2	
				Increased public use would require construction of additional nature trails in areas such as Strazzulla Marsh which would cause limited damage to native vegetation and increase potential for exotic infestation.

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Effects on the Biological Environment: Wildlife and Protected Species	Loss of native habitats due to exotic and invasive plants would have severe negative impacts on most bird species.	Improving Everglades marsh habitat through management efforts would benefit bird species.	Same as Alternative 2	Same as Alternative 1
	Loss of native habitats including native tree islands, the cypress swamp, and Strazzulla Marsh would have negative impacts on resident and neotropical songbirds.	Plant communities including native tree islands, the cypress swamp, and Strazzulla Marsh would remain viable for migratory and resident songbirds.	Same as Alternative 2	Same as Alternative 1
Research and Monitoring	There would be no improvement in waterfowl habitat which would continue to degrade.	Open areas through fire management and resulting new vegetative growth would provide better habitat and foraging conditions for waterfowl.	Same as Alternative 2	Same as Alternative 1
	Limited information gathering would have negative impact on management of wildlife and habitat.	Species and habitat response to management efforts would be used to 'fine tune' management activities.	Provides more information than Alternative 2.	Same as Alternative 1
Wildlife in the Compartments	Limited information would prevent refuge from assessing the effects of the Comprehensive Everglades Restoration Plan and providing data to assess Comprehensive Everglades Restoration Plan management process.	Comprehensive biological programs and cooperative research projects would have positive impact in assessing the Comprehensive Everglades Restoration Plan effort.	Same as Alternative 2	Same as Alternative 1
	Limited number of scientific research projects would not provide significant management information to be used in the Everglades ecosystem.	Greater number of research projects would provide significant management information that would have positive impact on the refuge and the whole Everglades ecosystem.	Same as Alternative 2	Same as Alternative 1
Research Natural Area	Managing Impoundment C-7 would occasionally provide 33 acres of beneficial marsh habitat, but the remaining 1997 acres in impoundments would provide minimal benefit to wildlife.	Impoundments A, B, and C would be managed so that 1-2 impoundments would provide optimal foraging habitat throughout the year resulting in large direct and cumulative positive impacts.	Removal of levees to rejoin Impoundments A, B, C and the cypress marsh would have positive, direct and cumulative impact on wildlife.	Management of Impoundment C would have positive impacts on wildlife there, however, the remaining acreage would be minimally managed, providing little benefit to wildlife.
	There would be negative impact because Old World climbing fern would not be controlled.	Removal or control of exotic and invasive plants would have a direct negative impact, however, major indirect and cumulative impacts would be realized.	Same as Alternative 2	Same as Alternative 1

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	Alternative 1. Maintain Current Management	Alternative 2. Ecosystem Emphasis	Alternative 3. Biological Emphasis	Alternative 4. Public Use Emphasis
Effects on the Biological Environment: <i>Airboat Impacts</i>	Airboat impacts would be minimal as the boats would be used only by staff and researchers.	Increase use of airboat by biologists, law enforcement and researchers would increase negative impacts, however avoiding visible wildlife and minimizing damage to vegetation would minimize overall impact.	Increased use of airboats by biologists and researchers would increase negative impacts, however avoiding visible wildlife and minimizing damage to vegetation would minimize overall impact.	Increased use of airboats by law enforcement would increase negative impacts, however, avoiding visible wildlife and minimizing damage to vegetation would minimize overall impact.
Fire Impacts: <i>Exotic Plant Control</i>	Unplanned wildfires would have much greater negative impact because prescribed fires would not be used to reduce the fuel load.	Prescribed fire program would have a positive impact on exotic plant control and subsequent habitat restoration as well as reduce the intensity of unplanned wildfires.	Same as Alternative 2	Same as Alternative 1
<i>Invasive Plant Control</i>	Lack of a prescribed burn would have an indirect and cumulative negative impact on wildlife and habitat.	Prescribed fire would greatly improve habitat and speed up efforts to restore the marsh.	Same as Alternative 2	Same as Alternative 1
<i>Compartment Management</i>	Lack of prescribed fire would have negative impact resulting in low habitat diversity and an abundance of cattail.	Prescribed fire would be used to create and maintain habitat diversity which would benefit resident and migratory birds, including shorebirds, wading birds and waterfowl.	Prescribed fire would be used less often but would be used initially to remove vegetation from Impoundments A, B and C opening the wetlands up for replanting of native cypress.	Prescribed fire would enhance the habitat in Impoundment C but would not be used on any other part of the refuge, resulting in low habitat diversity and rank vegetation.
<i>Catastrophic Wildfire</i>	Lack of prescribed fire to reduce fuel loads would result in catastrophic wildfires that would have negative impacts on vegetative habitats by destroying soils, tree islands, sawgrass marsh and cypress swamps.	Prescribed fire would reduce the chance of catastrophic wildfires thereby preventing negative impacts on vegetative habitats.	Same as Alternative 2	Same as Alternative 1
<i>Costs of Fire Suppression</i>	With no prescribed fire program to reduce catastrophic wildfires, costs would be incurred to replace facilities and equipment lost in a wildfire.	Prescribed fire programs would have a positive benefit on costs by reducing the chances of a catastrophic wildfire which would incur costs to replace facilities and equipment.	Same as Alternative 2	Same as Alternative 1
Effects on Cultural and Historic Resources:	Because data collection would be limited to review of existing documents, erosion control, interpretive and educational opportunities would be limited. Cultural resource management would be limited to investigations required by applicable laws.	Databases generated from a variety of investigative techniques, while working with multiple partners, would have a positive impact on the refuge's ability to monitor and protect cultural resources and increase public education opportunities.	Active investigations would provide information to be used for resource management, as well as improve protection of archaeological sites, however, public use activities would be limited due to closure of large areas to the public.	A variety of investigations, as well as multiple partnerships, would provide information on the cultural and archaeological resources of the refuge.

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Effects on Recreation, Environmental Education, and Interpretation: <i>Recreation</i>	Existing levels of public benefits such as opportunities for relaxation, family togetherness, interacting with nature, learning-discovery, escape from work-related pressures and exercising would be sustained, however, opportunities for solitude, observing wildlife and “semi-wilderness” experiences would be limited, as public use is concentrated into a limited number of sites.	All public use in Alternative 1 would be sustained as well as an increase in public accessibility, an increase in aesthetic appreciation, and additional hunting opportunities. Additional areas would be opened to the public, new facilities constructed or enhancement of existing facilities and establishment of a concession contract in the Hillsboro Recreation Area provide greater public use opportunities. However, additional recreation opportunities would result in potential user conflicts.	The same recreational opportunities would be available as in Alternative 1 including a modest increase in feral hog hunting, however, there would be a decrease in visitor use around Impoundment C and a decrease in waterfowl hunting opportunities.	Same as Alternative 2
<i>Environmental Education and Interpretation</i>	Current levels of interpretation and environmental education would continue with limited opportunities to educate the public about refuge issues or to provide interpretation of refuge resources by the staff.	Effectiveness of the environmental education program to increase the opportunities for learning about nature, the participant’s role in the ecosystem, and the mission of the refuge system would be enhanced by expanding the environmental education program, developing a school outreach program and adding additional facilities.	Current levels of interpretation and environmental education would continue as interpretive resources are slowly updated and a limited number of off-site environmental education programs are conducted.	The environmental education and interpretive programs would be the same as Alternative 2.
Effects on Socioeconomic Environment: <i>Ecotourism</i>	There would be minimal impact on the economy.	An increase in visitation to the refuge caused by more visitor facilities and increased recreational activities would have a positive impact on the local economy.	There would be a short-term decline in visitation followed by no minimal positive or negative impact on the economy.	Same as Alternative 2
<i>Tax Revenue</i>	There would be no change in local sales tax generated by visitors.	Increase in visitation would cause a moderate increase in sales tax generated.	A short term decline in visitation would have a minor negative impact on local sales tax generated.	Same as Alternative 2

Table 19. A summary of the environmental consequences of all the alternatives (continued)

Issue or Concern	<i>Alternative 1.</i> Maintain Current Management	<i>Alternative 2.</i> Ecosystem Emphasis	<i>Alternative 3.</i> Biological Emphasis	<i>Alternative 4.</i> Public Use Emphasis
Unavoidable Impacts:	Exponential growth of exotic plants would continue to threaten the biological integrity of the refuge and the refuge would continue to be viewed as a seed source causing the establishment of exotic plants in uninfested nearby areas.	Removing and controlling exotic and invasive plants would have an unavoidable negative impact on some non-targeted species, however the positive benefits to the native vegetation would far outweigh the negative impacts.	Same as Alternative 2	Same as Alternative 1
		An increase in visitor numbers would have a minor negative impact on the foraging ability of wading birds in Compartment C, however this impact is insignificant due to the types of public use allowed and if warranted, areas of Compartment C can be easily closed to the public.		
		Short-term air pollution to nearby communities would be associated with the prescribed burn program, however no major adverse impacts to the refuge resource or natural environment would occur.	Short-term air pollution to nearby communities would be associated with the prescribed burn program.	Same as Alternative 2 on a very limited basis.
		Construction would cause an immediate negative impact to the habitat around each work site, however standard conservative construction techniques would be used to minimize impacts.	Same as Alternative 2	Same as Alternative 2

Mitigation Measures

Described below are the measures used to mitigate and minimize potential adverse effects.

Wildlife Disturbance

Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously some activities innately have the potential to be more disturbing than others. All preferred alternative public use activities contained in this document have been carefully planned to avoid unacceptable levels of impact.

As currently proposed, the known and anticipated level of disturbance of the preferred alternative is not considered significant and well within the tolerance level of known wildlife species and populations present in the area. All hunting activities (season lengths, bag limits, number of hunters) would be conducted within the constraints of sound biological principles and refuge-specific regulations established to restrict illegal or non-conforming activities. Providing fishing opportunities allows the use of a renewable natural resource without adversely impacting other resources.

Fishing activities are not thought to cause a disruption in the resource because most anglers use catch and release methods. High amounts of mercury associated with fish in south Florida and at the refuge necessitate catch and release. The sources of mercury deposition in the Everglades ecosystem and the resulting effects on wildlife, fish and soils are not well known and the refuge is a contributing member to the extensive multi-agency research effort.

General wildlife observation (photography, walking, bicycling, canoeing/kayaking) activities may result in minimal disturbance to wildlife. If visitors venture too close to foraging wading birds, alligators, or other wildlife, disruption of foraging or resting activities would result in a more severe disturbance. To mitigate potential disturbances, a greater number of volunteers, serving as naturalist rovers, would help educate visitors about the problems associated with their actions. If a visitor disregards the rovers instructions, refuge law enforcement officers would handle the situation. Also, areas may be closed to the public if disturbance is excessive.

There are three major user groups that heavily use trails in the south Florida area for the opportunity to experience and enjoy the outdoors and observe nature and wildlife. They are hikers, bicyclists, and equestrian groups. The existing refuge perimeter levee is the highest vantage point in the area and for 30 feet on either side it is free of vegetation. The design of the levee, including the sharp slope and deep canals along each side, precludes off trail use. Because of these constraints, the levee allows excellent opportunities for wildlife observation while limiting the impact or disturbance of human use.

Because of the narrow width of the perimeter levee (16 feet at the top), it is not suited to support all three users at the same time and in fact could pose a safety hazard. For this reason, portions of the eastern side of the levee have been set aside for specific uses to enable a variety of means; i.e., on foot, bicycle, to be able to observe wildlife and experience a portion of the northern Everglades habitat.

Initial disturbance to wildlife and habitat would occur during the construction of new facilities such as the teaching pavilion, visitor center extension, Strazzulla Marsh boardwalk, canoe trail camping platform, and

development of the canoe trail extension. However minimal the wetland effects may be, wetland impacts would be mitigated to comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. Parking areas would be constructed to allow storm water to percolate into the soil rather than allowing it to run directly into the adjacent wetlands. Short-term negative effects to air, noise quality, and soils within the project site will be expected, and measures to protect the environment would be taken. Allowing these non-consumptive recreational opportunities on the refuge would help to maintain and build public support for the refuge and the Everglades ecosystem.

Monitoring activities through wildlife inventories and assessments of public use levels and activities would be conducted, and public use programs would be adjusted as needed to limit disturbance to acceptable levels. No pets would be allowed on the refuge because of their potential to cause disturbance to wildlife (with the exception of retrievers in waterfowl hunting). No pet may be left in any vehicle on refuge because of the threat of the animal overheating.

The refuge recognizes the impacts airboats have on vegetation and wildlife. Refuge management would continue to limit staff and researchers to necessary airboat travel. All airboat operators would have attended an airboat safety course and would refrain from driving through vegetation if at all possible and from causing disturbances to wildlife.

An airboat was initially considered as the craft to use for the concession shuttle boat. Because of the airboat disturbance to wildlife and the visitor's inability to hear an interpreter or experience the sounds of the Everglades, the use of an airboat was abandoned. Instead, a quietly operating (possibly electric) pontoon boat with an interpretive guide would be the choice for the seasonal shuttle boat.

The extensive labor, airboat use, and chemicals it would take to bring the more than 90,000 acres infested with exotic plants to maintenance control levels may exceed some wildlife species tolerances for disturbance. However, the refuge and the Service (Executive Order 13112 on Invasive Species) believe that controlling exotic plants is critical to retain the ecology of the refuge and the Everglades ecosystem as a whole.

Water Quality Disturbance

An access point for a poleboat trail and access trails into the waterfowl hunt area are planned. Each of these projects have the potential to allow water into the refuge interior from the perimeter canal. If this occurs, cattail would begin growing where it had not been previously established. To prevent further damage to the refuge vegetation structure, these trails would not be created until nutrients in the perimeter canal water are shown to be sustained at acceptable levels (yet to be determined) in accordance with the Consent Decree.

User Group Conflicts

As public use levels expand across time, unanticipated conflicts between user groups may occur. Programs would be adjusted as needed to eliminate or minimize each problem and provide quality appropriate, compatible wildlife-dependent recreational opportunities. Experience has proven that time and space zoning, (e.g., establishment of separate use areas, use periods, and restricting numbers of users), if necessary, are effective tools in eliminating conflicts between user groups.

Under the preferred plan, hiking and biking areas on the perimeter levee are zoned and some uses are separated to avoid potential conflicts between user groups and to enhance the experience of each user group.

The perimeter canal would also be zoned by speed to enhance the experience and to prevent potential conflict between different user groups. While motorboats utilize most of the refuge waters, they shall operate at “slow speed, minimum wake” at all times to prevent swamping canoeists, kayakers, and shuttle boat patrons and to minimize noise level disturbances to other users (*Figure 19*).

Effects on Adjacent Landowners

Implementation of the proposed action would not impact adjacent landowners. Future land acquisition would occur on a willing seller basis only, including the “Areas of Concern” and at fair market values. At several locations in the comprehensive plan, reference is made to the need for conducting water quality sampling and monitoring activities to document current conditions and seek to improve quality, if necessary. The refuge would follow the Consent Decree and other guidelines to enhance the quality waters entering the refuge.

As the refuge eradicates its exotic plants, exotic seed dispersal from the refuge would diminish. Eventually, when the refuge exotic plants are at maintenance control levels, minimal seed dispersal would occur and the refuge would be a much better neighbor to local land owners.

Land Ownership and Site Development

Proposed land acquisition efforts by the Service would result in changes in land and recreational use patterns, since all uses on national wildlife refuges must meet compatibility standards. The lands identified in the proposed acquisition boundary are currently agricultural lands. The lands selected for acquisition would be returned to a wetland or cypress swamp.

Potential development of the buildings, trails, and other improvements could lead to minor short-term negative impacts on plants, soil, and some wildlife species. Efforts would be made to use recycled products and environmentally sensitive treated lumber when building the boardwalks and observation towers. The placement of the visitor center environmental classroom/auditorium and the separate teaching pavilion would occur on existing fill areas (parking lots or adjacent open, grassy areas). The construction of an office/concessionaire building would be over an existing shellrock fill area in the same location as a former concession structure. All operations would comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. If necessary, affected parking areas would be constructed to allow stormwater to percolate into the soil, rather than allowing it to run directly into adjacent wetlands.

As indicated earlier, one of the direct effects of site development is increased public use; this increased use may lead to increased littering, noise and vehicle traffic. While Service funding and personnel would be allocated to minimize these indirect effects, such allocations would make the resources unavailable for other programs.

Short-term Uses versus Long-term Productivity

The proposed habitat protection and management program is dedicated to maintaining the long-term productivity of the refuge habitats. Short-term losses of visual aesthetics and visitor use after a prescribed burn would have long-term benefits for many wildlife trust species and reduce the probability of wildfire. While direct and immediate process of invasive exotic plant removal would produce unsightly results for a time, it would also provide long-term benefits to the refuge and to the surrounding natural areas. The construction of a wildlife trail and observation tower at the Strazzulla Marsh, towers at the Headquarters Area and a concession operation at Hillsboro Recreation Area would have short-term negative impacts on the marsh and swamp communities. Educational value and associated public support gained from the visitor experiences would have long-term benefits for the entire ecosystem.



Fire line
USFWS Photo by R.I. Payton

VII. Consultation and Coordination

A planning team composed of representatives from the Service, the South Florida Water Management District, the U.S. Army Corps of Engineers, Palm Beach County's Department of Environmental Resources Management, Florida Atlantic University's Department of Anthropology, the University of Florida's Department of Recreation, Parks and Tourism, and the University of Florida's Institute of Food and Agricultural Sciences, was formed to prepare the Draft Comprehensive Conservation Plan for the refuge.

The planning team met on five occasions (July 14-15, October 6-7 and November 4, 1998, January 12-13, 1999, and October 19, 1999) to develop a vision statement, goals, objectives, and strategies for the refuge. Specific team members were also involved in writing the various sections of the plan.

On August 17, 1998, the team conducted a public scoping meeting to determine the important issues and concerns (these issues and concerns are summarized in Chapter II of the Draft Comprehensive Conservation Plan). Based on the issues and concerns generated at this meeting and the team's knowledge of the refuge environment, a Draft Comprehensive Conservation Plan/Environmental Assessment was prepared for public review and consideration. Dr. Pat Bidol-Padva served as the facilitator for the planning team meetings and the public scoping meeting.

The planning team members were:

Bruce Arrington, Wildlife Biologist, Fish and Wildlife Service, A.R.M.
Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida

Marian Bailey, Wildlife Biologist, Fish and Wildlife Service, A.R.M.
Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida

Laura Brandt, Wildlife Biologist, Fish and Wildlife Service, A.R.M.
Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida

Susan Bullock, Hydrologist, Water Management Section, Army Corps of Engineers, Jacksonville, Florida

Fred Davis, Director, Land Stewardship Division, South Florida Management District, West Palm Beach, Florida

Dave Erickson, Refuge Planner, Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Region Office, Atlanta, Georgia

Allan Flock, former Acting Refuge Manager, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida

David Gillings, Environmental Program Supervisor for Land Acquisition, Palm Beach County Department of Environmental Resource Management, West Palm Beach, Florida

Steve Holland, Associate Professor, Department of Recreation, Parks and Tourism, University of Florida, Gainesville, Florida

Steve Jacob, Associate Professor, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida

Su Jewell, former Wildlife Biologist, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida

- Richard Kanaski, Regional Archaeologist, Fish and Wildlife Service, Savannah Coastal Refuges, Savannah, Georgia
- William Kennedy, Associate Professor, Department of Anthropology, Florida Atlantic University, Boca Raton, Florida
- Tracey McDonnell, former Refuge Operations Specialist, Fish and Wildlife Service, A.R.M. Loxahatchee National Wildlife Refuge, Boynton Beach, Florida
- Mark Musaus, Refuge Manager, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida
- Ryan Noel, Refuge Manager, Fish and Wildlife Service, Hobe Sound National Wildlife Refuge, Hobe Sound, Florida; Assistant Manager, A.R.M. Loxahatchee National Wildlife Refuge
- Serena Rinker, Supervisory Interpretive Specialist, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida
- Chuck Sisco, Environmental Analyst/Wildlife Biologist, Palm Beach County Department of Land Acquisition, West Palm Beach, Florida
- Suzanna Smith, Associate Professor, Institute of Food and Agricultural Science, University of Florida, Gainesville, Florida
- Bill Thomas, Jr., Biological Technician, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida
- David Viker, Deputy Refuge Manager, Fish and Wildlife Service, A.R.M. Loxahatchee and Hobe Sound National Wildlife Refuges, Boynton Beach, Florida
- Skye Wheeler, Graduate Student, Department of Anthropology, Florida Atlantic University, Boca Raton, Florida
- Dawn Whitehead, former Fisheries Resource Coordinator, Fish and Wildlife Service, Ecological Services Office, Vero Beach, Florida

Glossary

- Accrete To grow by being added to, such as an accumulation of peat, or sediment over a period of time.
- Alien Species With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem. Also known as an exotic species.
- Alternative A set of objectives and strategies needed to achieve refuge goals and desired future conditions.
- Anadromous Going from salt water to fresh water, such is said of salmon, shad, snook, or tarpon.
- Anthropogenic Caused by man, such as air pollution.
- “Area of Concern” Lands near the refuge boundary that the Service would prefer to stay undeveloped; remain agricultural or be restored to their natural state. The Service would assist in managing these lands for wildlife through developing partnerships or by entering into license agreements or boundary easements.
- Atmospheric Deposition Stations Stations in refuge interior which sample particulates from air and rainwater; components consist of 4 - 3 ½ gallon buckets and a solar-powered lid tripped by a solenoid during a period of rain; established procedure for testing for atmospheric deposition of phosphorus as part of the consent decree.
- Bioaccumulation The process in which industrial waste, toxic chemicals, or pesticides gradually accumulate in living tissue, or in the food web/chain.
- Biomagnification See bioaccumulation.
- Biomass The total mass, or amount of material in a particular area.
- Biological Diversity The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.
- Biota The plant and animal life of a region.
- Borrow Canal A canal which was created when soil or rock was removed to construct a dike, levee, or unpaved road.
- Buffer A multi-use transitional area designed and managed to protect core reserves and critical corridors from increased development and human activities that are incompatible with wildlife. In this document, agricultural lands are also considered buffer lands. “Areas of Concern” are also used to delineate buffer lands.
- Cacique An Indian chief, or local political boss.
- Calusa An Indian tribe of south Florida, now thought to be extinct.
- Catastrophic Wildfire Fires which historically occurred in the Everglades prior to the 1900s usually once every decade during severe droughts; fires had potential, due to their intense nature, to physically alter a particular plant community. Fires reduced accumulated peat and perpetuated the long-hydroperiod marsh habitat.
- Category I Florida Exotic Pest Plant Council has developed three ranking categories to classify the invasiveness and threat of exotic plants to the natural environment. Category I species are those species invading and disrupting native plant communities in Florida. This definition does not rely on the economic severity or geographic range of the problem, but on documented ecological damage.
- Category II Species that have shown a potential to disrupt native plant communities. These species may become ranked as Category I, but have not yet demonstrated disruption of natural Florida plant communities.
- Category III Plants to “watch out” for; only a few specimens have escaped to natural areas; unknown if planted as ornamentals by humans.

- Central and Southern Florida Project . . . This major project, first authorized by Congress in 1948, is a multi-purpose water resources project. The authorized purposes of the project include: flood control, regional water supply for agricultural and urban areas, prevention of salt water intrusion, water supply to Everglades National Park, preservation of fish and wildlife, recreation, and navigation. In short, this project resulted in the 1000s of miles of drainage canals across the historic range of Everglades and is what makes it possible for over five million people to now live and work in the 18,000 square mile area which extends from south of Orlando to Florida Bay.
- Central and South Florida Restudy The name that has officially been changed to the Comprehensive Everglades Restoration Plan. Please see this name in the glossary.
- Class III waters Waters suitable for fish and wildlife.
- Compatible Use An appropriate wildlife-dependent recreational use or any other use on a refuge that is within the mandates laid down in the Refuge Improvement Act of 1997; the intent of the Congress in the Act of 1997 or in the 'Final Internal Draft' document of appropriate uses on a National Wildlife Refuge. The Refuge Manager may also determine if an activity will that will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge.
- Comprehensive Conservation Plan A document that describes the desired future conditions of a refuge and provides long-range guidance and management direction for the Refuge Manager to accomplish the purposes of the refuge, contribute to the mission of the system, and to meet other relevant mandates.
- Comprehensive Everglades Restoration Plan The purpose of the Comprehensive Everglades Restoration Plan is to develop modifications to the Central and Southern Florida Project to restore the Everglades and Florida Bay ecosystems while providing for the other water-related needs of the region. The Comprehensive Everglades Restoration Plan is currently in the feasibility phase of the study which is jointly funded by the Corps of Engineers and the South Florida Water Management District. The Comprehensive Everglades Restoration Plan is being accomplished by an interdisciplinary, multi-agency team from a number of Federal, State, Tribal, and local government agencies.
- Consent Decree Settlement agreement in 1992 between federal and the state agencies to formulate a comprehensive plan to restore, preserve and protect the unique flora and fauna of the A.R.M. Loxahatchee National Wildlife Refuge and Everglades National Park, to maintain a cooperative relationship in accomplishing these goals, and to settle and resolve the disputes that have arisen between and among them without admitting or conceding liability.
- Everglades Agriculture Area Agricultural area (700,000 acres) northwest of the refuge noted for its production of sugarcane, rice, sod and winter vegetables; created as the result of the Central and Southern Florida Project and drainage of historic Everglades habitat.
- Ecosystem A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.
- Ecosystem Approach A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.
- Ecosystem Management Management of an ecosystem that includes all ecological, social, and economic components which make up the whole of the system.
- Ecotone A transitional zone between two habitat types, or adjacent communities.
- Edge Effect Theory in wildlife management that the area between two adjacent habitat types or along the edge of a particular habitat types supports and maintains a greater diversity and number of species.
- Elemental Contaminants Elements such as phosphorus, mercury or selenium that occur in the environment naturally, or unnaturally as the result of man.
- Endangered Species Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range.
- Everglades Nutrient Removal Project. . A 3,700 acre man-made filtration marsh created in 1994; located between the Everglades Agriculture Area and the refuge designed to remove nutrients (phosphorus) from storm water.

Appendix B - Glossary

Environmental Assessment	A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.
Everglades Protection Area	This includes all lands in the former Everglades ecosystem from the Everglades Agricultural Area south to Everglades National Park.
Epiphyte	A plant that grows on another plant but is not parasitic and produces its own food by photosynthesis, such as orchids, air plants, lichens, and mosses.
Exotic Pest Plant Council	Council of resource managers formed in 1984 to unify the exchange of information between federal, state, and local land managers, research scientists, and the plant industry that were concerned with the impacts of exotic plants in natural areas.
Estuarine	Deposited in an estuary; an inlet or arm of the sea where salt water and fresh water meet.
Eutrophic	A body of water rich in nutrients that causes the excessive growth of noxious plants.
Eutrophication	The process by which a body of water becomes rich in nutrients over a period of time; can be accelerated by man as a result of runoff of fertilizers or by agricultural practices such as cattle or crop farming.
Evapotranspiration	The total water loss from soil, including direct evaporation and that by transpiration from the leaf surface of plants.
Everglades Construction Project	The cornerstone of Everglades restoration. Major objectives of this program are to clean up nutrient enriched stormwater runoff before it enters the Everglades system and to improve the timing, distribution and flow of water within the Everglades system. This project includes provisions for construction of more than 40,000 acres of water treatment marshes known as Stormwater Treatment Areas. These areas would remove phosphorus and other pollutants from Everglades Agricultural Area stormwater runoff.
Exotic Species	A non-indigenous or alien species, or one introduced to this state, either purposefully (horticulture trade) or accidentally that escaped into the wild where it reproduces on its own, either sexually or asexually. Any introduced plant or animal species that is not native to the area and that may be considered a nuisance.
Feral	A wild, free-roaming animal; may be a domestic escapee.
Species of Management Concern	This is a category assigned to species for which information in the possession of the Service indicated that proposing to list as threatened or endangered was possibly appropriate, but for which sufficient data were not available to support proposed rules.
Geographic Information System	A computer based system for the collection, processing, and managing of spatially referenced data. This system allows for the overlay of many data layers and provides a valuable tool for addressing resource management issues.
Goals	Descriptive statements of desired future conditions.
Hydrologic	Involving water flows or their distribution as related to evaporation, or flow to fresh water marshes, marshes, seas, estuaries, etc.
Hydrology	The scientific study of the properties, distribution and effects of water in the atmosphere, on the earth's surface and in soil and rocks. A hydrologic model is a type of simulation which takes into account the known behavior of water in the form of mathematical formulas and computer models that allow one to mimic the movement of water in a known area.
Hydropattern	A description of water movement change in depth, timing, flow, or location of surface water.
Hydroperiod	A measure of the fluctuation and change of water levels and flow over time. The length of time an area is inundated.
Introduction	The intentional, or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.
Invasive species	A native, or non-native plant that has flourished beyond its normal constraints, due to changes in its natural environment. It is a variable condition defined by the Florida Exotic Pest Control Council category to which the species is ranked.

Appendix B - Glossary

- Issue** Any unsettled matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or the presence of an undesirable resource condition.
- Keystone Species** A species unique to, or dependent upon a specific habitat; that one of a number of associated parts, or things that support, or hold together the others, such as the periphyton found in the Everglades system or an American alligator.
- License Agreement** A lease agreement initiated in 1951 between the South Florida Water Management District and the Fish and Wildlife Service that enables the Service to manage Water Conservation Area 1 as a portion of the A.R.M. Loxahatchee National Wildlife Refuge. After 50 years (ending in the year 2001) the agreement has three renewable 15-year periods.
- Listed Species** Any species of fish, wildlife or plant which has been determined to be ‘at risk’ by a state or the federal government agency. In this document, at risk may include threatened, endangered, species of special concern, species of management concern or species included in the Convention of International Trade in Endangered Species
- Littoral Zone** The intertidal ecological zone along the shore, or the area between the perimeter canals and the dense, cattail growth.
- Lygodium** Genus for Old World climbing fern; an invasive vine from southeast Asia and Africa introduced in the 1950s, or earlier by the nursery trade as an ornamental vine; rapidly displacing native vegetation in the refuge and other areas of south Florida.
- Maintenance Control** Appropriate methods of eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce long term effects of invasive species and to prevent further invasions. The reduction of exotic pest plant populations to an economically or ecologically acceptable level through mechanical, chemical or biological means.
- Management** Any intentional or planned activity which has an effect on an existing natural community which has been degraded in some way. Management which attempts to restore natural community functions, structures and/or composition is termed restorative management.
- Melaleuca** Invasive weed from Australia; introduced intentionally into the Everglades to “dry up” the vast wasteland for agricultural purposes; also known as the paper bark tree, or punk tree; extremely disruptive to natural habitats such as the Everglades.
- Money Generation Model** National Park Service’s computer module that generates public usage/visitation estimates.
- Midden** A slightly elevated mound composed of shell fragments and other debris left as waste by native Indians; shell mounds found throughout the Everglades ecosystem constructed by native Indians.
- Monotypic** Consisting of one type or species, such as exotic vegetation. Examples include single crops (fields of sugar cane), the dense growth of cattail along the refuge perimeter canal, or melaleuca ‘heads’. Scientific studies have shown that monotypic stands of vegetation generally provide poor wildlife habitat.
- Multi-Species Recovery Plan** A newly developed plan (1999) spear-headed by the Fish and Wildlife Service to address listed species and their habitat needs.
- Native** A species already occurring in Florida at the time of European contact (1500 AD). With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.
- Naturalist Rover** A refuge volunteer that has completed specific training in wildlife identification and habitat interpretation. These volunteers assist visitors and help to enhance visitor experience at the refuge.
- Neotropical Migratory Birds** Birds that migrate from North America back and forth to South or Central America. These birds usually breed in North America and ‘winter’ in the Carribean, South or Central America. Usually this term is inclusive of many passerines and shorebirds.
- National Geodetic Vertical Datum** U.S. Geological Survey term describing surface water elevation above sea level.

Appendix B - Glossary

Non-indigenous Species	A plant, or animal which has been introduced to the state of Florida. A non-native, exotic or alien plant, or animal.
Objectives	Actions to be accomplished to achieve a desired outcome
Old World Climbing Fern	See Lygodium.
Organochlorines	Toxic pesticides such as DDT, DDE, dieldrin, and chlordane banned in 1970 due to persistent harmful residual characteristics; implicated as cause of decline of numerous raptor species due to its causing thin eggshells; biomagnified in the food chain.
Paleoenvironments	Involving or dealing with forms, conditions, phenomena, fossils, etc., of remote (esp. geologic) eras.
Parasitic	Living at the expense of others; one organism or species gains to the detriment of the host organism or species.
Partnerships	A mutually beneficial, joint relationship between two agencies or an agency and land owner, etc.
Passerine	The largest bird group, composed of small perching birds. Examples include northern cardinals, blue jays, warblers, sparrows and wrens.
Polychlorinated biphenyls	Residuals, or waste produced by urban industries which pose a risk to the environment, also known as PCBs.
Periphyton	A complex association of several types of algae unique to the Everglades; the basis of the Everglades food chain.
Piscivorous	Fish-eating.
Poleboat	Traditional narrow, flat bottom wooden boat used by the first settlers, or “glades men” of the Everglades; a long stiff pole is used to propel the boat through vegetation in the selected direction.
Parts per billion	Standard unit to measure concentrations of phosphorus.
Preferred alternative	The Service’s selected alternative identified in the Draft Comprehensive Conservation Plan.
Prescribed fire	A planned or intentional fire set by resource land managers to improve or restore wildlife habitat and reduce potentially dangerous fire fuel loads, also known as “controlled burn.”
Rachis	The principal axis of an inflorescence, or of a compound leaf; a collection of stems, or vines as related to Lygodium.
Refugia	A place of shelter, safety or protection from danger.
Research Natural Area	Specific natural areas set aside in large refuges of the National Wildlife Refuge System that are protected and preserved from disruptive uses, active or manipulative management, encroachment and development. In this refuge, 2,560 acres of the interior have been set aside and are generally off-limits to all personnel. Potentially, these areas can be used for comparative studies by research scientists and staff.
Restore or restoration management	Management actions to return a vegetative community or ecosystem to its original, natural condition. To bring a disturbed site or an area changed from its native state back to its historic structure, including water regimes, plant community and wildlife components. In this document, restoration can refer to exotic plant removal, planting native plants, and /or reintroductions of native plants or animals.
Restudy	The name that has officially been changed to the Comprehensive Everglades Restoration Plan. Please see this name in the glossary.
Sawgrass	The dominant plant, or sedge associated with Everglades habitats; the edge of the plant, or blade is extremely sharp and easily cuts human flesh.
Sawgrass Marsh	A wetland area dominated by sawgrass such as the Everglades.
Scoping	Process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues. Involved in the scoping process are federal, state, and local agencies, private organizations, and individuals.
Settlement Agreement	See consent decree.

Appendix B - Glossary

Slough	The deepest area of surface water covering the Everglades and the refuge. Usually contains white water lily and spatterdock as its dominate vegetative cover.
Species	A group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.
Stormwater Treatment Areas	A human-made marsh constructed to filter nutrients from agricultural runoff and stormwater. Two will be built on the northern boundaries of the refuge.
Stakeholders	Individuals or groups that have an interest in a potential or current issue; could include federal, state, tribal, and local government agencies, academic institutions, the scientific community, non-governmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests and private landowners.
Threatened species	Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act.
Tree islands	Areas of higher elevation within the Everglades ecosystem that characteristically support more upland type shrubs, trees, and woody vegetation, namely red and sweet bay, willow, wax myrtle, Dahoon holly, cocoplum, and buttonbush. Hundreds of tree islands are found in the refuge.
Trust species	Specifically, species that are federal responsibility and include migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals. The term is broadly used in this document to include federal, state and internationally listed species, including threatened, endangered, species of special concern and species of management concern. Also known as 'listed species'.
Umbrella species	Species for which protection of its habitat will protect the habitat and life history requirements of a large number of other plants and animals such as the American alligator.
Water Conservation Area	Man-made impounded wetlands, areas created by the Central and Southern Florida Project that were designed for water storage, water supply, flood protection, flood control, and outdoor recreation. Water Conservation Areas 2 and 3 are south of the refuge and are managed by the Florida Fish and Wildlife Conservation Commission. The refuge interior is 'laid over' Water Conservation Area 1.
Water Preserve Area	A conceptual design of interconnected series of marsh lands, reservoirs and aquifer re-charge basins. The basins would hold water lost from the Everglades system during wet hydroperiods; reduce seepage from the system, capture stormwater run off, provide water to the urban and agricultural areas during dry hydroperiods and buffer between the existing Everglades ecosystem and an increasing urbanized east coast.
Watershed	The entire land area that collects and drains water into a stream or stream system.
Wildlife diversity	Measure of the number of wildlife species in an area and relative abundance.

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Compatibility Determination

Introduction

This Compatibility Determination describes the wildlife-dependent and other uses that may be included in the public use program under the preferred alternative (Alternative 2 - Ecosystem Emphasis) and determines whether these uses are compatible uses. This determination applies to lands (144,842 acres) under a license agreement with the South Florida Water Management District, lands (2,550 acres) owned by the Fish and Wildlife Service, and the lands (680 acres) included in the expanded acquisition boundary.

Under the National Wildlife Refuge System Administration Act of 1966, the Refuge Recreation Act of 1962, and the National Wildlife Refuge System Improvement Act of 1997, the Service may not permit recreational uses on a national wildlife refuge unless these uses are first determined to be compatible wildlife-dependent uses. The Improvement Act now requires that the needs of fish, wildlife, and plant resources on national wildlife refuges come first. All public uses must be compatible with these resources. Compatibility is determined if the activity does not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System Mission or the major purposes of the national wildlife refuge where the use is proposed. Furthermore, compatible activities which depend on healthy fish and wildlife populations will be recognized as priority general public uses. The 1997 law established the priority public uses as hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Refuge Uses

The compatibility determination applies to: 1) wildlife observation and photography; 2) walking/hiking/bicycling; 3) canoeing/kayaking/poleboating; 4) camping on the canoe trail; 5) concession operation; 6) hunting; 7) fishing; 8) environmental education and interpretation; and 9) research and Special Use Permits.

Refuge Name

Arthur R. Marshall Loxahatchee National Wildlife Refuge

Date Established

June 8, 1951

Establishing and Acquisition Authority(ies)

A Cooperative and License Agreement between the Central and Southern Florida Flood Control District (precursor to the South Florida Water Management District) and the U.S. Fish and Wildlife Service with the Migratory Bird Conservation Act of 1929 authorized the establishment of Arthur R. Marshall Loxahatchee National Wildlife Refuge. In the initial License Agreement, 143,116 acres of wetlands, known as Water Conservation Area 1, were leased to the U.S. Fish and Wildlife Service by the State of Florida to be managed in accordance with the Agreement and legislative mandates. These mandates also apply to a subsequent amendment to the Agreement, which added the 1604-acre Strazzulla Marsh.

Refuge Purpose

This refuge was established

“...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

(Migratory Bird Conservation Act of 1929. 16 U.S.C. Sec. 664).

Refuge Vision

The refuge vision, crafted by the Comprehensive Conservation Plan team members in 1998, is:

“to serve as an outstanding showcase for ecosystem management that restores, protects, and enhances a portion of the unique northern Everglades biological community. This public asset provides for the enjoyment and enhanced quality of life for present and future generations.”

Mission of the National Wildlife Refuge System

The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997, is:

“to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

Description of Uses and Anticipated Biological Impacts

This compatibility determination relies on the best estimates of public use as compiled by the Department of Recreation, Parks and Tourism and the Institute of Food and Agricultural Sciences of the University of Florida. During the upcoming years, the Service would continue, as indicated in the Draft Comprehensive Conservation Plan, to conduct surveys to estimate wildlife populations and plant community diversity, gather definitive public use data, and assess public use impacts on wildlife resources. If adverse impacts to refuge resources associated with public use activities are identified in future years, modifications to that part of the program in question would be implemented to minimize that impact.

Wildlife Observation/Photography

The refuge is known for its easily observed population of alligators. This species probably brings more out-of-town visitors to the refuge than any other species. The refuge is also known for its diversity and visibility of resident and wintering wading birds. Some of the Florida specialty birds that bring in birders from around the country include the Florida snail kite, swallow-tailed kite, short-tailed hawk, smooth-billed ani, wood stork, and limpkin. The compartment system at the Headquarters Area can provide forage areas for thousands of birds. Some waterbirds nest in this area, providing excellent opportunities for photography. Since the refuge is geographically positioned in the Atlantic Flyway, there is a good possibility to observe waterfowl and migratory shorebirds. The cypress swamp and the ecotone surrounding it are rewarding areas to see migratory neotropical passerines and many birders enjoy the seasonal show of colorful warblers and vireos. Butterflies, dragonflies, and damselflies grace the landscape of all refuge areas, providing some of the best photo opportunities in south Florida. Grey fox, raccoon, river otter, bobcat and the exotic armadillo are also commonly seen by the quiet observer.

Non-consumptive uses such as hiking, butterfly watching, birdwatching, nature photography and plant identification are enjoyed by approximately 304,000 people a year; and according to 1998 information, visitors come from as many as 38 foreign countries, the whole United States, as well as locally. An increase in non-consumptive uses is expected to grow quite rapidly due to increases in resident population growth, winter visitor population, and the awareness of the refuge's diverse habitats and the new/upgraded facilities for observing wildlife.

To accommodate the burgeoning visitor use to the refuge, more access areas are needed to help educate the public and interpret the Everglades ecosystem. Projects such as extending or creating a boardwalk, observation towers or photo blinds would be approached with great care to minimize damage to the resource. All efforts would be made to use conservative construction techniques (e.g., silt barriers), recycled materials, and environmentally sensitive treated lumber in each of these projects.

In most cases, wildlife observation/photography would result in minimal disturbance to wildlife. However, if visitors venture too close to foraging wading birds, alligators or other wildlife, foraging or resting activities would be disrupted. To minimize the chance of these disturbances, volunteer "rovers" would educate visitors about the problems associated with their actions. If a visitor disregards the rover's instructions, a refuge law enforcement officer would be called upon to handle the situation. Also, areas may be closed to the public if disturbance is excessive.

Walking/hiking/bicycling

New and additional public use opportunities are being proposed to take advantage of existing roads/levees and trails that provide excellent opportunities to observe the many species of wildlife that use the refuge. The perimeter canal offers exceptional wildlife viewing and photographic opportunities for a myriad of wading birds, waterfowl, hawks, and alligators. Furthermore, the levee adjacent to the canal offers one of the highest vistas in the refuge enabling observation of the unique Everglades habitats. The existing refuge perimeter levee is the highest vantage point in the area and for 30 feet on either side it is free of vegetation. The design of the levee, including the sharp slope and deep canals along each side, precludes off trail use. Because of these constraints, the levee allows excellent opportunities for wildlife observation while limiting the impact or disturbance of human use.

There are three major user groups that heavily use trails in the south Florida area for the opportunity to experience and enjoy the outdoors and observe nature and wildlife. They are hikers, bicyclists, and equestrian groups.

Walking/hiking on the perimeter levee is allowed from Hillsboro Area northwest to the S-6 Pump. Hiking is also allowed from Hillsboro Area to the ACME 1 Pump Station which is northeast of Strazzulla Marsh. Bicycling is allowed on the perimeter levee from Hillsboro Recreation Area east-northeast into the Headquarters Area and visitor center. Bicycling is not allowed on the levees in the compartment areas or on the boardwalk. Users need to be aware that the same perimeter levee is traveled by refuge and South Florida Water Management District employees in vehicles.

Canoeing/Kayaking and Poleboating

Canoeing has been enjoyed by many visitors in past years. Increased maintenance of the existing trail and the extension of it would allow more visitor use. Accessibility to the refuge interior via the canoe trail provides the visitor with an exceptional opportunity to experience the ‘Glades’ as did Native Americans and early settlers did. The longer trail would enable maximum exposure for the visiting public to the most unique feature of the northern Everglades, the numerous tree islands, and the wildlife that use them, which are more prevalent deeper into the refuge. A planned extension of the existing canoe trail would minimally impact wildlife habitat because there would not be an additional entry point from the perimeter canal for possible harmful phosphorous penetration to the refuge interior.

Canoes or kayaks could also be used in all designated public use waters, including areas in the south, west-northwest and east-northeast perimeter canals. Boats traveling within 1 mile either side of the headquarters boat ramp or the ACME 1 and 2 stations and north to the “first bend going north from Hillsboro,” would show courtesy to others and slow to “slow speed, minimum wake.” In any other areas of the canals, boaters would be in compliance with all applicable refuge, U.S. Coast Guard, and State of Florida laws, as codified in Title 50, Code of Federal Regulations, Section 27.32; Title 33, Code of Federal Regulations, Sections 1-187; Title 46, Code of Federal Regulations, Sections 1-199 and Florida Statutes, Chapters 327 and 328. A limited canoe rental operation at the Headquarters Area is not thought to negatively impact the refuge; rather, it would assist visitor efforts to experience and appreciate the refuge and the Everglades.

While a separate poleboat trail is planned, it would not be created until nutrients in the perimeter canal water are maintained at yet to be determined acceptable levels. It is expected that the refuge would become more crowded as more of the nearby 6 million residents visit the refuge. The proposed poleboat trail is another opportunity to experience a different portion of the refuge via a slightly different boat than a canoe. Poleboating would lead to aesthetic appreciation of the refuge, provide interpretation of the cultural history of the refuge, and enable the visitor to observe wildlife in a manner reminiscent of earlier times. Poleboats pose less impact to the wetland than canoes, as they are pushed rather than paddled. A primitive route would be marked with small flags or signs only. The only maintenance required for this project would be to cut a short path pass through the perimeter vegetation to access the interior marsh.

Camping on the Canoe Trail

The canoe trail extension and overnight platforms would provide benefits such as learning about the Everglades, the unique opportunity to observe nocturnal wildlife by sight and sound, observation of celestial phenomenon somewhat away from urban light pollution, and an opportunity to recognize the uniqueness of the Everglades ecosystem. It is vital to provide ways to understand why supporting the cost of ongoing restoration/protection efforts is important to the residents of south Florida. To provide this experience, a very limited overnight opportunity is proposed on the extended canoe trail. Two platforms, large enough to support a composting outhouse and two small tents each, would be constructed on the trail. Visitors shall stay on the trail and use the platforms to stay the night.

Overnight stays would be by permit only, based on advanced reservations, limited by number and only during the winter months. Specific restrictions and guidelines would help keep visitors from becoming lost during the visit and reduce the number of emergency rescues by law enforcement staff. If mandatory rescue missions become too numerous, the camping experience would be shut down.

Further stipulations may be made to assure that wildlife or habitat are not disturbed, including ending the overnight option. Some disturbance to wildlife and habitat would initially occur with the construction of the platforms and development of a trail extension. However, long-term disturbance would be minimal.

Concession Operation at Hillsboro Recreation Area

Phase 1: Initial facility construction and associated increase in public use: A building would be constructed to support interpretive exhibits, a refuge office, partner office space, refuge cooperating association, volunteers, bathrooms and public phones. Refuge management is considering partnering with other agencies on sharing a building as a “contact station/interpretive center” in the Hillsboro Area. The visiting public would be able to learn more about the wetlands through exhibits that highlight the similarities and unique differences between Water Conservation Areas 1, 2, and 3, showcasing the northern and central Everglades.

Anticipated biological impacts associated with the building and area use are minimal and concluded that a new interpretive building at Hillsboro would not necessarily increase visitation, but would increase resource awareness and environmental education for people currently frequenting the site. The planning team also agreed that constructing a new building to fit the footprint of a pre-existing building would not cause further impact (with appropriate construction safeguards) to the nearby wetlands and the vegetation currently in the fill area is

exclusively exotic. Furthermore, a formal refuge presence in the Hillsboro Area would assist in increasing visitor safety and reduce vandalism and other crime.

Phase 2: Concession opportunity for motorboat/canoe/bicycle rentals and Zoned Use Areas: The second phase of the Hillsboro project supports a preliminary framework of a limited concession where a few boats (canoes, kayaks, motorized johnboats), bicycles and fishing gear rentals would be offered. By limiting the number of rentals and adhering to the “use zones,” potential impacts to wildlife in this area should be minimal. To assist in everyone’s safety, designated water speed areas would be assigned for motorboats. Boats traveling within 1 mile either side of the headquarters boat ramp or the ACME 1 and 2 stations and north to the “first bend going north from Hillsboro,” would show courtesy to others and slow to “slow speed, minimum wake.” In any other area, boaters would be in compliance with all applicable refuge, U.S. Coast Guard and State of Florida laws. Only canoes or kayaks are allowed on the canoe trail. If a poleboat trail is opened, only poleboats would be allowed.

The “Public Use Area” (including the waterfowl hunt area) may be accessed by all visiting public, including canoeists, kayakers, poleboaters, and anglers during all months of the year. However, during waterfowl hunt season (generally November, December, and January), only hunters may access the “waterfowl hunt area” during hunt hours (early to late mornings on certain days of the week).

Fishing guides: The concessionaire may be approved to provide guided fishing along the refuge perimeter canals or into the interior public use area by motorboat. Because of the harmful effects of mercury-laden fish in the refuge, fishing by catch and release would be encouraged. Negative impacts could be expected with the projected increase in fishing, including an increase in discarded fishing line, hooks, and sinkers.

Interpretive Pontoon Shuttle: A dawn and dusk interpretive boat tour from the Hillsboro Area to the Headquarters Area would be established. Each boat would have an interpretive guide to assist visitors in seeing and hearing wildlife, interpret the surroundings, and educate passengers about the issues associated with the Everglades. A slow, quiet pontoon type boat would be used. Selling certain types of food at Hillsboro may not be allowed, pending Service appropriateness and compatibility determinations.

Hunting

Waterfowl:

Many of the local residents enjoy waterfowl hunting in the Everglades area and on the refuge. Implementation of the preferred alternative, as described in the Draft Comprehensive Conservation Plan, would ensure that opportunities for various types of hunting would continue for future generations of hunters.

Waterfowl hunting would continue to be limited to the southern portion of the refuge where some of the best habitat is located. While the newly designated hunting area is slightly less than the current hunt area, the new boundaries provide improved motorboat access and potentially better hunting habitat. The hunting area may eventually be made more accessible to motorboats by creating trails into the hunting area from the east and southern sides of the perimeter canal. However, these access trails would not be created until nutrients in the perimeter canals are maintained at acceptable (yet to be determined) levels. Recreational airboating for waterfowl hunting or fishing is not allowed on the refuge (*Appendix J*).

The proposed hunt area includes deep sloughs and shallower ‘peat flats,’ which provide habitat for both divers and dabblers. Duck habitats are expected to improve with the implementation of the prescribed burn management plan (fire management plan). While individual ducks are negatively impacted by hunting on the refuge, the overall duck population using the refuge is not thought to be significantly impacted. There are two reasons for this: 1) few of the Atlantic Flyway ducks come this far south to winter; and 2) approximately 75 percent of the refuge wetlands available for the birds to loaf and forage is not accessible to hunting.

Feral Hog:

At Strazzulla Marsh, feral European hogs impact the refuge by uprooting vegetation, disrupting habitat, and creating potential exotic plant establishment sites. At times, the public may be asked to assist in removing these exotic animals from refuge lands. The occasionally announced hunt (primitive weapon only) time would be short and intensive to reduce the hog population and its impact on the refuge.

American Alligator:

It is common knowledge to the visiting public, local hunters, and to the refuge staff that there is a sizable population of alligators in the perimeter canals. A survey of the alligator population, conducted from 1979-1987 in the L-40 canal north of Headquarters and in the Hillsboro Recreation Area canal, showed alligator densities of 7.8 to 100.7 alligators per mile depending on season and water levels. Recent surveys indicate that alligator

densities in the canals fluctuate with water levels, but are regularly higher than in canals adjacent to Water Conservation Areas 2 and 3.

Since alligator population levels are sufficiently high and alligator hunting is a traditional recreation in south Florida, alligator hunting would be instituted in the refuge perimeter canals. The hunt would take place for a limited time period in accordance with guidelines provided by the Florida Fish and Wildlife Conservation Commission and other refuge regulations. Concurrent with the alligator hunting program, scientific studies would be performed to ascertain population health and to determine if the canal populations remain sustainable. The hunt may be suspended at any time by staff biologists. Users need to be aware that the same perimeter levee is traveled by refuge and South Florida Water Management District employees in vehicles.

Fishing

In south Florida, the public is a strong advocate for sport fishing. Largemouth bass, exotic tilapia, exotic oscar and other species are a traditional form of appropriate, compatible wildlife-dependent recreation in this region. On the refuge, sport fishing is the most common consumptive use of the refuge. Providing fishing opportunities allows the use of a renewable natural resource without adversely impacting other resources. Anglers must, of course, comply with state fishing regulations.

The refuge advocates catch and release fishing after research discovered the extent and severity of mercury in fish bodies. In 1989, the Florida State Health Officer advised fishermen to avoid consumption of several species of fish in more than 1,000,000 acres of the Everglades. The health advisory for the refuge is as follows: “The Florida Department of Health and Rehabilitative Services has issued a health advisory urging limited consumption of largemouth bass and warmouth caught in certain portions of the Everglades due to excessive accumulation of the element mercury. Fish caught in A.R.M. Loxahatchee National Wildlife Refuge (Water Conservation Area 1) should not be eaten more than once per week by adults and not more than once per month by children under 15 and pregnant women; and fish caught in Water Conservation Areas 2A and 3 should not be eaten at all. The refuge is a multi-agency partner supporting research to determine the source of mercury in Everglades waters.

Fishing tournaments (currently permitted only four times per year for one day by a limited number of boats) would be allowed. The impact to the landscape and wildlife in the south end of the refuge is minimal with these tournaments. Restricting the participation to 15 boats, and requiring that groups obtain all state permits, encourages only local clubs that enjoy competition as well as conservation. These same persons routinely fish on the refuge. These clubs, in lieu of a permit fee, support the refuge with volunteer projects such as removing litter at the Hillsboro Public Use Area or assisting refuge staff at youth fishing events.

Educational efforts would be increased to encourage anglers to collect and discard excess and old fishing line, hooks and sinkers, since wildlife are known to die after ingesting this debris. Problems associated with littering and illegal take of fish (undersized fish, over bag limit) would be controlled through law enforcement.

Recreational fishing would have minimal adverse impacts on the fisheries resource, other wildlife resources, listed or trust species, or other natural resources on the refuge. However, in the perimeter canal, the excessive speeds of some fishing boats, due to high-powered outboard engines, can result in collisions with wildlife, endangerment to canoeists, kayakers, and small johnboat operators, and disrupt the experience of the pontoon shuttle customers. To minimize these impacts, motorboats shall be operated in accordance with the following conditions: 1) boats traveling within 1 mile either side of the headquarters boat ramp or the ACME 1 and 2 stations and north to the “first bend going north from Hillsboro” would show courtesy to others and 2) slow to “slow speed, minimum wake.” In any other areas of the canals, boaters would be in compliance with all applicable refuge, U.S. Coast Guard, and State of Florida laws. Private airboats are not allowed on the refuge.

The estimated current and anticipated future levels of fishing is considered to be compatible with the purpose for which the refuge was established.

Environmental Education and Interpretation

Limited amounts of environmental education /interpretation activities have been ongoing at the refuge. Expanding the facilities to encompass additional activities would cause a minimal impact to the surrounding vegetation and is anticipated to have an insignificant effect on refuge resources, including fish, wildlife, and their habitats.

To avoid impacts, new facilities would be located in existing public use areas such as parking lots or filled areas covered in exotic grasses. New facility construction in any of the alternatives would have little negative effect. Any or all fill operations would comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. Parking areas would be constructed to allow storm water to

percolate into the soil rather than allowing it to run directly into the adjacent wetlands. Short term negative effects to air, noise quality, and soils within the project site would be expected, and measures to protect the environment would be taken.

Research and Special Use Permits

The refuge receives many requests to conduct scientific research and other types of activities. Priority would be given to studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitats. The following are some of the things that would be considered in the determination of whether to issue a Special Use Permit: Will the project benefit the refuge? Does the project address an issue of direct management concern to the refuge? Does the project address an issue of concern for overall Everglades restoration? Is the proposed research redundant to previous research conducted in the Everglades or in the refuge. Can the research be conducted elsewhere? Is the activity compatible or appropriate with the purpose, goals or objectives of the refuge? Will the use set a precedent that will be difficult to contain or control in the future? Is the project inconsistent with public safety? Has the project already been determined to be inappropriate on this or any other refuge? Can the proposed research can be conducted elsewhere? Is the applicant qualified?

Research applicants would outline the potential impacts their study may have on refuge habitats or wildlife, including disturbance (short- and long-term), injury, or mortality. If the proposed research methods would impact or potentially impact refuge resources (habitat or wildlife), it must be demonstrated that the research is necessary, and the researcher must identify the issues in advance of the impact. Potential impacts would be explained by the applicant and reviewed by refuge staff. Mitigation measures to minimize potential impacts would need to be developed.

At any time, refuge staff may accompany the researchers to determine potential impacts. Staff may determine that previously approved research and special use permits be terminated due to impacts. All refuge rules and regulations must be followed unless otherwise excepted by refuge management.

Listed Species

The refuge has documented or has suitable habitat for more than 63 state and federally listed threatened, endangered, State species of special concern, Fish and Wildlife Service species of management concern, species listed as Convention of International Trade in Endangered Species or Partners-In-Flight species (*Appendix K, Table 22*). Based on current information, it is anticipated that the current levels of wildlife-dependent recreation, environmental education and interpretation would not impact listed species, species of special concern, species of management concern, or designated/proposed critical habitat. Data gathered as a part of biological surveys and monitoring programs, regarding the presence or potential importance of the refuge to trust species or critical habitat, could result in changes to public use activities across time. If such changes are warranted, wildlife species would benefit from the change.

Incidental take of other wildlife species, either illegally or unintentionally, may occur with any public use program. At current and anticipated use levels, this incidental take would be small and would not directly or cumulatively impact wildlife population levels on the refuge or in the surrounding area. Implementation of an effective law enforcement program and development of site specific refuge regulations and special conditions would eliminate most incidental take problems.

Stipulations Necessary to Ensure Compatibility

Wildlife-dependent uses would be permitted on the refuge with the following caveats:

Vehicles would be restricted to existing roads and parking lots. No all-terrain vehicles would be allowed on any portion of the refuge except occasional use by refuge staff. Wildlife observation or photography activities may result in disturbance to wildlife, but it is expected to be minimal. To mitigate potential disturbances, volunteers serving as naturalist rovers would help to educate visitors about the problems associated with their actions. If a visitor disregards the rover's instructions, law enforcement officers would handle the situation. If disturbances are severe, areas can be closed to public access for specific periods, such as during nesting season.

Bicycling would be restricted to certain areas to minimize potential wildlife disturbances and to retain the quiet atmosphere appreciated by walkers and hikers. Bicyclists would be able to access Lee road and the visitor center parking lot while in the Headquarters Area. Bicycles may also travel south on the levee from the Headquarters Area along the perimeter canal to Hillsboro Recreation Area and back. Because of increased public access (walking, wildlife observation, photography) on the levees of Compartments A, B, or C, and on the boardwalk, bicycling is not allowed.

Canoeing , kayaking or poleboating would cause minimal wildlife disturbance. Canoes, kayaks and poleboats are allowed on the canoe trail, in the perimeter canal around the refuge interior, and in the Hillsboro Public Use Area. These boaters can use the designated hunting areas when hunting is not in season. This area is shared by motorboat users as well. Motorboats must be courteous to other visitors in the public use area, hunt area, or canals and must proceed at “slow speed and minimum wake” when encountering any canoeists and kayakers to reduce the potential of swamping them. Motorboats shall also proceed at “slow speed, minimum wake” when within 1 mile either side of the headquarters boat ramp or the ACME 1 and 2 stations and north to the “first bend north from Hillsboro”. Motorboat operators shall be in compliance with all applicable refuge, U.S. Coast Guard, and State of Florida laws.

Overnight stays on the extended canoe trail would occur under specific refuge guidelines and would be restricted to a designated area. A composting toilet and a platform would be provided, no glass containers or loud music would be allowed and regulations would be established to control the flow of visitors to the campsite.

Fishing and hunting would be allowed in accordance with State of Florida regulations and licensing requirements as well as specific refuge regulations. Firearms or bows are prohibited on the refuge except during designated hunting seasons and in designated areas.

The Hillsboro Recreation waterfowl hunt area would be located sufficiently far from the perimeter canals to protect boaters, hikers, and bicyclists from potential firearm overshooting.

The Strazzulla Marsh feral hog hunt (limited to primitive weapons) would also have a specific hunt area to limit potential overshooting.

All hunts are established on the basis of wildlife population levels and designed to provide quality hunting opportunities. Hunt season dates and bag limits would be adjusted as needed to achieve balanced wildlife population levels within carrying capacities, regardless of impacts to user opportunities. Refuge regulations could include, but may not be limited to: establishing season dates that differ from those of the surrounding hunt areas; suspending hunts; establishing new permit requirements; and closing areas on a permanent or seasonal basis to reduce disturbance to specific wildlife species or habitats (e.g., as bird nesting colonies, roosts, wintering waterfowl, or listed/trust species, or to provide public safety.)

No dogs (or other pets) would be allowed on the refuge because of their potential to cause disturbance to wildlife, except retrievers used in waterfowl hunting. No pet may be left in any vehicle because of the threat of animal overheating.

Additional buildings near the visitor center, the Marsh Trail, or at Hillsboro would be constructed on existing fill areas (parking lots and adjacent open, grassy areas). The construction of a Contact Station/Interpretive Facility at the Hillsboro Area would occur over an existing shellrock fill area in the same location as the former concession structure. All new facility construction would have little effect on water quality. All operations would comply with the requirements of Section 404 of the Clean Water Act and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods to minimize potential runoff during construction. If necessary, affected parking areas would be constructed to allow stormwater to percolate into the soil, rather than allowing it to run directly into adjacent wetlands.

National Environmental Policy Act Compliance

The wildlife-dependent and other recreational uses as evaluated in this compatibility determination have a negligible impact on refuge resources. Allowing these uses as part of an expanded public use program is not expected to be controversial regarding their potential impacts on refuge resources.

In assessing the potential impacts of the proposed refuge actions, all available tools were utilized. These tools included obtaining references from previous refuge management plans; other agency management plans; a review of pertinent scientific literature and technical reports; conversations with scientists and public use professionals; and a review of research conducted on or near the refuge. Input was also provided by the Service’s Regional Archaeologist, an Archaeologist at Florida Atlantic University, and three Sociologists at the University of Florida.

Determination

Based on available information, the proposed uses, namely, hunting; fishing; wildlife observation; wildlife photography; environmental education and interpretation; walking; hiking; biking; canoeing; camping; concession operations; research; and Special Use Permit uses are deemed compatible with the purpose for which the refuge was established and the mission of the National Wildlife Refuge System. There is no indication at this time of any long-term adverse biological impacts associated with these uses.

There are a number of situations, harmful to plant and animal life, that would warrant refuge closure or the development of use restrictions. Examples of these situations include, but are not limited to, protection of trust and listed species (flora and fauna), impacted vegetation, nesting or denning species, and the protection of and possible conflicts with other refuge management programs.

Justification

According to the National Wildlife Refuge System Improvement Act of 1997, wildlife conservation has first priority in refuge management; public uses are allowed and encouraged as long as they are appropriate and compatible with or do not detract from this priority mission and the purposes for which the refuge was established. Wildlife-dependent recreational uses (namely, hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation), assuming they are judged to be compatible, are considered as legitimate, appropriate and priority uses of the National Wildlife Refuge System. Other recreation uses, namely, walking, hiking, biking, canoeing, and camping have been determined not to materially interfere with or detract from the purposes of the refuge or the mission of the National Wildlife Refuge System.

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Compliance Requirements

There are many federal, state, and local laws and regulations affecting refuge management and development. Listed below are the key permits, approvals, and consultations needed to implement the preferred alternative and the step-down management plans on A.R.M. Loxahatchee National Wildlife Refuge.

National Wildlife Refuge System Improvement Act of 1997.

National Wildlife Refuge System Administration Act of 1966, as amended.
Refuge Recreation Act of 1962, as amended.

Omnibus Parks and Public Lands Management Act of 1966.

Management and General Public Use of the National Wildlife Refuge System (Executive Order 12996).

Endangered Species Act of 1973, as amended.

Floodplain Management (Executive Order 11988).

Section 404, Clean Water Act of 1974, as amended.

Protection of Wetlands (Executive Order 11990).

National Historic Preservation Act of 1966, as amended.

Protection of Historical, Archaeological, and Scientific Properties (Executive Order 11593).

Intergovernmental Review of Federal Programs (Executive Order 12372).

Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898).

Hazardous Substances Determinations (Secretarial Order 3127).

Key Legislation/Policies

Antiquities Act (1906): Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

American Indian Religious Freedom Act (1978): Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans With Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

Archaeological Resources Protection Act (1979) as amended: Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Archaeological and Historic Preservation Act (1974): Directs the preservation of historic and archaeological data in Federal construction projects.

Architectural Barriers Act (1968): Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977): Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Emergency Wetlands Resources Act (1986): The purpose of the Act is “To promote the conservation of migratory waterfowl and to offset or prevent the serious loss of wetlands by the acquisition of wetlands and other essential habitat, and for other purposes.”

Endangered Species Act (1973): Requires all Federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order 1312 Invasive species (1999): This order seeks to prevent the introduction of invasive species, provides for their control, and minimizes the economic, ecological, and human health impacts that are caused by invasive species.

Executive Order 13007 Indian Sacred Sites (1996): Directs Federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996): Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 11988 (1977): Each Federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Federal Noxious Weed Act (1990): Requires the use of integrated management systems to control or contain undesirable plant species; and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Fish and Wildlife Act (1956): Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act (1934); (amended in 1946, amended in 1958): Allows the Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Land and Water Conservation Fund Act (1965): Uses the receipts from the sale of surplus Federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

Migratory Bird Conservation Act (1929): Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934): Authorized the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918): Designates the protection of migratory birds as a Federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. (Refuge Administration Act): Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Environmental Policy Act (1969): Requires the disclosure of the environmental impacts of any major Federal action significantly affecting the quality of the human environment.

National Historic Preservation Act (1966) as amended: Establishes as policy that the Federal Government is to provide leadership in the preservation of the nation's prehistoric and historic resources.

Native American Graves Protection and Repatriation Act (1990): Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act (1962): Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Rehabilitation Act (1973): Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal government to ensure that anybody can participate in any program.

Summary: Public Scoping Meeting

A public scoping meeting was held August 17, 1998 concerning the future management of the A.R.M. Loxahatchee National Wildlife Refuge. The meeting began with brief presentations on the refuge mission and vision and the planning steps required to develop the current Comprehensive Conservation Plan and Environmental Assessment. After the presentations, approximately sixty meeting participants formed nine self-selected groups to discuss issues, concerns, and opportunities. Each comment was recorded in the participant's words on flip charts by volunteer recorders who were trained by the meeting facilitator. The meeting ended with a representative presenting the major themes that were generated by their group. All of the group comments were combined into the summary presented below.

A. General Refuge Management

The management of the wildlife habitat should take priority over the public use of the refuge.

Open the refuge to the public for as many hours as possible.

Continue to manage the refuge, ensuring refuge uses maintain a pristine low-impact environment.

The Refuge Manager needs to give priority attention to flood control and water supply needs of adjacent agriculture and urban areas.

Do not renew the A.R.M. Loxahatchee National Wildlife Refuge's contract with the South Florida Water Management District.

The land on which the refuge is located should be managed by the Water Management District as Conservation Area Number One.

B. Wildlife Habitat Management

Manage species and habitats to enhance the biodiversity of the largest remaining part of the northern Everglades.

Reduce and/or eliminate exotic species (e.g., melaleuca, Brazilian pepper, water hyacinth, feral hogs, cattails, and eels) from the refuge.

Protect, manage and restore the habitats of the fish and other aquatic species by appropriately managing the water quality, quantities and schedules.

C. Public Use Management

Hunting Opportunities and Management

Enhance opportunities to hunt waterfowl.

Provide permit applications to begin in early October.

Allow hunting at sunrise and sunset.

Allow frogs to be hunted during the day and at night.

Fishing Opportunities and Management

Allow fishing in the south.

Improve bank fishing at headquarters.

Allow nighttime fishing.

Birdwatching, Hiking, Camping and Other Opportunities

Provide more birdwatching opportunities.
Provide more hiking opportunities.
Allow limited overnight camping.
Allow opportunities for stargazing.

Horseback and Mountain Biking Opportunities

Allow horseback riding on levees.
Allow mountain biking on levees.

Canoeing Opportunities and Management

Enhance canoeing by increasing access.
Improve maintenance of the canoe trails including the removal of exotics.

Airboat Opportunities

Provide recreational airboat access to more of the refuge.
Provide public airboat tours.
Consider private airboat tours.

Management at Hillsboro Recreation Area

Reduce the access charge at Lee road and Hillsboro Recreational Area.
Provide adequate boat ramps, build a boat dock, and provide public telephones.
Tear down the store.
Provide law enforcement on the water as well as on land areas at Hillsboro Recreation Area.

D. Environmental Education and Interpretation

Enhance the current environmental education program by increasing the amount of events that target population niches such as: children and their families, schools, senior citizens, youth camps, and adult education classes.
Provide more interpreters on the marsh trail.
Provide more wildlife art exhibits.
Conduct summer activities and more special events such as a native species zoo.
Provide more printed interpretive information on the marsh native trail and the cypress boardwalk.
Provide more tours for the general public, elementary and secondary school population, and youth service organizations such as scouting groups.
Increase staff (all classifications) and volunteers to provide more educational programs.

E. Partnerships and Communications

Form a local Friends of the National Wildlife Refuge chapter.
Coordinate planning with other natural resource agencies in Palm Beach County for ecosystem management.
Prepare a joint stewardship report with the Fish and Wildlife Service, Florida Fish and Wildlife Conservation Commission, and the South Florida Water Management District.
Create connections between the refuge and hotels, tourist council, recreational sport organizations, and business.
Work with your excellent group of volunteers to raise funds.
Engage in ongoing talks between the Refuge Manager and recreational user groups

Comment Packet and Sheet

Future Management of A.R.M. Loxahatchee National Wildlife Refuge

The U.S. Fish and Wildlife Service is beginning to develop a comprehensive conservation plan for A.R.M. Loxahatchee National Wildlife Refuge that will guide its future direction. We would like to know the issues and concerns about the refuge that are important to you.

To provide you with information about the refuge and the planning process, the Comment Packet is divided into three sections: Background Information, Comment Sheet, and Mailing Request Form. If you would like to give us your ideas, please complete the Comment Sheet. If you also wish to be on our mailing list for further information, please complete the Mailing Request Form. You may return some or all of the sections to the refuge mailing address found inside or outside the Packet.

Background Information

National Wildlife Refuge System

The U.S. Fish and Wildlife Service is the principal Federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife and its habitat. As a part of its major responsibility for migratory birds and fish, endangered species, and certain marine mammals, the Service manages the National Wildlife Refuge System. The System began in 1903 when President Theodore Roosevelt designated Pelican Island, a pelican and heron rookery in Florida, as a bird sanctuary.

The System, now consisting of over 520 refuges, is a “network of lands and waters managed for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (Refuge Improvement Act of 1997). In the management of the System:

- Wildlife has first priority.
- Recreation uses are allowed as long as they are appropriate, wildlife-dependent and compatible with wildlife conservation.
- Wildlife-dependent recreational activities will be emphasized.

Refuge Environment. Established in 1951, Loxahatchee National Wildlife Refuge encompasses 221 square miles of the remaining northern Everglades. Sawgrass marshes, wet prairies, sloughs, and tree islands compose over 90 percent of the area's unique wetlands. The Refuge provides habitat for the snail kite, American alligator, neotropical birds, wading birds, and numerous other threatened and endangered species. The vision for this refuge is:

To serve as an outstanding showcase for ecosystem management that restores, protects, and enhances a portion of the unique northern Everglades biological community. This public asset provides for the enjoyment and enhanced quality of life for future generations.

The Refuge's diversity of wildlife species, coupled with the visitor center, provides opportunities for hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Over 116,000 people visit the refuge each year.

Comprehensive Planning

The Fish and Wildlife Service is beginning to develop a plan to guide the future direction of the refuge over the next 15 years. A planning team, consisting of persons from government agencies and state universities, has been assembled to: gather information about the refuge environment; identify problems affecting the refuge; evaluate the impacts of various management alternatives, and recommend a plan of action to the Fish and Wildlife Service.

In keeping with the National Environmental Policy Act (NEPA), the Fish and Wildlife Service will look at, and seriously consider, all reasonable alternatives in the development of the plan. The planning team will actively seek public input in the preparation of the comprehensive plan. To carry out the project, the Fish and Wildlife Service has begun a six-step planning process:

- Step 1. Gather information on the refuge environment
- Step 2. Hold a public meeting to identify issues and concerns
- Step 3. Identify management alternatives, and evaluate their effects
- Step 4. Prepare and release a draft comprehensive plan and environmental assessment
- Step 5. Hold a public meeting on the draft plan and environmental assessment
- Step 6. Prepare a final comprehensive plan

Involvement Opportunities

The U. S. Fish and Wildlife Service is looking for your ideas concerning its future direction. Please give us your ideas at a public meeting on August 17, 1998 at 7:00 p.m. at the Boynton Beach Civic Center. The Center is located at 128 East Ocean Avenue. This meeting will give you an opportunity to:

- Learn more about the refuge
- Express ideas about issues, concerns, and needed management programs
- Share your vision for the refuge.

This packet will be given to everyone who attends the public meeting. If you cannot attend the public meeting, please complete the comment sheet and mail it to: Loxahatchee National Wildlife Refuge, U.S. Fish and Wildlife Service, 10216 Lee Road, Boynton Beach, FL 33437-4796.

The packet provides:

- background information on the refuge, the refuge system, and the planning process
- a way to share your concerns, ideas, and thoughts on refuge management
- an effective way to make certain your thoughts will be taken into consideration

The comment sheet should be returned to the refuge no later than *September 18, 1998*.

Loxahatchee National Wildlife Refuge
Comment Sheet

1. What do you VALUE most about the Refuge?

2. What are your major CONCERNS about: the Refuge, current refuge management, or its future direction?

3. Listed below are some of the issues concerning the future management of the Refuge.

In developing the new plan, how important are these issues to you? For each issue, circle the number that best reflects its importance.

<i>Issues</i>	<i>Not Important</i>	<i>Important</i>	<i>Very Important</i>	<i>Don't Know/ No Opinion</i>
Protecting wildlife habitat	1	2	3	0
Increasing law enforcement to prevent poaching, vandalism	1	2	3	0
Making the Refuge more accessible to the public	1	2	3	0
Protecting threatened and endangered wildlife	1	2	3	0
Providing opportunities for wildlife viewing or hiking	1	2	3	0
Addressing urban development around the Refuge	1	2	3	0
Conserving native plants and animals	1	2	3	0
Providing more recreational opportunities	1	2	3	0
Addressing agricultural production near the Refuge	1	2	3	0
Protecting the whole biological system	1	2	3	0
Managing specific wildlife for hunting or fishing	1	2	3	0
Working closer with neighboring land owners and business	1	2	3	0
Controlling the spread of exotic or invasive plants	1	2	3	0
Protecting water quality	1	2	3	0
Educating the public about wildlife, & cultural resources	1	2	3	0
Limiting public access if needed to protect wildlife	1	2	3	0

4. Are there other issues of concern to you? (Please identify as many as come to mind)

5. Have you ever visited the Refuge? Yes No

6. Listed below are some of the recreational activities occurring on the Refuge. Please check which activities, if any, you would like to do.

- | | | |
|---|--|----------------------------------|
| <input type="checkbox"/> Wildlife Observation | <input type="checkbox"/> Photography or Painting | <input type="checkbox"/> Hunting |
| <input type="checkbox"/> Canoeing/kayaking | <input type="checkbox"/> Running/Jogging | <input type="checkbox"/> Hiking |
| <input type="checkbox"/> Boating | <input type="checkbox"/> Fishing | |
| <input type="checkbox"/> Interpretation/Environmental Education | | |

7. What other activities, if any, would you like to do at the Refuge?

8. What activities, if any, should not be allowed at the Refuge?

9. Where do you reside most of the year? City/Town _____ State _____

10. Are you attending the public meeting as member of an organization? __Yes __No
If yes, what is its name? _____

11. Where did you obtain the Comment Sheet? _____

Thank you very much for your comments!

Please place this sheet in the Comment Box at the public meeting or mail it to: Loxahatchee National Wildlife Refuge, U.S. Fish and Wildlife Service, 10216 Lee Road, Boynton Beach, FL. 33437-4797. Your comments are needed by September 18, 1998.

Mailing Request Form

To place your name and address on our mailing list, we must have your written permission. The reason for this is that federal government mailing lists must be released to the public upon request. If you wish to receive future information about the Loxahatchee National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, please complete the information below and return the form to:

Return to: A.R.M. Loxahatchee National Wildlife Refuge
 U.S. Fish and Wildlife Service
 10216 Lee Road
 Boynton Beach, FL 33437-4796

Yes, I wish to be on the mailing list to receive future information about the refuge comprehensive plan. I understand that the names and addresses on federal government mailing lists must be released to the public upon request, under the provisions of the Freedom of Information Act of 1974.

Signature: _____ Date: _____

First Name: _____ Last Name: _____

Mailing Address: _____

City _____ State: _____ Zip Code: _____

If you are acting in an official capacity as the representative of an organization, please complete the following two items:

Organization: _____

Title: _____

Note: After you have completed the Comment Sheet and/or Mail Request Form simply fold it in half (with the return mailer on the outside), and tape together. Attach the proper postage and drop it in the mail. Your Comment Sheet must be received by September 18,1998. Thank you for your help!

Summary: Comment Sheets

Early on in the process of developing the Conservation Plan, the planning team requested input from the public regarding the future direction of the refuge. The following explains how the information was gathered and analyzed.

A. Written Comments

Two types of comment sheets were used. A simple, open sheet requesting ideas was developed early in the process while a more complex comment packet was developed by staff members and planning team members from the University of Florida. Comment sheets or packets could be picked up from the refuge headquarters, the visitor center or from law enforcement officers. Comment packets were also sent out with each telephone and mail request. Individual letters were encouraged. The comment period was over three months long to allow as many people as possible to contribute and to insure the public had adequate time to respond.

B. Analysis of Open Comment Sheets and Complex Comment Packets

The two types of comment sheets and letters were analyzed for content. For statistical analysis, each question was examined as well as responses within each question (if they were multiple). Some respondents did not answer every question, and others gave numerous answers to a single question. Issues and concerns that were received in the open comment sheets and letters were integrated into the analysis. Each issue was counted and analyzed separately. The number of responses to a particular question is listed as 'N'. Please note; the value of 'N' changes with each question because individuals listed issues and concerns or answered questions in multiple ways.

The number of responses to questions ranged from 47 to 795. One hundred and ninety comment sheets and 26 letters/postcards were received for a total of 216.

Question 1. What do you value most about the refuge?

<i>Topics</i>	<i>N</i>	<i>Percentage</i>
Wildlife Protection/Observation	133	49.63%
Beauty/Solitude	51	19.03%
Hunt/Fish	8	2.99
Public Access	37	13.80
Everglades Ecosystem	26	9.70
Education	5	1.87
Administration	4	1.49
Other	4	1.49
Total	268	100.00%

All complex comment packets, open sheets, and letters that stated refuge values were used in the analysis of this question. Each value was counted separately, thus, the large N total.

Question 2. What are your major concerns about: the refuge, current refuge management, or its future direction?

Question 4. Are there other issues of concern to you?

Appendix I - Summary: Comment Sheets

<i>Topics</i>	<i>N</i>	<i>Percentage</i>
Protection of Ecosystem/Wildlife	97	19.96%
Limit Access	48	9.88%
Increase Access	25	5.14
Development	46	9.47
Management of Habitat	33	6.79
Management/Ownership	58	11.93
Water Issues	21	4.32
Hunting/Fishing	31	6.38
Motorized Vehicles	39	8.02
Maintenance	33	6.79
Exotics/Pollution	34	7.00
Other	21	4.32
Total	486	100.00%

All complex comment packet sheets, open comment sheets and letters with concerns were analyzed for question two. Only complex comment packet sheets were used in question four as any other concern from letters and open comment sheets were already used in question two. Question two and four were analyzed together as the questions were very similar in meaning. Each concern was counted separately.

Question 3. Listed below are some of the issues concerning the future management of the refuge. In developing the new plan, how important are these issues to you? For each issue, circle the number that best reflects its importance.

<i>Issues</i>	<i>N</i>	<i>Not Important</i>	<i>Important</i>	<i>Very Important</i>	<i>Don't Know/ No Opinion</i>
Protecting wildlife habitat	155	0.65%	7.10%	92.26%	0%
Increasing law enforcement to prevent poaching, vandalism	153	8.50%	28.76%	54.90%	7.84%
Making the refuge more accessible to the public	151	43.71%	30.46%	24.50%	1.32%
Protecting threatened and endangered wildlife	152	1.32%	11.18%	87.50%	0%
Providing opportunities for wildlife viewing or hiking	152	15.13%	49.34%	34.87%	0.66%
Addressing urban development around the refuge	150	4.00%	18.00%	77.33%	0.67%
Conserving native plants and animals	153	1.96%	13.07%	84.97%	0%
Providing more recreational opportunities	154	62.99%	22.08%	14.94%	0%
Addressing agricultural production near the refuge	150	4.67%	39.33%	54.67%	1.33%
Protecting the whole biological system	151	0.66%	12.58%	86.75%	0%
Managing specific wildlife for hunting and fishing	151	53.64%	20.53%	23.18%	2.65%
Working closer with neighboring land owners and business	147	9.52%	53.74%	31.97%	4.76%
Controlling the spread of exotic or invasive plants	153	1.96%	18.95%	79.08%	0%
Protecting water quality	153	1.31%	10.46%	88.24%	0%
Educating the public about wildlife, & cultural resources	154	3.90%	44.16%	51.95%	0%
Limiting public access if needed to protect wildlife	149	6.71%	23.49%	69.13%	0.67%