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### Restoring the Biological Integrity of Everglades National Park

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RESTORING THE BIOLOGICAL INTEGRITY  
OF EVERGLADES NATIONAL PARK

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EXTERNAL DEVELOPMENT AFFECTING  
THE NATIONAL PARKS

A case study presented at a national parks  
conference sponsored by the  
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## I. INTRODUCTION

### A. Summary

Everglades National Park is the southern portion of a 9,000 square mile ecological system known as the Kissimmee River-Lake Okeechobee-Everglades System. The park's estuarine waters, freshwater sawgrass prairies and hardwood swamps depend on overland sheet flow of water from areas to the north and outside its boundaries. Wetlands drainage, water impoundment and diversion and channelization associated with private agricultural and urban development and public flood control, water supply, navigation and highways for over a hundred years have drastically altered the hydrology of the entire system and decreased the biological productivity of the park.

In August 1983, Florida's Governor Bob Graham initiated the Save Our Everglades program with the goal that by the year 2000 the Everglades will look and function more like it did in 1900 than it does today. A major component of this program is the restoration of Everglades National Park. Under the

program, large scale land acquisition and wetlands restoration around the park and alterations of the water management system in South Florida is reason to believe biological integrity of the park has and will continue to improve. The program's success is due to strong public interest and excellent support and assistance of the Everglades Coalition (20 national conservation organizations and state conservation organizations).

#### B. Selected References

Nelson M. Blake, Land Into Water-Water Into Land (1980)

Miami Geological Society, Environments of South Florida Present and Past II (1984)(pp. 15-87)

U. S. Army Corps of Engineers, Final Feasibility Report, Golden Gate Estates, Collier County, Florida (May 1986)

Florida Governor's Office - Report of the Everglades Wildlife Management Committee (August, 1983)

Florida Governor's Office, Save Our Everglades - Issue Paper (August 9, 1983)

Florida Governor's Office, I-75 Construction/Big Cypress Acquisition (June 10, 1985)

Florida Governor's Office, Kissimmee River (November 1, 1985)

Florida Governor's Office, Fakahatchee Strand (November 1, 1985)

Florida Governor's Office, Third Annual Report Card - Save Our Everglades (August 22, 1986)

## II. THE PARK AND HOW IT FUNCTIONS

### A. Characteristics

1. Size - 1.4 million acres
2. Location - southern end of peninsula Florida in Dade, Monroe and Collier Counties including Florida Bay and Ten Thousand Islands.

3. Establishment - Established 1947 by state and private land donations and a state appropriation of \$2 million to be permanently preserved as a wilderness.

4. Noteworthy Facts

a. Only subtropical park in national park system.

b. One of eight areas in world designated as biosphere reserve and world heritage site.

c. Second largest national park in continental United States.

5. Physical Characteristics - Dominated by and dependent on water. Contains coastal estuarine water, mangrove coastal forests, hardwood hammocks, pinelands and freshwater sawgrass marshes and sloughs.

6. Notable bird and animal species - Great white heron, reddish egret, osprey, brown pelican, southern bald eagle, Florida sandhill crane, Everglades kite, peregrine falcon, woodstork, Florida panther, manatee, Everglades mink, green sea turtle, loggerhead turtle, crocodile, alligator and tree snails.

7. Values

- a. It is an integral part of South Florida's hydrological and ecological system.
- b. Biological diversity and productivity is unexcelled in the U.S. - contains more endangered species than any other park in the National Park System.
- c. Recreational Opportunities - Exceptional fresh and saltwater fishing, boating, hiking, bird watching.
- d. Over 500,000 visitors per year - some years exceeding 1 million with large foreign visiting populations.

### III. DRAINAGE AND DEVELOPMENT OF THE EVERGLADES SYSTEM - DEGRADATION OF THE PARK

A. Historical water supplies to park were 50% from local rainfall and 50% from overland flow from Everglades and Big Cypress Swamp to the north.

1. Park ecology is keyed to seasonal rainfall and fluctuations in water flow - summer rainy season and winter dry season.
  
2. Alterations to the entire Kissimmee River-Lake Okeechobee-Everglades System affected amount and timing of water flows entering the park. Historically water flowed overland and through natural streams from near Orlando, through the Kissimmee River floodplain, into Lake Okeechobee. During summer high water periods the lake would overflow its southern banks into the Everglades. Water flowed south through the Everglades at a rate of about one foot per day into Florida Bay and the Ten Thousand Islands area.

B. South Florida was still unexplored in the early 1800's and considered an uninhabitable archipelago.

C. Private and public efforts to drain the Everglades predate statehood (1845). Florida's first legislature petitioned Congress to send the Army Corps of Engineers to drain the Everglades so it could be converted to agricultural land.

1. The first successful effort at drainage was by Hamilton Disston, a Philadelphia industrialist, bought 4,000,000 acres of state land at \$.25 an acre and was promised half of all the land he could drain. He channelized the Caloosahatchee River in an attempt to drain Lake Okeechobee and connected the lakes in the Upper Kissimmee Basin. Disston pursued agricultural and urban development.

2. Everglades drainage by the state began in 1909. The Everglades Drainage District dug major drainage canals from Lake Okeechobee to the ocean (Miami, St. Lucie, North New River, South New

River and Hillsborough) that are the backbone to today's water management system. Lake Okeechobee was diked.

3. Following a 1928 hurricane that washed down the muck dike around the southern end of Lake Okeechobee killing 2400 people, the Army Corps of Engineers joined Florida's drainage (flood control) efforts. Between 1930 and 1938 a dike 85 miles long and 30 feet high was built around the lake.

4. Hurricanes and flooding in 1947 prompted federal legislation authorizing the Corps of Engineers to participate with Florida in construction of the Central and Southern Florida Project which today controls water in all of South Florida and the park.

#### D. The Central and Southern Florida Project

1. The purpose is to provide flood control and water supply.

## 2. Characteristics

- a. Kissimmee Canal (C-38) is 48 miles long 300 feet wide and 20 feet deep with 5 locks.
- b. Lake Okeechobee is completely controlled by levees, canals and water structures.
- c. Over 600,000 acres of Everglades muck south of Lake Okeechobee is in agriculture (mostly sugar cane) and protected.
- d. Over 1,000 miles of canals and levees lace South Florida providing flood control, navigation and water supply. Almost every river and stream in southeast South Florida has been channelized.
- e. Three state owned or controlled water conservation areas totalling 861,000 acres provide water supply, flood control and recreation benefits to urban southeast Florida.

The water conservation areas (Everglades) are completely diked and controlled by a Corps of Engineers regulation schedule. Water released from the water conservation areas through four water control structures on Tamiami Trail (U.S. 41) supply all external water for the eastern portion of Everglades National Park. During periods of prolonged rainfall and high water, excess water is released from the water conservation areas into Everglades National Park regardless of the natural cycles; this can be very destructive to nesting and brooding birds and alligators.

#### E. Private drainage and development

1. The Everglades Agricultural Area removed over 600,000 acres of Everglades. To protect crops, most excess water is pumped into the water conservation areas sometimes resulting in excesses in these areas.

2. Immediately north of the park and Tamiami Trail (U.S. 41) on the western side came massive residential developments. In the 1960's Gulf American Corporation divided a 60,000 acres area in the Fakahatchee Strand and Big Cypress Swamp into 2.5 and 5 acre unimproved parcels, and sold the lots in its unsuccessful Remuda Ranch venture. Gulf American merged with General Acceptance Corporation (GAC) and initiated Golden Gate Estates adjacent to and west of Remuda Ranch. Golden Gate Estates was 111,000 acres subdivided into 1.25, 2.5 and 5 acre lots and sold to over 50,000 individuals worldwide. Some 183 miles of flood control canals were dug and 813 miles of roads were built. Golden Gate Estates failed, but the effect of the canals has been drastic. Water levels were lowered over two feet and seasonal flooding greatly reduced. It is documented that the estuaries of the Ten Thousand Islands in the park have been seriously degraded by the large influxes of fresh water from the Faka Union Canal.

3. East Everglades - In the 1960's the sawgrass marshes of the East Everglades west of Homestead were sold in small parcels. An 8.5 square mile area of Northeast Shark River Slough, the major flow-way into the eastern portion of the park, is now developed into 200-300 home sites. About 10,000 acres of the East Everglades are in agriculture. Another 60,000 acres are undeveloped but owned in small parcels by about 5,000 individuals around the world.

4. Aerojet General - In the early 1960's, Aerojet General purchased 70,000 acres in the lower East Everglades, and under a NASA contract developed and tested space shuttle booster rockets. To move rocket parts to the assembly site, a canal (C-111) was dug from Biscayne Bay. The canal interrupted water flow into the park and caused salinity and ecological changes in Florida Bay. Subsequent to deactivating the rocket plant, Aerojet General sold all but about 12,000 acres of its holdings to the state. It now leases about 5,000 acres adjacent to the park in the Taylor Slough watershed for agricultural

production, creating water flow and chemical pollution conflicts with the park. Aerojet now proposes to NASA to reactivate the plant for construction of solid (no-joint) rocket motors for the space shuttle. It also proposes to swap nearly 6,000 acres of non-agricultural land to the federal government for public land in Nevada.

5. Jetport -- In 1967 the Dade County Port Authority approved a plan to construct the worlds biggest airport in the Big Cypress Swamp within five miles of the park. The jetport was to cover 38 square miles and spawn a hugh urban area. Projections were that a jet would land every 30 seconds. A state and nationwide environmental outcry lead to the formation of an Everglades coalition to oppose the project. The jetport died in 1970 with the signing of the Jetport Pact by Florida, the U.S. Department of Interior and Transportation and the Dade County Port Authority. Two runways constructed before the opposition got organized were used to train pilots until the late 1970's and then abandoned.

The jetport controversy was the major impetus for the establishment of the 574,522 acre Big Cypress National Preserve by the Department of Interior and the State of Florida in 1974.

#### IV. SAVING THE EVERGLADES AND RESTORING THE PARK

A. On August 9, 1983, Governor Bob Graham announced the Save Our Everglades program with a goal that by the year 2000 the Everglades will be more like it was in 1900 than it is today. Components of the program are:

1. Re-establish the Values of the Kissimmee River

a. Problem - Channelization by the Corps of Engineers and Florida in the 1960's converted a 98 mile long meandering river with a 1-2 mile wide flood plain into a 48 mile long by 300 foot wide by 20 foot deep canal with 5 navigational locks. The project directly drained 40,000 acres of marsh, and lead to the loss of another 100,000 acres. Water flows 11 times faster into Lake Okeechobee. Waterfowl populations

declined by 90% and 6 fish species were lost from the river. Restoration will require Corps and likely Congressional approval. The Corps holds that restoration is not eligible for federal assistance because there is no net national economic benefit.

b. Solution - Since a major river channelized as a public works project has never been restored, the state is developing a phased approach. Phase one will be used to design phase two, etc. until the program is complete. Ultimate plans are to partially backfill the channel and reflood the old oxbows along two-thirds of the river. Federal assistance will be sought.

c. Progress - Phase one construction is complete. The main features are three sheet pile weirs across the channel to divert water back into the old oxbows along a 12 mile stretch of the river. The weirs along with the elevation in water levels in the

river have caused a reflooding of the oxbows and old floodplains for the first time since channelization.

## 2. Protect Lake Okeechobee

a. Problem - This 730 square mile lake, an integral part of the water supply system for 4 million people in southeast Florida, is in jeopardy. For over 30 years it has been the discharge point for phosphorous and nitrogen rich runoff water from the agricultural area (sugar) to the south and the dairy and cattle industries to the north. Nutrients have doubled in the last 10 years and the viability of the lake is threatened. This past August about one third of the lake bloomed with bluegreen algae, the largest algae bloom ever. Some people predict doom for the lake.

b. Solution - In August 1985. Governor Graham directed the Florida Department of Environmental Regulation to do an intense

study of the lake. A technical committee of experts was formed and produced a report with numerous recommendations to clean up the lake. Recommendations include ceasing pumping of nutrient rich water into the lake from the agricultural area to the south, control of nutrients from the dairy and cattle farms to the north and diverting away from the lake, Taylor Creek and Nubbin Slough, the major source of dairy pollution. On August 23, the Governor issued an executive order directing individual state agencies to clean up the lake. He also initiated aquatic weed removal as a means of nutrient removal.

- c. Progress - Cleaning up a top state priority. Aquatic weed removal is underway, and intensive work has started to implement numerous parts of the clean-up plan.

### 3. Restore the Holey Land and Rotenberger Tracts.

- a. Problem - A 100 square mile area of former Everglades adjacent to the water conservation areas has been drained

incidental to general drainage in the Everglades agricultural area. This land has been neglected, burned and is overgrown with upland vegetation. The state owns 75% of the land, but the other 25% is divided into hundreds of small parcels. The Seminole Indian Tribe owns 3800 acres of the area.

b. Solution - The state is in the process of acquiring all privately owned land in the area. Discussions have begun with the Seminoles. The state has a plan for restoration of natural water levels on this land.

c. Progress - Construction of dikes along the eastern portion is underway. The 35,300 acre eastern tract (Holey Land) is planned for completion in 1988.

4. Manage deer in the Everglades so that they can survive high water levels.

- a. Problem - In the Summer of 1982 a deer herd of about 6,000 suffered high mortality due to extremely high water (2-3 feet deep) in the water conservation areas. During high water, food supplies are reduced and the deer starve. About half the herd was lost and the public became alarmed.
  
- b. Solution - The Governor asked the Florida Game and Fresh Water Fish Commission to manage the deer herd at a (lower) level that can withstand high water. He also directed that water management practices be improved for the benefit of wildlife.
  
- c. Progress - Since 1982 the deer herd has been maintained at about 2500-3000. No water related mortalities have occurred since 1982, although water levels were extremely high in June and July 1986.

5. Include Environmental Improvements in Converting Alligator Alley to Interstate 75.

- a. Problem - Alligator Alley traverses the Everglades causing over drainage in some parts of Water Conservation Area 3 and impoundment in other parts. The road is a serious threat to the endangered Florida panther as it crosses the Big Cypress Swamp and Fakahatchee Strand in Collier County. Four panthers have been killed on the Alley since 1983.
- b. Solution - Plans for I-75 include three additional bridges and numerous culverts, water spreader systems and plugs in roadside canals to alleviate hydrological problems and recreate natural flow through the Everglades. Thirty-six panther and animal underpasses and ten foot roadside fences will be constructed in the Big Cypress Swamp and Fakahatchee Strand. Over \$12 million worth of animal protection measures will be installed with the state paying \$10.5 million of the total. The project offers a unique opportunity to acquire a 128,000 acre addition to the Big Cypress National

Preserve at half the cost of the land. Severance damage payments to adjacent property owners will effectively reduce the value of the property by half. Federal legislation is necessary to expand the Preserve. The proposed addition to the preserve is an integral part of the Big Cypress hydrological system that supplies 50% of Everglades National Park's external water through overland flow. It is also the habitat of the panther and several other endangered species.

- c. Progress - Construction on I-75 in the eastern portion began in July 1986. In January 1986 legislation to add 128,000 acres to the Big Cypress National Preserve was introduced by Senator Lawton Chiles (S.2029) and U. S. Representative Tom Lewis (HR 4090). HR 4090 passed the House on July 28, 1986. The State of Florida has set aside \$22.5 million to cover its 20% share of the purchase and make other purchases in the Everglades region.

## 6. Restore Everglades National Park

- a. Problem - Bird populations in the park have steadily declined and only about 10% of the 1934 population existed in 1983. Fish and crustacean populations have declined, salinity changes have occurred in the estuaries and exotic species have invaded. These problems are a result of hydrological alternations caused by activities outside the park. The Golden Gate Estates Canal System, the Central and Southern Florida Project and development, agriculture and the Aerojet Canal (C-111) in the East Everglades are the major causes of these problems.
  
- b. Solution - More natural amounts and timing of water flow are needed. This can be achieved by acquiring large buffer tracts around the park, restoring natural flows in the East Everglades and Golden Gate Estates and improving the functioning of the Central and South Florida Project (the public water management system).

c. Progress - Since 1983, the Corps of Engineers has breached a levee allowing water to flow more naturally from the water conservation areas into the Big Cypress National Preserve and subsequently overland into the park. The Corps also plugged a canal adjacent to the park to force water from the canal and into the marshes of Shark River Slough. The South Florida Water Management has redesigned the water delivery plan for the park so that most of the time water is released into the park from the water conservation areas in proportion to rainfall in these areas. Public Law 98-181 of December 1983 provides for experimental water deliveries to the park over private land in northeast Shark River Slough in the East Everglades. This program effectively doubles the area over which water flows into the eastern portion of the park.

The state has purchased 55,000 acres in Shark River Slough and Taylor Slough which

flow into the park and plans to acquire over 70,000 additional acres in Shark River Slough. The state has also attempted to purchase most of the remaining 13,000 acres of Aerojet property in the East Everglades. The state and Corps have plans to correct hydrological problems caused by the Aerojet Canal (C-111). The state plans to purchase 86,000 acres in Golden Gate Estates and the Fakahatchee Strand and restore natural hydrology on 30,000 acres which drain into the Ten Thousand Islands area of the park. Since 1984 conditions in the park have improved -- increased ibis, woodstork and heron feeding; increased numbers of snook and Florida Bay and expansion of marine grass beds in Whitewater and Hell's Bays.

7. Protect the Florida Panther from Extinction

- a. Problem - Less than 50 Florida panthers exist, all in the Fakahatchee Strand, Big Cypress Swamp and Everglades National Park. Habitat loss and highway mortality are the

major threats. Twelve of twenty known deaths have been by automobiles. Continued habitat loss poses perplexing problems.

- b. Solution -- Acquisition of habitat, highway improvements, land, water and wildlife regulations. Scientific research and captive breeding offers hope. The state plans to purchase 86,000 acres of panther habitat in the Fakahatchee Strand and Golden Gate Estates; the U. S. Fish and Wildlife Service plans to purchase a 30,000 acre national wildlife refuge in the Fakahatchee Strand; and federal legislation (S.2029) and (HR 4090) purposes to purchase 134,000 acres as an addition to the Big Cypress National Preserve. State and federal environmental regulations offer some protection to panther habitat, but these regulations are not totally effective in protecting wildlife. The Florida Game and Fresh Water Fish Commission has an extensive radio tracking program for panthers. This program was used to determine proper locations for the

panther and animal underpasses planned for I-75. The regulation of deer and wild hog hunting by the Commission is also important to maintaining an adequate food supply for the panther.

c. Progress - Since 1983 the state has purchased 9,755 acres in the Fakahatchee Strand. The Department of Interior has acquired over 32,000 acres in the Big Cypress National Preserve; about 4,000 acres of private land remains to be acquired. The U.S. Fish and Wildlife Service has secured \$6.4 million for purchase of the 30,000 acre \$17 million refuge. Over the past three years the Florida Game and Fresh Water Fish Commission has spent \$250,000 annually on panther research. The National Park Service has budgeted \$400,000 over the next three years for panther research. The U.S. Fish and Wildlife Service, National Park Service, Florida Department of Natural Resources and Game and Fresh Water Fish Commission have formally joined in developing a panther

recovery plan. Panther warning signs, lowered speed zones and motorist alert strips are located on Alligator Alley, State Road 29 and Tamiami Trail (U.S. 41).

In July 1986 the Florida Game and Fresh Water Fish Commission entered into a contract to captive breed panthers on a 7,000 acre natural site in northeast Florida. Captively bred offspring will be raised and released in the wild.

## 8. Conclusion

- a. Florida has purchased 77,387 acres of land in the Everglades system since 1983 (under the Save Our Everglades program) and the federal government has purchased 32,209 acres. Florida plans to purchase 297,806 acres in this region and proposes that the federal government purchase 212,450 acres. The protection afforded by these extensive land purchases combined with the restoration of damaged systems and further improvements

to the public water management system in South Florida will improve and protect the integrity of Everglades National Park and the entire Kissimmee River-Lake Okeechobee-Everglades Ecological System.

- b. Achievement of this goal will require the long-term commitment of the Everglades Coalition, the public and public officials.