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december 2005



FLORIDA BAY

A Resource Assessment



National Parks Conservation Association®
Protecting Parks for Future Generations®

FLORIDA BAY AT A GLANCE

- Everglades National Park, which encompasses the southern tip of Florida and much of Florida Bay, has received international recognition for its superb resources that are important not only to United States citizens but to all the world's people: The park has been designated an International Biosphere Reserve, World Heritage Site, and Wetland of International Importance.
- The bay is home to the most significant breeding ground for wading birds in North America; provides habitats for a diverse collection of marine animals, including federally listed threatened and endangered species; and is part of the largest preserved mangrove system in the Western Hemisphere.
- Visitors from nearby communities, from around the country, and from all over the world take advantage of Florida Bay's opportunities to view wildlife, kayak, canoe, and experience solitude.
- Florida Bay is also a world-class destination for recreational anglers, and park waters support habitats and nurseries for fisheries (including spiny lobster and pink shrimp) that form the foundation of commercial fishing in the waters bordering Florida Bay.



Florida Bay offers a host of recreational opportunities, including kayaking, canoeing, and bird watching.

INTRODUCTION

At the southern tip of Florida is Everglades National Park, replete with flocks of wading birds as well as alligators and crocodiles—the only place in the world where these two species coexist. Varied habitats include labyrinthine mangrove forests, salt-tolerant coastal prairies, freshwater prairies and sloughs, hardwood hammocks, and pinelands. The park's 1.5 million acres (607,000 hectares) comprise the largest designated subtropical wilderness in North America and include much of Florida Bay, a marine lagoon that supports a host of recreationally and commercially important fishes as well as a number of federally listed threatened and endangered species.

Water is the lifeblood of Everglades National Park, and the park's dynamic story revolves around how water flows through the land, shapes the landscape, influences ecosystem functions, and drives plant and animal distributions. This story also reveals how water flow has been altered by human activities to the detriment of



park resources.

This report focuses on the condition of resources in the 444,790-acre (180,000-hectare) Florida Bay portion of Everglades National Park. The health of the bay and its resources largely depends upon water flow, so this report also addresses threats to the integrity of bay resources and ways that managers are working to protect these resources.

LAND USE HISTORY—WATER PROJECTS DRAMATICALLY ALTERED NATURAL ECOSYSTEMS

Before Everglades National Park was established in 1947, humans began to alter south Florida's environment to make it more suitable for agriculture, urban development, and resource exploitation. The most dramatic changes came as a result of major development and drainage projects that altered the hydrology of the entire region.

The ecological health of Florida Bay's natural resources is intimately tied to the hydrology of south Florida. Under natural conditions, a delicate balance of fresh and marine waters flowed through a complex series of shallow basins in the bay, creating a mosaic of salinity and nutrient conditions that in turn supported a wide array of marine life. Although the details of this hydrologic regime are not well understood, it is clear that the hydrologic balance of the bay has been significantly altered—particularly the amount, timing, and distribution of freshwater flows—by a series of extensive water drainage and diversion projects implemented in south Florida.

Beginning in the 1880s and continuing through the early 1970s, thousands and thousands of acres were drained, numerous canals and levees were con-

KEY FINDINGS

- The hydrologic balance of Florida Bay has been altered by a series of extensive water drainage and diversion projects implemented in south Florida beginning in the late 19th century. These projects altered the amount, quality, timing, and distribution of freshwater flows, leading to changes in bay ecosystem structure and function.
- The Everglades region, including Florida Bay, is the site of the largest restoration project yet conceived—the Comprehensive Everglades Restoration Plan (CERP). The overarching goal of CERP is to “get the water right” by restoring the natural hydrologic conditions of the region, while ensuring the continued economic and social development of south Florida. Successful completion of several key components of the restoration plan will provide direct benefits to Florida Bay resources.
- Numerous marine species migrate between Florida Bay and habitats outside Everglades National Park, so management policies must address the ecosystem as a whole. When part of the system is compromised by habitat damage or overfishing, migratory species suffer, including many species key to commercial and recreational enterprises.
- Evidence of seagrass damage caused by boat propellers is found throughout Florida Bay. By educating park users about safe navigation within the bay and showing boaters how to avoid shallow seagrass beds, the Park Service could reduce damage, but those education and outreach activities require funding. In addition to education, the Park Service must also improve navigation aids and channel markers.
- Estimates indicate that wading bird populations have declined 90 to 95 percent in south Florida, though not quite as precipitously in Florida Bay as in other areas, since major water drainage and diversion projects were begun more than 75 years ago.





Extensive water drainage and diversion projects undertaken in south Florida from the 1880s through the 1970s have transformed the landscape and dramatically altered natural water flows and ecosystem processes.

structed, and the Tamiami Trail was built to connect Tampa and Miami but in doing so bisected the Everglades. These projects transformed the landscape into compartmentalized and pooled regions. Water that once flowed slowly over the gently sloping landscape and into Florida Bay and surrounding waters now flows unnaturally through canals and other human-made channels, released in pulses that are out of sync with natural seasonal cycles.

Only half of the original Everglades or “River of Grass” wetland still exists today, and just one-fifth is protected within the park. More than 125 years of drainage and diversion projects have taken their toll on the Everglades and Florida Bay. The bay has experienced periods of increased salinity, loss of water clarity, massive seagrass and sponge mortality, phytoplankton blooms, reductions in wading bird populations, and diminished recreational fisheries.

Salinity within Florida Bay, which is

driven by variations in precipitation, evaporation, surface freshwater inputs, groundwater inputs, and Gulf of Mexico currents, can vary widely over time and space. Studies suggest that since the early 1900s, the bay’s salinity levels and their fluctuation have increased slightly as the bay has become more hydrologically isolated from both freshwater and marine influences. Human activities like groundwater withdrawal and the diversion of freshwater and marine water alter the normal flow of groundwater, freshwater, and marine water into Florida Bay, likely affecting salinity.

Plants and animals that live in the bay respond in different ways to changes in salinity. Some that are able to move might seek areas with more suitable salinities, while rooted plants and animals living on the bay floor might lose productivity or even die. Prolonged increases in salinity can change the structure of certain marine communities as salt-tolerant species replace those that prefer lower salt levels.

Seagrass communities, which cover much of the bay floor and are critical habitats for a variety of recreationally and commercially important marine species, provide one example: Salt-tolerant turtle grass (*Thalassia testudinum*) has replaced shoal grass (*Syringodium filiforme*) in some areas, resulting in seagrass communities that resemble monocultures rather than the mixed communities that result under lower salinity conditions. This change translates to a reduction in some recreationally and commercially important fish species in parts of Florida Bay. Restoring natural flows into Florida Bay could go far toward returning normal salinities and fluctuations, enabling the bay to support a more natural assemblage of plants and animals.

RESTORING AMERICA'S RIVER OF GRASS

Recognizing the need for a healthy ecosystem in the Everglades and Florida Bay, south Florida is embarking upon the world’s most ambitious restoration project. The Comprehensive Everglades Restoration Plan (CERP) will attempt to repair damage caused by decades of flood control, drainage, and diversion projects. The program’s main goal is to restore the ecosystem’s natural hydrology while ensuring continued economic and social development in south Florida. The U.S. Army Corps of Engineers and the South Florida Water Management District are leading this multi-agency restoration project, and preliminary work has already begun.

Specific CERP projects that will directly benefit Florida Bay resources include the C-111 spreader canal project and the Florida Bay/Florida Keys Feasibility Study. The C-111 spreader canal has multiple goals: rehydrate the coastal

wetlands between Everglades and Biscayne national parks known as the Model Lands; establish water flows that will sustain ecosystems in the Southern Glades and Model Lands; provide more natural water flows to Florida Bay by eliminating point sources of freshwater pulses to Manatee Bay and Barnes Sound; and maintain flood protection for agricultural and urban areas. The Florida Bay/Florida Keys Feasibility Study will evaluate connections between Florida Bay and the Everglades, Gulf of Mexico, and Florida Keys in order to determine how to restore water quality and natural conditions to the bay.

Other restoration projects that will affect Florida Bay are the Modified Water Deliveries and additional C-111 canal modification projects. Together, these projects will attempt to reestablish the historic pathway for water flow through the Everglades and into Florida Bay. The projects will modify the existing canal network system and other impediments to flow (such as the Tamiami Trail) to maintain more natural water levels, restore ecological integrity to the bay, and enhance an ecosystem

altered by almost a century of human activities.

Sound scientific research and resultant solutions are available to inform restoration projects. Restoration project managers are faced with the challenge of implementing such solutions while providing adequate flood protection and water supply to south Florida. NPCA believes that the best available science should be used to guide the restoration efforts so that maximum protection for park resources is achieved.

ECOSYSTEM-WIDE STRATEGIES ARE NEEDED TO CONSERVE RECREATIONALLY AND COMMERCIALLY IMPORTANT SPECIES

Florida Bay's diverse and complex series of shallow basins surrounded by mangroves and dominated by seagrass meadows create a multitude of important habitats for a variety of fishes and invertebrates and help the bay to maintain its mosaic of salinity and nutrient conditions. The close interplay of these communities creates a synergy where marine species can use these various habitats to fulfill different functions.

Some species migrate between mangroves and seagrasses on a daily basis to feed, while others spend parts of their lives in one habitat and then move to the other as they mature. For example, many of the fishes that reside within the boundaries of Everglades National Park do so only during their juvenile phases and leave the park for adult habitat and spawning sites.

Pink shrimp (*Penaeus duorarum*) begin their lives in the bay before moving to the Dry Tortugas, and juvenile spiny lobsters (*Panulirus argus*) live in the bay before moving across the Florida Keys to reside in the reef from Dry Tortugas to Pacific Reef, near Miami. Gray snapper (*Lutjanus griseus*) juveniles live in the bay, and adults migrate offshore to spawn. Research shows that gray snapper and some other migratory species are overfished, a fact that underscores the need to protect nursery habitat within the bay and manage the wider ecosystem of this species and others with similar migratory behaviors.

If all parts of Florida Bay and the adjacent marine ecosystems are not healthy and functioning properly in concert, then migratory species will suffer, leading to diminished recreationally and commercially important stocks. The economic effect on these fisheries will be negative, as will the impact on recreational activities that rely on a healthy Florida Bay. Some scientists who study marine fish advocate development of an integrated fishery management plan that addresses the ecosystems of Florida Bay, the Florida Keys coral reef, and the Dry Tortugas. Clearly it is becoming more important to coordinate partnerships among various state and federal management agencies, and some of that work has already begun.

Florida Bay is a world-class destination for recreational anglers.

EVERGLADES NATIONAL PARK



FUNDING CONSTRAINTS CREATE CHALLENGES FOR RESOURCE PROTECTION

One of the most significant factors affecting a park's ability to protect its resources is the funding Congress allocates to the National Park Service and individual parks. This funding is not sufficient: The National Park Service faces a \$600 million annual operational funding shortfall and a deferred maintenance backlog that is estimated to be between \$4.5 billion and \$9.7 billion. The annual operational shortfall and backlog translate to dwindling visitor services and resource protection activities, as well as a growing list of maintenance projects such as trail and park facility repairs, invasive species removal, and historic building restoration.

At Everglades National Park, the operational budget has increased an average of about 3 percent each year for the past five years. However, these increases have not kept pace with increased costs. Thus, the park faces significant shortages in key areas, including a lack of adequate numbers of research scientists and law enforcement personnel.

Populations in nearby Miami-Dade County have increased by 45 percent since 1980, and visitation at Everglades has nearly doubled in the last 20 years. Many of these visitors recreate on boats in Florida Bay. More people are using the park's waters, but the number of rangers patrolling Florida Bay has not kept pace with this growing use.

In 2005, Everglades National Park has a total of 12 full-time law enforcement rangers to patrol the



444,790-acre Florida Bay, with a total of eight marked Park Service patrol boats and three unmarked boats. According to the most recent law enforcement needs assessment, completed in 2003 by Everglades National Park, there is a 30 percent short-fall in the total number of rangers needed to adequately staff the park.

Without adequate numbers of law enforcement personnel, the park is unable to effectively prevent illegal poaching and trespassing on closed islands, illegal entry into backcountry

areas by boats that violate no-motor or no-entry restrictions, and damage to shallow underwater communities that occurs from groundings.

In conjunction with an increase in law enforcement personnel, Everglades National Park needs to have the means to better educate park visitors about appropriate activities and safe boating in Florida Bay's challenging waters. The park recently produced a new map and guide for boaters, a useful tool that should help inform boaters and reduce inadvertent resource damage.

SEAGRASSES—SCARRING CAUSES DAMAGE THAT COULD BE PREVENTED

The ecological importance of seagrasses cannot be disputed: These communities provide refuge, spawning areas, and a food source for many fish and invertebrate species. Florida Bay contains more than 346,000 acres (140,00 hectares) of seagrasses, and the health of these seagrasses is critical to the health of a variety of recreationally and commercially important fish, as well as several federally listed threatened and endangered species. Seagrasses are negatively affected by changes in salinity and sea surface temperatures; damage from boat propellers is also a serious concern.

Florida Bay is a subtropical marine lagoon that is composed of a mosaic of mud banks and shallow basins (averaging three feet deep or less in many areas). Navigating the bay is complicated and requires great care. Inexperienced or careless boaters can easily damage seagrasses with their propellers, churning up sediment and suffocating plants in the process, while

Prop scars mar seagrass beds throughout Florida's waters, and damaged seagrasses can take years to recover.



Boats that run aground damage seagrass beds and mud banks.

also tearing up plants and leaving denuded furrows that can take a decade or more to recover.

As development in south Florida continues, the number of people out on the water increases, and the likelihood of seagrass damage grows. Studies have shown that seagrass beds throughout Florida have experienced scarring from careless boaters. Although research spe-

cific to Florida Bay within Everglades National Park is lacking, there is a great deal of evidence (including aerial photos that show numerous whitish scars) that damage does occur within the park and that it could be significantly affecting the health of seagrass communities.

Everglades National Park has secured private funding to begin separate projects to determine how many boaters use Florida Bay and when peak usage occurs. The park will also assess the extent of damaged mud banks and seagrass beds in Florida Bay. Continued funding will be needed to support these and other vital projects.

Education is the main tool that can be used to reduce seagrass damage. Teaching park users how to safely navigate shallow waters and illustrating the potential damage could go far in reducing the extent of prop scarring in Florida Bay and other areas. Everglades National Park has recently expanded its public education and outreach campaign and developed a new, innovative brochure that pro-



vides a map and guide of Florida Bay for boaters and other park visitors.

To help decrease the incidence of prop scarring, the park should also consider requiring boaters to complete a boater safety course that deals specifically with conditions encountered in Florida Bay; increasing signs and buoys that warn boaters about areas particularly difficult to navigate; and increasing ranger patrols. Funding is needed to support these and other boater education and outreach programs.

ROSEATE SPOONBILLS— RESTORATION NEEDED TO REVERSE POPULATION DAMAGE CAUSED BY WATER PROJECTS

One of the defining characteristics of the Everglades region—before major water drainage and diversion projects—was the great numbers of wading birds that occupied the marshes, mangroves, and bays. Some early estimates place wading bird populations in the millions or hundreds of thousands. Though these estimates might be inflated, it is certain that enormous flocks of wading birds once populated the region.

Plume hunters decimated these populations from the last half of the 19th century into the early 20th century. Regulations and prohibitions helped some species begin to recover, but implementation of drainage and diversion projects dealt another blow to already suffering populations. An analysis of long-term data for five wading bird species in the central and southern Everglades region indicates that the number of wading birds has declined by about 80 percent, from a high of 180,000-245,000 birds during an early drainage period (1930-1946) to about 50,000 birds in a late

drainage period (1974-1989). More recent estimates indicate an even more precipitous population decline of 90 to 95 percent in south Florida.

Scientists believe that these changes in the numbers and distributions of wading birds were caused by water management activities that altered the quantity and timing of freshwater flows into Florida Bay and disrupted the natural flow of water through the Everglades marshes. These changes in water flow decreased foraging habitat, increased the frequency of extreme drying events, and disrupted nesting.

The roseate spoonbill (*Ajaia ajaja*) is a good indicator species to study because it has a unique feeding behavior called tactolocation, which requires certain hydrological conditions. In using tactolocation, roseate spoonbills stand in shallow water, submerge their partially open bills to search for

food, and quickly snap their bills shut once prey is encountered. Spoonbills must have access to prey in shallow waters, and spoonbill breeding relies on the seasonality of hydrology, where the wet season allows prey to flourish and the dry season concentrates prey into drying wetlands.

Human-caused changes to water flow in Florida Bay have altered the structure and function of the coastal mangroves that served as foraging habitat for spoonbills. Strong evidence also indicates that these habitat changes have reduced the number of spoonbills nesting in Florida Bay since the late 1970s and caused shifts in nesting areas. If this is the case, then restoring more natural conditions by reestablishing freshwater flows into Florida Bay should restore mangrove foraging habitats and stabilize roseate spoonbill abundance and distribution.

Roseate spoonbills, once hunted for their beautiful plumage, now face alterations in their foraging habitat caused by water drainage and diversion projects.



ACKNOWLEDGMENT

NPCA thanks the staff at Everglades National Park who reviewed the factual accuracy of information used in this report. We also thank peer reviewers for their valuable comments and suggestions.

A special note of appreciation goes to those whose generous grants and donations made the report possible: Ben and Ruth Hammett, the Efroymsen Fund of the Central Indiana Community Foundation, and anonymous donors.



Since 1919, the National Parks Conservation Association has been the leading voice of the American people in protecting and enhancing our National Park System. NPCA and its 300,000 members and hundreds of partners work together to protect the park system and preserve our nation's natural, historical, and cultural heritage for generations to come.

- More than 300,000 members
- 8 regional offices
- 35,000 activists

WHAT YOU CAN DO TO HELP:

- **Stay informed about park plans and south Florida restoration plans.** The public is invited to provide input on all park plans and studies. Planning involving Everglades National Park, Florida Bay, and other regional efforts includes:
 - Everglades National Park General Management Plan information is available at www.nps.gov/ever/gmp/gmp_index.htm and at <http://ParkPlanning.nps.gov/parkhome.CFM?ParkID=374>.
 - Tamiami Trail modifications of the Modified Water Deliveries Project information is available at www.saj.usace.army.mil/pao/hotTopics/tamiami_trail.htm.
 - CERP and other restoration project documents are available at www.evergladesplan.org/.
 - To voice your opinion about all of these restoration projects, visit NPCA's Action Alert headquarters, at www.npca.org/actioncenter/ActionAlerts.aspx.
- **Support or become a member of groups helping to protect Florida Bay and the park:** South Florida National Parks Trust (www.nationalparks.org/southflorida), Trust for Public Land (www.tpl.org), NPCA (www.npca.org/support_npca/), and other regional organizations.
- **Volunteer in the parks.** Many parks are looking for dedicated people who can lend a helping hand. To learn about opportunities at Everglades National Park, contact the park at 305-242-7752.
- **Become an NPCA activist and learn about legislative initiatives and protection projects affecting parks.** When you join our activist network, you will receive *Park Lines*, a biweekly electronic newsletter with the latest park news and ways you can help. Join by visiting www.npca.org/takeaction. You can also contact NPCA's Sun Coast Regional Office at suncoast@npca.org for local activism information.
- **Don't run aground, take the long way around.** Many nearshore waters in south Florida are dotted with shoals and other shallow areas. Boat carefully in Florida Bay—check your charts, look for marked channels, and do not cut across flats. Use the National Oceanic and Atmospheric Administration's chart 33E when navigating the bay, pick up a copy of the Florida Bay Map & Guide, and enroll in a boater safety/education course.



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