A BRIGHT, GREAT BAY

BISCAYNE BAY
PARTNERSHIP INITIATIVE

BISCAYNE BAY PARTNERSHIP INITIATIVE

POLICY DEVELOPMENT COMMITTEE

JANUARY 2001

FROM THE CHAIR

Dear Friends,

The 1999 Florida Legislature, under the enlightened sponsorship of Senator Mario Diaz-Balart, Representatives Carlos A. Lacasa and Rodolfo Garcia, Jr., and with the full recognition of Governor Jeb Bush, created the Biscayne Bay Partnership Initiative.

Its mission:

> *The development of an open and inclusive, community-based forum to survey public and private sector activities and programs affecting Biscayne Bay, and to provide recommendations for actions to protect, improve, and enhance the bay's resources, its social, economic, and natural values, with its ecological health as a priority.*

This report is the result of an open process involving thousands of hours of dedicated efforts by hundreds of individuals who represented all those with a stake in the future of Biscayne Bay. It was prepared by the Initiative's Policy Development Committee, and is based largely on the work of four subject specific survey teams. These teams focused on issues related to social and economic values, science, management, and regulation. Each survey team's complete report accompanies this document.

Our fervent hope and expectation is that you will find this report thoughtful, reasonably comprehensive, and even a bit poetic in its articulation of Biscayne Bay as a treasured ecosystem—not merely the aquatic playground some myopically see.

We remain unapologetically convinced that the real sustainability of the marvelous social and economic benefits we all reap from our bay is fully dependent on all of our efforts and commitment to preserve and enhance its fundamental ecological health as *the* lasting priority.

Sincerely,

Harvey Ruvin, Miami-Dade Clerk
Chair, Policy Development Committee
Biscayne Bay Partnership Initiative

P.S. I have enormous gratitude to all whose passion, time, and skillful input have helped to produce this report. Their real thanks will be in positive steps we hope will follow.

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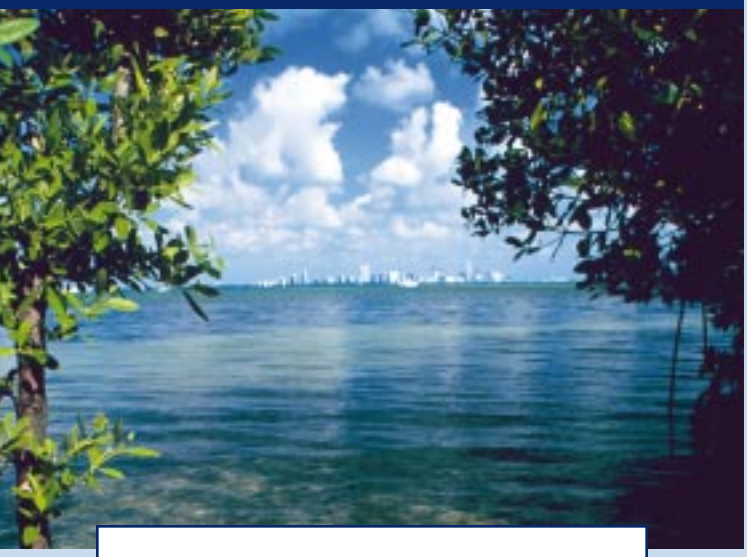
For more information about the Biscayne Bay Partnership Initiative, visit www.bbpi.org

INTRODUCTION



Looking north to Miami across Biscayne Bay. William Folsom, NOAA.

Without doubt, Biscayne Bay is one of the world's great water bodies—a jewel of south Florida and a magnificent natural feature around which much of life in Miami-Dade County revolves. For a number of reasons, however, the bay may be in long-term peril if important issues are not resolved favorably. To respond to these potential threats, we must address the following principal challenges to the Biscayne Bay ecosystem through collection of scientific information, education, and positive action:

- existing and proposed changes in the quantity, quality, timing, and distribution of freshwater inflow;
- human-induced inputs of pollutants, nitrogen, phosphorus, and toxic organic chemicals;
- potential development of coastal wetland and inappropriate development of adjacent uplands;
- physical alteration or damage to the bay bottom and other factors that destroy communities of bottom-dwelling organisms, destabilize bottom sediments, and increase turbidity;
- consumptive uses of bay resources, which increasingly, are inadequately monitored.

In 1513, Juan Ponce de Leon sailed south from his earlier landing in St. Augustine and found a "bright nameless great bay…and fresh springs in the rocks."

There are several stories about how the great nameless bay came to be called Biscayne Bay. Most assume that it is a variation of the Bay of Biscay, in the Atlantic Ocean north of Spain and west of France. Others maintain that the bay got its name because of a 1500s wreck in the bay of a ship owned by a man called El Biscaino. Another theory holds that the bay was so named after Don Pedro el Biscaino, who lived on one of the islands in the bay and had been the Keeper of the Swans at the Spanish court. Still others believe that the bay was named for Viscaino, who is said to have been a wealthy merchant in Manila.

Whatever the origins of its name, Biscayne Bay is and always has been a "bright, great bay" that has attracted explorers, adventurers, residents, and tourists. Not only is it a source for food, transportation, and commerce, it also offers boundless opportunities for recreation, education, and spiritual nourishment to those who visit and live near it.

Biscayne Bay is the largest estuary on the coast of southeast Florida and is contiguous with the southern Florida Everglades and Florida Bay. It encompasses a marine ecosystem that totals approximately 428 square miles. Its drainage area is 938 square miles, of which 350 are freshwater and coastal wetlands in Miami-Dade, Broward, and Monroe Counties. It is home to Biscayne National Park, the largest marine park in the national park system, Oleta River State Park, Bill Baggs Cape Florida State Park, the Biscayne Bay Aquatic Preserve, Barnacle State Historic Site, and numerous local parks.

The bay is also the location of the Port of Miami, one of the largest passenger and commercial ports of call in the world. In addition, the Miami River, one of the largest tributaries to the bay, is a working river and is Florida's fifth largest port and the primary service area of international trade to the Caribbean. The Miami River is also home to some of Miami's most historic and scenic neighborhoods.

Indeed, Biscayne Bay is many things to many people. It supports important sport and commercial fisheries. It is a source of environmental education and recreation. Its

As we begin the new millennium, we are at a crossroads for finding new and better ways to enhance the bay's health and its strength as an environmental and economic resource.

waters and shores are favored for sailing, boating, snorkeling, swimming, bay viewing, and sunbathing. More importantly, the bay is ecologically significant, supporting and nurturing an enormous variety of wildlife.

Biscayne Bay is part of a large south Florida ecosystem and relies upon water that flows directly from the Everglades, through the Biscayne Bay watershed, and into the bay. The recent passage by the United States Congress of the Comprehensive Everglades Restoration Plan, and the planning and implementation of other regional land and water management efforts, have focused attention and resources on problems facing the Everglades and the south Florida ecosystem. It is critically important that as these processes go forward, planning and decisions be made within the context of the broad south Florida ecosystem, including Biscayne Bay.

As we begin the new millennium, we have many opportunities to find new and better ways to enhance the bay's health and its strength as an environmental and economic resource. The challenge is to achieve the delicate balance between maintaining, protecting, and restoring the natural systems that keep the bay ecologically healthy and productive, and dealing with the needs of growing numbers of people who want to use and enjoy it.

A BRIEF HISTORY

Five thousand years ago, when sea level was about 20 feet lower than today, there was no Biscayne Bay. Biscayne Bay formed as sea level rose to fill a depression in the limestone between 5,000 and 2,400 years ago. During and since that time sandy barrier islands, banks of carbonate sand and mud, and coastal wetland swamp and marsh deposits have grown and evolved to give the bay its present form. Especially critical was the relatively slow rise in sea level that occurred during the past 2,400 years (less than 2 inches of increase in sea level per century). During that time, shallow sand and mud banks formed along the eastern margin of central Biscayne Bay and extended well across northern (north of present Julia Tuttle Causeway), south-central (Featherbed Banks), and southern Biscayne Bay, partitioning the bay into natural divisions.

Natural, unaltered Biscayne Bay was a magnificent shallow subtropical estuary characterized by clear water and dominated by diverse and productive bottom communities of seagrasses and hard bottom soft corals and sponges. Mangrove wetlands rimmed the bay margin with limestone reaching the coast in only a few places. The bay was once noted for freshwater springs that were visited by ships to get drinking water. The clear waters were maintained by the sediment filtering and trapping activity of the bottom (or "benthic") communities of plants and animals and by coastal swamps. The benthic communities, in turn, were able to flourish because of the clear waters. Landward, freshwater sheet flow, natural tributaries, and shallow depressions that cut through the coastal ridge (known as transverse glades), fed water from the Everglades to the

A Florida map in 1763. Florida State Archives.

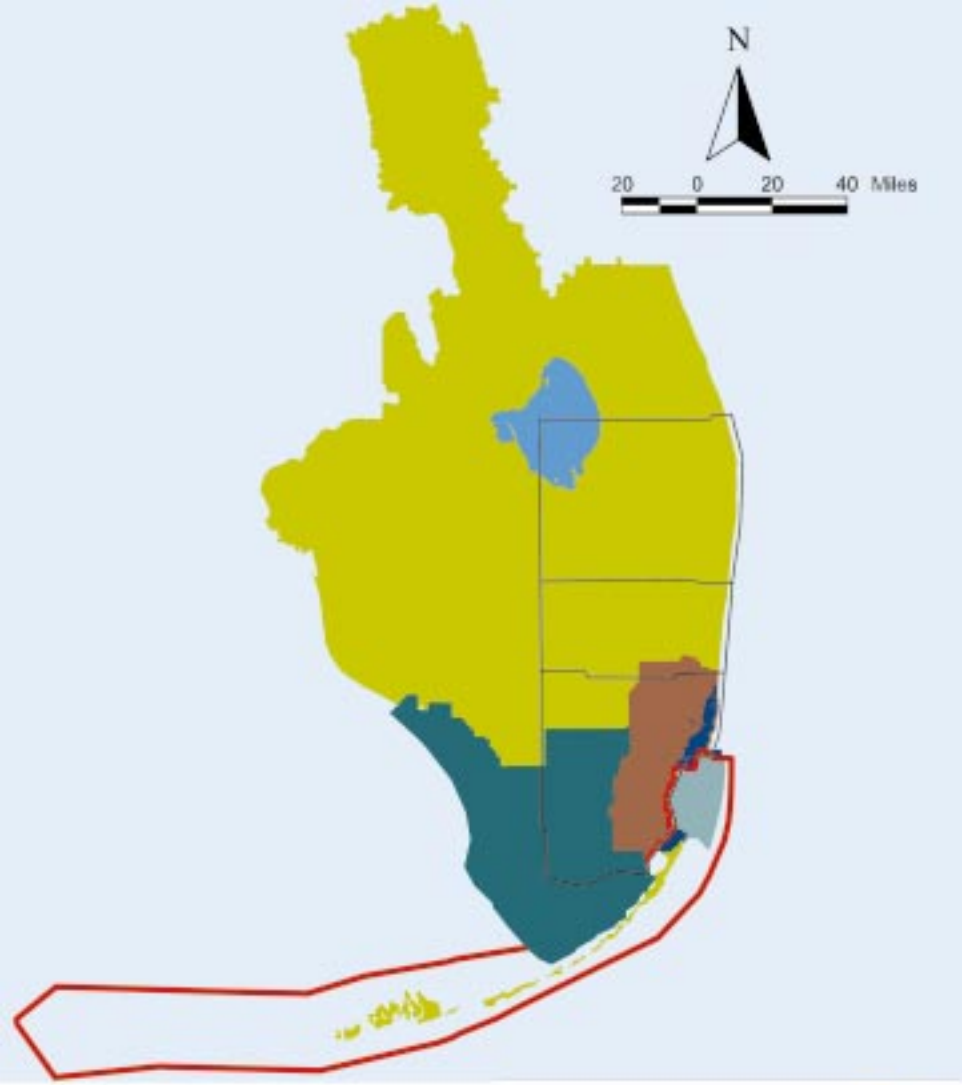
margins of the bay. Freshwater even entered the bay through springs in the limestone. Salinity channels and resulting freshwater upwelling affected the bay from the coastal cliffs to likely far offshore. The seaward margin of the bay was a series of sandy barrier islands to the north, channel-dissected shallow marine sand and mud banks along the central portion, and islands of an emergent coral limestone ridge to the south.

The entire south Florida coastal ocean ecosystem, including Biscayne Bay, has undergone major environmental change due to a century of extensive regional population growth that accelerated coastal and watershed development, pollution, and habitat loss and degradation. Miami began to grow at the beginning of the twentieth century, and Biscayne Bay became the site of one of its most important population centers. By 1917, four canals dissected the Everglades from Lake Okeechobee to the Atlantic Ocean, including the channelization of the Miami River. Later, Baker's Haulover was constructed and other ocean inlets across Biscayne Bay barrier islands were stabilized. Alterations continued throughout this period, culminating with significant changes that resulted from the Central and Southern Florida Project for Flood Control and Other Purposes, which began in 1948. This project dramatically lowered freshwater levels in the Biscayne Aquifer by approximately four feet by cutting drainage canals to drain surface and groundwater to prevent intermittent coastal flooding and expand agricultural production.

As a result of a century of modifications to hydrology, Biscayne Bay has changed from a subtropical estuary fed by coastal rivers, tidal creeks, and groundwater seepage, including submarine springs, to a pulsed system that alternates between marine conditions and extreme low salinity conditions near canal discharge sites. Freshwater now enters the bay as an intense point source rather than as distributed input over time and space.

Today, Biscayne Bay is an estuarine lagoon with salinity, circulation, and water quality that varies and is dependent on freshwater flow, wind driven circulation, and ocean exchange. The bay can be viewed as three distinct areas—each differs depending on local effects on hydrodynamics. The following describes each of these areas.

SOUTH FLORIDA ECOSYSTEM



This map was generated February 19, 2001, by the Florida Atlantic University Center for Visual Planning Technology using data from the SWIM Plan for Biscayne Bay originally compiled by the Florida Marine Research Institute and the South Florida Water Management District.

FAU Center for Visual Planning Technology VPT
JOINTCENTER
BISCAYNE BAY

DEFINING THE BAY

Aerial View of Miami, Biscayne Bay, Venetian and MacArthur Causeways and in the background Miami Beach, 1951. Florida State Archives Postcard Collection.

A REMARKABLE PLACE

Biscayne Bay is a remarkable water body surrounded by one of the world's most cosmopolitan and exciting cities. It also contains and is adjacent to natural areas not found anywhere else in the world. The fact that Biscayne Bay and its watershed are home to two national parks, a national marine sanctuary, a state aquatic preserve, and a host of other national and state managed and protected areas is testimony to the uniqueness of the area and the value of its natural resources. In fact, Miami-Dade County is the only county in the United States with two national parks and a national marine sanctuary in its boundaries. It is also home to over two million people. This combination of an expanding population and such valuable and fragile resources makes the task of protecting, managing, and preserving those resources, while providing adequate opportunities for their use and enjoyment, particularly challenging.

NORTH BISCAYNE BAY

North Bay extends from Dumfoundling Bay south to the Rickenbacker Causeway. A number of modifications have taken place in this part of the bay, most of which occurred by 1926. Two new inlets through south and north Miami Beach altered circulation in northern Biscayne Bay. The mangrove margins north of Coconut Grove and Key Biscayne were largely covered by fill, and bulkheads were constructed in order to develop the shoreline**.** Dredging of the bay margin for this fill left 10 to 20 foot deep troughs in much of northern Biscayne Bay. New dredged islands, port facilities, and six cross-bay causeways further segmented northern Biscayne Bay, with dredge-deepening of the bottom associated with each project.

Accordingly, northern Biscayne Bay is now segmented into six compartments connected by narrow gaps in the causeways. In addition, sewage effluent emptied unchecked into Biscayne Bay until diverted to sewage treatment plants in 1969. These modifications resulted in high levels of turbidity in much of north and north-central Biscayne Bay, further restricting the distribution of important benthic habitats.

Because of these changes, approximately 40 percent of north Biscayne Bay is too deep or too turbid for the benthic communities that characterized the natural bay, and the productive estuarine ecosystem has been diminished. Despite this, some parts of the northern bay remain highly productive. For example, there are significant mangrove wetlands along the Oleta River corridor, and the second largest mangrove stand is found at the Oleta River State Mangrove Preserve. In recent years water quality has been improved through regulatory action and shoreline revetment and restoration projects. The DERM (Miami-Dade County Department of Environmental Resources Management) has documented significant return of benthic communities in some portions of northern Biscayne Bay as a result of improved water quality.

CENTRAL BISCAYNE BAY

Central Biscayne Bay extends from the Rickenbacker Causeway south to Black Point and is bordered mainly by Coral Gables and Coconut Grove on the west and Key Biscayne on the east. This portion of the bay is the most well-mixed, achieving direct ocean exchange through the "Safety Valve" between Cape Florida and Soldier Key. Much of this part of the bay is also included as part of Biscayne National Park.

The entire south Florida coastal ocean ecosystem, including Biscayne Bay, has undergone major environmental change due to a century of extensive regional population growth that accelerated coastal and watershed development, pollution, and habitat loss and degradation.

SOUTH BISCAYNE BAY

South Biscayne Bay is usually subdivided into two parts. The south bay section extends from Black Point to Mangrove Point and encompasses the lower portion of Biscayne National Park. It is bordered by an intact mangrove shoreline that forms a narrow band along much of its coast.

The extreme south bay stretches from Mangrove Point to Jewfish Creek and includes Card Sound and Barnes Sound. These areas are somewhat separated from the rest of the bay by extensive shallow banks and are isolated from their natural watershed by roads and canals. This section of the bay is part of the Biscayne Bay Aquatic Preserve and Florida Keys National Marine Sanctuary. In addition, parts of north Key Largo are also within the Crocodile Lakes National Wildlife Refuge. It is interesting to note that this area contains one third of all nesting of the American crocodile in the continental United States.

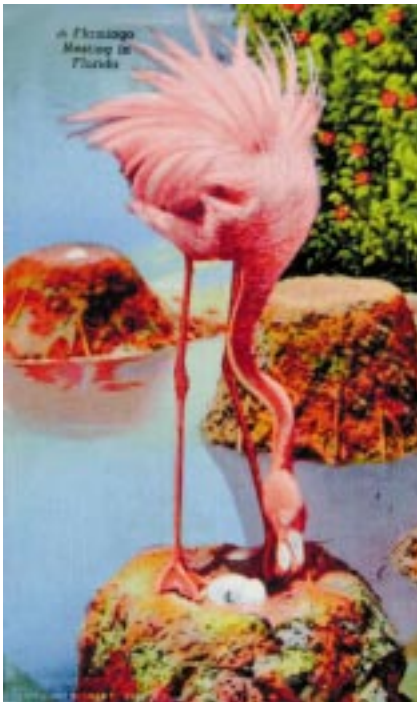
Much of the southern bay, despite substantial development in the watershed, has retained its relatively pristine habitats and good water quality and supports significant production of economically important fish and shellfish. Changes in freshwater input, however, have altered its estuarine character. In addition, vessel traffic, along with canals, rivers, and other factors, has contributed to turbidity levels and is causing increasing damage to the benthic communities.

BISCAYNE BAY WATERSHED AND COASTAL WETLANDS

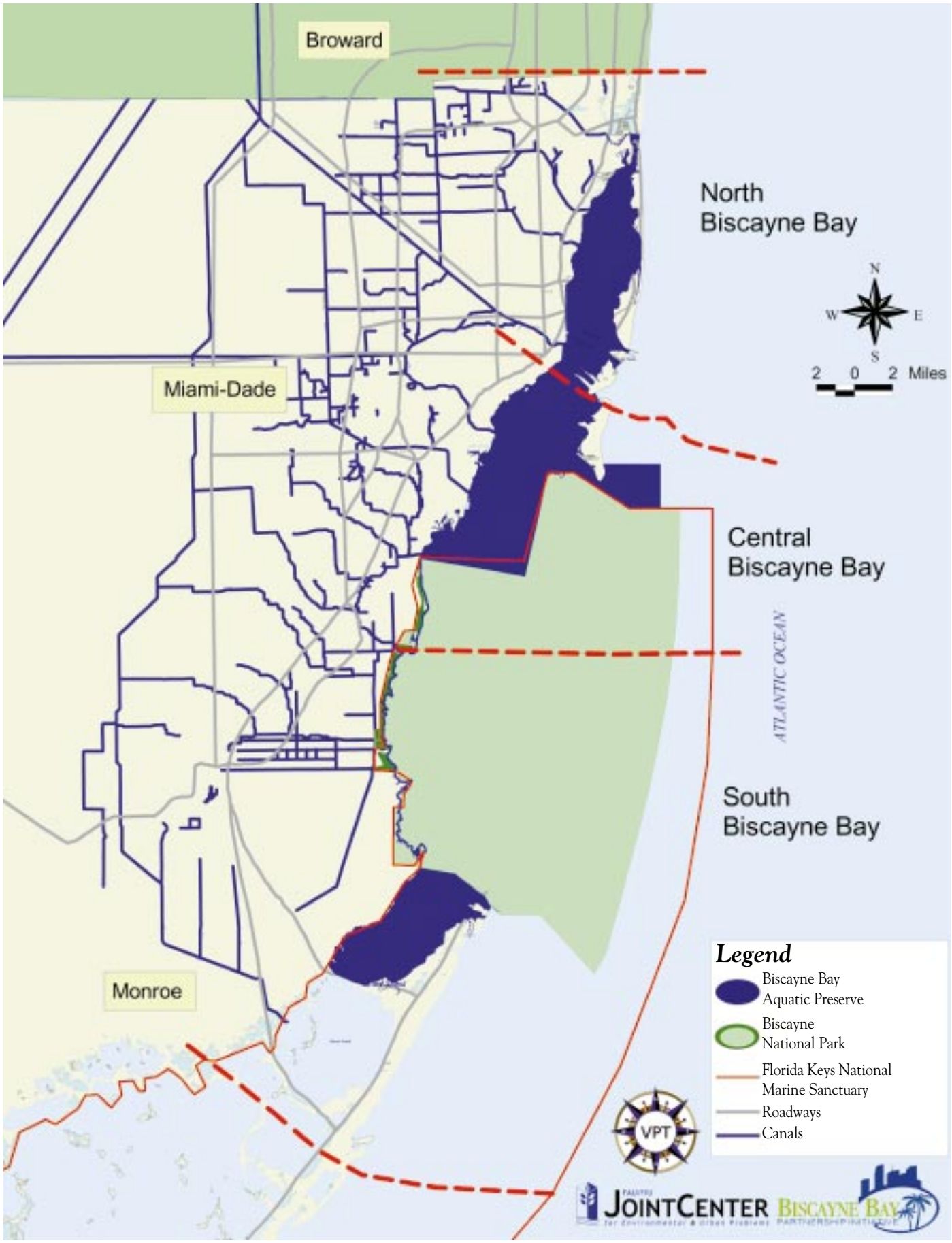
The Biscayne Bay watershed is contiguous to the Florida Everglades and receives water from the Everglades that flows directly into the bay. The Everglades were originally an uninterrupted stretch of marsh that extended from Lake Okeechobee to Florida Bay, with waters of the Everglades connected to Florida Bay by transverse glades. Drainage projects, beginning in the first half of the twentieth century, converted approximately 65 percent of the Everglades to agricultural and urban uses.

A great deal of that conversion has taken place in the Biscayne Bay watershed. Agricultural practices and the urbanization of the area have led to activities such as regional drainage, mosquito ditching, rock mining, landfills, and the construction of highways and roads. These activities and others have contributed to alteration of lands in the watershed. The fact that population of this urban watershed is expected to increase by over one million people in the next 20 years will only exacerbate the magnitude of impacts to the watershed and the resulting threat to the vitality of the bay.

Remaining coastal wetlands adjacent to Biscayne Bay in south Miami-Dade County extend from Matheson Hammock County Park south to U.S. Highway One (U.S. 1), which divides Barnes Sound and Florida Bay. This area includes the largest tract of undeveloped wetlands remaining in south Florida east of the Everglades. In fact, most are in public ownership or slated for acquisition by Miami-Dade County or the South Florida Water Management District.



1941, Florida State Archives Postcard Collection.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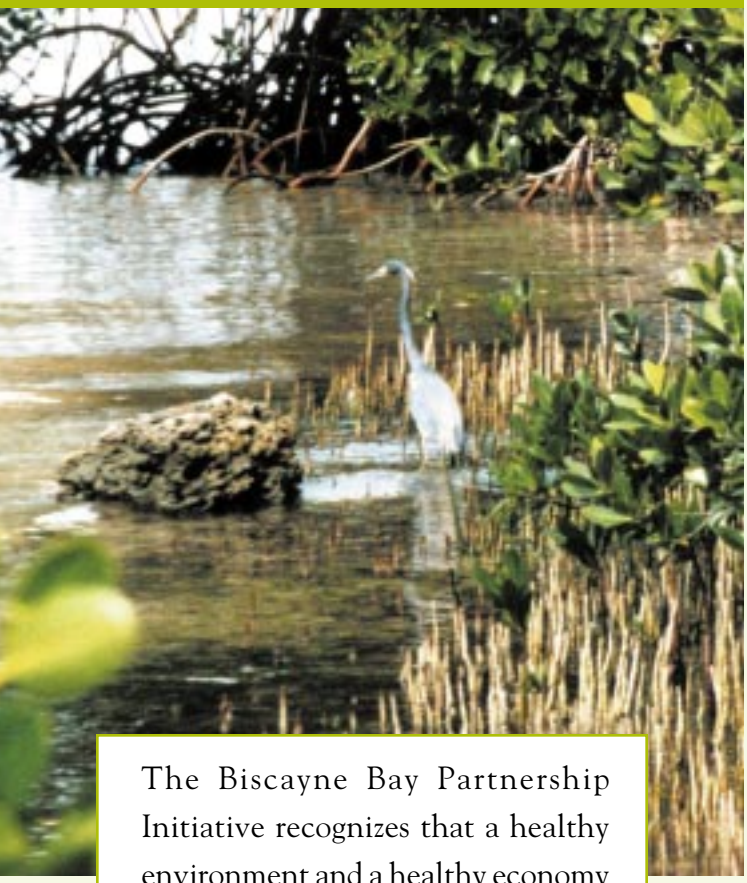
WHAT WE VALUE IN THE BAY



A Great Blue Heron along mangrove shoreline. Alison G. Delaplaine, NOAA.

The Biscayne Bay Partnership Initiative recognizes that a healthy environment and a healthy economy combine to provide a foundation for a high quality of life. The challenge is to improve the environment while encouraging those environmentally compatible economic activities that protect and enhance the bay and discouraging activities that would adversely impact the bay. The future of Biscayne Bay and the protection of its resources cannot be considered outside the larger context of human interactions, social values, and the regional economy.

The following discussion describes what we value in the bay and outlines a broad framework for managing the bay in a manner that will promote environmental restoration and protection of Biscayne Bay while providing for economic activity and recreation.

"We value the bay and must restore and protect its health."

This value sets an immutable parameter: the bay must be improved. Improvements would include a gain in miles of natural shoreline, an increase in acres of marine habitat, an improved diversity and abundance of fisheries, elimination of contamination that degrades natural conditions or affects human use, and restoration of more natural quantities and flows of clean water into the bay.

Efforts to improve freshwater inflow and water and habitat quality, particularly the restoration projects, need to be guided by this value.

"We value the economy in the region and want to protect and enhance it without endangering the bay."

A healthy, more natural bay will support a stronger economy. This means encouraging economic activity that is environmentally friendly. It also means seeking creative ways to allow for the maintenance of economically valuable uses, in ways that minimize and fully mitigate their negative impacts and are compatible with returning the bay to a more natural condition. This requires a regulatory framework that provides clarity, assurance, and predictability.

In the long term, this value may mean that some economic activities associated with the bay may need to be phased out due to their adverse environmental impact on the bay and their role in the Miami-Dade County economy assumed by more environmentally friendly economic activities. In addition, we value using developed shoreline for water-dependent or water-related uses wherever appropriate and avoiding the disturbance of any remaining natural shoreline.

Efforts to improve physical development, economic development, and commercial uses of the bay, shoreline, and watershed need to be guided by this value.

A healthy, more natural bay will support a stronger economy.

"We value more access to the bay and an informed public who will use it in a manner that preserves it for future generations."

An informed general public and their elected public officials, who possess an enlightened stewardship ethic, are our primary force for improving Biscayne Bay. Furthermore, all people must have safe access and opportunities for responsible use of the bay, regardless of their economic or social circumstances. We value the use of shoreline for green space that enhances habitat and access wherever appropriate. Public lands along the shoreline should provide maximum opportunity for public recreational and education experiences, which will build a sense of community pride, stewardship, and ownership of Biscayne Bay.

It is important to realize that there is a "carrying capacity" for Biscayne Bay. This means there must be a balance between developed lands and lands that support natural ecological functions, without which the bay will lose its natural resiliency. It is also important to understand that overuse can be as damaging as misuse. Consequently, the impacts of this fact must be reconciled equitably among the various users.

Efforts to improve public education, awareness, and access for Biscayne Bay need to be guided by this value.

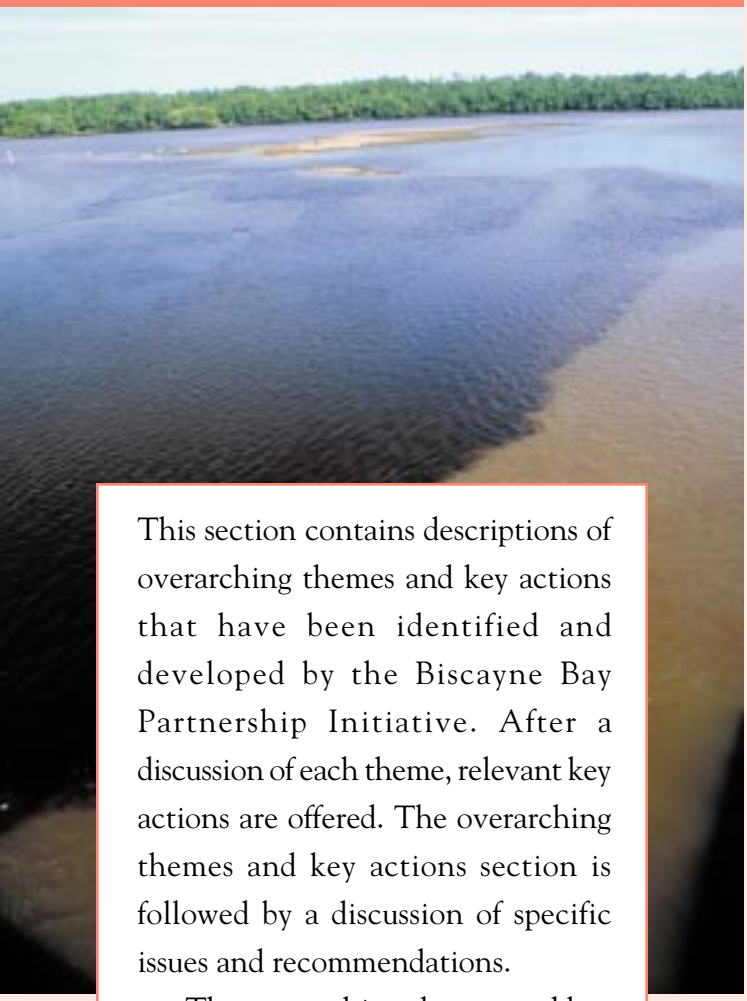
"We value a management system that allows us to resolve conflicts among these values."

While there should be ongoing opportunity for full enjoyment of Biscayne Bay and economic growth, there cannot be indefinite, unlimited use of the bay and its resources. Thus, the sum of all activity in the bay must allow for continual improvement in its health. The management and regulatory systems must be integrated among various local, state, and federal agencies in support of common goals, and must be flexible and inclusive of the public. If the public and private sectors work together with a bay-positive approach and attitude, conflicts among our values can be addressed in a broader cooperative management framework, while preserving the safeguards of our existing environmental laws.

Efforts to improve coordinated management and regulatory approaches for Biscayne Bay need to be guided by this value.

Top: Beach-goers. Greater Miami Convention and Visitors Bureau. Bottom: Line of cruise ships in Port of Miami. Carnival Cruise Lines.

OVERARCHING THEMES AND KEY ACTIONS



The ebb tide carrying clear and muddy waters into the Gulf of Mexico. William Folsom, NOAA.

This section contains descriptions of overarching themes and key actions that have been identified and developed by the Biscayne Bay Partnership Initiative. After a discussion of each theme, relevant key actions are offered. The overarching themes and key actions section is followed by a discussion of specific issues and recommendations.

The overarching themes and key actions, as well as the specific issues and recommendations, are supported by information found in four separate survey team reports, which are appended to this document. For further detail, please consult the accompanying survey team reports, or find them at *www.bbpi.org*.

CHARTING THE COURSE FOR ECOSYSTEM AND WATER MANAGEMENT PLANNING

Biscayne Bay is part of a larger ecosystem and it is directly impacted by activities on the land around it and by the waters connected to it. There are major water management and land use planning activities in progress in south Florida that could have substantial effects on freshwater flow to Biscayne Bay. Two are the Comprehensive Everglades Restoration Plan (CERP), which has restoration of natural systems as a major objective, and the Lower East Coast Regional Water Supply Plan (LECRWSP), which plans to provide water to human users while protecting the natural systems, using various tools of Florida water law. These tools are intended to provide for a sustainable, healthy ecosystem by establishing minimum flows and levels and by providing reservation of water for preservation or restoration of water deliveries.

CERP will substantially restructure the regional water management system. Many functions in CERP will have direct or secondary impacts on Biscayne Bay. In particular, the Biscayne Bay Coastal Wetlands Element of CERP and the South Miami-Dade County Reuse Plan will impact the bay.

The LECRWSP will affect the issuance of long-term municipal well field permits. Recent LECRWSP evaluations predict that future urban and agricultural development and water withdrawals for urban drinking water will reduce the amount of water flowing to Biscayne Bay. Currently, no minimum or maximum flows or levels have been established for Biscayne Bay or the lower Biscayne Aquifer.

Both of these planning efforts have created processes to use science-based biological criteria in planning and monitoring, with provision for modifications based on the assessment of monitoring results. Stronger science-based input into ongoing regional restoration plans, land use planning, and water management activities occurring in the watershed is essential for preventing degradation and making management of Biscayne Bay more effective, and for ensuring that Biscayne Bay's freshwater inflow needs are met.

The South Dade Watershed Plan, currently being initiated by the Miami-Dade County Department of Planning and Zoning, will examine the impact of different land use patterns on the water quality of Biscayne Bay. This plan will identify lands that are essential for preserving the environmental, economic, and community values of

Biscayne National Park. The South Dade Watershed Plan will complement water management activities by developing "Best Management Practices" for all sources of water runoff into Biscayne National Park, and assuring the compatibility of land uses and zoning decisions.

Key actions

- The Florida Legislature should provide funding for the most urgent science need, which is using ecological and physical criteria, including the application of numerical models, to determine the quantity, timing, and distribution of freshwater flow needed to protect and restore Biscayne Bay and to reestablish a viable estuarine ecosystem in the near shore and coastal wetland zone of western Biscayne Bay.
- Ongoing regional restoration plans and land-based activities occurring in the watershed should be integrated and coordinated with existing management processes in protecting Biscayne Bay.
- A Science Committee, integrated with the Science Committee of the South Florida Ecosystem Restoration Task Force, should be formed to coordinate the identification of needed scientific research, monitoring, and restoration activities necessary for the welfare of Biscayne Bay. This committee should provide a vehicle for formal interaction with science, management, and regulatory groups in Biscayne Bay and associated ecosystems.
- The Florida Legislature should provide long-term research funding to build scientific knowledge about the bay that can be used in regional water management planning processes to protect and restore the bay, as well as funding for interaction with the public and its representatives.
- The Florida Legislature should ensure that the CERP investigates an alternative to wastewater reuse to meet the ecological goals and objectives of Biscayne Bay. The CERP needs to follow the conclusions in the Implementation Plan and find other potential sources of water to provide freshwater flows to central and southern Biscayne Bay before pursuing the reuse facility.

REVERSING THE TIDE OF HABITAT LOSS

As a clear water subtropical estuary, the bay supports rich ecological communities and a diverse variety of fish and wildlife. Specific habitat is provided for each species that lives in the bay, including species that migrate in and out of the bay daily or seasonally. If habitat for these communities becomes unsuitable or disappears, the animals lose their home and humans lose the benefits of their presence. Coastal wetland habitat and benthic habitat, including seagrasses, are of the greatest importance to aquatic life. Intertidal habitat and adjacent upland habitat, including coastal scrub and coastal tropical hardwood hammock, are critical to the entire bay ecosystem and are impacted by changes to watershed hydrology and development.

The benthic communities of the bay act to maintain water clarity, stabilize sediments, and provide food and shelter for fish, shrimp, lobster, crab, and many other species—especially in sensitive early juvenile stages. When these communities are damaged or eliminated, they cannot serve these vital roles and the increased turbidity that results from their absence can prevent their reestablishment. Over 40 percent of the bottom area in north Biscayne Bay has been altered by spoil displacement and dredging; turbidity problems persist in the northern part of the bay partly as a result. Bulkheaded shorelines, which deflect waves and boat wakes and cause resuspension of bottom sediments, also contribute to turbidity problems in

The Christmas tree worm, Spirobranchus giganteous. *James Gattuso, NOAA.*

the northern bay, as does increasingly heavy boat traffic. Protection and restoration of vital benthic communities are needed.

In the past, freshwater and brackish marsh habitats bordered the bay's western shoreline and barrier islands, but over the last century, the bay's western shorelines and eastern barrier islands have undergone extensive loss of marsh and mangroves. The western bay was heavily impacted by the construction of 19 water management canals throughout the region that drained wetlands and now release water in pulses to prevent intermittent coastal flooding and facilitate agriculture. The result is a highly modified delivery of freshwater to the bay, rapidly fluctuating salinity regimes adjacent to canals, and loss of estuarine habitat elsewhere. Diversion of freshwater flow away from coastal wetlands degrades their ability to support wildlife, fish communities, and the bay ecosystem by preventing the establishment of a natural estuarine salinity gradient from wetlands to the bay. Development of coastal wetlands and inappropriate development of adjacent uplands are other major threats to coastal wetlands that would prevent restoration of more natural timing and distribution of freshwater flow to the bay. Restoration of coastal wetlands is key to restoring estuarine habitat and estuarine fish communities and wildlife in Biscayne Bay.

Key actions

- The Florida Legislature should provide funding to support the continuation of major habitat restoration projects and the development and implementation of a process for comprehensive planning and oversight of bay habitat restoration.
- Management of Biscayne Bay must focus on protecting and enhancing natural areas and open land, particularly in south Miami-Dade, as well as on restoring and improving environmental value and infrastructure in the built areas.
- The Florida Legislature should provide adequate funding for acquisition of lands currently identified as important in providing protective buffer or water redistribution functions and accelerate identification of any additional lands needed to provide these functions.
- The Florida Legislature should provide funding to mark channels, seagrass beds, and coral areas and provide maintenance for markers and signage.
- The Biscayne Bay Aquatic Preserve Act is inviolate and should never be weakened.

SOUNDING A VOICE FOR BISCAYNE BAY

Biscayne Bay's needs are most likely to be provided for when those who use, manage, and enjoy the bay speak with a unified voice. To provide for that unified voice, improve coordination within the context of ongoing regional restoration plans, and serve as a clearinghouse for many of the recommendations proposed in this report, the Biscayne Bay Partnership Initiative recommends the formation of the Biscayne Bay Project Coordination Team as part of the Working Group of the South Florida Ecosystem Restoration Task Force. The purpose of the Biscayne Bay Project Coordination Team would not be to replace or displace any existing legislative acts or any plans, but rather to enhance their importance and effectiveness.

There are a number of valid reasons for this recommendation. The South Florida Ecosystem Restoration Task Force is a well-established process created by Congress because of the state significance, and the national importance of a healthy south Florida ecosystem. Creating a Biscayne Bay Project Coordination Team, which would be an advisory committee within the structure of the Task Force, provides opportunities for administrative support, staff assistance, and also insulates members from the pressure of shifting agency priorities. Perhaps most important, as part of the Task Force mechanism, the Biscayne Bay Project Coordination

Team would be able to function as a public forum with ample opportunities to engage and inform the public. In this manner, those who use and manage Biscayne Bay can see the creation of a public/private partnership that will allow for interaction between private commerce and governmental agencies, members of the public and governmental agencies, and among agencies themselves. Details about proposed guiding principles, membership, and functions of the Biscayne Bay Project Coordination Team are outlined in the Management Survey Team's full report, which is appended to this document.

Another effort that would aid in the ability to think holistically about the bay, its needs, and the needs of the community, would be the development of a Biscayne Bay Action Plan. The plan would be developed through a consensus process led by the Biscayne Bay Project Coordination Team. Such a plan would guide efforts to balance environmental protection, increased habitat restoration, appropriate economic use, and improved public access. The plan could create links between major segments of the population and shoreline sites that currently provide, or should provide, desired uses. The plan would also promote links among shoreline activities, access sites, and transportation modes. A number of other ways that the plan would address public access, economic activities, habitat restoration, and environmental protection are outlined in the appended Social and Economic Values Survey Team report.

Key actions

- A Biscayne Bay Project Coordination Team should be formed as part of the Working Group of the South Florida Ecosystem Restoration Task Force. Furthermore, the Biscayne Bay Partnership Initiative recommends that the Florida Legislature provide adequate funding for the establishment, administrative costs, and dedicated staff for the Biscayne Bay Project Coordination Team.
- A Biscayne Bay Action Plan, prepared by the Biscayne Bay Project Coordination Team, should be developed that would guide efforts and prioritize activities to balance appropriate economic use with improved public access, increased habitat restoration, and environmental protection.

BISCAYNE BAY PROJECT COORDINATION TEAM GUIDING PRINCIPLES

- The team shall not supplant agency authority or have any regulatory authority.
- The work of the team shall be consistent with the Biscayne Bay Aquatic Preserve Act.
- The team shall serve in an advisory role and shall not serve as a direct granting agency.
- Team membership shall be representative of Biscayne Bay interests.
- Team members shall be knowledgeable about Biscayne Bay issues.
- The team shall recognize the importance of watershed management for the protection of Biscayne Bay.

BISCAYNE BAY PROJECT COORDINATION TEAM FUNCTIONS

- Provide a forum for the public to be involved.
- Provide information to the public about activities and issues related to Biscayne Bay.
- Provide a forum for interagency coordination and communication.
- Identify priority issues for action and create Biscayne Bay issue teams as needed to assist the Project Team.
- Make recommendations on key issues to agencies and organizations.
- Identify goals and performance measures related to key issues.
- Assess the achievement of goals.
- Identify and pursue funding on key issues.
- Review elements of the Comprehensive Everglades Restoration Plan that affect Biscayne Bay.

UNLOCKING ACCESS TO THE BAY

Access to the bay provides opportunities for recreation and education, and these experiences help build a sense of community pride, stewardship, and ownership of Biscayne Bay. All people, regardless of their economic or social circumstances, must have safe access and opportunities for responsible use of the bay. Thus, public lands along the shoreline, including marinas, should provide opportunity for public access.

Access, however, must not be allowed to impact the bay's natural resources or characteristics negatively, or reduce the value of the bay user experience. As more people use the bay, it may become necessary to increase educational efforts and provide additional protection to sites of high environmental value through limits on types of use, timing, or number of users, as well as improved enforcement to ensure compliance.

Key actions

- Sections of the Biscayne Bay and Miami River shoreline that are currently planned for intense development should be transformed into space for activities that are water-dependent or water-related with green space that enhances habitat and public access.
- Public lands, causeways, and public parks abutting Biscayne Bay should provide opportunity for public recreational and educational experiences, and should provide all people with safe access and opportunities for responsible use of the bay. Public access must be consistent with the need to protect the bay. In addition, infrastructure should be restored to accommodate changing needs.

Key Biscayne Beach, bay side.
William Folsom, NOAA.

PROMOTING EDUCATION AND STEWARDSHIP FOR A BETTER BAY

There is a great need for environmental education programs and activities specifically focused on Biscayne Bay and reaching all members of the community—not only students, but adults as well. The environmental awareness programs in our schools are good, but we should seek more "hands on" teaching that focuses on the bay. Effort should also be focused on making south Florida ecosystem education universal to all students. In addition, these programs need to be geared to the many audiences and cultures found in our community. Both materials and signage in the bay need to reflect our diverse cultures by being prepared in appropriate languages to provide information useful to all. Finally, special effort needs to be given to educating our community and neighborhood leaders so that they can both understand the impacts of their decisions and help educate their constituents about the importance of the bay.

Key actions

- Develop a central clearinghouse to collect available information and disseminate it efficiently to interested parties.
- Management strategies for Biscayne Bay must include coordinated public education and outreach among at least five groups: 1) primary, secondary, and post-secondary students and educators; (2) the general public, with an emphasis on involvement of minority groups; (3) public officials; (4) direct users of the bay, with an emphasis on boaters; and (5) tourists.
- The Florida Legislature should continue to provide funding for the purpose of public education and outreach regarding the long-term health of the Biscayne Bay ecosystem and south Florida's dependency on it.

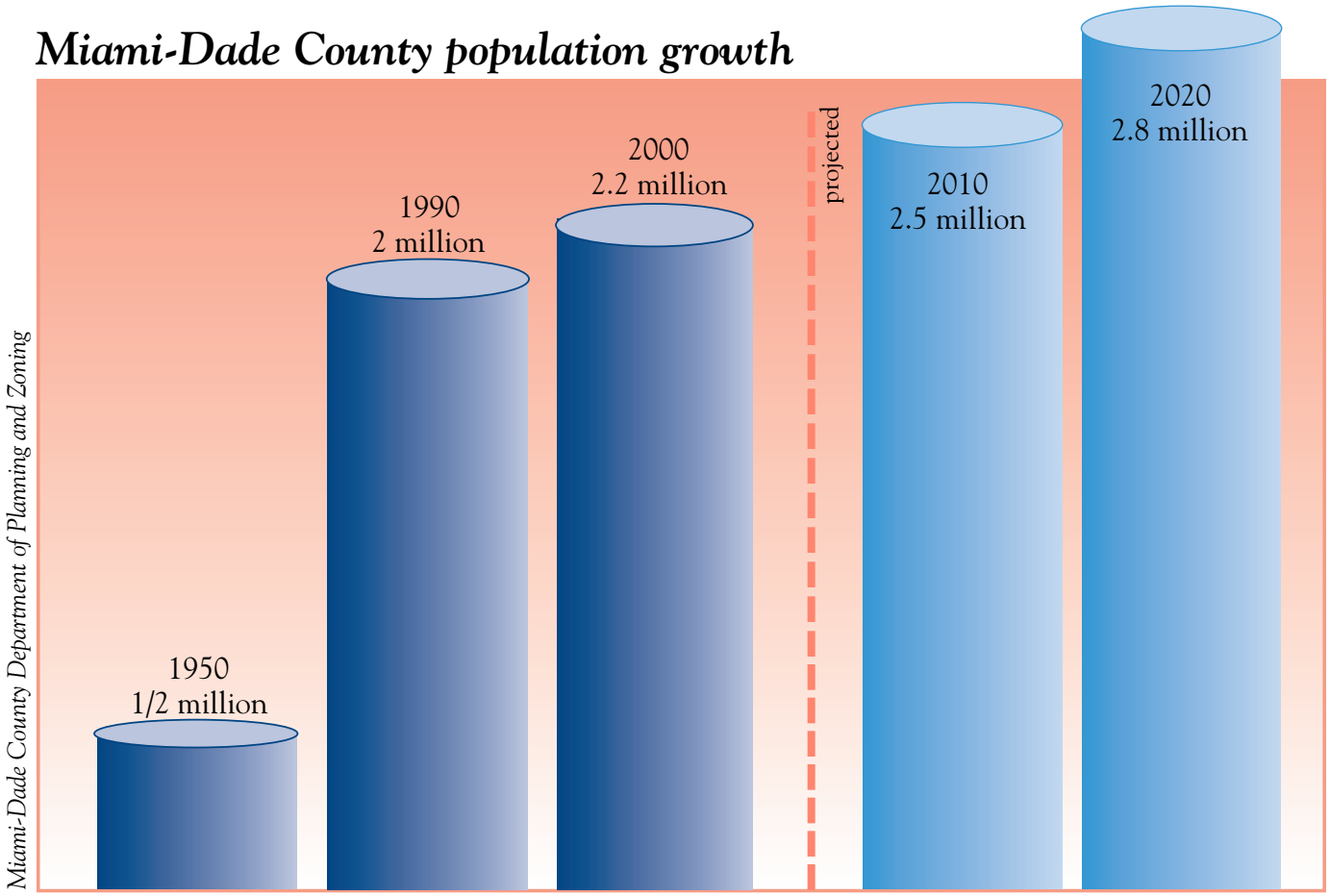
DEALING WITH THE WAVES OF POPULATION GROWTH AND SEA LEVEL CHANGE

Population and global climate change are two dynamic influences that will have profound effects on the long-term future of Biscayne Bay. Planning, restoration, and management efforts to maintain a quality Biscayne Bay will be for naught unless the role of these long-term stressors is properly addressed and incorporated. Key components of these influences must be addressed. According to the Miami-Dade County Department of Planning and Zoning, local population is forecast to rise 29 percent by 2020. More people with more demands will put more pressure on the resources of Biscayne Bay. Since 1930 sea level has been rising at a rate of one foot per century, and it is forecast to rise at least an additional two feet by 2100. We can and must assess the effects that these changes will have on the Biscayne Bay system. Furthermore, Biscayne Bay must have an independent and dynamic policy, management, and regulatory structure that is responsive to improved scientific knowledge.

Key actions

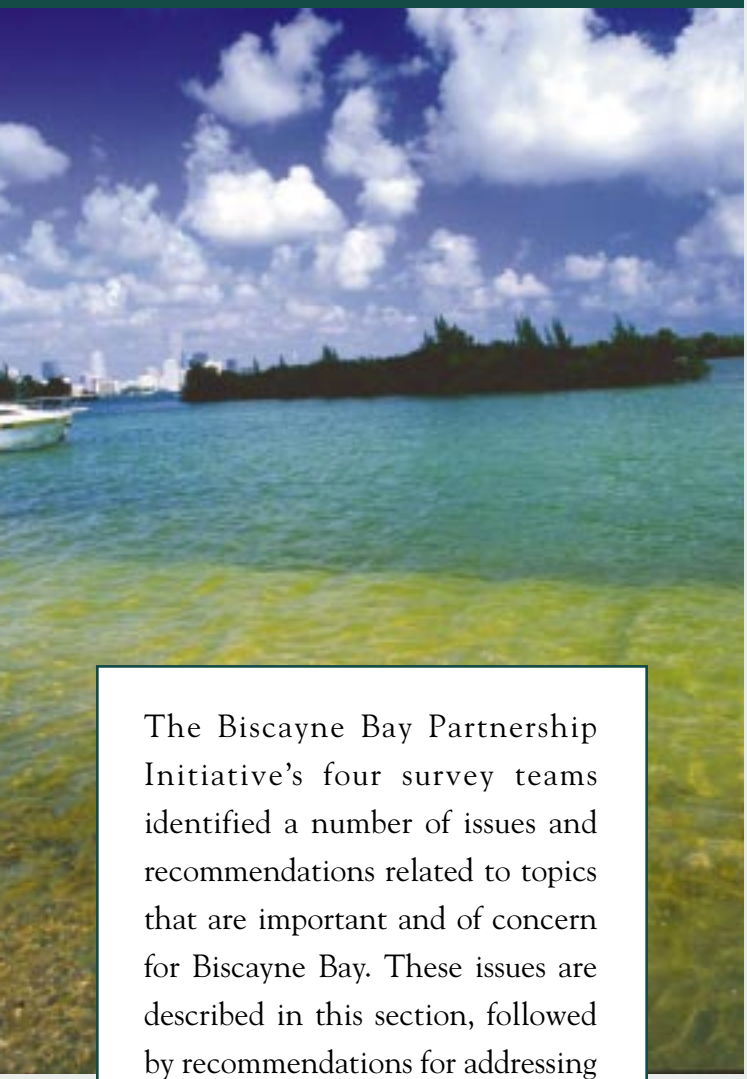
- Management of Biscayne Bay must possess a dynamic research, policy, management, and regulatory structure that is responsive to dynamic long-term stressors such as sea level rise and water and sediment quality, and that incorporates improved scientific knowledge.
- Using United States government and United Nations predictions of future sea level rise, carefully evaluate the resulting changes that will occur to Biscayne Bay, its margins, circulation, freshwater inflow, and habitats in response to global warming over the next 50 to 100 years. Incorporate resulting models of the future Biscayne Bay in all management, policy, economic, and remediation decisions.
- Support greenhouse gas reduction plans locally, globally, and statewide including the development of alternative energy sources.
- Use proactive growth management strategies rather than a reactive approach to the projected increase in human population growth in the watershed.

Miami-Dade County population growth



Miami-Dade County Department of Planning and Zoning

SPECIFIC ISSUES AND RECOMMENDATIONS



The Biscayne Bay Partnership Initiative's four survey teams identified a number of issues and recommendations related to topics that are important and of concern for Biscayne Bay. These issues are described in this section, followed by recommendations for addressing them. The information found here expands on the overarching themes and key actions identified by the Policy Development Committee.

For more information on the issues and recommendations, please consult the accompanying survey team reports or visit *www.bbpi.org*.

WATER: FRESHWATER INFLOW, SALINITY, AND CIRCULATION

Biscayne Bay is dependent upon continued and appropriate freshwater inflow that approaches natural flow. Historically and currently, the bay has received its freshwater from groundwater, surface water, and rainfall. Historic changes in land use and water management in the watershed have altered the volume, distribution, and timing of water flowing into the bay. Freshwater inflow has been significantly shifted from groundwater to surface water and sheet flow through coastal wetlands has been changed into point source discharge from canals directly into the bay. Recent evaluations predict that future urban and agricultural development and water withdrawals for urban drinking water will further reduce the amount of water flowing to the bay.

Any change in the type of water flow affects the Biscayne Bay ecosystem because of the many functions of freshwater inflow. One major function is to modify salinity, which affects physiological functions of plants and animals such as growth, survival, and reproduction. Another function is to carry terrestrially based nutrients into the estuary, where they can mix with ocean-based nutrients to provide a blend of essential minerals for photosynthesis, which supports the food web.

The two major regional water management planning initiatives underway in south Florida both have long-term planning horizons; both will influence freshwater flow to Biscayne Bay and both require detailed and reliable scientific information relating the quantity, timing, distribution, and quality of freshwater inflows to the health of the Biscayne Bay ecosystem. One of these plans, the Comprehensive Everglades Restoration Plan (CERP), has the goal of restoring south Florida's public wetlands and estuaries. The other, the Lower East Coast Regional Water Supply Plan (LECRWSP), is required by state law to "do no significant harm to natural systems while planning for future urban and agriculture water needs."

Both of these water management processes are designed to be guided by science-based ecological criteria. Knowledge about Biscayne Bay in relation to freshwater inflow is needed throughout the planning, design, and implementation phases. Biscayne Bay's future depends upon having reliable scientific information and modeling tools to protect its resources in the further development and implementation of regional restoration and water supply programs.

Mangrove islands, growing in the channel between Key Biscayne and Miami. William Folsom, NOAA.

Recommendations

- Using ecological criteria, determine the quantity, timing, and distribution of freshwater flow needed to restore and maintain a viable estuarine ecosystem in the nearshore and coastal wetland zone of western Biscayne Bay.
- Develop a spatially detailed understanding of the permeability of the aquifer and the influence of spatial variation in permeability on estimates of its relationship to groundwater flow to Biscayne Bay.
- Develop an understanding and modeling capability of salinity, circulation, and mass transport as it relates to the recommendations outlined above.
- The U.S. Army Corps of Engineers, the South Florida Water Management District, and Miami-Dade County should safeguard the ecological needs of Biscayne Bay as they develop and implement land use and water management plans and projects.

WATER AND SEDIMENT QUALITY

Biscayne Bay's water quality has improved over the past 30 years, and water quality generally meets or exceeds existing federal, state, and local standards, which are required for recreational uses and for propagation of fish and wildlife. In recognition of its exceptional values, the state of Florida has designated the bay and its natural tributaries as Outstanding Florida Waters, and as such they receive the highest level of protection from degradation. Furthermore, the Biscayne Bay Aquatic Preserve Act provides important protections for the bay and should never be weakened.

Nevertheless, some parts of the bay have been significantly affected by past development and water management practices. Loss of wetland and seagrass communities has contributed to changes in physical and ecological water quality characteristics, including increased turbidity. Also, the bay still receives dissolved nutrients, trace metals, organic chemicals, and particulates through stormwater run off from agricultural and urban land uses, canal discharge, and discharges from industrial facilities or vessels.

Future dredging and filling should continue to be the focus of scientific study to determine its impact on the water quality and hydrology of Biscayne Bay. This study should focus on both the impact of existing and new island morphology and the impact of the shipping activity using it.

Recommendations

- Quantify pollutant loading to Biscayne Bay.
- Refine water quality standards used to indicate the presence of sewage in surface water.
- Determine the effect of exposure to contaminants in surface water and sediments on local plant and animal populations.
- Develop water quality targets and performance indicators and measures that are necessary to prevent water quality degradation in Biscayne Bay.
- Future dredging and filling should be the focus of scientific study to determine its impact on the water quality and hydrology of north Biscayne Bay.
- Urgently pursue the goal of identifying and eliminating all sources of degradation, including toxicity.
- Ongoing regional restoration plans and land-based activities occurring in the watershed should be integrated and coordinated with existing management processes in protecting Biscayne Bay.
- Develop a quantitative understanding of sources of turbidity, interactions of turbidity and the benthic community, and effects of physical disturbance on the communities maintaining sediment stability.

MARINE AND COASTAL HABITAT QUALITY, RESTORATION, AND RESOURCES

Biscayne Bay supports diverse species and is known for its extensive seagrass beds, soft corals, and depleted sponge communities. Approximately 173 specially protected species are found in and around the bay, including the West Indian manatee, the bottlenose dolphin, sea turtles, and the American crocodile. Over 250 tropical or temperate fish species and many invertebrates are found in its waters. In addition, the bay, its coastal marshes, and its barrier islands provide valuable feeding grounds for a variety of birds, including white crowned pigeons, roseate spoonbills, brown pelicans, least terns, black-necked stilts, and many other birds that use the bay seasonally or year-round.

The bay is dominated by benthic communities, such as seagrasses and corals, that provide essential support for the functioning of the bay ecosytem and upon which many species of fish and wildlife depend. These benthic communities, in turn, need clear water and a substrate that is not physically disturbed. Historical changes to the bay and its margins, including the freshwater inflow regime, have degraded not only the water clarity, but also the overall

quality, diversity and functionality of the Biscayne Bay ecosystem. Turbidity caused by past dredging and filling practices, and local impacts from ongoing construction projects, prop damage, and scouring by vessels is further damaging the communities.

In addition, the bay is still substantially impacted by contaminants, sewage, and disturbance due to its proximity to Miami and a steadily growing population of more than two million people along its coastline. Sediments in parts of Biscayne Bay are highly toxic and contain substantial quantities of contaminants. The prevalence of deformities or other abnormalities in certain fish species in Biscayne Bay has alarmed fishermen, scientists, and environmental advocates. The cause of these fish abnormalities is poorly understood; however, some scientists have noted a correlation between all abnormalities and distribution of some types of sediment contaminants. Vessel traffic, which is increasing, can have an impact on bottom communities, water quality, and manatees.

Other problems include harbor dredging projects, which are needed to support an enormous growth of the shipping and cruise liner fleets serving the world. These projects, although mitigated, have been associated with degraded water quality and the destruction of essential habitats. Substantial beach renourishment projects on Miami Beach and Key Biscayne are regularly conducted to provide storm protection and recreational opportunities, but the resultant turbidity, siltation, and physical damage can impact nearshore habitats.

Finally, commercial and recreational fishing are thought to have contributed substantially to resource change in Biscayne Bay. The bay's resources have been used seasonally from the late 1700s, when the bay was visited by the migrant fishing fleet of Gloucester, Massachusetts, and even earlier by Native Americans such as the Tequesta tribe. Over the past 40 years, recreational fleet expansion has followed human population growth. The combined effects of the commercial and recreational fleets have contributed to increased fishing pressure. For example, the past 10 years have seen a growing fleet of "wing-netters" during winter months as well as shoreline netters, in addition to the long-time 20 to 30 vessel, commercial live-bait shrimp rollerframe trawlers. The rollerframe fleet damages hard bottom communities and also has fish bycatch. Researchers estimate that more than 20 percent of Biscayne Bay's bottom is swept at least four times annually by this fleet.

Recommendations

- Coordinate the requirements for reestablishing estuarine conditions in Biscayne Bay with the redesign and replumbing of the Everglades flow. It is of the highest priority to take advantage of this opportunity.
- Continue to pursue aggressive efforts that will continue the further reduction in turbidity within the waters of central and northern Biscayne Bay and will reduce physical damage to benthic communities and substrate.
- Continue to improve and expand monitoring of human-related impacts to endangered species, species of concern, and their habitats. Implement protection and recovery strategies for these populations.
- Develop and apply scientifically and economically sound methods for restoration and maintenance of freshwater wetland, coastal mangrove, and benthic seagrass and coral communities.
- Determine the status of fish and shellfish species, the extent of fishing effort, relative to the past, and the effect of fishing on target and nontarget stocks in Biscayne Bay.
- Expand education about value of habitats, species of concern, threats to the bay, and how individuals can maintain and improve the quality of the habitats and species in Biscayne Bay.
- The Florida Legislature should facilitate further acquisition of coastal wetlands and other open lands in southeastern Miami-Dade County near the bay to create a protective buffer for the bay and help redistribute freshwater inflows to Biscayne Bay, and should accelerate identification of any additional lands needed to provide these functions.

SEA LEVEL RISE

Global climate change is projected to cause dramatic to catastrophic changes to Biscayne Bay and its margins over the next century. The most significant consequence to the bay will be an increase in the rate of sea level rise. Beginning in 1930, the rate of sea level rise increased to about one foot per century, and sea level is forecast to rise at least an additional two to three feet by 2100. Consequences of that rise would include extensive destruction of coastal wetlands, major erosion of beach shorelines, increased frequency of coastal flooding, reduced stormwater drainage from low lying areas, and saltwater intrusion. With respect to the character of Biscayne Bay, we can anticipate that

global climate change will cause new and enlarged openings connecting the bay with offshore waters, changing circulation and salinity patterns in the bay, and increased frequency and intensity of tropical storms. As a result, habitat patterns can be expected to shift markedly. We can and must assess the effects that these changes will have on the Biscayne Bay system. Future development, urban planning, restoration, and management of the bay and its surroundings should be for the long-term welfare of the environments in and adjacent to Biscayne Bay. It is imperative that the high probability for significant future sea level rise be specifically addressed.

Recommendations

- Using United States government and United Nations predictions of future sea level rise, carefully evaluate the resulting changes that will occur to Biscayne Bay, its margins, circulation, freshwater inflow, and habitats in response to global warming over the next 50 to 100 years. Incorporate resulting models of the future Biscayne Bay in consideration of all management, policy, economic, and remediation decisions.
- Support greenhouse gas reduction plans locally, globally, and statewide including development of alternative energy sources.

DEVELOPING SCIENCE INFORMATION AND INCORPORATING IT INTO MANAGEMENT DECISIONS

Biscayne Bay faces many challenges and threats to its present and future well-being. The public and its representatives must be well-informed to protect the bay from the increasing pressures it faces. Biscayne Bay's future depends upon having reliable scientific information and modeling tools to restore and protect the bay in further planning, detailed design, and implementation of regional restoration and water supply programs.

A number of ongoing planning processes or proposed projects have the potential to influence the Biscayne Bay ecosystem dramatically. All of these projects require the continued development of detailed, specific scientific information that must be used to inform decision makers to ensure that activities are carried out in a manner that causes not only the least detriment, but improvement, to the bay. These processes and projects are listed below.

- Comprehensive Everglades Restoration Plan
- Development of the former Homestead Air Force Base
- Lower East Coast Regional Water Supply Plan
- Miami River clean up and dredging
- Military Canal clean up
- Sewage effluent disposal practices and the potential reuse of wastewater
- Old and malfunctioning deep well injection in south Miami-Dade County
- Port of Miami dredging, expansion, and sediment resuspension by vessels
- Marina development
- Virginia Key development and uses
- Old dumps and all operating and future landfills
- Rock mining activities
- Flood Task Force stormwater reverse and forward flow proposal
- Stresses and pollutants from urban and agriculture land use practices
- Miami-Dade County's CO_2 Reduction Plan
- Agriculture and Rural Use Study

The most urgent immediate need is for scientific information to reduce uncertainties associated with the Comprehensive Everglades Restoration Plan (CERP) and the Lower East Coast Regional Water Supply Plan (LECRWSP). CERP will restructure the regional water management system. LECRWSP will affect the issuance of long-term municipal well field permits for water withdrawals from the Biscayne Aquifer. Both plans may significantly change the quantity, timing, and distribution of freshwater inflow to Biscayne Bay. Both have safeguards to protect the bay and even improve its ability to function as a productive estuary, but these safeguards depend upon detailed scientific knowledge.

In particular, planners and designers from CERP and LECRWSP need to know how salinity patterns in the bay are affected by freshwater inputs and the specific salinity and habitat needs of characteristic species. How water quality might be affected by changes in the freshwater inputs to Biscayne Bay also needs to be understood. This involves the identification of biological indicators, performance measures about these indicators, and targets regarding what must be achieved. For the information to be most beneficial to the bay, the scientific projects to address these information needs must begin immediately.

Other issues of concern relative to Biscayne Bay will also benefit from greater knowledge about the bay. Scientific knowledge is critical to the bay's future. A sound

scientific understanding of the bay and its past and present living resources will promote better stewardship by the people of Miami-Dade County and their representatives.

Funding is not adequate to address the urgent immediate and continuing science needs of Biscayne Bay. State funding is requested for a strategic science program for Biscayne Bay.

This plan should be accomplished through interaction among scientists and managers to define a strategic plan for scientific research, monitoring, and restoration needs, priorities, and funding in order to guarantee the present and future welfare of Biscayne Bay. Development of a strategic science plan should be supervised by a Science Committee and modeled after the Florida Bay Project Management Committee. The Science Committee would also perform a number of other functions, including monitoring the quality of science being conducted and assuring rapid dissemination of data, information, and conclusions. These are described in detail in the Science Survey Team report.

Recommendations

- The Florida Legislature should provide funding for the development of a strategic science plan.
- The Florida Legislature should provide long-term research funding to build scientific knowledge about the bay that can be used in regional water management planning processes to protect and restore the bay, as well as funding for interaction with the public and its representatives.

PHYSICAL AND VISUAL ACCESS AND DEVELOPMENT OF THE SHORELINE

Biscayne Bay is an integral part of the daily lives of the thousands of people who work, commute, or live near it. A bay of tropical splendor, it also has the distinction of being surrounded by an incredibly vibrant and diverse metropolis. Its inviting waters make it a premier recreation spot for residents and visitors alike. The beaches, causeways, sandbars, and parks at its edges provide the settings for leisurely access to one of the world's great water bodies.

Unfortunately, thousands of residents and visitors to south Florida do not have adequate access to the bay. Because of limited access, many people who grew up in the bay area do not have a strong tradition of bay use. Other people are new arrivals from other parts of the United States or other countries who bring with them differing traditions of water use and varying amounts of exposure to marine communities. Consequently, today there are people living within a few miles of the bay who have never been boating or swimming there. Appropriate, environmentally compatible bay access is essential if we are to foster a sense of community pride and ownership of Biscayne Bay.

Questions about public access to the bay go to the heart of the area's character as a region, the democratic nature of its political culture, and its sensitivity to the environment. Everyone, regardless of economic or social circumstances, is entitled to visual access to the bay from public lands and to physical access to the bay, provided that the types and intensities of access are safe and compatible with protecting the bay's natural systems and threatened or endangered species.

Several factors affect the ability of people to have access to the bay. For example, a hotly contested issue has been the use of dedicated public parks and other publicly owned property along the shoreline for commercial purposes, limiting future opportunities for public access and recreation. Another is the continuing trend of converting waterfront property into nonwater-dependent uses. Issues of public access have involved struggles over port development, potential impacts, and user conflicts among various types of vessel use, and the fact that much of the urban shoreline of the bay has become privatized and lined with residences. Finally, the forms of public transportation taking people to the waterfront and around the bay limit the ability of many to enjoy the water or constrain the tourist industry's ability to present a more comprehensive experience of our region. As a result, people who do not live or work near the bay shore frequently do not have adequate access to the water.

Many of the bay's shoreline parks are heavily used, but others are notably underused or closed. The infrastructure at many shoreline parks is outmoded, inappropriate, and in a state of disrepair. Successful parks, such as Kennedy Park in Coconut Grove, stand in stark contrast to Bicentennial Park or Jose Marti Park, which have poor security, design problems, and little active use. Waterfront parks are key green spaces—connecting urban life to the water. To be successful, these parks and other bay access points must be safe, actively used, attractive, and properly maintained with infrastructure and amenities that are tied to user needs.

Recommendations

- Preserve, protect, and enhance all existing public access opportunities, sites, and facilities along the bay shoreline.
- Link access points using a variety of economic and commercial activities (e.g., shoreline restaurants and attractions, boat tours) and transportation modes (e.g., bus, water taxis, bicycles, boats). People should be made aware of access points via improvements in signage and information about public transportation to these access points.
- Ensure that all public lands, causeways, barrier islands, and parks abutting Biscayne Bay provide accessible public access to the general public, and provide the maximum opportunity for public recreational and educational experience, subject to carrying capacity. In addition, restore and improve public access, as well as infrastructure in these areas to accommodate existing and future public needs.
- Ensure that public access is equitable. All segments of the population, including those who are not familiar with the bay, should have access to bay-related programs and opportunities. Every child should access the bay at least once a year through an educational experience.
- Improve visual and physical access to the bay whenever possible by implementation of the Shoreline Development Review ordinance. This is especially true today when passive recreational activities such as walking are very popular. Access should be provided at both the neighborhood and regional levels.
- Preserve water-dependent uses and facilities along bay shoreline.
- Local governments should adhere to existing adopted policies in their comprehensive plans and zoning regulations that set waterfront use priorities.
- Maintain public shoreline access spaces that are free from debris.
- Maintain green space.

POPULATION AND ECONOMIC GROWTH

Miami-Dade County has experienced tremendous population growth since 1900 and will continue to do so. With a population of 2.2 million, Miami-Dade County accounted for 13.9 percent of Florida's total population in 1999. By 2010, the county's population is expected to exceed 2.5 million. During the coming decades, this population growth will make it more difficult to preserve and enhance Biscayne Bay as demand for access to the bay and human activity surrounding the bay increases. Perhaps most important, if current trends persist, much of the area's population growth will come from outside Florida and outside the United States; Miami-Dade County will thus continue to become home for citizens who are not familiar with the bay ecosystem and who will need to be educated about its value to our community.

In addition, Miami-Dade County's economy, though diversified, may be unable to meet the demands of its growing population. In the absence of plans to decelerate population, Miami-Dade County's population is likely to become larger, poorer, and more diverse. The influx of new citizens will need places to work, live, and play, placing increased pressure on both the economy and the environment. Miami-Dade County's economy will continue to be a major concern for public officials as they try to find ways to accommodate newcomers to the community over the next decade. It is important to remember that the area's natural resources are the very basis of its economy.

Population growth and related economic pressures have historically led to unplanned urban expansion and alteration of vast areas of uplands and wetlands. This long-term trend is closely connected to the rise of development and construction as a major sector in the local economy. The current importance of that economic sector itself stimulates continued demand for new land for development. Urban growth has already consumed lands that were vitally important to the health of Biscayne Bay. Further loss of open space and farmland would greatly increase the bay's peril and should be discouraged.

In recent years, state and county governments have made efforts to direct future development away from such lands and back into existing underused urban areas. The success of these efforts, however, is undetermined. Further, there are no major programs to slow the expected increase in population or to shift the area's economy to make it less dependent on new development and more on other sectors of economic vitality.

For the past one hundred years there has been a strong relationship between the economy and quality of life in Miami-Dade County and Biscayne Bay. The importance of the Port of Miami to Miami-Dade County's economy is well documented. The marine activity of the Miami River also makes a significant contribution, particularly with regard to the cargo carrier industry and trade with Latin America and

the Caribbean. Shoreline attractions, such as the Miami Seaquarium and Bayside, tour and party boats, charter boats, guided fishing trips, shoreline restaurants, various water-related recreational activities, along with sales and service businesses such as boat sales and repairs also contribute to the local economy. Taken altogether, bay-related commercial and recreational activities and facilities may account for approximately 15 to 20 percent of the local economy. Of potentially even greater impact is the market and tax value of shoreline real estate.

Even though the area boasts great affluence among some of its population, Miami-Dade County has one of the largest proportions of poor people in the country. Because of expected population growth, the demands facing the county are quite large, and it is likely that the use of Biscayne Bay for water-dependent and water-related economic activities will continue. Currently, it appears as though the most important direct economic impacts on the bay are those found at the Port of Miami. Given the importance of these activities to the area's economy, there will probably be significant pressure to increase their intensity and perhaps their physical scope.

Nevertheless, economic expansion that is compatible with a healthy, sustainable bay should continue to be encouraged over other economic activities that are not. Public officials will need to pursue an aggressive program of environmental restoration, not merely the preservation of current natural habitat and water quality. In addition, increased use of "Best Management Practices" to reduce the impact of watershed development and bay uses is needed to encourage more sustainable growth. This means that water-dependent and water-related economic activities should be made compatible with the enhancement of the bay ecosystem, or they may not be allowed to expand or even continue.

Recommendations

- Encourage the use of waterfront property (along the bay and the Miami River) for habitat restoration, public access, or where appropriate, job producing, water-dependent, commercial activity that is compatible with environmental protection.
- Conduct a comprehensive study assessing all economic activities affecting or affected by Biscayne Bay. This study would identify the value of commercial activities and residential property, the age and condition of structures, zoning regulations, and land use plans around bay waters, as well as the environmental impacts of all these activities.
- Carrying capacity of Biscayne Bay should be determined and not exceeded.
- Encourage the containment of urban development within present urban boundaries, focusing on currently developed, but underused, areas.
- Provide incentives for the growth of economic sectors that do not rely strongly on development of new lands, to reduce the economy's dependence on rapidly expanding development.
- Study other areas of the country that have successfully slowed population growth without harm to the economy or the quality of life, in search of possible means for slowing the population explosion in southeastern Florida.

ADEQUACY OF REGULATIONS AND ENFORCEMENT

Over the years, many laws, rules, and regulations have been passed and implemented to protect the bay and govern its use. However, challenges still remain in improving regulation for both the regulated and the regulators. Current regulations and agency structures are generally adequate to manage activities within the bay; however, they are inadequate to protect against impacts to Biscayne Bay from urban development and other land uses within the watershed. In addition, the effects of population growth and its resulting increase in bay use are exacerbated by a decrease in enforcement, regulatory personnel, resources, and assets. Finally, there is no comprehensive data source that quantifies impacts to Biscayne Bay caused by the different types of uses, and no central clearinghouse to collect available information and disseminate it effectively to interested parties.

When it comes to regulating activities within Biscayne Bay, existing local, state, and federal laws and regulations are generally sufficient, although compliance is inadequate. Furthermore, current laws and regulations are inadequate to protect against impacts to Biscayne Bay from development of lands within the watershed. The effects of increasing population and the resulting increase in bay use are exacerbated by a substantial decrease in law enforcement personnel and regulatory assets. Agency resources, including personnel, boats, and equipment, are needed for adequate enforcement. For example, currently there is no 24 hour, 7 days per week, marine patrol coverage. In addition, there is no formal enforcement mechanism of the Shoreline Development Review Committee recommendations regarding development fronting Biscayne Bay, and the

committee has no jurisdiction over the majority of south Biscayne Bay. Also, state law does not provide options for enforcement officers to treat violations as civil or criminal. Finally, there is no law, in the same manner as in Biscayne National Park, which allows for criminal and civil penalties to address vessel grounding damage to benthic resources.

Other problems revolve around the need to improve coordination and communication, not only among agencies, but also with the public. While the various local, state, and federal agencies that have jurisdiction over Biscayne Bay are aware of their jurisdictions and responsibilities, the public is often uninformed and uncertain about which agency responds to various situations.

Education about requirements and enforcement of regulations is also hampered by inadequate and poorly maintained marine signage on the bay. Many existing signs and markers are in disrepair and, therefore, do not function to inform the public about current laws and regulations. In addition, there is a need for more signage to address issues such as illegal mooring and to better mark existing channels and speed zones.

Regulators and agency public information providers should work together closely to ensure that the community has access to information about regulations. In addition, regulators and educators should collaborate during the regulatory development stage, when input from educators could help identify potential shortfalls in regulatory proposals prior to their enactment. Regulators must work closely with the community at large to develop innovative enforcement strategies with incentives for compliance and disincentives for noncompliance. Limited enforcement assets dictate that the community voice their enforcement priorities to deal with violators vigorously. At the same time, enforcement professionals must seek voluntary compliance via education and incentive.

Recommendations

- Improve current and subsequent regulations and agency structures to protect against impacts on Biscayne Bay caused by human activities and natural catastrophes.
- Increase funding and other resources for enforcement, public information, signage and its maintenance, and regulatory efforts to increase compliance rate.
- State law enforcement officers should have the option of treating violations as civil or criminal.
- Mark channels, seagrass beds, and coral areas and provide maintenance for markers and signage.
- Develop a mechanism to ensure that Shoreline Development Review Committee resolutions are implemented and expand the committee authority to include all of Biscayne Bay and its adjacent shoreline areas.
- Improve the decisionmaking process by providing a system of feedback from affected user groups to the regulators and legislators.
- Develop a data source that quantifies impacts to Biscayne Bay caused by the current user population, including recreational and commercial users.
- Expand the Marine Advisory Support Team (MAST) to include an interagency marine regulatory task force to address baywide enforcement issues.
- Designate a common marine law enforcement radio frequency for Miami-Dade County to conduct interagency operations. All agencies engaged in marine enforcement within the geographical areas of Miami-Dade County should be mandated to install this communication capability on their vessels.
- Enact a law, in the same manner as in Biscayne National Park, which allows for criminal and civil penalties to address vessel grounding damage to benthic resources.

MANAGEMENT APPROACHES AND COORDINATION AMONG AND BETWEEN GOVERNMENT, NONPROFIT, AND PRIVATE ENTITIES

Over the years, a variety of management plans and processes have been developed to address important Biscayne Bay issues. Many of those plans and processes are currently being implemented. While the goal is to do even more, a broad array of management plans and processes can be credited with many significant accomplishments in protecting and restoring bay resources. Some of the numerous existing or proposed management plans and studies that directly impact Biscayne Bay are listed below.

- Biscayne Bay Management Plan (adopted 1981)
- Biscayne National Park General Management Plan (completion by 2003)
- Biscayne National Park Resource Management Plan (completed 1998)
- Biscayne Bay Aquatic Preserve Rule and Act (established 1974)

- Lower East Coast Regional Water Supply Plan (completed 2000)
- Biscayne Bay Surface Water Improvement and Management Plan (completed 1988, revised 1995)
- State Park Plans (completed and revised 1997-2000)
- Central and Southern Florida Project Comprehensive Review Study and Comprehensive Everglades Restoration Plan (completed 1999)
- *Coordinating Success: Strategy for Restoration of the South Florida Ecosystem*, prepared by the South Florida Ecosystem Restoration Task Force (July 2000)
- South Florida Multi-Species Recovery Plan (finalized 1999)
- South Dade Agriculture Area Study (expected completion November 2002)
- South Dade Watershed Plan (proposed completion 2002)
- Dredged Material Management Plan for the Intracoastal Waterway in Miami-Dade County, Florida (proposed completion 2000)
- The Port of Miami Comprehensive Master Plan (completed 2000)
- Miami River Master Plan (completed 1992)
- The Miami River Study Commission Report (completed 1998)
- The Florida Keys National Marine Sanctuary Management Plan (completed 1996)
- The Florida Keys National Marine Sanctuary Water Quality Protection Program (completed 1993)
- The Final Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council (completed 1998)
- Miami-Dade County Comprehensive Master Development Plan (in relevant parts) (revised 2000)
- Miami-Dade's CO_2 Reduction Plan (completed 1992, adopted 1993)

The management of Biscayne Bay is guided by management plans such as the ones listed above, which are often created by individual agencies. Management plans encompass a variety of activities including public involvement, education, and access, and environmental protection, restoration, enhancement, monitoring, research, evaluation, and enforcement. There are a significant number of excellent management efforts currently underway in Biscayne Bay. Those management efforts are based on years of experience and have resulted in significant improvements to the bay. Any future management activities should build upon these existing efforts, rather than "reinventing the wheel."

Funding is an important issue in the implementation of management processes and plans. The existing management processes and plans have received some significant funds in the past. Many plans and projects designed to enhance the bay exist, but funds are not currently available for implementation. A greater and more consistent level of funding, including the use of matching funds, would help management processes be more effective in the restoration and enhancement of Biscayne Bay.

The management of Biscayne Bay involves a large number of local, state, and federal agencies as well as nongovernmental organizations and individuals. It is always challenging to maintain effective communication and coordination among so many entities. Improved interagency coordination would enhance management processes and result in better protection and restoration of bay resources.

All stages of the management process should include community stakeholder input because users of the bay are impacted by decisions regarding its management. Protection and enhancement of Biscayne Bay are dependent on public support. Finally, managers and citizens should be constantly aware that Biscayne Bay is part of a larger ecosystem and it is directly impacted by the activities on the surrounding land and by the waters connected to it. For example, the water management system that controls water flow to Biscayne Bay will be restructured by implementation of the Comprehensive Everglades Restoration Plan and affected by regulatory changes associated with the Lower East Coast Regional Water Supply Plan; managers must be prepared to deal with potential changes in freshwater inflow to the bay. The existing management processes for Biscayne Bay would be more effective in protecting the bay with a stronger consideration of ongoing regional restoration plans, land use, and water management activities in the watershed.

Recommendations

- Build any future management activities upon existing efforts, rather than "reinventing the wheel."
- Adhere to the letter and intent of the Biscayne Bay Aquatic Preserve Act.
- Ongoing regional restoration plans and land-based activities occurring in the watershed should be integrated and coordinated with existing management processes for the protection of Biscayne Bay.

- Form a Biscayne Bay Project Coordination Team as part of the Working Group of the South Florida Ecosystem Restoration Task Force.
- The Florida Legislature should provide a greater and more consistent level of funding to assist management programs and scientific studies aimed at restoration and enhancement of Biscayne Bay, especially with regard to ongoing regional water management planning processes.
- The Florida Legislature should fund additional Biscayne Bay projects in order to leverage matching funds, greatly enhancing the value of the initial state allocation.
- Improve interagency coordination to enhance management processes and result in better protection and restoration of bay resources.
- Include community stakeholder input at all stages of the management process.
- Implement coordinated education and outreach programs.
- Develop and maintain an openly available GIS database layered to contain all historical and future publicly funded scientific research, modeling, and monitoring data and results.

PUBLIC AWARENESS AND EDUCATION

Biscayne Bay faces many challenges and threats to its present and future well-being. Only a well-informed public and its representatives can protect the bay from the increasing pressures of diversion of freshwater flow, development of coastal wetlands, recreational activity, port and marina expansion, and damage related to fishing techniques. Scientific knowledge is critical to the bay's future. An understanding of the bay's characteristic species, communities, and support functions and the interactions among the bay ecosystem's many components will help promote and guide efforts to protect and restore the bay.

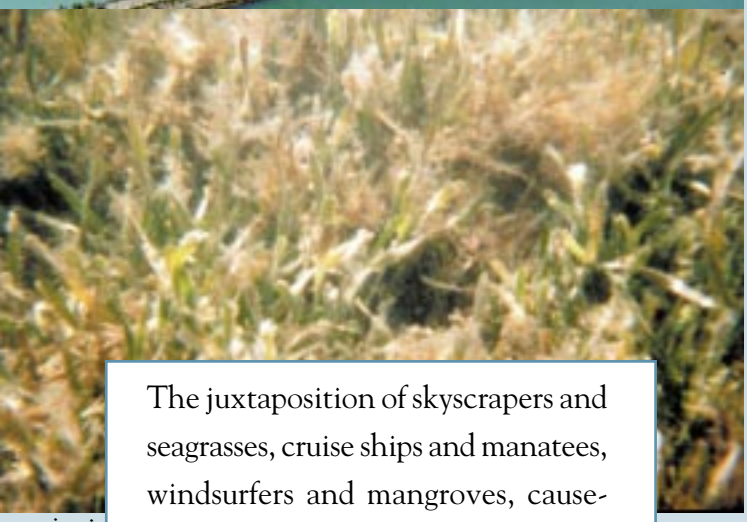
Most of the 2.2 million people living in the Greater Miami area lack first-hand exposure to Biscayne Bay and its dynamics. Miami-Dade County public schools serve 360,000 students with no less than 10,000 additional students entering the system each year. At present there are a small number of environmental education programs being carried out by the public and private schools, environmental organizations, and federal and state agencies. While these programs are often of very high quality, they reach only a fraction of the student population in Miami-Dade County in any given year. Furthermore, their focus is typically broader than Biscayne Bay.

There is still a great need for environmental education activities and resources focused specifically on the bay reaching not only students, but all residents. In addition, the rich cultural diversity of the communities surrounding the bay needs to be recognized, and all existing and new educational initiatives need to be geared to the area's many audiences and cultures. Both materials and signage in the bay need to reflect these cultures by being prepared in appropriate languages and media to provide information that is useful to all. Finally, special effort needs to be given to educating our community and neighborhood leaders so that they can both understand the impacts of their decisions and help to educate their constituents about the importance of the bay.

Recommendations

- Determine the target audiences that need to be reached, how they can best be identified, and create a coordinated education and outreach program to address their needs.
- Provide education about the bay, including an awareness of its legacy, and regular visits in all school programs in Miami-Dade County.
- Develop a procedure to keep all decision makers abreast of decisions and recommendations of bay-related committee and program successes as they are achieved.
- Improve the process for getting existing public education material, including adult and multilingual material, disseminated to people who need it.
- Develop public information programs for new residents and tourists in nontraditional educational avenues, including radio, television, Internet, and signage.
- Carry out a vigorous education program on the value of Biscayne Bay's important plant and animal communities, how to enhance the quality of Biscayne Bay's environments, and how to prevent damage to the most critical elements.

CONCLUSION



Top: Cruise ships preparing for departure. Carnival Cruise Lines.
Bottom: Mangrove roots in Biscayne Bay. NOAA.

The juxtaposition of skyscrapers and seagrasses, cruise ships and manatees, windsurfers and mangroves, causeways and sea turtles makes Biscayne Bay unique. The bay provides us with a forum for international trade, site for world class water sports, and opportunities for peaceful reflection.

The community that surrounds it is one of the most diverse in the United States. That combination of modern metropolis and natural beauty, work and play, and longtime residents and newcomers makes us who we are and compels us to seek ways to preserve and enhance this precious part of our heritage.

Biscayne Bay is a gift of nature and, like all fine gifts, deserves to be treated with care. The Biscayne Bay Partnership Initiative has spent the past year assessing the status of the bay's resources, and offers the information and recommendations included in this report as its contribution to preserving and protecting the bay and its natural, social, and economic values.

This report is the product of many talented and dedicated people who have given their time, energy, and expertise to the Biscayne Bay Partnership Initiative. Their spirit and commitment to a healthy, vibrant Biscayne Bay is inspiring and impressive. It is our hope that theirs will be the first steps among many efforts to ensure that Biscayne Bay remains a "bright, great bay."

An important element of the Biscayne Bay Partnership Initiative process was the development and maintenance of its Web site: *www.bbpi.org*. The site was created to maximize the opportunity for public input, ensure that team members and public participants were able to communicate efficiently and effectively, and to allow for the broadest dissemination of background materials and project documents. Online discussion groups were created for each survey team, the Policy Development Committee, and the general public. This interactive feature allowed for contemporaneous feedback from Initiative members and the public, and was a useful tool in the development of the reports.

The Web site continues as a valuable resource and enables users to access general project information, summaries of all team meetings, background documents and reports, GIS data and maps, information about outreach activities, and related links and resources. Copies of this report, as well as the four survey team reports, can be found on this site.

For more information about the Biscayne Bay Partnership Initiative, visit www.bbpi.org

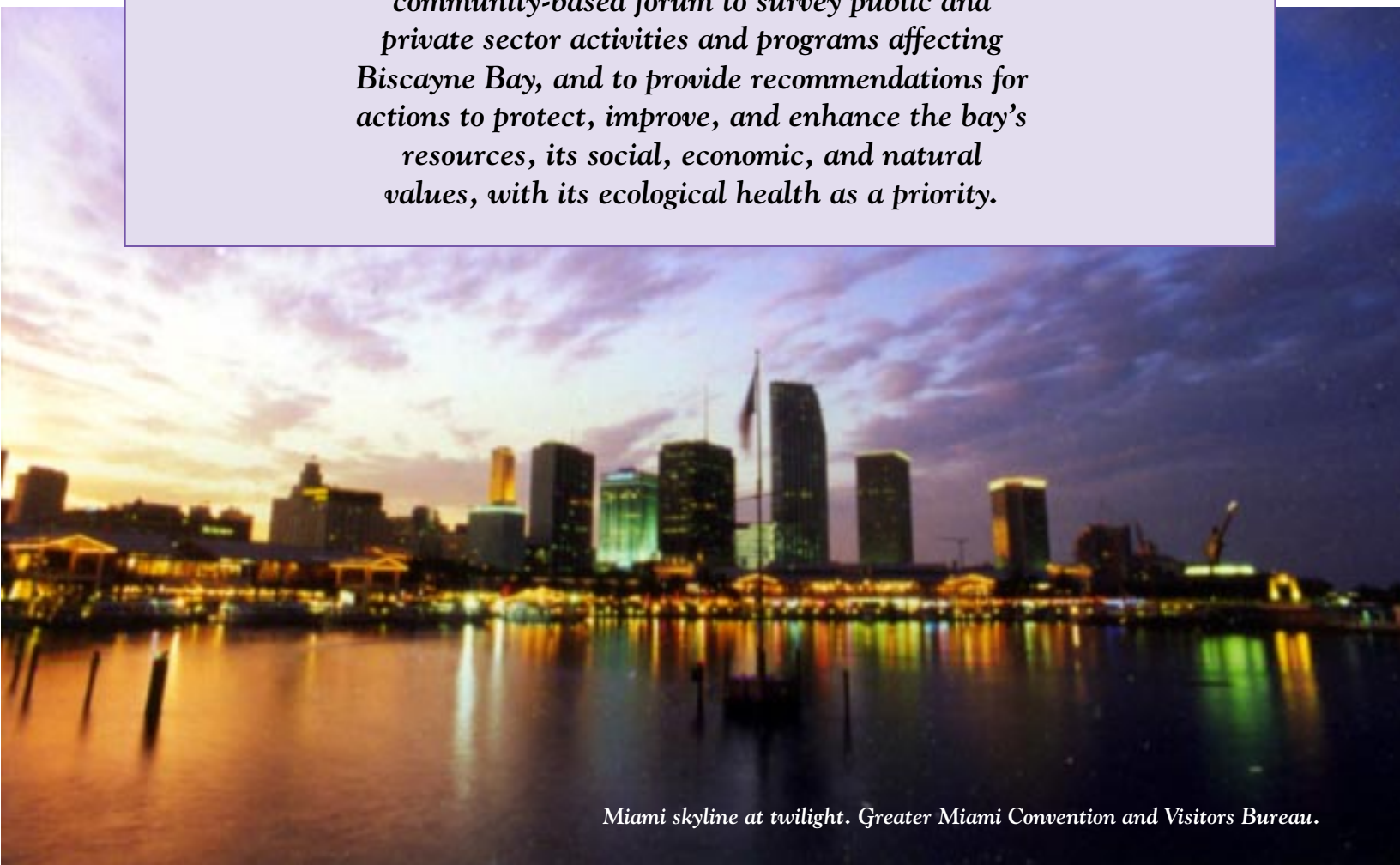
ABOUT THE BISCAYNE BAY PARTNERSHIP INITIATIVE

The Biscayne Bay Partnership Initiative was created by the 1999 Florida Legislature to survey the status of Biscayne Bay's resources and their management, and to produce a final report of its findings and recommendations to the Florida Legislature in early 2001. Part of the philosophy behind the Initiative is a belief that conflicts among what appear to be competing values—public access, economic use, and environmental protection and restoration—can be managed through vigorous public effort and a collective commitment to a long-term vision of the bay, not only as it is now, but also as an even more impressive natural setting interwoven with a great metropolis.

This report was prepared by the Biscayne Bay Partnership Initiative's Policy Development Committee. It contains the results of the Initiative's survey of the status of the bay's resources and recommendations for their protection, improvement, and enhancement. It is not a summary of the survey team reports, but is based largely on the tremendous and laudable efforts of four subject specific survey teams that focused specifically on findings and recommendations regarding science, social and economic values, regulation, and management. The complete reports of each of the survey teams accompany this report. The reader is encouraged to consult the survey team reports for additional information.

BISCAYNE BAY PARTNERSHIP INITIATIVE MISSION

The development of an open and inclusive, community-based forum to survey public and private sector activities and programs affecting Biscayne Bay, and to provide recommendations for actions to protect, improve, and enhance the bay's resources, its social, economic, and natural values, with its ecological health as a priority.



Miami skyline at twilight. Greater Miami Convention and Visitors Bureau.

A LETTER OF THANKS

Christo's Surrounded Islands in Biscayne Bay, 1980-1983. Wolfgang Volz.

After over a year of hard work by many, many people, we are pleased to deliver this report, *A Bright, Great Bay*, by the Biscayne Bay Partnership Initiative Policy Development Committee. Biscayne Bay is one of Florida's most beautiful and productive resources. It provides enormous social, economic, and environmental value not only to the people of Miami-Dade County, but also to the state of Florida, the nation, and even other countries. It is vitally important that we take the steps necessary to protect and enhance this important resource.

The production of this report was dependent on the efforts and contributions of many people and organizations. In particular, we would like to thank the state of Florida and the South Florida Water Management District for providing funding to make the Biscayne Bay Partnership Initiative possible. Additional support was provided by Carnival Cruise Lines, BellSouth, Budweiser, Pisco Bauzá, Florida Power and Light, Sealine, Carlton Fields, and the Curtis and Edith Munson Foundation.

Many meetings were held at numerous locations around the Biscayne Bay area. Our sincere thanks to the following entities for hosting our meetings over the course of the last year:

Biscayne National Park
Florida International University
Maritime and Science Technology (MAST) Academy
Marjory Stoneman Douglas Biscayne Nature Center
Miami-Dade Community College
Miami-Dade County Commission
Southeast Fisheries Science Center, NMFS NOAA
Port of Miami
South Florida Water Management District
United States Geological Survey
University of Miami Rosenstiel School of Marine and Atmospheric Science
Wyndham Biscayne Bay Hotel

Finally, we would like to express our gratitude to the Honorable Harvey Ruvin, Miami-Dade Clerk, for his skillful leadership, to the eight co-chairs of the four survey teams for their hard work and commitment, and to all of the participants of the Biscayne Bay Partnership Initiative. Without their efforts, this report would not have been possible.

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