



The ICW is a navigational channel that was cut through the major estuarine waterbodies of eastern Palm Beach County in the early 1900s. The majority of natural systems associated with the Intracoastal are contained in the Indian River Lagoon, Loxahatchee River, and Lake Worth Lagoon, each of which is undergoing a variety of restoration and enhancement efforts. These waterbodies support important natural systems such as seagrass beds and mangrove communities, which are integral for the spawning of and nurseries for fish and marine life. In addition, these areas contain manatees and manatee habitat, which represent environmental priorities for Palm Beach County and the state. The ICW Plan supports the continued implementation of on-going projects and programs to restore and enhance these natural systems. In addition, the Plan addresses the issue of stormwater management and introduces concepts for improved stormwater treatment related to the Intracoastal. Finally, the effects of sea level rise are evaluated as they relate to the ICW, and a series of strategies are presented to address this issue along the waterway.

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The Atlantic Intracoastal Waterway is a navigational channel that was cut through the major estuarine waterbodies located in eastern Palm Beach County. In Palm Beach County, the Intracoastal runs for about 1.5 miles through the Indian River Lagoon, less than a mile through the Loxahatchee River, and about 20 miles through Lake Worth Lagoon. The ICW was completed from the south end of the Lake Worth Lagoon to Biscayne Bay in the early 1900s. Peanut Island, as well as other spoil islands, was created from spoil dredged from the inlets and waterway.

The majority of the natural systems associated with the ICW in Palm Beach County are contained in the Indian River Lagoon, Loxahatchee River, and Lake Worth Lagoon. These waterbodies support important natural communities, including seagrass beds and mangrove forests, which serve as a major spawning and nursery area for fish and marine life. The Lake Worth Lagoon Management Plan Revision is the most comprehensive program addressing water quality, habitat and species issues relevant to the ICW in Palm Beach County. Goals of this plan focus on improving water quality, decreasing the amount of suspended material, and habitat restoration, enhancement, and monitoring. The plan identifies a number of specific action plans to implement these goals.

The Palm Beach County Manatee Protection Plan is another important plan relative to use of the ICW. The main objectives of the plan are to implement strategies and policies that will protect manatees and manatee habitat, promote and increase public awareness of manatees and manatee habitat, promote safe boating, and allow reasonable recreational and commercial use in the coastal zone in a manner consistent with the protection of manatees and manatee habitat. The plan includes eight priority initiatives to provide comprehensive protection for manatees in local waterways.

This report notes the Miami-Dade County Climate Change Advisory Task Force recently found there is

a very high likelihood that there will be at least a 3 to 5 feet rise in sea level during the next century. This report recommends following the Task Force's recommendation to adopt a 50-year planning window to accommodate an anticipated rise in sea level of 1.5 feet over the next 50 years and 3 to 5 feet over the next 100 years.

The Intracoastal Plan recommends continued support for the existing management plans to improve water quality, restore estuarine habitats, and protect manatees. The report also recommends that Palm Beach County establish a stormwater utility to assist in improving water quality. Finally, the report recommends support for several programs to plan for sea level rise in Palm Beach County.

### Overview of the Natural Systems

The ICW is a 10-foot deep, 100-foot wide navigational channel that was cut through the all of the major estuarine waterbodies located in eastern Palm Beach County. The ICW enters Palm Beach County from Martin County to the north and passes through the Indian River Lagoon, Loxahatchee River, Lake Worth Creek, Lake Worth Lagoon, Lake Rogers, Lake Wyman, and Lake Boca Raton before exiting to Broward County in the south. The majority of the natural systems associated with the ICW in Palm Beach County are contained in the Indian River Lagoon, Loxahatchee River, and Lake Worth Lagoon. This chapter describes the existing natural systems associated with the major waterbodies traversed by the ICW in Palm Beach County.

### Indian River Lagoon

The Indian River Lagoon is a 156-mile long estuary separating the barrier island from the mainland on the east coast of Florida. Only the southern 1.5 miles of this waterbody, extending from the Martin County line to the Jupiter inlet, lies within Palm Beach County. The Indian River Lagoon has been designated as an Estuary of National Significance in

the National Estuary Program because of its diverse natural resources, which are well-represented in the Palm Beach County portion of the lagoon. Extensive seagrass beds in the shallow waters and tidal swamp forests dominated by mangroves along the shoreline contribute to the lagoon serving as a major spawning and nursery ground for fish and marine life.

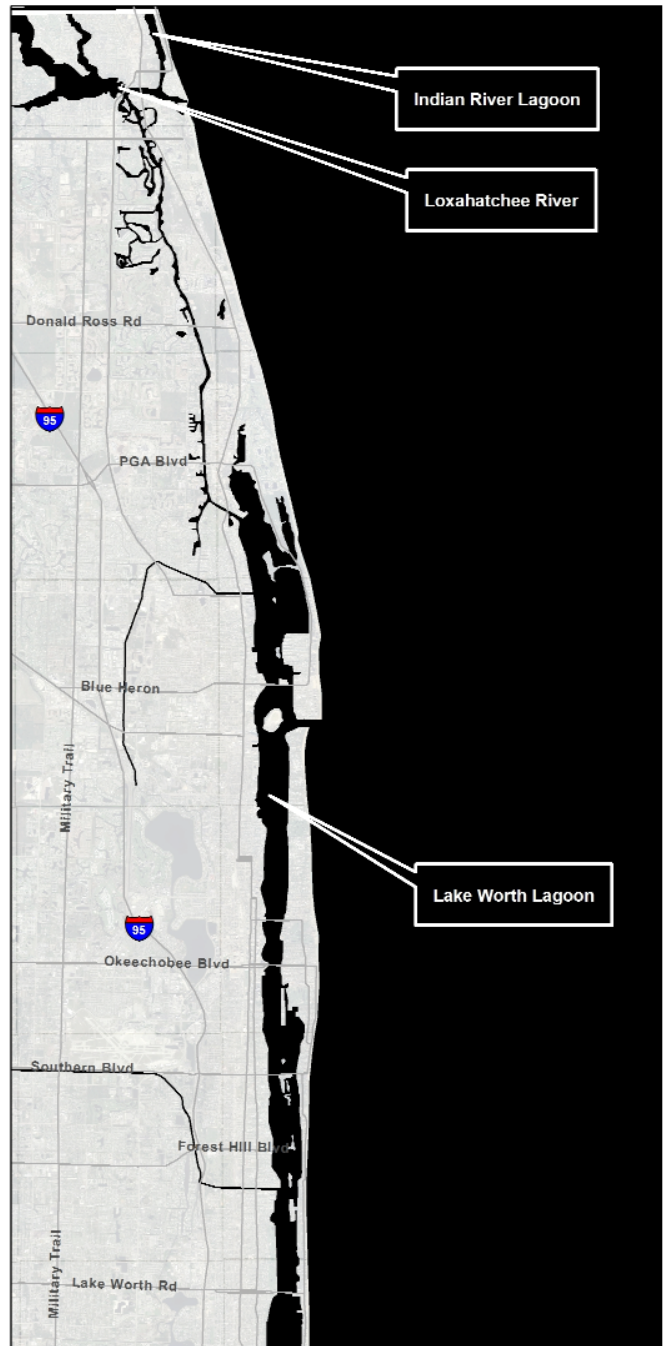
**Loxahatchee River**

The ICW extends less than a mile through the Loxahatchee River near the Jupiter Inlet. The main branch of the Loxahatchee River is the Northwest Fork, which is joined by the Southwest Fork and the North Fork before emptying into the Atlantic Ocean through the Jupiter Inlet. A portion of the Northwest Fork of the Loxahatchee River upstream from the ICW is designated as a National Wild and Scenic River because of its outstanding natural qualities. However, the ICW does pass through the Loxahatchee River – Lake Worth Creek Aquatic Preserve where it exits the Loxahatchee River to the south. Estuarine natural communities in this area include mangroves along the shoreline with submerged resources including tidal flats, seagrass beds and oyster bars.

**Lake Worth Lagoon**

The ICW passes through Lake Worth Lagoon, a 20-mile long estuary separating the barrier island from the mainland. This estuary is located centrally along the east coast of Palm Beach County. Similar to the Indian River Lagoon, Lake Worth Lagoon has important natural communities, including seagrass beds and mangrove forests, which support a variety of fish and wildlife. This estuary is equally important for providing recreational opportunities and is vital to commerce and maintaining the economy of the marine industries in Palm Beach County.

In predevelopment conditions in the early 1800s, Lake Worth was primarily a freshwater system without permanent connections to the ocean (Dames



*As pictured in the map above, the ICW in Palm Beach County traverses three distinct natural waterboies, including the Indian River Lagoon, Loxahatchee River, and Lake Worth Lagoon.*

and Moore et al. 1990). The first major change to the system was in 1877 with the construction of an inlet, which changed Lake Worth into a brackish water lagoon system. During the 1890s a navigation channel was dredged from the north end of Lake Worth

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Lagoon to the Jupiter Inlet. This resulted in increased freshwater flows to the north end of the lagoon. The ICW was completed from the south end of Lake Worth Lagoon to Biscayne Bay in the early 1900s. Today the ICW runs the entire length of the lagoon.

In 1915 the Port of Palm Beach dredged the Lake Worth Inlet to 4 feet deep near the City of Riviera Beach. In 1925 the inlet was deepened to 16 feet. This inlet is now 400 feet wide and 35 feet deep. In 1917 the South Lake Worth Inlet was created near Boynton Beach to improve tidal circulation and provide flushing to the south end of the lagoon. This inlet is now 200 feet wide and 6 feet deep. Peanut Island along with other spoil islands were created from spoil dredged from the inlets and ICW.

The construction of the Earman River (C-17 Canal), West Palm Beach Canal (C-51 Canal) and Boynton Canal (C-16 Canal) resulted in additional freshwater flow into Lake Worth Lagoon. Along with the construction of these canals, the groundwater was lowered in the lands adjacent to and west of the lagoon. This allowed urbanization of the basins draining into the lagoon, which has altered the timing of stormwater flow into the estuary and caused more pollutants to enter the system.

Along with urbanization in the 1900s, most of the natural shoreline of Lake Worth has been altered by dredge and fill activities. At present, approximately 81 percent of the lagoon's shoreline is bulkheaded and only about 278 acres of mangroves remain along the shoreline. In addition, the Riviera Beach Power Plant discharges warm water into the lagoon. The warm water discharge point, just south of the Lake Worth Inlet, is one of the major attractants of manatees on the east coast of Florida. Heavy boat traffic in the coastal waterway threatens this endangered species.

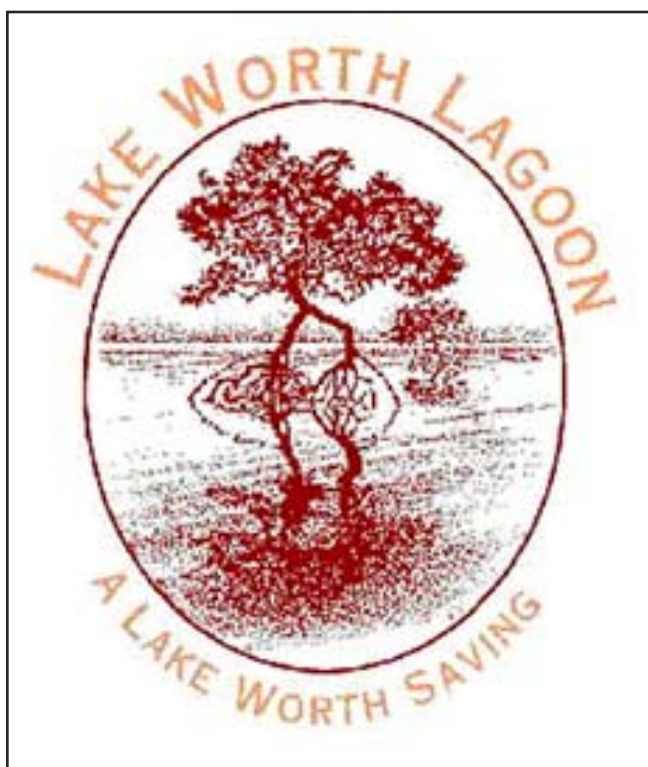
### Major Environmental Issues

Each of the waterbodies described above share a number of key environmental issues. Foremost among the factors impacting the ICW and adjacent water bodies is the quality and quantity of water entering the estuaries. Stormwater runoff has a major detrimental impact. The runoff contains heavy metals and hydrocarbons from roadways as well as fertilizers, herbicides, and pesticides from developed areas. Discharge from sewage treatment plants, leakage from faulty septic tanks, and sewage from boats have also added excess nutrients and pollutants to the estuaries.

Dredging is another major environmental issue because it can directly or indirectly impact estuarine natural communities. Dredging is needed to create, improve and maintain channels and docking facilities. However, dredging activities need to be carefully designed in terms of the source and deposition areas, the composition of the dredged material, and the construction technique to avoid adverse environmental impacts. Dredge and fill activities have the potential to eliminate littoral vegetation and mangroves from the shoreline. This may lead to erosion and all polluted runoff to enter the estuaries directly from waterfront property. The removal of seagrasses and mangroves by dredge and fill operations has contributed to degradation of a variety of estuarine resources, including fish and wildlife. Also, dredging may allow increased boating activity, which may contribute to a higher mortality rate in manatees.

### Management Plans

Management plans to protect and restore natural systems have been developed for each of the major waterbodies described above. For example, the Indian River Lagoon National Estuary Program recently released the Indian River Lagoon Comprehensive Conservation and Management Plan Update 2008; the South Florida Water Management District developed the Restoration Plan for the Loxahatchee



*The Lake Worth Lagoon Management Plan was revised in 2008.*

River in 2006; the South Florida Water Management District and the Florida Department of Environmental Protection are currently working to update the Loxahatchee River National Wild and Scenic River Management Plan, which was last updated in 2000; and Palm Beach County and the Florida Department of Environmental Protection recently released the Lake Worth Lagoon Management Plan Revision in 2008. In addition to these plans targeting waterbodies, Palm Beach County recently adopted the Palm Beach County Manatee Protection Plan in 2006, which is specifically designed to protect manatees. These last two plans are discussed in more detail below because they are most relevant to the ICW in Palm Beach County.

### **Lake Worth Lagoon Management Plan Revision**

In 1997 the FDEP and Palm Beach County formed a partnership to co-sponsor a consensus-building process designed to enhance and protect the Lake

Worth Lagoon. This partnership resulted in the development of the Lake Worth Lagoon Management Plan in 1998. This plan was revised in 2008 (Palm Beach County & FDEP 2008). The mission and goals of the plan are: “To restore, conserve and manage the Lake Worth Lagoon ecosystem to a level of quality to obtain measurable and significant improvements to the Lagoon’s water and sediment quality; to provide habitat for native plants, fish and wildlife, and aesthetic, recreational and economic benefits for the residents and visitors of Palm Beach County; and to encourage, develop and promote a partnership of public and private interests to manage the lagoon.”

The revised management plan is divided into the five broad areas to identify specific goals and objectives for restoring the lagoon, including: water and sediment quality program; habitat restoration enhancement and monitoring program; public use and outreach program; interagency planning and coordination; and funding. The revised management plan presents a comprehensive series of actions to assist with the implementation of the management plan. The following discussion focuses primarily on water and sediment quality and habitat protection sections of the plan.

### **Major Accomplishments and Challenges**

In the nine years since its completion of the Lake Worth Lagoon Management Plan, many tangible components of the plan have been implemented. Significant progress has been made through stormwater treatment and habitat restoration projects. Through the Lake Worth Lagoon Partnership Grant (LWLPG) a total of 37 projects have been funded. Among those projects, 27 have been completed and the remaining projects are in various stages of implementation. Twenty-two stormwater treatment projects have been implemented within the LWL watershed treating more than 1,700 acres of runoff that previously discharged directly to the LWL. The use of pollution control devices, stormwater ponds,

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wetland treatment, and treatment swales has significantly reduced the amount of nutrients, sediments, and heavy metals entering the lagoon. A pollutant loading reduction study (PBCERM 2004a) was performed on six representative stormwater and septic retrofit projects in LWL. Based on the data, loading reductions were extrapolated to all stormwater and septic retrofit projects. It appears that substantial amounts of suspended solids and nutrients are being removed through innovative treatment technologies. Preliminary results indicate the removal of 1.6 million lbs of total suspended solids per year; 36,000 lbs of nitrogen per year; and 6,000 lbs of phosphorus per year.

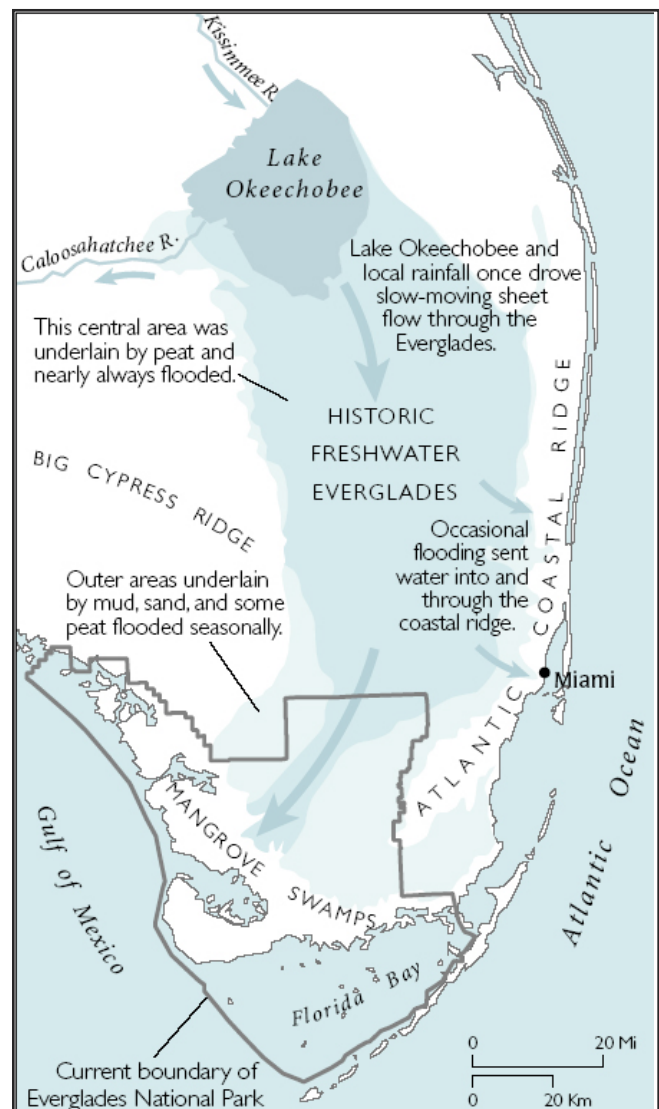
In addition to the stormwater projects discussed above, 12 habitat enhancement and restoration projects have been implemented with LWLPG funds. Two septic to sewer projects have been completed to reduce septic loading to the LWL. The grant program has also funded one marina pump-out station. This project benefits the lagoon by reducing the occurrence of overboard discharges from vessel holding tanks.

Although the aforementioned projects have been developed through the LWLPG in cooperation with 15 agencies and municipal partners, several projects were also implemented by PBCERM using other funding sources. Combined with the grant funded projects, approximately 184 acres of habitat has been created or restored in the LWL: 67 acres of mangroves, 64 acres of potential submerged aquatic vegetation (SAV), 14 acres of artificial reef, and 39 acres of maritime hammock. Some of the most successful restoration projects are listed below:

- The Munyon Island restoration project removed 35 acres of exotic vegetation, created 20 acres of mangrove habitat and restored 25 acres of maritime hammock.
- The Peanut Island enhancement project removed over 60 acres of exotic vegetation,

and excavated the sand spoils to create/restore upland and wetland habitats: 4.5 acres of tidal channels and ponds, 1.3 acres shallow-water reef and 3.0 acres of mangroves. Created upland habitats include 7.1 acres of maritime hammock, 8 acres of beach dune and 4 acres of coastal strand habitat. Over 125,000 native plants have been planted to enhance the island.

- The Ocean Ridge Natural Area restoration



The map above illustrates natural flow patterns through south-east Florida (from USGS Circular 1182 "Florida Everglades," <http://sofia.usgs.gov/publications/circular/1182/>).

project removed 5.0 acres of exotic vegetation, restored and created 7.0 acres of mangrove wetlands, 0.6 acres of tidal ditches/ponds for SAV habitat, and 0.8 acres of transitional/coastal strand uplands.

- The Snook Island project added good quality wetland habitat (mangroves, oyster reefs, and seagrass recruitment areas) to the central part of the LWL. Four mangrove islands and three shoreline mangrove planters were constructed resulting in 10.1 acres of red mangrove habitat, 2.8 acres of spartina marsh, and 2.3 acres of oyster reefs. Approximately 57 acres of submerged habitat suitable for seagrass recruitment has been created.
- The John’s Island restoration project included the restoration of approximately 1.7 acres of existing mangroves, the creation of approximately 3.3 acres of red mangroves, and the enhancement of approximately 1.4 acres of maritime hammock.
- The C-51 Sediment Management project removed over 101,000 cubic yards of muck deposits up to 20’ thick from the bottom of the C-51 canal before it reached the lagoon. An estimated 480 tons of nitrogen and 52 tons of phosphorus were removed from the system. The project included the creation of a sediment trap upstream of the S-155 structure to reduce future sediment loads to the LWL.

**Problems and Issues Affecting the Lake Worth Lagoon**

Even with the success of the projects discussed above, there are many challenges still facing the lagoon. Population in Palm Beach County (PBC) has climbed approximately 30% since 1990 and is expected to reach 1.8 million by 2030 (Smith 2002). The population increases will likely further habitat

loss, fishing and boating pressure from both recreational and commercial demands. Efforts to improve water quality in the LWL while accommodating future growth will have to be balanced with the competing social and economic needs of local communities. Another challenge facing the lagoon is its altered hydrology and the large-scale freshwater releases from regional canals. Although changes to the water management strategies for the LWL are planned as a result of the Comprehensive Everglades Restoration Plan (CERP), their direct or indirect effect to the health of the ecosystem is yet to be studied. The input of contaminants and toxins from urban and agricultural runoff, elevated loads of nutrients and suspended and dissolved organic matter, are all contributing factors to the environmental distress of this estuary. A new approach is required in the LWL. The restoration efforts should include consideration for best current and future uses of the lagoon, and must be supported by clearly defined funding and sound management strategies to implement future actions to protect and restore natural resources.

**Water and Sediment Quality Program**

The goal of the Water and Sediment quality program in the 1998 LWLMP was to reduce adverse impacts on lagoon salinity and decrease pollutant loadings in the system to acceptable levels. Current goals for this program are:

- Expand and implement a long term water quality ambient monitoring program in the LWL for baseline purposes and trend analysis.
- Increase focus on decreasing inputs of suspended materials, nutrients, and toxic substances from point and nonpoint sources.
- Identify and reduce anthropogenic loadings of fecal contaminants in the LWL.

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With the projected growth forecasted in the next 30 years in PBC, maintaining and improving water and sediment quality will require more effort every year in order to compensate for the increased pollution associated with growth. Most of the water quality gains have been attributed to wastewater treatment technologies, which have significantly reduced municipal sewage discharges in the lagoon. Point sources of pollution have been greatly reduced from the 1950s when an estimated 10 million gallons of raw sewage was discharged in the lagoon. By early 90s, approximately 2.4 million of gallons of secondarily treated sewage effluent were still discharged into the LWL watershed. These former discharges have been nearly eliminated with the exception of two package plants, emergency sewer discharges, and broken sewer mains. Nonpoint sources are now the primary source of pollution in the LWL. A total of 381 outfalls were identified within the lagoon in the Lake Worth Lagoon Natural Resources Inventory and Enhancement Study (PBCERM 1990). The various LWLPG projects implemented in the lagoon have offset to some degree the amount of pollutant loading from these sources, but with the drainage that the lagoon receives from its 450 square miles watershed, the impact of these projects cannot be fully evaluated.

Action plans targeted specifically to improve and monitor the Lagoon water quality (WQ), and to reduce wastewater (WW), stormwater (SW), and sediments (SE), are outlined below. Refer to the Lake Worth Lagoon Management Plan for a complete description of each action plan.

WQ-1 Implement Water Quality Monitoring Goals

WQ-2 Reduce the Occurrence of Municipal Sewer overflows

WQ-3 Install Additional Sewage Pump-out Facilities for Recreational Boaters and Live-aboard Vessels

WQ-4 Improve Fueling and Bilge-Pumping Practices Among Recreational Boaters

WW-1 Identify Septic and Municipal Wastewater

Loading to Lake Worth Lagoon

WW-2 Provide Additional Sanitary Sewer Connections to Priority Areas

SW-1 Reduce Discharge of Freshwater and Total Suspended Solids

SW-2 Implement Best Management Practices on Golf Courses near the Lake Worth Lagoon

SW-3 Identify and Increase Stormwater Retrofit Projects

SW-4 Encourage Use of Best Management Practices

SE-1 Substrate Characterization

SE-2 C-51 Basin and Lake Worth Lagoon Sediment Sourcing Study

SE-3 Manage Sediments in Lake Worth Lagoon

### Habitat Restoration Enhancement and Monitoring Program

The restoration and protection of diverse habitats within the LWL is crucial to the lagoon's health. Goals for this program are:

- Restore, enhance, and create seagrass beds, oyster habitat, emergent mangrove wetlands, coastal hammock habitat, and protective upland buffer zones.
- Add riprap to vertical seawalls to reduce wave-generated sediment resuspension and provide additional hard bottom habitat.
- Construct artificial reefs that provide juvenile, intermediate and adult habitats required by the life cycle of estuarine and marine dependent fish and invertebrate species.
- Evaluate the status and protect sea turtles, manatees, and other endangered, threatened, and rare species, and species of special concern using the LWL.

Recent studies and surveys performed by ERM

indicate that 1,626 acres of seagrass beds are currently present within this estuary. These studies also identify approximately 278 acres of mangroves in the lagoon. Oyster reefs currently mapped or observed within the lagoon show a small but relatively healthy oyster population (~5 acres). Increasing and preserving the quantity, quality and diversity of these communities are the long-term goals of this management plan. The overall target within the next five years is to restore approximately of 125 acres of tidal marsh habitat, add a minimum of 16 acres of oyster reef habitat, and to protect and enhance the lagoon's existing mangrove and seagrass areas. Artificial reefs and land acquisitions are also planned as part of the overall restoration.

Action plans targeted specifically for Habitat Enhancement (HE) and Environmental Monitoring (EM) are outlined below. Refer to the Lake Worth Lagoon Management Plan for a complete description of each action plan.

HE-1 Expand Oyster Habitat

HE-2 Restore, Create and Protect Mangrove and Spartina Habitats

HE-3 Implement the Palm Beach County Manatee Protection Plan

HE-4 Develop a Seagrass Restoration Target

HE-5 Expand Reef Habitats

HE-6 Acquisition of Submerged lands in Lake Worth Lagoon

EM-1 Implement Sea Turtle Monitoring

EM-2 Develop a Fishery Monitoring Program

EM-3 Develop a Submerged Aquatic Vegetation (SAV) Monitoring Program

EM-4 Monitor Oyster Reef Habitats

### Palm Beach County Manatee Protection Plan

In October 1989, the Florida Governor and Cabinet directed thirteen coastal counties, including Palm Beach County, to prepare a plan to protect manatees.

The Florida subspecies of the West Indian Manatee (*Trichechus manatus latirostris*) is listed as federally endangered throughout its range and is protected by the Florida Manatee Sanctuary Act of 1978. In Palm Beach County, manatees are found in all accessible freshwater, estuarine, and marine waterbodies, although their relative abundance may vary at specific locations and seasonally.

The main goal of the Palm Beach County Manatee Protection Plan (MPP) is to protect manatees and manatee habitat. The main objectives of the MPP are to implement management strategies and policies that will protect manatees and manatee habitat, promote and increase public awareness of manatees and manatee habitat, promote safe boating, and allow reasonable recreational and commercial use in the coastal zone in a manner consistent with the protection of manatees and manatee habitat.

One of the important components of the MPP is the Boat Facility Siting Plan (BFSP). The BFSP in the plan provides four categories defining Preferred, Conditional, Non-preferred, and Exclusionary locations for new boat facilities with more than two slips. Facilities within each category will be required to meet certain criteria to minimize impacts of manatees. Restrictions will be greatest in areas of highest risk to manatees (Non-preferred and



Manatees in the Lake Worth Lagoon (Photo Courtesy of Palm Beach County DERM)

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Exclusionary locations) and least in areas of lowest risk (Preferred locations).

Geographic areas of particularly high abundance include the northern portion of Lake Worth Lagoon, Jupiter Sound, and Lake Wyman within Boca Raton. High abundance in these areas is likely due to the availability of seagrass foraging habitat and warm water refuges. The warm water discharge from the Florida Power and Light Riviera Plant near the Port of Palm Beach attracts high numbers of manatees and greatly influences the distribution of manatees in the winter.

The largest single cause of mortality (39%) documented in the County results from collisions with watercraft. Manatees are most likely to be struck by boats in areas where there is an overlap between high levels of manatee abundance and boat traffic. Watercraft-related mortalities were highest in the north Lake Worth Lagoon, Jupiter Sound, and the section of ICW between Delray Beach and Boca Raton.

The recommendations for plan implementation include the following eight priority initiatives to provide comprehensive protection for manatees in local waterways:

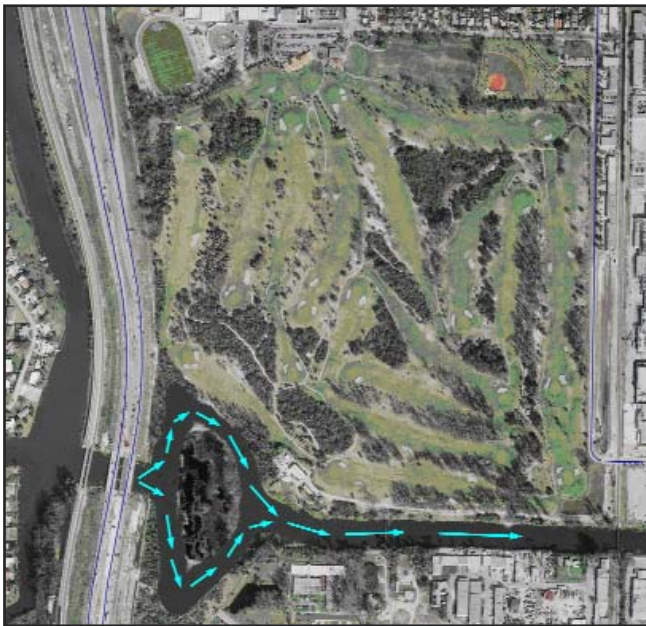
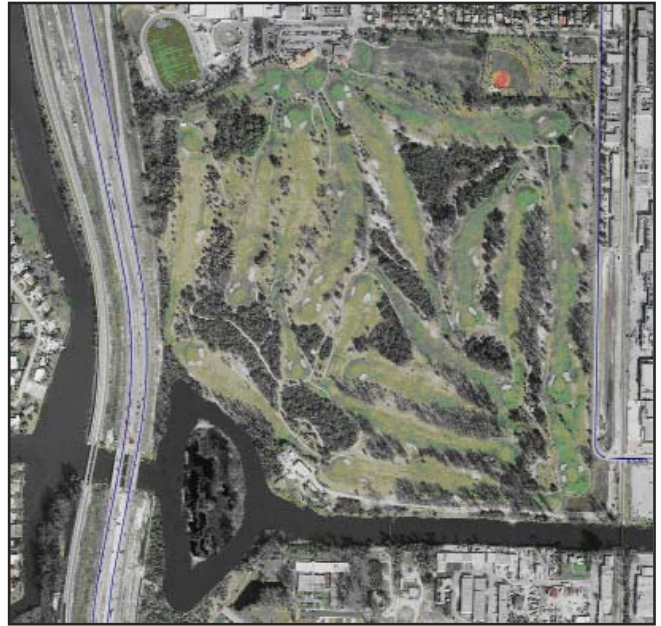
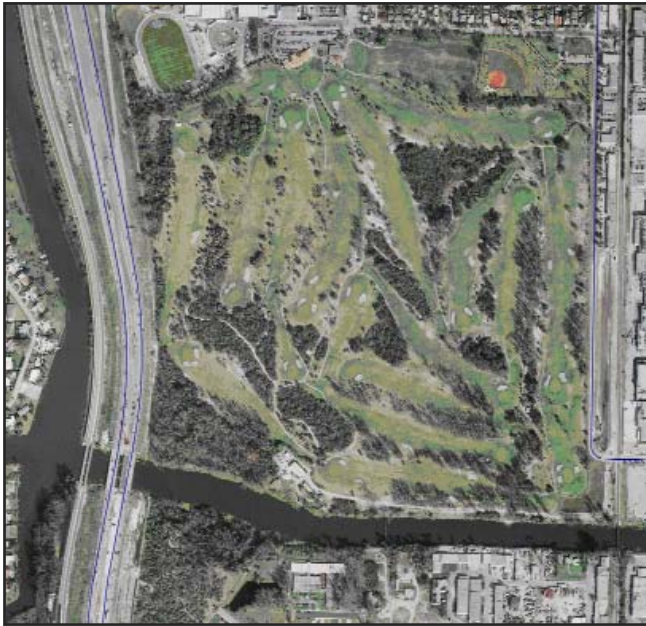
1. MPP Implementation – Incorporate approved boat facility siting policy into County and local Comprehensive Plans.
2. Manatee Protection Fund – A dedicated funding source has been established to implement the goals and objectives the MPP.
3. Undertake a Boater Speed Zone Compliance Study – A study will be conducted to determine current levels of compliance with boating speed zones and to identify times and locations of greatest non-compliance and reasons for non-compliance.
4. Law Enforcement – Initiate a number of measures to provide funding for staff,

procure supplies, and increase law enforcement presence and efficiency on the waterways.

5. Education and Awareness – Develop and initiate a number of programs designed to raise public awareness of manatees, including improvements in manatee protection zone signage, creation of additional manatee educational kiosks and fliers, identify/utilize additional educational material distribution resources, and public service announcements.
6. Habitat Protection – Continue with existing and support future programs within the County to preserve, enhance, and restore manatee habitat and water quality.
7. Collect Current Data on Manatee Use and Boating Activity Patterns on County Waterways – Bimonthly aerial surveys will be conducted, as funding permits, to identify any changes that may have occurred in the seasonal and special distribution and relative abundance of manatees within Palm Beach County since the last surveys were conducted in the early 1990s.
8. Adaptive Management – The Palm Beach County Department of Environmental Resources Management will undertake a full assessment of plan performance every seven years to coincide with the required Evaluation and Appraisal Report process of amending the County's Comprehensive Plan and, as necessary, revise the plan to improve performance.

### Stormwater Utility

In May 2006, the Palm Beach County Board of County Commissioners requested the TCRPC develop an Urban Redevelopment Area (URA) redevelopment study and master plans. The study area encompasses approximately 25 square miles west of I-95 in central Palm Beach County, including unincorporated parts of Palm Beach County, the

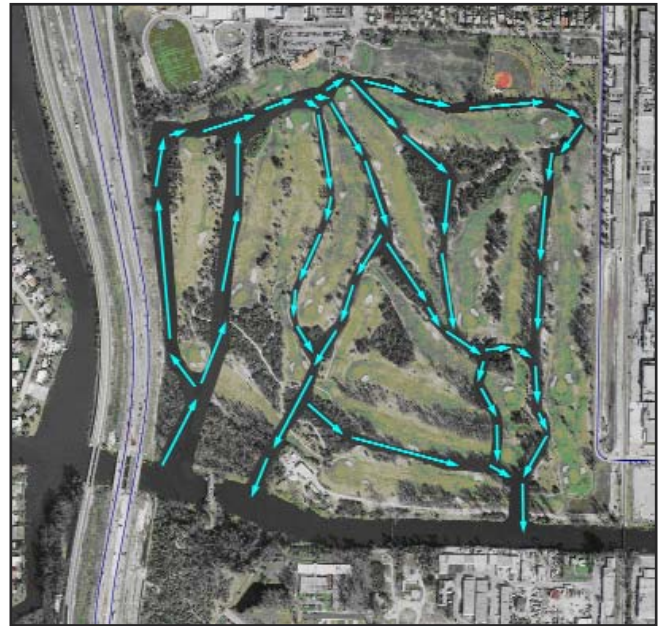


*In these images, a prototypical stormwater treatment concept is illustrated utilizing the City-owned West Palm Beach Golf Course. The existing condition is shown in the top left image. A simple intervention could be the addition of an oxbow (island) at the nexus of the canals to divert water flow, thereby slowing water flow rates and allowing particulates to settle prior to their entrance into the ICW.*

Towns of Cloud Lake, Glen Ridge, Lake Clark Shores, and Haverhill; Village of Palm Springs; and portions of the Cities of West Palm Beach, Lake Worth and Greenacres. The Palm Beach County URA study and corridor master plans are efforts to forge a vision for urban redevelopment in central Palm Beach County, to illustrate obstacles and opportunities for that redevelopment, and to provide recommendations and priorities for implementing the vision.

The study area is well west of the ICW, but drainage from this area can have a major effect on water quality in the ICW and coastal estuaries. The URA study recognized the proposed master plans for these corridors call for a denser mix of buildings fronting these corridors than currently exists, and intensification of the development program will make it difficult to accommodate building program, parking, and storm water management facilities all on individual parcels.

Individually-parceled and segregated storm water facilities will be difficult for small parcels and much more difficult for larger parcels that could dedicate space for both parking and storm water treatment. A better development patten could be achieved by shifting the storm water treatment facilities away from areas that should be more intensely developed into areas where these facilities could be viewed as amenities.



The URA study noted that the ideal scenario for encouraging redevelopment and assuring the highest standard for stormwater management would be for a master storm water drainage or utility to be established that would provide this service on an area-wide or regional basis. Under this scenario, the utility would design and build a storm water treatment system to meet the storm water retention and detention requirement of targeted redevelopment areas as well as adjacent neighborhoods needing improved drainage service.

The system could include existing drainage and surface water management components that are under utilized, or land could be acquired to provide new components. The utility model allows a system-wide evaluation that would include the opportunity to better utilize existing features and to consolidate new treatment areas into more efficient and manageable designs that would also provide higher levels of treatments.

Under this model, stormwater management facilities would be owned, operated, maintained and managed by the utility. Parcels receiving benefits would be charged a fee for service similar to the model

*These images present a more elaborate water quality improvement with the introduction of channels into the golf course. With careful planning, the channels could become interesting water hazards, allowing the golf course to continue in a unique manner while providing unparalleled environmental benefit to the Lake Worth Lagoon.*

currently used by Palm Beach County Water Utilities in providing water and wastewater service. The fee would assist in amortizing any debt the drainage district incurred in acquiring land, developing a master system, and maintenance of the system.

There are many benefits to the utility model, including design efficiency, better management of storm water, better land utilization, ancillary benefits, cost efficiencies, and improved property values and tax base. Perhaps the most important benefit to an area-wide utility approach is the smart and efficient management of storm water for the water quality benefits that could accrue within the Lake Worth Lagoon. Under the parcel-by-parcel approach, retention systems are inefficiently sized and located and are managed by a large number of entities none of which have storm water management as their first priority. It is questionable whether such systems are operated and maintained properly.

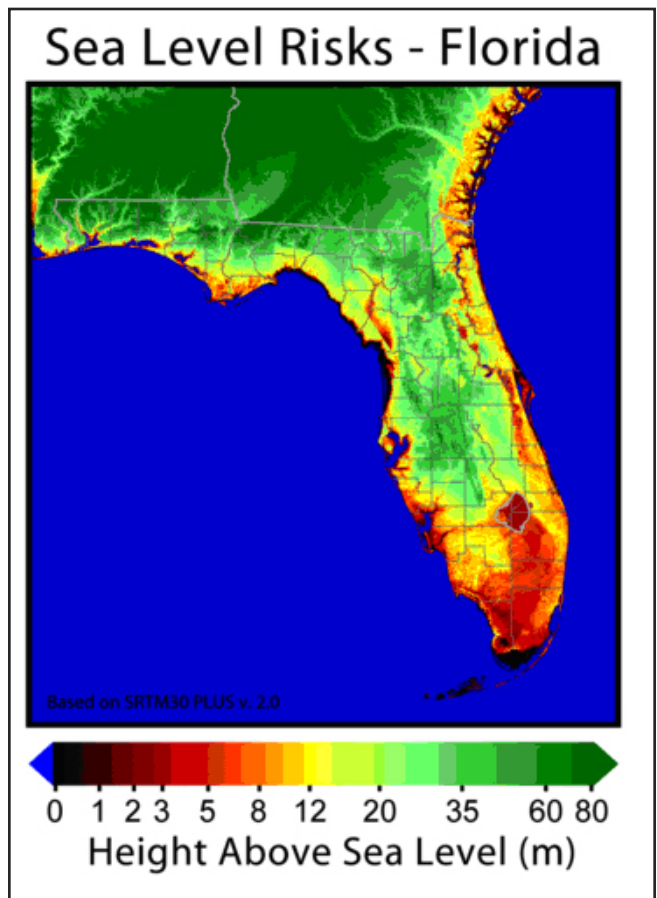
One of the key recommendations of the URA study

is: Within the URA, the county should take responsibility for storm water management, and provide such service via a master storm water drainage district administered by the Palm Beach County Department of Water Utilities. Establishment and development of a master storm water drainage district and system will require the cooperation of several agencies at the county, state and federal levels. The stormwater utility concept should be supported as an additional mechanism for improving water quality and protecting natural resources in the ICW and coastal estuaries.

**Sea Level Rise**

Recent measurements from tidal gauges worldwide indicate that ocean levels are currently rising. Measurements along the United States coast indicate that sea level has risen at a rate of about 10 to 12 inches per century, but recent measurements suggest that sea level may rise at an accelerated rate in the future. The Miami-Dade County Climate Change Advisory Task Force recently issued a report indicating there is a very high likelihood that there will be at least a 3 to 5 feet rise in sea level during the next century. The report recommends that south Florida adopt a 50 year planning window to accommodate an anticipated rise in sea level of 1.5 feet over the next 50 years and 3 to 5 feet over the next 100 years.

As part of an ongoing program evaluating global climate change, the U.S. Environmental Protection Agency (EPA) initiated a nationwide project promoting planning for and awareness of sea level rise. As part of the EPA program, TCRPC conducted a study of sea level rise within the region, including Palm Beach County (TCRPC 2005). The study followed the general approach of other sea level rise planning studies sponsored by the EPA. The study used decision rules defined by a statewide approach for identifying likelihood of land use protection to characterize all uplands from 0 to 10 feet in elevation and within 1000 feet of shoreline into the following four general categories: protection almost certain;



*Florida's low elevation creates vulnerability in the face of sea level rise, especially along coastal areas.*  
 Source: [http://www.globalwarmingart.com/wiki/Image:Florida\\_Sea\\_Lev\\_el\\_Risks\\_png](http://www.globalwarmingart.com/wiki/Image:Florida_Sea_Lev_el_Risks_png)

protection reasonably likely; protection unlikely; and no protection.

A total of 56,535 acres of uplands and 4,001 acres of wetlands were identified in the Palm Beach County portion of the study area. The “Protection Almost Certain” category accounts for about 93.0 % of the uplands in the study area in Palm Beach County. The combination of the “Protection Almost Certain” and “Protection Reasonably Likely” categories accounts for 96.7 % of the uplands mapped in this county. The county has no significant concentrations of areas classified as “Wetlands,” and there are little or no opportunities for the inland migration of wetlands in Palm Beach County.

**KEY FINDINGS AND RECOMMENDATIONS**

Palm Beach County has a number of excellent programs in place that are addressing the protection of natural resources in the waterbodies associated with the ICW. This report recommends continued support for these programs as follows:

**Improve Water and Sediment Quality**

- Support the Lake Worth Lagoon Management Plan Revision goals and recommended action plans to improving water quality and decrease the amount of suspended material in the lagoon and adjacent waterways.

**Support Habitat Restoration Enhancement and Monitoring**

- Support the Lake Worth Lagoon Management Plan Revision goals and recommended action plans for habitat enhancement and environmental monitoring in the lagoon.

**Support Manatee Protection**

- Support the Palm Beach County Manatee Protection Plan priority initiatives focusing on plan implementation, manatee protection fund, speed zone compliance study, law enforcement, education and awareness, habitat protection, monitoring boating activity patterns, and adaptive management.

**Consider Development of Stormwater Utility**

- Support the Palm Beach County Urban Redevelopment Area Planning study recommendation for the County to establish a stormwater utility administered by the Palm Beach County Department of Water Utilities.

**Monitor and Plan for Sea level Rise**

- Support a program to assess the impact of sea level rise on all existing infrastructure adjacent to the Intracoastal Waterway, including buildings, bridges, roads, docks, boat ramps, parking lots, seawalls, and water and sewer systems.
- Support a program to ensure that all new buildings and infrastructure proposed adjacent to the Intracoastal Waterway are designed to accommodate future sea level rise.
- Support a program to develop and implement new building standards and floor elevations for future development proposed adjacent to the Intracoastal Waterway.
- Support a program to design all new and upgraded seawalls to include environmentally friendly features to include mangroves, seagrasses and other natural resources adjacent to areas protected from sea level rise.