

PALM BEACH COUNTY SHORELINE PROTECTION PLAN

**PALM BEACH COUNTY
DEPARTMENT OF ENVIRONMENTAL RESOURCES
MANAGEMENT**

**ENVIRONMENTAL ENHANCEMENT & RESTORATION
DIVISION
2014**



**PALM BEACH COUNTY
DEPARTMENT OF
ENVIRONMENTAL RESOURCES MANAGEMENT**

MISSION STATEMENT

The mission of the Palm Beach County Department of Environmental Resources Management is to establish, implement and maintain programs for the protection, preservation, and enhancement of the land and water resources of Palm Beach County. Through the accomplishment of this mission, the Department will promote the quality of environment and continued health, safety, and general welfare of both residents of, and visitors to, Palm Beach County.



PALM BEACH COUNTY SHORELINE PROTECTION PLAN

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SHORELINE PROTECTION PLAN SUMMARY

What do our beaches mean to Palm Beach County? They continue to attract residents, visitors and sea turtles to our shores. They protect our homes, our roads and our parks from an unsettled sea. They are home to many species of native flora and fauna.

But the beaches, by nature, are unstable.

Thirty-one miles of our forty-six mile coastline in Palm Beach County are considered “critically eroded,” leaving adjacent upland areas potentially vulnerable to damage by severe weather. Storm protection provided by the natural beach/dune system continues to be compromised by coastal development, an inevitable aspect of a growing community.

Together with local, state and federal governments, Palm Beach County has been working to counter the trend through the Shoreline Protection Program. The 20 projects identified in the thirty year plan encompass approximately twenty miles of critically eroded coastline in areas with public access. To date, the Program has restored 112 acres of dune and either maintains and or helps fund 14.5 miles of beach renourishment projects. Each project is designed to minimize environmental impact and restore natural habitat.

Project funding is provided by specific federal appropriations, dedicated state grants and local commitment. County support for the Shoreline Protection Program includes the Tourism Development tax revenue.

Where development has impinged on the natural ebb and flow of beach sand, erosion is likely to follow. Though there are no viable permanent solutions to coastal erosion, the restoration and maintenance of coastal areas provides for continued shore protection, recreation and natural habitat. With continued inter-governmental cooperation and support, the Shoreline Protection Plan will continue to provide a stable strategy for managing our unstable beaches.



SEA OATS (*UNIOLA PANICULATA*), PALM BEACH COUNTY

PALM BEACH COUNTY SHORELINE ENHANCEMENT & RESTORATION PROGRAM

Palm Beach County's forty-six (46) miles of ocean shoreline has been subjected to coastal erosion for many years due to the stabilization of inlets, residential and commercial development, and natural forces. The coastal strand ecosystem is one of the most threatened natural systems in Florida due to over-development. Presently, thirty-one (31) of the County's 46 miles are listed as critically eroded by Florida's Department of Environmental Protection (FDEP).

While there is no one solution to beach erosion, several methods are utilized by Palm Beach County - each with its own merits and drawbacks. The first approach is to facilitate sand transfer at the inlets in order to restore the natural flow of sand. The second approach includes protecting the existing dunes and beaches and restoring the portions of shoreline that are already degraded. The last approach includes evaluating erosion control structures for use along beaches that may not qualify for a traditional beach fill project or may experience an erosional hot spot. All approaches include environmental monitoring of the resources to ensure that our effort to restore sand is accomplished in a manner that protects the natural environment to the greatest extent possible. Through the Shoreline Enhancement & Restoration Program, the County is able to provide publicly accessible beaches, support the tourist-based economy, restore beach habitat and protect upland property.

Funding for this capital improvement program is derived from a portion of "bed tax" fees administered through the Tourist Development Council, as well as funds from the state, the federal government and municipal partners.

Inlet Management

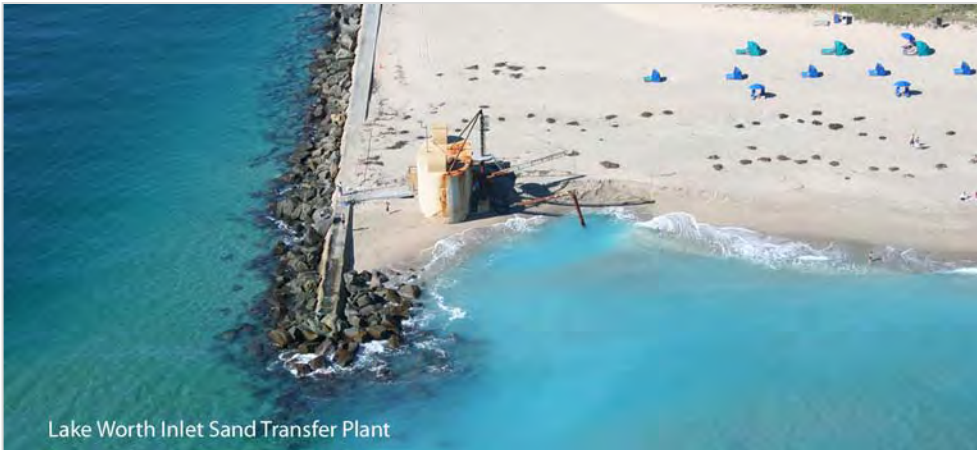
Modifications to natural tidal inlets and the creation and stabilization of artificial inlets affect the natural littoral transport of sediments. Therefore, efforts to maintain the natural sediment movement in and around all four inlets in Palm Beach County are



encouraged. Transfer of material from the north side of an inlet to the south prevents beach quality sand from being lost to the interior of an inlet or from becoming impounded within nearshore shoals.

Since the dissolution of the South Lake Worth Inlet District in 1996, the County has been responsible for the management of the South Lake Worth Inlet (Boynton Inlet) and the development of the Inlet's Management Plan. In 2011, the County constructed a new sand transfer plant (STP) and rehabilitated the north and south jetties. The STP is operated by the County and transfers approximately 70,000 cubic yards of material per year to the beaches south of the Inlet. The County also dredges the Inlet's interior sand trap approximately every six years. Sand from the trap is pumped into the nearshore along the beach south of the Inlet.

The Jupiter Inlet District, United States Army Corps of Engineers (USACOE) and City of Boca Raton manage the three other inlets within the County. The Jupiter Inlet District (JID) dredges the Inlet's sand trap approximately every year and the Florida Inland Navigation District (FIND) dredges nearby sections of the Intracoastal Waterway (ICW) every three years. The dredged material is then placed on the beach south of the Inlet's south jetty within Jupiter Beach Park. More information is available at: http://jupiterinletdistrict.org/?page_id=44



The Lake Worth Inlet (Palm Beach Inlet) is a federal inlet managed by the USACOE. Maintenance dredging of the Inlet's sand traps occurs every one to two years. Dredged material is placed immediately south of the Inlet's southern jetty. A sand transfer plant owned by the Town of Palm Beach and operated by Palm Beach County staff bypasses

approximately 100,000 cubic yards of material per year to the same location.

The City of Boca Raton owns and operates a mobile dredge stationed inside the Boca Inlet. This dredge runs throughout the year and pumps the material onto the beach located south of Inlet's southern jetty. The Inlet's north jetty also contains a weir to limit sand accretion. More information is available at: <http://www.myboca.us/muni/dredge.shtm>

Beach Nourishment

In order to supplement the natural littoral transport of coastal sediments, the County and its municipal partners maintain a feeder beach system. The planning, engineering, design, construction, monitoring and funding of a multi-million dollar beach nourishment project is a long process that can take from four to seven years to complete.

Currently, nine beach nourishment projects are authorized in Palm Beach County. Three are managed by the County: Jupiter/Carlin Shore Protection Project (1995, 2002), Juno Beach Shore Protection Project (2000, 2009) and Ocean Ridge Shore Protection Project (1998, 2005, 2014). Palm Beach County also works with municipal partners to manage and fund beach nourishment projects in Delray Beach, Palm Beach and Boca Raton.

In order to ensure that placed sand is beach compatible, geotechnical investigations of potential offshore borrow areas are necessary to locate sand of sufficient quantity and quality for placement on the beach. These investigations include taking multiple vibracores (up to 20 feet deep) within the proposed borrow area to determine sand grain, color, and composition characteristics. Bathymetric, seismic, magnetometer and sidescan sonar surveys are used to help locate which portion of the proposed area contains the greatest quantity of beach compatible sand and avoid any cultural resources that may be present. Ideally, the goal is to identify a borrow area that can be used for multiple nourishments.

Once a sand source is identified, coastal engineers will develop a beach restoration fill template, calculate fill volumes required and determine a borrow area design. Following design of the project, permit applications are

submitted to the Florida Department of Environmental Protection (FDEP) and the United States Army Corps of Engineers (USACE). These agencies in turn seek input from the Florida Fish and Wildlife Conservation Commission (FWC), Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS) and U.S. Fish & Wildlife Service (FWS). Receipt of a permit from either agency can take up to one year.

Construction of beach nourishment projects in Palm Beach County are only permitted from November 1 through May 1. Construction after March 1 requires special monitoring measures including night monitoring and early morning nesting surveys in order to avoid impacts to nesting sea turtles. All construction occurring on the beach must be completed by May 1.

Hydraulic Dredge at Ocean Ridge 2014



Depending on the proximity of the borrow area to the project site, the contractor may either mobilize a hydraulic or hopper dredge. A hydraulic dredge, which pumps sand directly to the beach, is utilized when the borrow area is located adjacent to the shoreline receiving the fill. A hopper dredge is employed if the borrow area is located a distance away from the project shoreline. Hopper dredges have the capability to store the dredged material directly on the dredge for transport and then discharge the material via floating pipeline to the beach.

In order to decrease turbidity within the nearshore, shore-parallel sand dikes are constructed to help promote the settlement of dredged material on the beach. Heavy equipment then moves the deposited material into the designed profile. Water quality monitoring occurs at both the borrow area and beach disposal sites.



Screening of Pumped Material at Juno Beach



Constructing a large-scale beach nourishment can take a few weeks to several months depending on the capacity of the dredge, weather conditions, and varying other factors. If rock is present within the borrow area, screening of the dredged material can occur on the dredge or directly on the beach prior to placement. Any material greater than 1" in diameter must

either be deposited in a permitted offshore rock disposal site or removed from the beach.

Post-construction monitoring identifies any adverse environmental impacts and measures the erosion rate of the restored beach.

Dune Restoration

Restored Dune at Coral Cove Park (2013)



Sand dunes provide additional protection to the upland from the sea. The dunes act as buffers against high storm surge and waves protecting the upland from flooding. Dunes provide a reserve supply of sand to replenish the beach during times of severe erosion. Where feasible, the County re-establishes viable dune systems planted with native vegetation. To date, 112 acres of dune have been restored at Coral Cove Park, Jupiter Beach Park, Carlin Park, Juno Beach, Loggerhead Park, Singer Island, Riviera Beach, Lake Worth, South Palm Beach, Lantana Municipal Beach, Ocean Inlet Park, Ocean Ridge, Gulfstream Park and South Inlet Park. The program has provided funding for dune projects managed and constructed by municipal governments in Delray Beach and Boca Raton.

Environmental Monitoring

In order to design and construct beach projects with minimal environmental impacts County staff are responsible for developing and implementing extensive environmental monitoring programs for beach projects. Monitoring efforts include, but are not limited to, taking annual coastal aerial photos, measuring the amount of exposed nearshore reef, obtaining beach profiles, tracking the County's threatened and endangered nesting sea turtle populations and performing pre & post storm beach assessments.

Example of Digitized Reef



During the summer, rectified coastal aerial photographs are taken in order to capture the nearshore reef/hardbottom exposure along the County's coastline. The aerials are then digitized and evaluated to determine the quantity or acreage of exposed nearshore reef communities. Palm Beach County has maintained an annual record of exposed nearshore reef on an annual basis since 1993.

Beach profiles are measured once per year and following large storm events in order to track the movement and volume of sand on the beach. Hurricanes, tropical storms and nor'easters often reshape the shoreline altering the amount of sand remaining within dunes and along the beach berm. Monitoring these changes helps coastal managers determine if large volumes of sand have been eroded from the profile and lost to the nearshore.

The County's sea turtle monitoring program tracks sea turtle nesting and artificial lighting issues along project beaches. Beach

construction projects can impact the County's endangered and threatened sea turtle populations therefore it is imperative that construction projects utilize beach compatible sand and take precautions to limit the amount of any new artificial light from illuminating the beach.

Click the following link to learn more about Palm Beach County's nesting sea turtle population: <http://www.co.palm-beach.fl.us/erm/coastal/sea-turtles/#intro>.

During construction of beach projects, monitoring of water quality is a permit requirement and the County also independently monitors nearshore waters along project beaches to document background levels in the absence of any construction projects. In 2010, ERM staff worked to develop a record of natural turbidity levels near Inlets and along the coastline.

Throughout the year, staff also conduct pre and post storm beach assessments to monitor shoreline change. Storm related impacts to beaches and the associated dune system can compromise upland infrastructure. Assessing pre and post storm conditions help managers quantify the financial impact of the storm and determine if impacts require emergency repair.

Engineered Structures

The program also evaluates the use of both "time proven" and "state of the art" engineered structures for their potential application to eroding shoreline areas. Each year, new or improved erosion control structures and methodologies are made available to the industry. When it can be demonstrated that these methods are both viable and cost effective, they will be considered for implementation along the County's shoreline.

Ocean Ridge Granite T-Head Groins



Groins and breakwaters are two types of engineered structures that are used to control erosion along the County's shorelines. Groins are shore perpendicular structures typically constructed with granite boulders or adjustable concrete panels. The function of these structures is to disrupt a portion of the sand flowing south along the beach and deposit it on the updrift side of the structure. Since groins can cause downdrift impact to adjacent beaches, they must be designed to allow sufficient sand bypassing.

Although straight groins were often installed throughout the County, the shoreline located immediately south of the South Lake Worth Inlet contains a series of T-head groins. These were installed in conjunction with the 1998 beach nourishment project. They serve to both counteract the erosive effects of the inlet, and to protect the nearshore reef from sand inundation.

Breakwaters are shore parallel structures comprised of granite or limestone boulders and placed just a few hundred feet offshore in shallow waters. These structures can either be emergent or submerged and are constructed to dissipate the energy of incoming waves. Breakwaters can be found world-wide and there several breakwaters protecting Intracoastal shorelines within Palm Beach County.



Limestone boulder breakwaters at Dubois Park (Jupiter Inlet) help to protect the Park's shoreline and provide hardbottom habitat for a diverse array of marine life.



Limestone boulder breakwaters at Peanut Island Park (Lake Worth Inlet) protect the Park's sandy shoreline and form salients (portion of shoreline connecting to the breakwater) behind the structures.

BRIEF HISTORY OF SHORE PROTECTION IN PALM BEACH COUNTY

- From the middle and late 1800's until the early 1900's, various groups, both private and public, in various ways attempted to address beach erosion problems.
- Two inlets were created and all four of Palm Beach County's inlets were stabilized in the 1920's and early 1930's.
- To reduce erosion south of the inlets, sand transfer plants were built at the South Lake Worth Inlet in 1937 and at the Lake Worth Inlet in 1955.
- On June 14, 1943, the State Legislature, in Chapter 22324 Laws of Florida, authorized Palm Beach County to protect Ocean Boulevard by the levy of Ad Valorem taxes or by special assessment tax. It is uncertain how the County funded erosion control efforts prior to that date. However, coastal municipalities and special taxing districts designed and funded their own projects such as the creation of inlets, construction of seawalls and construction of groin fields or other coastal erosion control projects.
- By action of the United States Congress on July 3, 1958 (PL 85-500) and October 23, 1962 (PL 87-874), all of Palm Beach County shoreline became eligible for federal funding of beach erosion control projects. In April 1987, this authorization was further expanded in the document: "Beach Erosion Control Projects for Palm Beach County, Florida, General Design Memorandum with Environmental Impact Statement" (US Army Corps of Engineers).
- On June 25, 1985, the Palm Beach Countywide Beaches and Shores Council was created by interlocal agreement between the County, the inlet (or special taxing) districts, two environmental organizations and all coastal municipalities. The purpose of the council was to be a forum for information exchange and cooperative effort to assist participants in fulfilling interests of shore protection, preservation and/or enhancement.
- Until 1987, countywide erosion control efforts were conducted through the Beach Erosion Program under the direct responsibility of the County Engineer. In 1987, with the formation of the Palm Beach County Department of Environmental Resources Management, Beach Erosion Program staff joined with environmental staff to form the Shore Protection Section of the Coastal and Wetlands Division. The section and division name changed in 1998 to the Shoreline Enhancement & Restoration Section of the Environmental Enhancement & Restoration Division. This restructuring allowed for a more expanded approach to shore protection efforts, combining environmental and engineering expertise toward the development, assessment, design, construction and monitoring of shore protection projects.
- The Beach Erosion Control Program was funded by the Ocean Boulevard Fund until September 30, 1987. On July 2, 1987, the Board of County Commissioners approved 1988 revenues of the Tourist Development Tax to be used for beach erosion control.

- On March 8, 1988, the Florida Governor and Cabinet formally approved “Florida’s Beach Restoration Plan”, a document identifying beach projects eligible for state funding, including all the Palm Beach County projects.
- The “Coast of Florida Erosion and Storm Effects Study – Region III with Draft Environmental Impact Statement” was a draft feasibility report completed in May 1995. The report summarized a cooperative cost shared feasibility study on beach erosion and storm damage problems throughout the lower southeast coast of Florida. This comprehensive report was the result of planning, engineering, environmental, economic and real estate studies of the area and its shoreline erosion problem. It also included recommendations for modifications of existing projects. The report was written by the U.S. Army Corps of Engineers with some input from state and local agencies, including Palm Beach County.
- During the 1996 legislative session, the Florida Legislature abolished the South Lake Worth Inlet District, its powers and responsibilities being turned over to Palm Beach County.
- The 1998 Florida State Legislature enacted a law to guarantee annual funding statewide in grants for the preservation and repair of Florida's beaches by dedicating a portion of the Ecosystem Management and Restoration Trust Fund. For more information about FDEP's Beach Management Funding Assistance Program: <http://www.dep.state.fl.us/beaches/programs/becp/index.htm>
- To date, 14.5 miles of shoreline within Palm Beach County are managed with beach nourishment. Another 5 miles is maintained by dune restoration.
- Program highlights and the Shore Protection Plan are published on the Internet at: <http://www.co.palm-beach.fl.us/cnty/erm/divisions/enhancement/shoreline/index.htm>.

The Economic Benefit of Beaches to Palm Beach County & State of Florida

“In the State of Florida, every dollar spent on beach projects generated almost \$48 in sales tax revenues.” (Stronge, 2013)

Maintaining healthy beaches is critical to the State of Florida and Palm Beach County’s economy. In 2013, “Florida had more beach tourists (810 million) annually than any other state or country and more visits to all theme parks and national parks combined (Houston, 2013).” Florida’s beach tourists “annually spend \$36 billion and generate \$6.5 billion in taxes (Houston, 2013).”

At one time, several of Florida’s iconic beaches, such as Miami Beach, actually remained in a constant eroded state. However, with the establishment of beach nourishment programs, Florida’s beaches have become both domestic and international travel destinations helping to rejuvenate many local economies. Presently, the annual recreational value of Florida’s beaches is estimated to be \$50 billion (Houston, 2013).

Palm Beach County is one of Florida’s coastal counties that rely upon beach tourism to help fuel the local economy. With forty-six miles (31.3 miles are designated as critically eroded) of coastline to maintain, it is essential for the County to sustain an active and funded beach program. During the 2013 summer season (May–October), approximately 1.7 million visits were made along the County’s beaches attracting both residents and tourists. Over sixty percent (61.2%) of these visits were by Floridians (53% Palm Beach County residents) while the remaining 38.8% of visits were by out-of-state tourists (11% international) (Stronge, 2013). This is typical during the summer months when the County’s beaches are visited primarily by County residents or residents of the State of Florida. The County experiences an influx of out-of-state beach visitors during the winter months. Regardless of which season experiences the most tourists, each visitor group contributes millions of dollars to the local economy. In summer 2013, out-of-county beach tourists spent \$84.4 million while visiting the County while out-of-state tourists spent \$76.8 million (Stronge, 2013). The result of this direct spending not only fueled the County’s local businesses (hotels, restaurants, stores) but it also created 1.3 million jobs (Stronge, 2013).

Considering 91% of the 2013 surveyed visitors come to the beach to swim/sun bathe it is important for the County to maintain safe recreational beaches for its residents and visitors. Residents and tourists alike depend upon the County, State and Federal government to renourish the portions of shoreline that provide direct public access and have become critically eroded. Providing “healthy” beaches is just one way to ensure the continued growth of the County’s local economy.

PALM BEACH COUNTY ECONOMIC IMPACT OF BEACH VISITORS SUMMER 2013 (MAY - OCTOBER)			
	Palm Beach County Resident	Out-of-County Beach Tourist	Out-of-State Beach Tourists
Number of Beach Visits	920,820	142,381	673,521
*Spending Per Tourist Per Day	No Data Available	\$103.52	\$113.98
Total Direct Spending (\$M)	No Data Available	\$84.4	\$76.8
Total Indirect Spending (\$M)	No Data Available	\$54.6	\$75.8
Total Economic Impact (\$M)	No Data Available	\$139.0	\$152.6
Number of Jobs Created (million)		1.3	1.4
* Includes lodging, dining, groceries/food, recreation/entertainment, shopping, local transportation & other			

FIGURE NO. 1

Based on data collected by William B. Stronge, Ph. D., Senior Fellow in Economics & Greta von Unruh, Managing Consultant, The Economic Development Research Institute. 2013 State multipliers were obtained from the RIMS II Model produced by the U.S. Department of Commerce.

PROGRAM PLANNING CONSIDERATIONS

Erosion

The potential impacts of erosion on recreational beaches, dune habitat, or upland public property is the primary consideration used to determine project limits. Erosion can be a long term process resulting from a combination of sea level rise and high frequency/low intensity storms, or it can be a short term response to seasonal weather changes or major storm events. Generally, beach nourishment (usually with a dune restoration component) is proposed where long term erosion causes a reduction of sand volume in the beach profile. Dune restoration projects are typically recommended where erosion events have resulted in the loss of the dune or when potential environmental impacts preclude the use of extensive fill.

Inlets

There are two man-made and two man-altered inlets in Palm Beach County. These inlets are the primary cause of erosion to our shoreline. The jetties at these inlets alter the natural longshore flow of sand and tidal currents cause sand to be lost to interior waters or impounded on offshore shoals. This creates sand deficits for beaches to the south. Effective bypassing at inlets is critical to offset the losses.

Storm Response

Storms can have devastating effects on shorelines since they redistribute large volumes of sand in a short period of time. Within the last decade, Palm Beach County has endured the direct impact of three major hurricanes. In 2004, Hurricanes Frances (Category 2) and Jeanne (Category 3) both made landfall just north of Palm Beach County within the same month. The following year, Hurricane Wilma, a Category 3 storm, impacted the already battered beaches of Palm Beach County. Natural recovery of the beaches has been slowed by the numerous tropical and nor'easter storm events that have occurred since 2004. Subtropical Storm Andrea, which impacted County beaches in 2007, required an emergency declaration due to the extent of the erosion. Within the County's Jupiter Beach Park, a maintenance building and 1.3 acres of a healthy dune system were lost and the Park's parking lot was breached. It is these tropical storms and more common winter storms that produce high seas for days at a time, with considerable cumulative affects. The Shoreline Enhancement & Restoration program is designed to respond to emergency response scenarios, however substantial damage cannot always be addressed through emergency measures and often alters long term planning.

TIMELINE OF STORMS IMPACTING PALM BEACH COUNTY BEACHES	YEAR
<i>HURRICANE IRENE</i>	1999
<i>HURRICANE FRANCES</i>	2004
<i>HURRICANE JEAN</i>	2004
<i>HURRICANE WILMA</i>	2005
<i>SUBTROPICAL STORM ANDREA</i>	2007
<i>UNNAMED NORTHEASTER</i>	2007
<i>TROPICAL STORM NOEL</i>	2007
<i>TROPICAL STORM FAY</i>	2008
<i>SEPTEMBER STORM (UNNAMED)</i>	2008
<i>TROPICAL STORM HANNAH</i>	2008
<i>HURRICANE IRENE (SWELL ONLY)</i>	2011
<i>TROPICAL STORM SEAN</i>	2011
<i>HURRICANE SANDY</i>	2012

FIGURE NO. 2

Environmental Regulation Consistency

Current regulations apply to planning considerations and no attempt is made to predict future changes in the regulatory climate. The current focus in shore protection project permitting is on protection of reef habitat, water quality, sea turtles, and sea grass with a continuing increase in fisheries protection. A change in the degree of regulatory protection or a shift toward increased protection of another resource (marine mammals, shore birds, and invertebrates) could affect project permitting and scheduling.

Sand Availability

This plan assumes that sand for beach nourishment can be located in sufficient quantity, will be of acceptable quality and be found in an area where dredging is cost effective and with little to no significant environmental impact. Previous studies indicated that Palm Beach County had a more than adequate supply of sand than neighboring Counties to the south (Broward & Dade) however, Palm Beach County does not have an infinite amount of sand available offshore for beach nourishment and not all sand sources are suitable for beach placement. Additional study is proving that many of these presumed sand sources are not beach compatible for varying reasons. Either the sand is too fine, too coarse, too dark or has unacceptable levels of silt, clay or cobble to be suitable for beach nourishment. Additional geotechnical study that occurs as each project is developed helps determine whether the sand source is viable for beach nourishment and is economically and environmentally feasible.

The Army Corps of Engineers (USACOE) Jacksonville District recently completed the Southeast Florida Sediment Assessment and Needs Determination (SAND) study (<http://ross.urs-tally.com/Reports.aspx>). This study is a continuation of the USACE's *Southeast Atlantic Regional Sediment Management Plan for Florida (RSM) Final Report (2009)* (<http://ross.urs-tally.com/Reports.aspx>) which developed the criteria for categorizing offshore sand sources as proven, potential, unverified and depleted or unusable and provided an estimated volume of sand available for beach placement within the southeast region of Florida. The USACOE determined that the estimated volume of sand identified in the 2009 report required further refinement and analysis.

The SAND study further identified offshore sand resources within both State and Federal waters suitable for beach placement and quantified the volume of material needed to perform full-sized beach nourishment projects over a 50-year period within St. Lucie, Martin, Palm Beach, Broward and Miami-Dade Counties. It is estimated that 174 million cubic yards (mcy) of sediment is needed to construct all of the federal and nonfederal beach projects out to 2062 within the SE Region.

The Florida Department of Environmental Protection (FDEP) also maintains a sand database known as the ROSS (<http://ross.urs-tally.com>) (Reconnaissance Offshore Sand Search) database. ROSS is an inventory of Florida's current and historical geological and geotechnical data and identifies potential offshore sand sources acceptable for beach nourishment throughout the state. Geotechnical data collected by the USACOE for the SAND study is available for review on ROSS/OSI.

In addition to offshore sand sources, the County often uses upland sand for smaller scale dune and berm restoration projects. Upland material must be processed prior to placement on the beach. This material is screened and washed several times in order to remove any incompatible material and excess fines. Using an upland sand source is most economical when a smaller quantity of sand is needed. Palm Beach County maintains technical specifications for beach sand separate from the State of Florida. County technical standards are tailored to replicate the characteristics of Palm Beach County native beach sand.

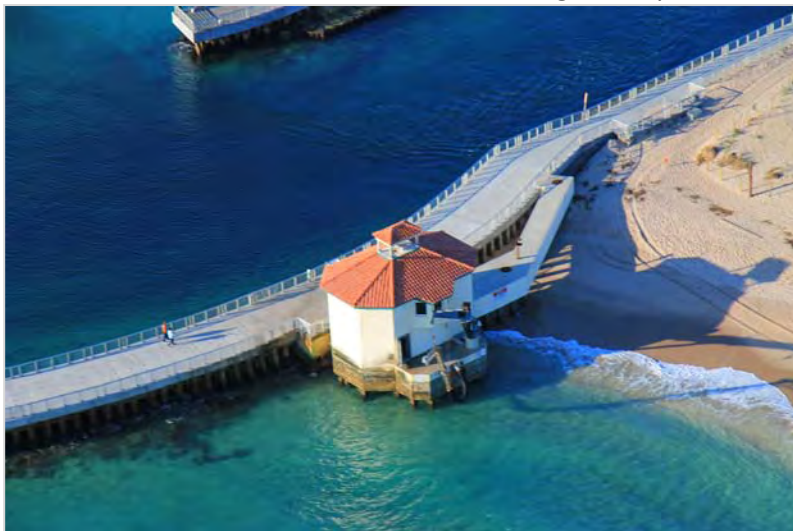
The standards require a lower silt content than the state and more geotechnical testing of the material prior to placement on the beach.

New Technology

Improvements in technology lead to more effective methods for inlet bypassing, increased operating depths for dredges, overall project performance and the development of alternative technologies that are proven effective. Continuing advancements in computer modeling enable engineers to predict effects of various alternatives with a greater level of certainty. When erosion control projects are designed, computer modeling is used to help coastal engineers determine what volume of sand is needed for a project or where a structure, such as a groin or breakwater, should be placed along the shoreline.

Sand Deficit Reduction

Inlet fortification and historical coastal management practices have resulted in a sand starved system



throughout the SE coast of Florida. Improvements to sand bypassing, such as the construction of the new South Lake Worth Inlet Sand Transfer Plant, and additions of large volumes of sand to the littoral system via beach nourishment can help reduce the deficit. This will ultimately result in projects that last longer and lower the costs of maintaining the beach/dune system.

South Lake Worth Inlet Sand Transfer Plant

Duration of Project Development (Timing)

It is assumed that the current requirements for securing federal and state funding for any new beach nourishment projects will remain unchanged. This process requires the development of a General Design Memorandum (GDM) and an Environmental Impact Statement (EIS) which includes a detailed study of project alternatives. These studies are expensive and can add years of lead time to project development for large scale projects such as beach nourishment.

Federal and State permits must be obtained prior to the construction of any coastal projects. Permitting is a time consuming process which must be built into the project timeline.

Projects that qualify for Federal funding/cost-share may even be subject to an additional level of review prior to construction starting if the funding agreement, known as a Project Partnership Agreement (PPA), between the USACE and project sponsor (e.g. Palm Beach County) has expired. Often an expired PPA triggers the completion of a LRR (Limited Reevaluation Report), GRR (General Reevaluation Report) or 934 Report to justify the economic feasibility of the project.

Neighbors are Important

As the saying goes, "We all live downstream." Shore protection and coastal management activities are not isolated in space. Actions to control erosion can affect a project area and usually extend to adjacent shorelines depending upon the magnitude of the actions. The effectiveness of sand transfer at inlets, the extent of shoreline armoring, and the placement of large volumes of sand on the shoreline can all have dramatic impact on downdrift and updrift shorelines. The degree of success of the Shoreline Enhancement & Restoration Program depends upon coastal governments and property owners making wise coastal management decisions which result in minimal negative impacts to downdrift neighbors.

PROJECT CRITERIA

In order to qualify for state or County funding, proposed coastal projects must meet the following three criteria: critically eroded shoreline designation from FDEP, public accessibility and minimal environmental impact to the coastal resources. All three elements must be present for an effective beach management strategy.



FIGURE NO. 3

Critical Erosion:

Critically eroded areas are defined by the Florida Department of Environmental Protection (FDEP) as "segments of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. In Palm Beach County, 68% (31.3 miles of ~46 miles) of the ocean shoreline was considered by the FDEP to be critically eroded in 2012. This designation is an important prerequisite in any beach management plan and indicates areas that may be candidates for the expenditure of state funds for beach restoration projects.

Public Access:

The expenditure of limited public funds is focused on areas accessible and open for use by the public. Proposed project areas are evaluated for state cost sharing (up to 50 percent of the total costs for non-federal beach management projects) based upon FDEP guidelines found in Chapter 62B-36.007 F.A.C. The state cost share received for a shore protection project is subject to modification based on the amount of public accessibility calculated.

“Project shoreline lengths eligible for cost sharing are quantified at the rate of 100 units of eligibility per mile (5,280 feet) or 52.8 feet per unit. A unit is defined as one automobile parking space, one rental unit in a Public Lodging Establishment, one mass transit stop, or 4 bicycle parking spots.”

In order to review the criteria used to determine how eligible shoreline lengths are calculated refer to Chapter 62B-36, Florida Administrative Code (Beach Management Funding Assistance Program), 62B-36.007 Project Cost Sharing (<https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62b-36>)

Minimal Environmental Impact to Coastal Resources:

Ideally, shore protection projects create no negative environmental impacts. Realistically, both negative and positive influences to natural resources are inevitable; the key is in balancing the impacts. For the purposes of this report, the minimal impact designation is primarily based upon the absence of persistent nearshore hardbottom as determined by recent aerial photography. A sandy sea floor within the design equilibrium toe of fill indicates areas where impacts from placing sand in nearshore waters during beach nourishment would be minimal. Effects on other resources and species such as offshore reefs, softbottoms, water quality, sea grass beds and sea turtles are primarily correlated with the location and quality of borrow material and require more detailed assessment after a potential borrow area is identified.

SHORELINE PROTECTION PROGRAM PROJECT LOCATIONS NORTHERN SEGMENT

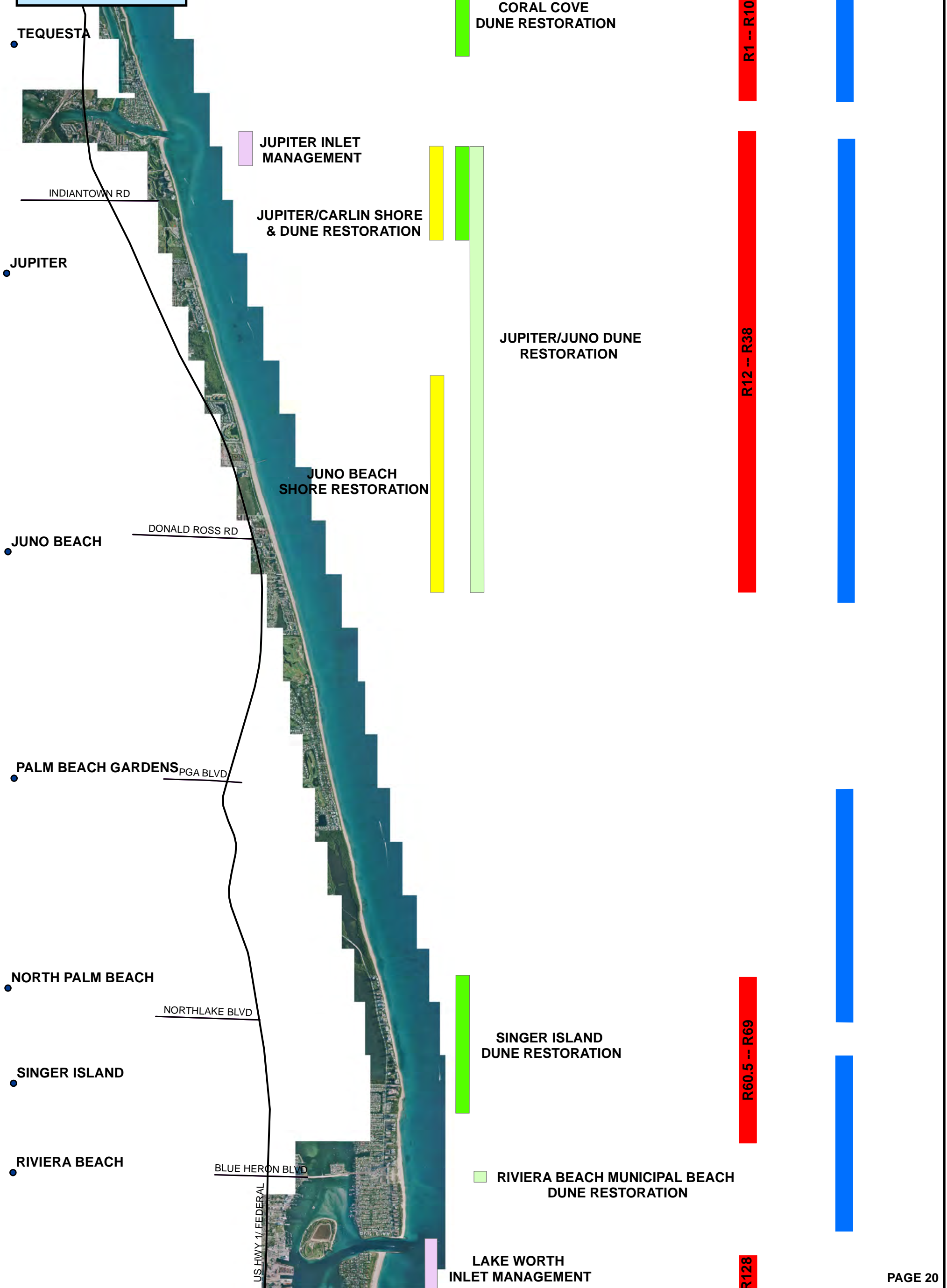
Total length of northern segment beach nourishment projects = 3.3 miles
Total length of northern segment dune projects = 3.4 miles

Legend

- PUBLIC ACCESS
- INLET MANAGEMENT
- STRUCTURES
- HISTORICAL DUNE PROJECTS
- CURRENT DUNE PROJECTS
- BEACH NOURISHMENT PROJECTS
- CRITICAL EROSION

CRITICAL EROSION
(as per 2012 FDEP inventory)
Northern Segment: 8.2 miles

PUBLIC ACCESS
(meets FDEP criteria
for state funding)



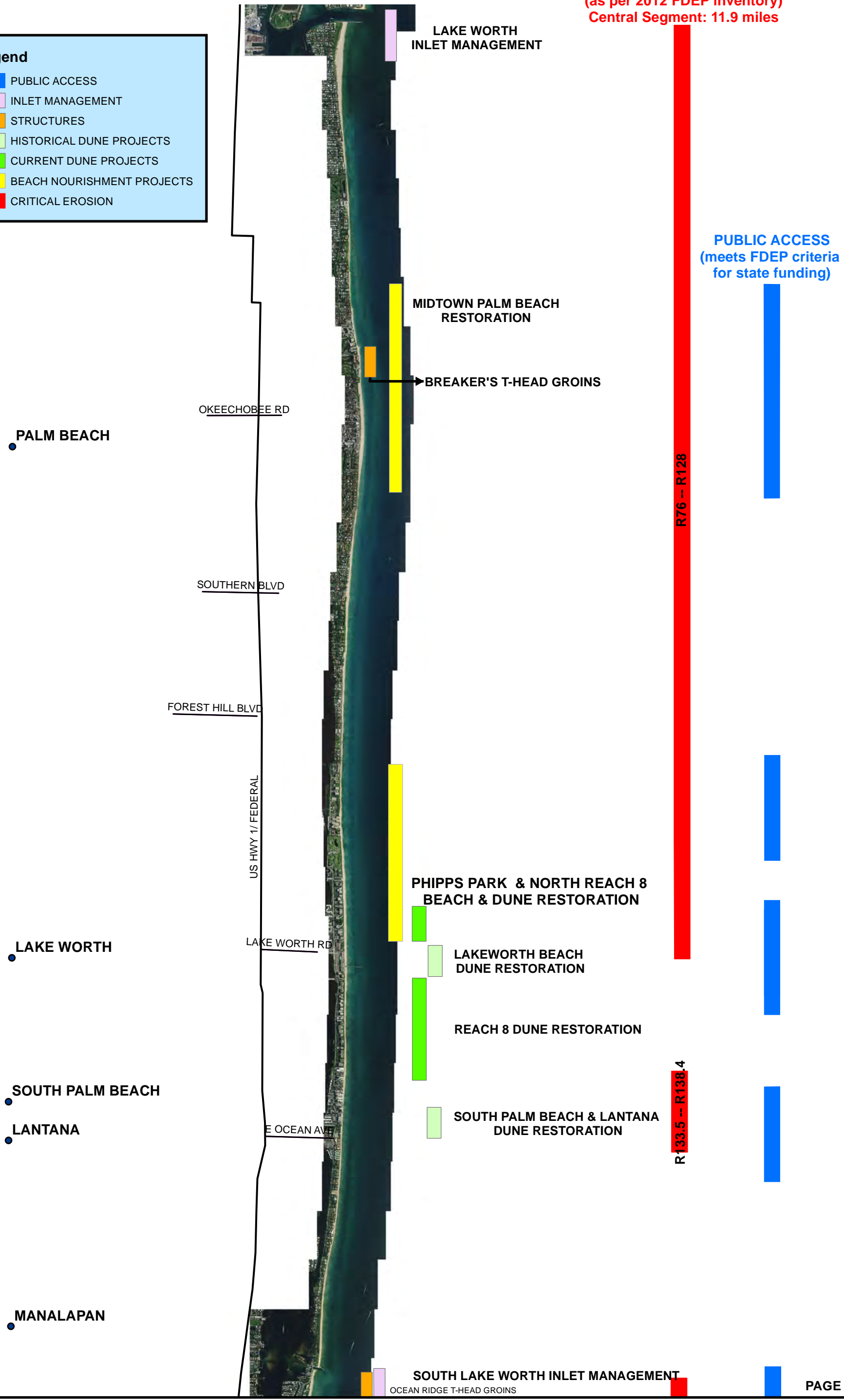
SHORELINE PROTECTION PROGRAM PROJECT LOCATIONS CENTRAL SEGMENT

Total length of central segment beach nourishment projects = 4.5 miles
Total length of current central segment dune projects = 1.6 miles

CRITICAL EROSION
(as per 2012 FDEP inventory)
Central Segment: 11.9 miles

Legend

- PUBLIC ACCESS
- INLET MANAGEMENT
- STRUCTURES
- HISTORICAL DUNE PROJECTS
- CURRENT DUNE PROJECTS
- BEACH NOURISHMENT PROJECTS
- CRITICAL EROSION



PUBLIC ACCESS
(meets FDEP criteria
for state funding)

R76 -- R128

R133.5 -- R138.4

SHORELINE PROTECTION PROGRAM PROJECT LOCATIONS SOUTHERN SEGMENT

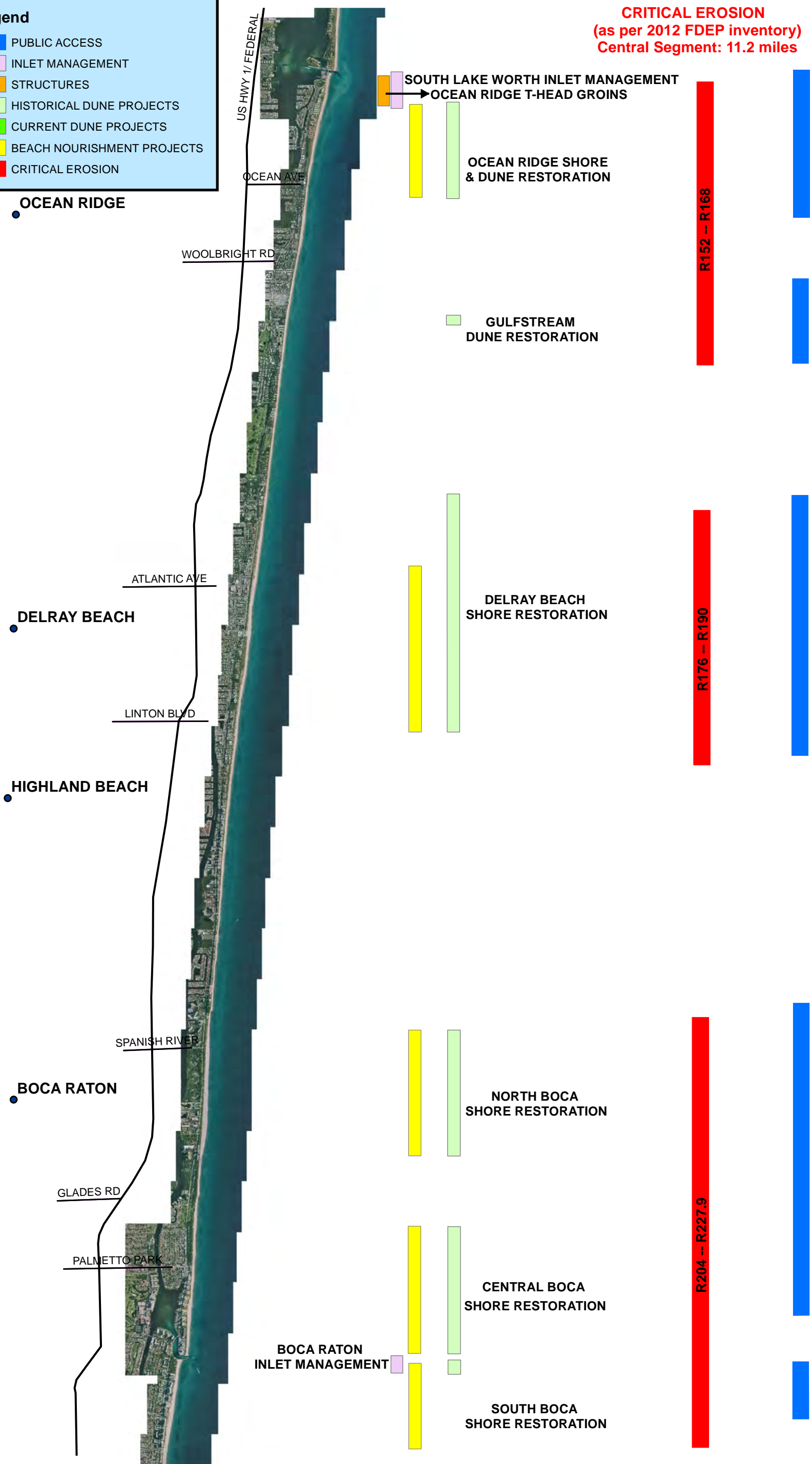
Total length of southern segment beach nourishment projects = 6.7 miles
Total length of current southern segment dune projects = 0 miles

Legend

- PUBLIC ACCESS
- INLET MANAGEMENT
- STRUCTURES
- HISTORICAL DUNE PROJECTS
- CURRENT DUNE PROJECTS
- BEACH NOURISHMENT PROJECTS
- CRITICAL EROSION

CRITICAL EROSION
(as per 2012 FDEP inventory)
Central Segment: 11.2 miles

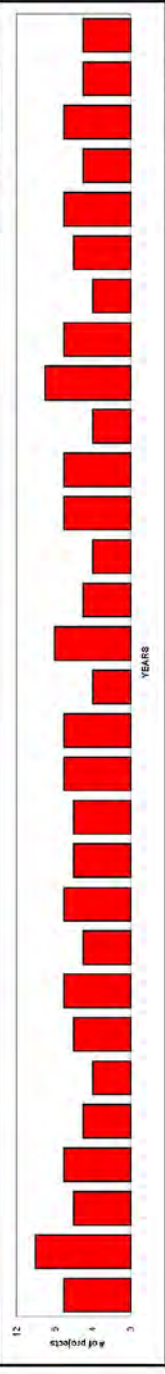
PUBLIC ACCESS
(meets FDEP criteria
for state funding)



SHORELINE ENHANCEMENT & RESTORATION PROGRAM Construction Timeline

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	(YR)	
Shore Protection																																
Jupiter/Carlin																																7
Juno Beach																																6
Midtown																																8
Phipps																																6
Ocean Ridge																																6
Delray Beach																																10
North Boca Raton																																10
Central Boca Raton																																10
South Boca Raton																																6
Dune Restoration																																
Coral Cove																																3
Jupiter/Carlin																																3
Singer Island																																3
Other																																
ICW Maintenance Dredging																																2
South Lake Worth Inlet Mgmt																																1
Lake Worth Inlet Mgmt																																1
Jupiter Inlet Mgmt (JID)																																1
Emergency Beach Projects																																3

Total Projects = 184
 Grand Total = 184
 Avg # projects/year = 6.1



T:\050\Plan\05\revised\05_2011\2014

30 YEAR PROGRAM BUDGET

METHODOLGY

The 30-Year Beach Improvement Plan is based on *need* rather than *funding availability*. Project planning assumes average weather conditions with no catastrophic events and the continuation of long-term erosional trends. Several projects included in the budget are only in the planning stages and others may only be constructed if state funding becomes available.

The budget assumes:

- no further changes in state and federal funding than those projected;
- no changes in the current bed tax allocation of 14.1% of the first three cents less convention center and special events fund allocations
- supplemental funding for any additional projects; and
- additional funding, when required, from other sources, such as increases in present allocation, grants, municipal contributions, or private property cost sharing.

A total of twenty-three projects over a thirty-year period with a 3% inflation adjustment was identified at a total cost of \$1.2 billion. County funds would make up 17% of that total, or \$207million, equating to an average yearly funding requirements of \$7 million.

Revenue received from Bed Tax Collections is the main funding components of the County's beach program. Chapter 17 of the Palm Beach County Code defines the tourist development plan (Ord. No. 95-30, § 7, 8-15-95), which identifies specific projects/special uses of tourist development tax revenue in accordance with Florida Statutes, § 125.0104(5). This chapter further specifies how the tax revenues shall be allocated to each category of use. A percentage of the 2nd and 3rd cent collected shall be use to fund *Category C*: "Provide for beach improvement, maintenance, renourishment, restoration, and erosion control with an emphasis on dune restoration where possible."

Click the following link to learn more about Palm Beach County's Tourist Development Ordinance 95-30:

<http://www.pbcgov.com/touristdevelopment/ordinances.htm>

FUNDING ISSUES

FEDERAL FUNDING

The planning for federal funding of beach restoration projects began in 1946 (PL79-727). Eligibility was based on the project's expected level of shore protection as calculated by a cost to benefit ratio. Only publicly accessible beaches where economic benefits, both in terms of storm damage reduction and recreation exceeded costs would receive federal financial assistance. The 1996 Water Resources Development Act (WRDA) gave further funding preference to established federal project areas and beaches influenced by federal projects, such as navigational inlets. It also recognized environmental restoration as another primary purpose of beach erosion control projects. The exact amount of project funding is determined by criteria identified in a federal document known as a General Design Memorandum (GDM). A GDM is developed for each shore protection project. The Federal cost-share can be decreased if a portion of the beach nourishment project does not have sufficient public access or if it is deemed to have a solely recreational benefit (as opposed to a storm damage reduction benefit). Generally, dune projects only qualify for federal funds as part of a larger beach project. Appropriated funds are distributed on a reimbursement basis.

Funding for beach projects is generally appropriated by Congress through a line item or in a maintenance budget of an appropriations bill, which then goes into the Army Corps of Engineers' operating budget. WRDA 2000 limited federal cost sharing for projects without existing contracts to 50 percent. Typically, federal funds for shore protection projects are requested by the Corps of Engineers during their budget process. Other projects can still be funded by Congress but outside of the general civil works bill. Under this scenario, funding would be requested by the local sponsor based upon an approved GDM. Shore protection projects that could be affected by changes in the current federal direction are:

<u>PROJECT</u>	<u>GDM Approved</u>	<u>PCA</u>	<u>Future Application</u>
Jupiter/Carlin	X		X
Ocean Ridge	X	X	
Delray Beach	X	X	
North Boca Raton	X	X	

Federally funded beach projects can qualify to receive emergency rehabilitation funding following a severe storm event under the United States Army Corps of Engineers Flood Control and Coastline Emergency Program (FCCE). Following Hurricane Sandy in 2012, the four existing federally sponsored beach nourishment projects within Palm Beach County and one inlet dredging project received FCCE funding to help restore the sand along the County's beaches. The Jupiter Carlin, Ocean Ridge, Delray Beach and North Boca Shore Protection Projects received a total of \$16,000,000 in federal funding as part of the \$60 billion Sandy relief act passed by the United States Congress in early 2013.

CURRENT STATUS OF STATE FUNDING

Chapter 161 s.161.088 declares that “beach erosion is a serious menace to the economy and general welfare of the people of this state and has advanced to emergency proportions” and therefore is “declared to be a necessary governmental responsibility to properly manage and protect Florida beaches fronting on the Atlantic Ocean, Gulf of Mexico, and Straits of Florida from erosion and that the Legislature make provision for beach restoration and nourishment projects, including inlet management projects that cost-effectively provide beach-quality material for adjacent critically eroded beaches.”

In 1986, the Florida Legislature adopted the position to protect and restore Florida’s beaches through the establishment of a comprehensive beach management planning program. The Florida Department of Environmental Protection’s Beach Management Program (62B-36.003 General) was established to develop and carry out a comprehensive, statewide beach management plan that protects, maintains and restores the State of Florida’s critically eroded shorelines.

One component of FDEP’s comprehensive Beach Management Program is the Strategic Beach Management Plan (SBMP) which was adopted by FDEP in 2000 and again in 2008. The Plan provides “a multiyear repair and maintenance strategy to carry out the state responsibilities of a comprehensive, long-range, statewide program of beach erosion control; beach preservation, restoration, and nourishment; and storm and hurricane protection.” (*State of Florida SBMP Introduction*)

“The principles of this strategy are to:

- Maximize the infusion of beach-quality sand into the coastal system;
- Implement those projects that contribute most significantly to addressing the state’s beach erosion problems;
- Promote inlet sand bypassing to replicate the natural flow of sand interrupted by improved, modified or altered inlets and ports;
- Extend the life of beach restoration projects and reduce the frequency of nourishment;
- Encourage regional approaches to ensure the geographic coordination and sequencing of projects; and
- Reduce equipment mobilization and demobilization costs.”

SBMP- Introduction

The SBMP details specific construction and monitoring strategies for stretches of critically eroded shorelines along the Atlantic Ocean, Gulf of Mexico and Straits of Florida. FDEP’s Division of Water Resource Management evaluates the recommended strategies and determines if they qualify for funding through the Florida Beach Management Funding Assistance Program (BMFA) (Chapter 62B-36, Section 161.101). Under the BMFA, state, federal and local entities work together to implement shore protection and preservation projects. Local entities such as county and municipal governments and special taxing districts can qualify to receive up to 50 percent of eligible project costs. Eligible projects include “beach restoration and nourishment activities, project design and engineering studies, environmental studies and monitoring, inlet management planning, inlet sand transfer, dune restoration and protection activities, and other beach erosion prevention related activities consistent with the adopted Strategic Beach Management Plan.” (*FDEP website*)

Legislation providing dedicated state funding for eligible beach projects (CS-HB-3427) was enacted in 1998. Funding of these projects is received from a portion of the real estate documentary tax which funds 50% of the non-federal project costs with a provision for up to 25% more for actual costs savings resulting from geographic coordination and sequencing. At one time, the law makers anticipated \$30 million annually in state grants for local dune, beach and inlet management projects however, following 2007, there was a reduction in the amount of funding available due to a decrease in the documentary stamp revenues associated with a decline in real estate transactions during the recession.

Local governments/sponsors seeking state cost share on their beach and inlet management projects must submit an annual funding request to FDEP's Division of Water Resource Management. Statewide beach management projects are ranked in priority based on the following criteria:

- a. Severity of Erosion
- b. Threat to upland structures
- c. Recreational and economic benefits
- d. Availability of federal funds (federal sponsorship)
- e. Local sponsor financial and administrative commitment
- f. Previous state commitment
- g. Project performance
- h. Mitigation of Inlet effects
- i. Innovative Technologies
- j. Enhance nesting sea turtle refuges
- k. Regionalization
- l. Significance

A list of eligible projects and their rankings are submitted to the Legislature by FDEP where funding levels for the following fiscal year are established.

FUNDING ISSUES

PROGRAM SCOPE REDUCTION

In the event that program fiscal requirements exceed available funding, the scope of the projects must be reconsidered in terms of:

PROJECT SCHEDULE – Projects could be delayed or eliminated at the risk of increased storm damage, further degradation of habitat, reduction of property values and increased potential of shoreline armoring. Less sand added to the system would also reduce the synergistic effects that multiple projects have on the entire county coastline.

PROJECT DESIGN – a substantial portion of the costs associated with these projects is spent on design, engineering, permitting, administration and mobilization. It is, therefore, generally more cost effective to build larger projects to reduce the average price per cubic yard of sand added to the system. Reducing project dimensions (length, width, volume, number of plants, etc.) also reduces habitat creation and storm protection. Coastal projects are presently designed to optimize the balance of cost and benefit. Any deviation would also risk the financial participation of State and Federal agencies.

MUNICIPAL PROJECT FINANCING

The 30 Year Program Budget identifies reimbursement funding for projects in Riviera Beach, South Palm Beach, Palm Beach, Delray Beach and Boca Raton. Estimates for the amount of participation cited are based on past policy decisions. Any changes in those policies would affect the financial position of the entire program. Municipal participation in the funding of county projects could also be used to supplement the program budget.

DISASTER RELIEF FOR BEACH PROJECTS

FEDERAL ASSISTANCE- Restored beaches built without federal funding may be eligible for 75% reimbursement from the Federal Emergency Management Agency (FEMA) under the Stafford Act, but only for the volume of sand lost during the specific catastrophic event. FEMA regulations provide that disaster relief funds administered by that agency will not be made available when another federal agency has specific authority to restore facilities damaged or destroyed by the event that caused the disaster. The Army Corps of Engineers (USACE) has the responsibility to restore federally-authorized beach projects (at 100% federal cost) that are part of federally-authorized projects (Public Law 84-99). The repair work, too, must be controlled and constructed by the USACE, as there is no reimbursement provision.

FEMA Disaster Relief Policies for Beaches
from the Code of Federal Regulations
Sec. 206.226 Restoration of damaged facilities.

Work to restore eligible facilities on the basis of the design of such facilities as they existed immediately prior to the disaster and in conformity with the following is eligible:

- (a) *Assistance under other Federal agency (OFA) programs.* (1) Generally, disaster assistance will not be made available under the Stafford Act when another federal agency has specific authority to restore facilities damaged or destroyed by an event which is declared a major disaster.

- (j) *Beaches.* (1) Replacement of sand on an unimproved natural beach is not eligible.

- (2) Improved beaches. Work on an improved beach may be eligible under the following conditions:
 - (i) The beach was constructed by the placement of sand (of proper grain size) to a designed elevation, width, and slope; and
 - (ii) A maintenance program involving periodic renourishment of sand must have been established and adhered to by the applicant.

STATE ASSISTANCE- Provisions of Chapter 161, Florida Statutes, provides the following:

“161.111 Shore erosion emergency.—If a shore erosion emergency is declared by the Governor, the state, acting through the department, may spend whatever state funds are available to alleviate shore erosion.”

(http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0100-0199/0161/Sections/0161.111.html)

APPENDIX A

PROJECT FACT SHEETS

Coral Cove Dune Restoration Project

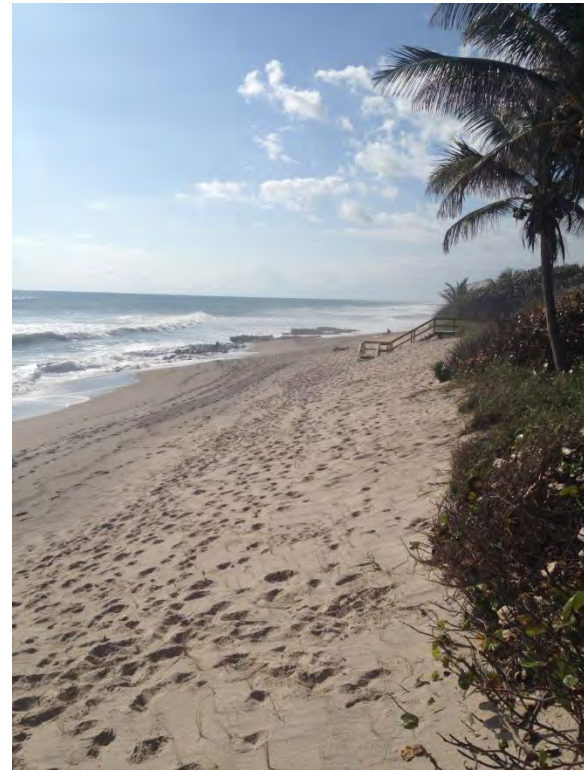
A Palm Beach County Shore Protection Project

Before



Dune suffered severe damage from Hurricane Sandy, October 2012

After



Project Location

- Northern Palm Beach County (PBC), approximately 1 mile north of the Jupiter Inlet.
- Project area is from the countyline south to the southern boundary of Coral Cove Park.

The Problem

- PBC's dunes are vulnerable to severe storm impacts, human activity, and invasive nonnative vegetation.

The Solution

- Restore damaged dune by adding sand.
- Stabilize the dune with native vegetation.
- Remove invasive nonnative vegetation.
- Create beach access with dune crossovers to minimize disturbance.

Benefits

- Restores beach habitat.
- Provides sea turtle nesting habitat.
- Healthy dunes naturally protect the beach shoreline from erosion.
- Native salt-resistant dune vegetation traps wind blown sand, collects it around the plant, and builds up the dune and surrounding beach.

Project Funding

- Funding is obtained through county, state, federal and local governments.
- County funds are obtained through taxes paid by tourists on hotel and motel rooms.

Connect with the Department of Environmental Resources Management and download our mobile maps.



Project Overview

- In 1989, Coral Cove Park Dune Restoration was first initiated. It included:
 - Removal of invasive nonnative vegetation.
 - Filling dune with sand to restore natural dune elevation.
 - Installation of 9.6 acres of native dune vegetation.
 - Construction of 4 dune walkovers.
 - Annual dune maintenance such as removal of invasive nonnative vegetation.
- Subsequent dune restoration was completed in 1993, 2005, and 2013.
- In winter 2013-2014, approximately 35,000 tons of sand was used to rebuild the dune.
- Native vegetation was installed to stabilize the dune slope and limit erosion.

Project Partners

Palm Beach County, Florida Department of Environmental Protection, Federal Emergency Management Agency (FEMA)



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Department of Environmental Resources Management
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How You Can Protect Dunes

- Preserve native dune plants.
- Remove invasive nonnative vegetation.
- Refrain from pruning native dune plants. Note: Pruning/removal may require a permit from Florida Department of Environmental Protection.
- Limit beach raking.
- Limit fertilizer and irrigation use around dune areas.
- Keep recreational activity away from dune areas (beach chairs, surfboards, volleyball nets).
- Use dune walkovers.

Jupiter/Carlin Renourishment Project

A Palm Beach County Shore Protection Project

Project Location

- Northern Palm Beach County (PBC), south of the Jupiter Inlet, extending to the southern boundary of Carlin Park. (1.05 miles)

The Problem

- Storm events and the project area's downdrift proximity to the Jupiter Inlet have resulted in chronic erosion which extends from the inlet south along the shoreline.
- Beach erosion threatens land & buildings and results in the loss of important beach & dune habitat and recreation area.

Solutions

- Ongoing efforts to stabilize the shoreline through beach nourishment and dune restoration is conducted by PBC.
- Intracoastal Waterway maintenance & inlet dredging are conducted by the Florida Inland Navigational District (FIND) and the Jupiter Inlet District (JID).

Benefits

- A stabilized beach and dune will provide storm protection, recreational opportunities, and sea turtle nesting habitat.

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Project Overview

- The project area includes both Jupiter Beach and Carlin parks and has received sand from two large-scale County beach nourishment projects (1995 & 2002) and multiple sand trap (JID) & Intracoastal Waterway (FIND) dredging events.
- In 2008 & 2012, two large-scale dune restoration projects were completed.
- The US Army Corps of Engineers' effort to secure Federal funding for future projects is ongoing.
- All permits for the project have been issued.
- Construction is scheduled to begin in Fall 2014.
- **Project Update – Fall 2014**
 - Approximately 300,000 cubic yards of sand will be placed within the project limits, providing a restored dune and a 50 ft wide beach.

Project Partners

Palm Beach County, Florida Department of Environmental Protection, US Army Corps of Engineers



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Subtropical Storm Andrea caused the collapse of a maintenance building along Jupiter Beach Park (May 2007).



Heavy equipment moved dredged sand during County's 2002 renourishment.



Juno Beach Renourishment

A Palm Beach County Shore Protection Project

Project Location

- In northern Palm Beach County along the shoreline from 1 mile north of the Juno Pier to 1.4 miles south of the Juno Pier in the Towns of Jupiter and Juno Beach.

The Problem

- Ongoing erosion is threatening A1A, infrastructure and beach habitat.

The Solution

- Renourish the beach with sand dredged from offshore to act as a sacrificial berm.
- Stabilize the dune with native vegetation.

Benefits

- Storm protection
- Restoration of beach habitat
- Maintenance of public recreation
- Provides sand to adjacent beaches to the south by longshore current activity.

Project Funding

- Federal Emergency Management Agency (FEMA) and Florida Department of Emergency Management
- Florida Department of Environmental Protection
- Palm Beach County Tourist Development Tax Revenue

Completed Project



Project Overview

- The project area was first nourished with offshore sand in 2001 and designed to last 5 years.
- Most of the 2001 nourishment project remained stable until the re-nourishment, 9 years later.
- Approximately 926,000 cubic yards of sand was used to refill the beach to the same size as the 2001 project.
- Sand was placed above the high water line so that wave action could slowly over time contour it into a natural beach slope.
- More than 50,000 sea oat plants were planted to restore the eroded dune south of the Juno Pier.



FAQ'S

- 1. How much did the project cost?**
\$10,534,028.45
- 2. How long did construction take?**
December 20, 2009 to March 20, 2010.
- 3. Where did the sand come from?**
An offshore borrow area 4 miles south.
- 4. What was the impact to sea turtle nesting?**
8 Leatherback nests were relocated from the construction area to another section of beach and hatched successfully.
- 5. Were there any reef impacts near the borrow area?**
The reef adjacent to the borrow area was carefully monitored before, during, and after construction and no impacts were observed.
- 6. How much of the new beach will be accessible to the public?**
The entire beach is open to the public.
- 7. Why was it necessary to screen the beach after the renourishment was completed?**
To remove rocks and shell that could impact sea turtle nesting. The rocks and shell were then used to create 6 acres of oyster reef habitat in the Loxahatchee River.

Project Partners

Palm Beach County and Florida Department of Environmental Protection



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Singer Island Dune Restoration Project

Project Location

- Northern Palm Beach County (PBC), approximately 1.5 miles north of the Lake Worth Inlet within the City of Riviera Beach
- Project area is from Ocean Reef Park north to the J.D. MacArthur Beach State Park

The Challenge

- PBC's dunes are vulnerable to severe storm impacts, human activity, and invasive nonnative vegetation.

The Solution

- Restore damaged dune by adding sand.
- Stabilize the dune with native vegetation.
- Remove invasive nonnative vegetation.

Benefits

- Restores beach habitat.
- Provides sea turtle nesting habitat.
- Healthy dunes naturally protect the beach shoreline from erosion.
- Native salt-resistant dune vegetation traps wind blown sand, collects it around the plant, and builds up the dune and surrounding beach.

Project Funding

- Funding is obtained through county, state, federal and local governments.
- County funds are obtained through taxes paid by tourists on hotel and motel rooms.

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Project Overview

- The Singer Island Dune Restoration Project was initiated in the year 2000.
- 9 dune restorations have been completed from 2001-2013 with 431,105 tons of sand placed in the restored dune at a total cost of approximately \$9M.
- Most recently, 69,476 tons of sand from the Stewart Mine in Fort Pierce were used to rebuild the dune during the winter of 2012-2013.
- Native vegetation was installed to stabilize the dune slope and limit erosion.
- Project funding is split 40% DEP, 20% City of Riviera Beach, and 20% PBC.

Project Partners

Palm Beach County, Florida Department of Environmental Protection, City of Riviera Beach

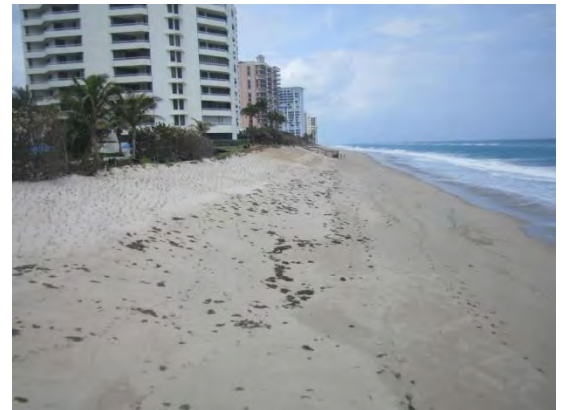


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Before



After



How You Can Protect Dunes

- Preserve native dune plants.
- Remove invasive nonnative vegetation.
- Refrain from pruning native dune plants. Note: Pruning/removal may require a permit from Florida Department of Environmental Protection.
- Limit beach raking.
- Limit fertilizer and irrigation use around dune areas.
- Keep recreational activity away from dune areas (beach chairs, surfboards, volleyball nets).
- Use dune walkovers.



Lake Worth Inlet

A Palm Beach County Shore Protection Project

PROJECT OVERVIEW



Project Location

- The Inlet is located between the southern end of Singer Island and northern end of Palm Beach Island

The Problem

- Inlet construction and fortification has interrupted the natural littoral transport of coastal sediments south to Palm Beach Island beaches

Solutions

- Maintain the existing Sand Transfer Plant which bypasses beach sand across the inlet to Palm Beach Island
- Continue scheduled dredging of the Lake Worth Inlet basins
- Place beach compatible dredged sand on the dry beach and within the nearshore south of the Inlet

Benefits

- A stabilized beach located directly south of the southern jetty
- Movement of sand into the littoral system located south of the southern jetty

Funding Partners

- United States Army Corps of Engineers (USACE)
- Palm Beach County (PBC)
- Port of Palm Beach
- Town of Palm Beach (TPB)

SAND TRANSFER PLANT

- The Lake Worth Inlet (or Palm Beach Inlet) is an artificial inlet that was stabilized in 1918 just as the Port of Palm Beach was developing into an important shipping facility. In 1958, a sand transfer plant (STP) was constructed on the north side of the inlet to bypass sand to the Palm Beach Island shoreline. The STP functioned until 1990 when the sand transfer pipe, which was located in a trench on the inlet's floor, rusted through and required replacement. A new transfer pipe was directionally drilled under the inlet floor and in 1995, the plant received an upgraded engine and pump.
 - Although the Town of Palm Beach (TPB) owns the STP, daily operation of the plant is conducted by Palm Beach County staff.
 - Structural restoration and rehabilitation of the mechanical and electrical systems of the STP were completed in 2010 by the Town of Palm Beach.
- The TPB is currently in the design and permitting phase of adding a second discharge point approximately 3,000' south of the original discharge point along the Town's shoreline. In order to bypass the sand further south along the beach, the Town plans to install a booster pump and additional pipeline next to the existing plant on the north jetty. The design plans include directionally drilling the second pipeline under the inlet entrance channel south to the second discharge site.

INLET MAINTENANCE DREDGING

- The United States Army Corps of Engineers (USACE) maintains the depth of the inlet's entrance channel and turning and settling basins by dredging these areas approximately every 1-2 years. Beach-quality sand is placed on the dry beach and within the nearshore south of Inlet's southern jetty. If the beach template becomes full south of the Inlet, the USACE is permitted to place excess dredged material within the Town of Palm Beach's Mid-town and Phipps Ocean Park beach nourishment templates.

Additional project information can be viewed online at :

<http://www.co.palm-beach.fl.us/erm/coastal/shoreline/beach/reports.htm>

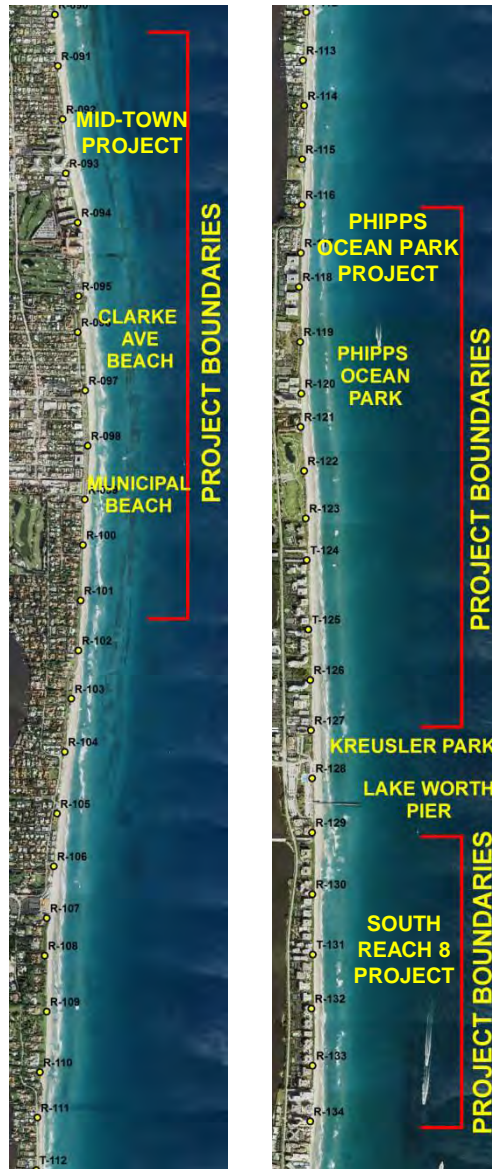


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Published August 2014

Mid-Town, Phipps Ocean Park/ North Reach 8 & Reach 8 Beach & Dune Restorations

PROJECT LOCATIONS



Project Locations

- Projects are located in central Palm Beach County within the Town of Palm Beach. The Mid-town project is located approximately three miles south of the Lake Worth Inlet and encompasses 2.4 miles (12,726'). The Phipps Ocean Park & North Reach 8 projects are located 3 miles south of the Mid-town Project and encompass 2.1 miles (11,250'). The Reach 8 Dune Restoration Project is located south of the Lake Worth Pier and is 1.2 miles (6,252') in length.

The Problem

- Chronic beach erosion threatens multiple municipal parks and adjacent upland infrastructure as well as hurricane evacuation route State Road A1A.

Solutions

- Ongoing efforts to stabilize the shoreline include continued periodic large-scale beach and dune nourishments

Benefits

- Storm protection
- Increased sea turtle nesting habitat
- Provides sand to downdrift beaches
- Increased public recreation

Project Sponsors

- Florida Department of Environmental Protection
- Town of Palm Beach

FAQs

- How often are the project areas renourished?**
The Mid-town and Phipps Ocean Park beach nourishment projects have a projected eight (8) year nourishment interval.
- Where does the sand come from?**
The sand is obtained from offshore borrow areas and then pumped to shore. The Town is currently completing an offshore sand search to identify additional borrow sites.

Sand from upland mines is also used for the smaller scale dune restoration projects.

PROJECT HISTORY

Mid-town (Reaches 3 & 4)

The first Mid-town beach restoration was constructed in 1995 and included installation of eleven (11) groins. Since the initial nourishment, the Town of Palm Beach (Town) has built one full-scale renourishment in 2003 and hurricane restoration in 2006. In total, 3.04 million cubic yards of sand has been placed throughout the project area since 1995.

The Town has tentatively scheduled the next full-scale renourishment for Winter 2014/2015. Approximately 800,000 CY will be placed on the beach. This project is expected to be permitted through the recently approved Beach Management Agreement (BMA).

Phipps Ocean Park (Reach 7) & North Reach 8

The Phipps Ocean Park project area received its first full-scale beach nourishment in 2006. In 2011, 56,000 cubic yards of material were placed to construct both beach and dunes.

South Reach 8

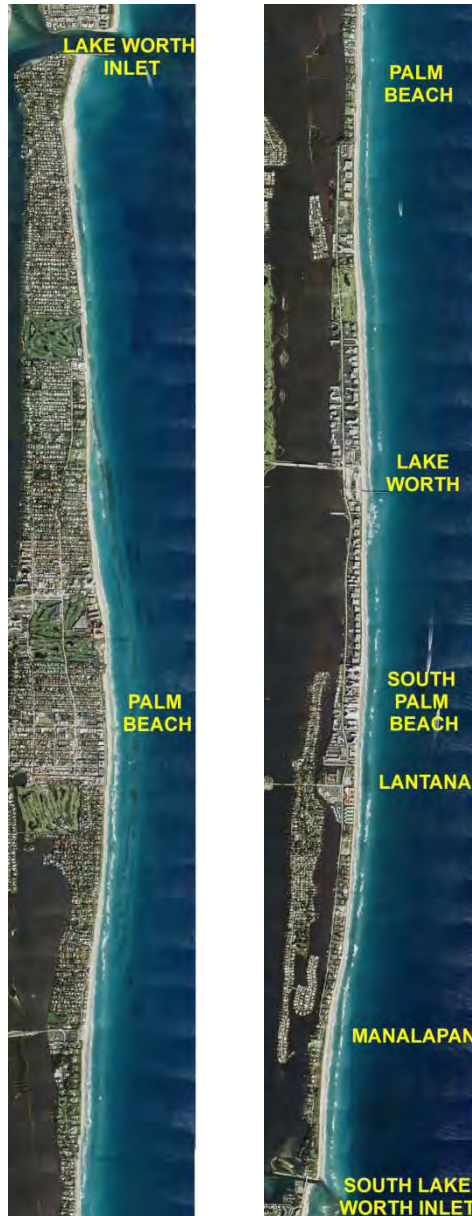
Periodic truck-haul dune restorations along this section of shoreline are built on an as-needed basis. The Town's proposed shoreline stabilization project (South Reach 8) for this area is currently being evaluated under the joint EIS and includes placement of 74,300 cubic yards of beach quality sand.

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BEACH MANAGEMENT AGREEMENT (BMA)

LIMITS OF BEACH MANAGEMENT AREA (BMA)



Project Location

- The coastal cell/project area encompasses a 15.7 mile stretch of shoreline extending from Lake Worth/Palm Beach Inlet south to the South Lake Worth/Boynton Inlet .

Benefits

- A regional approach to managing and permitting beach projects will improve coastal management of the cell and should help streamline the permitting process.

Partners

- Florida Department of Environmental Protection
- Florida Fish & Wildlife Conservation Commission (FWC)
- Town of Palm Beach
- Palm Beach County

FAQs

• What is a BMA?

The intent of the Florida Department of Environmental Protection's (FDEP) Palm Beach Island Beach Management Agreement (BMA) is to develop a regional approach to permitting current beach restoration and inlet management efforts. The current method includes evaluating and permitting most beach restoration projects on a project-by-project basis. The BMA is a cooperative agreement/document that manages, monitors and permits a stretch of shoreline as a region. The first region identified for the Palm Beach County BMA extends from the Lake Worth Inlet to the South Lake Worth Inlet and includes fifteen miles of shoreline. This stretch of shoreline crosses five municipal boundaries (Town of Palm Beach, City of Lake Worth, Town of South Palm Beach, Town of Lantana and Town of Manalapan) and includes numerous stakeholder groups. These entities worked together collaboratively for over a year to develop the final BMA document and identify and assess the region's beach management needs including improved inlet bypassing, beach restorations, environmental monitoring, cost-sharing opportunities and permitting requirements.

In September 2013, the Florida Department of Environmental Protection, Florida Fish & Wildlife Conservation Commission, Town of Palm Beach and the County became the first participants to sign the BMA. During the same time, the Town and County signed an Interlocal Agreement to partner on the completion of the physical and biological monitoring requirements defined within the BMA document.

"The primary goal of the BMA is to define mutually agreeable methods among the Department, local municipalities, and stakeholders for coastal erosion control, natural community protection, and monitoring protocols in pursuit of regional management of Palm Beach Island's coastal system, while providing net ecosystem benefits to the cell." – BMA

Click here to view the approved BMA document:
<http://www.dep.state.fl.us/beaches/pb-bma/index.htm>



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SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT

A Palm Beach County Shore Protection Project

Project Location

- Encompasses .82 miles of shoreline extending from the Town of South Palm Beach (R134+135') south to the Ritz Carlton Hotel (R138+551') located in Manalapan

The Problem

- Continued erosion along the project area threatens upland structures & recreational beaches

The Solution

- PBC has completed six (6) dune restoration projects along the shoreline. The constructed dune served as a buffer against the intense 2004 & 2005 hurricane seasons and numerous tropical and nor'easter storms
- Construct a series of low-profile groins in order to stabilize the beach. Place sand behind the structures where the beach is the most critically eroded and reconstruct a dune system planted with native plants.

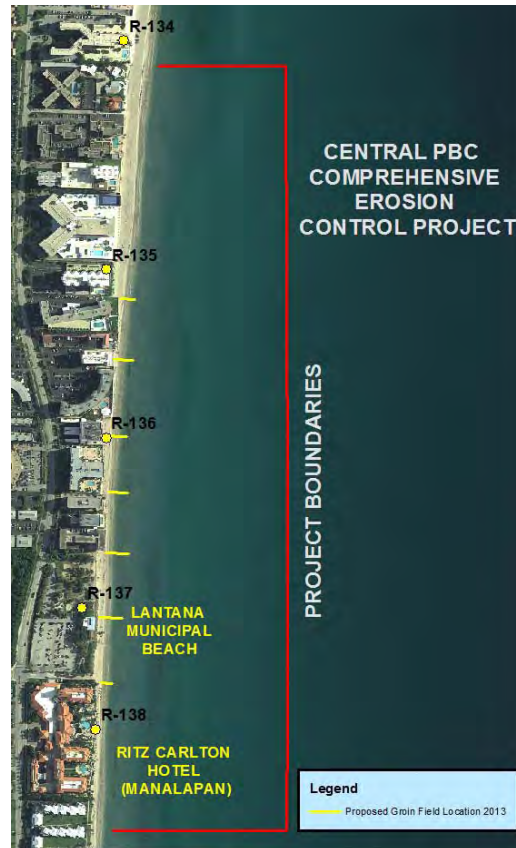
Benefits

- A stabilized beach and dune will provide storm protection, recreational opportunities, and sea turtle nesting habitat

Partners

- Palm Beach County (Tourism bed tax revenue)
- Florida Department of Environmental Protection (FDEP)
- Town of South Palm Beach

PROJECT LOCATION



PROJECT OVERVIEW

- Since 2007, the County has completed several engineering studies that have evaluated various long term erosion control alternatives (no action, beach nourishment, groins & breakwaters) for the Central PBC project area.
- In January 2013, the County completed a final engineering analysis to help identify the most appropriate shore protection plan for the project area. A series of 7 low-profile, shore-perpendicular groins plus a moderate beach fill (~75,000 CY) was the selected plan.
- Due to the close proximity of the Town of Palm Beach's proposed South Reach 8 project the two projects are being evaluated under one Environmental Impact Statement (EIS). The USACE requires completion of an EIS under the National Environmental Policy Act (NEPA). The EIS will further evaluate project alternatives & impacts.
- The EIS public & permitting agency scoping meetings were held in August 2013. Comments received from the meetings will help influence the final design & permitting of the project.

FAQ

- What is the cost of the project?**

The project as presently proposed would cost approximately \$5 million to construct. This cost also includes surveys, environmental monitoring and mitigation.

- How often will the project area require maintenance?**

The project is designed to last 3 years. Therefore, placement of fill material (~75,000 CY) will be required approximately every 3 years depending on several factors including wave climate, storm impacts and the results of post-construction physical monitoring.

- What are the groins made of?**

The groins will most likely be concrete panels with concrete support piles.

- How do the groins work?**

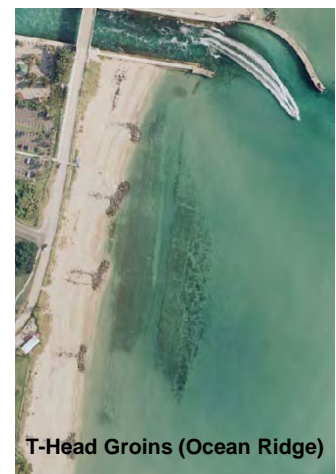
Groins are shore perpendicular structures that disrupt a portion of the sand flowing south along the beach and deposit it on the updrift side of the structure.

- Have groins been used successfully in other locations?**

Yes, they have been extensively used throughout the world and along Palm Beach County shorelines for decades. Since groins can cause downdrift impact to adjacent beaches they must be designed to minimize impact.

- Will the structures have any impact to recreational activities?**

The goal of the project is to stabilize the beach while maintaining current recreational activities such as surfing, fishing, swimming and snorkeling.



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South Lake Worth Inlet

Sand Trap and Channel Maintenance Dredging Project

Palm Beach County Inlets

- 4 inlets, 2 natural and 2 man-made.
- South Lake Worth Inlet, also called the Boynton Inlet, constructed in 1925.

Project Location

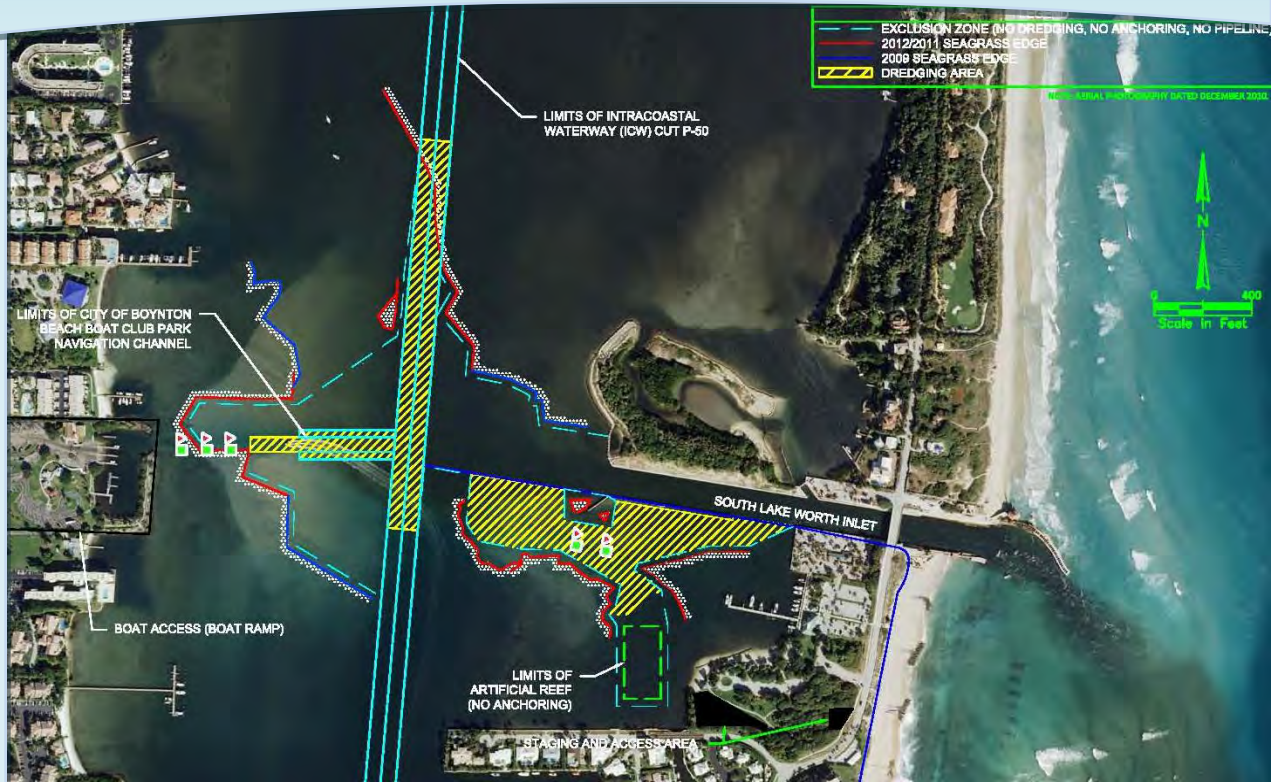
- Between the towns of Manalapan and Ocean Ridge in the Lake Worth Lagoon.

The Problem

- Sand piles up in the man-made sand trap and navigation channels.
- The irregular rock bottom of the sand trap south of the inlet “training” wall prevents the efficient removal of sand.

The Solution

- Dredge the sand trap inside the inlet.
- Dredge the shoaled sand from the Intracoastal Waterway navigation channel and Boat Club Channel.
- Return the beach quality sand to the beach south of the inlet.
- Remove additional rock from the sand trap to increase future capacity.
- Barge lesser quality sand and small rock to a deep hole by Half Moon Bay and Grass Flats Restoration Project in the Lake Worth Lagoon.



2013-2014 Maintenance Dredging Project

Phase I – Hydraulic Dredging – completed

- A cutterhead dredge removed accumulating sand from the sand trap and two navigation channels west of the inlet.
- The sand/water mixture was pumped via pipeline through the inlet, over the south jetty, and along the beach where it was discharged into the ocean at Ocean Hammock Park.
- Approximately 39,000 cubic yards of sand was re-introduced to the coastal (beach) system.



Dredged sand being discharged near shore

Phase II – Mechanical Dredging – ongoing

- An excavator dredged fine sand and small rock from the two navigation channels. The material was barged to other sites in the Lake Worth Lagoon for beneficial re-use.
- Larger rock excavated from the sand trap was added to a nearby artificial reef.
- Final dredging of the sand trap is expected to be complete by Fall 2014.



Artificial reef deployment

Project Partners

Palm Beach County, Florida Inland Navigation District, City of Boynton Beach, Florida Department of Environmental Protection



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Ocean Ridge Renourishment

A Palm Beach County Shore Protection Project

Palm Beach County Beaches

- 46 miles of coastline.
- 4 inlets, 2 natural and 2 man-made, connecting inland waters to the Atlantic Ocean.

Project Location

- Just south of the South Lake Worth Inlet on the Atlantic Ocean.

The Problem

- Chronic beach erosion threatens beach habitat and upland resources.

The Solution

- Renourish the beach with sand dredged from offshore.
- Maintain healthy dunes stabilized with native vegetation.
- Dredge the sand trap inside the inlet, and return the sand to the beach south of the inlet.
- Construct new sand transfer plant to mitigate for the erosive effects of the inlet.
- Use T-groins to help further stabilize the beach adjacent to the inlet.

Benefits

- Storm protection.
- Restoration of beach habitat.
- Provides sand to adjacent beaches.
- Maintenance of public recreation.

2013-2014 Project Overview

- Approximately 550,000 cubic yards of sand to be hydraulically dredged from 2 borrow sites 1,800 feet offshore.
- Sand will then be pumped onto the beach and shaped by bulldozers to widen 1.1 miles of beach.
- Renourishment project to begin in early January 2014.
- The project is part of the sediment management plan for the South Lake Worth Inlet.
- 74% of the \$7 million project is being funded by the federal government and the State of Florida. The remaining 26% percent will come primarily from Tourist Development Tax Funds generated through hotel and motel room taxes.



Advantages of Beach Renourishment

- Protects upland habitat and both public and private property by adding beach compatible sand to eroded shorelines.
- Effectively dissipates wave energy.
- Retains the flexibility of the beach/dune system.
- Provides vital nesting habitat for threatened and endangered sea turtles.
- Uses a "soft stabilization" method.

Beach erosion caused by Hurricane Sandy in 2012



Project Partners

Palm Beach County, Florida Department of Environmental Protection, U.S. Army Corps of Engineers



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City of Delray Beach Renourishment

Project Location

- In southern Palm Beach County located 500' north of Atlantic Avenue (R179A) to 500' south of Atlantic Dunes Park (R188A), encompassing approximately 1.7 miles (8,976 feet)

The Problem

- Chronic beach erosion threatens two municipal parks and adjacent upland infrastructure as well as hurricane evacuation route State Road A1A.

Solutions

- Ongoing efforts to stabilize the shoreline include continued periodic large-scale beach renourishments

Benefits

- Storm protection
- Restoration of beach habitat
- Increased sea turtle nesting habitat
- Provides sand to downdrift beaches
- Increased public recreation

Funding Partners

- United States Army Corps of Engineers
- Florida Department of Environmental Protection
- Palm Beach County
- City of Delray Beach

PROJECT LOCATION



FAQs

- **How often is this project area renourished?**
The project is designed to last 10 years.
- **How much sand was placed on the beach for the 2013 project (fifth periodic renourishment)?**
Approximately 1 million cubic yards (mcy) of sand.
- **Where does the sand come from?**
Two offshore borrow areas that run parallel to the project area.
- **How is the project built?**
Sand is dredged from the ocean floor approximately ½ mile east of the beach. A hydraulic dredge transports the sand to the beach via a pipeline where it is graded by heavy equipment to a desired profile.

PROJECT HISTORY

- Congressional authorization was received for the Delray project in 1962 under the River and Harbor Act and included Federal participation for a period of 10 years. Government participation has been extended over the years and in 1992 a Local Cooperative Agreement (LCA) executed between the USACE and Palm Beach County (local sponsor) authorized federal participation on the Delray project for 50 years. In 1994, the City of Delray Beach assumed the role of project manager through an interlocal agreement with the County.
- The initial beach nourishment was completed in July 1973 and included a larger project area at 2.65 miles (~13,992 linear feet). The first project added approximately 1.6 mcy of material to the beach and included a dune planting the following year.
- Subsequent renourishments within the project area occurred in 1978, 1984, 1992, 2002 and storm repair in 2005.
- An additional storm repair project will occur in 2014 to repair erosion caused by Hurricane Sandy.



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North Boca Raton Beach Renourishment

Project Location

- In southern Palm Beach County located approximately 3.5 miles north of the Boca Raton Inlet. The project encompasses 1.45 miles (7,630 feet).

The Problem

- Chronic beach erosion threatens a popular municipal park and adjacent upland infrastructure as well as hurricane evacuation route State Road A1A.

Solutions

- Ongoing efforts to stabilize the shoreline include continued periodic large-scale beach renourishments

Benefits

- Storm protection
- Restoration of beach habitat
- Increased sea turtle nesting habitat
- Provides sand to downdrift beaches
- Increased public recreation

Funding Partners

- United States Army Corps of Engineer
- Florida Department of Environmental Protection
- Palm Beach County
- City of Boca Raton

PROJECT LOCATION



PROJECT HISTORY

- The initial beach nourishment was completed in 1988 and included placement of 1.1 million cubic yards of sand. Six artificial reef modules were built south of the project area to mitigate for loss of nearshore reef during the initial project. In order to protect the reef modules from project impacts, a shore detached groin was constructed north of the project.
- Subsequent renourishments within the project area occurred in 1998 and 2010 with 680,000 CY and 782,000 CY of sand placed respectively.
- The North Boca Raton project is a federally sponsored project with the City acting as the local sponsor. In 2006, the City and County entered into a long-term Interlocal Agreement that provides the City with 20% reimbursement of all design, permitting, engineering, construction & monitoring costs.

FAQs

- **How often is this project area renourished?**
Renourishment occurs throughout this project area approximately every 8 years.
- **When was the last renourishment completed and when is the next renourishment scheduled?**
The second renourishment occurred in 2010. The third renourishment was scheduled for construction in 2018, however this project was accelerated due to impacts from Hurricane Sandy and will be built in 2014.



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Central Boca Raton Beach Renourishment

Project Location

- In southern Palm Beach County located at the Boca Raton Inlet and extending north along the shoreline 1.5 miles (7,880 ft).

The Problem

- Beach erosion threatens two popular municipal parks and adjacent upland infrastructure as well as hurricane evacuation route State Road A1A.

Solutions

- Ongoing efforts to stabilize the shoreline include periodic large-scale beach renourishments and the construction of a groin.

Benefits

- Storm protection
- Restoration of beach habitat
- Increased sea turtle nesting habitat
- Provides sand to downdrift beaches
- Increased public recreation

Funding Partners

- Florida Department of Environmental Protection
- Palm Beach County
- City of Boca Raton

PROJECT LOCATION



PROJECT HISTORY

- The initial beach nourishment was completed in spring 2004 and included placement of 747,000 cy of sand, construction of a 170-ft groin and relocation of a weir within the Inlet's north jetty. The groin, which is centrally located (~1,600' north of the Boca Raton Inlet) within the project area, was built to address an erosion hot spot and increase the life of the project. The relocation of the jetty's weir further seaward helped to stabilize the beach located immediately north of the jetty.
- The 2004/2005 hurricane seasons accelerated erosion throughout the project area. As a result, storm damage repair was required in 2006 with the placement of 325,000 CY of sand. The material for the emergency repair was obtained from the ebb tidal shoal which had become a navigational hazard adjacent to the Inlet.
- The City of Boca Raton and the County participate in a long-term Interlocal Agreement that provides the City with 20% reimbursement of all design, permitting, engineering, construction & monitoring costs.

FAQs

- **How often is this project area renourished?**
Renourishment occurs throughout this project area approximately every 10 years.
- **When is the next renourishment scheduled?**
The first renourishment is currently scheduled for construction in 2015.



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South Boca Raton Beach Renourishment

PROJECT LOCATION

Project Location

- In southern Palm Beach County including the Boca Raton Inlet south to the Palm Beach County line. The project encompasses approximately 1 mile (5,060 feet).

The Problem

- Chronic beach erosion threatens a popular County park and adjacent upland infrastructure as well as hurricane evacuation route State Road A1A.

Solutions

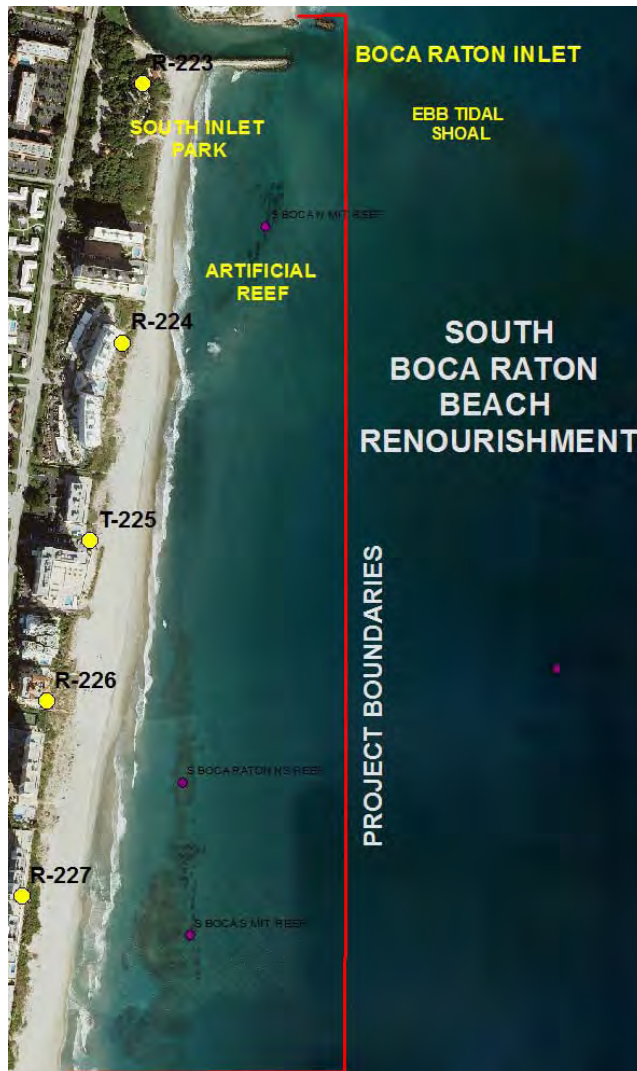
- Ongoing efforts to stabilize the shoreline include continued periodic large-scale beach renourishments

Benefits

- Storm protection
- Restoration of beach habitat
- Increased sea turtle nesting habitat
- Provides sand to downdrift beaches
- Increased public recreation

Funding Partners

- Florida Department of Environmental Protection
- City of Boca Raton
- Palm Beach County



FAQs

• How often is this project area renourished?

Renourishment occurs throughout this project area approximately every 6 years.

• When is the next renourishment scheduled?

The fourth renourishment was completed in conjunction with the 2013/2014 USACE Hurricane Sandy repair dredging projects occurring throughout the County. In December 2013, the City placed approximately 150,000 cubic yards throughout the project template.

PROJECT HISTORY

- The initial beach nourishment was completed in 1985 and was constructed in response to severe erosion throughout the project area. It included placement of 221,000 cubic yards of sand along 2,900' feet of shoreline south of the Inlet. Material to construct the project was dredged from the ebb tidal shoal adjacent to the Inlet.
- Subsequent renourishments within the project area occurred in 1996, 2002 and 2010. All sand used for construction was dredged from the accreting ebb tidal shoal. The 2010 project was built in conjunction with the second North Boca Raton Renourishment Project.
- In order to mitigate for direct and indirect impacts to nearshore reef within the project area, 2.39 acres of artificial reef were constructed in 2003.
- The City of Boca Raton and the County participate in a long-term Interlocal Agreement that provides the City with 20% reimbursement of all design, permitting, engineering, construction & monitoring costs.



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Boca Raton Inlet Maintenance Dredging

Project Location

- The southernmost inlet is located in the southern end of Palm Beach County just north of South Inlet Park.

The Problem

- A history of severe shoaling following storms
- Interrupted littoral transport of sand to southern beaches due to inlet construction and fortification

Solutions

- Routine maintenance dredging of the inlet with placement of dredged material on the beach located south of the southern jetty

Benefits

- A stabilized beach located directly south of the southern jetty
- Increased sea turtle nesting habitat south of the southern jetty

Funding

- City of Boca Raton

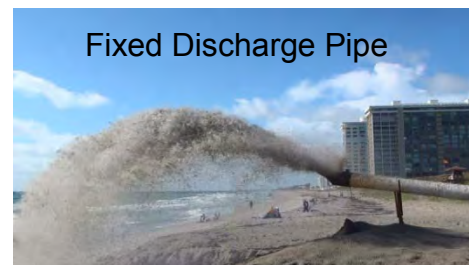
PROJECT LOCATION



- In order to stabilize the inlet and maintain its navigability, a three-phase program began in the 1960s. Work included repairing and extending the northern jetty and widening and deepening the Inlet channel.
- In 1972, the inlet, its jetties, and maintenance access easements were deeded to the City of Boca Raton. That same year, the city purchased an 8-inch hydraulic pipeline dredge to maintain the Inlet.
- Since the City began routine bypassing of sand, the inlet has remained open. The City currently bypasses approximately 55,000 CY of sand per year and transfers the dredged material through a fixed discharge pipe to the beach south of the Inlet.

PROJECT OVERVIEW

- The Boca Raton Inlet is a naturally occurring inlet connecting Lake Boca Raton to the Atlantic Ocean.
- Over the past 200 years the inlet has changed location due to shifting sands.
- The current location of the inlet was first dredged in 1926 and two parallel jetties were constructed in 1930-31.
- Over the decades, the inlet experienced storm related damage to the jetties and frequent closure of the Inlet due to shoaling.



- Today the entrance channel is approximately 150 feet wide and 10 feet deep. The north jetty is 650 feet long with a 65 foot weir section two-thirds of the way seaward. The south jetty is 800 feet long.



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