

# Shoreline

MARCH 2008



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## Sea Level Rise in Coastal Areas in Florida and its Economic Impact

By Dr. Todd Walton and Dr. Julie Harrington,  
FSU Beaches and Shores Resource Center

*(The opinions expressed in this article do not necessarily represent those of FSBPA)*

The subject of sea level rise in Florida was the topic of a past FSBPA newsletter article which discussed only the sea level rise considerations. In the past year the FSU Beaches and Shores Resource Center along with the Center for Economic Forecasting and Analysis have completed a preliminary technical and economic study for a limited number of regions in Florida to assess the estimation of sea level rise based on historical local tidal gage data, and to assess the corresponding costs of sea level rise (based on intensity and storm surge return period as well as changes in property values). The sites investigated in Florida consisted of areas in Dade, Duval, Monroe, Escambia, Dixie and Wakulla counties.

The preliminary study had a two-pronged approach. The data collection and estimation of future sea level in year 2080, based on forecasting techniques that utilize only historical tidal station gage data, was performed by the Beaches and Shores Resource Center (BSRC). In addition to BSRC forecasted sea level rise, the project utilized projected changes in eustatic sea level for year 2080 based on the Intergovernmental Panel on Climate Change (IPCC) estimates which rely on world climatic modeling. Based on the BSRC and IPCC future sea level estimates, the Center for Economic Forecasting and Analysis (CEFA) reassessed existing knowledge-based storm event return periods and then evaluated cost damages and property values affected as a result of the sea level rise using revised storm return period for the sites noted. A short summary of the findings for sea level rise and the economic consequences is provided below:

### Sea Level Rise Estimation

The BSRC found that although there was a wide distribution of different gage sites over the Florida Peninsula, the projected sea level rise in year 2080 does not vary substantially, the largest value being 0.35 meters in St. Petersburg, FL, while the smallest value is 0.25 meters in Fernandina, FL.

This study explored sea level rise forecasting methods beyond the traditional polynomial linear estimation forecasting method utilizing gage data from NOAA first order sea level gages. A second order approach and a non-linear approach as used in this study provided answers within the range of projected climate modeling scenarios that show an increasing sea level rise possibly due to greenhouse gas effects.

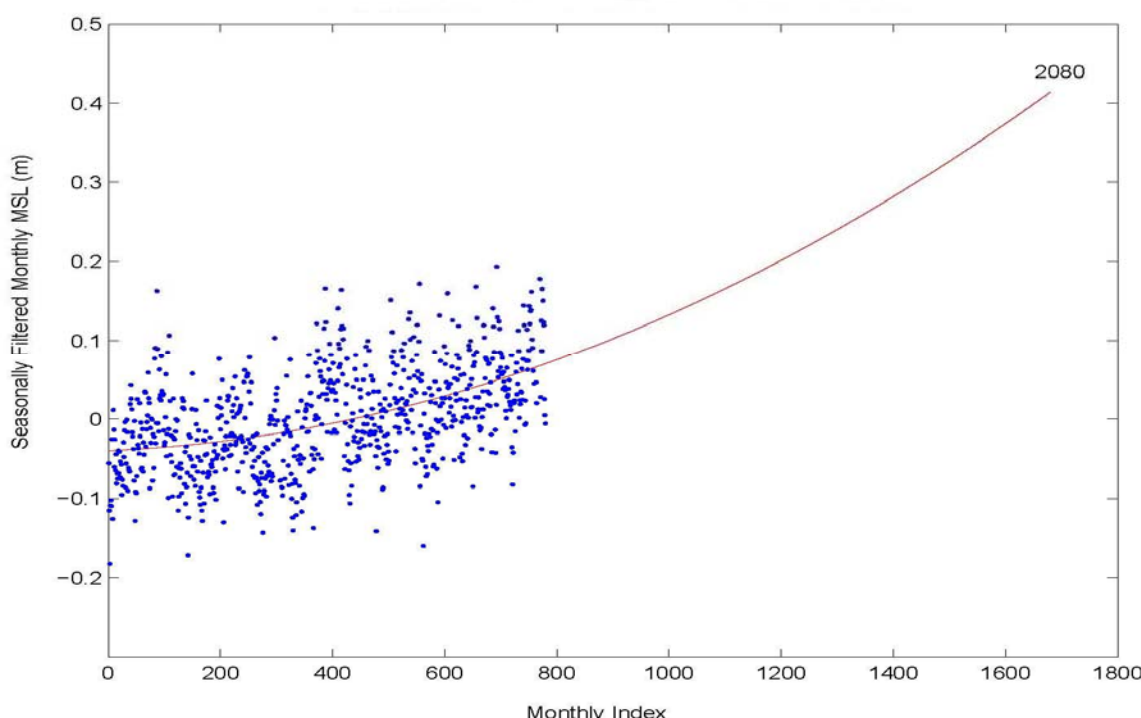
### Economic Analysis of Sea Level Rise

There will be a change in storm return period frequency with an associated sea level rise. That is, a given level of severe storm event will become more frequent than in the past.

The Center for Economic Forecasting and Analysis (CEFA) found that cost damages associated with storm events can be expected to increase with respect to sea level rise. Based on the IPCC sea level rise estimates, regarding a number of coastal counties, CEFA found that people living along the coast will experience property losses at twice the rate of normal based on possible IPCC projected scenarios of sea level rise.

The economic findings convey a considerable loss of property, in terms of property values and land area, due to sea level rise for projected forecast year of 2080.

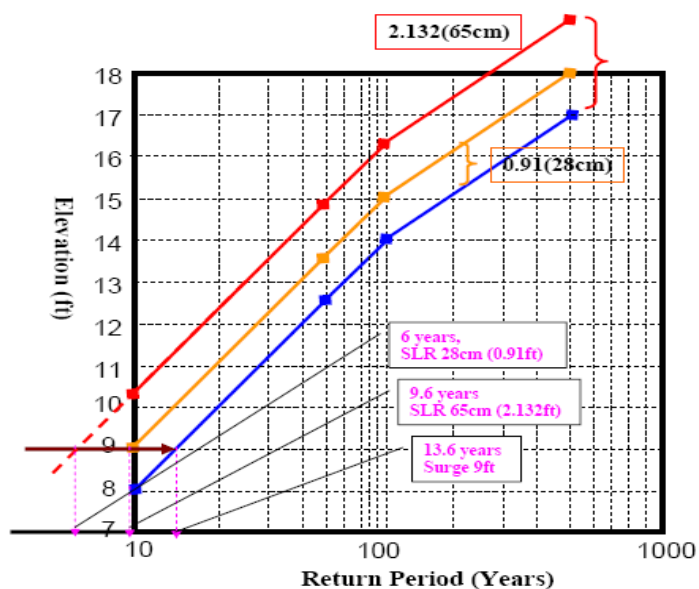
This preliminary study was able to establish a reasonable range of low to high sea level rise estimates to year 2080, with BSRC estimates providing a lower bound for sea level rise based on historical gage data (which was found to be in agreement with median estimates of the IPCC climatic modeling scenarios), and above average IPCC sea level scenario estimates providing an upper bound (i.e. based on climate modeling scenarios ranging toward the upper end of the IPCC modeling scenarios). An example sea level rise forecasting curve with seasonally filtered (detrended) water levels removed is provided below for Pensacola Florida.



**Figure 1. Pensacola Gage Station Forecast Filtered Sea Level Rise**

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The sea level forecast scenarios by both BSRC and IPCC were utilized by the CEFA to reassess storm return period for the various areas and then to project the consequent costs of both the sea level rise and the consequent reduction in storm period return for extreme storm water levels. An example graph of the projected revised storm return periods is provided below.



**Figure 2. Reduction of Hurricane Return Year(s) in Dixie County by Elevation Based on IPCC and FSU Sea Level Rise Estimates**

The results of this preliminary study underscore the importance of including sea level rise as a critical component in the hazard preparedness and mitigation planning for coastal communities but also the importance of additional data collection to improve future estimation. Details of the sea level rise study by BSRC can be found in Walton (2007), and the economic/storm surge reassessment study results (full report) can be requested from the FSU Center for Economic Forecasting and Analysis (CEFA).

A recent study ([Greenpeace, 2006](#)) estimated the costs of adapting to a one meter sea level rise in the US would amount to US \$156 Billion (3 percent of GDP). There have been a number of limited climate change studies conducted for Florida, two of which will be mentioned here. Yohe et al (1998), conducted sea level change research for certain sites in Florida (Miami, Key West, Port Richey, Apalachicola, and St. Joseph) on "no foresight" and "perfect foresight" scenarios, regarding gradual erosion loss and adaptation of the market with respect to the sea level predictions, using a benefit-cost decision making framework for estimating the human response to sea level rise. The Yohe estimates examined 33, 67, and 100 cm SLR scenarios, and relied on relatively low-resolution elevation data by today's standards. The first option assumes sufficient advance warning of SLR and fairly rapid market response to the perceived threat. The second option reacts to the imminent loss of property at the time of inundation, while the last option accepts protection as given and simply seeks to minimize its costs. In general, costs for the advanced foresight option are lower than for the wait-and see option, especially for the two higher SLR scenarios, but this advantage requires more precise knowledge of the course of SLR and an effective market-based retreat policy. Costs are highest for permanent protection. For Florida, Pielke and Landsea (1998) found that hurricane damage for a 1926 Miami hurricane, in normalized 1992 dollars, was \$39 billion.

Florida is particularly vulnerable to sea level change. Florida is the fourth most populated state (17.5 million people in 2005) and projected to increase 47% by the year 2025, according to the U.S Bureau of Census. Approximately 4,500 square miles (of the total 66,000 square miles) in Florida are within 4.5 feet of sea level. There are options for adaptation to sea level rise in Florida including: elevating existing areas and rebuilding/reinforcing Florida's natural dunes, building dikes and flood control structures (similar to the Netherlands, and New Orleans which lies beneath sea level), and encouraging relocation. All of these options need to be considered along with an economic plan to raise necessary financing for needed engineering to provide for a future healthy Florida.

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## Inlet Management/Inlet of the Year Legislation

By Lisa Armbruster  
Assistant Director of Governmental Affairs

Only a week into the legislative session, and FSBPA's inlet legislation is off to a great start! All indications are that Senate Bill 1672 (sponsored by Dennis Jones) and House Bill 1427 (sponsored by Stan Mayfield) will be headed to their first stop – the Senate Environmental Preservation and Conservation and the House Environmental Protection Committee under the Environment and Natural Resources Council – as early as the second week of session. The bill appears to be sustaining considerable support from various interest groups. For further detail on the history of Florida's policies related to inlet management, the justification for Florida to recommit its efforts to inlet management, and an explanation of the proposed bill, click the link below to see FSBPA's legislative fact sheet on the inlet management initiative. Stay tuned! The progress of the bill will be updated via BeachWatch member updates and in Shoreline.



[Click to View FSBPA's Legislative Fact Sheet](#)

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## Honeymoon Island State Park Interim Shore Protection Project

By Catherine Florko and Paden Woodruff, DEP

The award winning Florida Park Service is one of the largest in the country with 161 parks spanning 700,000 acres and 100 miles of sandy beaches. Honeymoon Island State Park, across the causeway from the community of Dunedin on the Gulf coast, had a recreational beach area composed of dredged limestone and gravel. Now they have a beautiful restored beach thanks to the leadership of Pinellas County.

Honeymoon Island has been the most visited state park in the Sunshine State for the past two years, with close to one million people visiting last year. The Florida Park Service has estimated that in 2007, park visitors infused almost \$43 million into the local economy.

Recognizing the economic and environmental significance of Honeymoon Island State Park, former FSBPA Chairman, the late James B. Terry, Sr., spearheaded efforts to restore the critically eroded shoreline in the park. Pinellas County initiated the project in 1997.



*Preconstruction photograph, taken in June 2005, in the main use area at Honeymoon Island State Park.*

A Technical Advisory Committee [TAC] was formed with representatives from Pinellas County, the City of Dunedin, the Florida Park Service, the Bureau of Beaches and Coastal Systems, the Pinellas County Aquatic Preserve and the Florida Fish and Wildlife Conservation Commission, to assure that all the stakeholder concerns were addressed. The goals of the restoration project included:

1. Restoring the state park beach to meet recreational needs and to provide protection of park facilities and infrastructure
2. Protecting natural resources, including the north and south shorebird nesting areas, marine turtle nesting habitat, and submerged aquatic vegetation
3. Minimizing the amount of sediment entering Hurricane Pass.

The TAC reviewed and discussed preliminary design options for several years before tasking Humiston & Moore Engineers with the design of the project. Meanwhile, the Florida Park Service spent millions of dollars relocating restrooms and dune walkover structures as erosion stress continued to impact the park shoreline. Humiston & Moore Engineers designed a project to protect park infrastructure and natural resources using sand from the ebb shoal south of Hurricane Pass. A T-head groin was also proposed in the design to stabilize the beach and limit the loss of sand from the restoration project into Hurricane Pass.





*Photograph taken in June 2005, of the severe erosion in front of one of the bathhouses in the main use area of the park (Photo courtesy of Pinellas County).*

Pinellas County awarded a construction contract to Coastal Marine Construction on June 19, 2007, and construction commenced in September 2007. The first action taken was to remove the tremendous amount of large rock, debris and concrete that had been piled on the beach in years past to abate erosion. Pilings that were left on the beach after structures were moved landward, as well as palm trees that died as a result of the erosion, were also removed.



*View above Hurricane Pass of construction underway in November 2007 (Photo courtesy of Pinellas County).*

Pedestrian control, as visitation did not drop off, was a constant priority during project construction. Nonetheless, approximately 160,000 cubic yards of beach compatible material was placed on approximately 2,500 feet of the most severely eroded segment of beach, the T-head groin was constructed, and the project was successfully completed in February 2008.

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*Photograph of the bathhouse immediately after construction (Photo courtesy of Pinellas County).*

Park Manager, Peter Krulder, worked closely with Pinellas County Coastal Coordinator, Dr. Nicole Elko, to supervise the project. Following construction, Dr. Elko arranged for the purchase of sea oats and Mr. Krulder organized groups of volunteers to plant the sea oats to help anchor the placed sand on the back berm.

Mr. Krulder reports, "The sand on the new beach is incredibly soft and very inviting. We have already had a huge influx of visitors who have waited months on end to see the improved beach and it has not disappointed! Even the shorebirds have flocked to this new sand."



*Photograph of visitors enjoying the restored beach (Photo courtesy of the FPS).*

Pinellas County has been an outstanding partner in the restoration project. Following the successful completion of what is referred to as Phase I, the FPS has now taken over the project. Recently, the FPS contracted with Humiston & Moore Engineers to design the Phase II restoration, which will consist of a larger scale project that will address the entire 1.4 miles of critically eroded shoreline in the park. The first challenge facing Humiston & Moore Engineers is locating a suitable sand source. Construction is scheduled for 2010.

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## USACE Jacksonville District's Project Status:

### **Feasibility Studies:**

- St. Johns County - further Beach-fx data gathering is planned in Summer Haven and an extension of the Vilano reach running to the north jetty of St. Augustine Inlet. Bathymetric surveys of offshore borrow areas are planned for early summer to refine borrow source delineations.
- Volusia County - on hold due to lack of sponsor contributed funds.
- St. Lucie County - cultural resources work and State Historic Preservation Officer coordination are being completed by the Corps with conclusion of fieldwork anticipated in March 2008. In addition, the Corps will be completing some of the wave modeling for this study. The non-Federal sponsor will be completing the remainder of the study work.
- Flagler County - current efforts focus on NEPA initiation as well as Beach-fx and shoreline process data collection.

### **Other Major Planning Reports:**

- The Brevard County Mid Reach General Reevaluation Report (GRR) is in the plan formulation phase. An Alternative Formulation Briefing (AFB) was held in November 2007. The project team is now addressing comments raised by USACE Headquarters during the AFB. The draft report is expected to be complete in June 2008.
- The North Boca Raton Second Periodic renourishment Limited Reevaluation Report was sent to the Corps' South Atlantic Division (SAD) office in October 2007. The project team is addressing the comments received in December 2007 and expects to submit a revised report to SAD in April 2008.
- An addendum to the April 2006 Nassau County, Florida Shore Protection project GRR has been incorporated into the main report. The addendum identifies 6 new structures added to the project inventory changes cost sharing based on shoreline ownership.
- The Draft Ft. Pierce Shore Protection project GRR completed by the non-Federal Sponsor underwent review at the Jacksonville District. The sponsor is now completing revisions per Jacksonville's comments. The GRR seeks an additional 50-years of Federal participation in the project as well as the inclusion of groins to the project area.
- Broward County Shore Protection project - Segment I (north county line to Hillsboro Inlet) - GRR and NEPA document - Initiation of preparation of the GRR and NEPA document for initial construction of this segment is awaiting Federal and non-Federal funds to be provided to the Jacksonville District. A Design Agreement was executed in 2006 with the city of Deerfield Beach in order for the Jacksonville District to initiate preparation of the document.

### **Other:**

- A cost sharing addendum based on changes in shoreline ownership is being prepared for Lee County, Gasparilla SPP Project, and is expected to be finalized this spring.
- The Brevard Independent Coastal Expert Letter Report is undergoing revision at the Jacksonville District while awaiting official comments from SAD on the draft.

### **Borrow Site Investigations:**

- Martin County and Sarasota County borrow area investigations are underway. Geotechnical field work is complete for both studies, and the bathymetric survey field work is complete for Martin County. Bathymetric surveys for Sarasota will commence soon. Cultural resource magnetometer and side-scan sonar survey field work for Martin County should be complete by the end of March 2008, and wave gauge data to be used to calibrate the STWave model is being collected. The Martin County draft EIS is being written and will be sent out for public and agency review once the surveys and modeling are complete.
- The Pinellas County, Sand Key borrow area investigation is underway. Geotechnical work and surveys will be completed this Summer.
- Hard bottom mapping for Martin County is scheduled for this summer.

A revised version (per Headquarters comments) of the Dade County Sand Source Letter Report has been sent to SAD and to Headquarters. On 10 December 2007, the Assistant Secretary of the Army (Civil Works) sent a memo to the Director of Civil Works recommending a three-tiered approach to meet Dade County's beach renourishment needs:

1. Consider use of emergency sand reserves in current borrow area SGC-Ext 1 and remaining material in other traditional borrow sources offshore of Dade County.
2. Examine the viability of non-domestic sand sources for intermediate and longer-term renourishment needs.
3. The remaining Florida coastal domestic sand sources should be evaluated through a comprehensive Regional Sediment Management (RSM) plan to address long term needs along Florida's Atlantic coast.

Work on Plans and Specs to meet Tier 1 is beginning. All economically and environmentally feasible domestic sources are being considered for placement on the Dade Co. project. Discussions regarding political and logistic concerns related to Tier 2 have begun with stakeholders. A Scope of Work is being developed to address the Tier 3 directive.

### **Regional Sediment Management:**

Three complete regional sediment budgets for the sandy coast of Florida are available. A large push is being made to participate in the Gulf of Mexico RSM initiative, utilizing existing stakeholders to assist in a regionalization of information and technology. The first Regional Sediment Source Report was contracted out in October, focusing on Dade, Broward and Palm Beach Counties. This report will evaluate the volume of beach quality material in current domestic borrow sources and compare that volume with material needs of current Federal and non-Federal beach nourishment projects in the region. Future collaboration with the state and stakeholders is planned. The report should be finalized by April 2008.

### **Construction:**

The Lee County, Captiva Island FCCE Rehabilitation Project was awarded to Weeks Marine Inc. and will be constructed in early Spring 2008.

**END**

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## Mark Your Calendar 2009 National Conference on Beach Preservation Technology February 18-20, 2009 TradeWinds Beach Resorts St. Petersburg Beach

By David Tait  
Executive Director

Sometimes the ball just bounces your way. That was certainly how I felt the other day when I received an email from Al Ten Broek, FSBPA's first chair emeritus and a longtime friend of the association. We had already been contemplating possible sites for the 2009 National Conference on Beach Preservation Technology when I got Al's message urging us to consider holding one of our meetings at the TradeWinds Beach Resort in St. Petersburg Beach. This was good news on two counts: First, Al associates himself only with top-notch properties, and second, St. Pete Beach was already at the top of our wish list since it's in the district of Florida's premier legislative beach advocate, Senator Dennis Jones.

So, with little delay, we booked the TradeWinds Beach Resort and look forward to a first-class event in early 2009.



For budgeting purposes, the single-double rates will be \$159 per night. Included in the rate is free self-parking, use of the resort fitness center, beach cabana, wireless internet in guest rooms and common areas, in-room coffee makers, and daily delivery of the local newspaper

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## Calendar of Events

**March 4—May 2, 2008**

Regular Session of the Florida Legislature

**March 31—April 4, 2008**

National Hurricane Conference

[www.HurricaneMeeting.com](http://www.HurricaneMeeting.com)

**August 31—September 5, 2008**

International Conference on Coastal Engineering

Hamburg, Germany

**September 10—12, 2008**

FSBPA Annual Meeting

South Seas Plantation

[www.FSBPA.com](http://www.FSBPA.com)

**February 16—18, 2009**

10th Annual CIRP Workshop

TradeWinds Island Resorts

St. Petersburg Beach, FL

**February 18—20, 2009**

National Conference on Beach Preservation Technology

TradeWinds Island Resorts

St. Petersburg Beach, FL

**September 16—18, 2009**

FSBPA Annual Meeting

Amelia Island Plantation

Amelia Island, FL

**Date and Site to be Determined**

11th Annual CIRP Workshop

**Date and Site to be Determined**

National Conference on Beach Preservation Technology

**September 22—24, 2010**

FSBPA Annual Meeting

South Seas Island Resort

Captiva Island, FL

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