MIAMI-DADE COUNTY
FINAL OFFICIAL MINUTES
Miami-Dade Sea Level Rise Task Force

Overtown Transit Village North
701 N.W. 1st Court
2nd Floor Training Room
Miami, Florida 33128

March 7, 2014
As Advertised

Harvey Ruvin, Clerk
Board of County Commissioners

Christopher Agrippa, Director
Clerk of the Board Division

Maryse Fontus, Commission Reporter
(305) 375-4906

CLERK'S SUMMARY AND OFFICIAL MINUTES
MIAMI-DADE COUNTY SEA LEVEL RISE TASK FORCE
MARCH 7, 2014

The Miami-Dade County Sea Level Rise Task Force (Task Force) convened a meeting on Friday, March 7, 2014, at the Overtown Transit Village North, 2nd Floor RER Training Room, 701 N.W. 1st Court, Miami, Florida, at 10:00 a.m. Present were Honorable Clerk of Courts Harvey Ruvin, Task Force Chairman; and members Mr. David Enfield, Ms. Sara Fain, Mr. Arsenio Milian, and Mr. James Murley; (Mr. Willard T. Fair and Mr. Jorge Gonzales were absent).

In addition to the Task Force members, the following staff members were present: Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); Assistant County Attorney Christopher Angell; Ms. Lisa Klopp, Sustainability Program Assistant Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); and Deputy Clerk Maryse Fontus.

I. Welcome and Introductions

Chairman Ruvin called the meeting to order at 10:06 a.m., and welcomed all of the participants. He asked the members of the Task Force to introduce themselves, and noted a quorum was present.

Chairman Ruvin noted today (3/7) the Task Force was focusing on natural systems and their role with regard to adaptation. He recalled that since their initial meeting, the Task Force members had listened to a wide range of presenters. Chairman Ruvin suggested that after the presentations today the Task Force agree on a schedule of meetings to be held before its report was finalized. He noted at least two meetings would be necessary for the members to discuss the report. Chairman Ruvin pointed out that the four counties of South Florida were greatly affected by sea level rise, and the Task Force's recommendations would attract a significant amount of attention. He recalled that the insurance industry found that it could no longer rely on historic data to set rates or assess risk and now had to rely on predictive data. Chairman Ruvin said that this finding made him keenly

aware of the urgency of the Task Force's mission; nevertheless, he was optimistic that Miami could survive in the future as a vibrant world capital.

Mr. Murley pointed out that the timing of the Task Force's report would coincide with the release of the National Climate Change Assessment and additional reports from the International Panel on Climate Change.

Ms. Fain said she agreed with Chairman Ruvin that the Task Force's message should be one of optimism, noting the report should show that the task was manageable.

In response to Mr. Milian's question regarding the deadline for the report, Assistant County Attorney Christopher Angell advised that the deadline for submitting the report was June 22nd, 2014, and the presentation of the report would be on July 1st, 2014.

Pursuant to Mr. Milian's question as to whether there was any possibility for an extension, Chairman Ruvin noted the Task Force was already granted an extension. He said he believed that it was possible to finalize the report by the deadline.

Mr. Murley noted July 1st was the date of the presentation of the report, and that presentation, which would be visual, would be almost as important as the report.

Chairman Ruvin informed the participants that the Task Force had a website, which contained the minutes and presentations. He introduced the first presenter, Mr. Dan Kimball, Park Superintendent, Everglades National Park. Chairman Ruvin announced that Mr. Kimball would be retiring and presented him with a proclamation. He congratulated him for his stewardship of the park, and his far-reaching vision.

II. Mr. Dan Kimball, Park Superintendent, Everglades National Park

Mr. Dan Kimball said that it was an honor to address the Task Force. He noted he served on the Climate Change Advisory Task Force at the request of Chairman Ruvin. Mr. Kimball indicated that he was the only

federal government representative serving on that body, and while serving, he made some contacts that proved to be invaluable for the park.

Mr. Kimball said that he would make some introductory remarks, and his colleague, Dr. Erik Stabenau, would make a presentation on natural systems. He recalled that in 2007 he was asked to make a presentation before Congress about climate change. He noted he prepared a testimony, which accurately reflected the status of climate change in South Florida at that time, and the figures were still, to a large extent, accurate today.

Mr. Kimball emphasized that the Everglades National Park (The Park) was very vulnerable to climate change, as 60 percent of The Park was at an elevation of less than a meter. He noted the maximum elevation in The Park was 11 feet; therefore, climate change was a huge issue for The National Park Service. Mr. Kimball said that The Park was visited by 15,000 children every year, and management organized environmental-education camps in which climate change messages were woven. He indicated that The Park was managed as a "vignette of primitive America." Mr. Kimball said that in light of climate change The Park's policies were being reviewed; and a climate change response strategy, as well as an action plan with four cornerstones had been developed, including mitigation; adaptation; science; and communication.

Mr. Kimball noted even though The Park was a major natural park, people lived there, and it was important to protect their cultural heritage. He indicated that The Park's management was trying to weave climate change concepts into its redevelopment activities, and that any new building project had to not only be a smart investment, but also be capable of withstanding hurricanes, storm surges and sea level rise. Mr. Kimball provided an example of plans to build an elevated restaurant and cottages connected through walkways down at Flamingo, within The Park. Unfortunately, he noted, The Park had been unable to identify a bidder for this project.

Mr. Kimball said that management was in the process of installing four climate change information kiosks in The Park. He also explained that The Park's management was restoring a fresh water ecosystem in the

Everglades. Mr. Kimball emphasized that the restoration was a massive climate change adaptation tool, creating a healthier South Florida ecosystem that is more resilient to the effects of climate change, while also replenishing the wellfields that provide drinking water for SE Florida.

III. Dr. Erik Stabenau, Oceanographer and Coastal Ocean Modeler, National Park Service, South Florida Natural Resources Center

Dr. Erik Stabenau noted there were four major parks in South Florida, and three of them were located near oceans; therefore, the parks were affected by sea level rise. He recalled the known facts relating to sea level rise, including that the level of the sea was rising at an increasing rate; flooding occurred on an annual basis; saltwater intrusion had impacted wellfields and was moving further west; and coastlines were shifting.

Dr. Stabenau discussed the findings of the1963 Leopold Report, which stated that "A national park should present a vignette of primitive America ... if the goal cannot be fully achieved it can be approached." He said that in 2013, the Leopold Report was revisited, and the following recommendation was made: "The overarching goal of National Park Service (NPS) resource management should be to steward NPS resources for continuous change that is not yet fully understood, in order to preserve ecological integrity and cultural and historical authenticity, provide visitors with transformative experiences, and form the core of a national conservation land- and seascape."

Dr. Stabenau displayed a slide depicting sea level rise, noting in South Florida water levels had risen at an average of 2.2 mm per year over the last 100 years, and closer to 2.8 mm per year for the last decade. He said it was clear that the water level was rising, and the data revealed two periods in the previous 50 years when water levels had increased 10 times faster than the long-term trend; thus, making it harder to plan for a sea level rise scenario.

Dr. Stabenau noted coastal erosion had occurred in the South end region of Florida. He pointed out that massive erosion had occurred in the Middle

Cape Canal, and the Little Sable Creek had also lost coastline. Dr. Stabenau said this put the rare species living along the coastal ridge at risk.

Dr. Stabenau displayed a slide depicting sea level rise projection through 2100, and explained that it demonstrated the difference between a 2-feet sea level rise marsh loss without flow restoration, and with flow restoration. He said that the U.S. Army Corps of Engineers was involved in the restoration.

Dr. Stabenau described the flood control efforts. He said that coastal ocean water level was higher than inland water level each fall. Dr. Stabenau explained that inland the South Florida Water Management District was managing water levels in the canals, noting on the high tides the gates had to be closed to keep the salt water out; and on the low tides the gates had to be opened to maintain inland water levels and allow fresh water to flow out. He concluded his presentation by pointing out that Miami was almost at the point where it was below sea level.

Mr. Enfield noted the Florida Keys experience less rainfall than the areas near the Everglades. He explained that this situation was due to the effect of the Everglades on the sea breeze front during the summer time, which produced more rainfall over the Everglades. Mr. Enfield said that when the coastal ridge was backed up by the embayment formed by sea level rise, a topographic situation was created similar to the Florida Keys, with sea water on either side, thus reducing the amount of rainfall. He noted one consequence of preventing that embayment was that it would help preserve the amount of rainfall.

Dr. Stabenau noted this point was critical, because it was not known how much fresh water South Florida would have in the future.

Referring to the slide depicting the sea level rise projection through 2100, Mr. Kimball explained that the figure on the left demonstrated that without restoration, the Everglades would receive roughly 20 percent of its historic annual flow. He said that the figure on the right, represented a model completed through the Central Everglades Planning Project, which sought

to bring more water to the Everglades. Mr. Kimball noted this model would cost $1.8 billion, and while it was expensive, it would restore the average annual water flow to 80 percent of the historic flow.

In response to a question from Mr. John Croney from Florida International University as to whether it would be beneficial for Miami-Dade County to have a network of 10-15 gauges in key locations to determine future water level trends and to enhance the database, Dr. Stabenau pointed out that it would be necessary to carefully select the locations. He said that this would be valuable, but the overall network would have to be considered.

Referring to Mr. Kimball's comments regarding the National Park Services' efforts to adapt to climate change, Ms. Fain asked him what actions could be taken by Miami-Dade County to assist in protecting the natural systems.

Mr. Kimball said that the County's role was to be involved with the natural areas, and not to concentrate solely on the built environment. He pointed out that South Florida was a combination of a number of inter-connected areas, including the cities, the beaches, the Everglades, and Biscayne. Mr. Kimball emphasized that natural systems were an important part of climate change.

IV. Ms. Lauren Ordway, Associate Director Philanthropy, the Nature Conservancy, Florida Chapter

Chairman Ruvin presented Ms. Lauren Ordway, from the Nature Conservancy, and said that she would discuss the role of natural infrastructure in coastal resilience and risk reduction.

Ms. Lauren Ordway noted Mr. Chris Bergh, Director of Conservation for South Florida, was unable to attend today's (3/7) meeting, as he had a prior engagement. She provided a brief background on the Nature Conservancy and explained that its mission was to protect and restore the lands and water on which all life depends. Ms. Ordway noted the organization worked in 35 countries around the world and had identified four global challenges that it was uniquely suited to address: conserving critical lands, reducing impacts of climate change, restoring the oceans, and securing

fresh water. She said that the Conservancy's focus in South Florida was to ensure that fresh water was secure, to conserve critical lands and waters, and to promote healthy, safer coasts.

Ms. Ordway noted despite the value of nature, it was often overlooked by decision-makers; and to address this shortcoming, the Conservancy decided to highlight the value of nature not just from a bio-diversity perspective, but from an economic and social perspective, as well. To this end, said Ms. Ordway, the organization convened a group, under the banner of the Nature Capital Project, to improve ecosystem valuation methods; to incorporate the value of nature into business decisions with corporate leaders; and to assemble data and practical evidence on the value of nature.

Ms. Ordway noted in order to address sea level rise, it was necessary to adapt the communities to its impacts; but this required funding. She said that the Conservancy sought to identify strategies to invest limited resources for maximum benefit, and found that green solutions were most cost-effective when co-benefits of natural solutions were also taken into account. For example, she noted, substituting natural for built infrastructure could reduce capital costs; integrating natural infrastructure into built infrastructure could produce operation savings; and utilizing natural infrastructure could produce additional, complementary benefits, such as increased property values. Ms. Ordway pointed out that when comparing gray versus green infrastructure, the initial capital investment was higher with the latter, but over the long-term it was more cost-effective. However, she said, the Conservancy did not promote one solution over the other; rather, it asked the communities to assess their vulnerabilities and decide for themselves.

Ms. Ordway provided some examples of natural systems that provide protection:

- Coral reef restoration: Studies show that coral reefs attenuate and reduce more than 85 percent of incoming wave energy. Ms. Ordway

said that the Conservancy was working with partners to restore the coral reefs.

- Dune restoration: Dunes tend to fare well after a storm event. Ms. Ordway acknowledged the work carried out by the Conservancy's partners to restore the dunes in Miami-Dade, and Palm Beach County.

- Oyster reef restoration: Oysters provide food and filtration; a single oyster can filter 50 gallons of water per day. Ms. Ordway said that the Conservancy was restoring oyster reefs in Florida and Alabama.

Ms. Ordway said that it was important to quantify the benefits of natural infrastructure; to this end, this past summer a group of scientists, including the organization's chief scientist, published an article in the Journal of Nature, which found that coastal habitats defend the greatest number of people and total property value in Florida, New York and California. She noted the results suggested that the number of people and total value of residential property most exposed to hazards could be reduced by half by the end of the century if existing coastal habitats remained fully intact.

Ms. Ordway said that the Conservancy had developed a wave and storm surge flooding model and had incorporated it into Swiss Re's open source model "Climada." She noted this was a publicly-available model that could examine risks from wave, storm surge, wind, and rain hazards and was a far more robust model for assessing the cost-effectiveness of alternative solutions.

Ms. Ordway provided the Case study in Howard Beach, Queens, NY, as an example for integrating natural infrastructure into urban coastal resilience. She said that the organization was asked by the City of New York to evaluate the current and future climate risks facing Howard Beach as a sample community, with an emphasis on coastal flooding, and to demonstrate the potential role and value of an integrated suite of strategies that included natural and built infrastructure. Ms. Ordway explained that the Conservancy developed four suites of strategies containing natural and

built infrastructure elements, and that two of the strategies were further modeled for risk reduction capacity using sea level rise projections. In conclusion, she noted, the hybrid strategies offered a significant benefit against high-frequency, low-impact storm events, and on average between $300-400 million in avoided loss due to building damage.

In addition to developing these models, said Ms. Ordway, the Conservancy had developed innovative financing mechanisms. She provided the example of water funds, which enabled water users to finance conservation and improvements to land management, with the aim of protecting water quality and quantity.

Ms. Ordway noted Mr. Chris Bergh served on the Southeast Florida Regional Climate Change Compact, and was coordinating the work of the Shoreline Resilience Working Group, which would provide an opportunity to put these concepts into practice.

Mr. Enfield referred to a built environment behind the mangroves in Palmetto Bay. He inquired how resilient the mangrove swamp would be to sea level rise. Ms. Ordway said that this question was valid for all natural systems that were located next to densely-built environments. She noted the Conservancy promoted mangrove restoration, as they were important for stabilizing shorelines.

V. Mr. Paul Voight, PG, Intergovernmental Affairs Administrator, Environmental Resources Management, Regulatory and Economic Resources Department

Chairman Ruvin noted Miami-Dade has been involved in mangrove restoration, and referred to the work done in North Biscayne Bay. He said that all of these elements would eventually be blended into the resiliency model, which the Task Force would be proposing for South Florida. Chairman Ruvin then presented the next speaker, Mr. Paul Voight, Intergovernmental Affairs Administrator, Miami-Dade County Department of Regulatory and Economic Resources, Division of Environmental Resources Management (RER-DERM).

Mr. Voight noted Mr. Lee Hefty, Assistant Director, Department of Regulatory and Economic Resources (RER), was unable to attend today's (3/7) meeting, due to a prior engagement. He described some of DERM's functions as follows: to enforce Miami-Dade County's environmental regulations; to issue permits for facilities and to inspect them; and to authorize land use to protect wellfields.

Mr. Voight said that in addition to these regulatory functions, DERM implemented the following programs in an effort to preserve natural resource resilience:

- The Environmentally Endangered Lands Program;
- Monitoring salt intrusion boundary;
- The Erosion Control/Beach Renourishment program;
- Natural resource restoration projects; and
- Regulatory programs that protect natural resources.

Mr. Voight described the Environmentally Endangered Lands (EEL) Program, noting this program was approved by referendum and created in 1990 to acquire, preserve, enhance, restore, conserve, and maintain environmentally endangered lands for this and future generations. He explained that the FY91-92 property tax increase generated $90 million in revenue originally collected to fund the EEL Program. Mr. Voight said that from 1992 to 2013, the EEL Program received an additional $106 million in revenue, and through 2013, over $149 million was spent to acquire and manage more than 23,000 acres of targeted conservation lands in Miami-Dade County. Mr. Voight explained that rising sea levels added to the threat of saltwater intrusion into the Biscayne Aquifer, the sole source of drinking water in Miami-Dade County. He noted the saltwater intrusion boundary must be monitored for proximity to public wellfields and other sensitive receptors. Mr. Voight said that DERM and the Water and Sewer Department (WASD) fund the United States Geological Survey's operation and maintenance of 90 water level recording stations and 74 saltwater monitoring stations. He pointed out that all 10 wells east of the salt front from the Broward County line to the C-2 Canal show an increasing trend in

chloride concentration, which indicates regional movement of the salt line inland.

Mr. Voight displayed a series of slides depicting Miami-Dade County's Erosion Control/Beach Renourishment Program, and explained that the program maintained beaches and dune systems, which provided protection from storm damage, while preserving the economic benefits of wider beaches.

Mr. Voight displayed a number of slides depicting the Miami-Dade Dune Revegetation Project, which began in the mid-1980s. He said that the objectives of the program, which cost $4.2 million, were to restore the design elevation of hurricane berms; restore a functional dune system for sand trapping/stabilization; channel pedestrian and vehicular traffic; and enhance the aesthetics of 8 miles of beach.

Mr. Voight described some of the challenges for future beach erosion control in Miami-Dade County, including sand management; optimizing sand distribution along the project area; identifying sources of future nourishment materials; and funding.

Mr. Voight described the natural areas restoration programs, which attempted to restore the natural areas' resilience through the Miami-Dade County Biscayne Bay Restoration and Enhancement Program; various demonstration projects and pilot projects; and EEL Volunteer Days. He displayed a number of slides depicting coastal wetlands restoration.

Mr. Voight described Miami-Dade County's regulatory programs that protect coastal resources. He noted State and local statutes restricted the pruning and cutting of mangrove trees. Mr. Voight emphasized the importance of restoring mangrove reefs as mangrove shorelines dissipate storm energy/surges and retain floodwaters while protecting inland areas. Mr. Voight explained that these protective barriers are usually high-value lands for conservation of habitat and ecosystems. He said that placing these lands in preservation reduces development in areas that would be more vulnerable to storm impact.

Chairman Ruvin thanked all of the presenters, noting they had underscored the value and potential utility of natural systems in making Miami a resilient world capital in the future in spite of sea level rise.

In response to Ms. Fain's question as to whether more funds were needed to acquire and manage lands through the EEL program, Mr. Voight noted an acquisition list had been approved by the County Commission; however, the need outweighed the funds. He indicated that DERM received some State funding, and hoped to receive more such funding in the future.

Pursuant to Ms. Fain's question regarding whether there was a need to expand the list that had been approved by the County Commission, Mr. Voight said that DERM was trying to connect the natural areas to restore the flow of water and have a more functional ecosystem. He noted DERM's emphasis was on South Dade wetlands.

Chairman Ruvin suggested that the Task Force recommend to the County Commission that a higher priority be placed on acquiring land that would protect against sea level rise. He noted the funds for the EEL Program were raised on a two-year extraordinary millage; and these funds were leveraged through matching funds. Chairman Ruvin said that the Task Force could recommend that the program be extended for another two years.

Mr. Murley asked Ms. Hefty whether there were plans to arrange a presentation from the Parks, Recreation and Open Spaces Department. He noted this department's Master Plan would complement the presentations made today (3/13), and illustrate how the County was facilitating the general public's access to the lands which it acquired through the EEL Program.

VI. Discussion and next steps

Chairman Ruvin said that he would now move the discussion to the preparation of the report. He expressed appreciation for the members of the Task Force and of the public who regularly attended the meetings. He noted this Task Force did not have perpetual life, and pointed out that this

body's report would have to be submitted by June. Chairman Ruvin said that he had a list of other potential presentations to be made, including by the U.S. Army Corps of Engineers. However, he noted, at some point the Task Force members would have to focus exclusively on the contents of its report.

Chairman Ruvin stated that one of the Task Force's recommendations would be for the County to implement a robust capital improvement program to enhance its infrastructure. He said that the Task Force's challenge was to formulate its recommendation in a manner that would spur the Administration to hire a number of major global engineering firms to develop this program. He noted it would be valuable for the Task Force to hear from Ms. Myriam Singer, Assistant Director, Internal Services Department, who could advise the members regarding how to solicit the services of these engineering firms. He also suggested that Mr. John Englander, former Executive Director, Cousteau Society, be invited to address the Task Force. Chairman Ruvin said that he foresaw three more meetings of presentations and suggested three days for the Task Force's next three meetings: March 21st, April 4th and April 18th.

Mr. Milian pointed out that the Task Force had already seen a number of presentations, noting much was being done to address sea level rise. He said he believed it was time to start discussing the content of the report.

Ms. Hefty pointed out that based on the schedule, if the report had to be considered in Committee, it would have to be completed by April 22nd.

Assistant County Attorney Angell advised that the report would have to be considered in Committee; however, the Board of County Commissioners' Chairwoman could waive this requirement. He said that currently, it was not possible to amend the resolution creating the Task Force. In any case, any additional extension would be limited to 23 days as the Task Force would have to expire within 365 days of its enactment, noted Mr. Angell.

Ms. Fain suggested two more meetings with presentations, and then the Task Force could focus on the report.

Chairman Ruvin suggested that the members agree on dates for the next three meetings: the first two meetings would be devoted to presentations, and the third meeting would be devoted to discussions on the report.

Discussion ensued regarding the dates that were most convenient for the next three meetings.

It was moved by Ms. Sara Fain that the next three meetings of the Task Force be held on March 19th in the afternoon; April 4th, and April 18th in the morning. This motion was seconded by Mr. Arsenio Milian, and upon being put to a vote, passed by a unanimous vote of those members present.

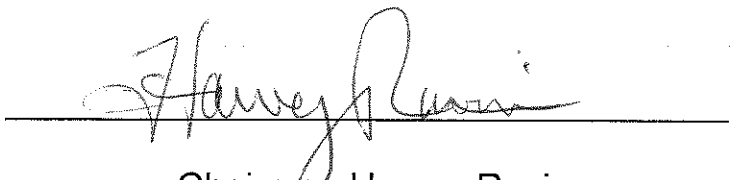
VII. Approval of Meeting Minutes

Chairman Ruvin called for a motion to approve the minutes of the fourth meeting of the Task Force.

It was moved by Ms. Sara Fain that the minutes of the February 11th, 2014, Sea Level Rise Task Force meeting be approved, as presented. This motion was seconded by Mr. Arsenio Milian, and upon being put to a vote, passed by a unanimous vote of those members present.

VIII. Adjournment

There being no other business to come before the Sea Level Rise Task Force, the meeting adjourned at 12:30 p.m.



Chairman Harvey Ruvin
Sea Level Rise Task Force

Miami Dade County
Sea Level Rise Task Force
March 7, 2014

Prepared by: Maryse Fontus

EXHIBITS LIST

NO.	DATE	ITEM #	DESCRIPTION
1	3/7/14		Agenda
2	3/7/14		Attendance Sheets
3	3/7/14		Climate Change: Discussion on South Florida Resources at Risk
4	3/7/14		Presentation by the Nature Conservancy
5	3/7/14		Preserving our Natural Resource Resilience
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Miami-Dade Sea Level Rise Task Force Meeting

March 7, 2014
10:00 AM – 12:00 PM
Overtown Transit Village North
701 NW 1st Court, Second Floor Training Room
Miami, FL 33136

- **Welcome and Introductions**
  Honorable Clerk & Sea Level Rise Task Force Chair, Harvey Ruvin

- **Approval of Meeting Minutes**
  - February 11, 2014

- **Mr. Dan Kimball, Park Superintendent, Everglades National Park & Dr. Erik Stabenau, Oceanographer & Coastal Ocean Modeler, National Park Service, So. FL. Natural Resources Center**

  Connecting Everglades Restoration with Sea Level Rise Mitigation

- **Ms. Lauren Ordway, Associate Director Philanthropy, The Nature Conservancy, Florida Chapter**

  The Role Natural Infrastructure Plays in Coastal Resilience and Risk reduction

- **Mr. Paul Voight, PG, Intergovernmental Affairs Administrator , Environmental Resources Management, Regulatory and Economic Resources Department**

  Preserving Our Natural Resource Resilience

- **Q/A and Discussion**

- **Public Comment**

- **Proposed Topics and Date for Next Meeting**

MIAMI-DADE SEA LEVEL RISE TASK FORCE
MEETING DATE OF March 7, 2014

	TASK FORCE MEMBERS	PRESENT	LATE	ABSENT
1	Enfield, David	✓		
2	Fain, Sara E.	✓		
3	Fair, T. Willard			✓
4	Gonzalez, Jorge			✓
5	Milian, Arsenio	✓		
6	Murley, James F.	✓		
7	Ruvin, Harvey	✓		

Four (4) members constitutes a quorum

Sea Level Rise Task Force Meeting
March 7, 2014
10:00 AM
Overtown Transit Village North
2nd Floor Training Room

	Name	Organization	Phone Number	Email Address
1	PRAKASH KUMAR	Tuesday Mng B/F Club	305 803 7759	[illegible]
2	LAUREN MEDWAY	TENTATIVE CONSERVANCY	305-445 8352	LOEDWARD[illegible]
3	Julie Dick	Everglades Law Center	312-399-4057	julie@evergladeslaw.org
4	DAN KIPNIS	PUBLIC	786-325-8518	captaindankipnis@att.net
5	ERIK STABENAU	Everglades National Park	305. 224.4209	Erik_Stabenau@nps.gov
6	Bertha Goldenberg	M-D WASD	786-552-8120	bmg@miamidade.gov
7	R. Pettegrew			
8	Ms Carpenter			
9	Kelly Nagel	CAC —		
10	Enfield	member		
11	Meeks	member		
12	Millecan	member		

	Name	Organization	Phone Number	Email Address
13	Sara Jacin	Member		
14	Kim Brown	MDC - Planning	305-375-4724	
15	ILEANA DE CARDENAS	TROPICAL AUDUBON	305 790 9337	
16	Reinaldo Borges	Borges + Assoc. Architects	3053749216	rborges@borgesarchitects.com.
17	PAUL VOIGHT	O.E.R.M.	305-372-6849	
18				
19	John Proni	F.I.U.	305-282-0685	Jproni@fiu.edu
20	Elizabeth Wheaton	City of Miami Beach	305 673 7080	ewheaton@miamibeachfl.gov
21	Lynn W Bernstein	City of Miami Beach	305-673-7080	lynnbernstein@miamibeachfl.gov
22	Tom David			
23				
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Everglades National Park

South Florida Natural Resources Center

National Park Service
U.S. Department of the Interior

Climate Change:

Discussion on South Florida Resources at Risk

Dan Kimball, Superintendent
Everglades National Park
Erik Stabenau, Ph.D., Oceanographer
Everglades National Park

What do we know for sure?

- Sea level is rising at an increasing rate
- Flooding occurs on an annual basis
- Saltwater intrusion has impacted wellfields and is moving further west
- Coastlines are shifting

The National Park Service and the Leopold Report

1963 Leopold Report

Key feature:

"A national park should present a vignette of primitive America…if the goal cannot be fully achieved it can be approached. A reasonable illusion of primitive America could be recreated, using the utmost in skill, judgment, and ecologic sensitivity."

- Snapshot, frozen in time
- Illusion is acceptable, if needed

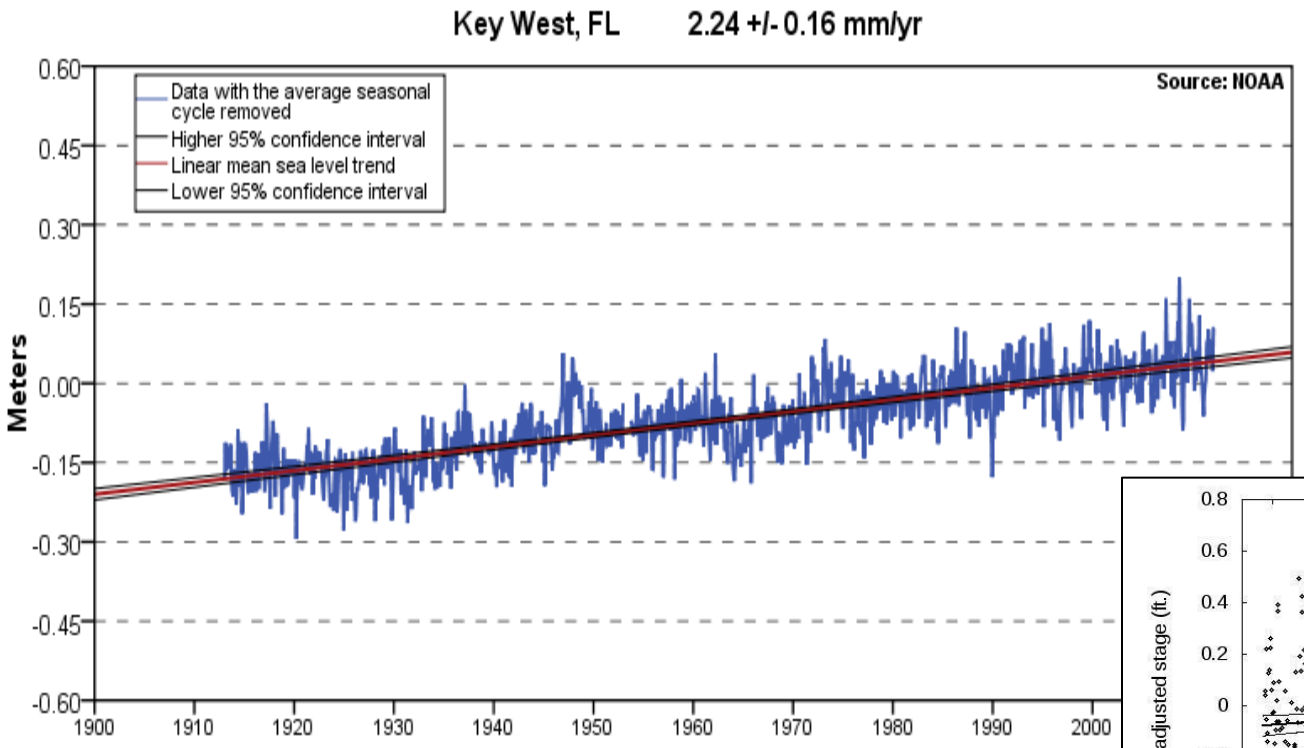
2013 Leopold Revisited

Key feature:

"The overarching goal of NPS resource management should be to steward NPS resources for continuous change that is not yet fully understood, in order to preserve ecological integrity and cultural and historical authenticity, provide visitors with transformative experiences, and form the core of a national conservation land- and seascape"

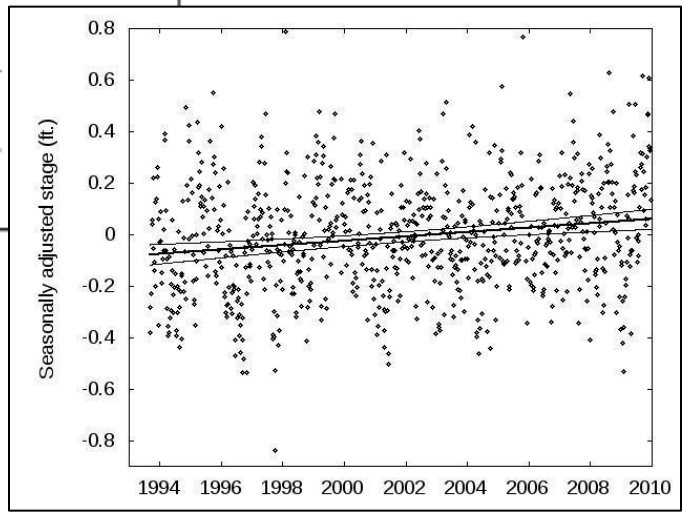
- Provide for continuous change
- Protect ecosystem function

Sea-level rise



Little Madiera Bay water level shows similar rate of sea level rise as observed in Key West.

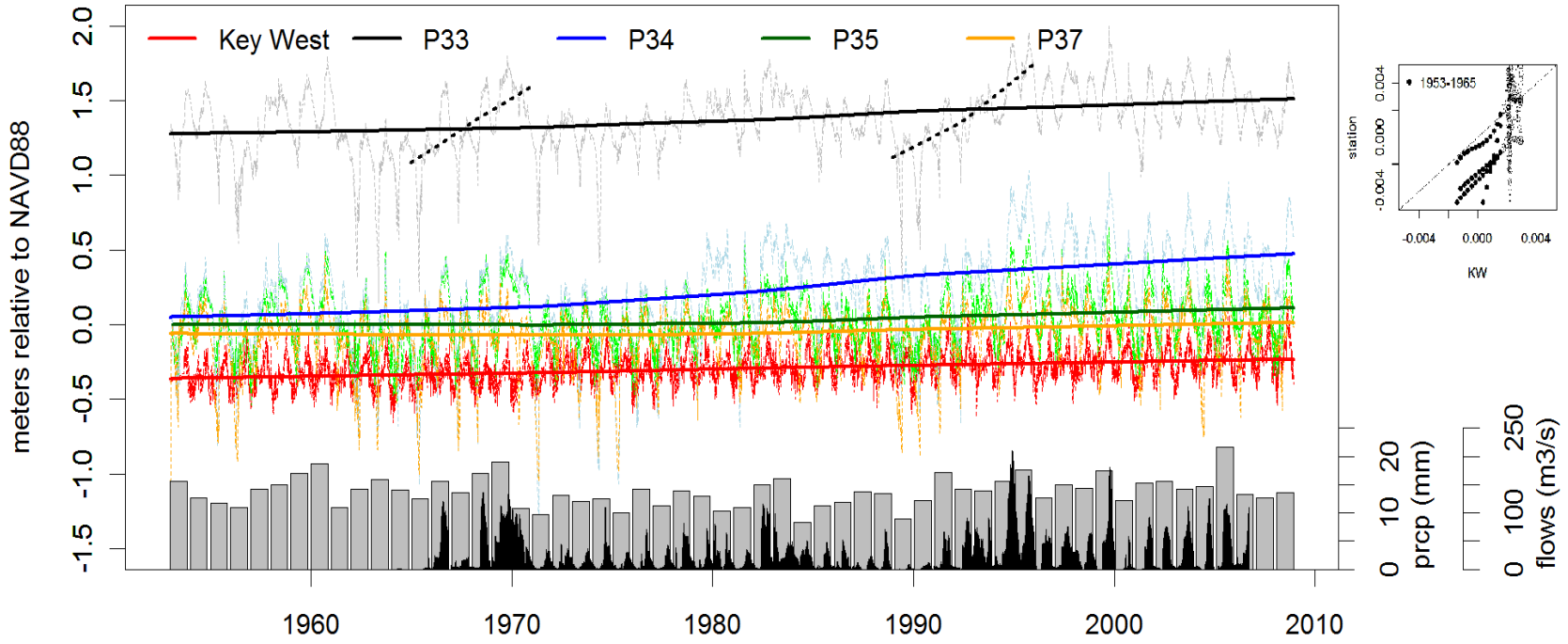
Water levels have risen at an average of 2.2 mm/yr over the last 100 years and closer to 2.8 mm/yr for the last decade.



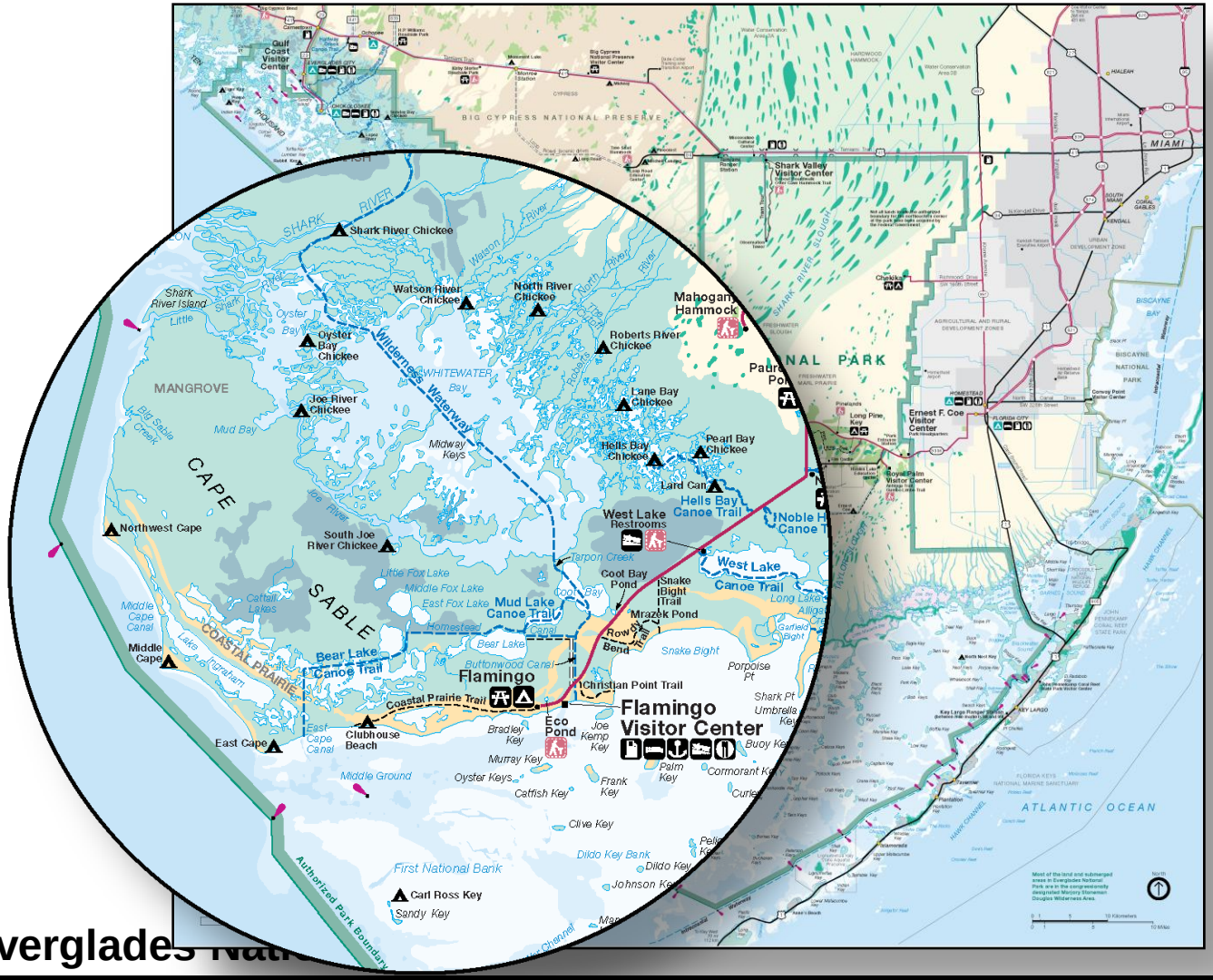
Station LM; 2.58 ± 0.47 mm/yr

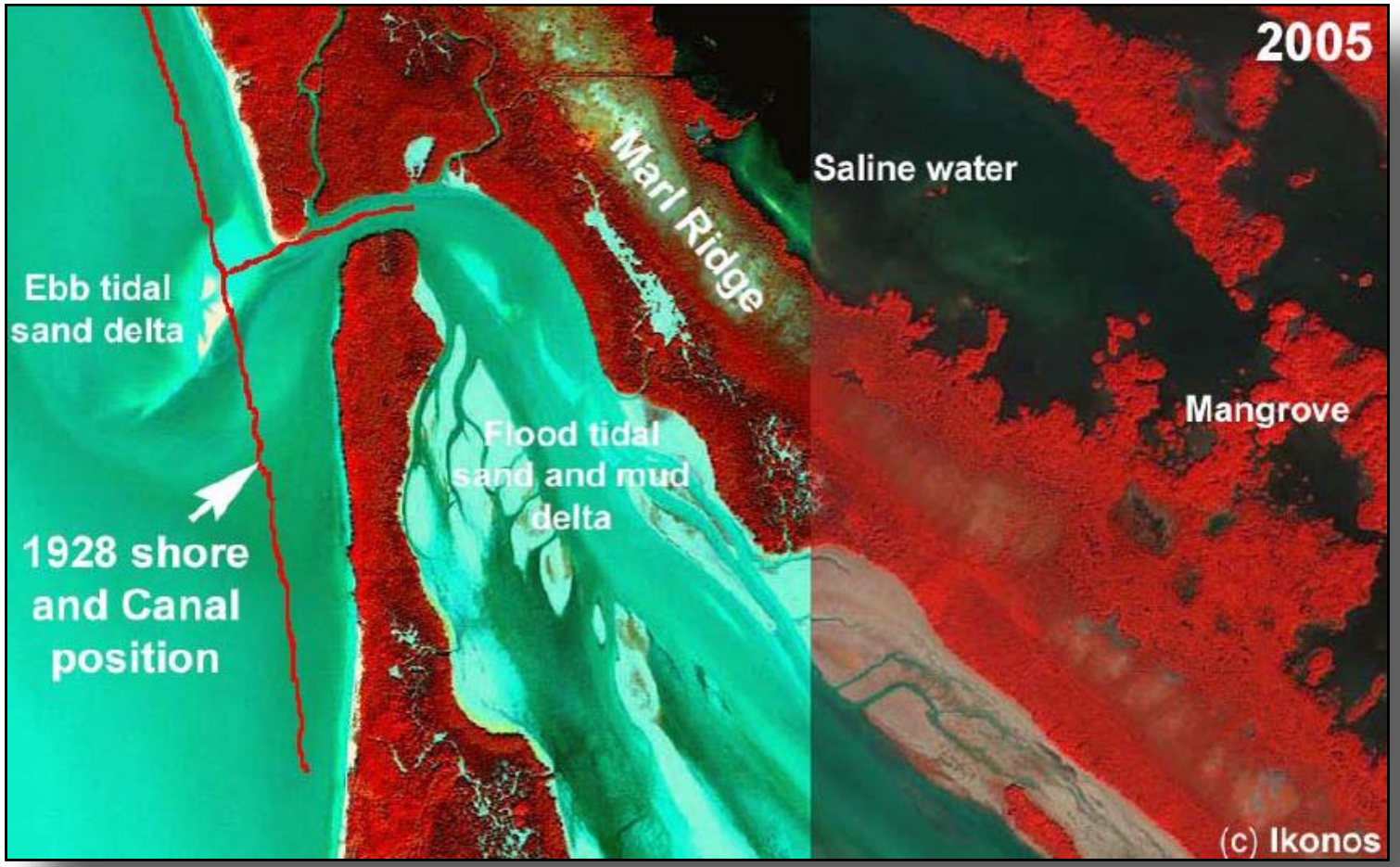
Punctuated equilibrium

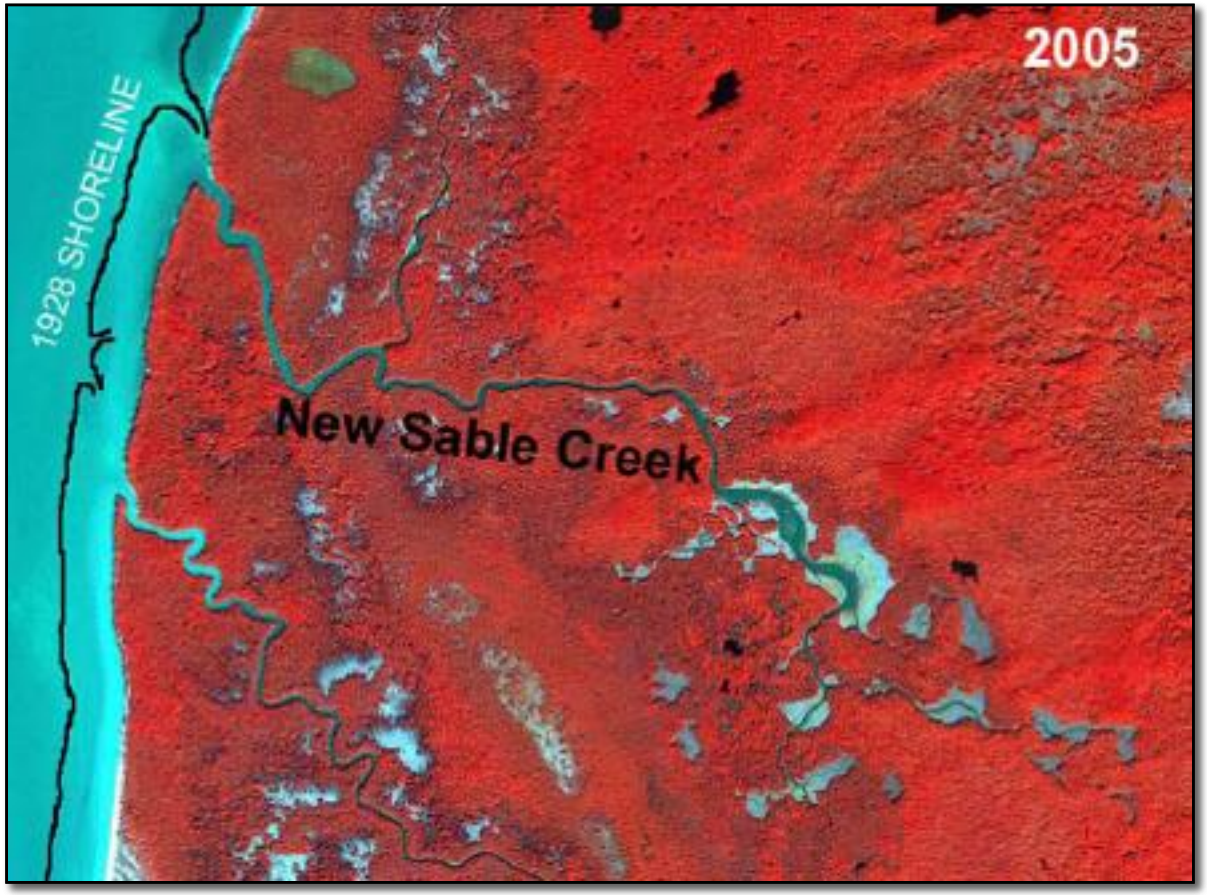
Data reveals two periods in the previous 50 years when water levels have increased **10 times faster** than the long term trend.



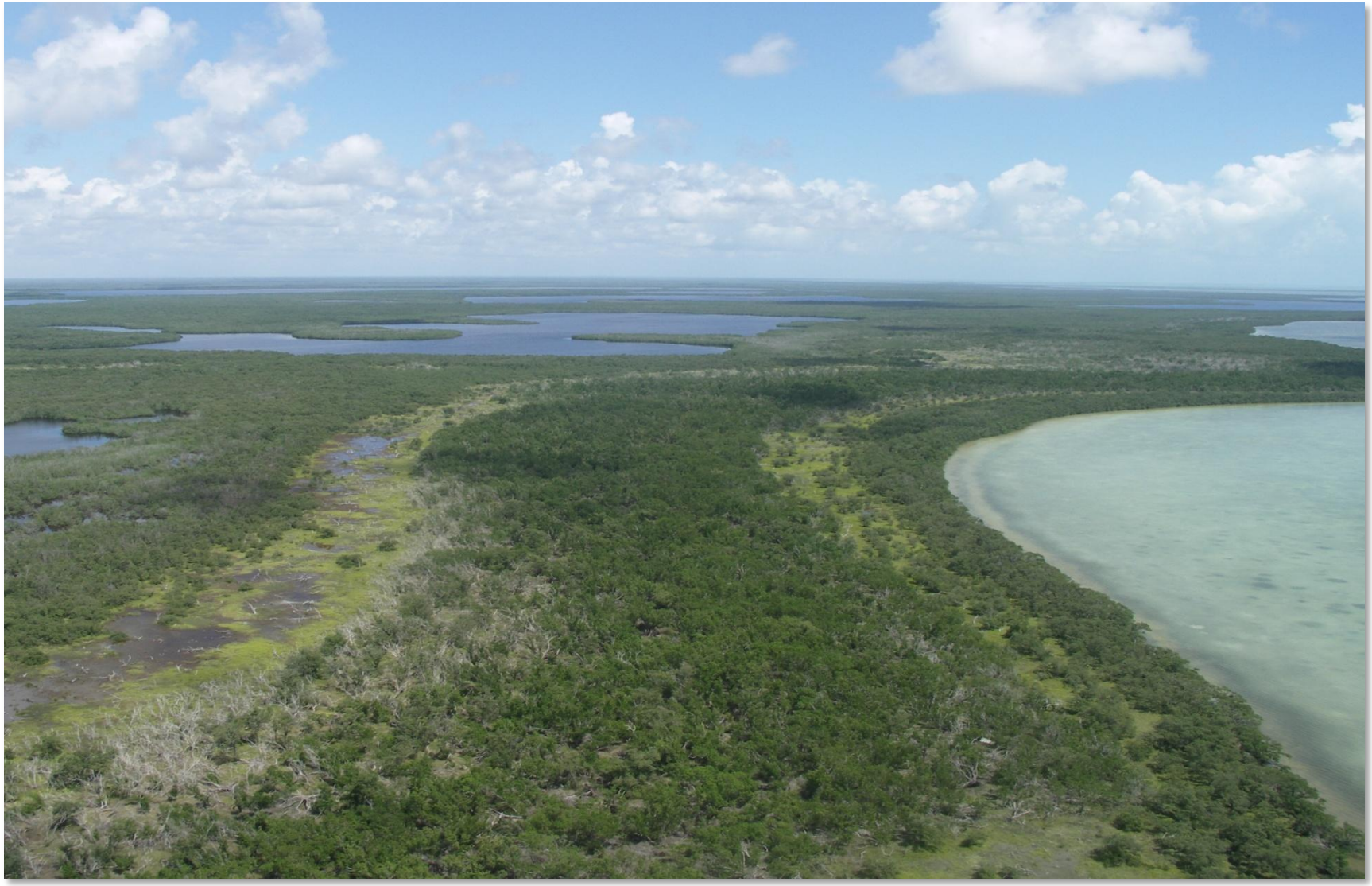
Coastal Erosion




2005
Saline water
Marl Ridge
Ebb tidal
sand delta
Flood tidal
sand and mud
delta
Mangrove
1928 shore
and Canal
position
(c) Ikonos

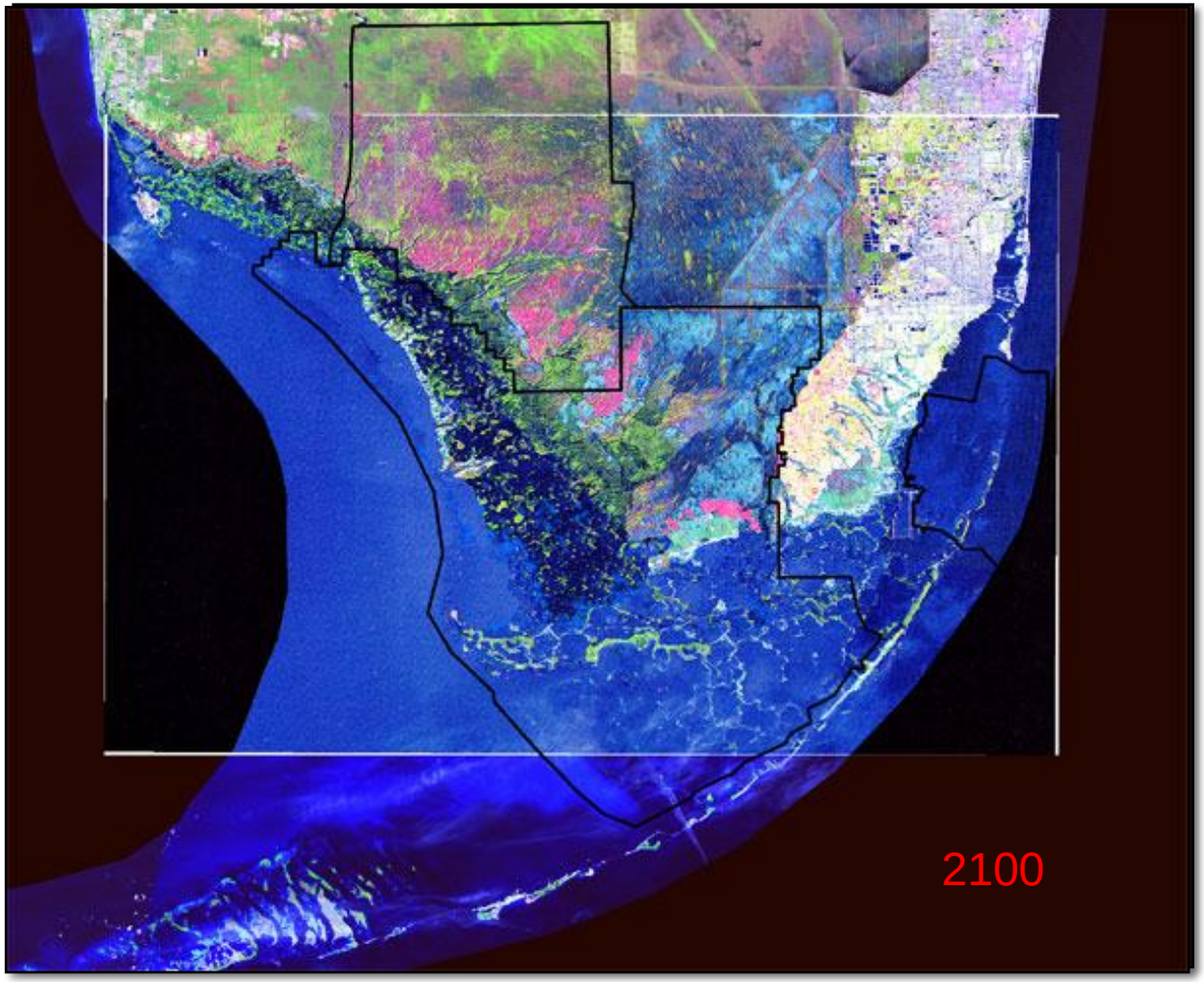

2005
1928 SHORELINE
New Sable Creek

What's at risk?



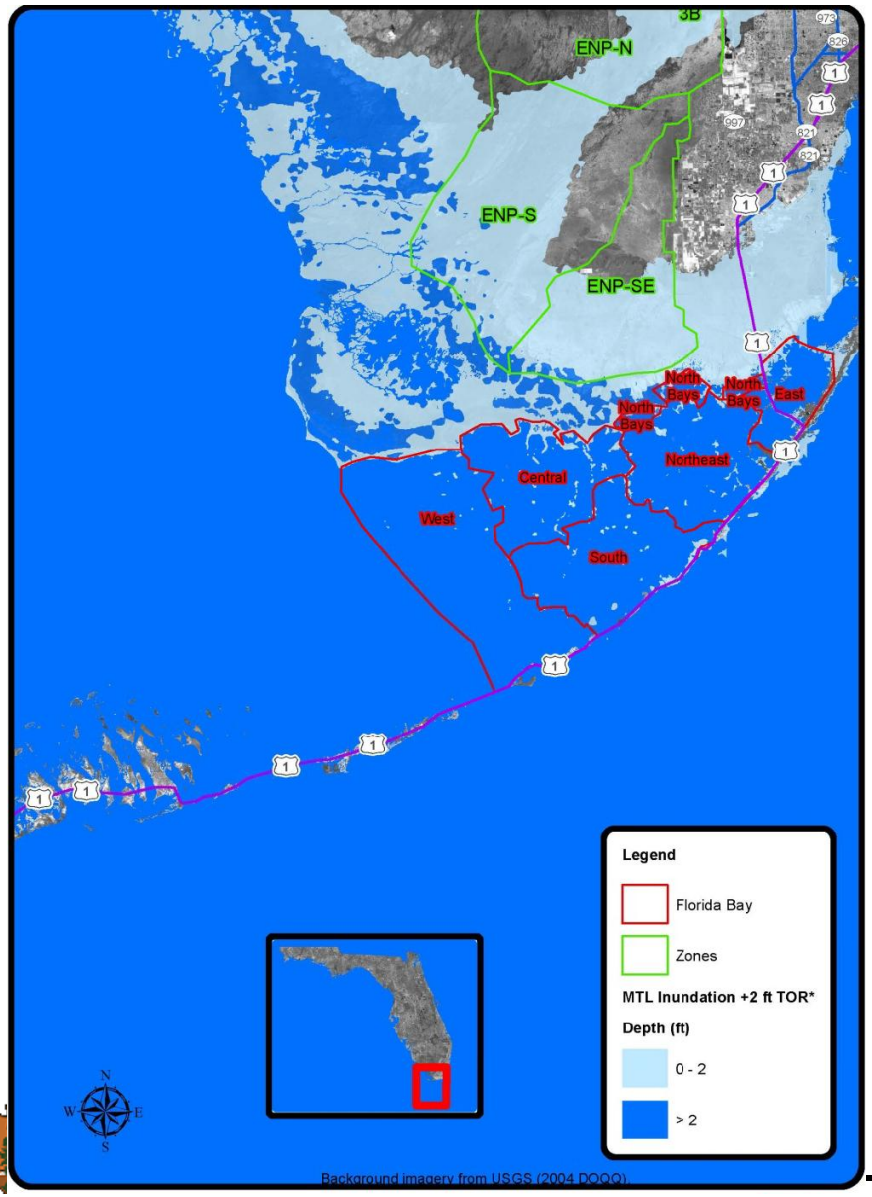
Sea Level Rise

Statement of Dan Kimball, Superintendent, Everglades National Par, National Park Service, Department of the Interior, Before the Subcommittee on Interior, Environment, and Related Agencies of the House Appropriations Committee Concerning Climate Change and Lands Administered by the Department of the Interior, April 26, 2007.

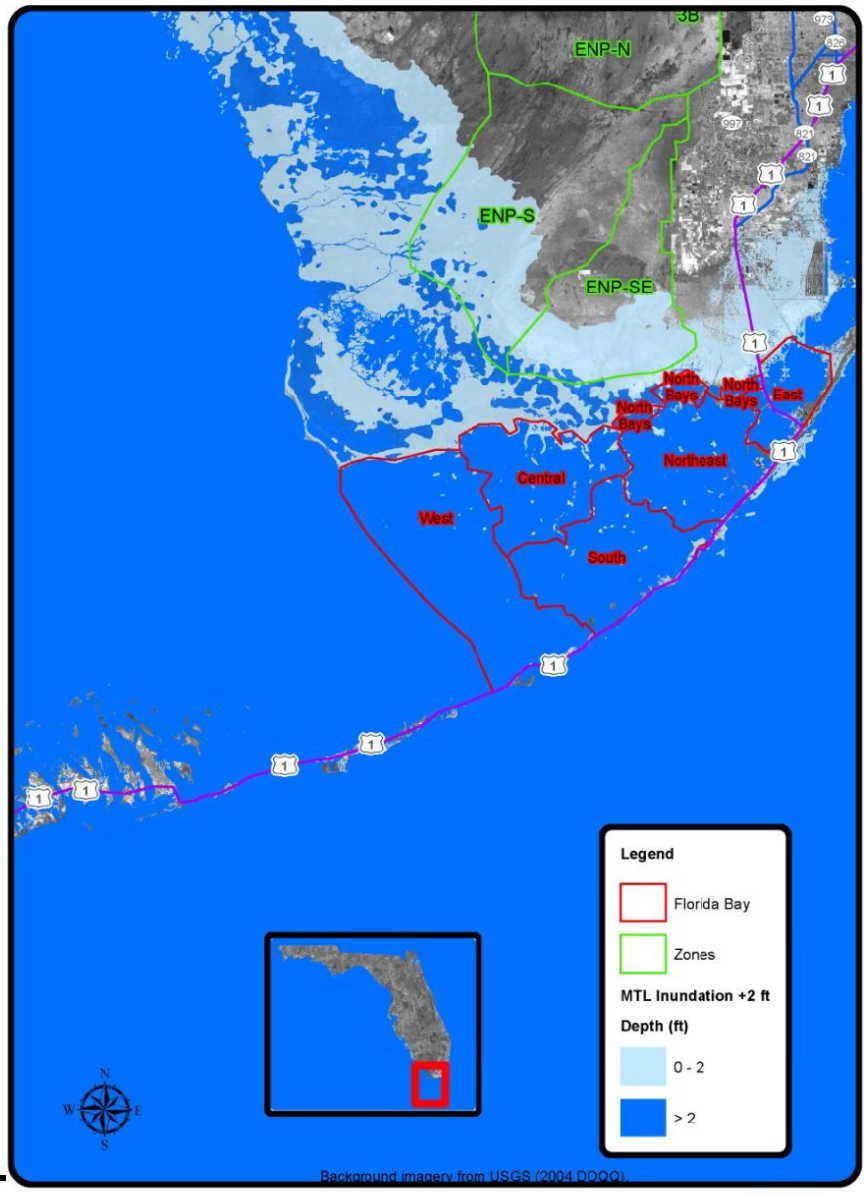


Sea Level Rise Projection through 2100

2 Foot SLR Marsh Losses Without Flow Restoration



2 Foot SLR Marsh Losses With Flow Restoration

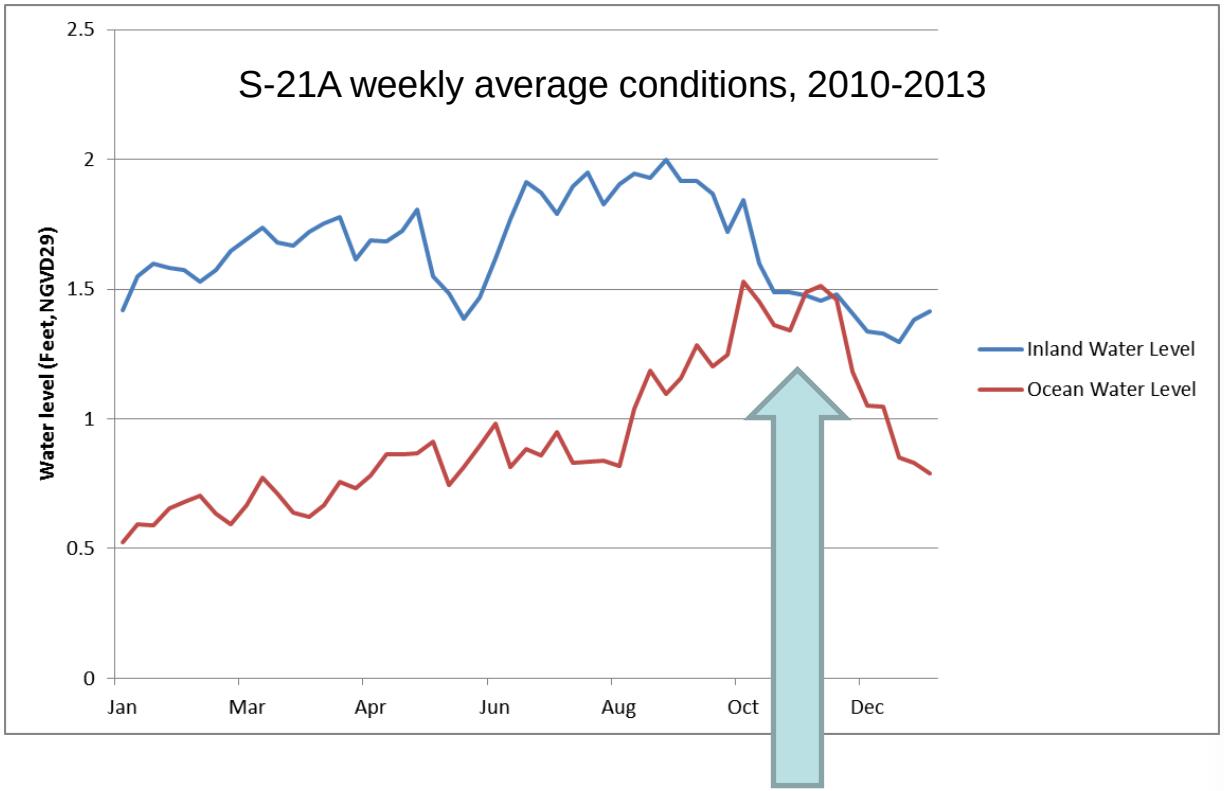


Flooding & Storm related impacts

Ft. Lauderdale

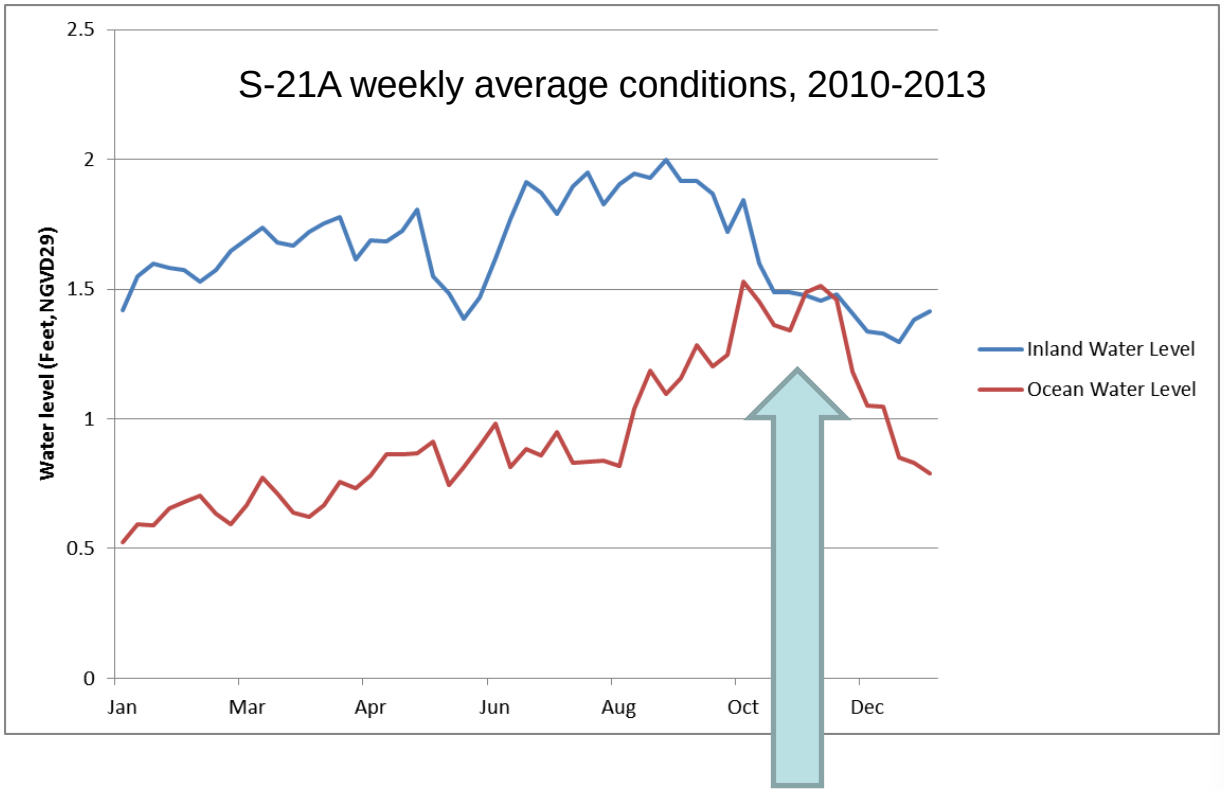
Miami Beach

Flood control



Coastal ocean water level is higher than inland water level each Fall.

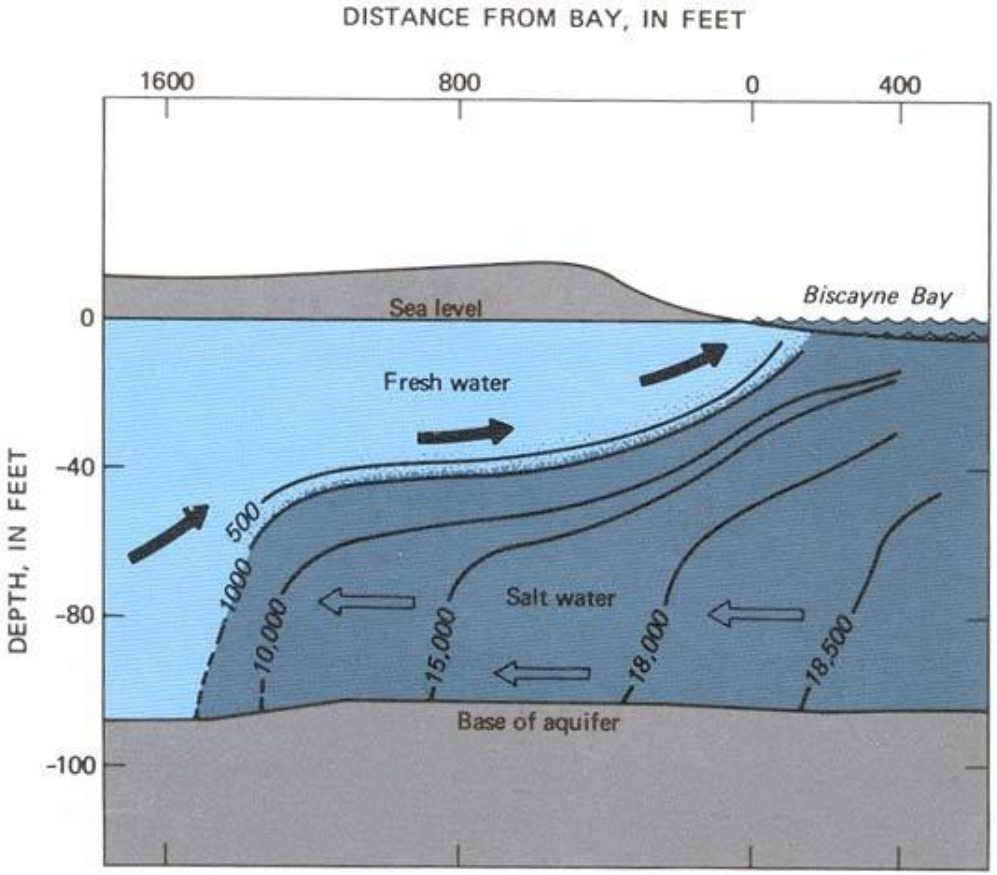
Flood control

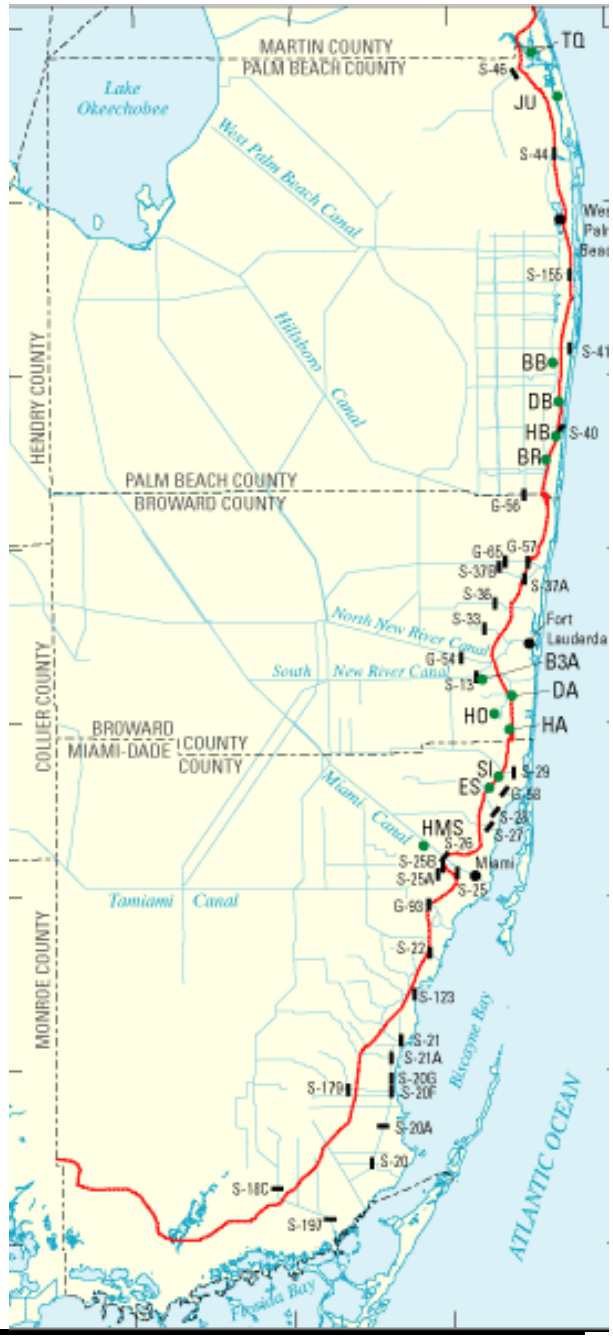


"Unusually low Florida Current transports were observed in May and June (2009) and were linked to high sea level and coastal flooding along the east coast of the United States in the summer"

Arndt, et al., State of the Climate, 2009
Bulletin of the American Meteorological Society

Saltwater Intrusion

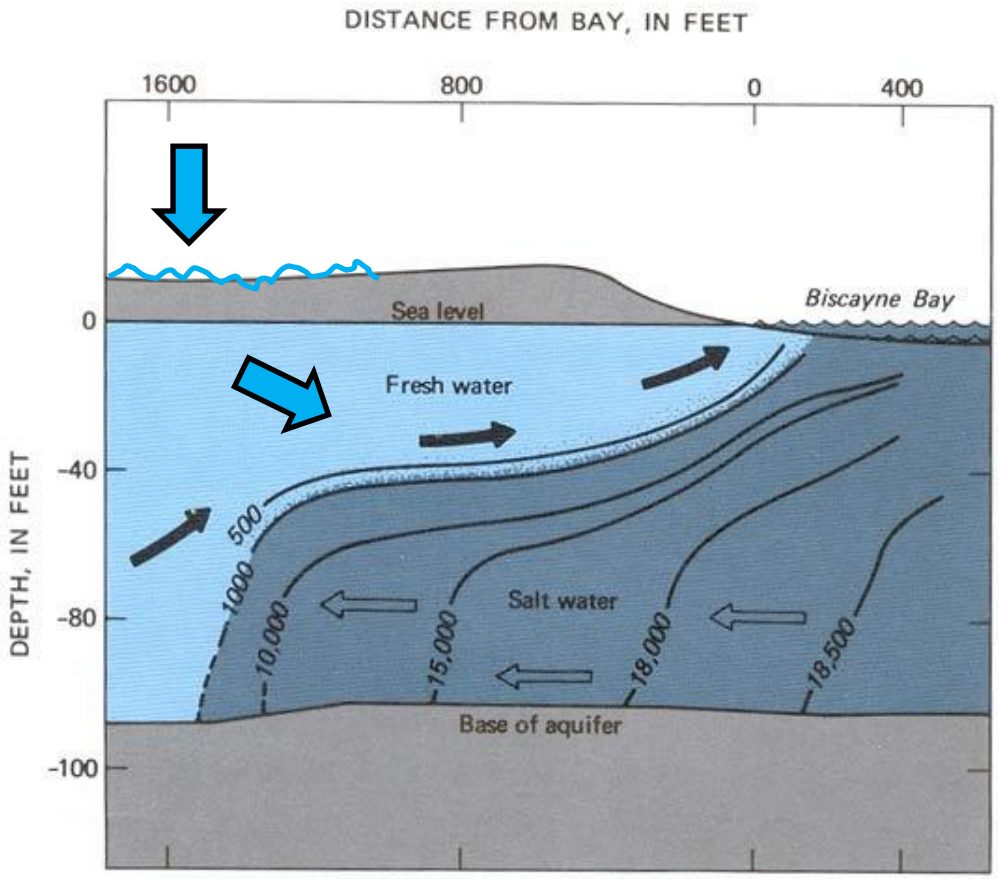


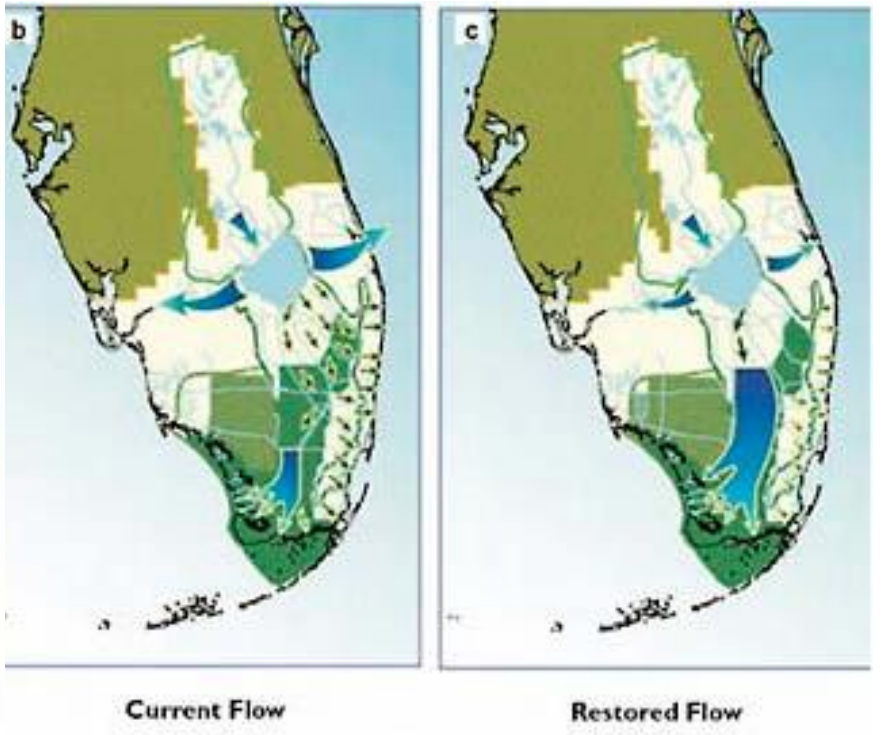


Everglades National Park

South Florida Natural Resources Center

Everglades Restoration is a climate change adaptation tool





Discussion

- Everglades Restoration as a climate change adaptation tool
- Physical science behind sea level variability
- Saltwater intrusion
- Hurricanes and other episodic events
- Pumps and canals

MIAMI DADE COUNTY
SEA LEVEL RISE TASK FORCE

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy
Lauren Ordway
lordway@tnc.org

MISSION

PROTECTING AND RESTORING THE LANDS AND WATER ON WHICH
ALL LIFE DEPENDS

FLORIDA FOCUS

NATURE HAS **VALUE**

- Improving ecosystem valuation methods with the Natural Capital Project
- Incorporating the value of nature into business decisions with corporate leaders
- Assembling data and practical evidence for the value of nature

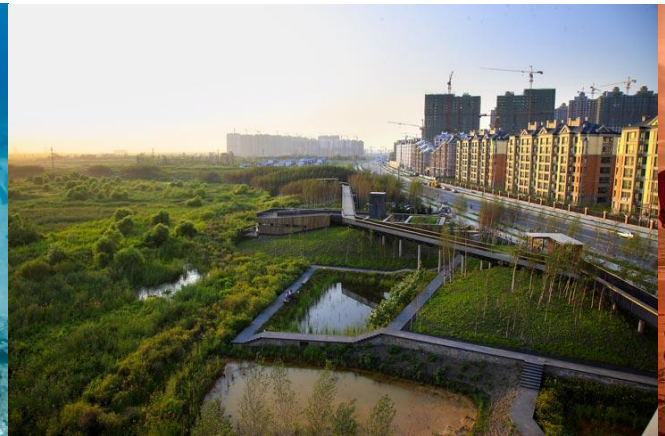
HOW DO WE **INVEST** LIMITED RESOURCES FOR MAXIMUM **BENEFIT**?

OTHER **BENEFITS** OF INTEGRATING NATURE INTO THE **SOLUTION**

1. **Substitution value** where substituting natural for built infrastructure reduces capital costs (CapEx). Operating costs may increase, decrease or remain the same.

2. **Integration value** where integrating natural infrastructure into built infrastructure produces operation savings (OpEx). Capital costs may increase, decrease, or remain the same.

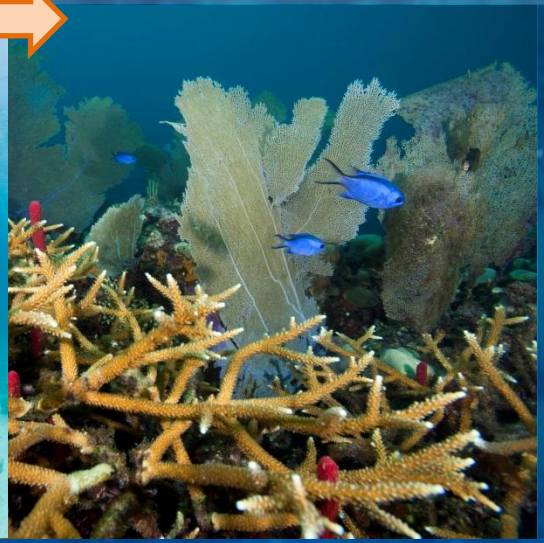
3. **Complementary value** where utilizing natural infrastructure produces additional, complementary benefits, e.g., increased property values (revenues). Capital and operating costs may increase, decrease, or remain the same.

CORAL **RESTORATION**

"Studies show that coral reefs attenuate and reduce more than 85% of incoming wave energy."

Source: World Risk Report 2012



Protect, restore & enhance natural defenses

Conduct demonstrations

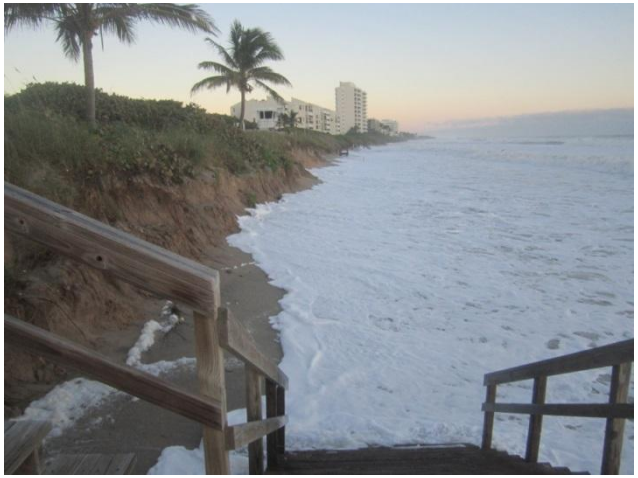
Scale up reef restoration

DUNE **RESTORATION**

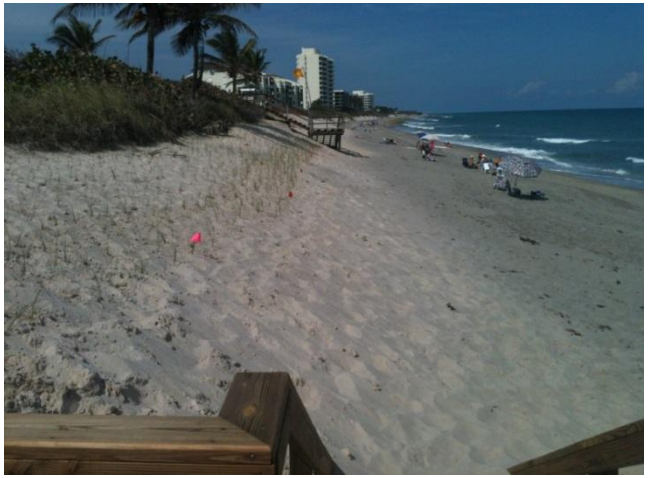
MIAMI DADE

SOUTH POINTE PARK

PALM BEACH



November 2012



March 2013

Developing specific tools to address coastal adaptation and risk

DECISION SUPPORT TOOLS

Apps

Share |

TOOLS

Apps

The decision support tools for Coastal Resilience include a visualization platform where ecological, social, and economic information can be viewed alongside sea level rise and storm surge scenarios in specific geographies. In addition, Coastal Resilience "apps" have been developed for specific geographies. They are intended to cater to the needs of stakeholders, policies and planning processes. These apps can be used to simplify complex relationships or models, convey a specific ecological or social concept, or used to compare different future condition scenarios. A short description of each app for Coastal Resilience 2.0 is below.

Click on the icons below to see infographics that illustrate the objective of each **Coastal Resilience app**

Coastal Defense

Coastal Defense quantifies how natural habitats (oyster and coral reefs, tidal marshes, seagrass beds) protect coastal areas by reducing wave-induced erosion and inundation. It uses standard engineering techniques to help you estimate how and where to restore or conserve critical habitat, and increase the resilience of your coastal community and infrastructure.

Currently implemented in: **Puget Sound**

Currently planning for: **Gulf of Mexico** (Fall 2013), **Florida Keys** (Spring 2014)

Community Planning

The Community Planning app is the location where resilient communities host their locally specific data to inform their decisions and track their successes. It is also where the community comes to view their information alongside and with the other Coastal Resilience data layers. This app provides information for a community-level engagement process over time.

Currently implemented in: **Grenada, St. Vincent and the Grenadines, Gulf of Mexico,** and **New York and Connecticut**

Flood & Sea Level Rise

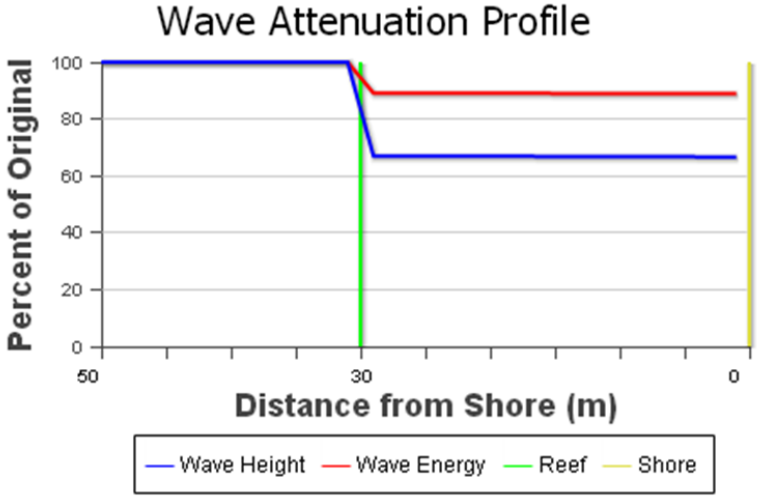
Flooding is increasing along the coast and certain rivers. Use this app to view areas affected today and in the future due to increased sea level rise, surge from storms and hurricanes, and inland flooding.

Currently implemented in: **Florida Keys , Grenada, St. Vincent and the Grenadines, Gulf of Mexico, New York and Connecticut, Ventura County,** and **United States**

Currently planning for: **New Jersey, MesoAmerican Reef, Puget Sound,** and **U.S. Virgin Islands** (Fall 2013),

Future Habitat

Nearshore Waves Tool



The figure shows the average profiles of percent of wave height and energy attenuation computed from all Reef Points along your reef. Attenuation is defined as the ratio of wave height (energy) in the presence of the reef over wave height (energy) in the absence of the reef.

Layers: Wave Attenuation - (Click a profile point for attenuation detail.)

Fetch Distances

Bathymetry

Choose a New Reef Location (Start Over)

Link to the output (turn off popup blocker): Results Link

ADVANCING THE **SCIENCE**

"Coastal habitats defend the greatest number of people and total property value in **Florida**, New York and California.

Results suggest that the number of people and total value of residential property most exposed to hazards can be reduced by half by the end of the century if existing coastal habitats remain fully intact."

nature climate change

Home | Opinion & Analysis | Latest Research | Current Issue | Focuses & Reports | Archive | For Authors

Archive > 2013 > October > Letters > Abstract

ARTICLE PREVIEW

view full access options ▸

NATURE CLIMATE CHANGE | LETTER

Coastal habitats shield people and property from sea-level rise and storms

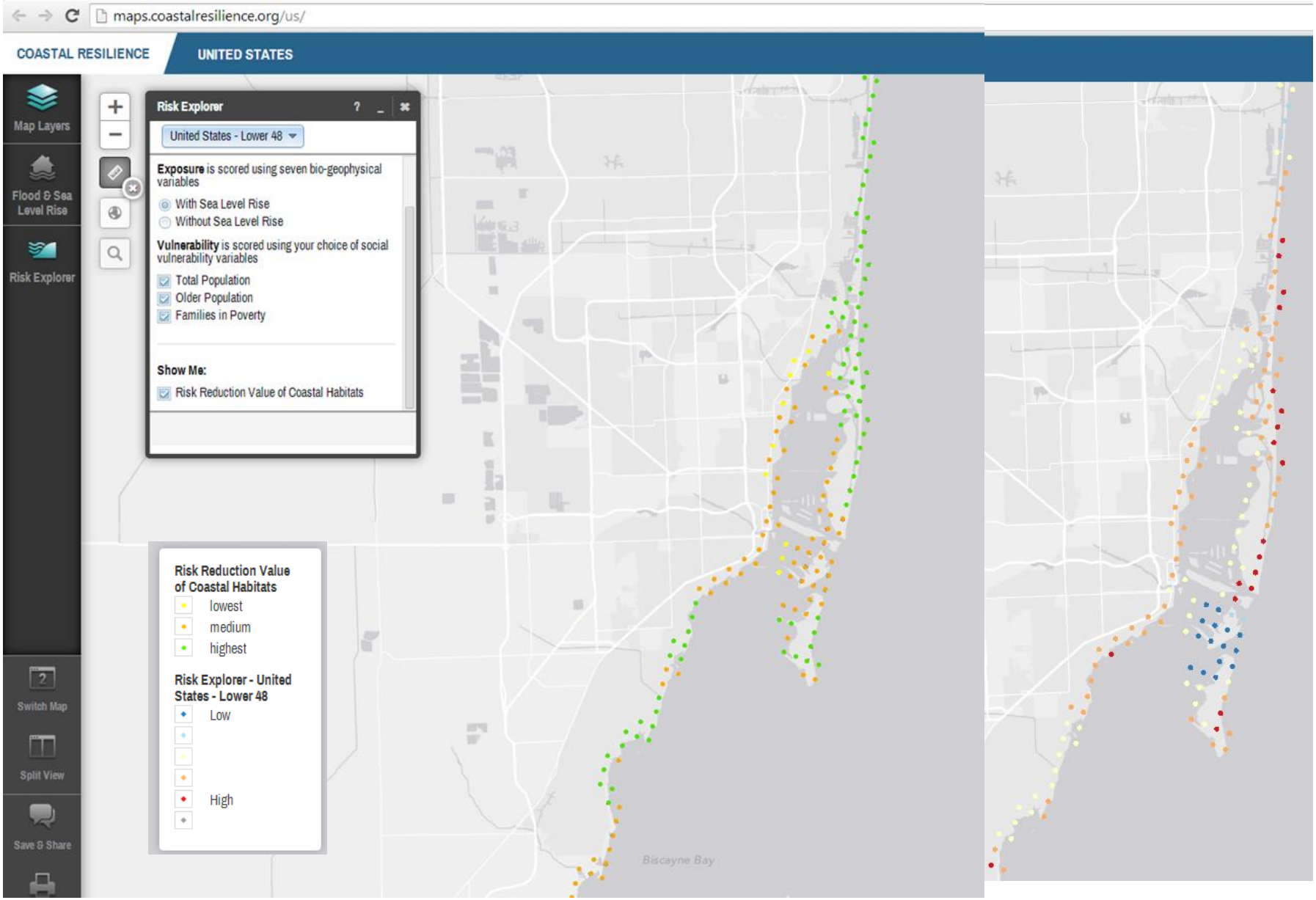
Katie K. Arkema, Greg Guannel, Gregory Verutes, Spencer A. Wood, Anne Guerry, Mary Ruckelshaus, Peter Kareiva, Martin Lacayo & Jessica M. Silver

Affiliations | Contributions | Corresponding author

Nature Climate Change **3**, 913–918 (2013) | doi:10.1038/nclimate1944
Received 21 November 2012 | Accepted 03 June 2013 | Published online 14 July 2013
| Corrected online **01 August 2013**

Citation | Reprints | Rights & permissions | Article metrics

Extreme weather, sea-level rise and degraded coastal ecosystems are placing people and property at greater risk of damage from coastal hazards[1, 2, 3, 4, 5]. The likelihood and magnitude of losses may be reduced by intact reefs and coastal vegetation[1], especially when those habitats fringe vulnerable communities and infrastructure. Using five sea-level-rise scenarios, we calculate a hazard index for every 1 km^2 of the United States coastline. We use this index to identify the most vulnerable people and property as indicated by being in the upper quartile of hazard for the nation's coastline. The number of people, poor families, elderly and total value of residential property that are most exposed to hazards can be reduced by half if existing coastal habitats remain fully intact.


maps.coastalresilience.org/us/
COASTAL RESILIENCE
UNITED STATES
Map Layers
Flood & Sea Level Rise
Risk Explorer
Switch Map
Split View
Save & Share
Risk Explorer
United States - Lower 48
Exposure is scored using seven bio-geophysical variables
With Sea Level Rise
Without Sea Level Rise
Vulnerability is scored using your choice of social vulnerability variables
Total Population
Older Population
Families in Poverty
Show Me:
Risk Reduction Value of Coastal Habitats
Risk Reduction Value of Coastal Habitats
lowest
medium
highest
Risk Explorer - United States - Lower 48
Low
High
Biscayne Bay

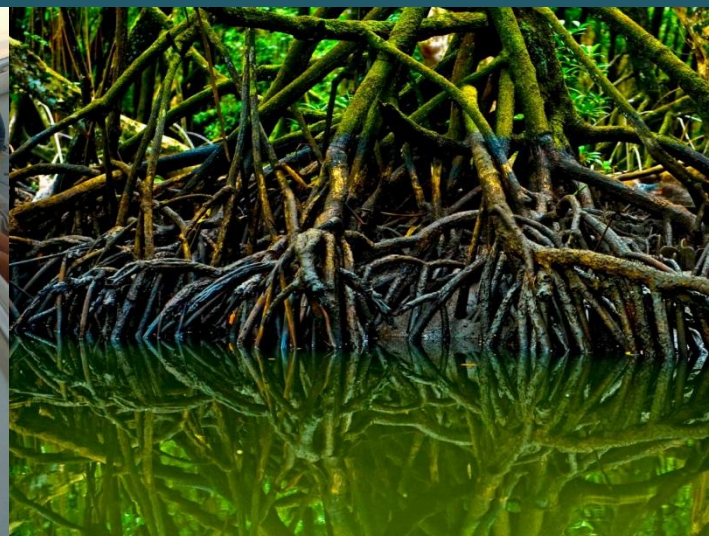
ADVANCING THE **SCIENCE**

- Developed a wave and storm surge flooding model (ie coastal flooding model) and incorporated this in to Swiss Re's open source model "Climada"
- Publicly available model that can examine risks from wave, surge, wind and rain hazards and is a far more robust model for assessing the cost effectiveness of alternative solutions – including natural defenses for reducing damages from these hazards

Swiss Re

"Tidal marsh can reduce wave energy in extreme storm events by **over 50%.**
A hybrid flood protection system comprising a landward levee and an adjacent tidal marsh provides an equivalent level of flood protection to that of a much larger landward levee alone. **Further, the cost of the hybrid system is almost half that of the traditional levee alone.**"

– The Bay Institute



INTEGRATING NATURAL INFRASTRUCTURE INTO **URBAN COASTAL RESILIENCE**

Case study: Howard Beach, Queens

- Evaluate the current and future climate risks facing Howard Beach as a sample community, with an emphasis on coastal flooding, and demonstrate the potential role and value of an integrated suite of strategies that include natural and built infrastructure
- Developed four suites of strategies ("Alternatives") containing natural and built infrastructure elements, and modeled their ability to mitigate damage caused by a 1-in-10, 1-in-25, and 1-in-100 year storm
- Two of these alternatives were further modeled for risk reduction capacity using sea level rise projections (12 and 32 inches), to determine how their protective capacity would change over the next 40 years

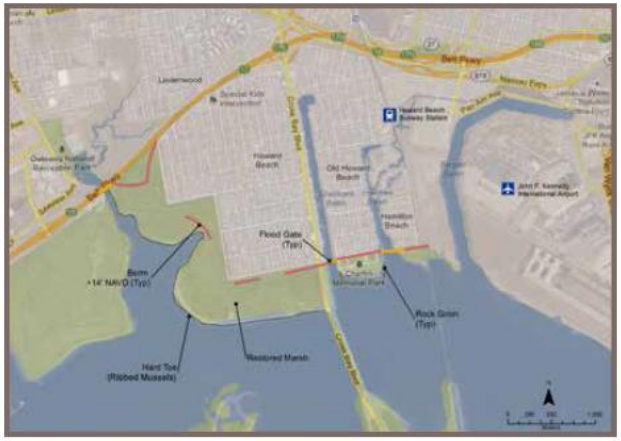
Alternative 3:

Hybrid with removable walls

Capital Cost: $249 M
Annual O&M: $913 K
1-in-100 yr. damage: $146 M
Avoided damage: $348 M
Annual Ecosystem Services Benefit: $662 K
B/C Ratio: 1.39

Elements: *+14' NAVD berms, restored marsh and ribbed mussel hard toe in Spring Creek Park; berm and rock groins at Charles Memorial Park; removable flood walls along Crossbay Boulevard, Shellbank Basin, west side of Hawtree Basin and portions of the Belt Parkway.*

Source: *CH2M Hill*



Source: *CH2M Hill*

Alternative 4:

Hybrid with operable flood gates

Capital Cost: $76 M
Annual O&M: $895 K
1-in-100 yr. damage: $28 M
Avoided damage: $466 M
Annual Ecosystem Services Benefit: $662 K
B/C Ratio: 6.08

Elements: *+14' NAVD berms, restored marsh and ribbed mussel hard toe in Spring Creek Park; berm and rock groins at Charles Memorial Park; movable flood gates at entrances to Shellbank and Hawtree Basins; berm at parkland in Hamilton Beach.*

The Nature Conservancy
Protecting nature. Preserving life.™

CH2MHILL

INNOVATIVE FINANCING: **WATERFUNDS**

Water funds enable water users to finance conservation and improvements to land management, with the aim of protecting water quality and quantity.

PUTTING CONCEPTS INTO **ACTION**

SOUTHEAST FLORIDA REGIONAL COMPACT CLIMATE CHANGE

BROWARD COUNTY FLORIDA

MIAMI-DADE COUNTY

PALM BEACH COUNTY FLORIDA

SHORELINE RESILIENCE WORKING GROUP

mprove coastal resilience in the ompact region by increasing the efficacy, number and scale of nature-based erosion control and flood attenuation projects

BUILD SAFER, BUT ALSO **SMARTER**

South beach

seven 50
counties years

THANK YOU

LAUREN ORDWAY
255 Alhambra Circle #640
Coral Gables, Fl 33137

lordway@tnc.org
305.445.8352

www.nature.org

The Nature Conservancy
Protecting nature. Preserving life.™

PRESERVING OUR NATURAL RESOURCE RESILIENCE

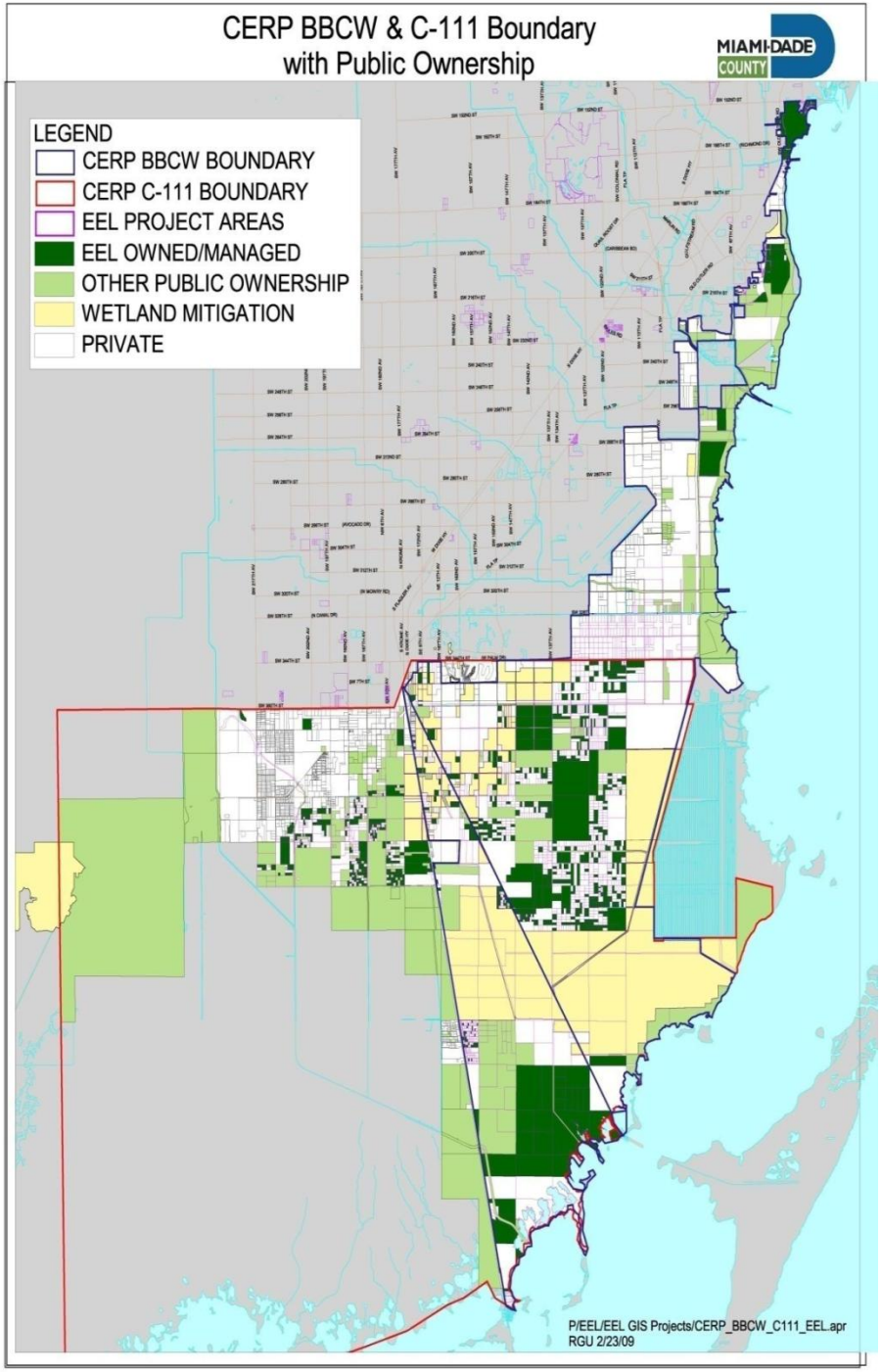
SEA LEVEL RISE TASK FORCE MEETING
MARCH 7, 2014

Miami-Dade County
Department of Regulatory and Economic Resources,
Division of Environmental Resources Management
(RER-DERM)

DERM preserves natural resource resilience through:

- The Environmentally Endangered Lands Program's acquisition of conservation lands
- Monitoring the salt intrusion boundary
- The Erosion Control / Beach Renourishment Program
- Natural resource restoration projects
- Regulatory programs that protect natural resources

- Miami-Dade County’s natural mangrove shorelines dissipate storm energy/surges and retain floodwaters while protecting inland areas.
- These protective natural barriers are usually high-value lands for conservation of habitat and ecosystems.
- Placing these lands in preservation reduces development in areas that would be more vulnerable to storm impact.



ENVIRONMENTALLY ENDANGERED LANDS PROGRAM

The EEL Program was approved & created by voters in 1990 to acquire, preserve, enhance, restore, conserve, and maintain environmentally endangered lands for this and future generations.

The FY91 & FY92 property tax increase was approved by referendum and generated $90M in revenue originally collected to fund the EEL Program.

From 1992 to 2013, the EEL Program received an additional $106M in revenue from grants, County bonds (GOB), interest and other sources.

Through 2013, over $149M was expended to acquire and manage more than 23,000 acres of targeted conservation lands in Miami-Dade County.

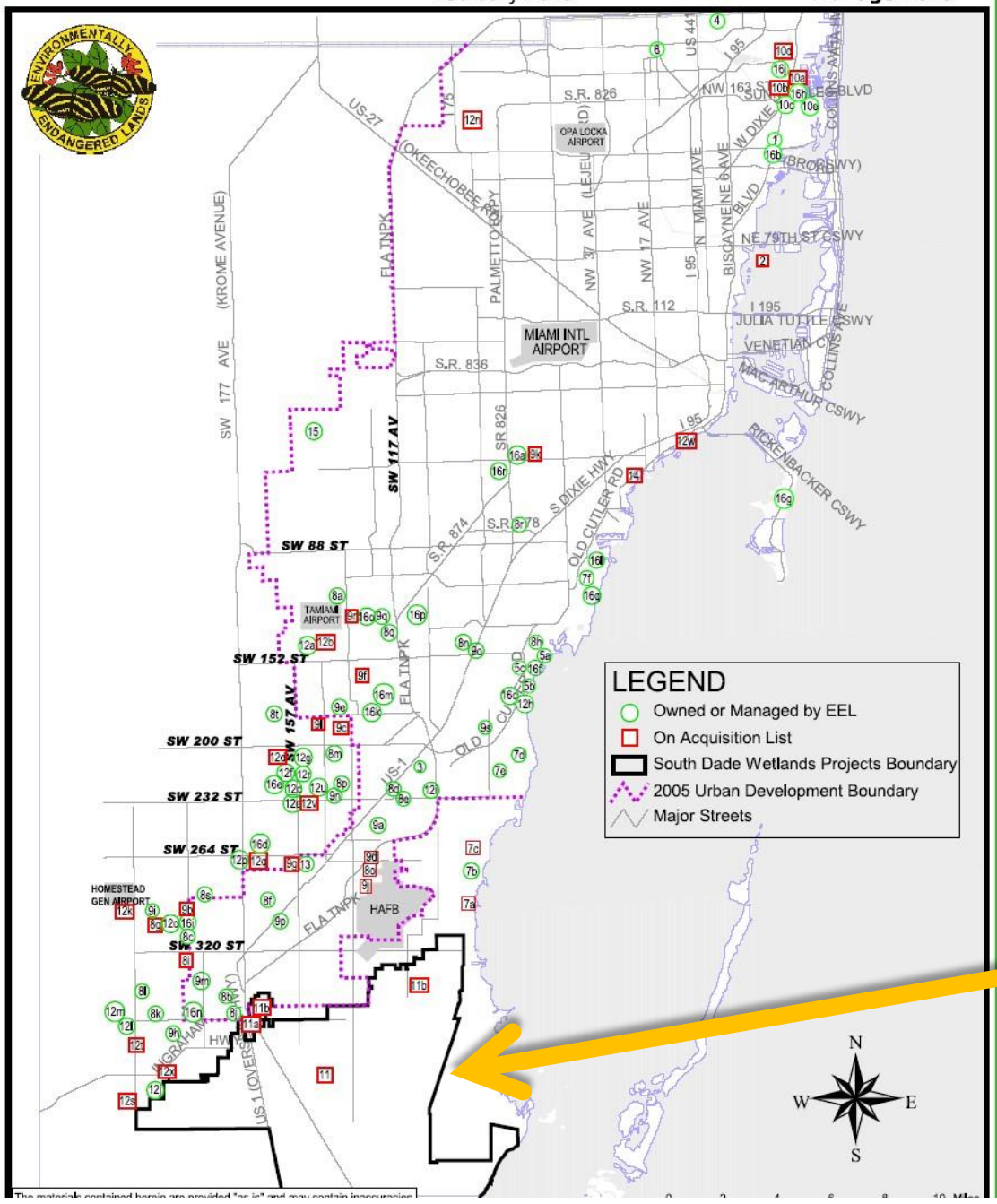
MIAMI-DADE COUNTY

MIAMI-DADE COUNTY

ACQUISITION PROJECTS

Environmentally Endangered Lands Program
February 2010

Department of Environmental Resources Management



Of the more than 23,000 acres acquired under the EEL Program in Miami-Dade County, many are in low-lying coastal areas.

EEL Program acquisition in the South Dade Wetlands Project places land in preservation thereby reducing development in an area vulnerable to storm impact.

Lands in public ownership are crucial to restoring hydrology and surface water levels, which can help reduce the potential for salt water intrusion. But funds are needed to complete the targeted acquisitions.

MONITORING SALTWATER INTRUSION

Rising sea level adds to the threat of saltwater intrusion into the Biscayne Aquifer, the sole source of drinking water in Miami-Dade County.

The salt intrusion boundary must be monitored for proximity to public wellfields and other sensitive receptors.

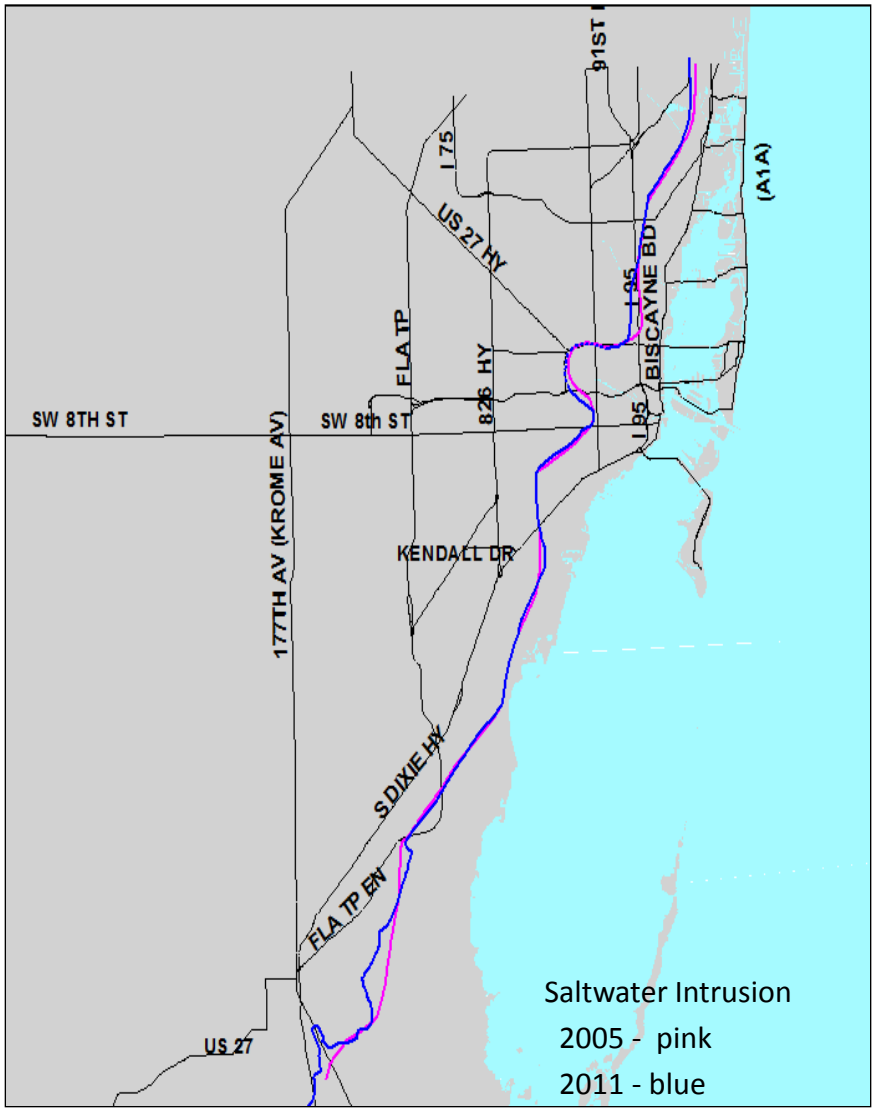
DERM and WASD fund the USGS's operation and maintenance of 90 water level recording stations and 74 saltwater monitoring stations.

Chloride sampling is done monthly, quarterly or annually depending on location. Induction logs are collected annually for select wells.

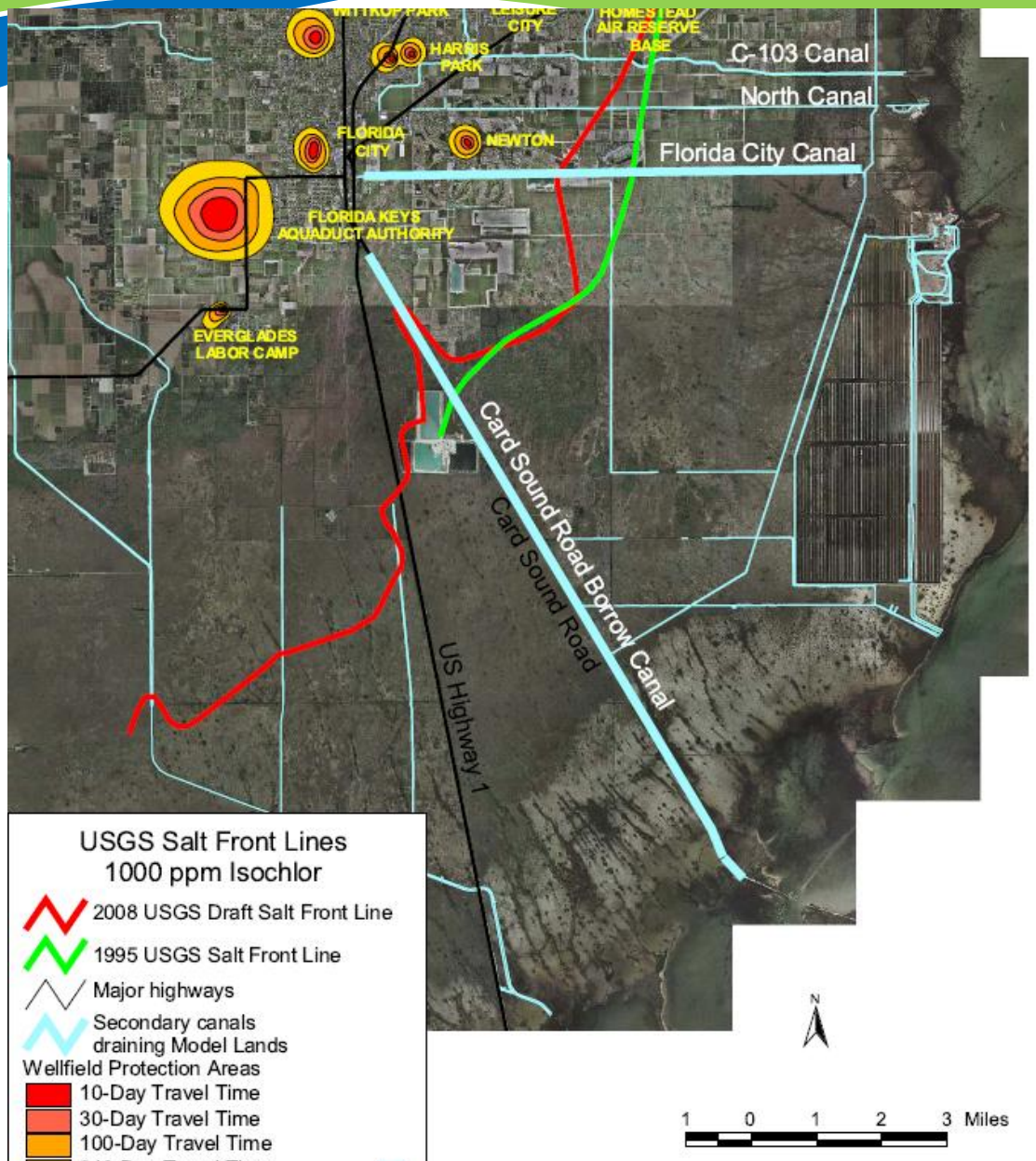
MONITORING SALTWATER INTRUSION

All 10 wells east of the salt front from the Broward County line to the C-2 Canal show an increasing trend in chloride concentration, which indicates regional movement of the salt line inland.

This diagram shows the inland migration of the boundary between 2005 (in pink) and 2011 (in blue).



Salt Water Intrusion



Saltwater intrusion boundary
1995 vs 2008

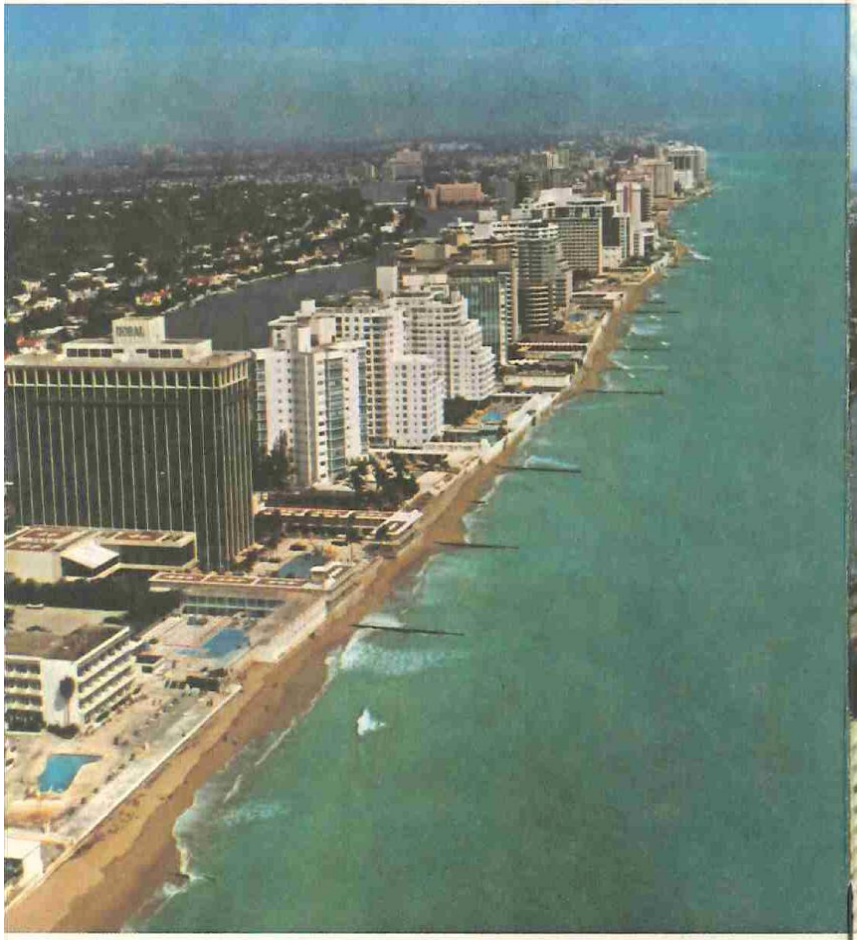
Significant westward movement along the Florida City and Card Sound Canals.

Both of these canals have salt control structures being constructed.

MIAMI-DADE COUNTY EROSION CONTROL / BEACH RENOURISHMENT PROGRAM

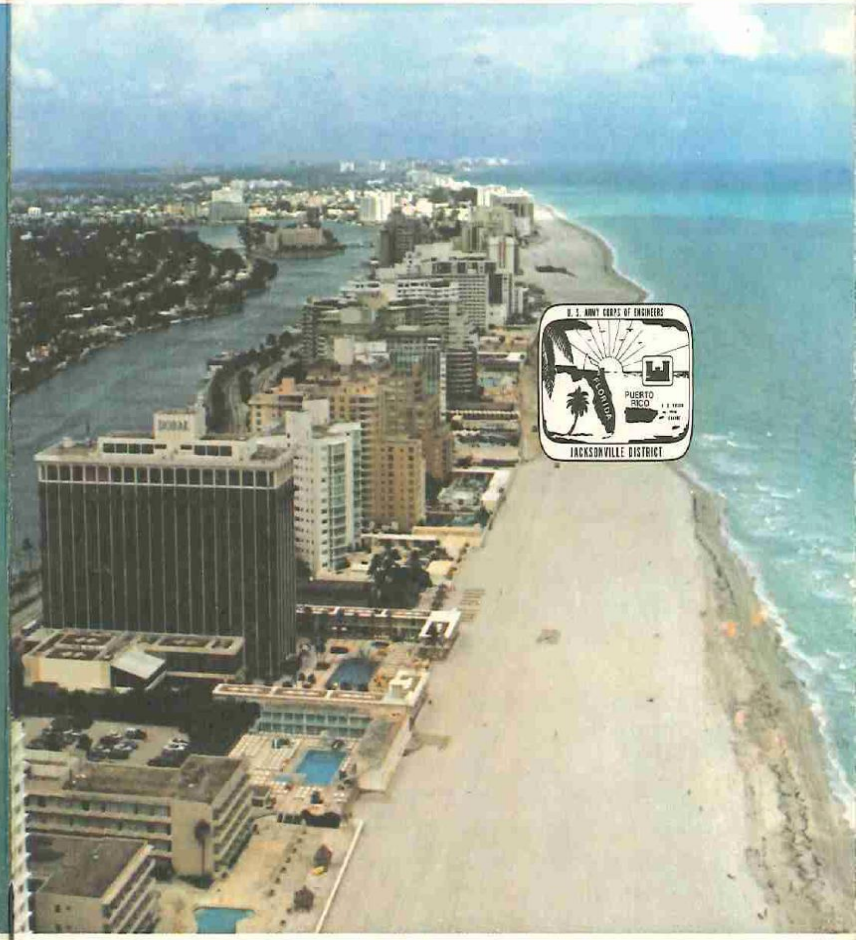
The Miami-Dade County Erosion Control / Beach Renourishment Program maintai beaches and dune systems which provide protection from storm damage, while preserving the economic benefits of wider beaches

OUR OLD BEACH



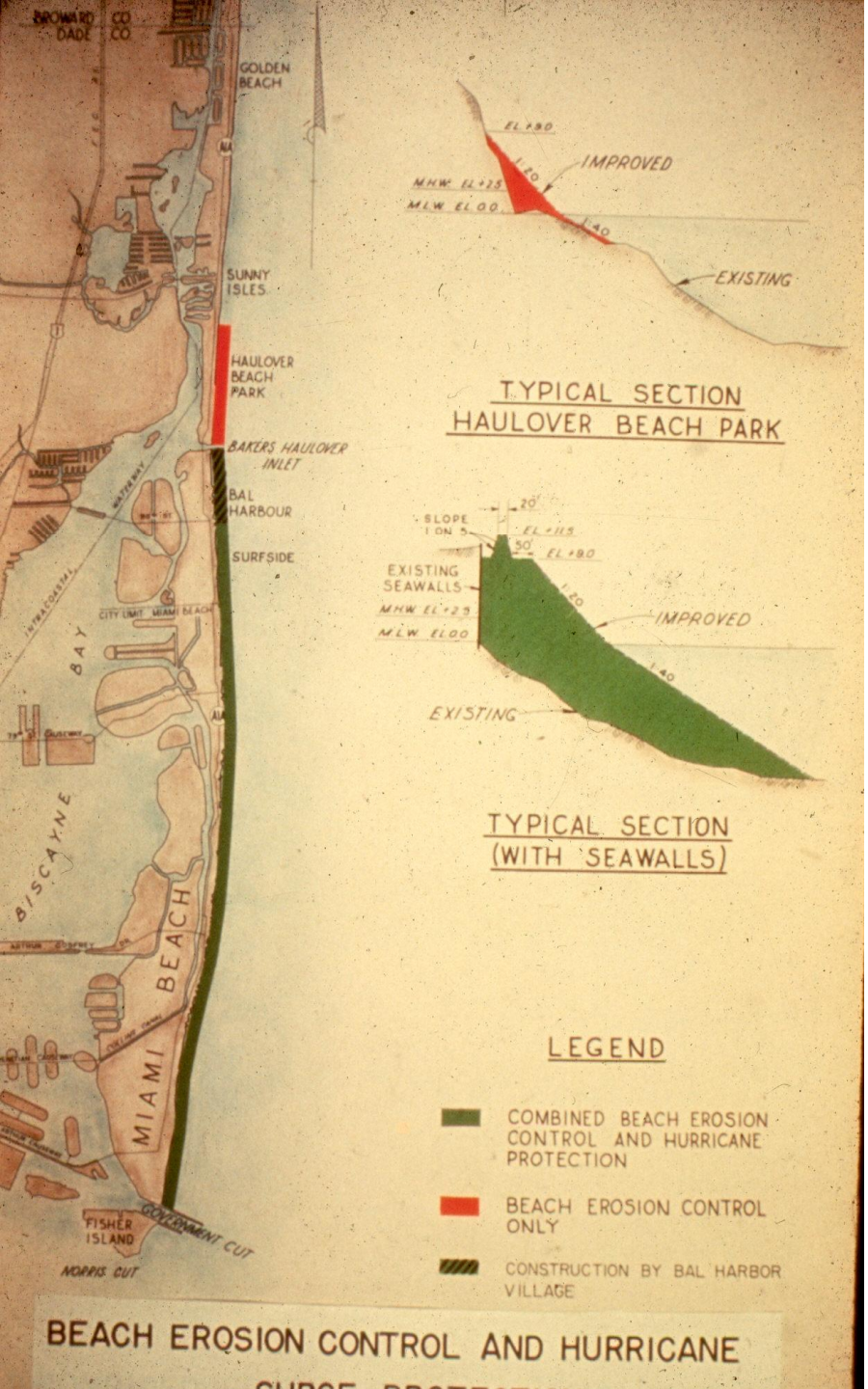
Looking north from approximately 48th Street in Miami Beach

OUR NEW BEACH
How It Works



DADE COUNTY BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT


8 12 89



Dade County Beach Erosion Control and Hurricane Surge Protection Project

Initially 10.5 miles-Extended to 13 miles in 1988

Three Different Design Berms 225’ to 280’ from ECL

Initial Restoration: 17.8 million c.y.

$52 million


BISCAYNE

MIAMI-DADE DUNE REVEGETATION PROJECT

Objectives:

Restore design elevation of hurricane berms

Restore a functional dune system for sand trapping/stabilization

Channel pedestrian and vehicular traffic

Aesthetic enhancement of beach area

8 miles total length - $4.2 million


10 30 '86

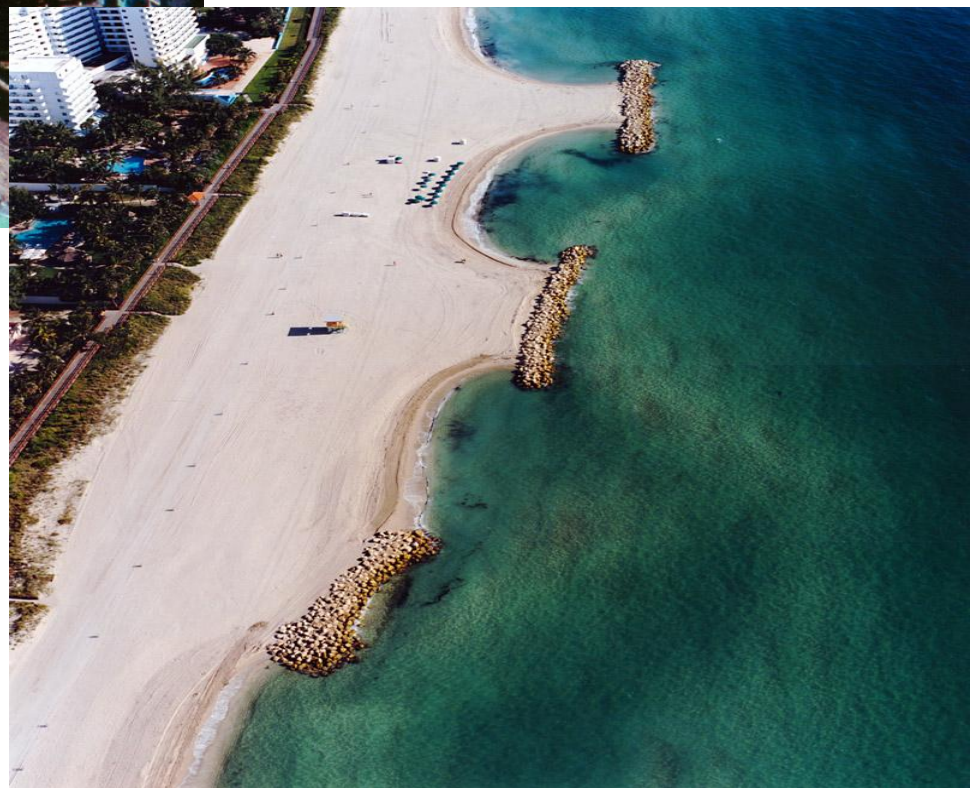

9 15 '86

MIAMI-DADE COUNTY

Change in shoreline orientation

Highest rate of littoral transport on entire project

Study recommends strategic use of structures to anchor and transition the beach fill into the stable beaches to the south



CHALLENGES FOR FUTURE BEACH EROSION CONTROL IN MIAMI-DADE COUNTY

Sand Management

Optimizing Sand Distribution along the Project

Identifying Sources of Future Nourishment Materials

Funding

NATURAL AREAS RESTORATION PROGRAMS

Attempting to restore the natural areas resilience through:

- **The Miami-Dade County Biscayne Bay Restoration and Enhancement Program**
- **Various demonstration projects and pilot projects**
- **EEL Volunteer Days**

Miami-Dade Biscayne Bay Restoration and Enhancement Program
Ongoing Restoration Efforts

Summary of the restoration of natural areas by the Biscayne Bay Restoration and Enhancement Program from 1987 to present:

- 53 sites restored
- 500 acres of wetlands restored
- 155 acres subtropical hardwood hammock, coastal strand, and dune community restored
- 2.3 acres of seagrass restored
- 9.5 miles shoreline stabilization (native vegetation and limestone revetments)
- Many hours of labor donated by community volunteers

Miami-Dade Biscayne Bay Restoration and Enhancement Program
Ongoing Restoration Efforts (3/2013)

Coastal Wetlands Restoration

- Virginia Key ACOE Section 1135 Ecosystem Restoration
- Florida International University BBC/Oleta River State Park
- City of North Miami (NE 135th Street)
- Crandon Preserve
- Matheson Hammock Park

Shoreline Stabilization

- R. Hardy Matheson Preserve Shoreline Enhancement
- Dinner Key Islands Phase III Enhancement
- Miami Marine Stadium Park Shoreline Stabilization

Seagrass Restoration

- Oleta River State Park Dredged Areas
- North Virginia Key Prop Scar and Boat Groundings

Freshwater Wetlands Restoration

- Highland Oaks Park (Headwaters of the Oleta River)
- Oleta River State Park

Dune/Coastal Strand Restoration

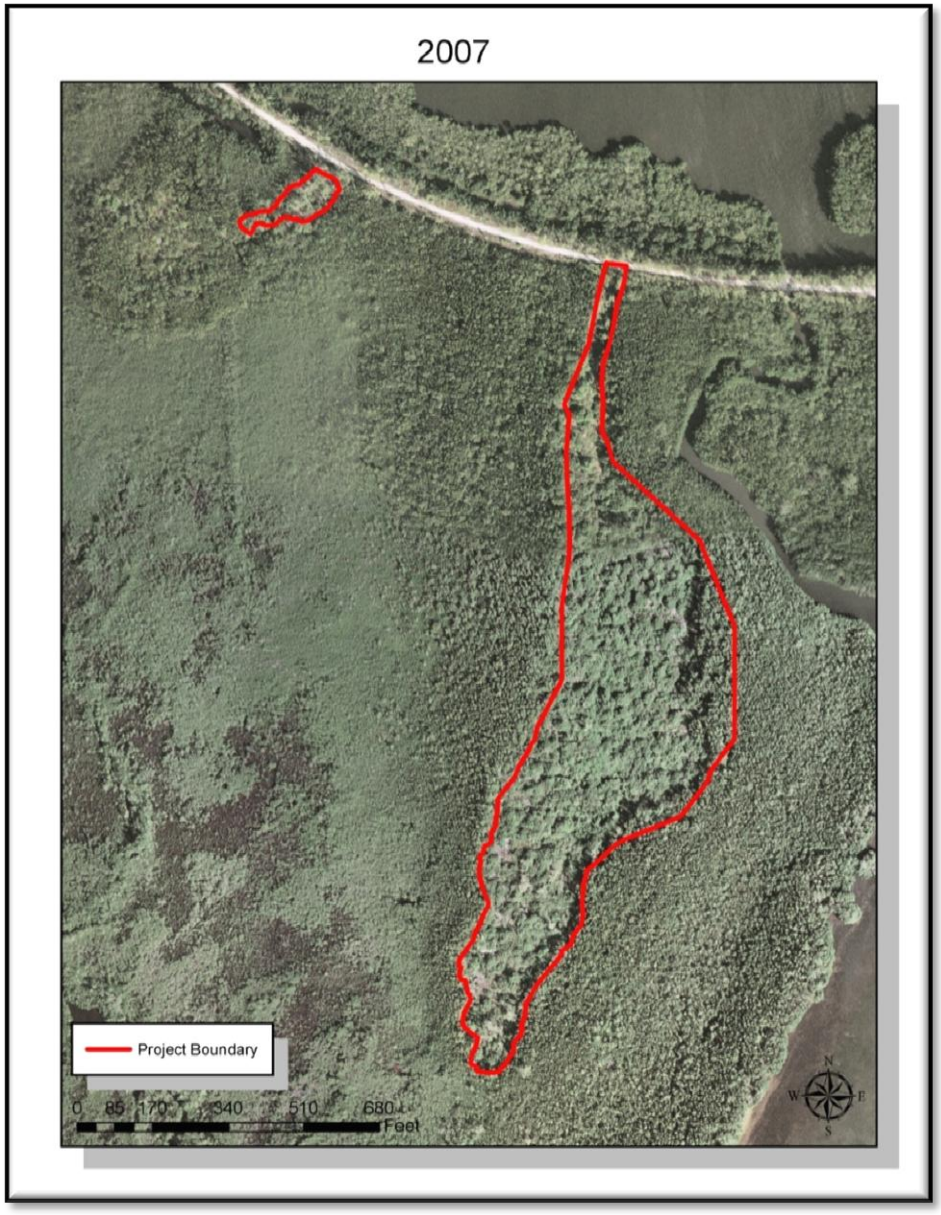
- North Virginia Key (North Point)
- Historic Virginia Key Beach Park (South)
- Oleta River State Park

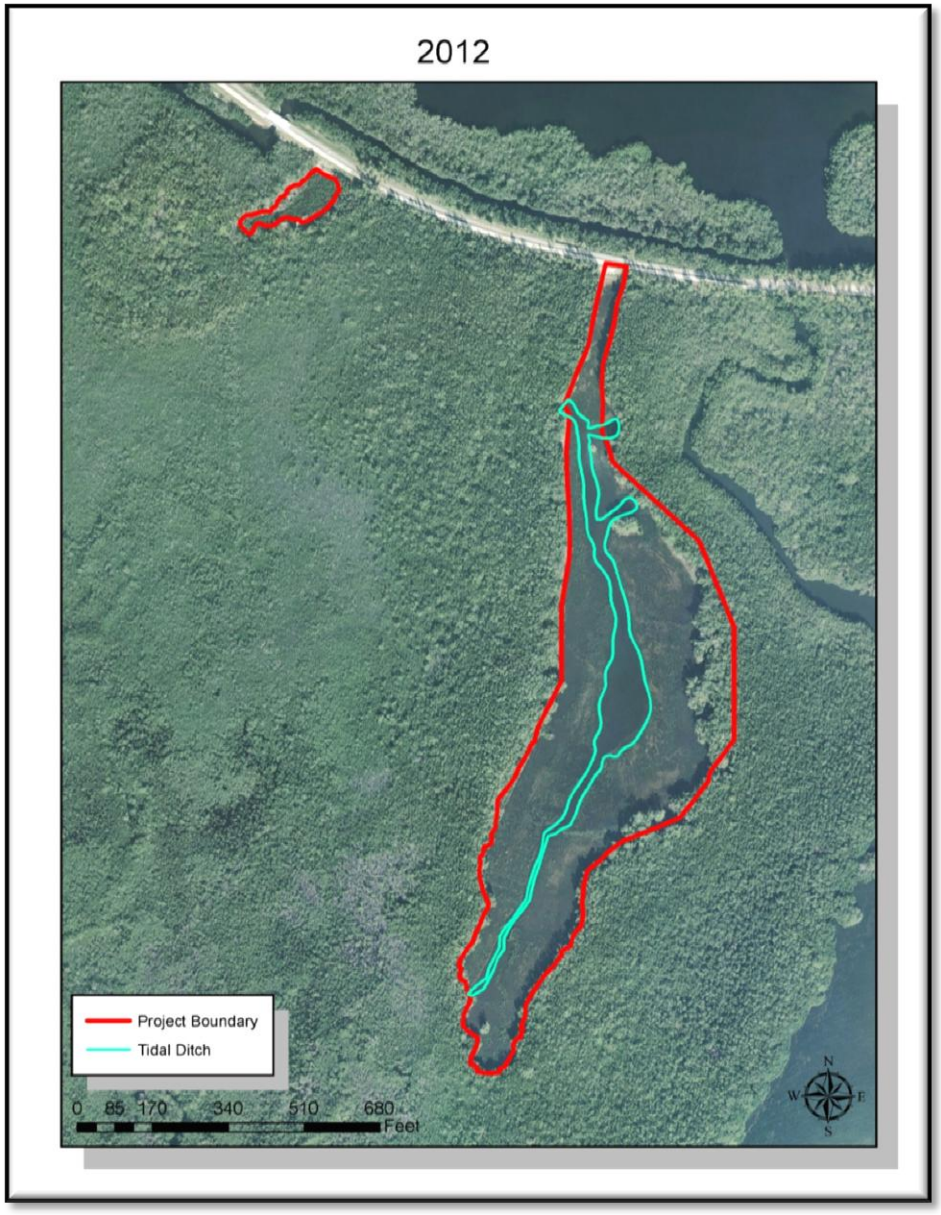
Tropical Hardwood Hammock Restoration

- Holiday Hammock
- Oleta River State Park
- Virginia Key (North Point)

Coastal Wetlands Restoration

Chapman Field Park Wetlands Restoration



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June 2010


December 2010


December 2011


December 2012

September 2009

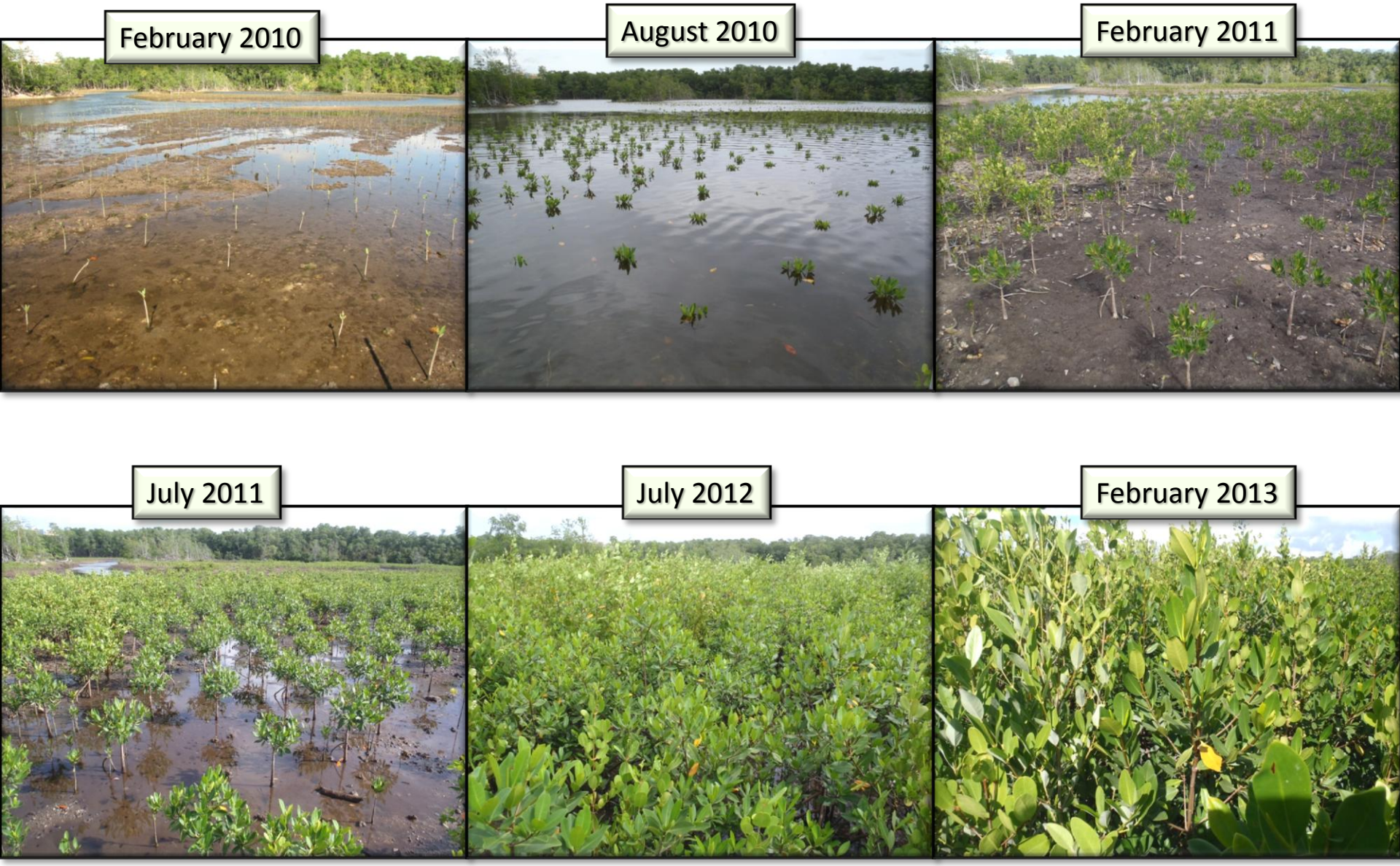
February 2013

Oleta River State Park Wetlands Restoration

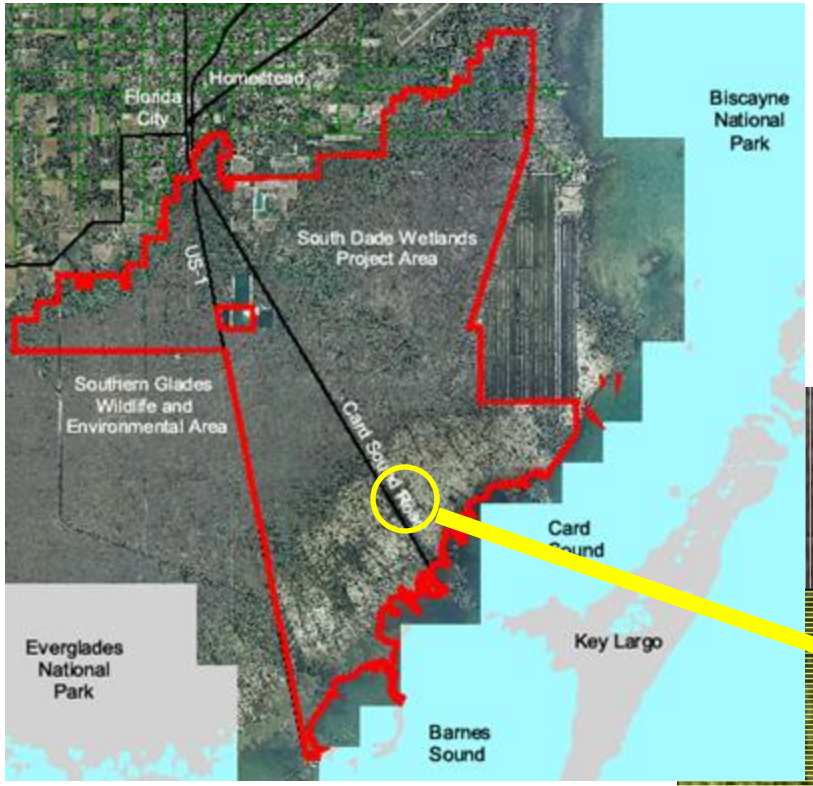

02/11/2013

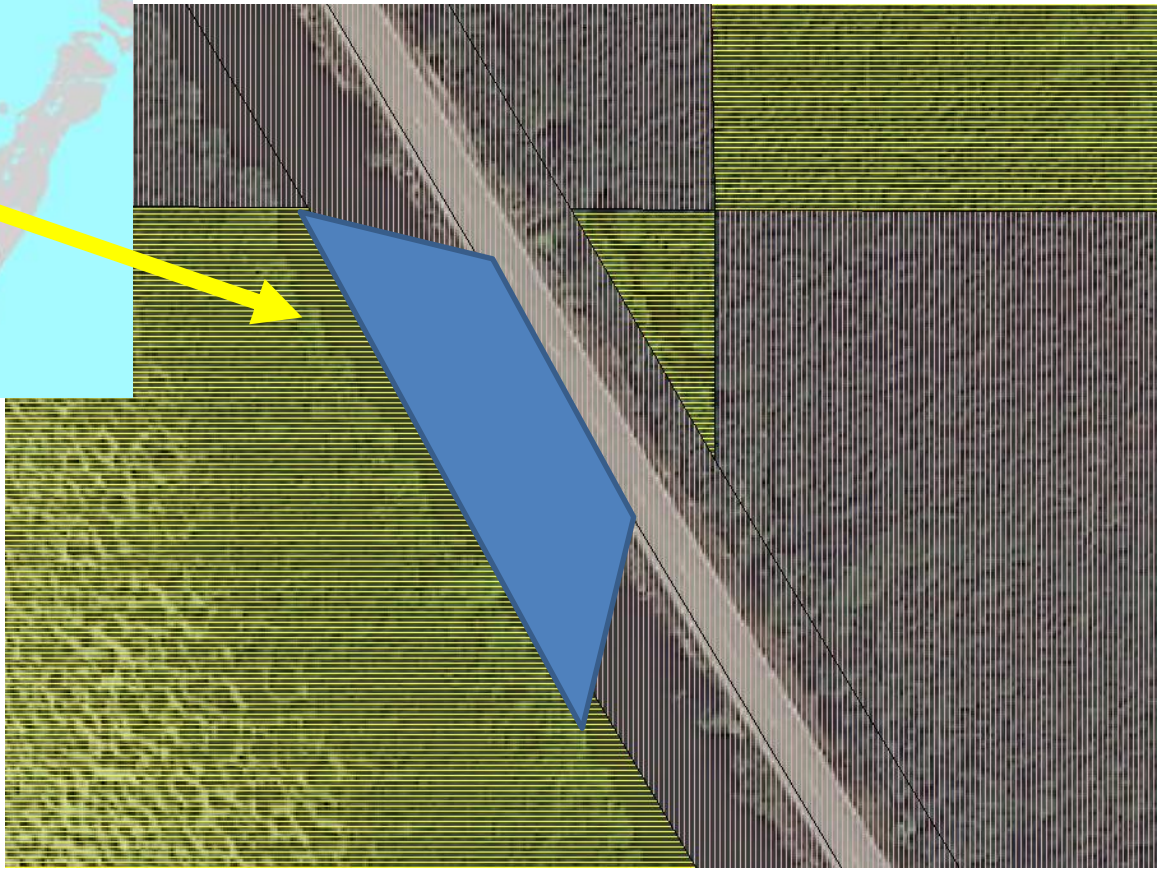

02/11/2013

Monitoring for Success



CARD SOUND BORROW
CANAL PLUG
PILOT PROJECT





CONSTRUCTED PILOT PROJECT
CARD SOUND ROAD BORROW CANAL PLUG

MANGROVES PLANTED WITHIN THE PLUG'S RESTORED WETLANDS

MIAMI-DADE COUNTY'S REGULATORY PROGRAMS THAT PROTECT COASTAL RESOURCES

Under Sec. 24-48.1 of the Code, Class I coastal construction permits are required to alter mangrove trees or for any work to take place in, on, over or upon any tidal waters or in salt wetlands anywhere in Miami-Dade County.

Sec 24-48.3(2) of the Code protects coastal wetlands through the dredge & fill criteria that will allow permitting only for minimal and necessary impacts to coastal wetlands.

Sec. 24-48.16 prohibits of top pruning of mangrove trees in a coastal band community, except for specified trimming activities exempt from permitting requirements pursuant to Section 403.9326, Florida Statutes. No Class I permit shall be issued for the top pruning of coastal band mangrove trees except when necessary for the protection of overhead power lines.

From the FL Dept of Environmental Protection website:
"… Mangrove forests protect uplands from storm winds, waves, and floods. A very narrow fringe of mangroves offers limited protection, while a wide fringe can considerably reduce wave and flood damage to landward areas by enabling overflowing water to be absorbed into the expanse of forest. Florida's estimated 469,000 acres of mangrove forests contribute to the overall health of the state's southern coastal zone. "

403.9323, Florida Statutes, Legislative intent.
(1) It is the intent of the Legislature to protect and preserve mangrove resources valuable to our environment and economy from unregulated removal, defoliation, and destruction.
(2) It is the intent of the Legislature that no trimming or alteration of mangroves may be permitted on uninhabited islands which are publicly owned or on lands set aside for conservation and preservation, or mitigation, except where necessary to protect the public health, safety, and welfare, or to enhance public use of, or access to, conservation areas in accordance with approved management plans.