



MIAMI DADE COUNTY **SEA LEVEL RISE TASK FORCE**



The Nature Conservancy
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MISSION

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



FLORIDA FOCUS



FRESHWATER



CONSERVING
CRITICAL LANDS & WATERS



HEALTHY, SAFER COASTS

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



natural
capital
PROJECT

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

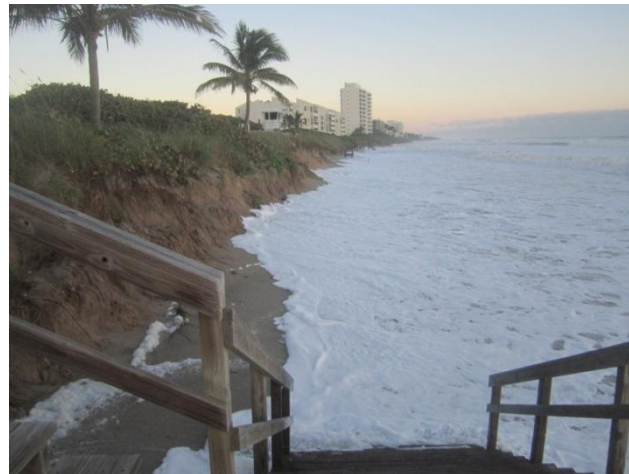


MIAMI DADE

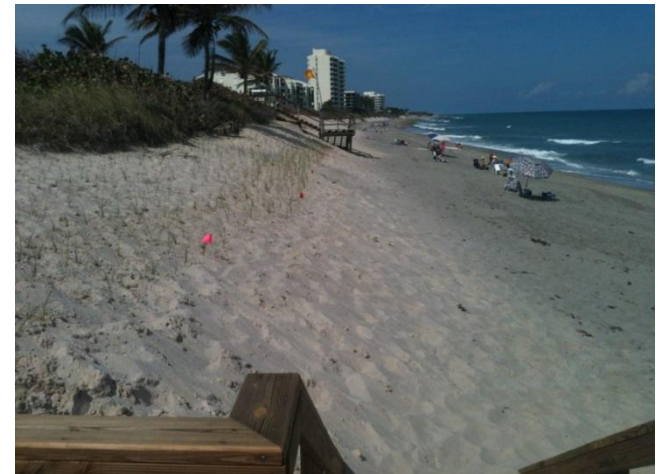


SOUTH POINTE PARK

PALM BEACH



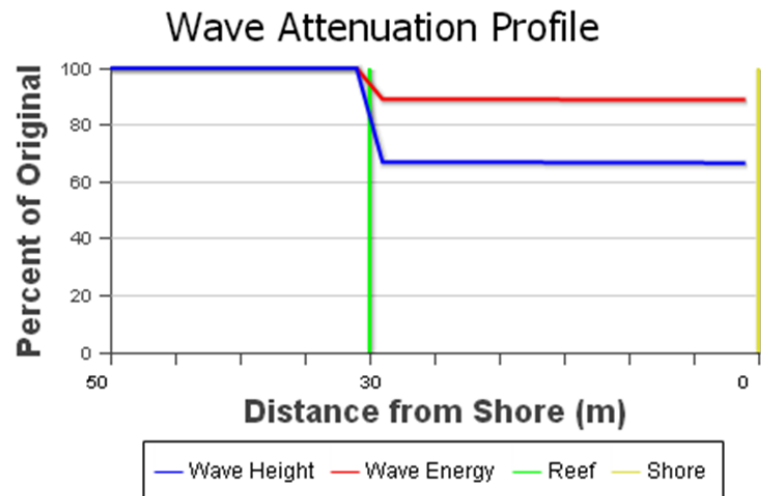
November 2012



March 2013



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

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

Developing specific tools to address coastal adaptation and risk

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

Share | Facebook | Twitter | YouTube | LinkedIn

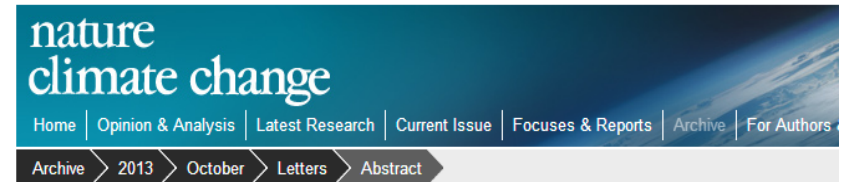
TOOLS

Apps

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.”



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

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| Corrected online 01 August 2013



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 vegetation¹, especially when those habitats fringe vulnerable communities and infrastructure. Using five sea-level-rise scenarios, we calculate a hazard index for every 1 km² 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.

Map Layers

Flood & Sea Level Rise

Risk Explorer

2

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

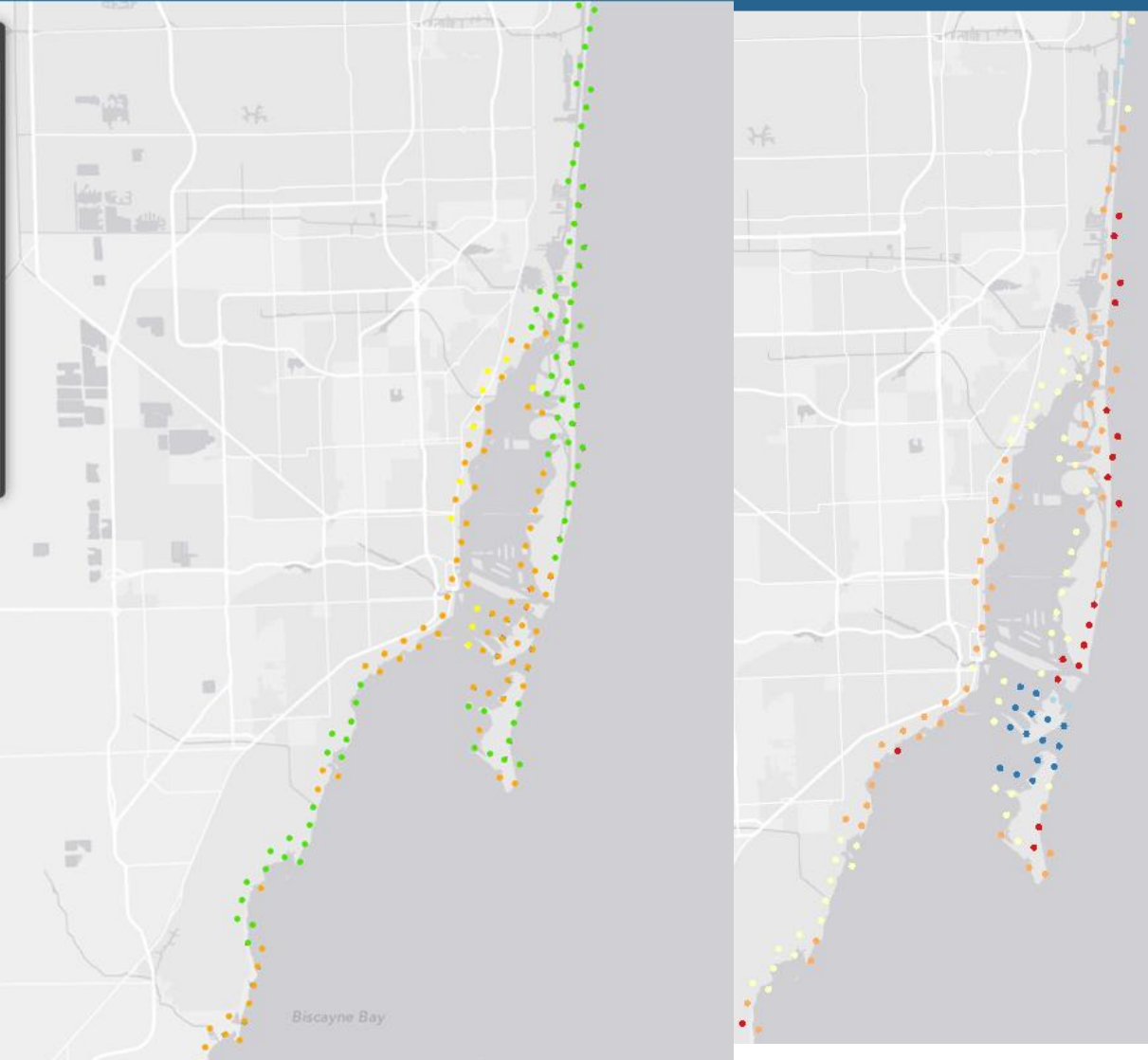
☐ medium

☐ highest

Risk Explorer - United States - Lower 48

☐ Low

☐ High



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



“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

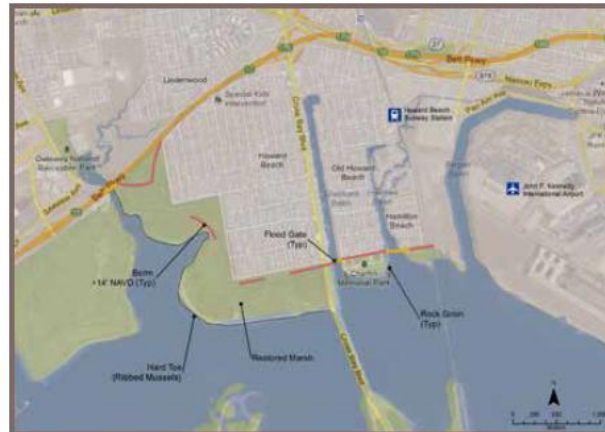
Annual Ecosystem Services Benefit: \$662 K

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.

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



SHORELINE RESILIENCE WORKING GROUP

improve coastal resilience in the compact 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



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