



Grave Threat  
Great Opportunity

**FIU** | **Sea Level  
Solutions Center**  
FLORIDA INTERNATIONAL UNIVERSITY

**SEA LEVEL SOLUTIONS CENTER (SLSC)  
ALL-HANDS MEETING**

**WEDNESDAY, FEBRUARY 3, 2016,**

Evelyn Gaiser  
Executive Director  
School of Environment, Arts and Society



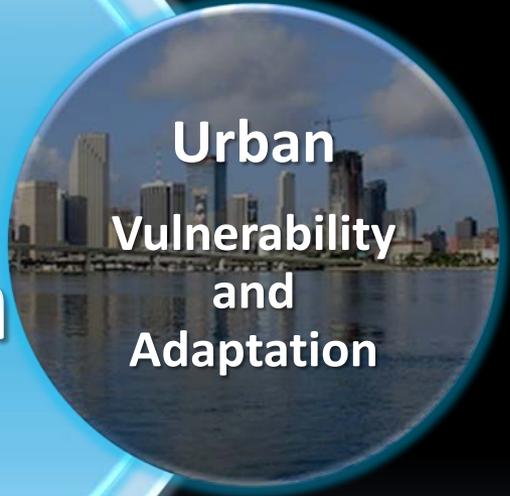
Florida Coastal  
Everglades Long Term  
Ecological Research  
[fcelter.fiu.edu/](http://fcelter.fiu.edu/)



Urban Resilience to  
Extremes Sustainability  
Research Network  
[sustainability.asu.edu/urbanresilience](http://sustainability.asu.edu/urbanresilience)



Algae Research  
Laboratory  
[algae.fiu.edu](http://algae.fiu.edu)

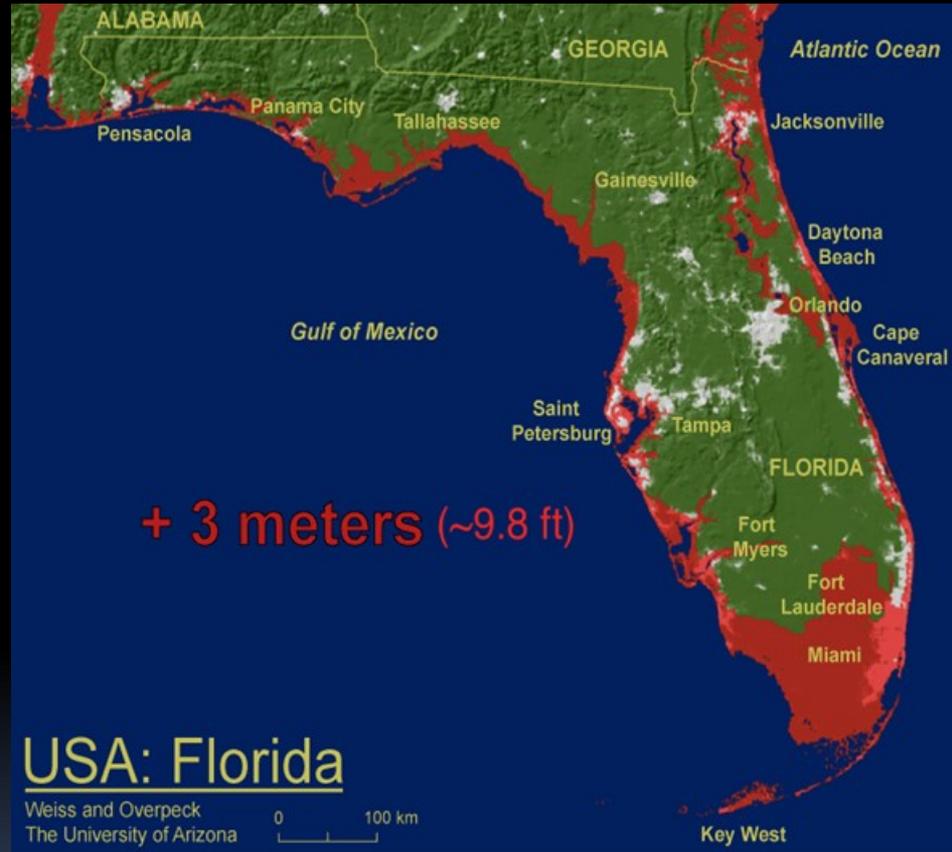
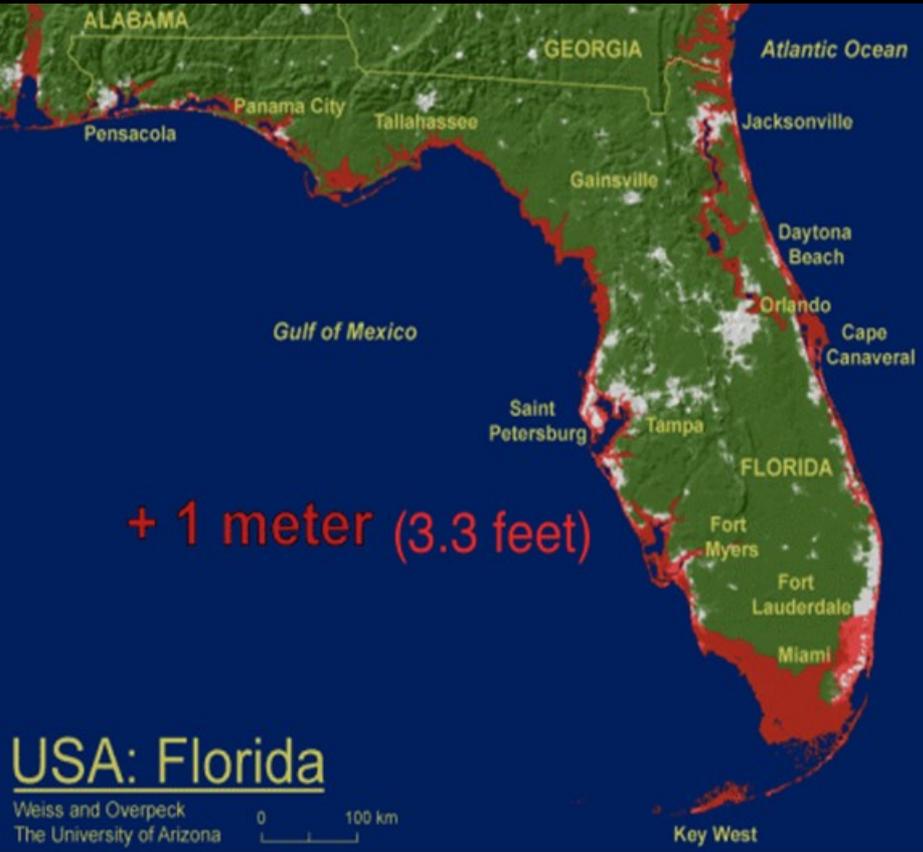


# Sustainable South Florida

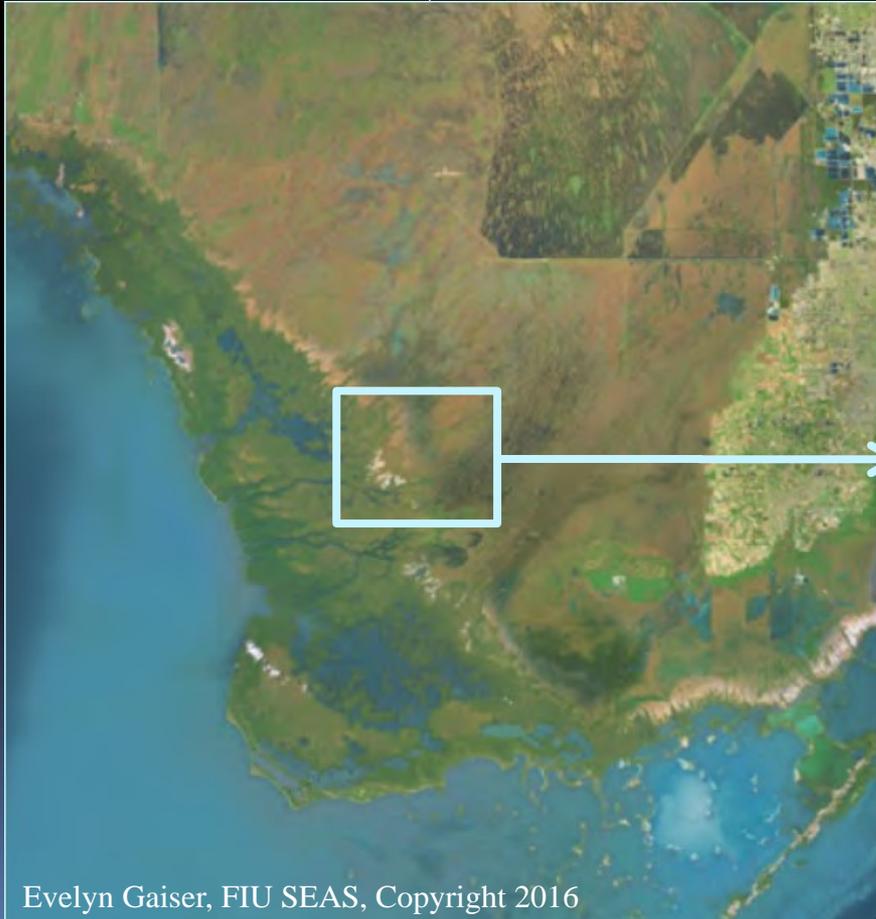
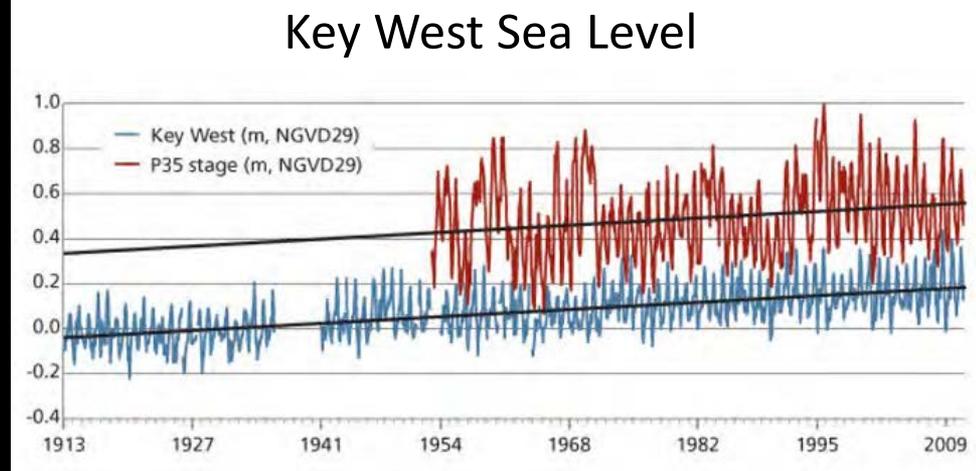




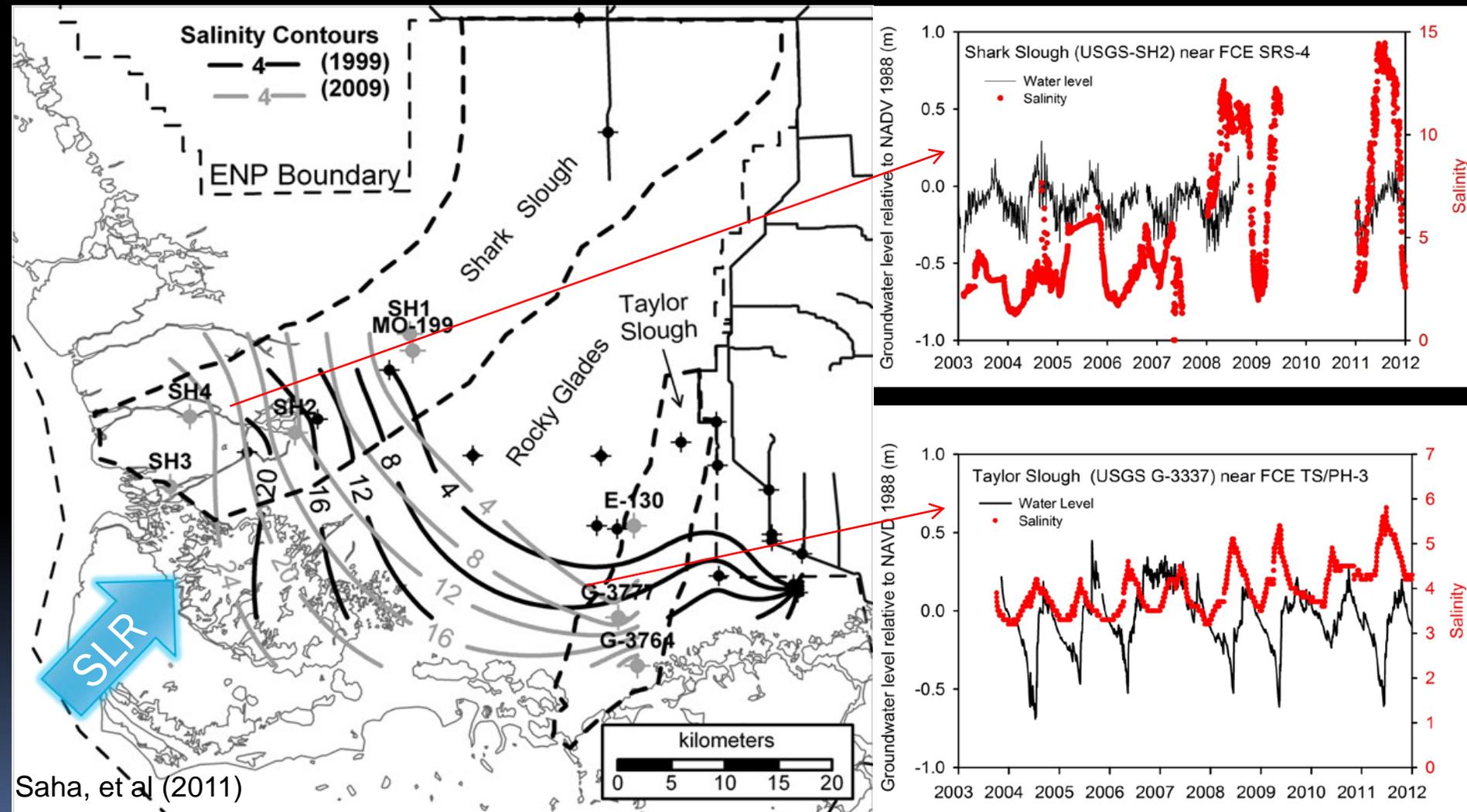
# Sea Level Rise Projections



# Sea Level Vulnerability in Everglades



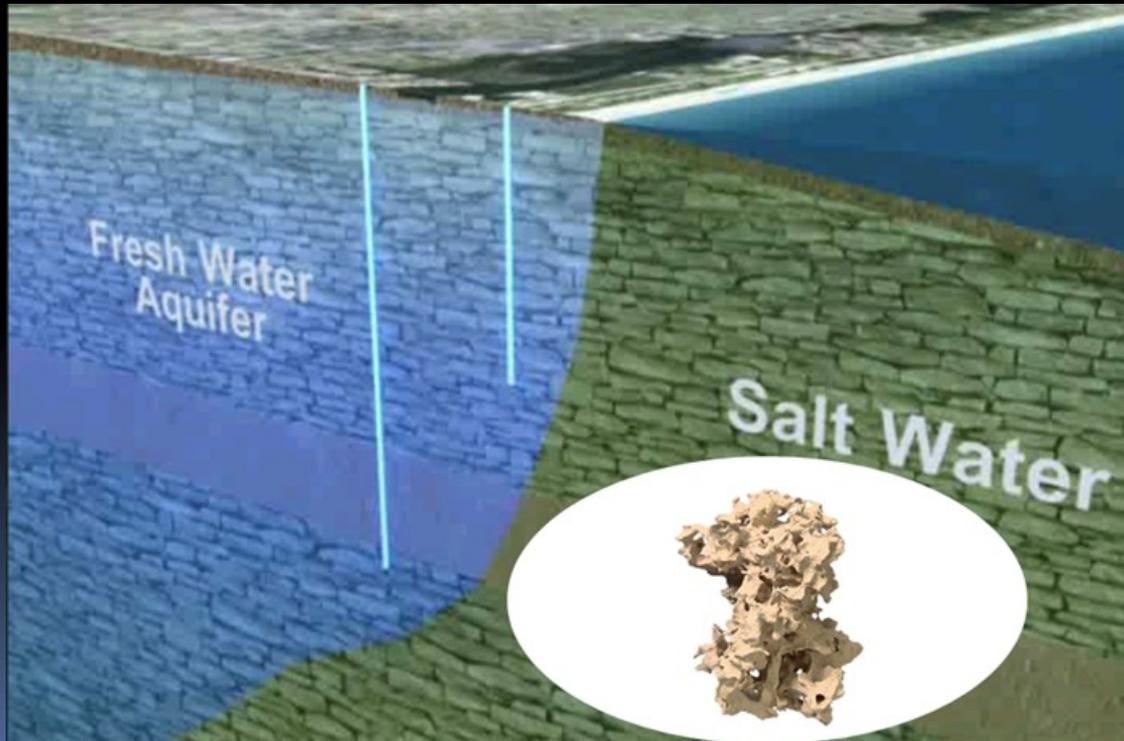
# Saltwater Intrusion into the Everglades



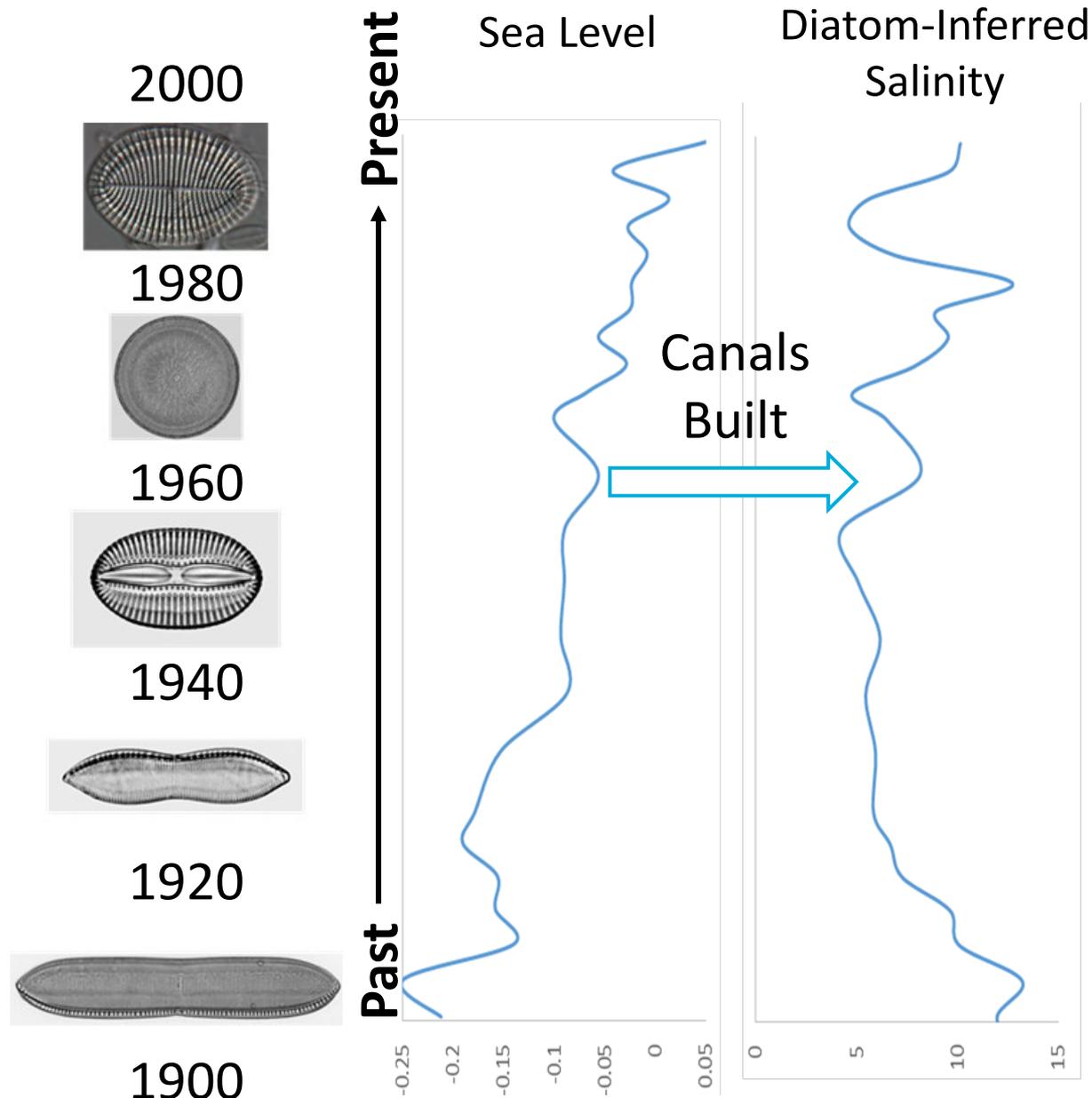
Groundwater salinity keeps rising

# Vulnerability due to:

- Porous, shallow limestone aquifer
- Thin peat soils caused by evaporation and drainage
- Long exposed coastline, low & flat topography
- Lost natural water storage (small changes in rain triggers floods or droughts)



# Diatom records of saltwater intrusion



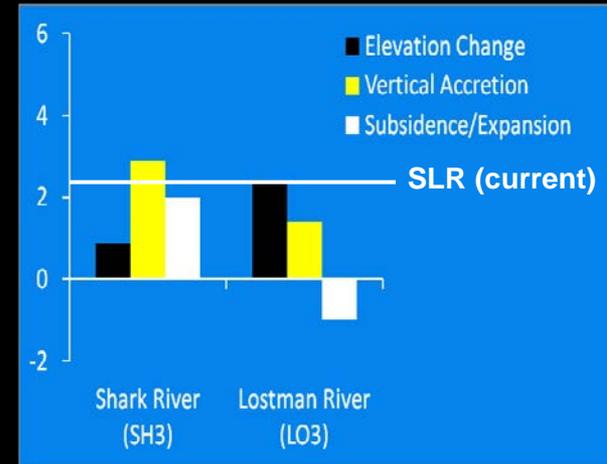
Fossils in sediment cores tell us about the past

# Peat Collapse - a possible consequence of rapid SLR

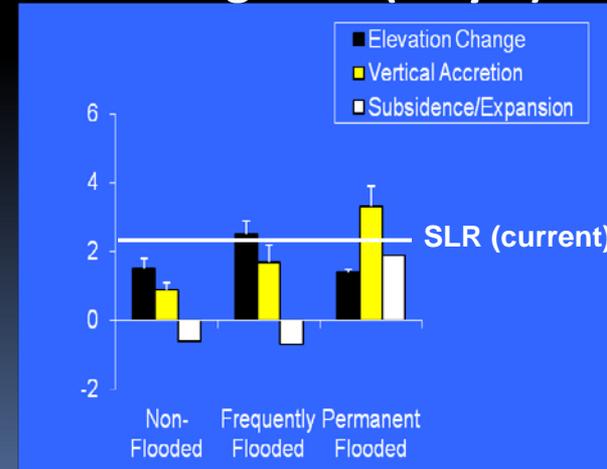


Peat accretion needs to keep pace with sea level rise

## SW Everglades (10 yrs)



## SE Everglades (11 yrs)



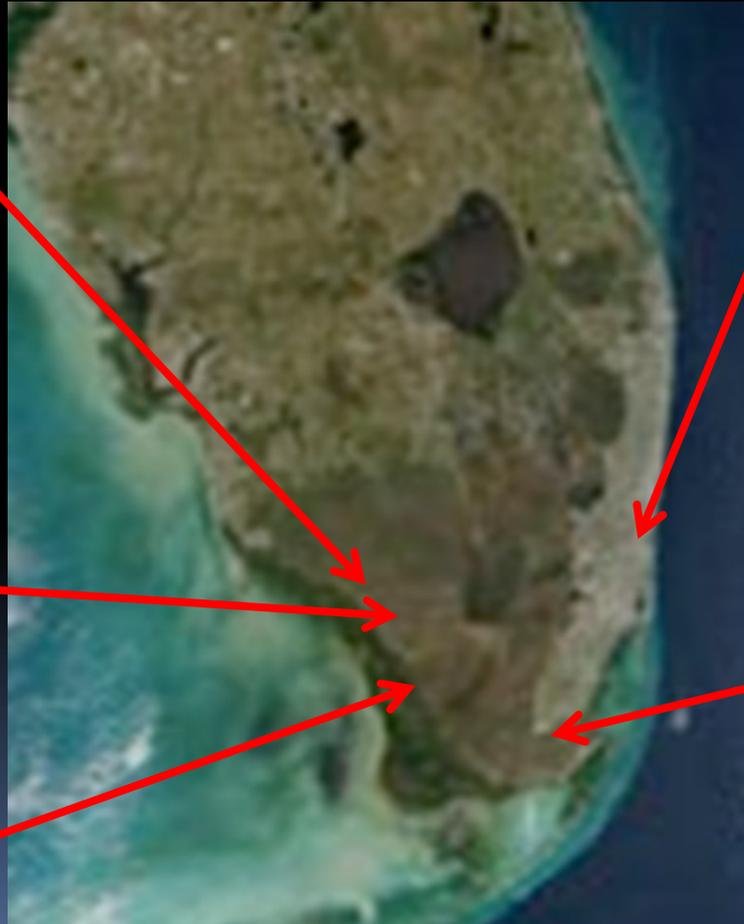


# Observed changes in coastal resources in response to SLR

- Surface water levels increase with SLR along coastline

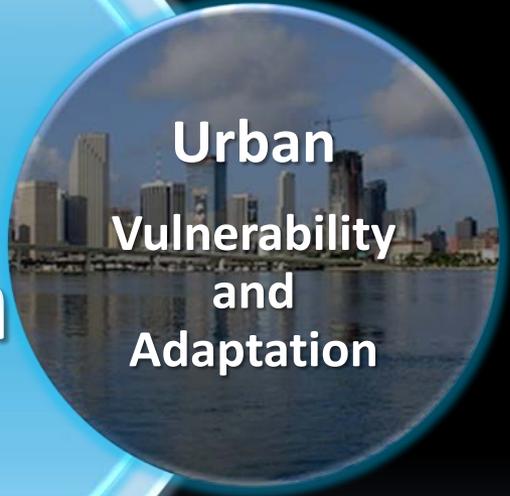
- Decrease in coastal hammock species, with an increase of mangroves

- Peat collapse



- Increase in the occurrence of nuisance flooding particularly in Miami Beach

- Increase in the landward extent of seawater intrusion along all coastlines



# Sustainable South Florida

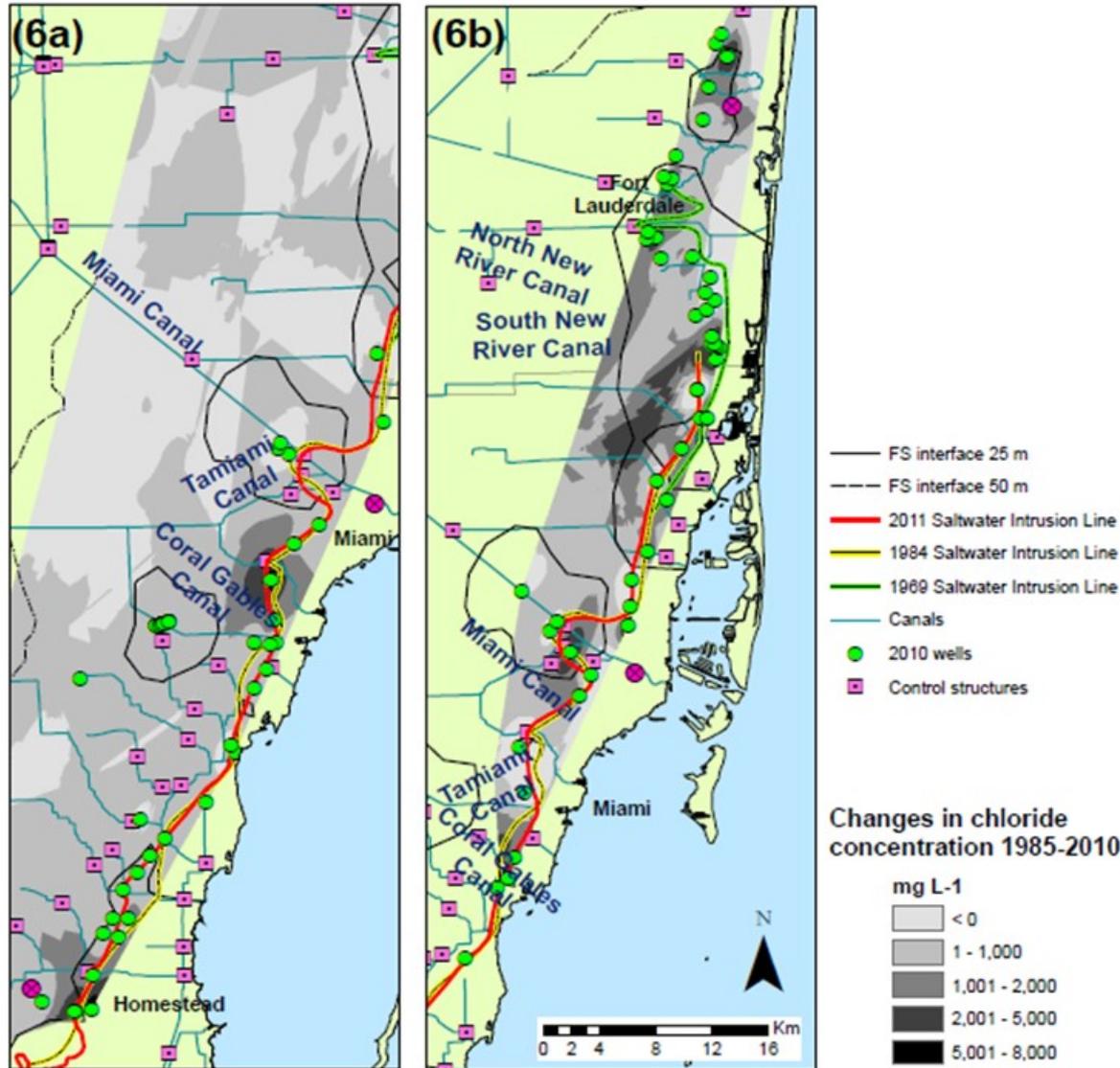


# Flooding in Miami



Alton Rd between 8<sup>th</sup> and 10<sup>th</sup> streets has been flooding every year for the past 7 years at least. Saltwater intrudes below ground too, into our aquifer!

# A threatened water supply



Since 1985, there has been a decline in the available freshwater resources of 12–17% in the Biscayne Aquifer.

**In 2010**

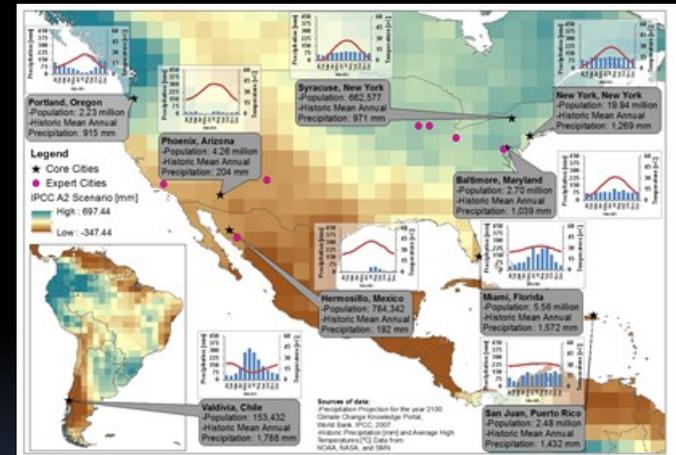
Population = 5.6 million  
Water demand = 1.8 billion gal./day

**By 2030**

Population = 6.6 million  
Water demand = 2.1 billion gal./day

# Urban Resilience to Extremes Sustainability Research Network

The UREx SRN focuses on integrating social, ecological, and technical systems to devise, analyze, and support urban infrastructure decisions in the face of climate uncertainty.



*UREx SRN  
Network Cities:*

Baltimore, Maryland  
Hermosillo, Mexico  
**Miami, Florida**  
New York, New York  
Phoenix, Arizona

Portland, Oregon  
San Juan, Puerto Rico  
Syracuse, new York  
Validivia, Chile

# City of Miami Beach

**RESEARCH TEAM:**

- Evelyn Gaiser, FIU, PI
- Rinku Roy Chowdhury, Clark, PI & City Lead
- Tiffany Troxler, FIU, co-PI & City Lead
- John Kominoski, FIU, co-PI
- Kevin Grove, FIU
- Ali Mostafavi, FIU
- Mike Sukop, FIU
- Jeff Onsted, FIU



**PRACTITIONER TEAM:**

- Elizabeth Wheaton, CoMB, Practitioner Lead
- Susie Torriente, CoMB
- Bruce Mowry, CoMB
- Nancy Schneider, ISC/Compact
- Jennifer Tistehammer, Deering Estate
- Stephen Davis, Everglades Foundation
- Greg Guannel, The Nature Conservancy
- Jim Murley & Katie Hagermann, Miami-Dade County
- Jayantha Obeysekera & Fred Sklar, SFWMD





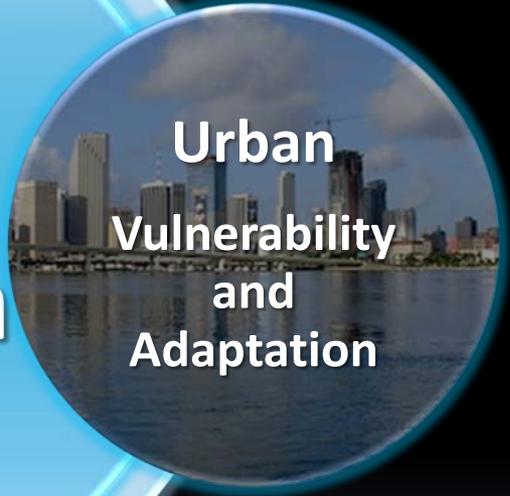
# UREx Practitioner Network

## Status:

- **Contact: Elizabeth Wheaton, Ast. Building Director, CMB**
- **Network of practitioners - city, county, SFWMD, NGOs**
- **Grew from long partnership with CMB and SFWMD**
- **Expanding engagement in planning meetings, proposals**
- **Insight for research needs to implement transitions**

## Needs:

- **Adaptation strategy advice from other cities**
- **Detailed elevation maps and models**
- **Structural and non-structural best management practices**
- **Cost-benefits analysis of green infrastructure**
- **Cost-benefits of adaptation and mitigation**



# Sustainable South Florida



# Adaptations to Climate Change and Sea Level Rise

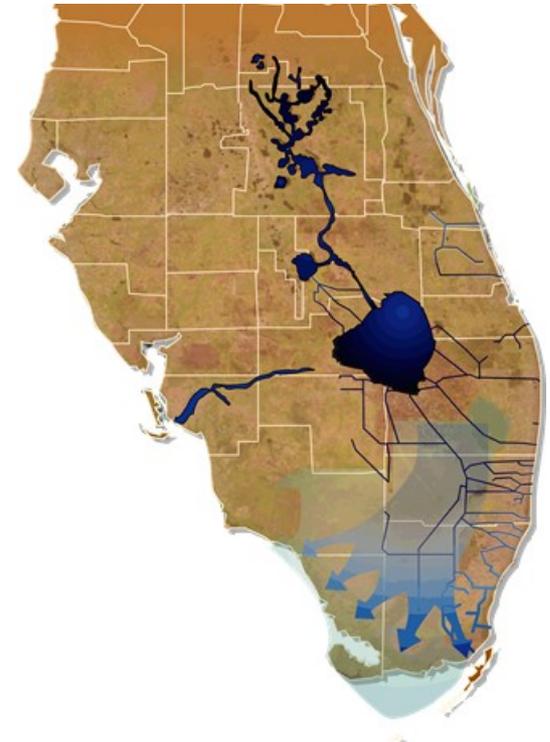
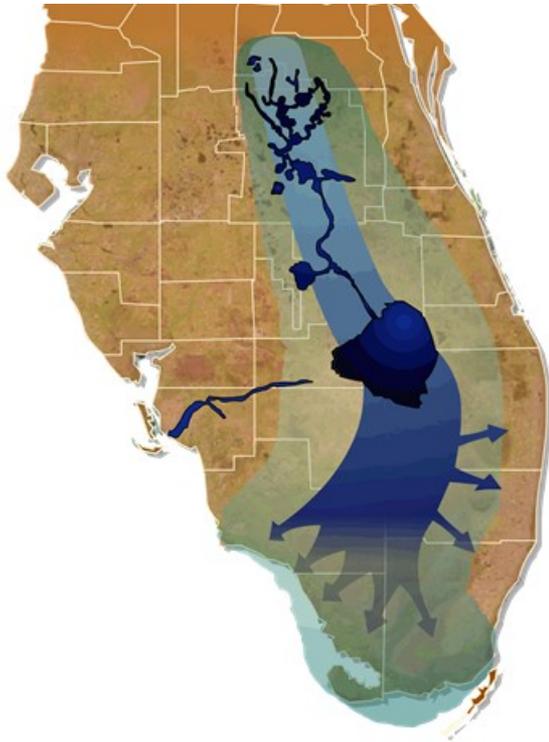
## Everglades restoration will increase the resilience of the natural & built ecosystem

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Historic Flow

Current Flow

Restored Flow



# Adaptations to Climate Change and Sea Level Rise

## Everglades restoration will increase the resilience of the natural & built ecosystem

- Increase water storage, extending the life of wellfields,
- Restore freshwater flows through the Everglades,
- Push back saltwater intrusion, securing water supply,
- Protect water quality,
- Protect soils and mangrove buffering,
- Protect native species and wildlife,  
securing natural resources
- Remove barriers to wildlife movement



# Conclusions

- **Sea level will keep rising – projection certainty will improve in coming years**
- **We need improved models of impacts (surface flooding, groundwater intrusion and natural resources)**
- **Adaptation strategies exist - Everglades restoration will sustain resources and buy us time for urban adaptation**

