

Climate 101

A Quick User's Guide to Understanding Sea Level Rise



Nancy J. Gassman, Ph.D.

Broward County

Natural Resources Planning & Management Division



Miami-Dade County – Sea Level Rise Task Force
November 21, 2013

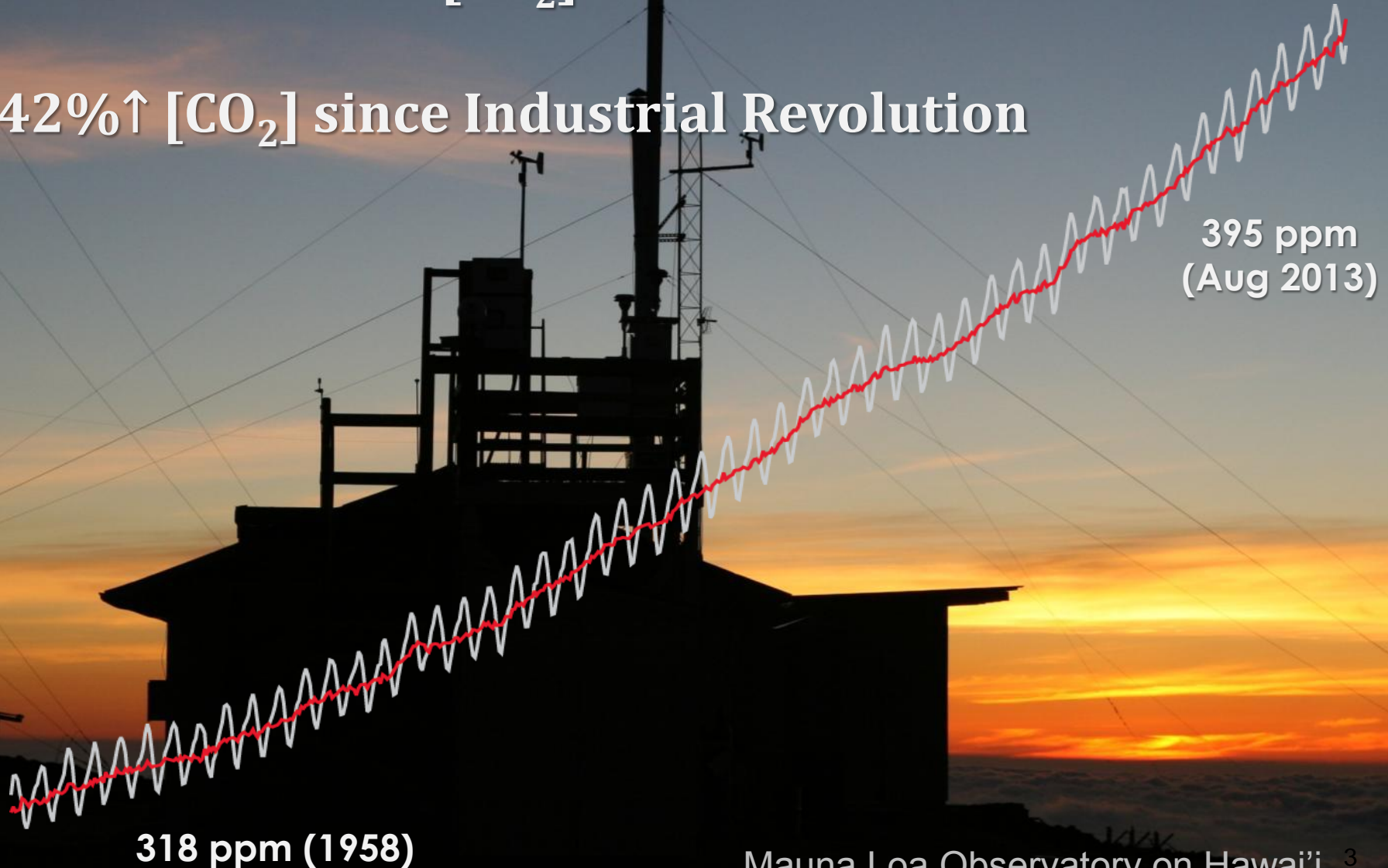


Overview

- Climate Basics
- Climate Concerns in Southeast Florida
- Southeast Florida Regional Technical Tools

Atmospheric Carbon Dioxide

- 24%↑ measured [CO₂] since 1958
- 42%↑ [CO₂] since Industrial Revolution



Leading Indicators of Change



Leading

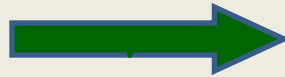
Lagging

↑ CO₂



↑ Air Temp

↑ Air Temp



↑ Ice Melt/ Thermal
Expansion

↑ Ice Melt/TE



↑ Sea Level Rise

Climate Change Impacts in SE FL

- Increasing Temp (2 to 10°F) by 2100
- Increasing occurrence of extreme weather
 - hotter summers
 - drier droughts
 - wetter rainy seasons
 - cold snaps
- ↓ frequency with ↑ intensity of tropical storms
- Sea level rise (2-5 feet) by 2100

Photo Credit: Sun-Sentinel

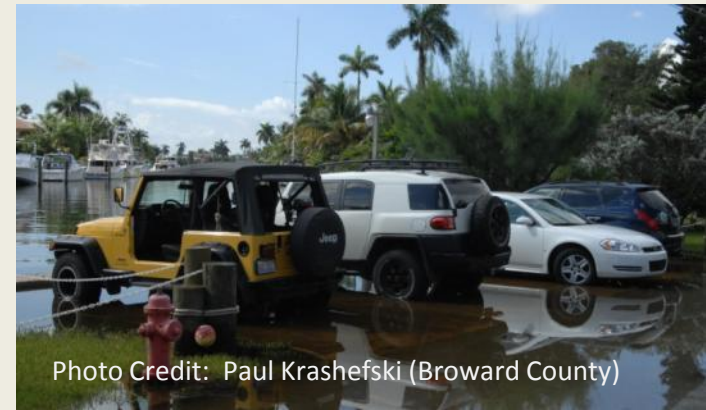


Photo Credit: Paul Krashefski (Broward County)

Climate Change Impacts in SE FL



**“Of all the regions,
in all the towns,
in all the world,
sea level is affecting
mine.”**

Sea Level Rise Implications for SE Florida

- Saltwater intrusion into the aquifer
- Drainage and flood control compromised
- Impacts to public and private infrastructure
- Beach erosion
- Impacts to coral reefs
- Impacts to Everglades





Regional Climate
LEADERSHIP SUMMIT

Southeast Florida Regional Climate Leadership Summit

Friday, October 23, 2009



SECTION 5: That each county shall work with other counties party to this compact in developing a Southeast Florida Regional Climate Change Action Plan. The Action Plan could, at a minimum, include the following components:

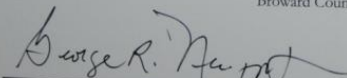
SECTION 6: That each county shall work with other counties party to this compact in developing a Southeast Florida Regional Climate Change Action Plan. The Action Plan could, at a minimum, include the following components:

- (a) A baseline of greenhouse gas emissions for Southeast Florida;
- (b) Strategies for coordinated emission reductions throughout the built environment to include the use of energy efficiency, energy conservation, and the use of demand-side renewable energy resources;
- (c) Strategies for coordinated emission reductions from the transportation sector to include increased reliance on public transit, emerging vehicle technologies, and advanced biofuels;
- (d) Strategies for coordinated emission reductions resulting from changes in local and regional land use;
- (e) Strategies for the coordinated regional preparation for and adaptation to a rapidly changing global environment based upon regional mapping of projected sea-level rise and any resulting amplification of localized impacts of tropical cyclone events. Such strategies shall incorporate climate preparation concerns for the regional economy, regional infrastructure and the built environment, social and cultural needs, and natural systems within the four counties party to this compact.

SECTION 7: That each county shall commit to participating with other counties party to this compact in hosting the Second Southeast Florida Regional Climate Change Summit in October, 2010.


Commissioner Kristin Jacobs
Broward County

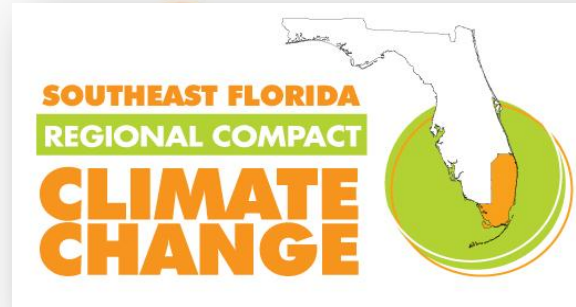

Commissioner Katy Sorenson
Miami-Dade County


Mayor George Neugent
Monroe County


Commissioner Shelley Vana
Palm Beach County



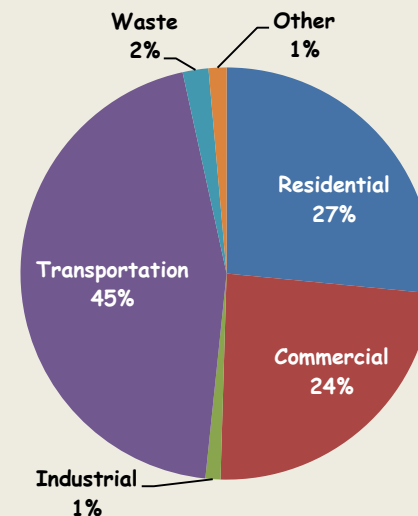
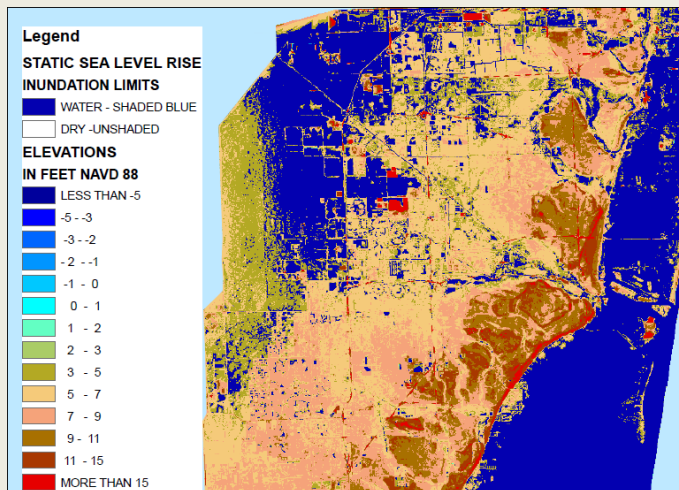
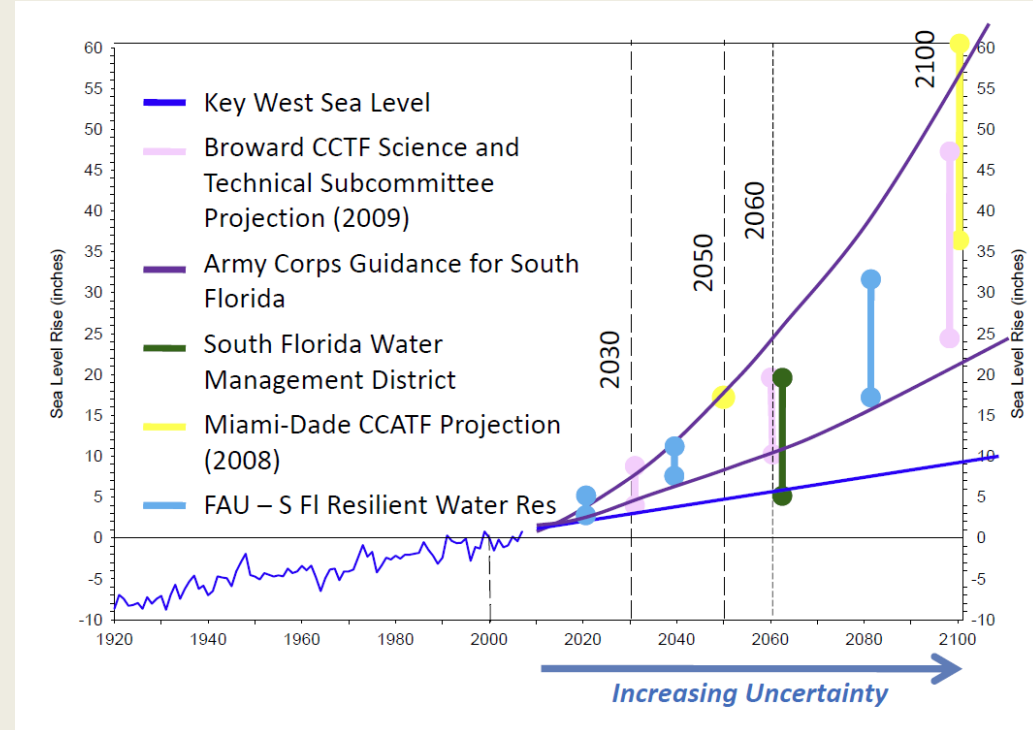
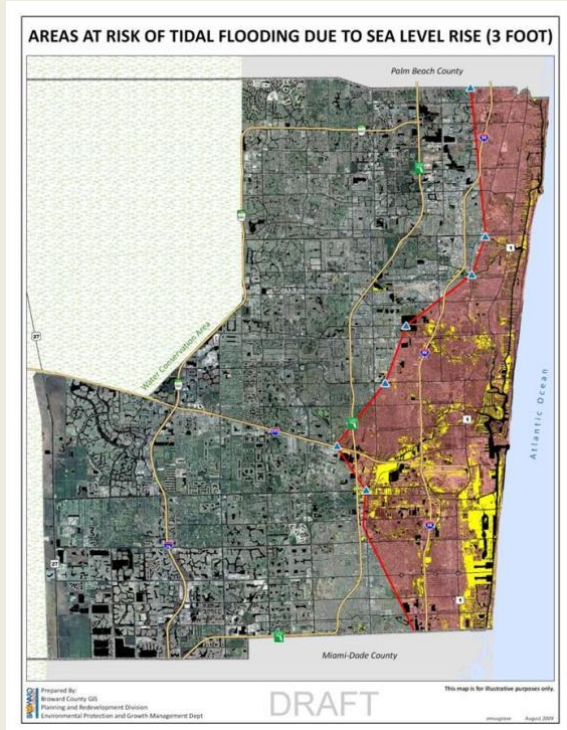
Compact Commitments



Use Regional Resources on:

- **Policy Collaboration**
- **Technical Planning Tool Development**
- **Regional Climate Change Action Plan**
- **Annual Climate Leadership Summits**

Common Concerns/ Different Approaches



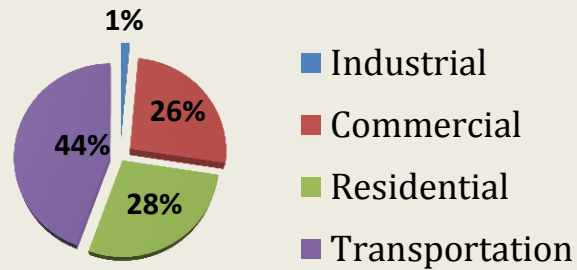
Compact's Technical Foundation

A Unified Sea Level Rise Projection for Southeast Florida

Southeast Florida Regional Climate Change Compact Counties



April 2011
Prepared by the
Technical Ad hoc Work Group



Southeast Florida Regional Climate Compact

Regional Greenhouse Gas Emissions Inventory
Baseline Period: 2005 - 2009



Produced by the Regional Compact
GHG Inventory Working Group

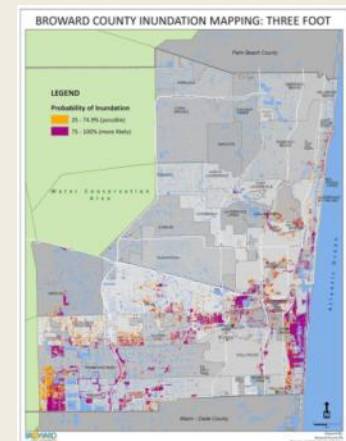
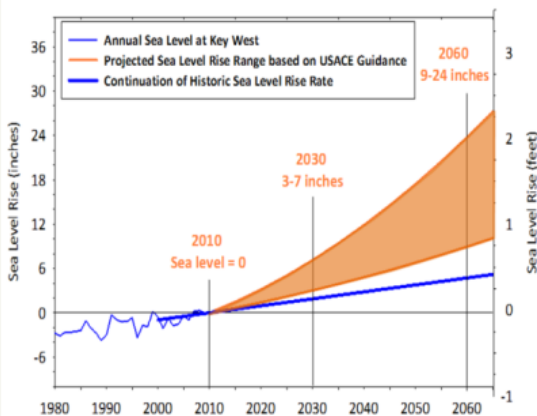
November 2011



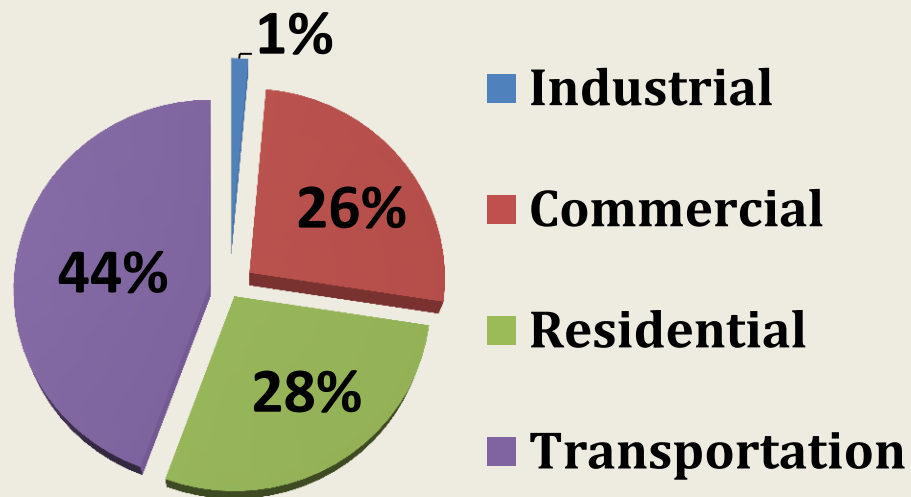
Analysis of the Vulnerability of Southeast Florida to Sea Level Rise

Southeast Florida Regional Climate Change Compact
Inundation Mapping and Vulnerability Assessment
Work Group

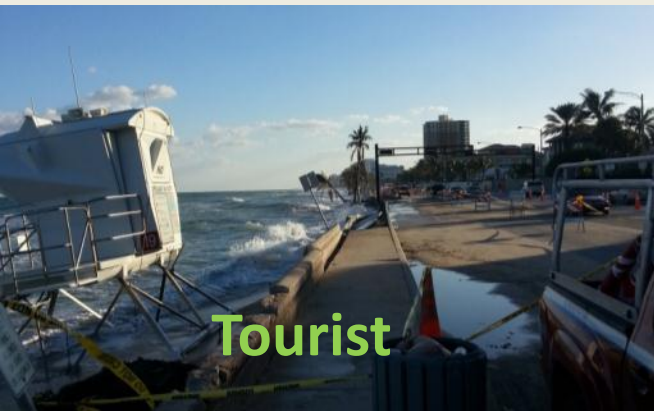
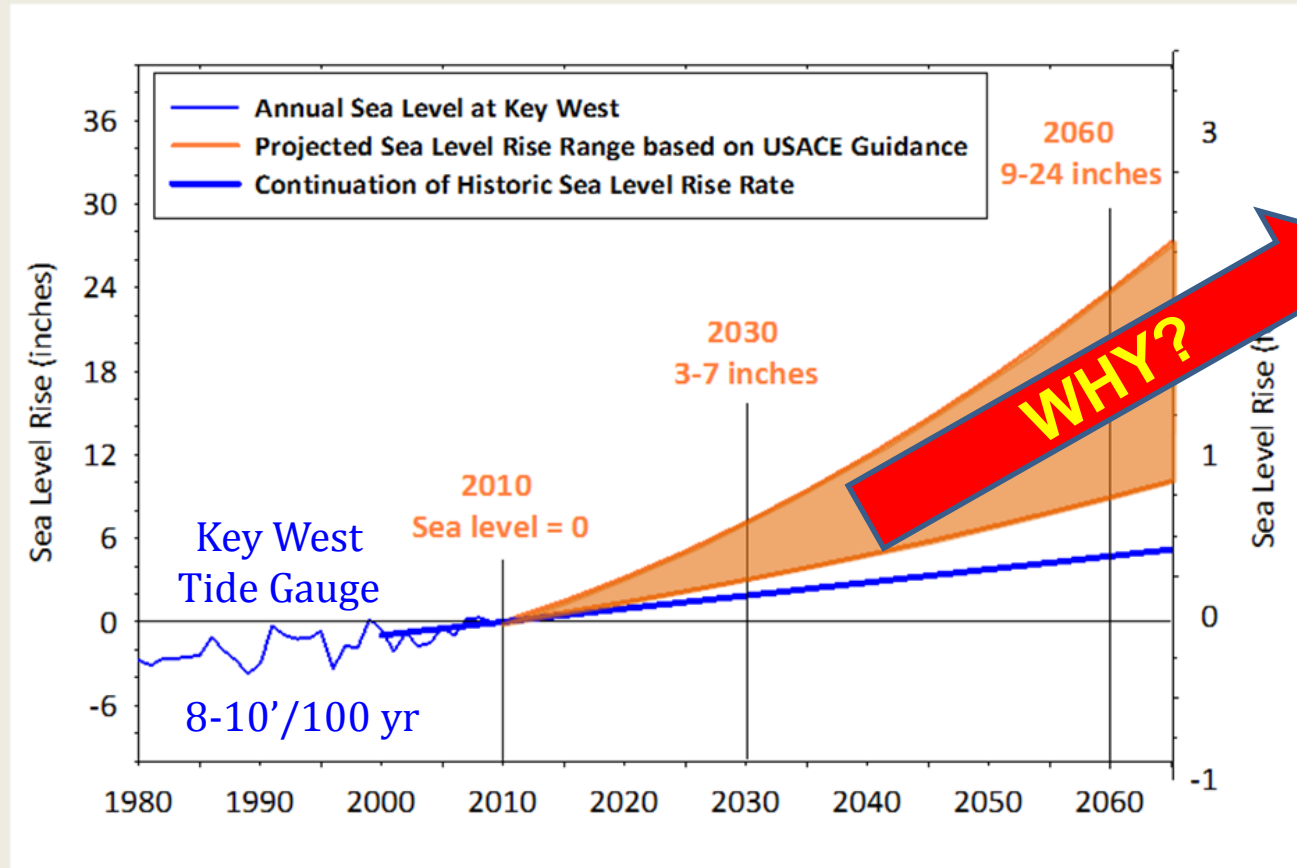
August 2012



Regional GHG Emissions by Sector



Planning for Sea Level Rise



Leading Indicators of Change

TIME

Leading

↑ CO₂

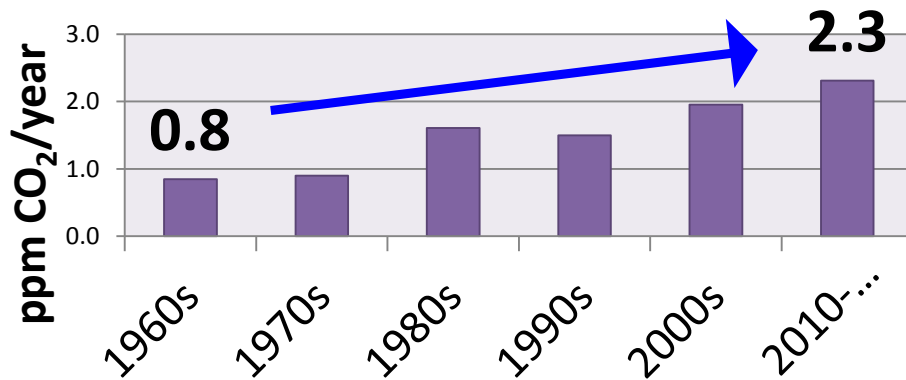
Rates are
Increasing



Lagging

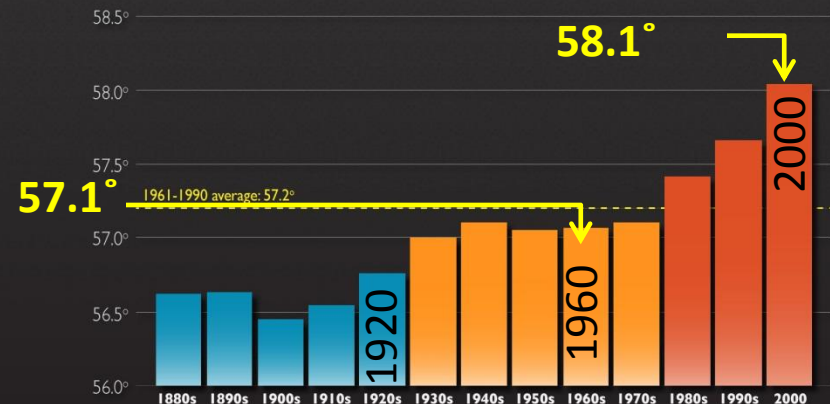
↑ Air Temp

Avg Annual Rate of ↑
Mauna Loa CO₂ by Decade



NOAA- ESRL

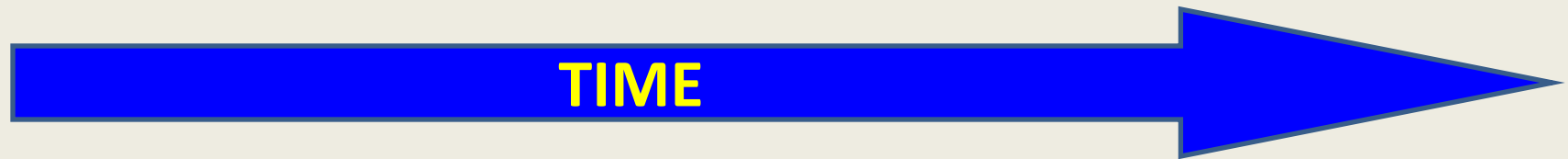
Decades of Warming
Average Global Surface Temperature



CLIMATE CO CENTRAL

Average Global Surface Temperature

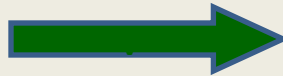
Leading Indicators of Change



Leading

Lagging

↑ CO₂



↑ Air Temp

↑ Air Temp



↑ Ice Melt

↑ Ice Melt



↑ Sea Level Rise

Leading Indicator of Sea Level Rise

Loss of Greenland Ice

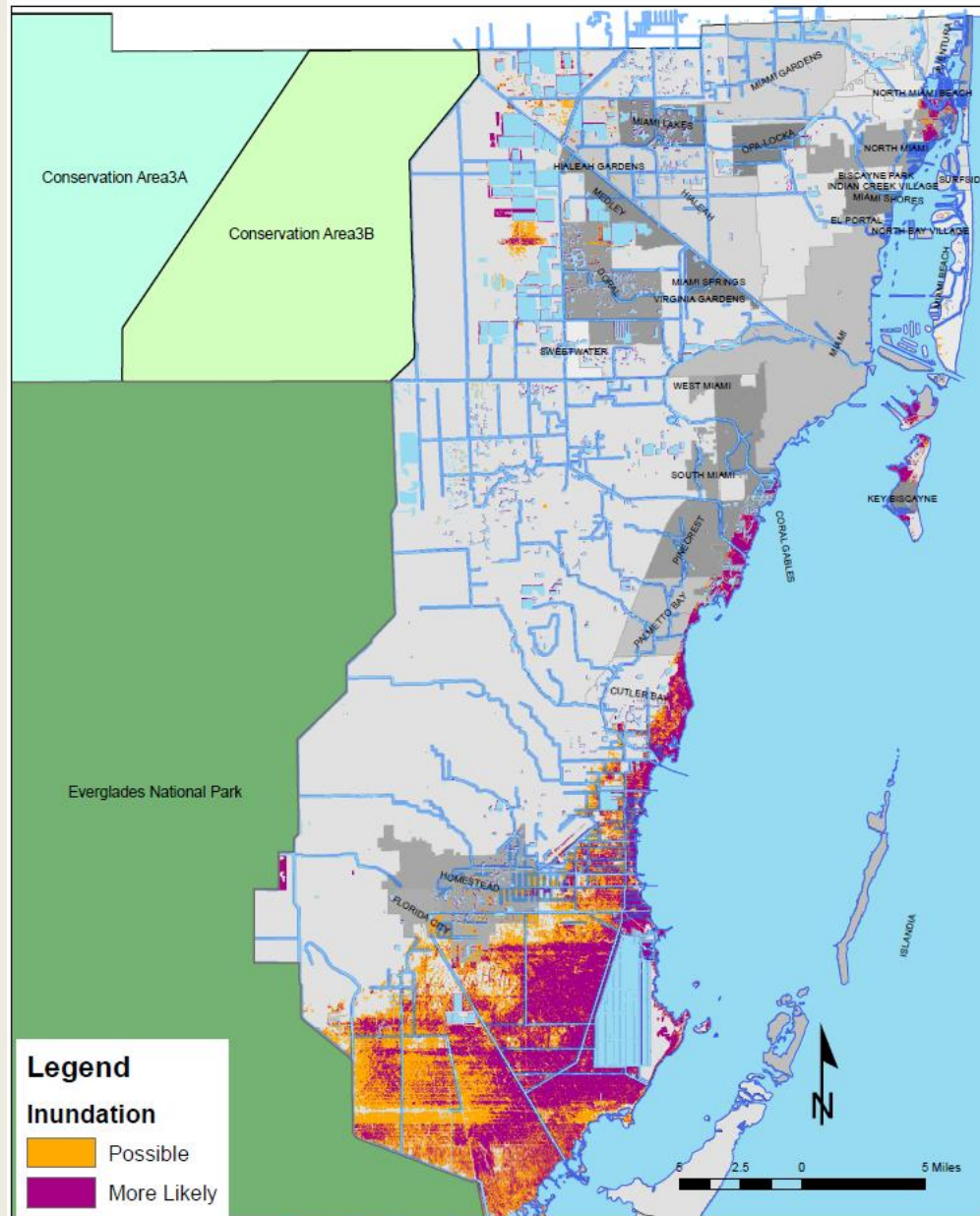
> **25x** than a decade ago

1990s:
7B tons/yr

2000s:
177B tons/yr



1-foot Sea Level Rise In Miami-Dade County

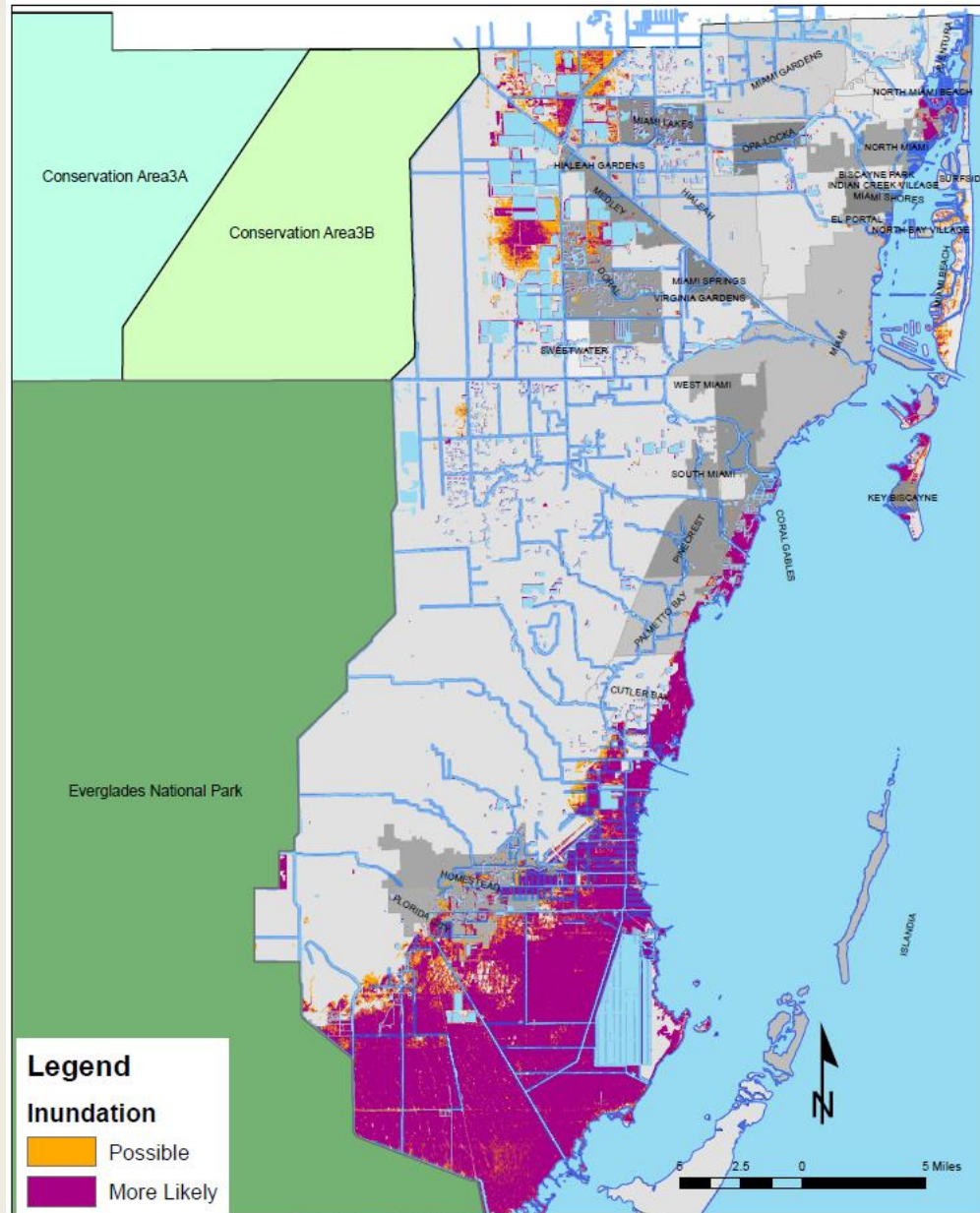


SE FL Regional Vulnerability Analysis

- Identifies area with elevations below Mean Higher High Water
- Planning tool to identify areas of concern

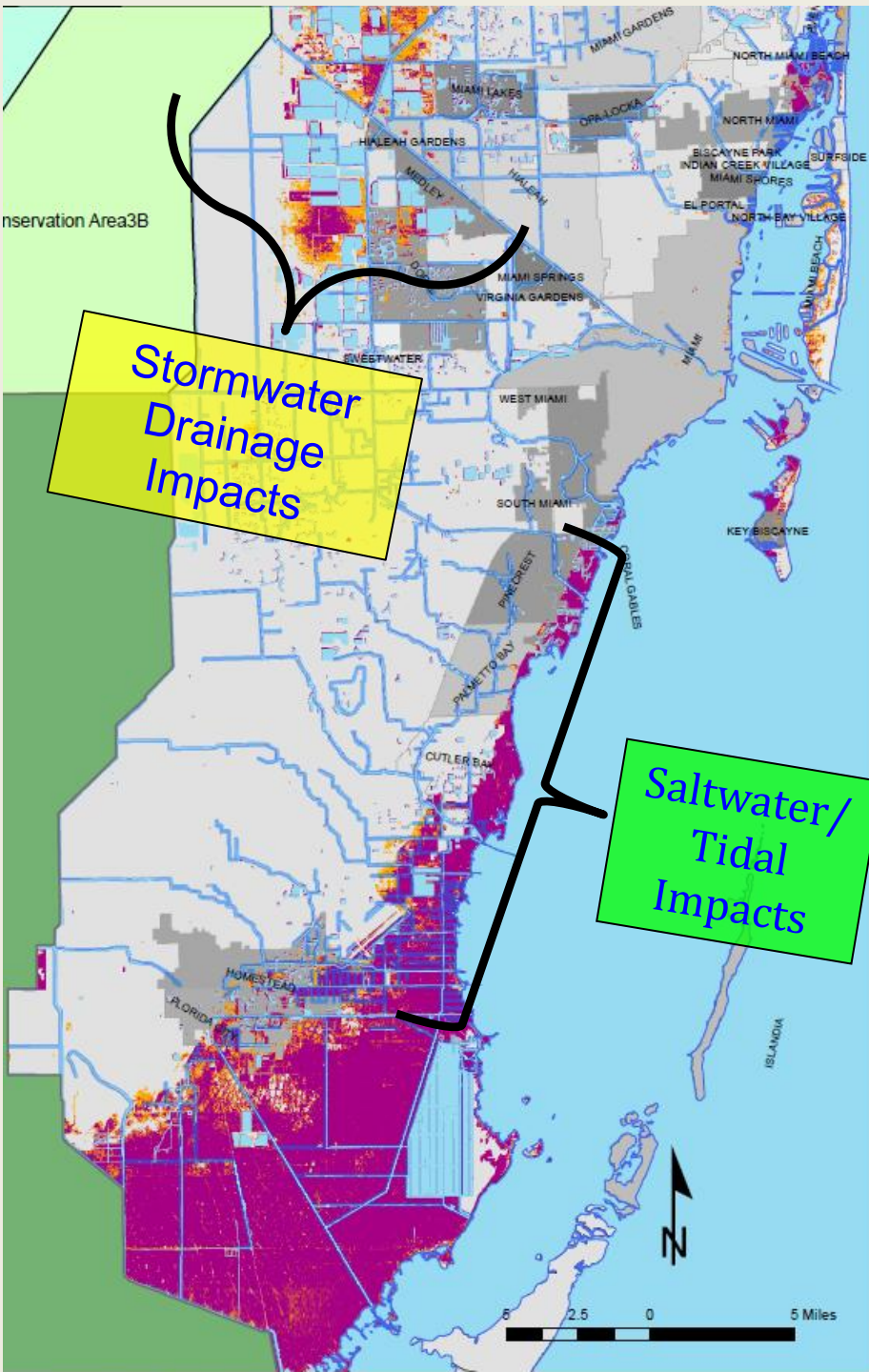
**Timeline for 1 ft SLR
Scenario
2040 – 2070**

2-foot Sea Level Rise In Miami-Dade County



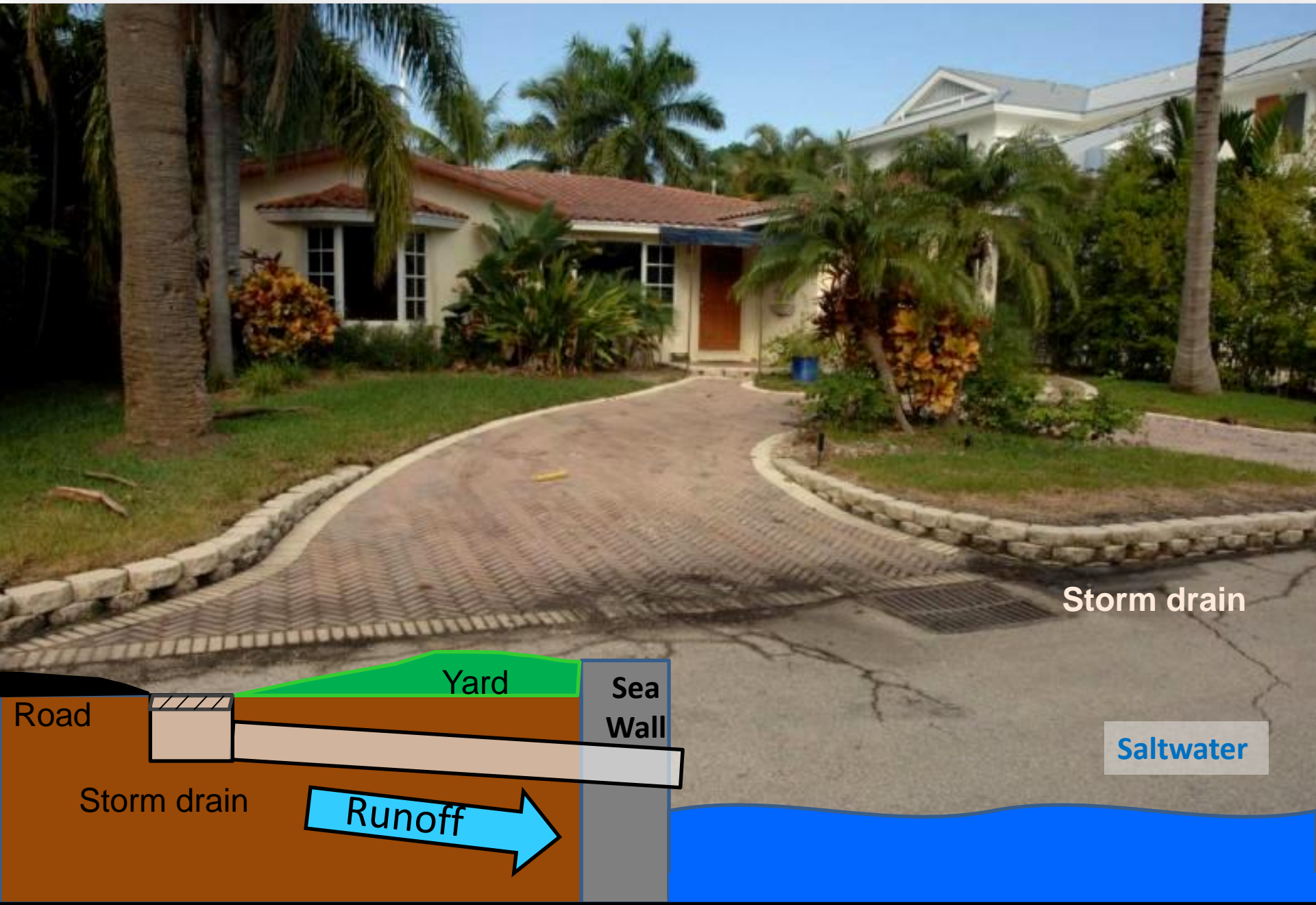
SE FL Regional Vulnerability Analysis

**Timeline for 2 ft SLR
Scenario
2060 – 2115**

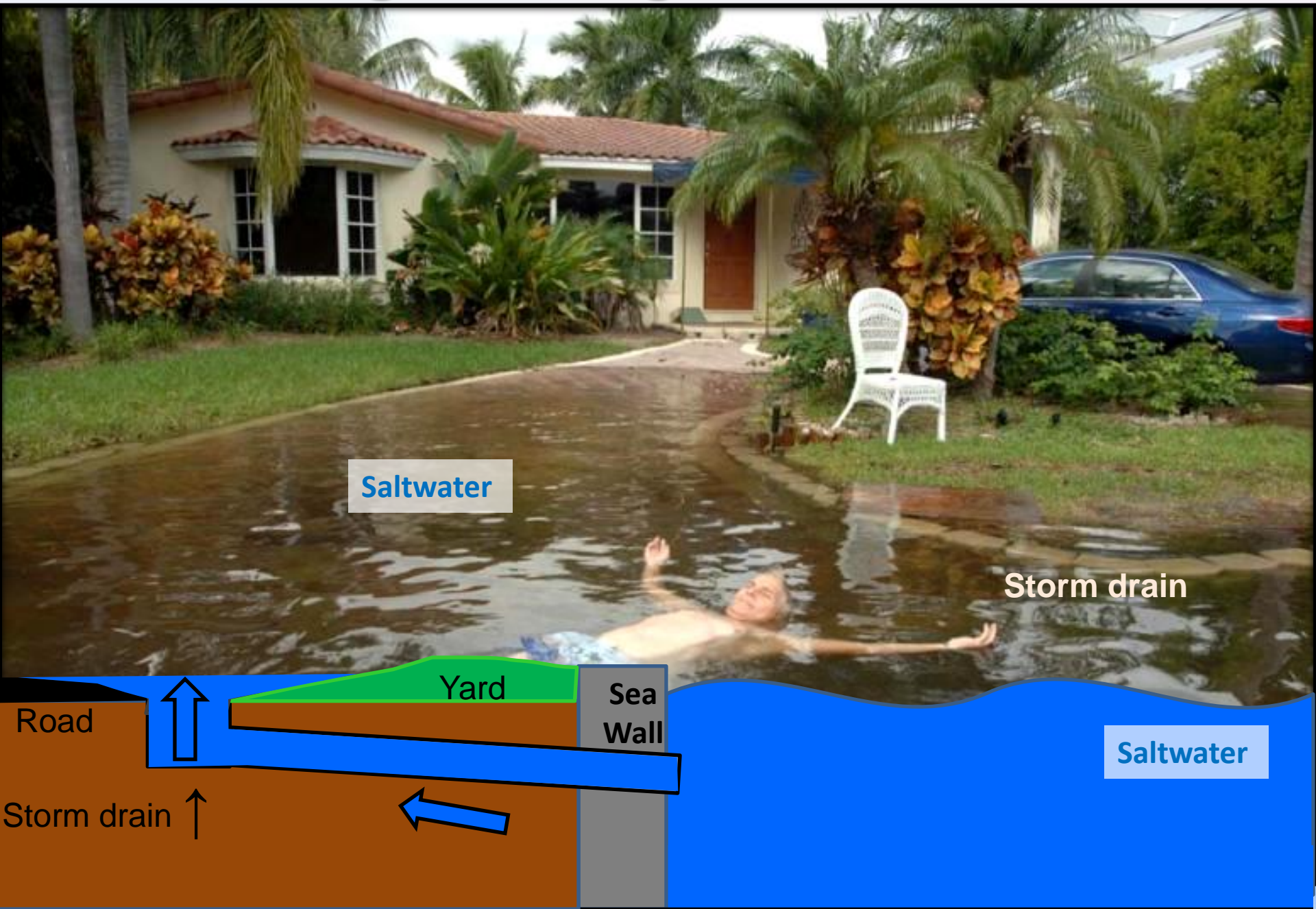


**Vulnerability to
Sea Level Rise
is not just a
Coastal Issue**

Drainage under Average Tidal Conditions



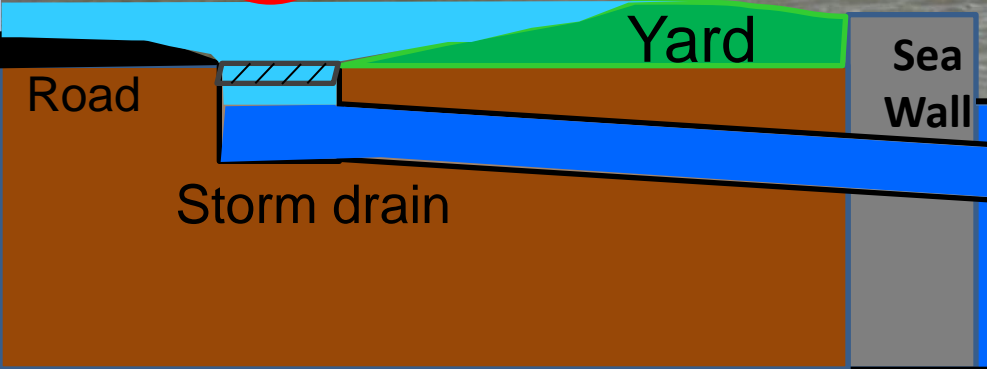
Drainage Challenge with Sea Level Rise





Freshwater

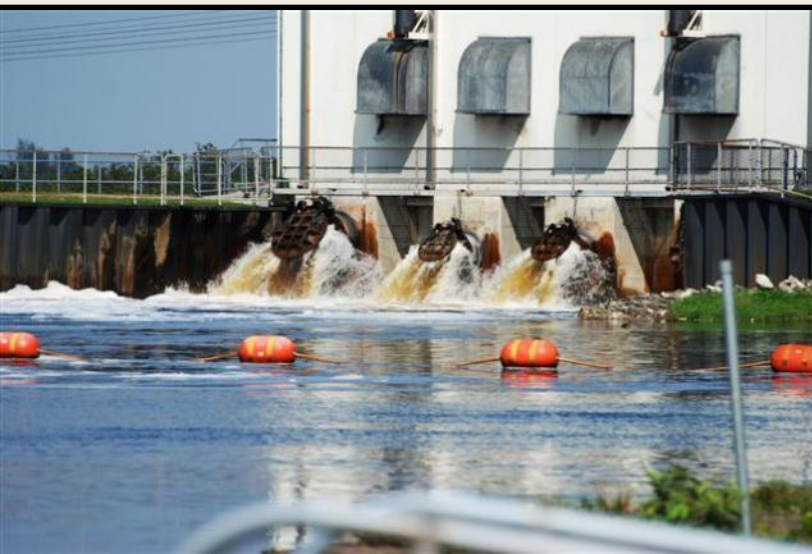
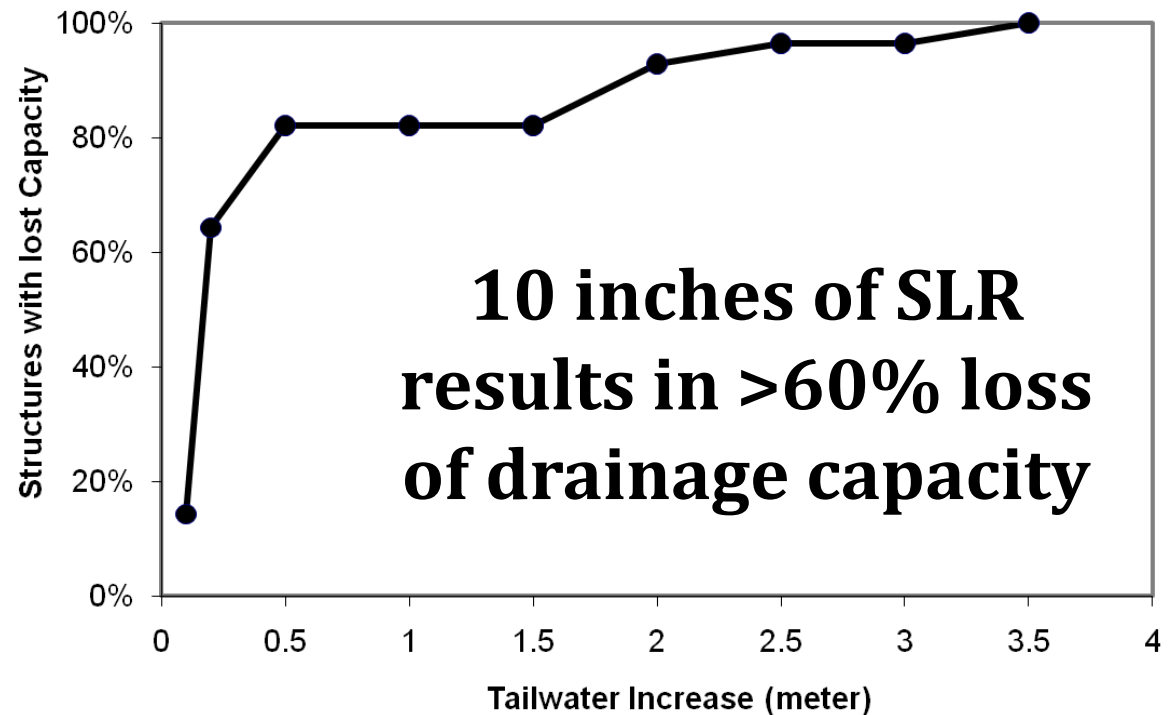
Stormwater cannot drain



High Tide/ Sea Level Rise

Resulting Coastal (SW) or Inland (FW) Flooding





Local Climate Impact

- More flooding
- Compromised drainage infrastructure

Extreme High Tide Events – Not our Future, NOW

A woman in a white dress and sunglasses is riding a yellow scooter through a flooded street. In the background, there is a white sedan and modern buildings, including one with a green wall and palm trees. The scene is set in a sunny, urban environment.

**Fall 2013 Extreme High Tides
Predicted:**

Oct 6-7, 17-20

Nov 3-6

Dec 3-6

The No Action Option for Coastal Communities



“Frankly my dear, sea level rise doesn’t give a damn.”



Whether or not we plan to address current or future sea level rise, it will come.

Questions?

