

CLIMATE CHANGE

concerns for

EVERGLADES RESTORATION PLANNING

Greater Everglades Ecosystem Restoration
Conference 2008

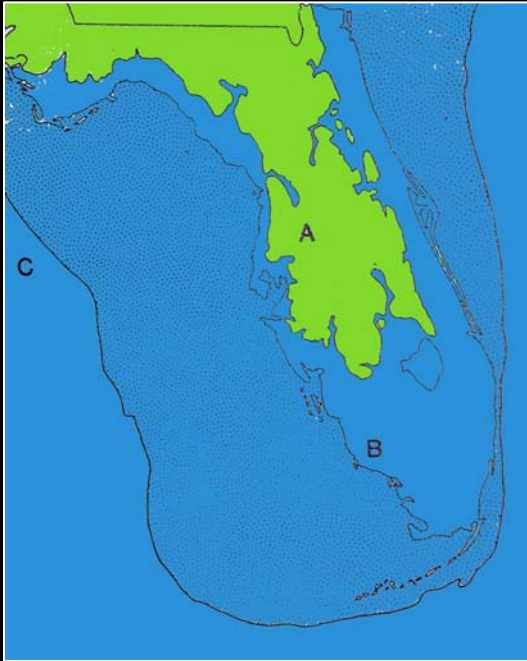
Presented by: Glenn Landers
U.S. Army Corps of Engineers, Jacksonville District



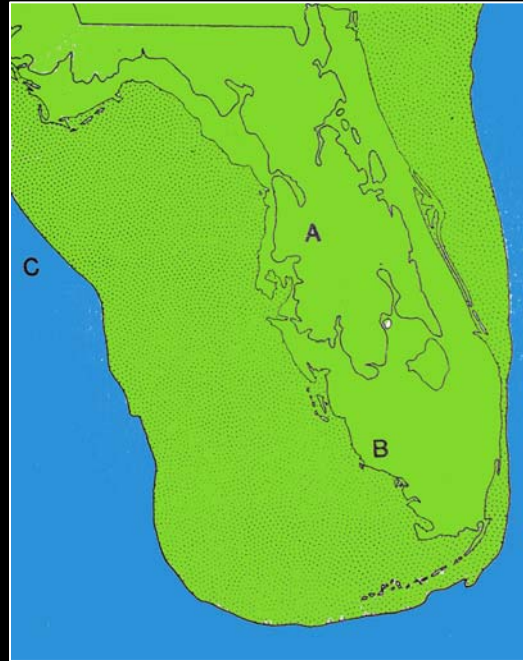
Everglades Restoration Goals

- Restore natural hydrologic conditions in the remaining 50% of historic Everglades
 - Water quantity, quality, timing and distribution
- Maintain existing services in developed areas
 - Flood Protection, Water Supply, and other (currently for 6.5 M people)

Florida Through Time – Climate Change Happens!



120,000 years ago
+ 6 meters (20')*



18,000 years ago
- 120 meters (420')



Today

* ~ 1/2 from Greenland
* ~ 1/2 from Antarctica

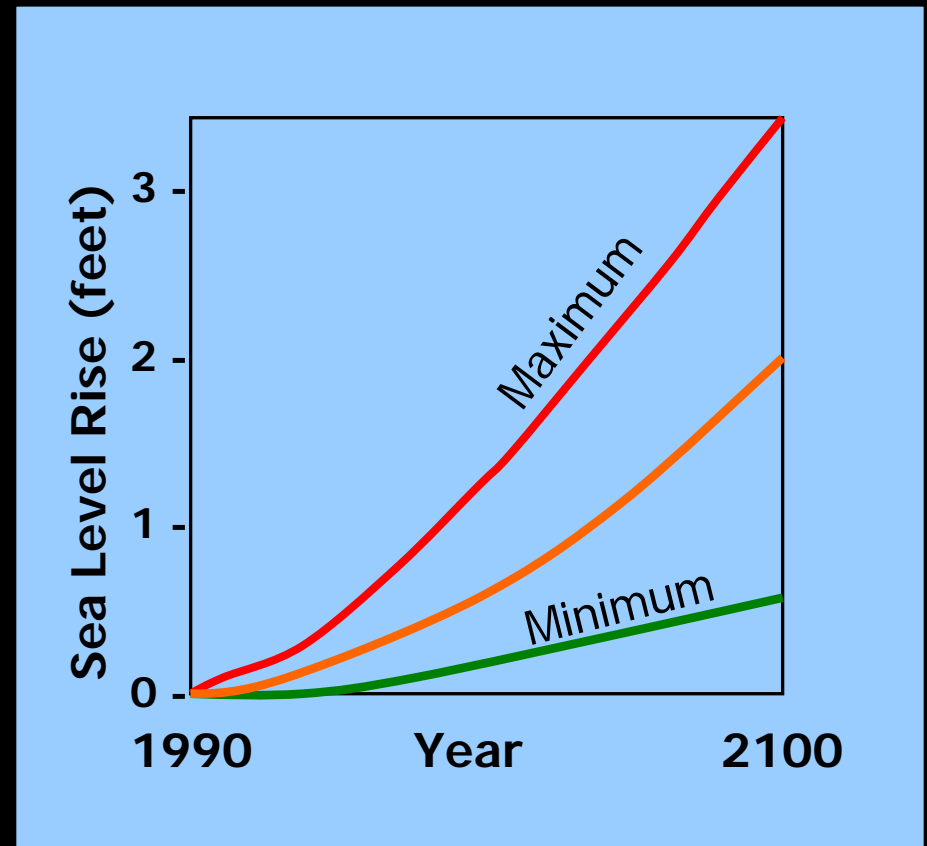
Credit: Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences;
co-chair of Miami-Dade Climate Change Task Force

How Will Climate Change Impact Everglades Restoration?

- **Warmer Temperatures**
 - Evaporation losses up; water supply down
 - Stresses on plant, animal and marine ecosystems
 - Changes in growing season and migratory patterns
 - Changes in water quality
- **Hydrologic Pattern Changes**
 - Potential for less frequent and more intense rain events
 - Potential increased tropical storm intensity or frequency
- **Sea Level Rise**
 - Salinity changes in coastal bays
 - Shoreline retreat with natural habitat changes/losses
 - Increasing flooding in coastal areas
 - Saltwater intrusion in water supply wells
 - **Uncertainties and RISKS in rate and depth of sea level rise**

What is forecast for future sea level rise?

- The 2001 United Nations Intergovernmental Panel on Climate Change (IPCC) forecast ~ 2-ft rise in sea level by 2100
- The 2007 IPCC forecast was approximately the same at 7 – 23 inches
- These projections assume a gradual linear response of climate and sea level
- Scientists did not reach agreement on melting rates for glaciers and ice sheets in Greenland and Antarctica



IPCC, 2001

Scientists on the Miami-Dade Climate Change Advisory Task Force:

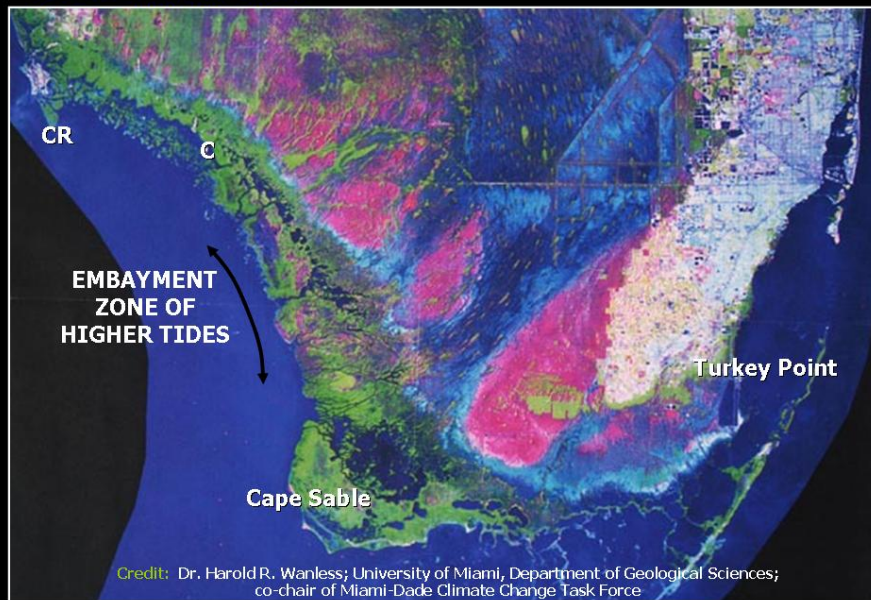
- “With what is happening in the Arctic and Greenland, [there will be] a likely sea level rise of **at least** 1.5 feet in the coming 50 years and a total of **at least** 3-5 feet by the end of the century, possibly significantly more. Spring high tides would be at +7 to +9 feet.”
- “This does not take into account the possibility of a catastrophically rapid melt of land-bound ice from Greenland, and it makes no assumptions about Antarctica.”
- “The projected rises will just be the beginning because of further significant releases from Greenland and possibly Antarctica.”

(September 20, 2007)

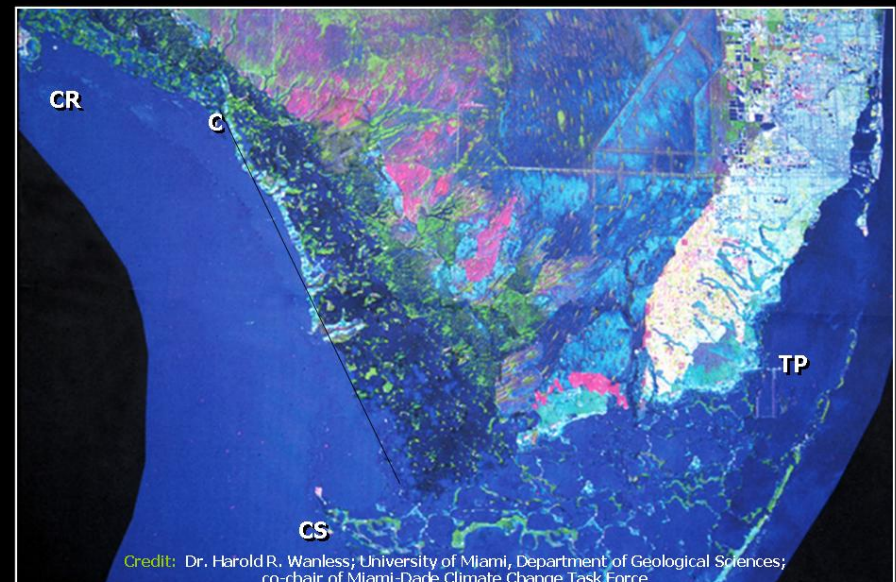
Sea Level Rise in Florida

- A little less than one foot during the past century measured at Key West
- Forecast by 2100 ranges from one foot to five feet or more
- The National Academy of Science Committee on Independent Scientific Review of Everglades Restoration Progress (CISRERP) is expected to address differences between IPCC and Miami-Dade forecasts

South Florida 1995



+2 foot rise (mhhw = +4.5' above 1929 MSL)



Climate Change Uncertainties:

Examples of Sea Level Rise Impacts

- Shoreline retreat with natural habitat changes/losses
- Increasing flooding in coastal areas
- Saltwater intrusion in water supply wells
- Uncertainties and risks in rate and depth of sea level rise

Natural Areas



Saltwater inundation leads to peat collapse and decline of freshwater wetlands habitat

Photo Credit: Dr. Harold R. Wanless;
University of Miami, Department of Geological Sciences; co-chair of
Miami-Dade Climate Change Task Force



60% of Everglades National Park lands are below 3 feet MSL.

Everglades restoration will increase freshwater flows to natural areas and may delay some future habitat changes

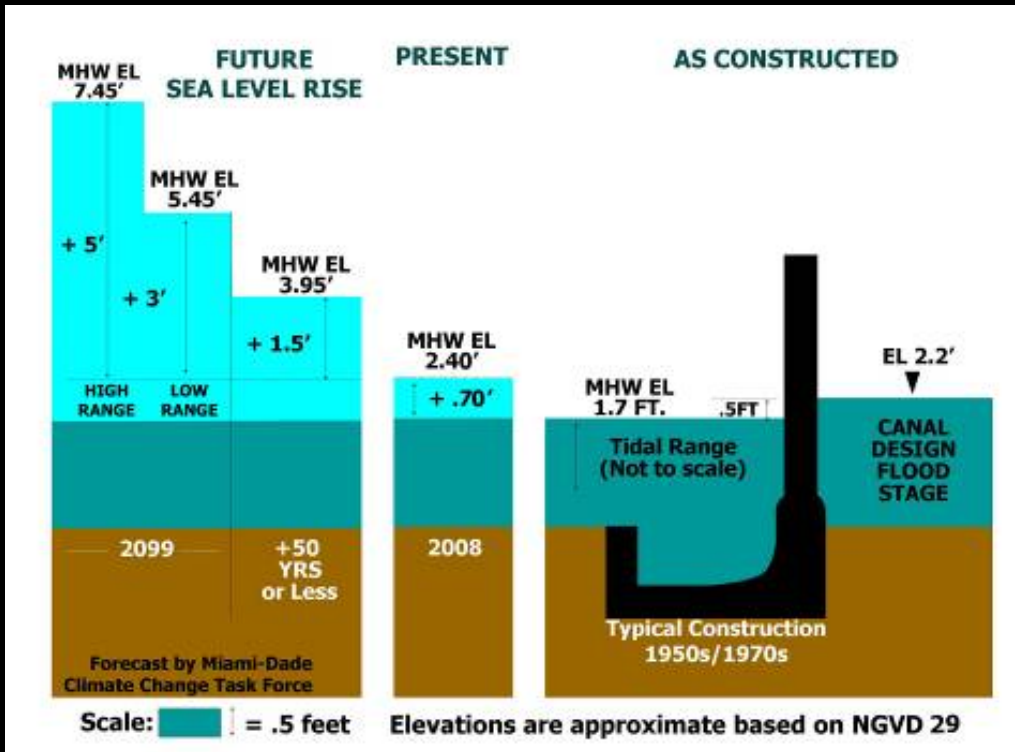
Developed Areas



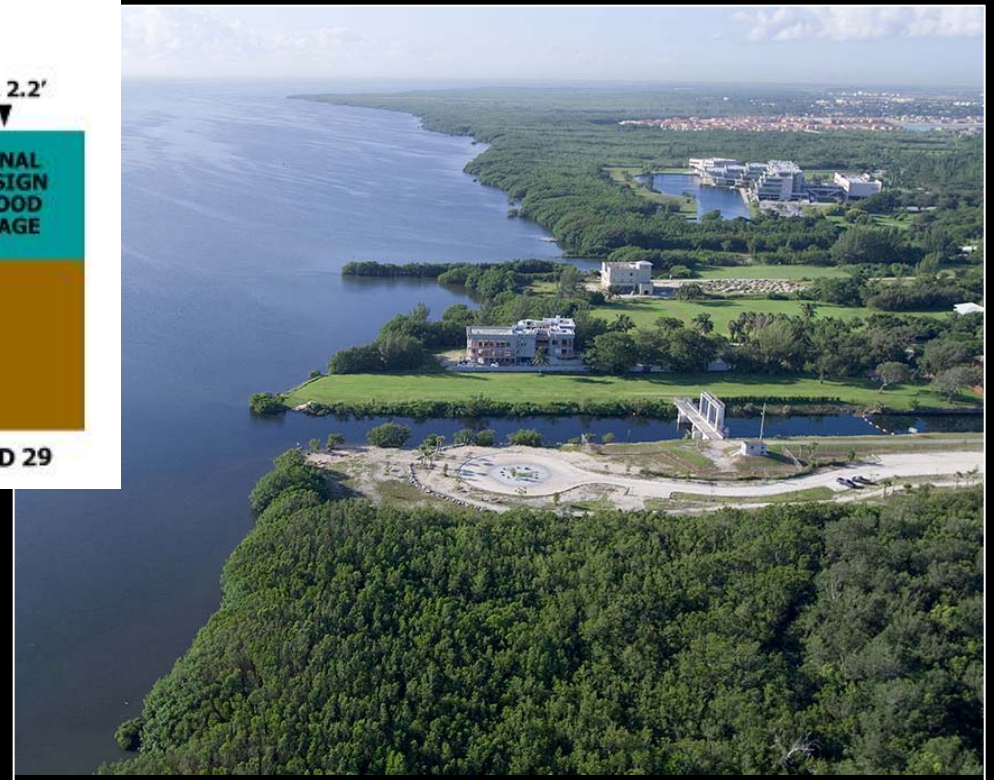
Photo courtesy of SFWMD

The population of south Florida is 6.5 million and growing. Climate change and subsequent sea level rise will impact local flood protection and water supplies.

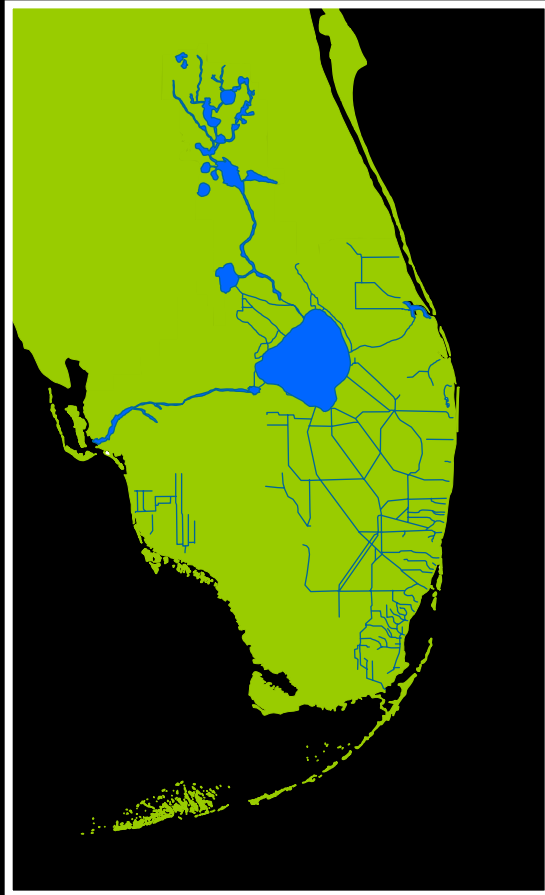
Flood Damage Concerns



Sea level rise will reduce effectiveness of gravity drainage canals



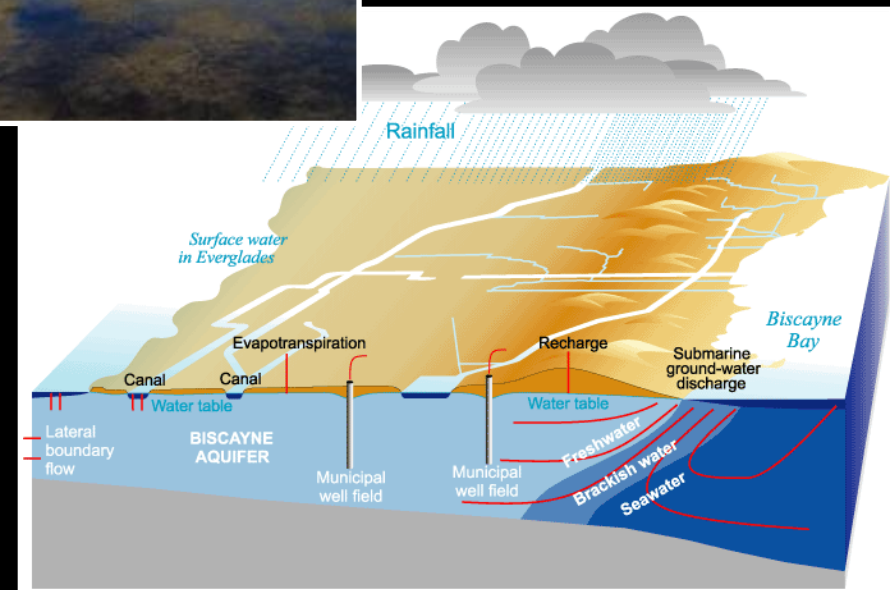
Water Supply Concerns



Kissimmee River Basin and Lake Okeechobee



Lake Okeechobee Drought

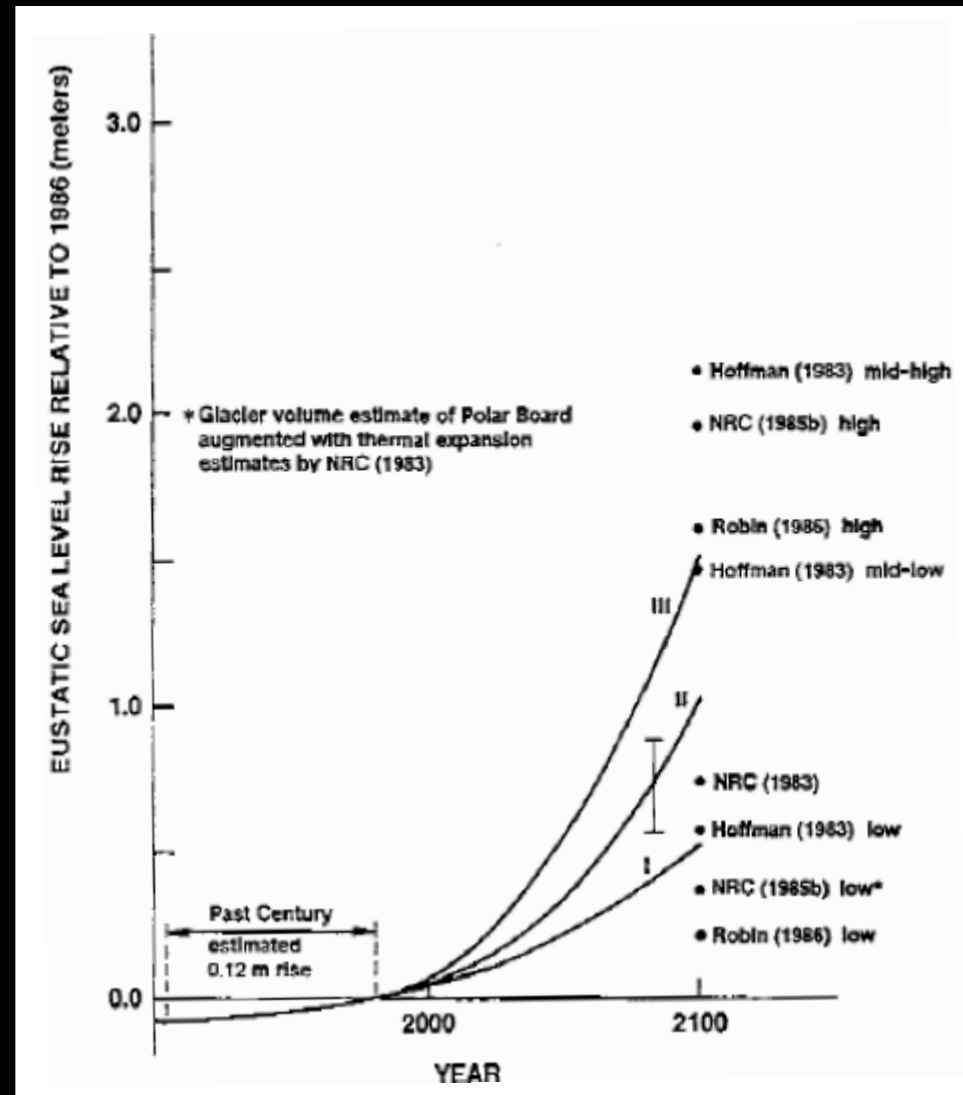


- Climate change impacts on rainfall patterns and evaporation rates will increase water storage needs

- Sea level rise and related saltwater intrusion will impact water supply wells and create a need for alternative freshwater sources

USACE Planning Guidance on Sea Level Rise

- Based on guidance from the National Research Council of National Academy of Sciences
- Recognize uncertainties and risks in rate and depth of sea level rise
- Consider alternative plan performance for low/med/high future scenarios based on local history and NRC curves
- CERP Guidance Memo #16 says PIRs to address 0.8 ft by 2050
- Updated USACE guidance expected in late 2008



National Research Council

Way Forward

Collaboration

**Policy
Development**

**Project
Development**



Everglades Restoration

Upcoming Actions Regarding Climate Change

- **Jul 08 Greater Everglades Ecosystem Restoration (GEER) Conference**
 - 4-day interagency Everglades science coordination meeting
 - Includes multiple workshop sessions on climate change
 - Information sharing via posters, papers and panel discussions
 - Identifies science studies needed to help guide Everglades restoration
- **Sep 08 National Academy of Sciences (NAS) Biennial Report to Congress on Everglades Restoration Progress**
 - May include strategic planning guidance for a range of potential climate change impacts
 - Expect guidance on future rate and depth of sea level rise
 - Expect comments on existing USACE planning guidance for sea level rise (developed from 1987 NAS/NRC guidance)

Everglades Restoration

Upcoming Actions Regarding Climate Change

- **Dec 08 SE Region Interagency Climate Change meeting**
 - Sponsored by SE region federal natural resource agencies
 - Information sharing and coordination with states and others
- **FY09 Everglades Sea Level Rise Sensitivity Analysis**
 - RECOVER Planning Team to develop Scope of Work
 - New coastal areas digital topography from FEMA National Flood Insurance Program available late 2008
 - Update water management datum - NGVD29 to NAVD88
 - Identify flooding risks for a range of rising sea levels
 - Identify water supply wells and saltwater intrusion risks
 - Identify impacts to natural areas and species of concern
 - Develop scope of work for additional studies and other actions
 - Information sharing with others for strategic planning

Everglades Restoration Climate Change Concerns

Key Take-a-Way Points

- Large uncertainties and RISKS exist regarding climate change, particularly future rate and depth of sea level rise
- National Academy of Sciences expected to provide guidance in Fall 08 on future rate and depth of sea level rise (IPCC versus Miami-Dade forecasts)
- Everglades Restoration will help delay climate change impacts in natural and developed areas

Everglades Restoration Climate Change Concerns

Key Take-a-Way Points

Restoration of the Greater Everglades
“...is even more critical in a time
of rising seas.”

Testimony to Congress
ENP Superintendant Dan Kimball
April 26, 2007

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