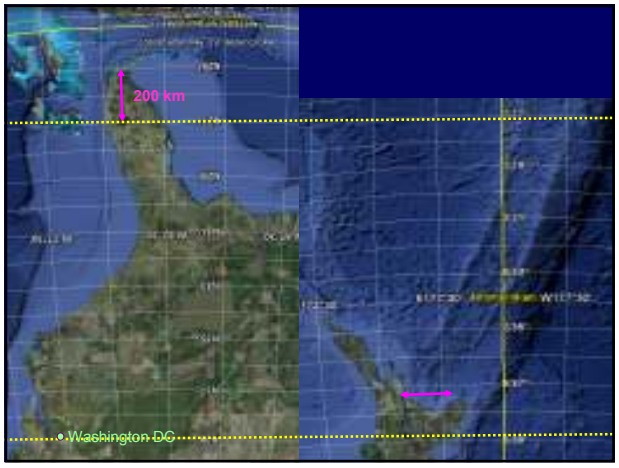
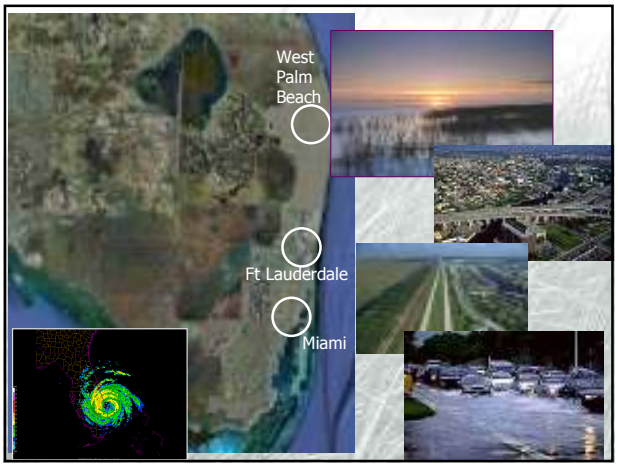
Florida Everglades: Perspective on Wetland Restoration

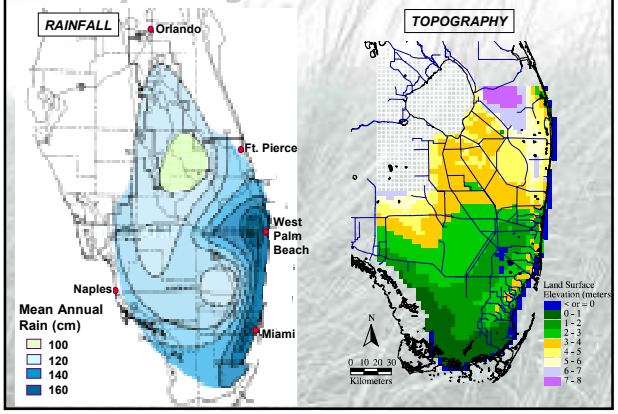
National Wetland Symposium
Rotorua – 4 March 2010

Ken Tarboton





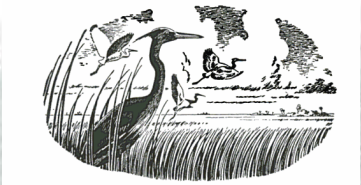
Hydrologic Characteristics



Overview

- ✓ Perspective
- What did the Everglades wetland look like historically?
- How have they changed?
- What is being done to restore the Everglades?
- What can we learn from this?

The Nature of the Everglades



"There are no other Everglades in the world."

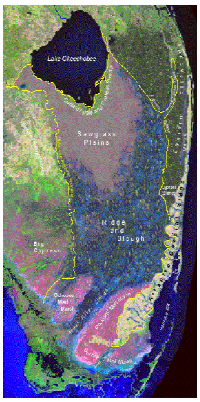
"The miracle of light pours over the green and brown expanse of saw grass and of water, shining and slowly moving…"

"It is a river of grass" *Marjory Stoneman Douglas*

Everglades Lanscapes

Everglades Lanscapes

Historic Everglades

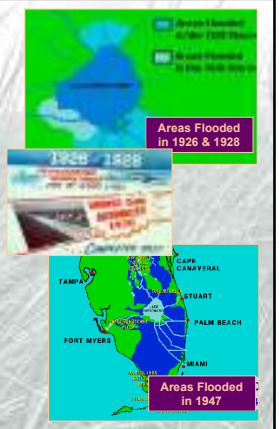


How have the Everglades changed?

- **Settlement in south Florida increased in the early 1900's**
  - Navigation improvements
  - Flagler Railroad
- **Everglades Drainage District**
  - Initial drainage works improved development opportunities
  - Flooding & droughts persisted

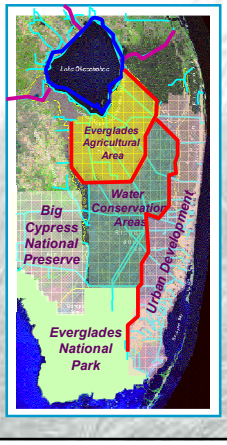
Historic Problems

- **Flood Control**
  - 1926/1928: Lake Okeechobee Levee Failure
  - 1947: Hurricane Flooding
- **Water Supply**
  - 1931 - 1945: Lower East Coast saltwater intrusion threat identified
- **State of Florida requested federal assistance**



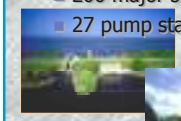
The Central and Southern Florida Project

- **"Central and Southern Florida Project for Flood Control and Other Purposes"**
  - Constructed between 1950's and 1970's
  - Covers 47,000 km²
  - For projected population of 2 million by 2000
  - 2005 population was 6 million
  - Projected 2050 population is 12-15 million
- **No longer effectively meets environmental and water supply needs of the region**



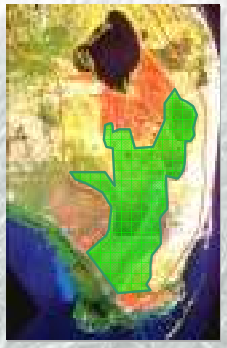
Current System

- 2,800 km of canals and levees
- Herbert Hoover Dyke
- River Canalization
- Protective levees
- 160 major drainage basins
- ~2,000 water control structures
  - 200 major structures
  - 27 pump stations



Major Problems Facing Everglades

- Loss of Everglades habitat
- Disruption of hydropatterns (i.e., timing, volume & distribution)
  - Repetitive water shortages and salt water intrusion
  - 6.5 million cubic m of water a day wasted to tide
- Degradation of water quality
- Exotic plant species



Overview

- ✓ **Perspective**
- ✓ **What did the Everglades wetland look like historically?**
- ✓ **How have they changed?**
- **What is being done to restore the Everglades?**
- **What can we learn from this?**

What is being done to restore the Everglades?

- **Comprehensive Everglades Restoration Plan**
- **New wetlands – stormwater treatment areas**
- **Habitat Suitability Indices**

Comprehensive Everglades Restoration Plan CERP

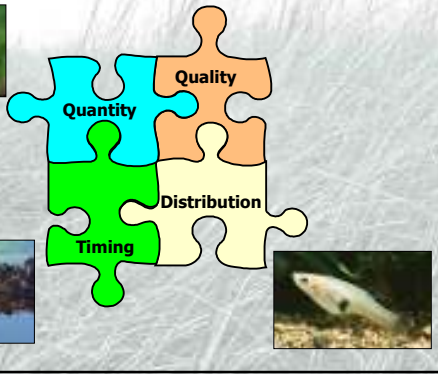
- **World's largest ecosystem restoration effort**
- **Goal – sustainable restored ecosystem**
  - Clean, reliable water supply
  - Flood protection
- **Concept**
  - Capture, store excessive flows to tide
  - Use when and where most needed
- **Approved 2000 - 30 years to complete**
- **Original cost estimate $7.8 billion (1999 dollars)**

Comprehensive Everglades Restoration Plan CERP

60 major components – broadly grouped

Everglades Restoration Plan Components

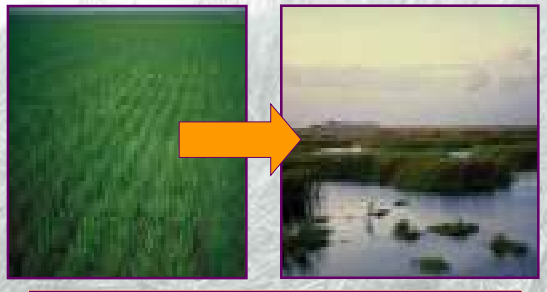
Getting the Water Right



New Wetlands – Stormwater Treatment Areas

Stormwater Treatment Areas

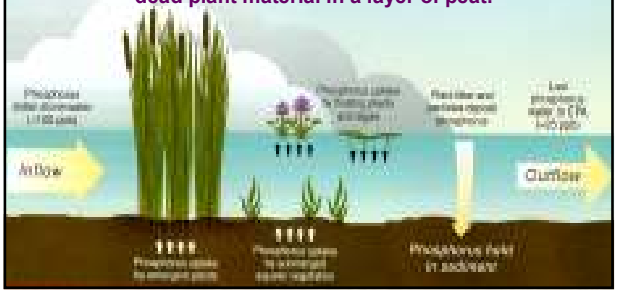
Agricultural Land **Constructed Wetland**



Phosphorus Reduction in Stormwater

Stormwater Treatment Areas

STAs are constructed wetlands that remove and store nutrients through plant growth and the accumulation of dead plant material in a layer of peat.



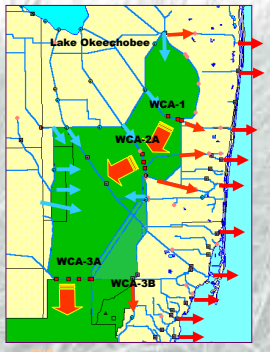
Everglades Stormwater Treatment Areas

- 6 STAs with more than 18,000 ha of treatment footprint

- In 2009:
  - STAs treated over 1500 billion m^3 of water
  - Reduced phosphorus load by 80%
  - Average Phosphorous inflow of 152 ppb reduced to 25 ppb outflow
- Since 1994:
  - Over 1,200 metric tonnes of phosphorus have been retained in the STAs that would have otherwise entered the Everglades

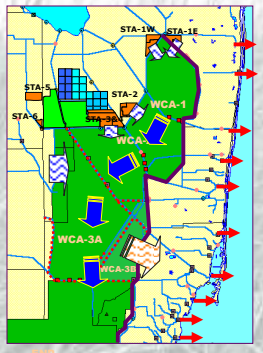
Flow Distribution before Plan

- **Point source discharge into WCA's**
- **Major structures move water south in WCA's**
- **Smaller structures discharge east, primarily for water supply purposes**
- **Considerable loss to tide**

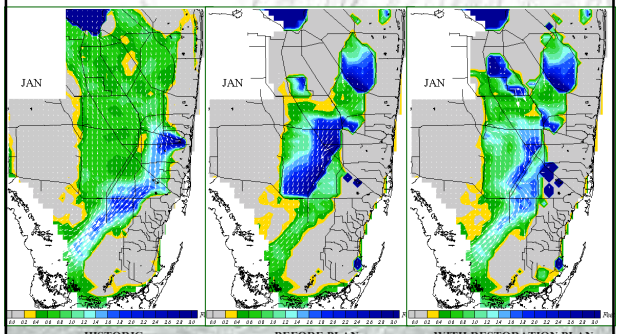


Flow Distribution with Restoration Plan

- STA treated and diffuse inflow
  - **159 % more flow for environmental needs**
  - **21 % less agricultural runoff**
- Removing sheet flow barriers and operation changes
  - **75 % more flow to ENP**
- Levee Seepage management
  - **34 % decrease**
- Reduced flow to tide
  - **19 % decrease**



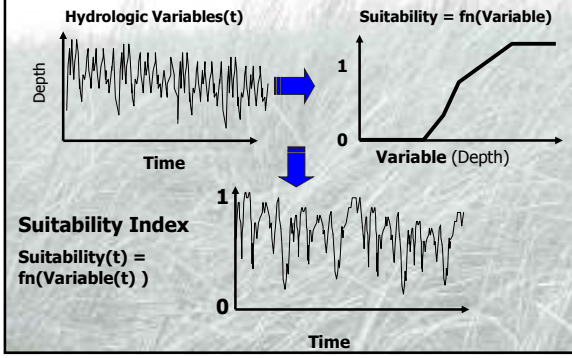
Mean Monthly Ponding Depth Flow



Habitat Suitability Indices (HSI)

- **How do we know we got the water right?**
- **HSI's provide a link between hydrologic variables and ecological habitat response**
- **Can be used to estimate trade-offs over time, space, and among different habitats**

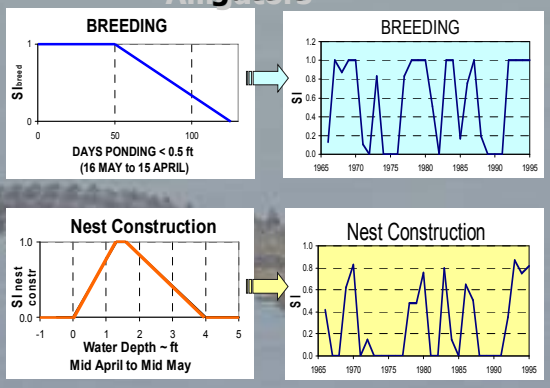
How to get Habitat Suitability Indices?



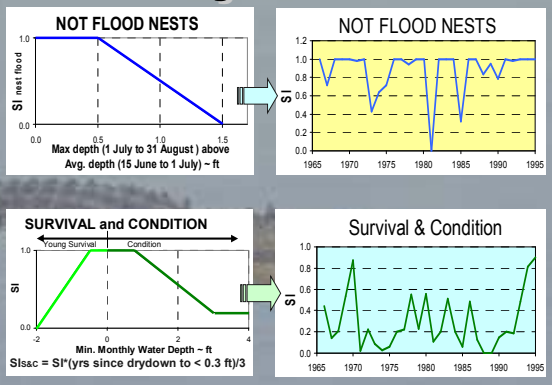
Example HSI - Alligators

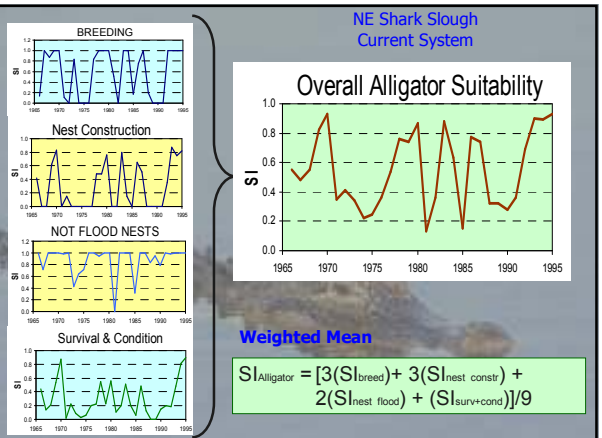
- **Particular Habitat needs**
  - Breeding
  - Nesting
  - Hatching
  - Survival & condition

Alligators

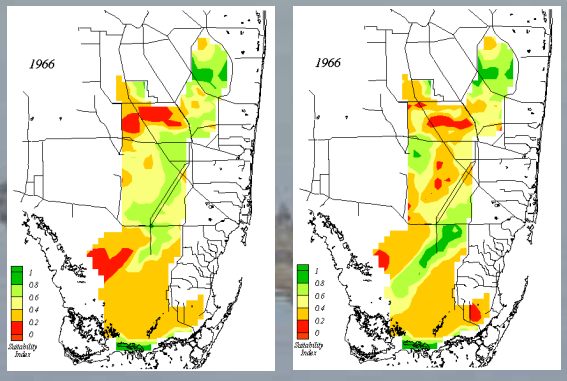


Alligators



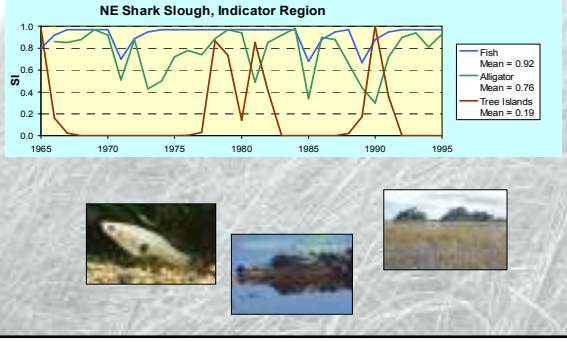


Alligators



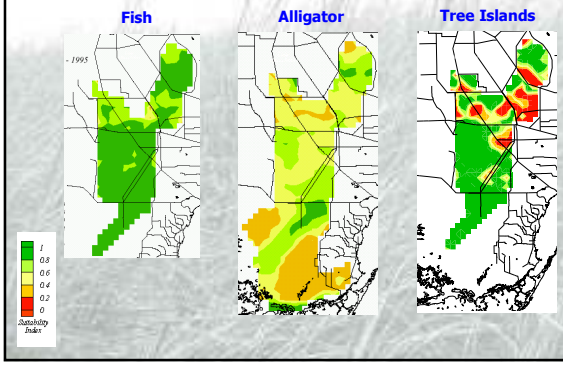
Habitat Suitability Comparisons

Temporal Comparison: Annual Values at Specific Location



Habitat Suitability Comparisons:

Spatial Comparison: Period of Record or Long-Term Average



HSI's can be used to …

- **Provide more information on …**
  - Did we get the water right?
  - Are there opportunities for changing hydrology to improve ecology? Where?
  - Evaluate "what if" scenarios and their effect on habitat
  - Better understand the hydrologic-ecologic relationship and how they change

What can we learn from this?

Lessons

- **Wetlands degradation has been a part of development the world over**
- **Decide what restoration should look like**
- **Determine what hydrological change will result in the desired ecological change**
- **Act now to raise awareness of declining wetlands**

Lessons

- **Embrace different functional wetlands such as stormwater treatment areas**
- **Look for the win win such as development mitigation to restore and enhance wetlands**

Thank You