C-111 Spreader Canal Project: A Unique Example of Public Involvement and Adaptive Management in Everglades Restoration

INTERCOL 9
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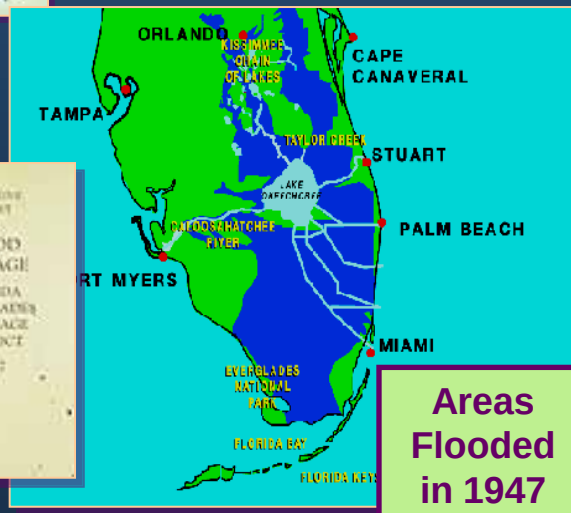
Overview

- South Florida's flood control history
- Brief CERP overview
- Definition of Adaptive Management (AM)
- C-111 basin
- Incorporation of AM strategies
- Summary

Historical Perspective

- 1906 – 1927 Everglades Drainage District creates many of the canals to drain the region
- Hurricanes in 1926 and 1928 resulted in flooding from Lake Okeechobee
- 1930 USACE constructs Herbert Hoover Dike
- Hurricanes in 1947 resulted in wide-spread flooding throughout South Florida
- State of Florida requested Federal flood control assistance in 1947
- Congress authorized the Central & Southern Florida (C&SF) Project in 1948
  - Flood protection, drainage and water supply were physically inter-related

Areas Flooded in 1926 & 1928

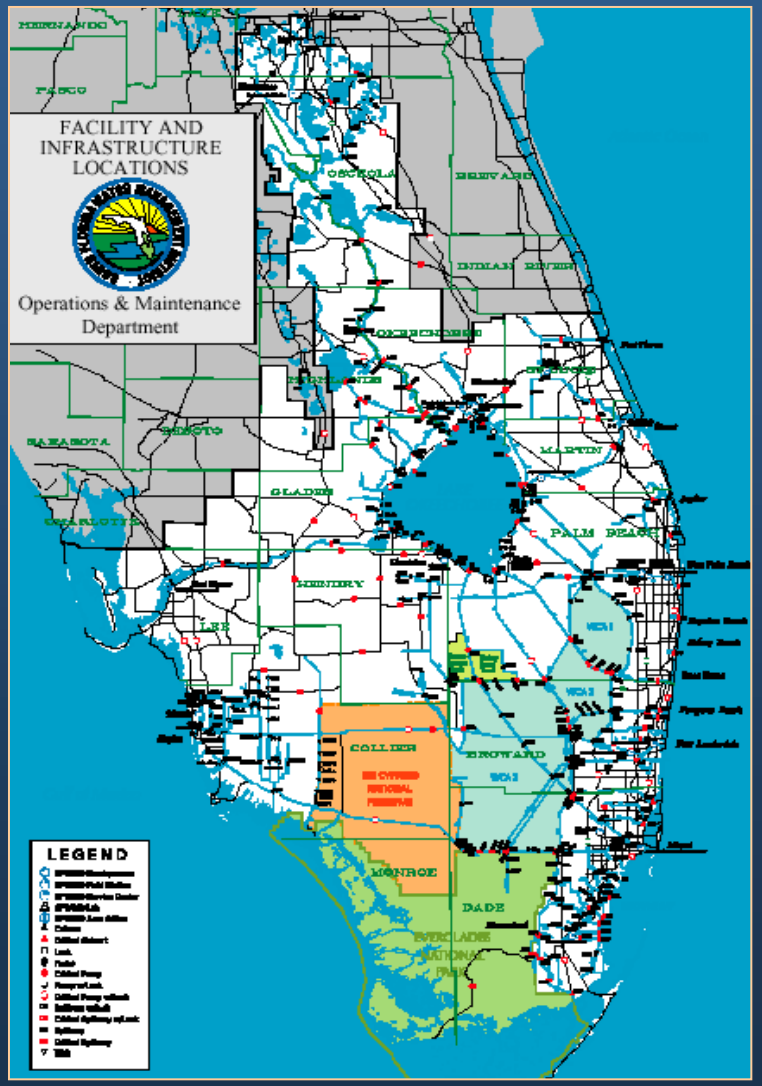


Areas Flooded in 1947

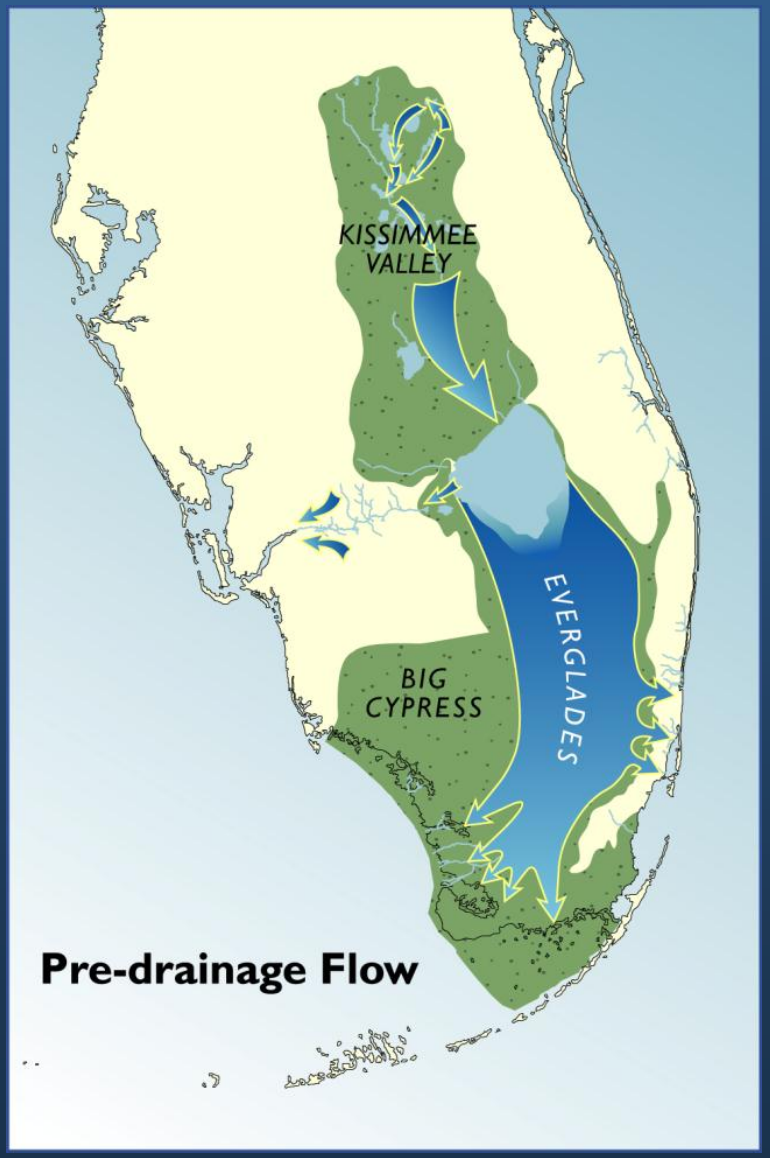
C&SF Project

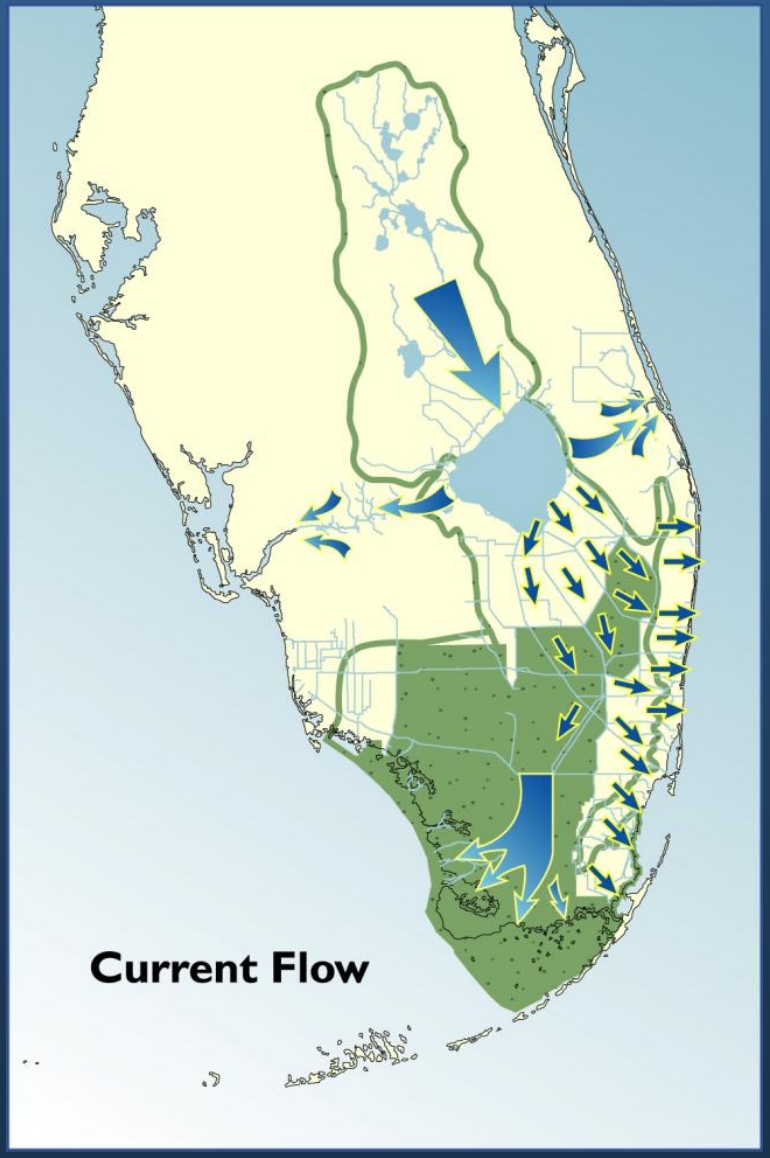
One of the world's largest and most complex water management systems

- 1,500 miles of canals
- 1000 miles of levees
- 200 water control structures



Everglades Historical vs. Current Flow

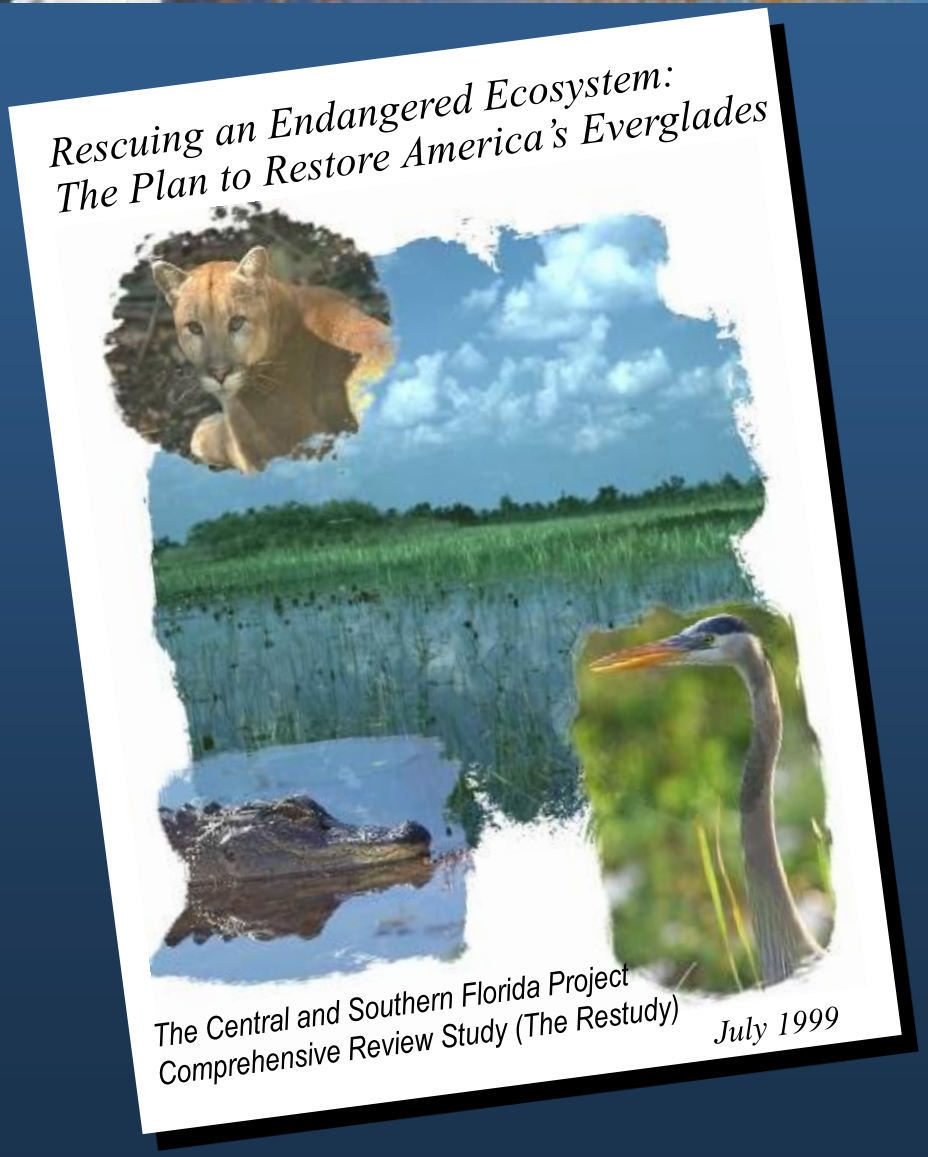




Impacts of the C&SF Project on the Everglades Ecosystem

- Too much or too little water for the South Florida ecosystem
- 1.7 billion gallons of water per day is lost to the ocean
- Declining estuary health
- Massive reductions in wading bird populations
- Degradation of water quality
- Loss of native habitat to invasive exotic vegetation
- 68 Federally-listed threatened and endangered species
- An ecosystem in trouble…

Comprehensive Everglades Restoration Plan (CERP)



- On July 1,1999, the Secretary of the Army and the State of Florida presented the Plan to Congress
- Approved by Congress as the Framework for Everglades Restoration in the Water Resources Development Act of 2000 (WRDA-2000)

Project Cost Sharing

50% Federal

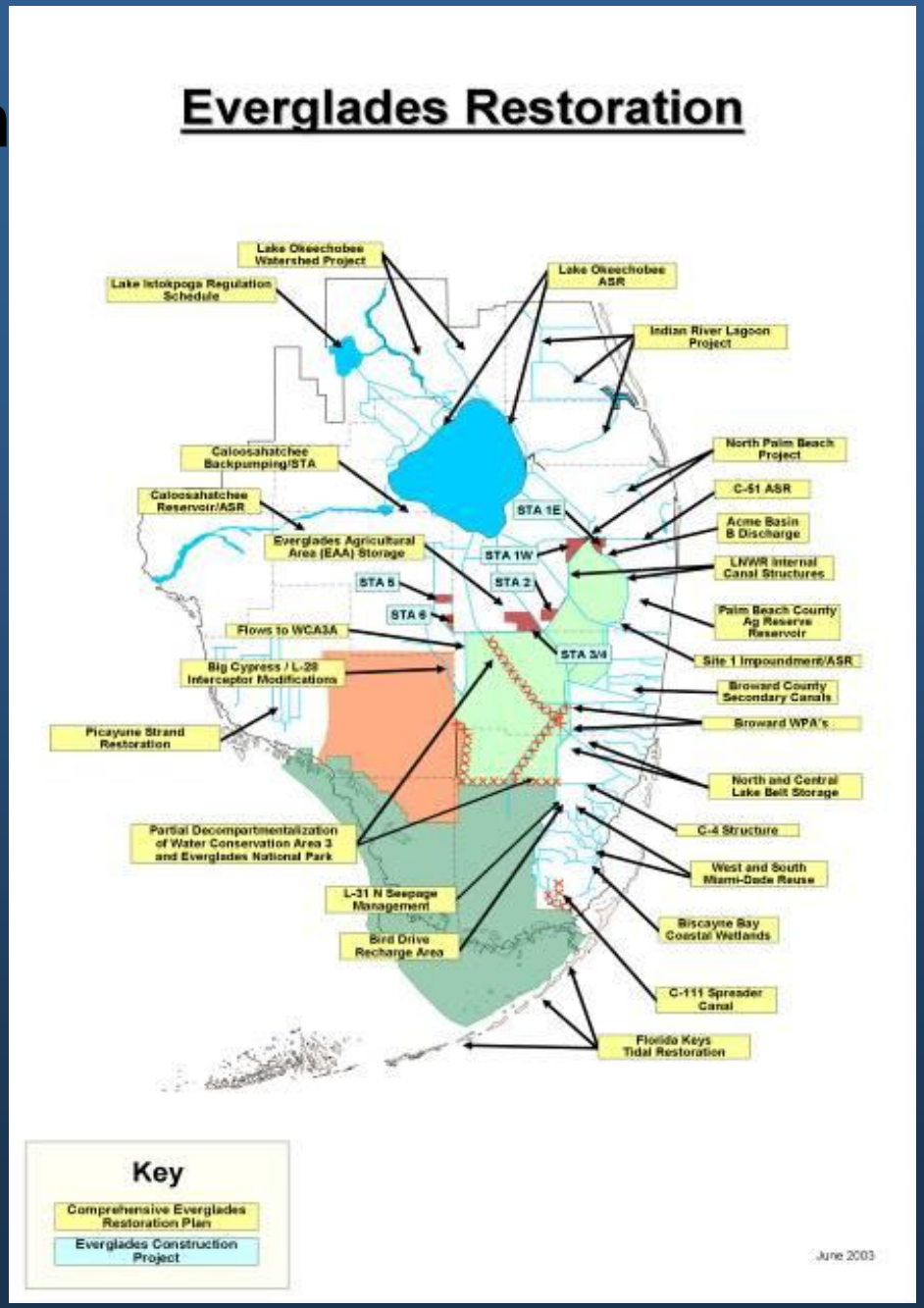
50% State

Comprehensive Everglades Restoration Plan

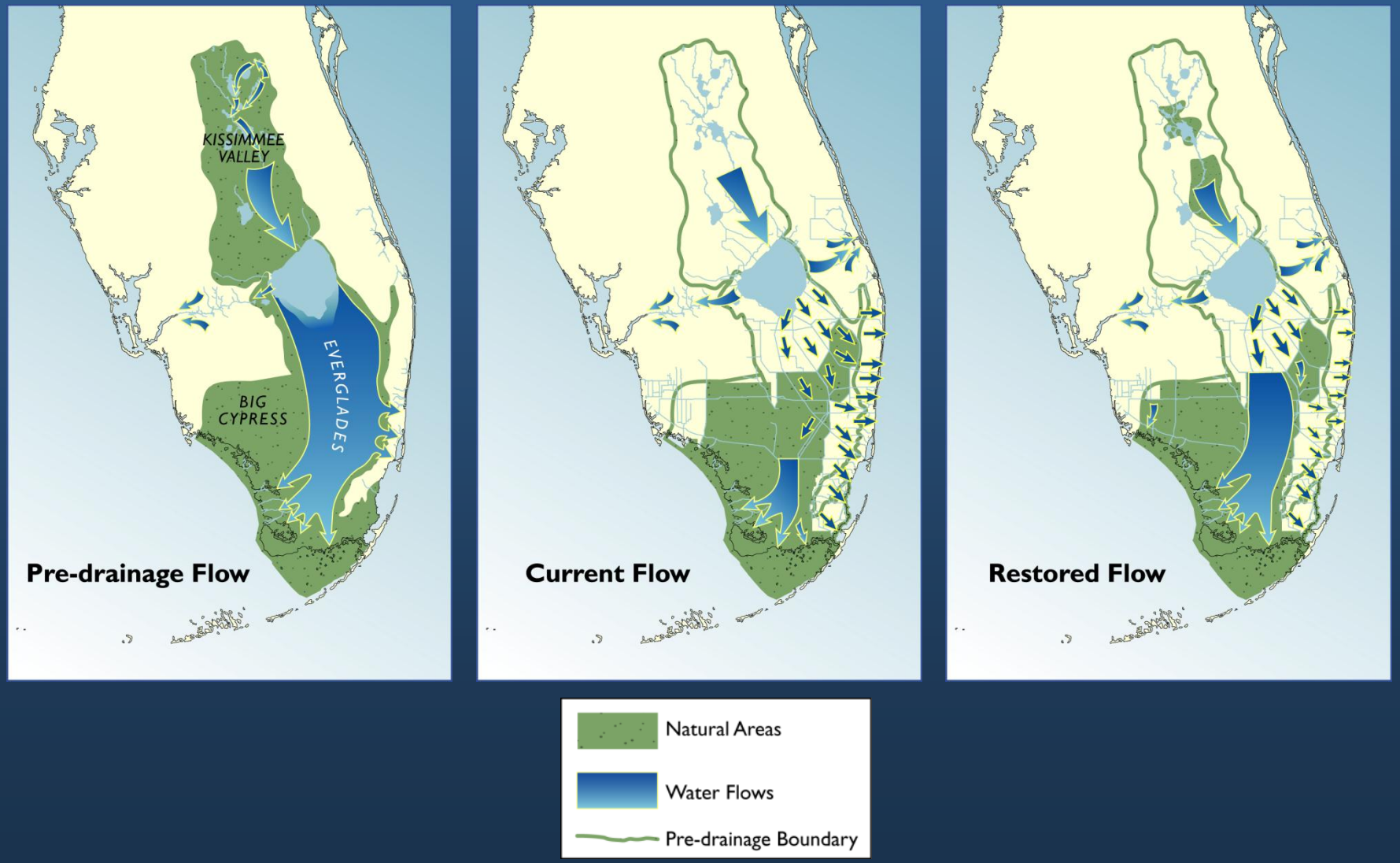
Includes 68 components to be implemented over 35 years

WRDA Big 3

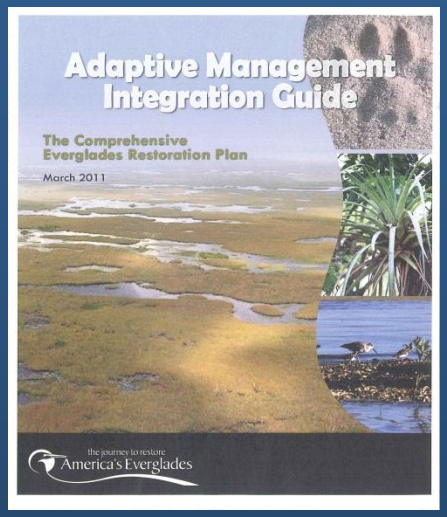
- *Level of service for flood protection*
- *Effects on existing legal source of water*
- *Protection of water for the natural system*



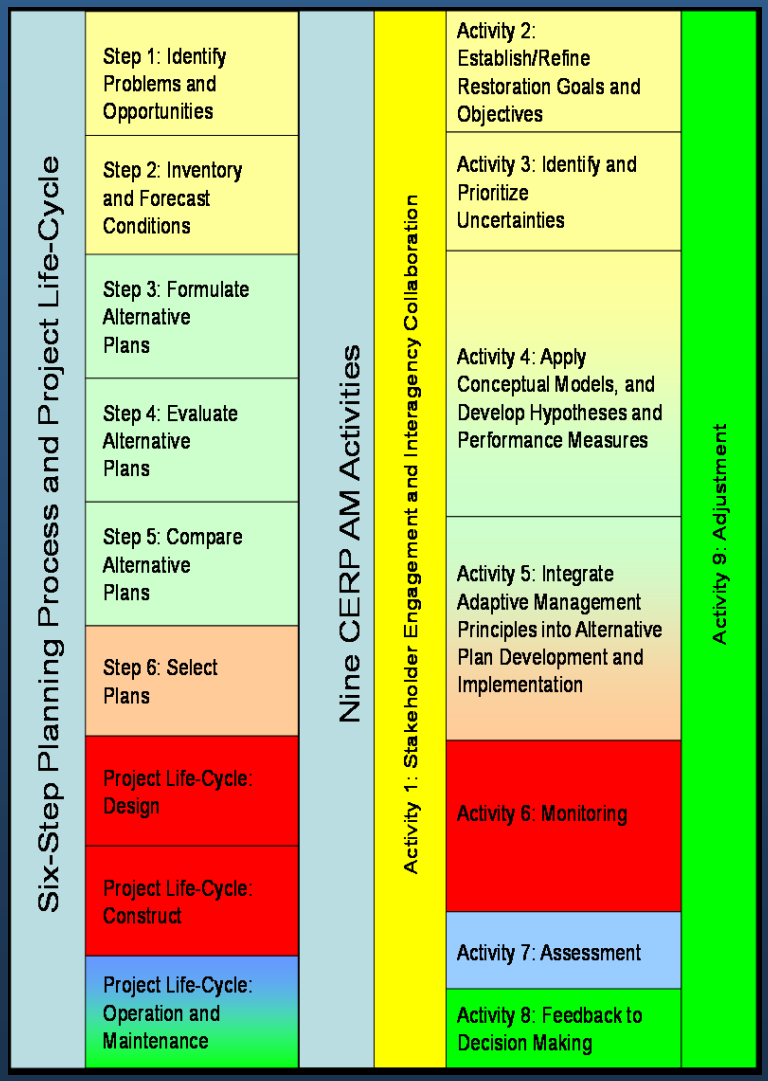
CERP Goal


KISSIMMEE VALLEY
BIG CYPRESS
EVERGLADES
Pre-drainage Flow
Current Flow
Restored Flow
Natural Areas
Water Flows
Pre-drainage Boundary

Everglades Restoration Adaptive Management



- CERP contains a provision for the use of Adaptive Management (AM)
- AM links science to decision making and improves probability of restoration success
- CERP Programmatic Regulations (2003) require development of AM program



What Is the Goal of Adaptive Management?

- AM facilitates natural resource management or environmental restoration activities when uncertainty about the potential outcomes of management actions is present (NRC, 2007)
- Allows stakeholders to proceed without a fixed design and to reduce uncertainty through the iterative refinement of management actions ideally based on experimentation (Lee, 1999; Walters and Holling,1990)
- This is "Learning by Doing" NOT "Trial and Error"
  - Plan, Act, Monitor, Evaluate

What is Adaptive Management?

- AM processes include:
  - Management objectives that are regularly revisited and accordingly revised
  - Model or models of the managed system
  - The monitoring and evaluation of outcomes
  - Mechanisms for incorporating what is learned into models guiding future decisions
  - A collaborative process for stakeholder participation and learning

  (NRC, 2004)

What is Adaptive Management?

- Additional processes that should be considered:
  - Design formulation should include operational flexibility
    - Define ranges of operations based on hydrologic parameters to include rainfall frequency, flood protection, water supply, wetland enhancement
  - Critical project features that are dependent on unclear hydrologic processes should be identified and moved to a later phase or scaled downward until sufficient monitoring can be obtained to move forward (pilot tests)

What is Adaptive Management?

- Additional processes that should be considered (cont.):
  - Performance objectives and permits should include recognition that there will always be short term environmental impacts when restoring and altered ecosystem
    - Water quality, endangered species, exotics, hydropatterns
  - Environmental rules and permits should be more flexible during construction and project start-up, recognizing that the long term benefits outweigh the short term impacts/risk

C-111 Spreader Canal and AM

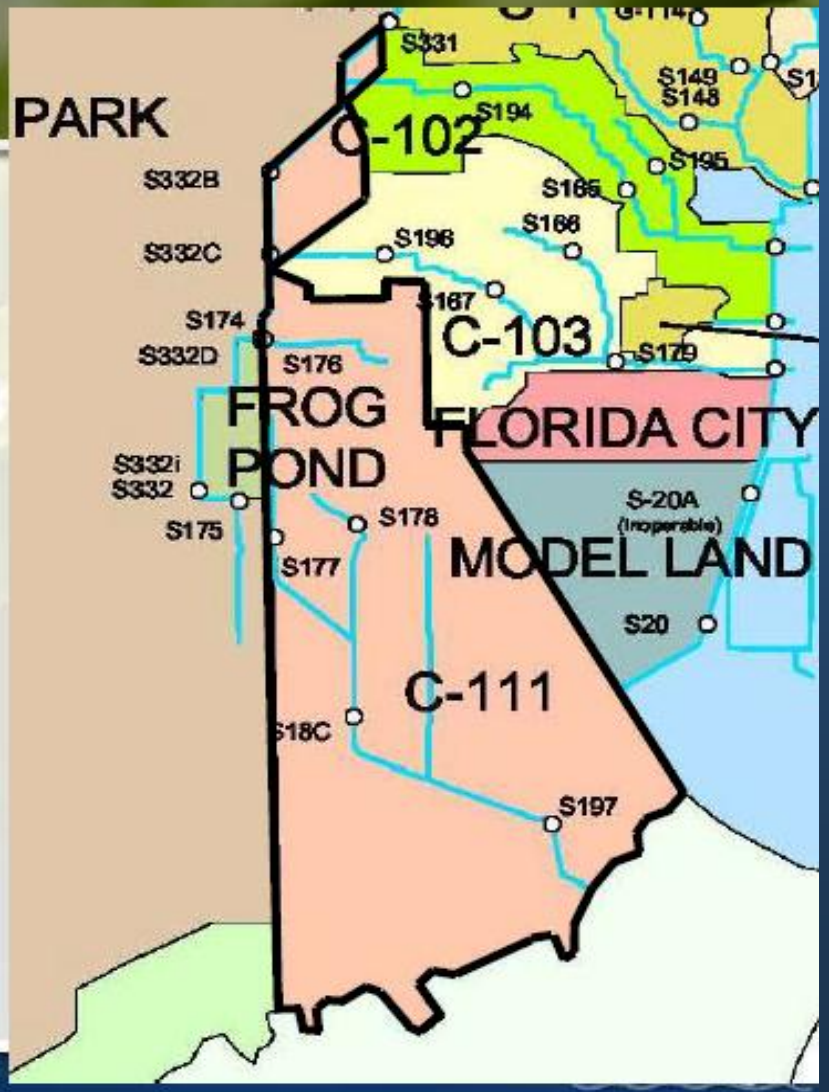
Drainage of the System and Water Flow Alterations

- Pre-Central and South Florida Projects
- Central and South Florida Projects initiated in 1948
- C-111 Canal Constructed as a result of 1962 Flood Control Act

C-111 Basin

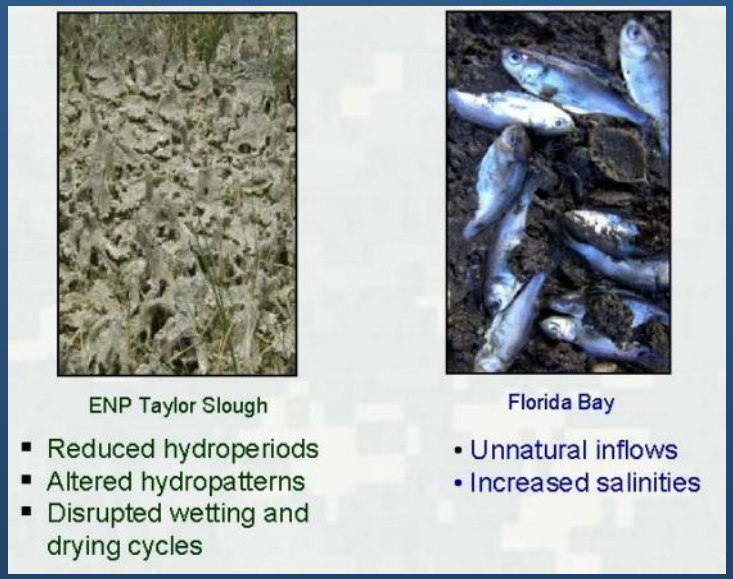
C-111 Basin Map

The C-111 Basin serves an area in excess of 100 square miles, and includes Homestead and portions of Florida City



C-111 Environmental Issues

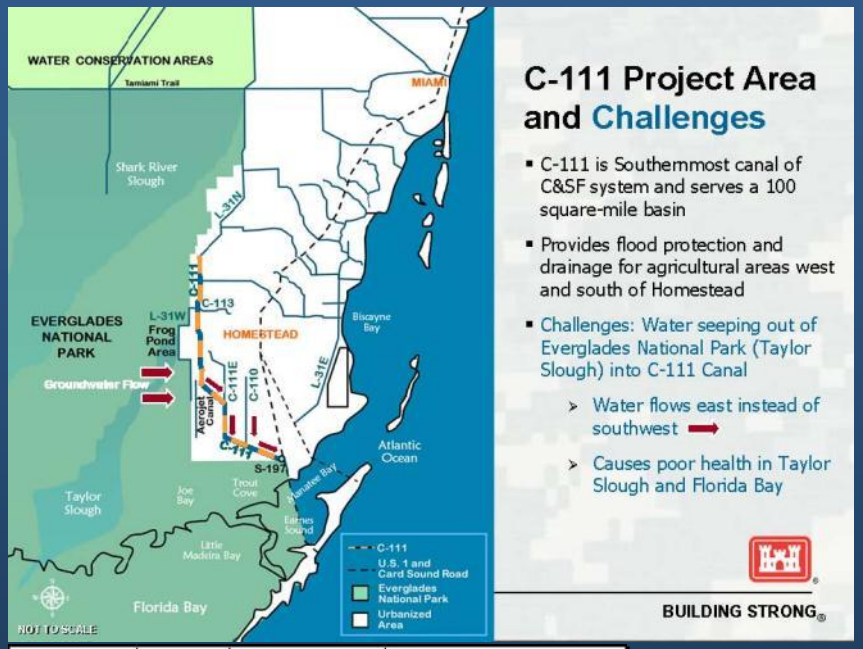
- Seepage from Everglades National Park (ENP) and specifically Taylor Slough to C-111
- Loss of areal extent of freshwater wetlands
- Alteration of historical flow patterns
- Colonization of natural areas by invasive exotics
- Reduction in surface and groundwater flows to estuaries
- Adverse impacts to juvenile fish as a result of hypersalinity
- Degradation of water quality
- Declining of estuary health

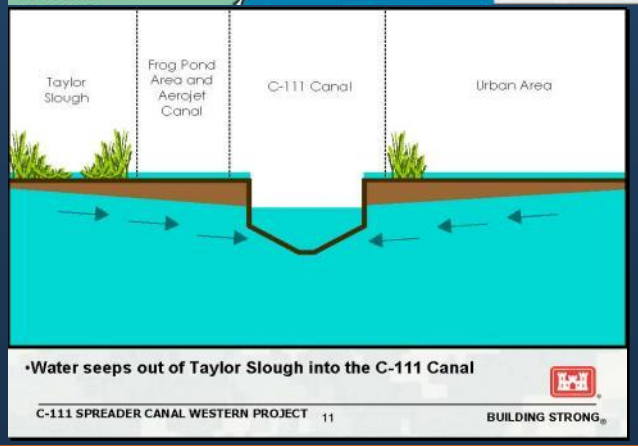


A total of 45 fish species, 14 amphibian species, 46 reptilian species, 14 mammalian species and 178 avian species have been documented to occur in the region including at least 36 state or federally listed species (endangered threatened or special concern)

Restoration Opportunities and Objectives

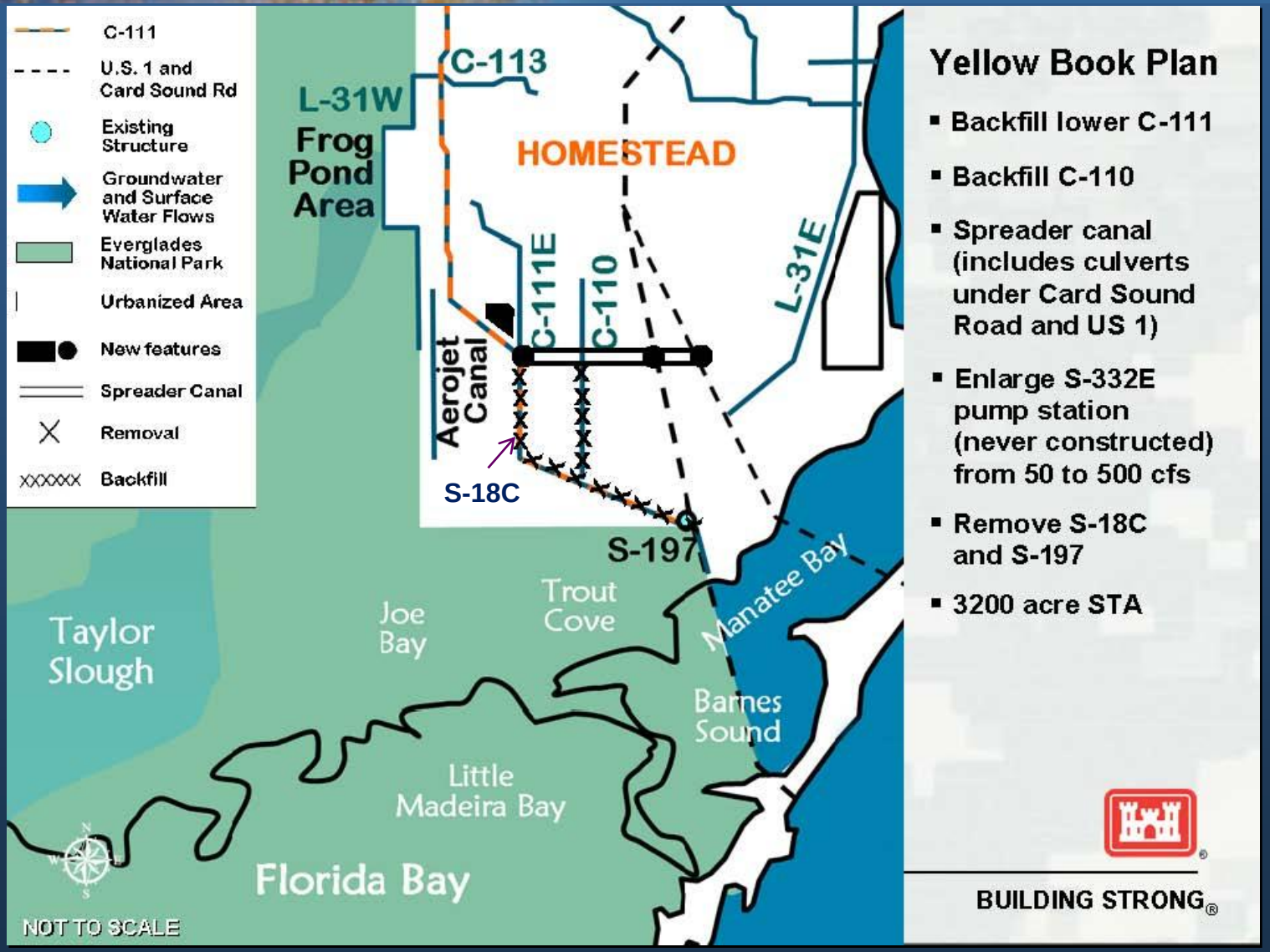
- Restore the quantity, timing and distribution of water delivered to Florida Bay via Taylor Slough to pre-drainage levels
- Improve hydropatterns in the Southern Glades and Model Lands
- Restore pre-drainage coastal zone salinities





Source: Civil Works Review Board (CWRB) Briefing, Jacksonville District USACE, Dec. 2009

C-111 Spreader Canal CERP Plan



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C-111 Project Implementation Report (PIR)

- Development from 2005-2010
- Federal Advisory Committee Act (FACA)
  - Only governmental entities at table
  - Others stakeholders comment but not necessarily addressed
- Multiple approval levels, OMB overrule
- No streamlined inter-agency dispute resolution
- Slow Congressional authorizations
  - 2000, 2007, ??
- Inefficient planning process

Stakeholder Concerns with C-111 Spreader Canal PIR

- Cape Sable Seaside Sparrow nesting
  - How would rehydration affect nesting
- Move canal as far north as possible
  - More land acquisition
- Make canal alignment follow set contour
  - Curvilinear vs. straight line
- Fill in all existing canals
  - Acquire impacted lands
- Reduce seepage from ENP
  - Benefit to Taylor Slough

AM and Public Involvement Strategies for C-111 Spreader Canal Project

State Accelerates C-111 Outside of CERP Process

- 2008 SFWMD starts own planning process
  - Goal is to reach consensus between widely diverging interests and construct project
- Ecosystem restoration benefits sooner
- Faster implementation than Federal
  - Shorter planning time frame
  - Reduced approval levels,
  - State to provide financing
- State at risk for federal crediting
  - Land, design, construction $
  - State must obtain federal permits

SFWMD Creates Inclusive Stakeholder Process

- Water Resources Advisory Committee
  - WRAC Issues Workshops on C-111 Spreader Canal Project
  - Outside Federal Advisory Committee Act (FACA)
  - All inclusive, everyone at table
    - NGO's
    - Agriculture, Urban
    - Governmental
    - Tribal
  - All meeting in the Sunshine

SFWMD Creates Inclusive Stakeholder Process

- Frequent meetings
- Separate tailored agendas
- Monthly feedback to WRAC and GB
  - Issue identification
  - Modeling solutions
  - Consensus building
  - Outstanding concerns
  - Next steps
  - Assignments

WRAC Workshop Results

- Consensus reached in 9 months
- Phase 1 and Phase 2 projects
- Phase 1 - reduce seepage from ENP
  - Western Project includes;
    - Pump stations to pull excess water from C-111
    - Reservoir construction
    - Canal conveyance reduction
      - Weirs
      - Canal plugs
    - Soil remediation
  - Adaptive management monitoring

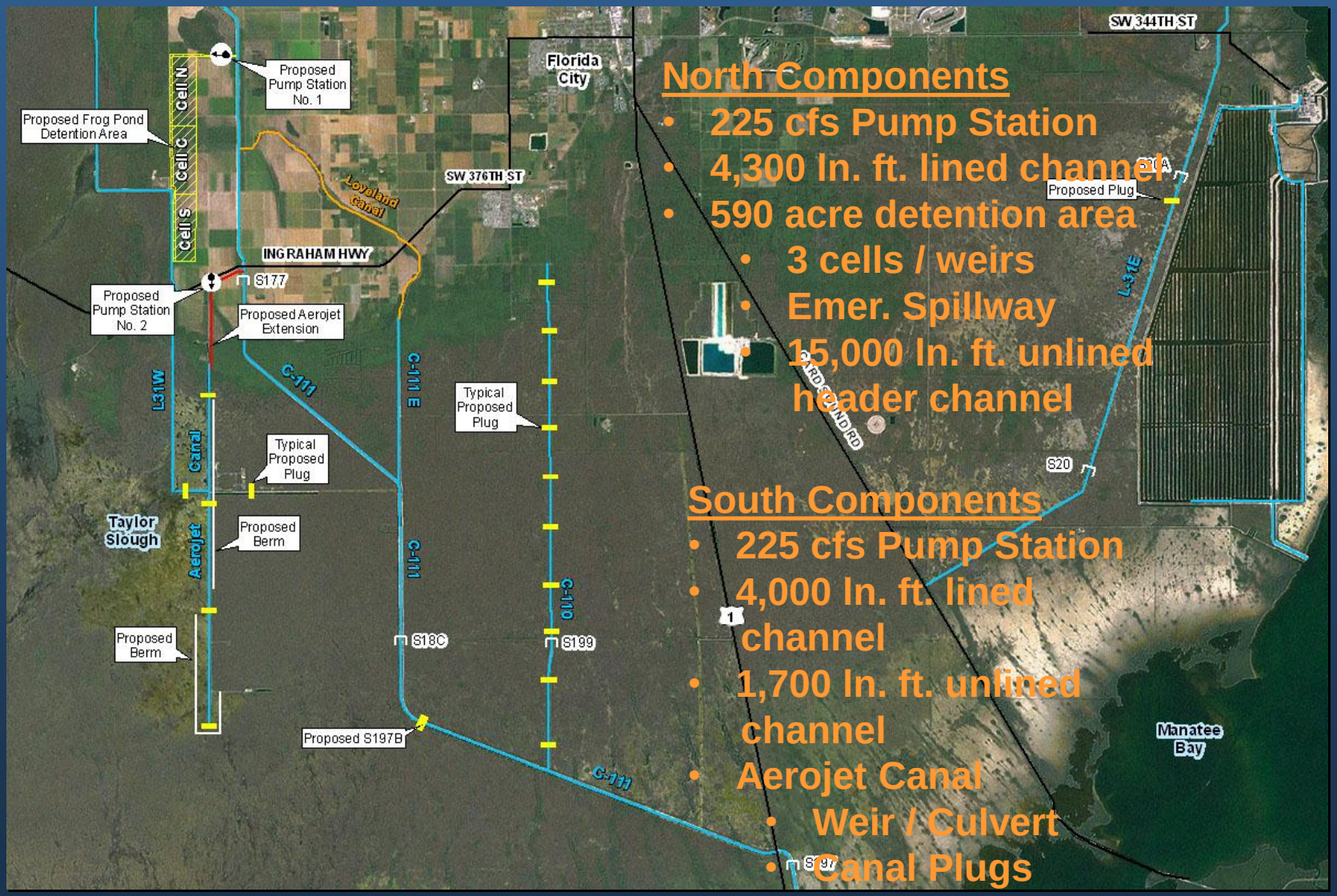
WRAC Workshop Results

- Phase 2 – rehydrate Model Lands
  - Eastern Project
    - Incorporate PH- 1 adaptive management monitoring
      - Flood impacts
      - Groundwater monitoring
      - Pilot spreader test using existing canal
      - Seepage reduction estimates
      - Hydropattern improvements
    - Spreader canal alignment
    - Canal backfilling
    - Water control structure removal

WRAC Workshop Results

- Phase 2 (cont.)
  - + Reservoirs if necessary
  - + Pump stations if necessary
  - Water quality improvements
  - Canal berm removal
  - Recreational opportunities

Phase 1 Components



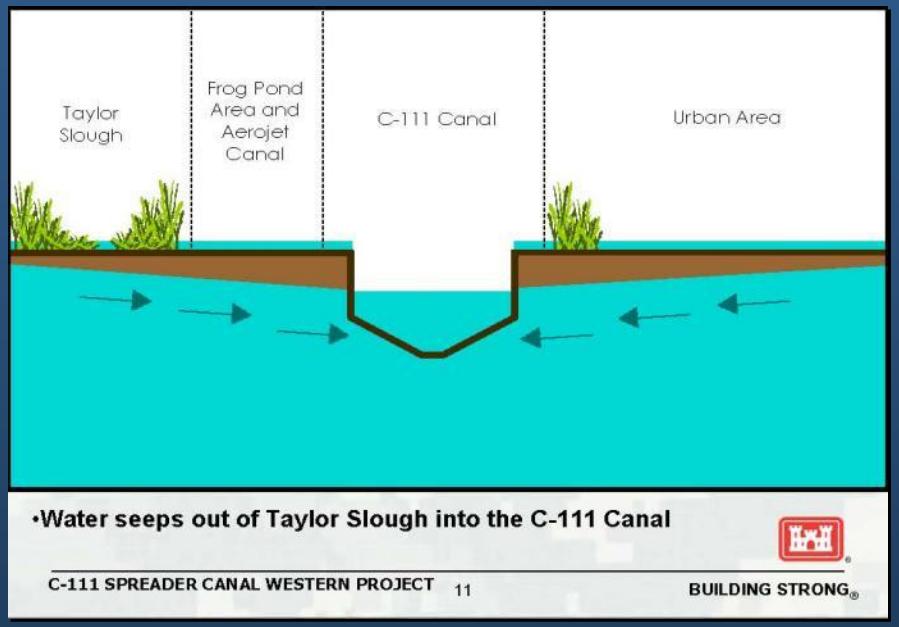
North Components

- 225 cfs Pump Station
- 4,300 ln. ft. lined channel
- 590 acre detention area
  - 3 cells / weirs
  - Emer. Spillway
  - 15,000 ln. ft. unlined header channel

South Components

- 225 cfs Pump Station
- 4,000 ln. ft. lined channel
- 1,700 ln. ft. unlined channel
- Aerojet Canal
  - Weir / Culvert
  - Canal Plugs

Phase 1 Objectives



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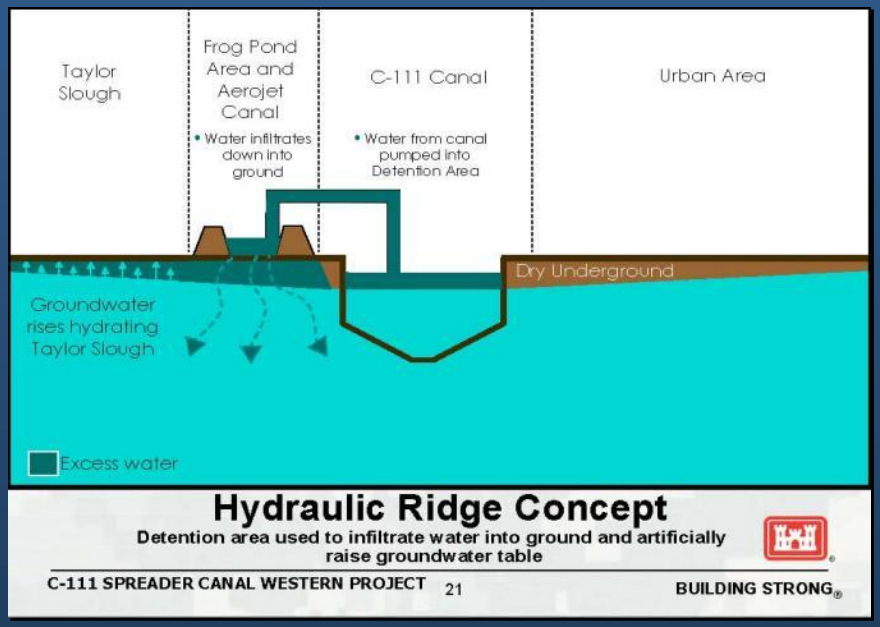
Existing Condition



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Proposed Condition

AM Project Level Monitoring

- Hydrological monitoring is necessary to guide AM decisions, protect existing levels of flood damage reduction and evaluate overland flow/seepage for future spreader canal alignment
- Ecological monitoring is necessary to ensure project benefits, ensure no adverse impacts to protected species or ENP and guide future AM decisions
- Water quality monitoring is necessary to remain compliant with State law

Summary

- Adaptive Management is a crucial element to any environmental restoration project
- The C-111 Spreader Canal project incorporated many existing aspects of AM and expanded its usefulness to the planning process
  - Stakeholder Involvement – 9 months to consensus
  - Divided project into 2 phases – shifted uncertain benefits/components to second phase and pilot testing
  - Design/Permit Flexibility – 225 cfs pump stations w/ empty bay for additional capacity
  - Held construction of Structure S-198 until it was determined to be necessary

Summary

- The use of AM must be expanded to include not only an emphasis on modeling but also on public input, project planning and implementation including:
  - Potential phasing
  - Permit and regulatory flexibility during construction and operations
  - Project monitoring for making appropriate AM future decisions
- The USACE incorporated the results of State planning process and received authority to submit a Phase 1 PIR to Congress (Chiefs Report) in 2011

Summary

- The Phase 1 portion of the C-111 spreader Canal began construction 2010 and was operational March 2012

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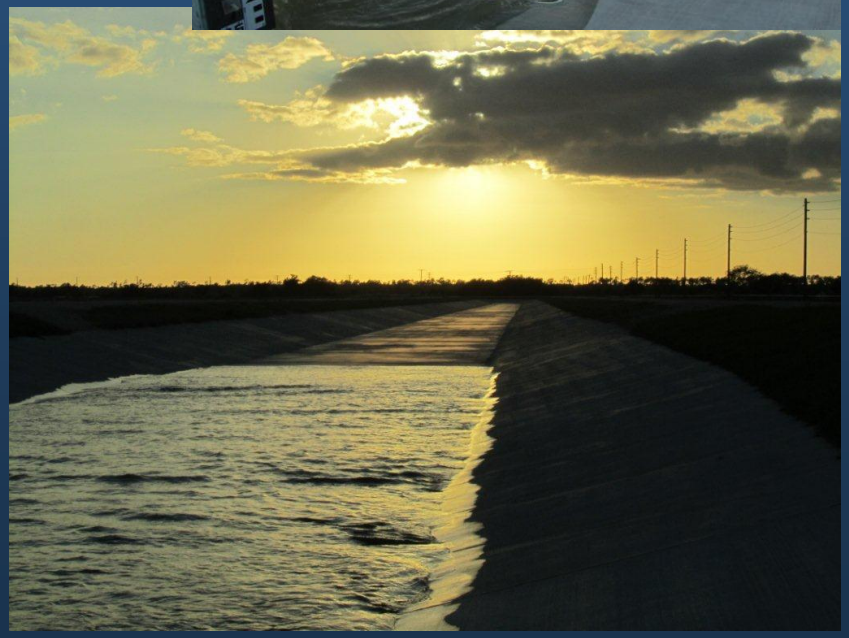
Thank You!



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