SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Historical Overview of Current Kissimmee Basin Projects: How the Pieces Fit and Overlap

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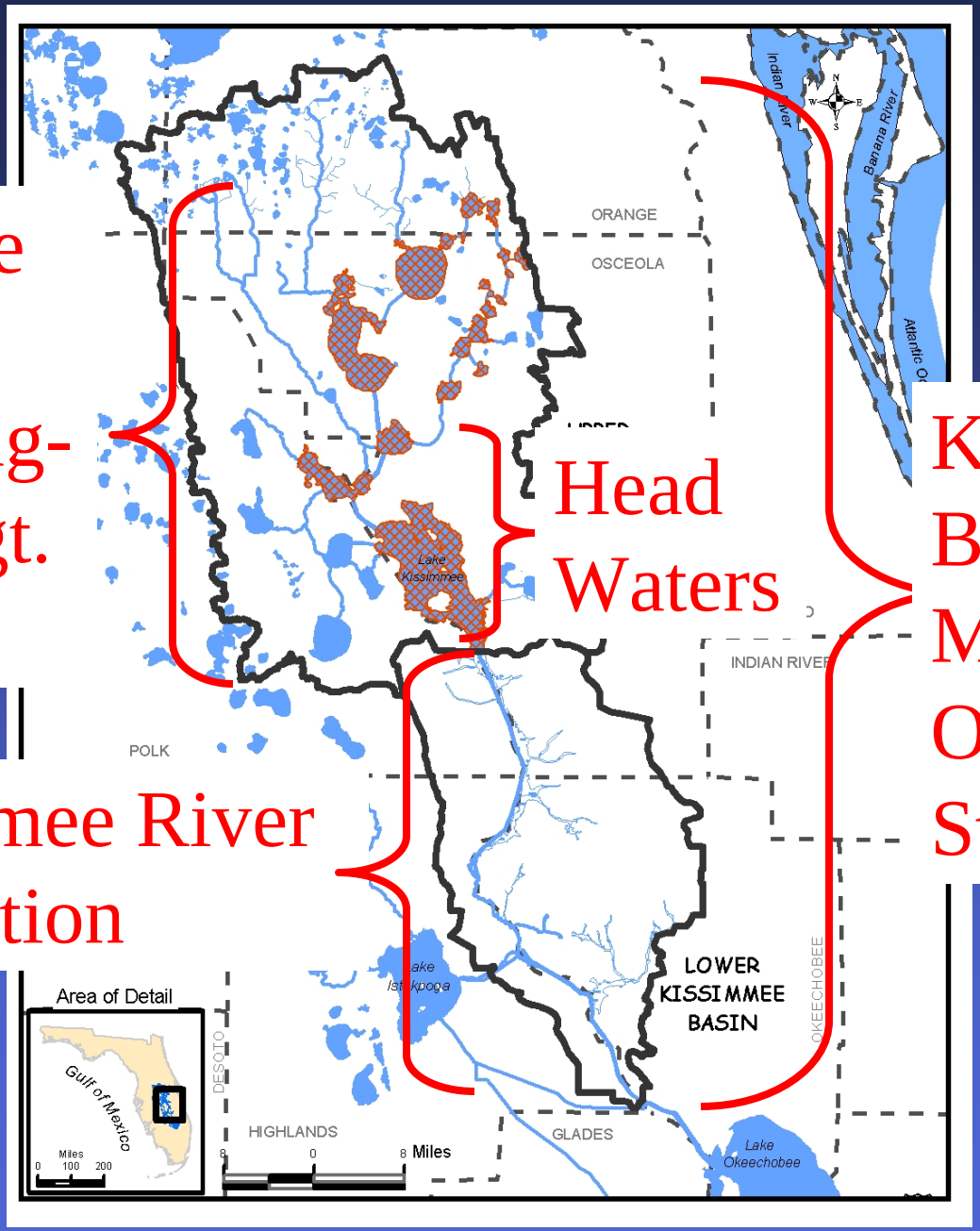
sfwmd.gov

Kissimmee Chain of Lakes Long-Term Mngt. Plan



Head Waters

Kissimmee Basin Modeling & Operations Study

Kissimmee River Restoration

Project	KRR	HWR	KBMOS	LTMP
Basis	Ecosystem Restoration	Storage and Wetland Quantity and Quality	Assess Current Operations	Coordinate Management Actions and Operations
Goal	Ecological Integrity	Water for KRR	Operations criteria	Enhance and Sustain Lake Health
Evaluation	Ecosystem – level Performance Measures	Monitoring	Hydrologic Performance Measures	Hydrologic & Ecologic Performance Measures

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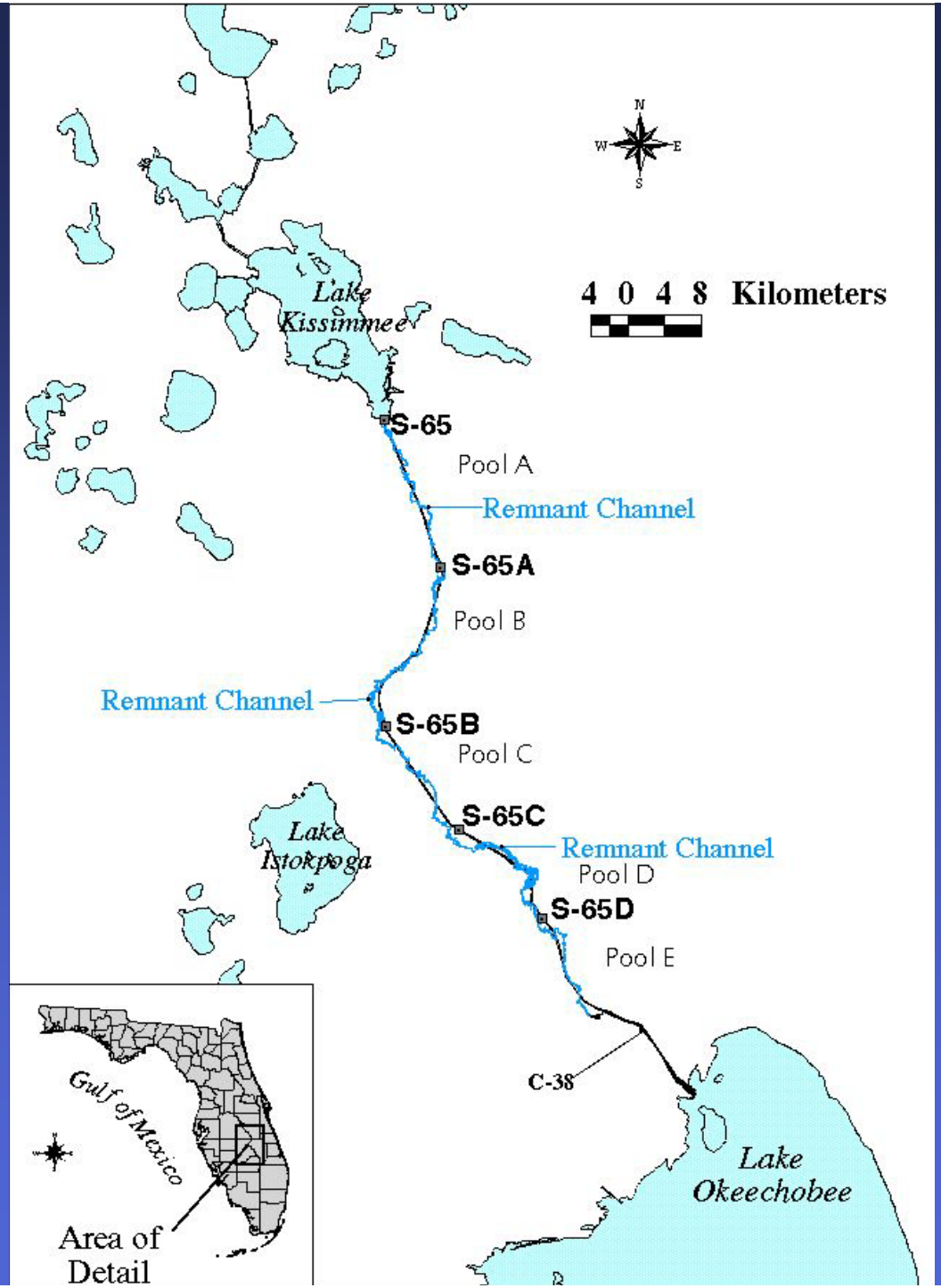
Kissimmee River Valley, circa 1955

City of Kissimmee Flooding circa 1948

Channelization

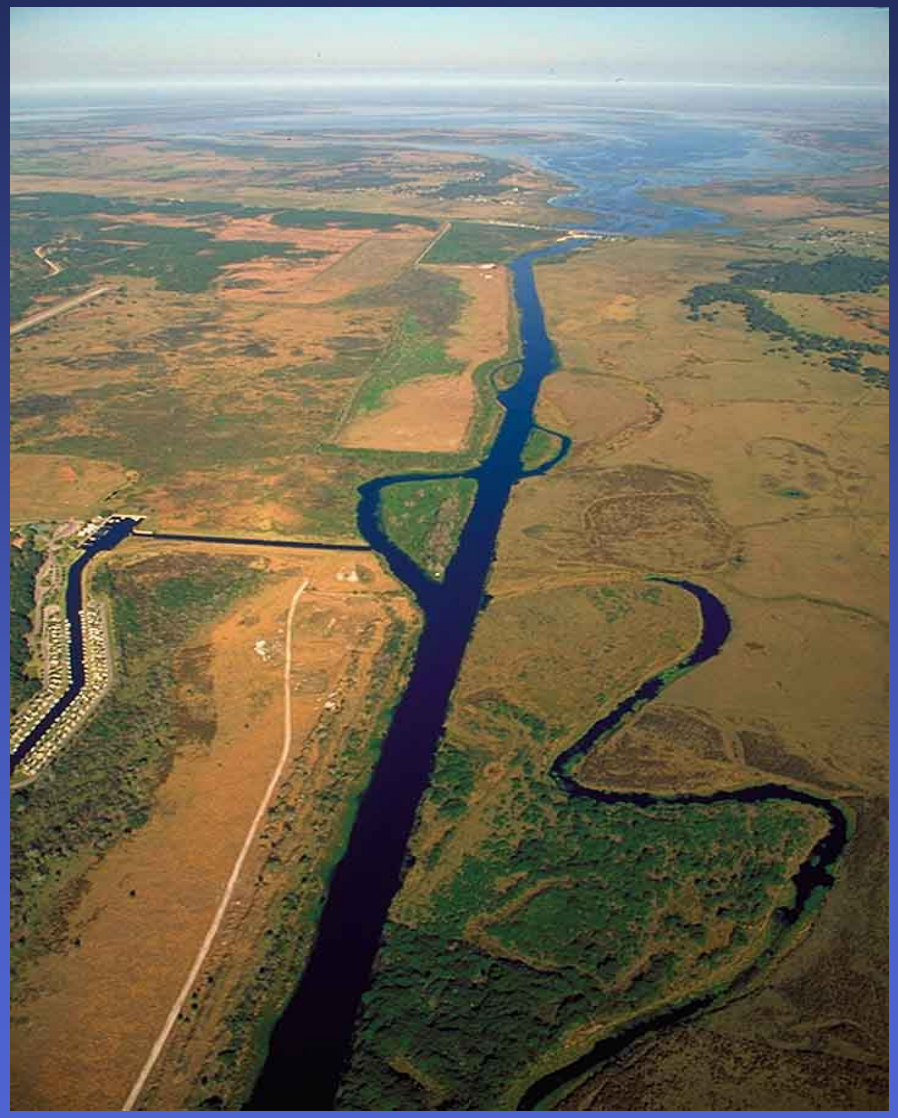
1962-1971



Channelized Kissimmee River

Effects of Channelization

- Elimination of Floodplain Innundation
  - Shift to terrestrial plant communities
  - Fewer wading birds, ducks using floodplain
  - Loss of highly productive habitats for fish and aquatic invertebrates
- Loss of flow in remnant river channels
  - Increases in floating vegetation
  - Increases in organic matter deposition
  - Lower dissolved oxygen
  - Shift in fish, invertebrate communities



Pre-channelization

Post-channelization

Restoration Initiative

- 1971 – USGS Report
- 1976 – Kissimmee River Restoration Act (FL legislature)
- 1978 – 1st Feasibility Study
- 1984 – SFWMD Demonstration Project
- 1990 – 2nd Feasibility Study
- 1992 – Water Resources Development Act authorizes KRR (Federal legislature)
- 1994 – Project Cooperative Agreement

Mandates

- 1976 Kissimmee River Restoration Act
  - Restore seasonal water level fluctuations in the floodplain
- 1992 Water Resources Development Act
  - Restore river/floodplain ecosystem according to criteria outlined in 1990 Alternative Plan Evaluation and Preliminary Design report and 1991 Integrated Feasibility Report/EIS

5 Restoration Criteria

- Continuous flow with duration and variability comparable to pre-channelization periods
- Average flow velocities between 0.8-1.8 ft per second, when flow within bank
- Stage discharge relationship resulting in overbank flow >1400 ft^2/sec and >2000 ft^2/sec
- Stage recession rates on floodplain

  <1 ft/month
- Floodplain inundation comparable to historic hydrographs

Ecological Integrity Goal

Defined as “the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to natural habitat of the region”. (Frey 1975, Karr and Dudley 1981)

Approach for the Kissimmee River Restoration Project

Reconnect, reconstruct physical form of the river

Modify headwater inflows to mimic historical patterns

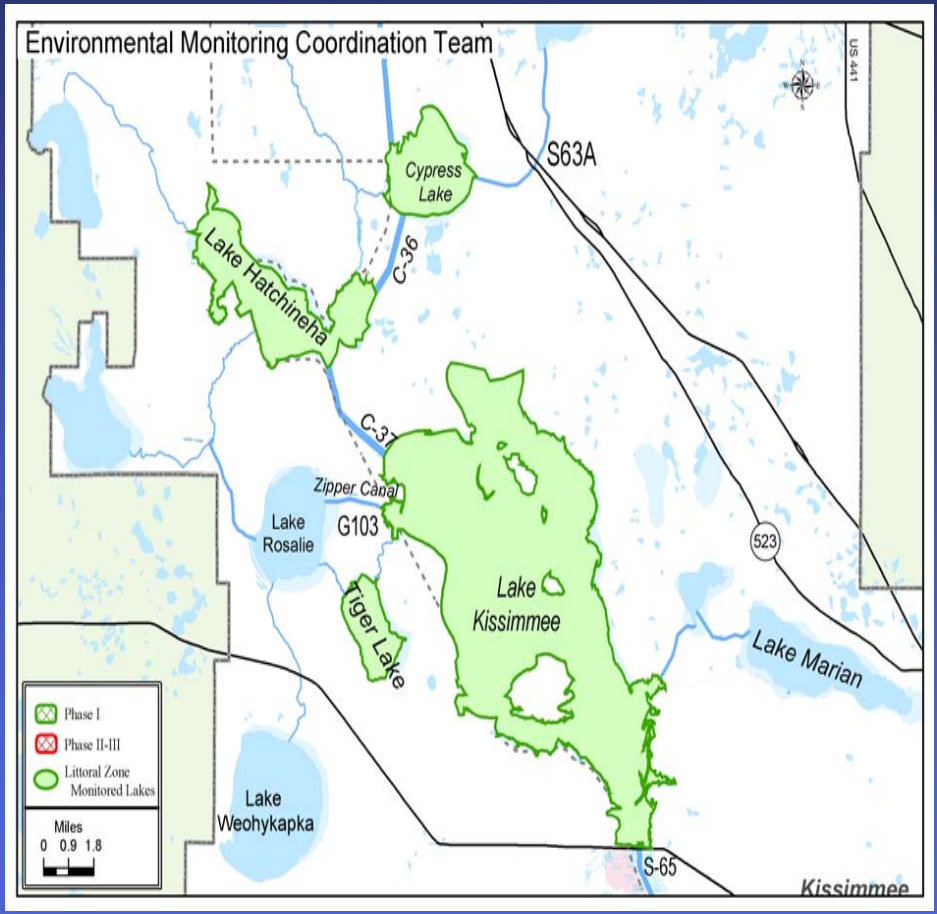
Restoration of ecological integrity to central region of the Kissimmee River

Kissimmee River Restoration Project

- 50/50 cost share USCOE/SFWMD
  - $620 Million
- Backfill 22 mi of C-38 canal
- Recarve/reconnect more than 40 mi of river channel
- Remove 2 water control structures (one has been removed)
- Headwaters Revitalization Project – to provide outflows from headwater lakes needed to restore the Kissimmee River - 2011
- Comprehensive restoration evaluation program – thru 2017

Headwaters Revitalization
(Lakes Kissimmee, Hatchineha, Cypress, Tiger)

- Changes how S-65 structure is operated at south end of Lake Kissimmee – 1996 Project Report/EIS
- Provide greater and more natural lake level fluctuations and delivery to Kissimmee river
- Expand existing peripheral marsh habitats (~7200 acres)
- Provide adequate operational flexibility to incorporate management strategies that meet the needs of the Kissimmee River and lower chain of lakes.



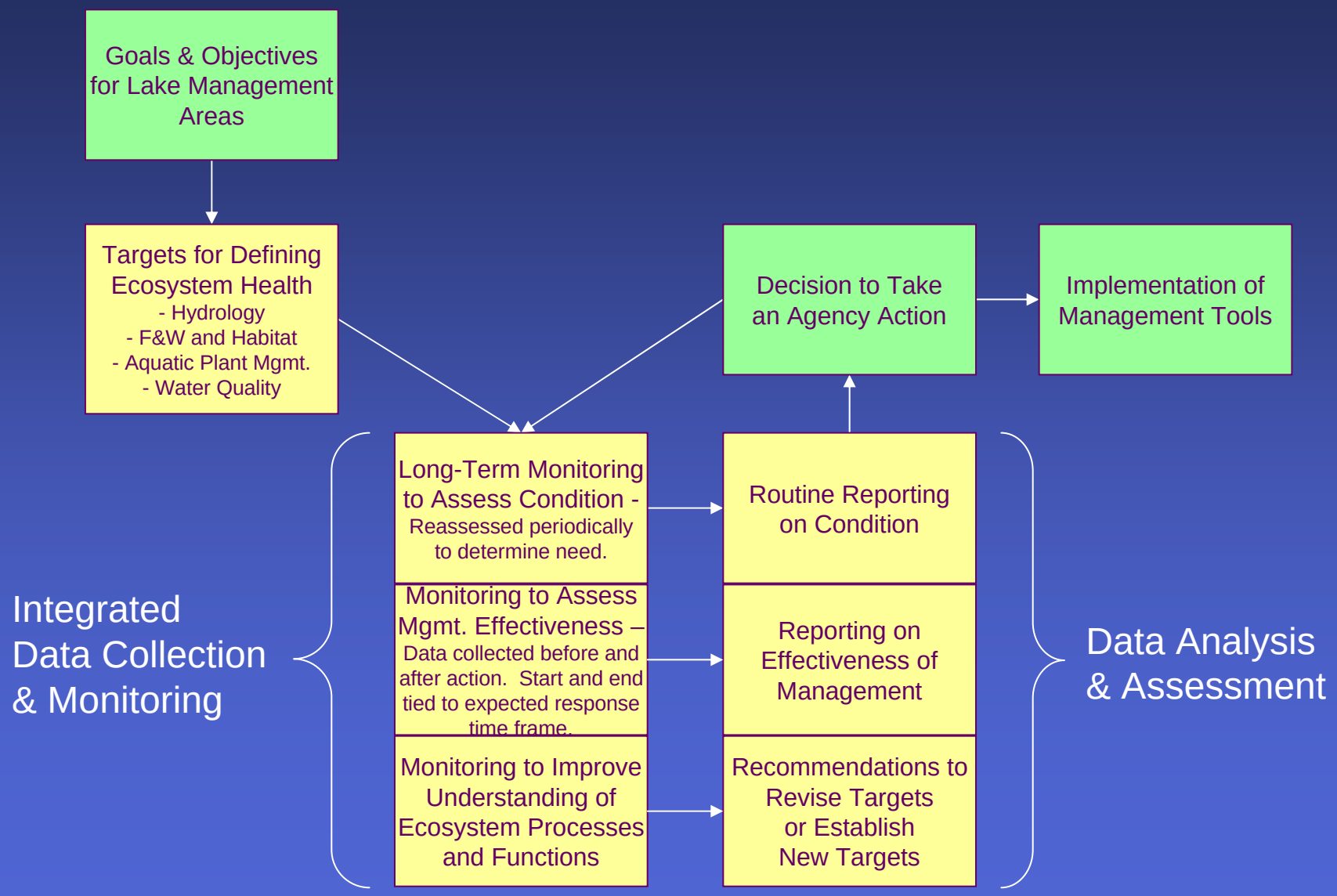
KCOL Long Term Management Plan

- Adaptive management framework for Inter-agency decision making
- Assessment performance measures and indicator measures for lakes

Effects of Channelization & Water Regulation on the Kissimmee Chain of Lakes

- Loss of fluctuating lake water levels
  - Increased in organic matter deposition along the lakeshore
  - Lower dissolved oxygen
  - Shifts in vegetation communities to more problematic species

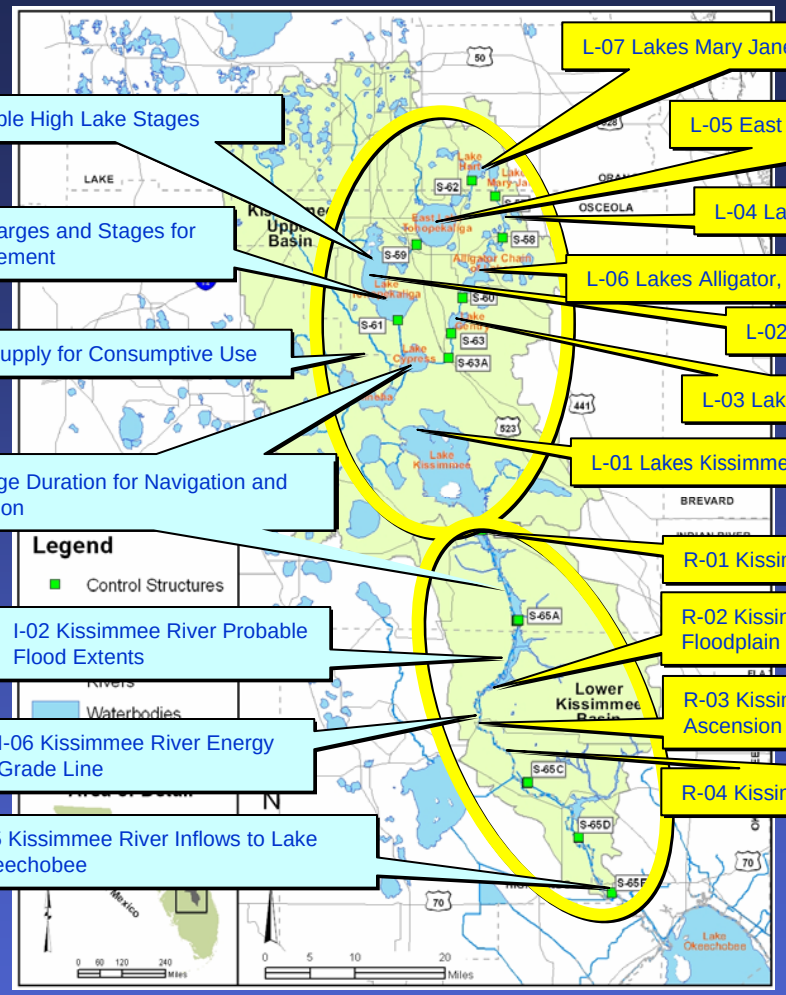
Role of Assessment Activities in Decision-Making and Application of Management Tools



Kissimmee Basin Hydrologic Assessment, Modeling, and Operations Study

KBMOS Goals

- "…achieve a more acceptable balance among operational objectives while balancing downstream ecosystem impacts…"
  - Flood Control
  - Water Supply
  - Aquatic Plant Management
  - Natural Resources



I-01Probable High Lake Stages

I-03Lake Discharges and Stages for Hydrilla Management

I-04 Water Supply for Consumptive Use

I-07 Stage Duration for Navigation and Recreation

I-02 Kissimmee River Probable Flood Extents

I-06 Kissimmee River Energy Grade Line

I-05 Kissimmee River Inflows to Lake Okeechobee

L-07 Lakes Mary Jane and Hart

L-05 East Lake Toho, Fell's Cove, & Lake Ajay

L-04 Lakes Joel, Myrtle, & Preston

L-06 Lakes Alligator, Brick, Lizzie, Coon, Center and Trout

L-02 Stages in Tohopekaliga

L-03 Lake Gentry

L-01 Lakes Kissimmee, Hatchineha, Cypress & Tiger

R-01 Kissimmee River Flow

R-02 Kissimmee River Stage Hydrograph / Floodplain Hydroperiod

R-03 Kissimmee River Stage Recession / Ascension

R-04 Kissimmee River Channel Velocity

A suite of **Performance Measures** and **Performance Indicators** were developed to evaluate alternatives

Desired Hydrology

- Lakes
  - Seasonality and Variability in Lake Stages
  - Stage Recession and Ascension Rates
  - Extreme high and extreme low events at a specified frequency, timing, and duration
- River
  - Continuity and Seasonality of Flows
  - Stage Recession and Ascension Rates
  - Floodplain Inundation (depth and duration)

Evaluation Performance Measures

- Define the natural resource requirements for meeting the ecological integrity goal for the river and the ecosystem health goal for the lakes.

Evaluation Performance Indicators

- Define flood control, water supply, aquatic plant management, and other operational requirements for the C&SF project

Constraint Evaluation Performance Indicators

Flood Control

- I-01. Probable High Lake Stages
- I-02. Kissimmee River Probable Flood Extents

Downstream Ecosystems (Lake Okeechobee)

- I-05. Kissimmee River Inflows to Lake Okeechobee

Energy Grade Line

- I-06. Kissimmee River Energy Grade Line

Opportunity Evaluation Performance Indicators

Water Supply

- I-04. Water Supply for Consumptive Use

Navigation

- I-07. Stage Duration for Navigation and Recreation

Aquatic Plant Management

- I-03. Lake Discharges and Stages for Hydrilla Management

Limitations

Work within:

- existing infrastructure (No structural modifications)
- Existing land interests (No additional land acquisition)

Study Team

STAKEHOLDERS

Phase I

Planning
Identified Issues
Establish Goals and Objectives
Defined Operating Objectives

→ Establish Model Requirements → Select Modeling Tools

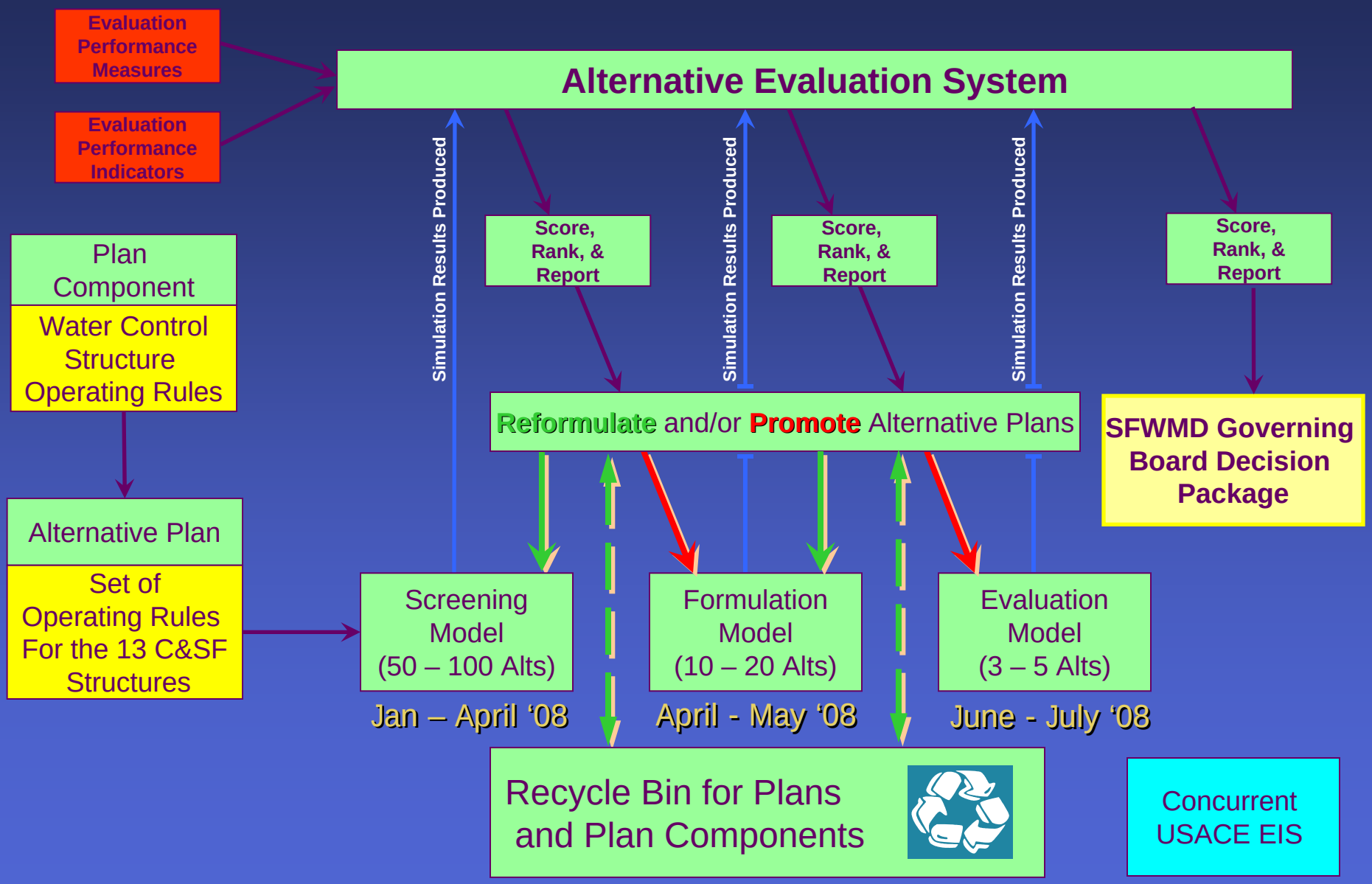
Phase II: Alternative Plan Selection Process

Alternative Screening → Alternative Formulation → Alternative Evaluation

Performance Measures
Performance Indicators

→ Alternative Evaluation System → **Decision Package**

Alternative Plan Selection Process



EIS for Modification of KB Structure Operating Criteria

- Evaluate alternatives relative to potential beneficial and adverse effects on
  - Flood control
  - Navigation
  - Water quality
  - Water supply
  - Wetlands and fish and wildlife habitats and values
  - Endangered and threatened species
  - Historical or archaeological resources
  - Public use and recreation

EIS

- Initiated May 2005
- Scoping letter sent out July 2005
- KBMOS planning process served as basis for USACE EIS scoping
- Scheduled for completion in late 2009

Inter-agency and stakeholder meetings to date

- July 8, 2004
- August 19, 2004
- August 31, 2004
- October 26, 2004
- September 29, 2005
- November 14, 2005
- November 16, 2005
- February 23, 2006
- February 28, 2006
- September 13, 2006
- February 15, 2007
- February 23, 2007
- March 1, 2007
- March 13, 2007
- March 16, 2007
- March 20, 2007
- March 27, 2007
- April 2, 2007
- April 3, 2007
- April 10, 2007
- April 17, 2007
- April 19, 2007
- April 25, 2007
- May 1, 2007
- May 8, 2007
- May 14, 2007
- May 15, 2007
- May 22, 2007
- May 29, 2007
- June 5, 2007
- July 12, 2007
- September 13, 2007

Future Updates to Lake O WRAC, WRAC, Governing Board

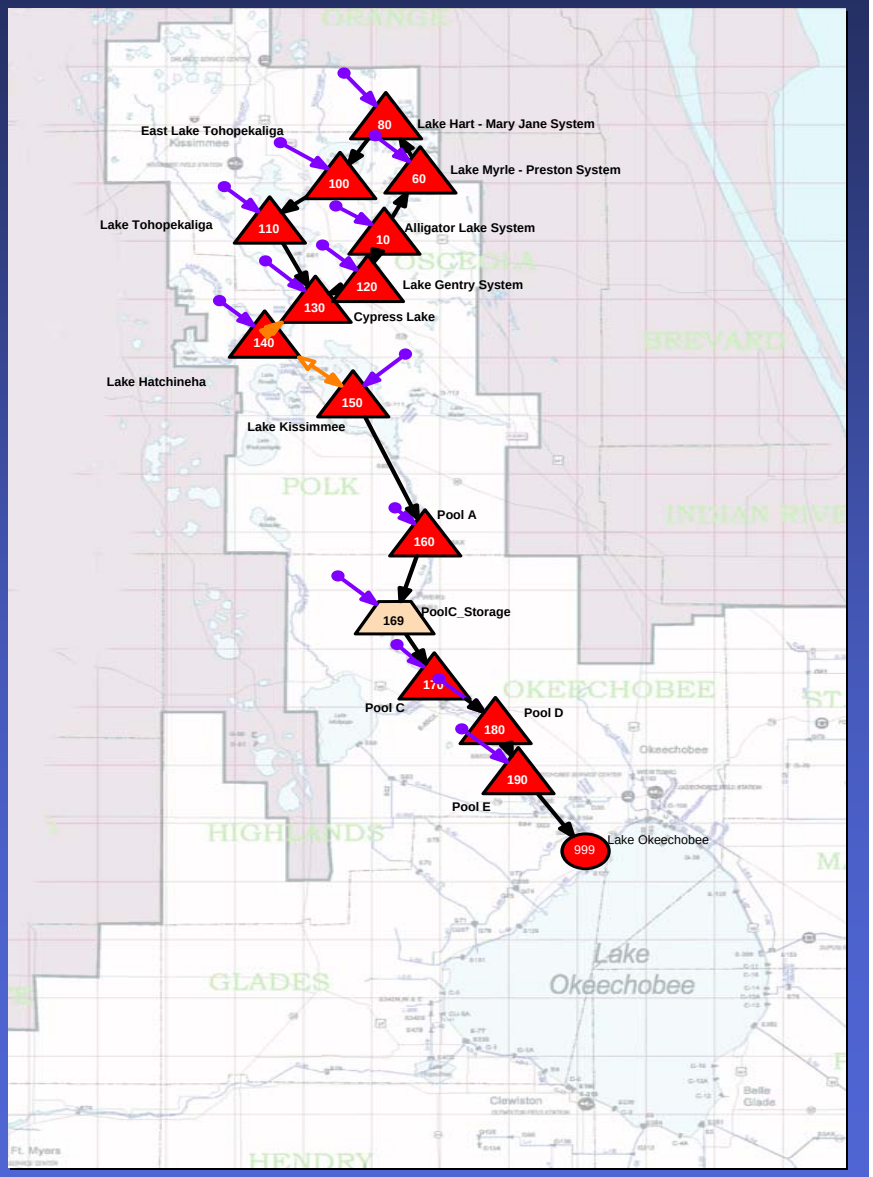
- Screening Tool Results – June 2008
  - Significance: Provides an overview of the alternative operations being considered
- Formulation Model Results – July 2008
  - Significance: Identifies the 3 alternatives that will advance for final consideration in the EIS process
- Evaluation Model Results – September 2008
  - Presents the results of the evaluation of the 3 alternatives and provides information related to flood control, Lake Okeechobee, and water supply for the best natural resource alternatives
  - Significance: Defines water for Kissimmee River restoration and supply

Thank You

Back-pocket slides

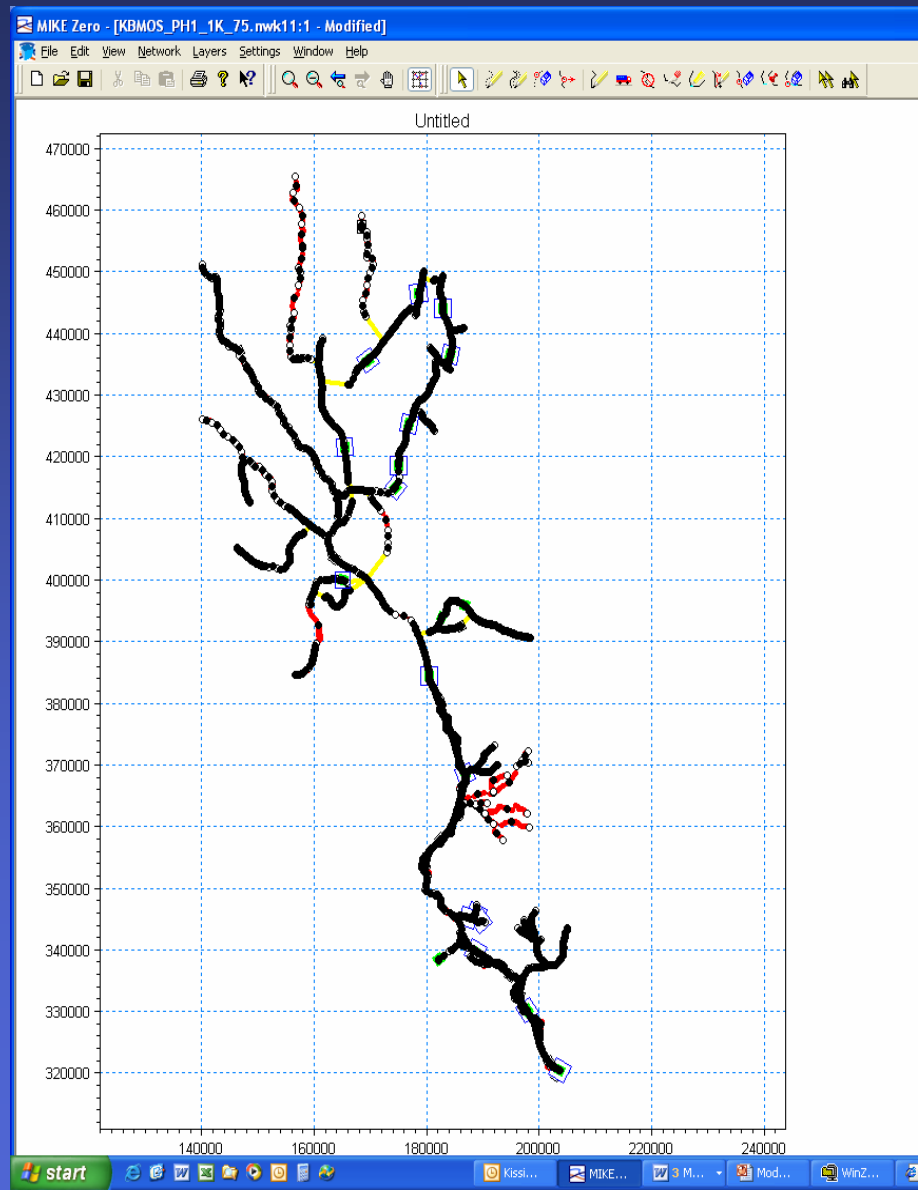
Screening Tool – OKISS

- Screening Tool is a water budget model
- Uses Operations Control Language (OCL) to describe Structure Operations
- Output:
  - Daily Flow – the amount of water moved over time
  - Daily Stage – the elevation of the water surface
  - Daily Storage – volume of water in lakes and floodplain
- Many ways to use flow and stage to evaluate alternative plans



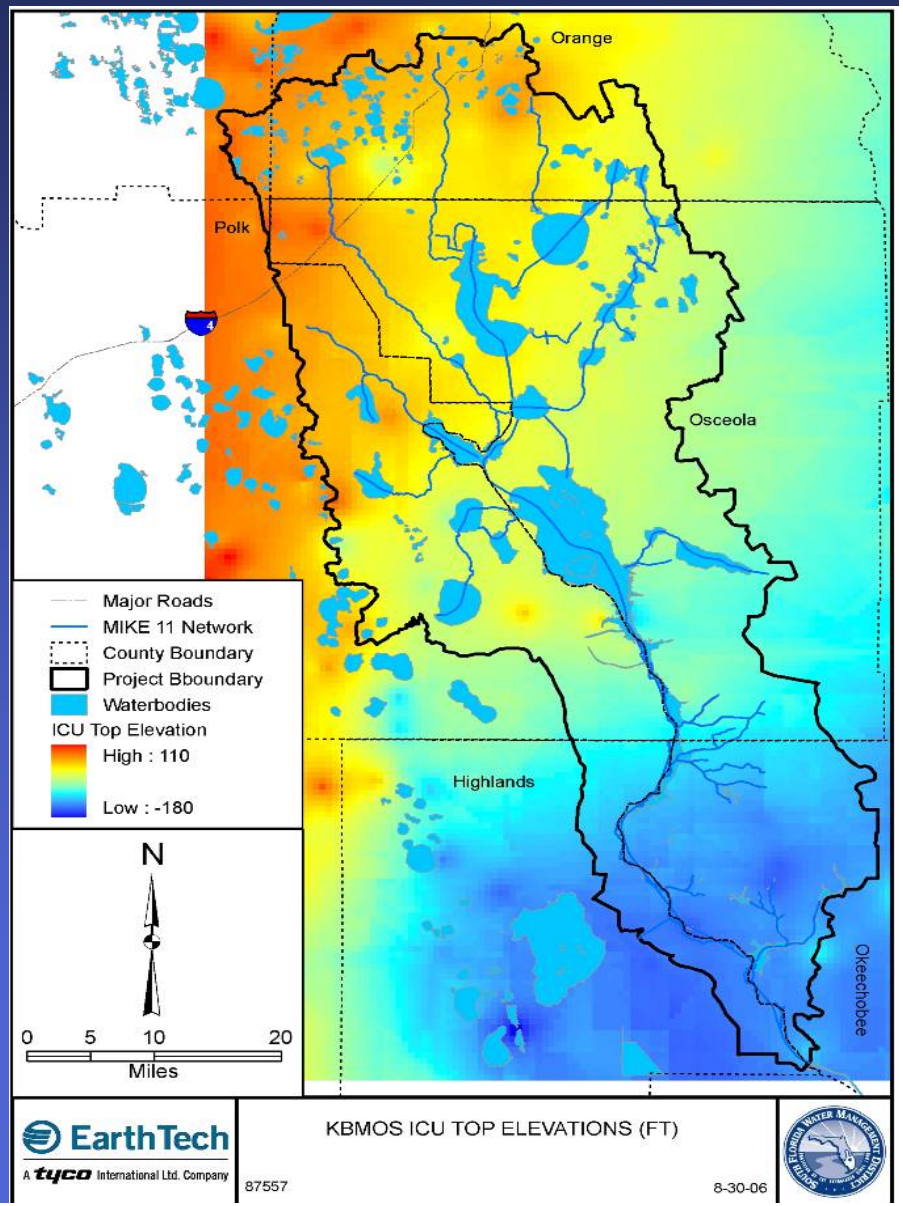
ALTERNATIVE FORMULATION TOOL

- Mike 11 running decoupled from Mike SHE
- Hydrologic Inflows to be obtained from the Base Condition runs in the fully coupled model (Mike SHE/Mike 11)
- Use full cross sections to represent the extension of the Kissimmee River Floodplain



ALTERNATIVE EVALUATION TOOL

- Fully Couple MIKE SHE/MIKE 11 model
- 3-layer 3,000 ft grid cell including the Floridan Aquifer System (FAS) and the Intermediate Confining Unit (ICU)
- Alternatives will be evaluated with a 1-layer 1,000 ft grid cell model which will use boundary conditions developed with the 3-layer model.



Model Run Times

- Screening Tool (OKISS) – 15 minutes
  - Water budget model
  - Daily Flow, Stage, Storage
- Formulation Tool (MIKE 11) – 2 days (48 hours)
- Evaluation Tool
  - MIKESHE/11 – 1000 ft model 7 days (168 hours)
  - MIKESHE/11 - 3000 ft model 3.8 days (91.2 hours)
- Performance Measure Evaluation Tool – 15 minutes