Regional Simulation Model Overview

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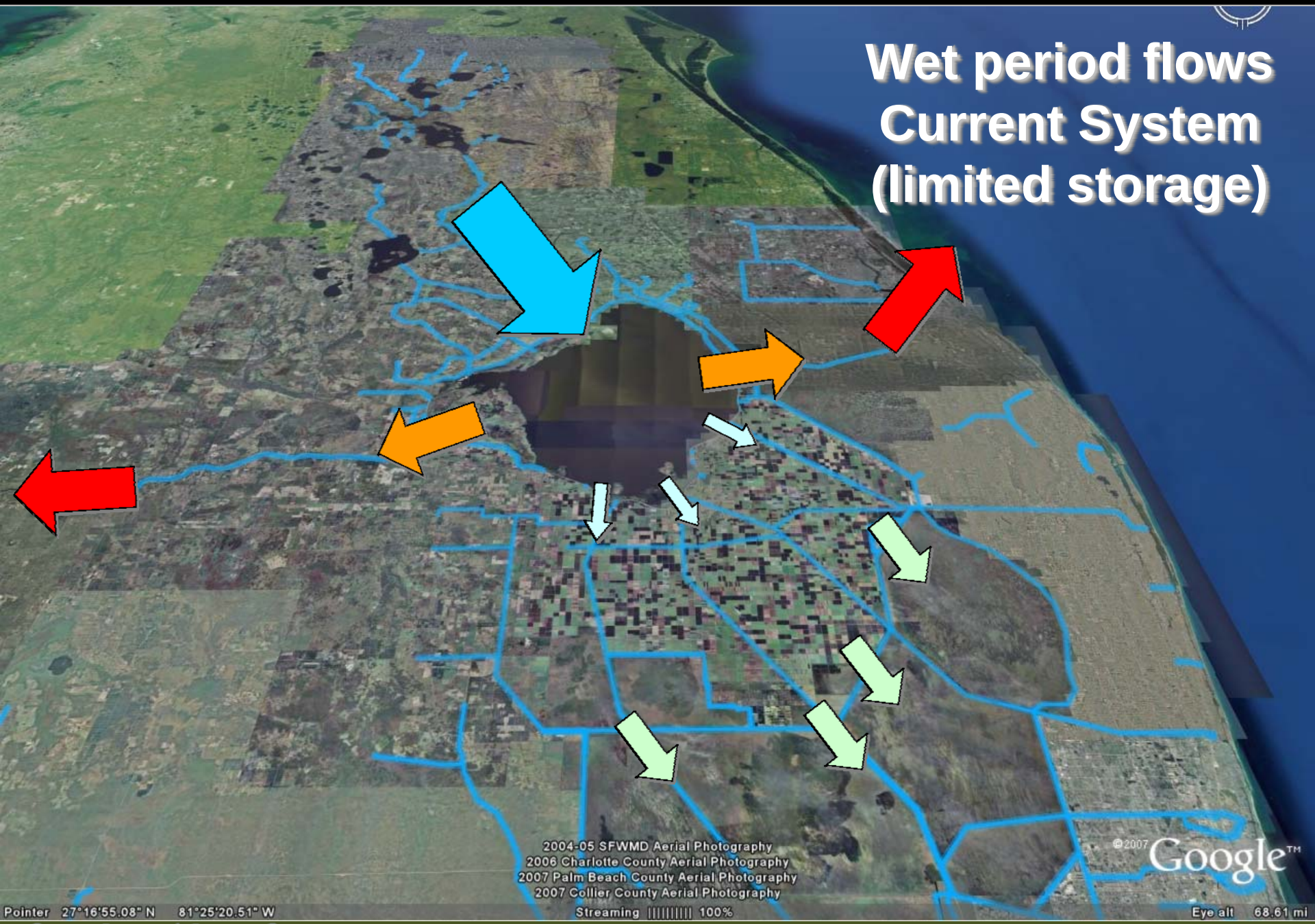
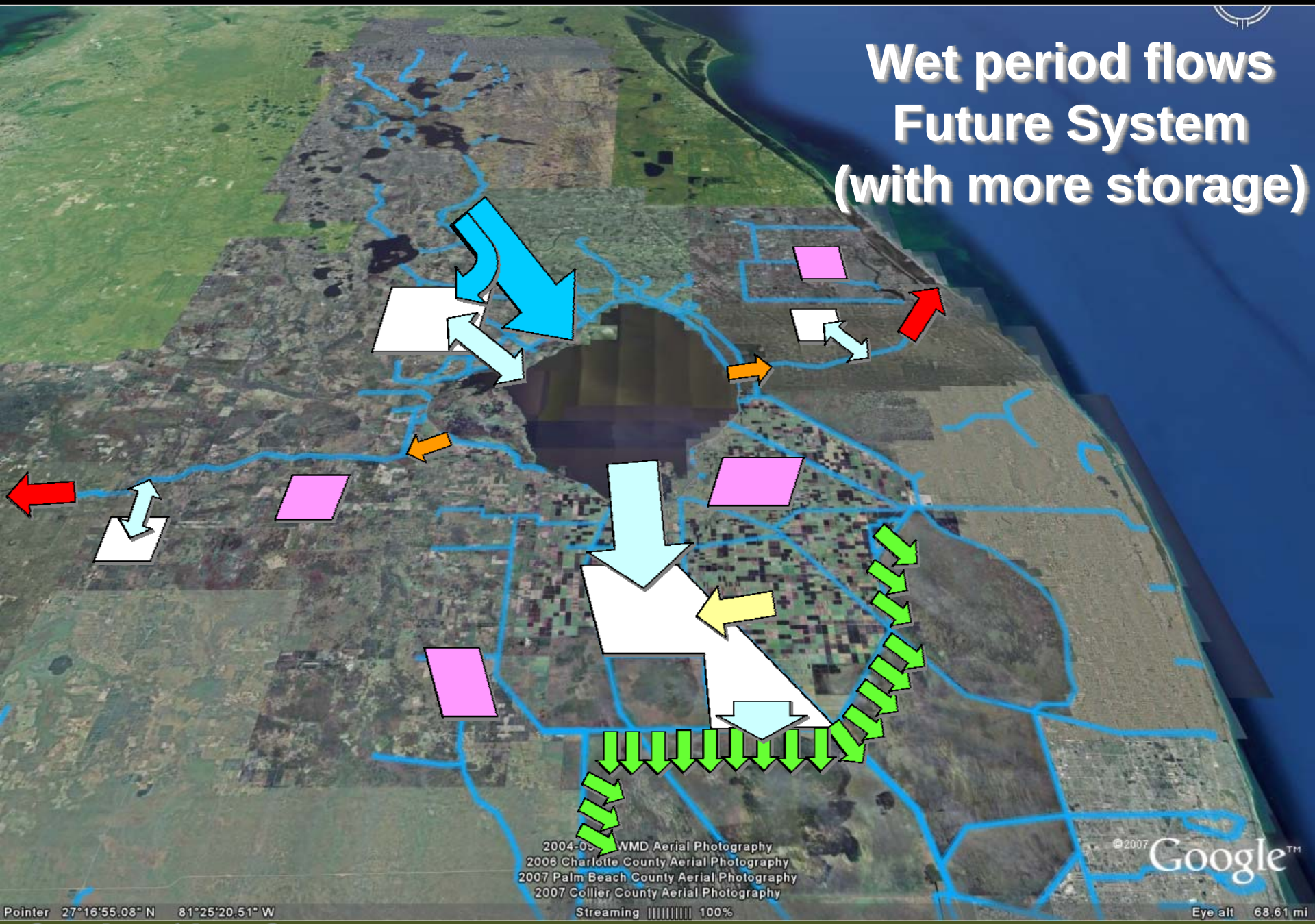
sfwmd.gov/riverofgrass

Presentation Overview

- Physical System Relationships
- Hydrologic Modeling Toolbox
  - Model Features
- RESOPS - ROGSM Comparison
- Modeling Input & Output
- Phase 2 Modeling Assumptions


Wet period flows
Current System
(limited storage)
2004-05 SFWMD Aerial Photography
2006 Charlotte County Aerial Photography
2007 Palm Beach County Aerial Photography
2007 Collier County Aerial Photography
Streaming 100%
©2007 Google™
Pointer 27°16'55.08" N 81°25'20.51" W
Eye alt 68.61 mi


Wet period flows
Future System
(with more storage)
2004-05 SFWMD Aerial Photography
2006 Charlotte County Aerial Photography
2007 Palm Beach County Aerial Photography
2007 Collier County Aerial Photography
Streaming 100%
©2007 Google™
Pointer 27°16'55.08" N 81°25'20.51" W
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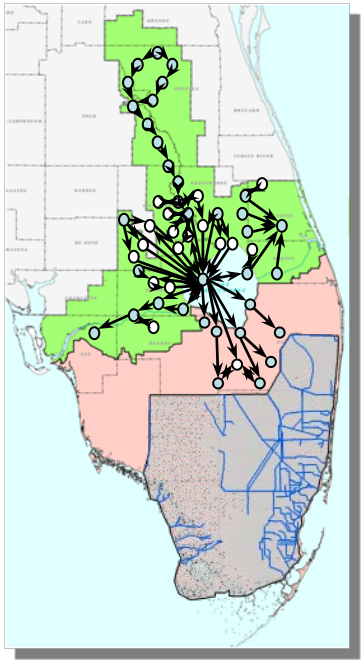
Modeling Approach

- Climatic Input
  - Rainfall
  - ET
- Boundary Conditions

Period of record: 1965-2005

Scenario



- Project Features
- Land Use/Land Cover
- Water Demands
- Operating Criteria

Model Output

- Daily time series of water levels, flows
- Demands not met

Performance Measures (Ag, Env, Urban)

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Hydrologic Modeling Toolbox

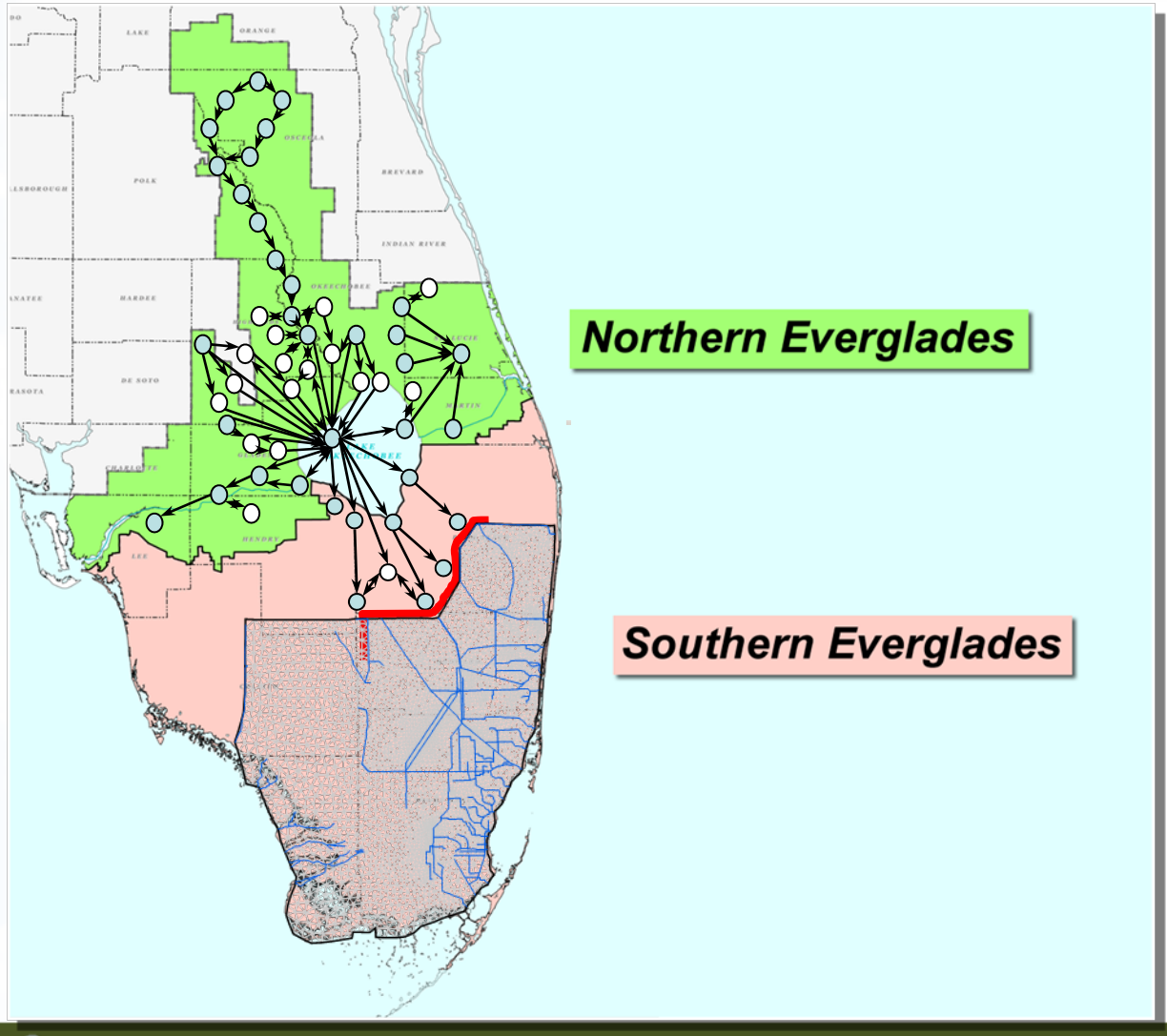
Purpose:

- Simulate rainfall-runoff processes and flow routing within the ROG Phase 2 planning region as a function of existing infrastructures and proposed configurations

Overall Strategy:

- Use a decoupled link-node RSM model for the EAA, STAs and northern areas in combination with a detailed RSM meshed model for the remnant Everglades-Lower East Coast areas

Decoupled Modeling Approach

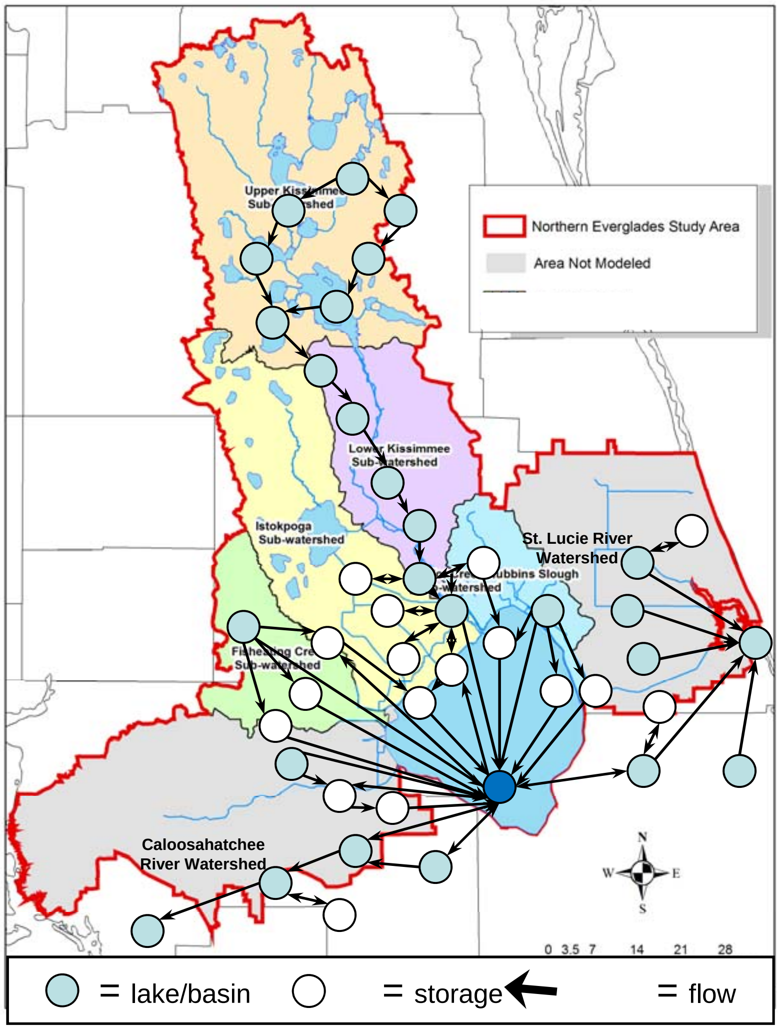


Hydrologic Modeling Toolbox

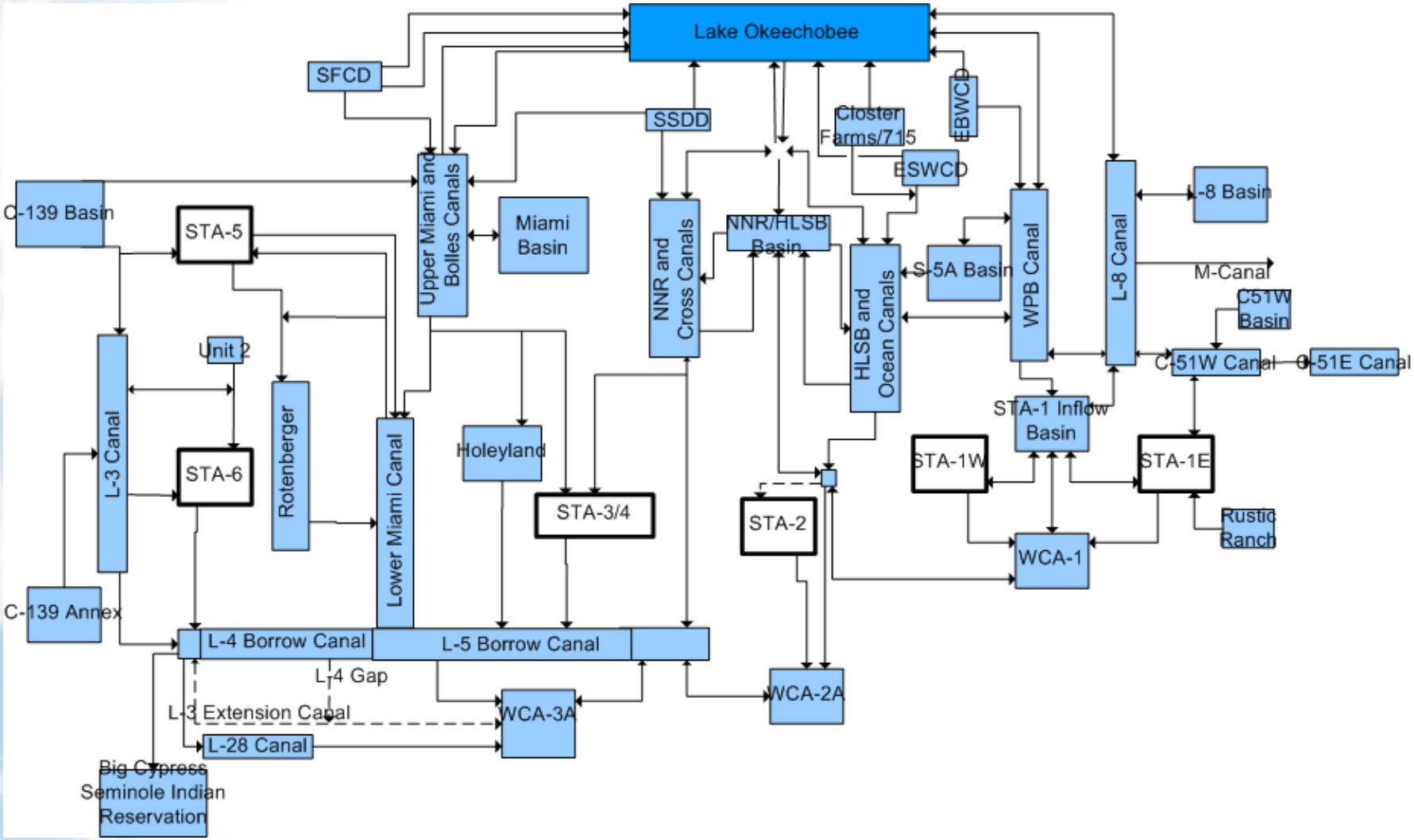
Toolbox Components:

- ROGSM
  - "River of Grass Simulation Model"; a basins or node-link application of the Regional Simulation Model (RSM) specific to ROG Phase 2 project area, i.e. north of the "Red Line" or Northern Everglades
  - An expanded version of NERSM (Northern Everglades Regional Simulation Model)
  - Provides connectivity between the EAA and watersheds north, east and west Lake Okeechobee (LOK) include the Lake itself

Conceptualization in NERSM



Conceptualization of Everglades Agricultural Area in ROGSM



Features of ROGSM

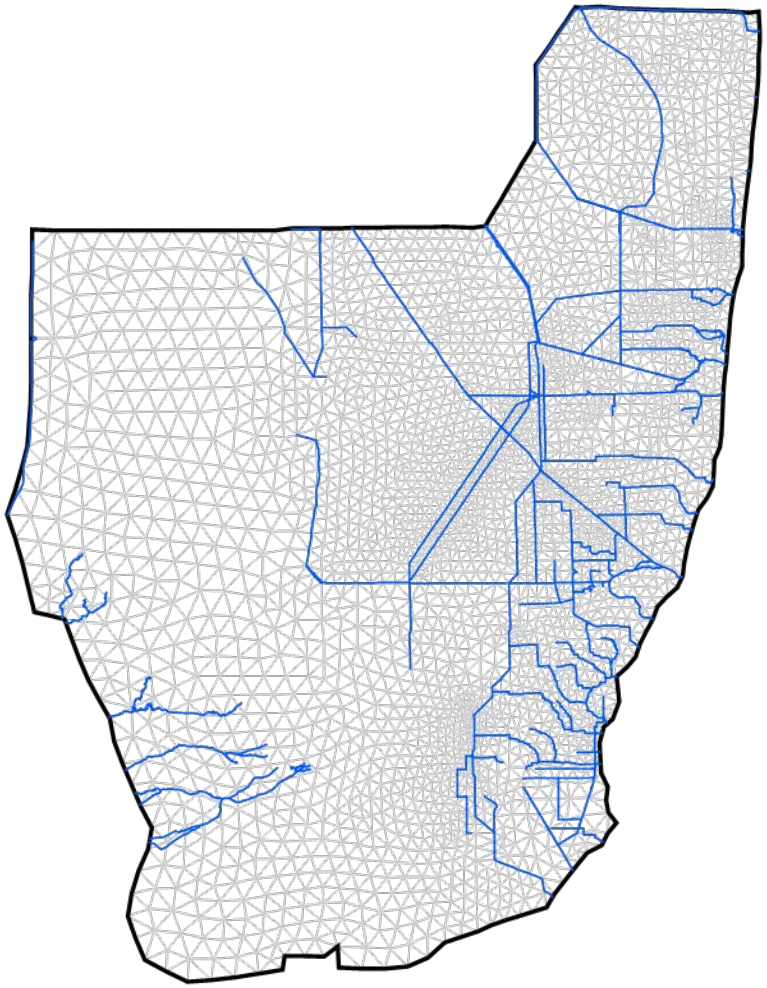
- Simulates the physical and operational components of Lake Okeechobee, the EAA, the River Watersheds and adjacent areas.
- Main hydrologic model for ROG Ph2
- Replaces and expands the functionality of RESOPS which was the hydrologic model used in ROG Ph1
- Source of hydrologic input to DMSTA2 and Glades-LECSA model

Hydrologic Modeling Toolbox

Toolbox Components:

- Glades-LECSA
  - Application of RSM specific to the Everglades, i.e., south of the “Red Line” or Southern Everglades
  - A full mesh and canal network application of the Regional Simulation Model (RSM) concurrently under development for the CERP DECOMP project
  - Will provide detailed (cell-based) stage and flow information consistent with anticipated Glades-based performance measures

Conceptualization in Glades-LECSA
(below “Red Line”)



Features of Glades-LECSA Model

- Simulates the physical and operational components of Everglades system.
- Mesh application of RSM in the remnant Everglades (south of the “Red Line”)
- One of the models used in determining range of operational flow targets during Targets Workshop; Concurrently being used in the CERP DECOMP Project;
- Will simulate hydrologic response in the Everglades based on input from ROGSM

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Differences Between RESOPS and ROGSM

RESOPS

- Conceptualizes single reservoir & single STA in the EAA for all configurations. Coarse scale.
- Consolidates functionality of existing & proposed treatment/storage features in the EAA.

ROGSM

- Conceptualizes existing and proposed reservoirs and STAs in the EAA as separate entities. Medium scale.
- Operations of existing facilities within the EAA may need to be reconfigured to accommodate new ROG features.

Differences Bet. RESOPS and ROGSM (con't)

RESOPS

- Microsoft Excel (2003) spreadsheet application.
- Monthly time step.

ROGSM

- Compiled Object-oriented C++ code.
- Daily time step.

Differences Bet. RESOPS and ROGSM (con't)

RESOPS

- Runs within 1 second on WINDOWS operating system.
- Some optimization (sizing and operating rules) is built into the model.

ROGSM

- Runs in less than half an hour on LINUX operating system.
- Limited or manual optimization functionality.

Differences Bet. RESOPS and ROGSM (con't)

RESOPS

- Post-processing is automatically recalculated within the same spreadsheet.
- Simple, flexible and fast screening tool.

ROGSM

- Post-processing is done using external tools.
- More detailed planning tool.
- Requires extensive time to set-up, run and evaluate.

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Example ROGSM Input Data Requirements

- Definition of “nodes” (configuration)
  - Drainage Basins, Reservoirs and treatment areas
  - Monthly time-series (1965-2005) of rainfall, evaporation, tributary basin runoff, selected service area demands, estuary water needs
  - “Red Line” target flows
- Physical connection or “links” (connectivity)
- Procedure for moving water among “nodes”(operating rules)

Example ROGSM Output Data

- Water budgets
- Stage hydrographs
- Stage and flow duration curves
  - Lake Okeechobee
  - Storage Areas
- Hydrologic performance measures
  - Lake Okeechobee stage envelope scores
  - Estuary flow distributions
  - Water deliveries to the Everglades
  - Water shortage indicators

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Phase II Modeling Assumptions

- ROGSM will simulate each of the configurations with the following common elements
  - Fixed storage assumptions east & west of Lake Okeechobee as proposed in River Watershed Protection Plans
  - Total storage north will be defined by ROG teams
    - Will not model treatment features north of Lake
  - Separate storage, treatment and conveyance features south of Lake Okeechobee will be defined by ROG teams
    - Operational protocols for new infrastructures need to be defined

Configuration Planning Common Elements

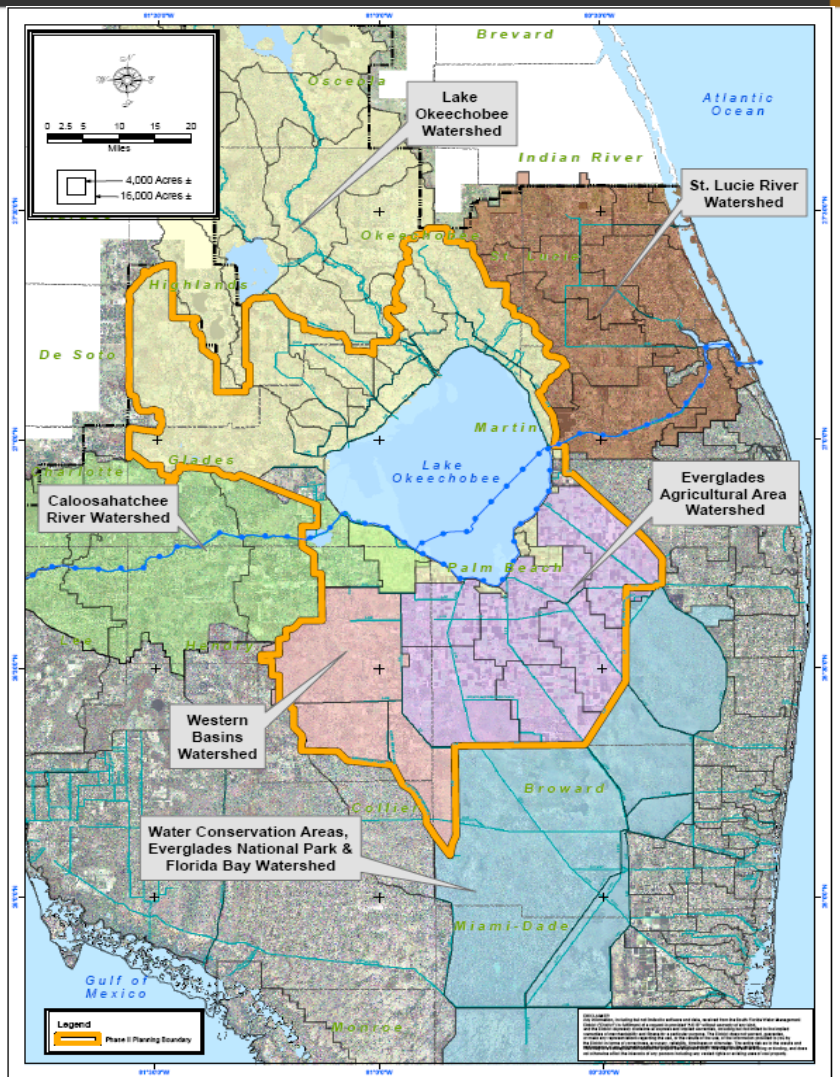
- Lake Okeechobee operations: will use operating limits as defined by LORS 2008
  - Will be modified based on use of proposed storage
- Caloosahatchee River Watershed Protection Plan (CRWPP) in place with approximately 400,000 ac-ft of storage (as recommended in 2008 plan)
- St. Lucie River Watershed Protection Plan (SLRWPP) in place with approximately 200,000 ac-ft of storage (as recommended in 2008 plan)

Configuration Planning Common Elements (con't)

- Up to approximately 900,000 ac-ft of storage north of Lake (based on recommendation from Lake Okeechobee Phase 2 Technical Plan, 2006).
  - Planning limit - can be specified as less by configuration teams.
- Compartments B & C expansions in place - to be simulate as STAs.
- Talisman property to be part of configuration exercise.

Phase II Planning Boundary (reminder)

- General area that will be considered for potential project features



Questions?