SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Everglades Land Acquisition Project

Phase I Project Planning Recap
Phase II Scope, Schedule and Tools

December 18, 2009

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RESTORATION PLANNING

Phase I Recap

Temperince Morgan, Director, Federal & State Policy Division

River of Grass Planning
Phase I

- January - September 2009
- Based on original acquisition contract
  - During Phase I Planning, amended terms were accepted and contract was modified
- Scope: Determine the range and general location of acreage needed for Everglades restoration, in support of Governing Board original contract deliberations
  - Phase I Planning Approach: Land availability not considered a constraint; did not consider downstream constraints

Hydrologic Restoration Targets Workshop
January 14-16, 2009

- Reviewed latest science associated with hydrologic stage and flow targets
- Presented data that supported restoration of greater Everglades system
- Constraints “tabled”
- Discussed Reservoir Sizing and Operations Screening (RESOPS) model planning tool
- Identified range of appropriate flow regimes for use in the Phase I planning effort

Phase I Activities

- Hosted 15 public planning workshops
- Identified vision, goals and scope for Phase I planning process
- Identified problems, objectives and constraints
- Nine stakeholder configurations developed and evaluated
  - Benefits (hydrology, ecology, and water quality), impacts and costs
- Evaluated influence of specific features and operations on Everglades performance
- Identified five primary combinations of features for further consideration in Phase II planning

Restoration Vision and Approaches Proposed During Phase I

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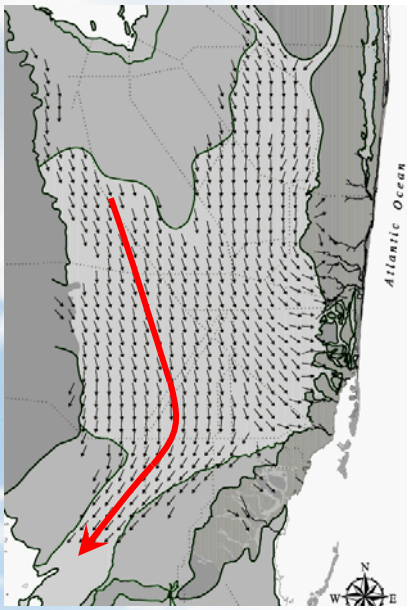
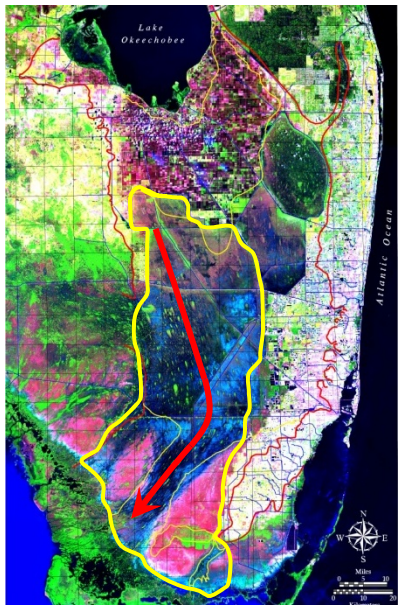
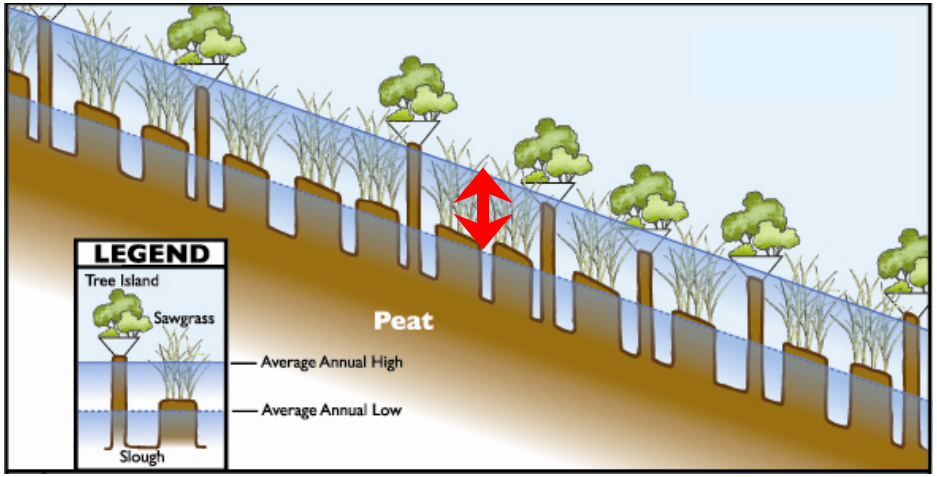
Restoration Vision and Approaches

Everglades Restoration Concept: - *Right flows, Right depths*

- Right depths - throughout length
- Sheetflow (free flowing)
- Phase-in of upstream operational control to protect depth-sensitive elements

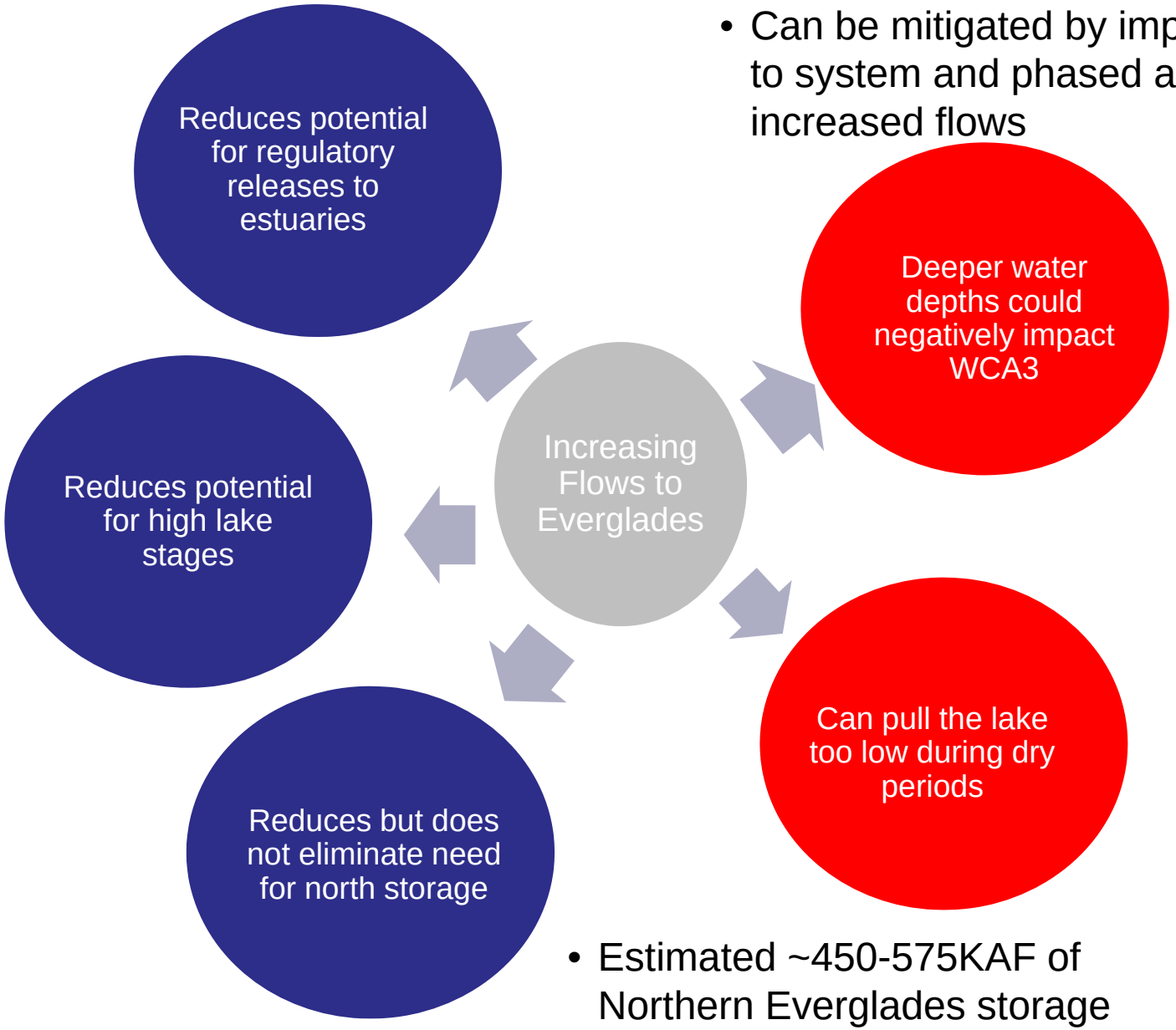






Hydrologic Relationships

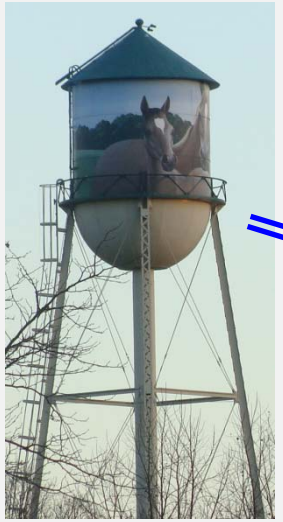
- Need to evaluate constraints during Phase II
- Can be mitigated by improvements to system and phased approach to increased flows



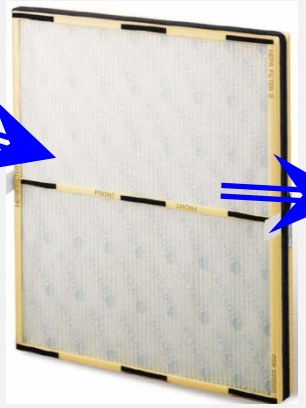
- Estimated ~450-575KAF of Northern Everglades storage needed

Everglades Restoration Concept: Storage, Treatment, and Delivery

Storage

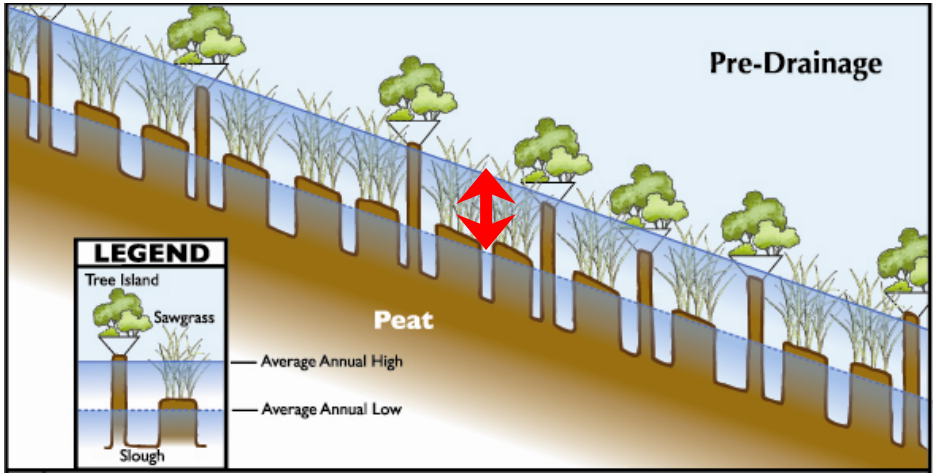


Filter / Treatment

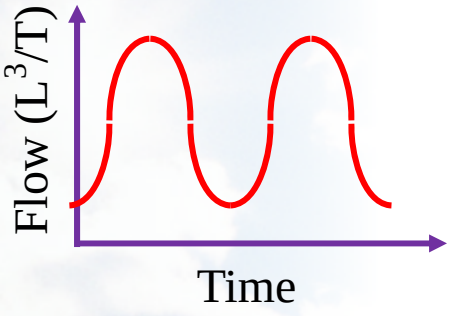


Delivery

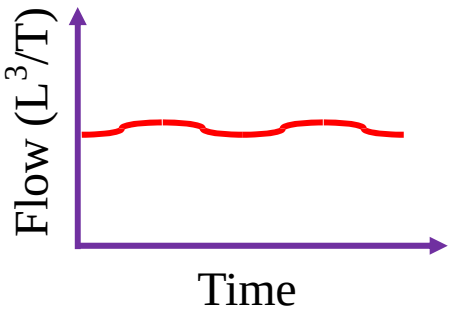
Ridge and Slough Everglades (sheet flow)



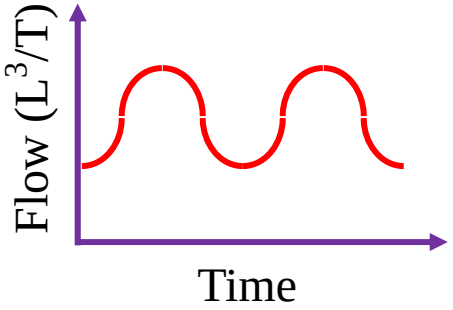
Water Quality Relationship to Hydrologic Targets



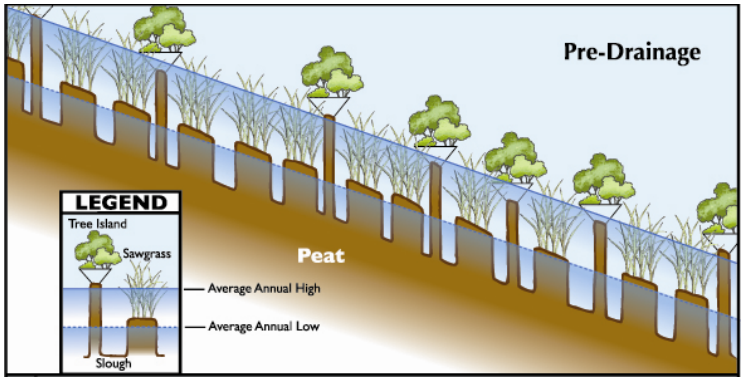
Storage- Inflows Highly Variable



Treatment- optimal at Steady-State Conditions



Target- Need to define peak flows, inter- and intra-annual variability (TBD in Phase II)



Stakeholder Configurations

Stakeholder Input During Phase I

- General agreement regarding overarching goals
- Differences of opinion regarding -
  - Everglades target and need for dry season carryover storage
  - Managed versus natural features
  - Spatial extent versus minimizing footprint/economic impacts
  - Significance of evapotranspiration
  - Cost considerations
  - Recreational considerations

Evaluation of Stakeholder Configurations

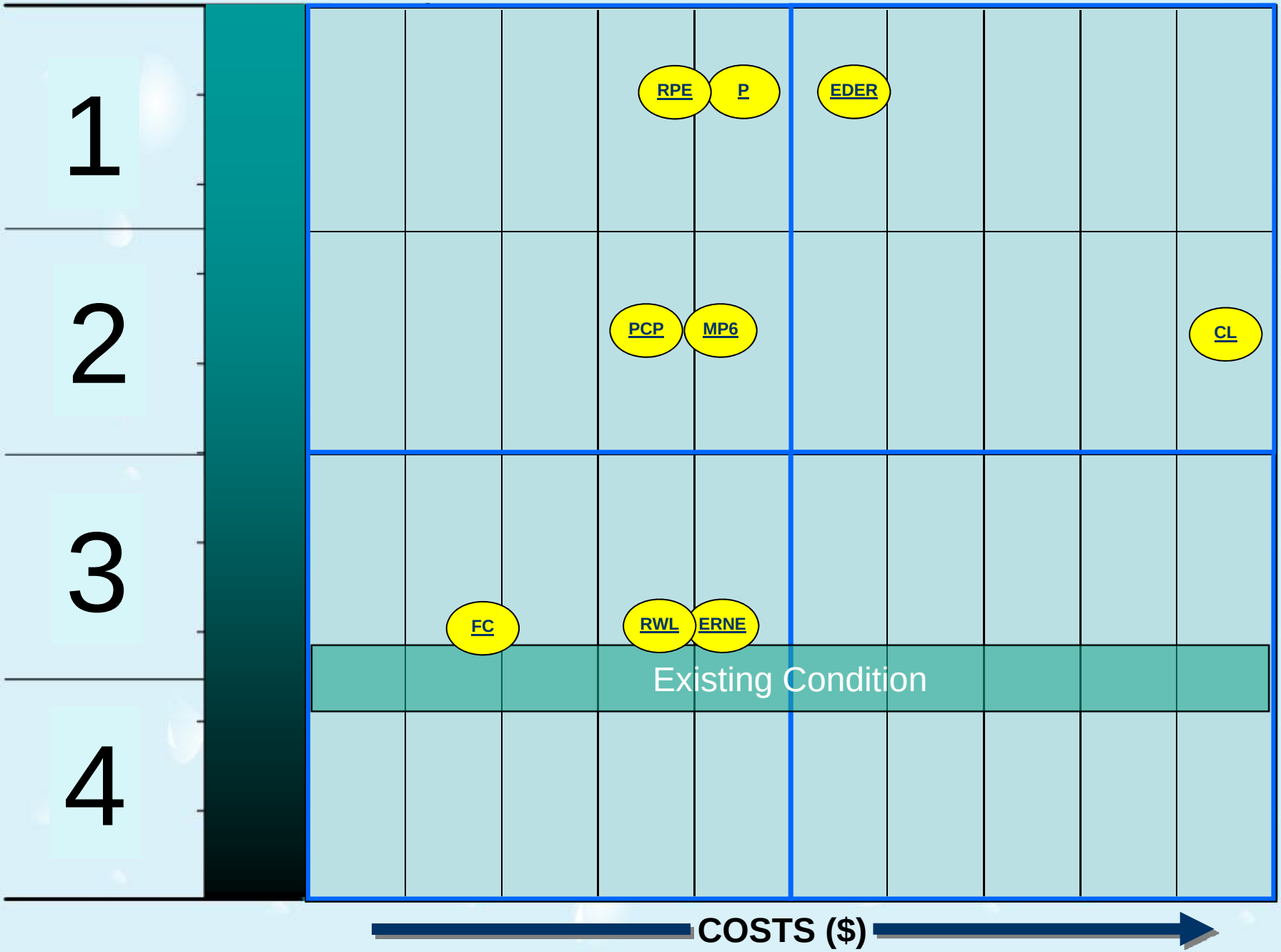
- 9 proposed stakeholder configurations were developed
- All configurations contained storage, treatment, and conveyance project features
- Performance
  - Similar performance for Northern Estuaries, Lake Okeechobee and water supply (Lake Okeechobee Service Area)
  - Varying performance for Everglades and water quality
    - Ability to meet Everglades demand is the primary performance difference between configurations

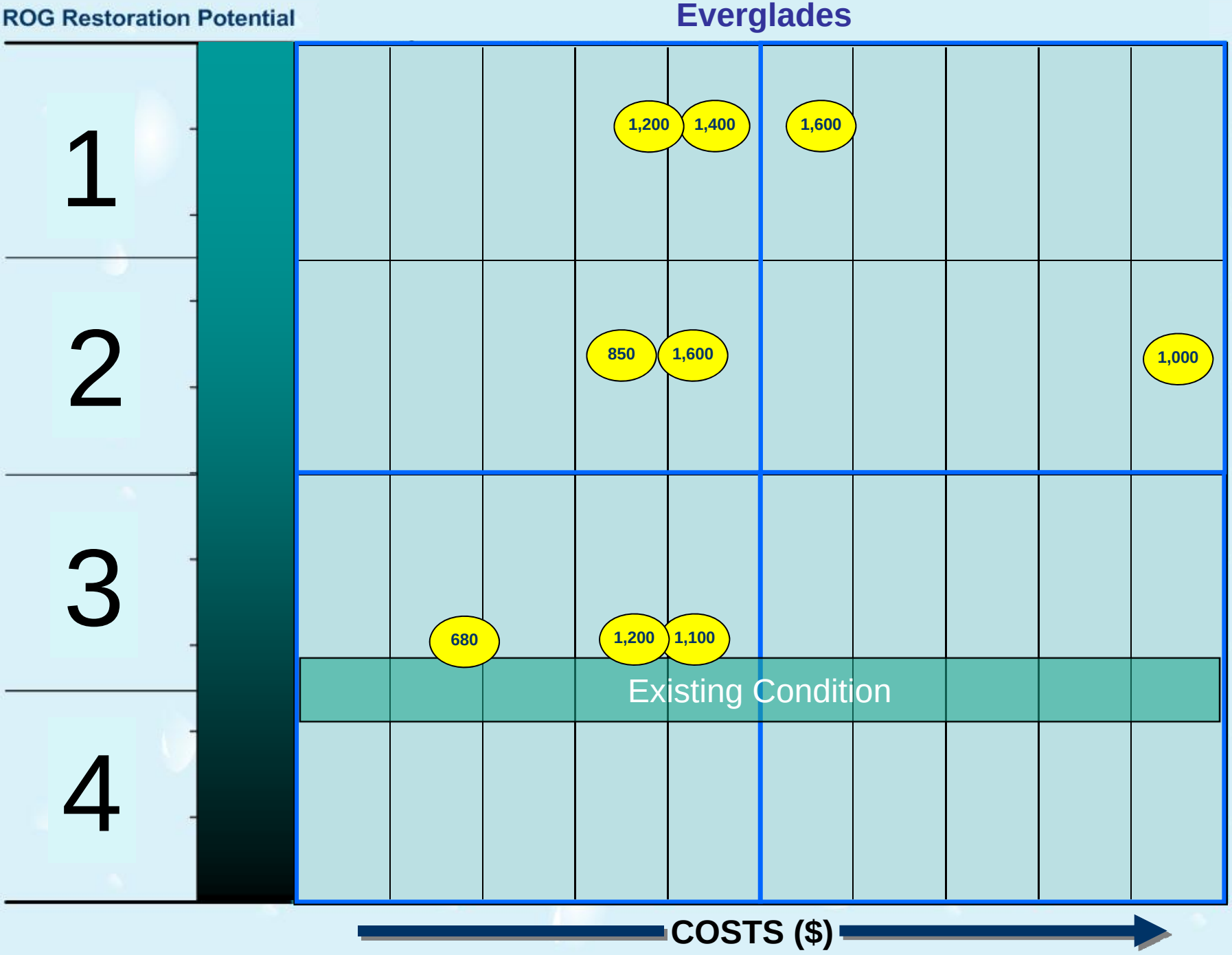
Evaluation of Stakeholder Configurations (continued)

- Land acquisition requirements ranged from 19,000 acres to 229,000 acres
- Other differences in configurations were related to approach For example -
  - Restore EAA, increase habitat, or increase recreation
  - Minimize footprint, reduce economic impacts, or avoid conflict with inland port
  - Increase performance or increase cost-benefits
- Costs
  - Highly variable costs across configurations
  - Total costs ranging from $5.3 - $31.3 billion
  - River of Grass costs ranging from $747 - $11.8 billion

ROG Restoration Potential

Everglades




ROG Restoration Potential
Everglades
1
2
3
4
1,200
1,400
1,600
850
1,600
1,000
680
1,200
1,100
Existing Condition
COSTS ($)

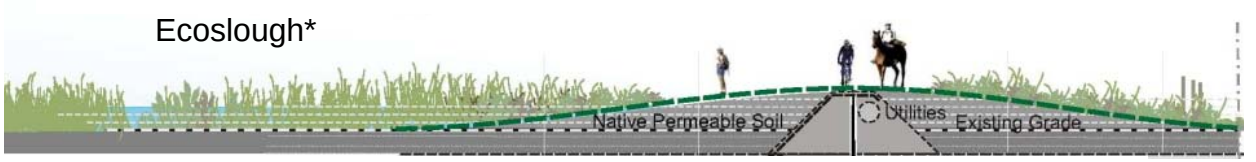
Performance and Cost Relationships

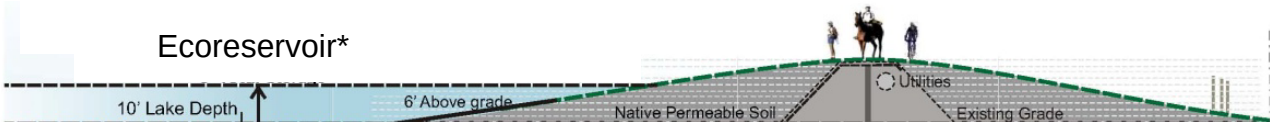
- Non-linear
- Performance not strictly tied to costs or total storage volume
- Performance highly dependent on feature type and operations
- Need to refine these relationships once constraints are evaluated in Phase II

Features - Performance Comparison

Approaches for Storage, Treatment and Delivery
Proposed Features

- Reservoir
- Shallow Impoundment
- Reservoir within Lake Okeechobee
- Dispersed Storage
- Flowway
- Ecoreservoir
- Ecoslough
- Wetlands Management Area
- Stormwater Treatment Area





* Landform in lieu of typical levee

Proposed Features - Water Quality Performance

- STAs
  - The best performing STA (STA-3/4) achieves 13-23 ppb total phosphorus
- Reservoirs/Ecoreservoirs
  - Limited long-term TP removal performance data exists, estimated at maximum of 15-25% at best, could be less under actual conditions
- Flow-Way/Ecosloughs
  - Experience with emergent wetland treatment cells suggests that the most optimistic estimate of flow-way TP removal – if maintained wet for most of the year – is a long term average annual outflow concentration of 25 ppb
- Since non-STA features can not reliably achieve concentrations less than 25 ppb, discharges from these features must receive further treatment in an STA before delivery to the Everglades

Proposed Features
Wet vs Dry Footprints

Maintaining Wet Footprint

Improves water quality performance

Improves habitat within feature footprint

Allowing Footprint to Go Dry

Increases available storage

Stored water is available to meet targets

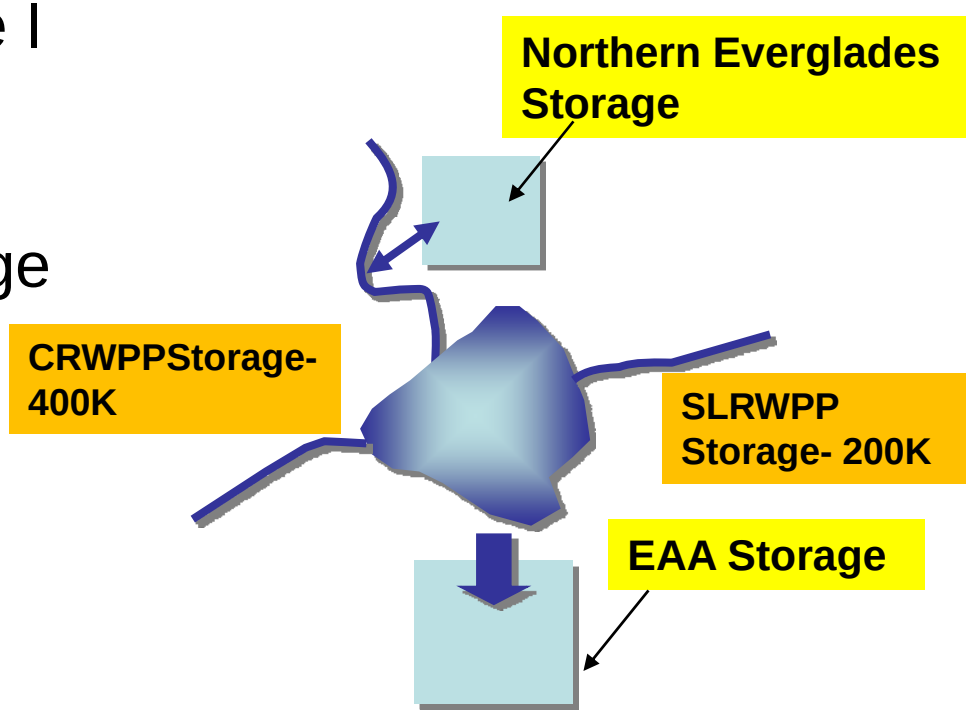
If wet footprint, then significantly greater storage volumes/acreage to achieve same performance

Proposed Features
Deep Storage vs. Shallow Storage

- Volumetric evaporation losses relative to inflows are higher in shallow storage (30-60%) as compared to deep storage (15-30%)
- Deep storage requires more stringent safety standards
- Shallow storage is less expensive per unit volume but has greater land requirements (larger footprint)
  - 1,000,000 acre-ft of shallow storage requires 278,000 acres of land

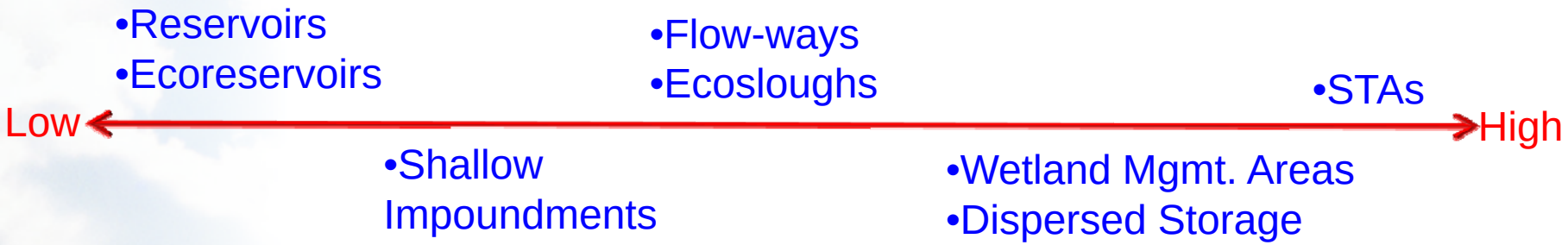
Proposed Features - Storage Needs Evaluation
Northern Everglades and EAA Storage

- Based on evaluation of Phase I configurations
  - Estimated total Northern Everglades and EAA storage needs are 700,000 - 1,100,000 acre-ft
  - If a feature is to be maintained wet, then approximately 700,000 additional acre-ft will be required
  - Improving Lake Okeechobee low level performance will also require additional storage (amount TBD in Phase II)

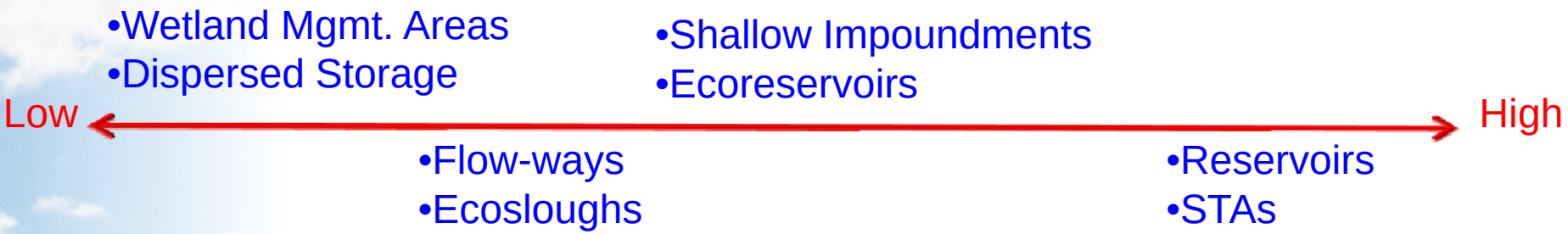


Relative Feature Performance

Water Quality- Phosphorus Treatment Performance

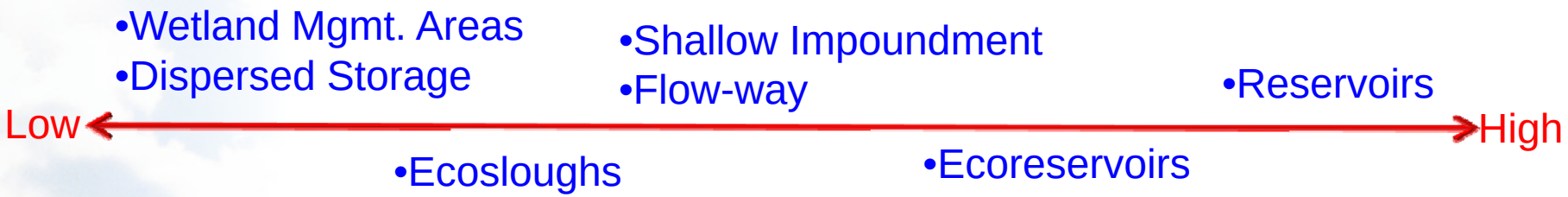


Management Intensity

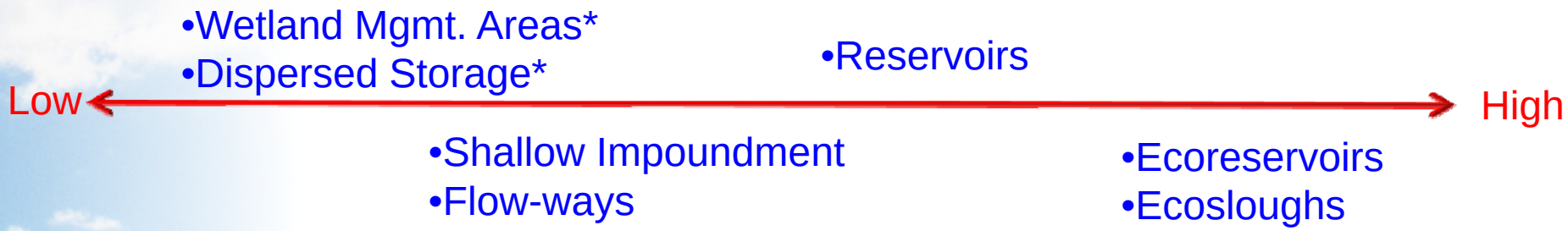


Relative Feature Performance

Storage per Acre



Cost per Acre-ft of Storage



* Costs highly variable, can range from low to higher than reservoir costs

Phase I Comparative Evaluation Summary of Combined Project Features

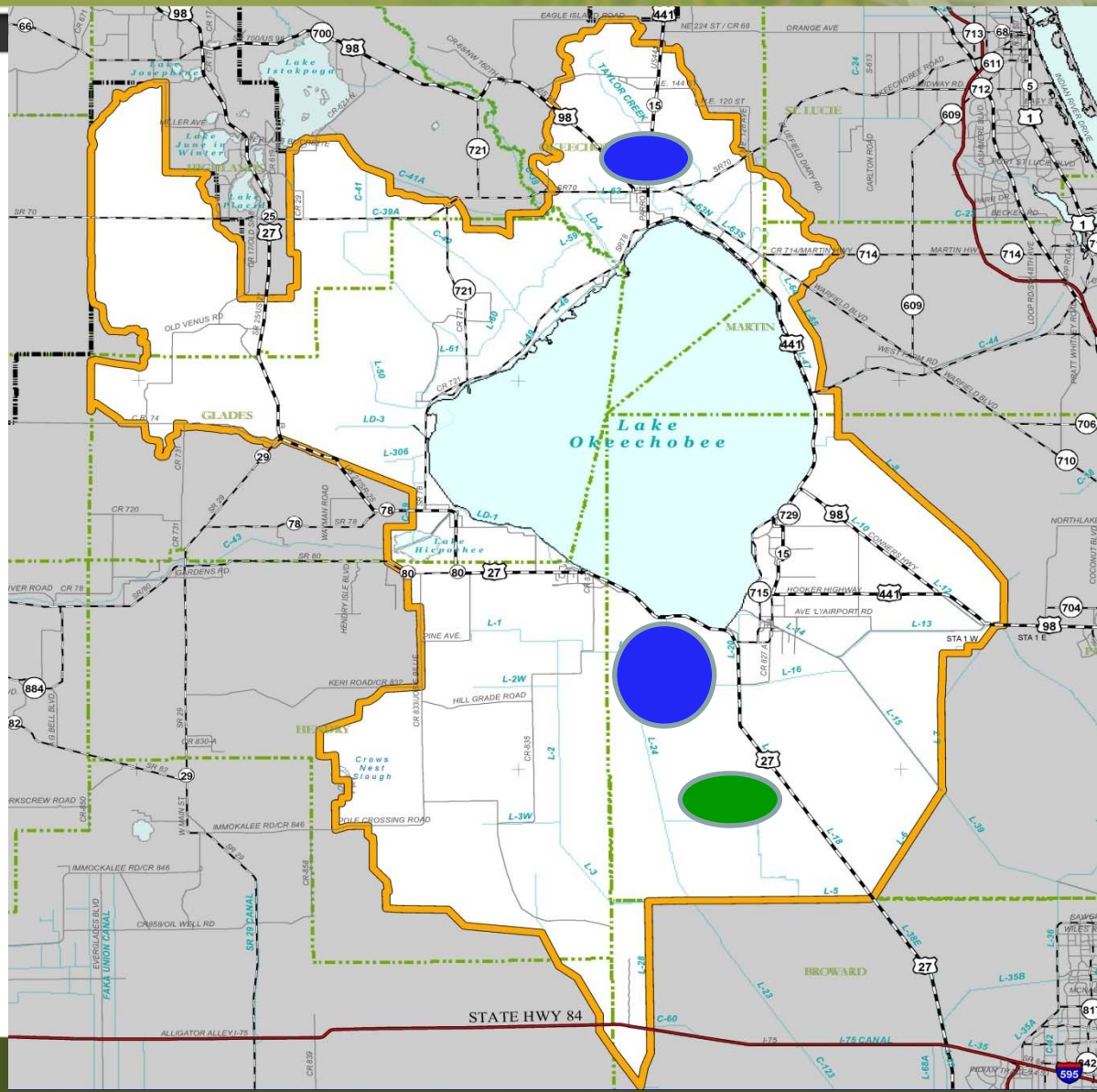
Deep Storage Reservoir With STAs

<u>Everglades Restoration</u>
High

<u>EAA Wetlands</u>
Low

<u>Cost Estimate</u>
Medium

<u>Land/Economics</u>
Medium



Phase I Comparative Evaluation Summary of Combined Project Features

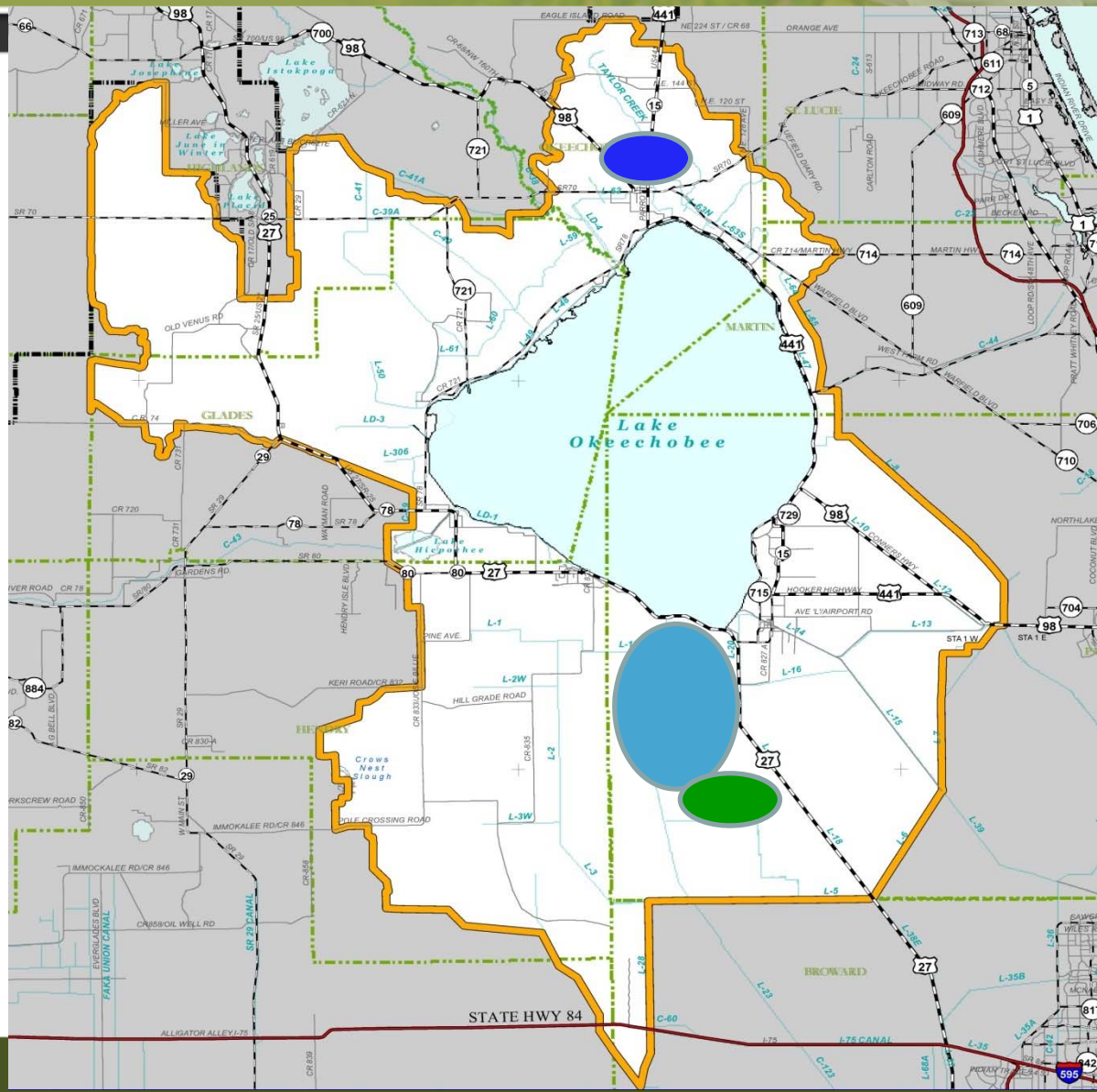
Shallow Dry Storage With STAs

Everglades Restoration
Low to Medium

EAA Wetlands
Low to Medium

Cost Estimate
Low to Medium

Land/Economics
Medium to High



Phase I Comparative Evaluation Summary of Combined Project Features

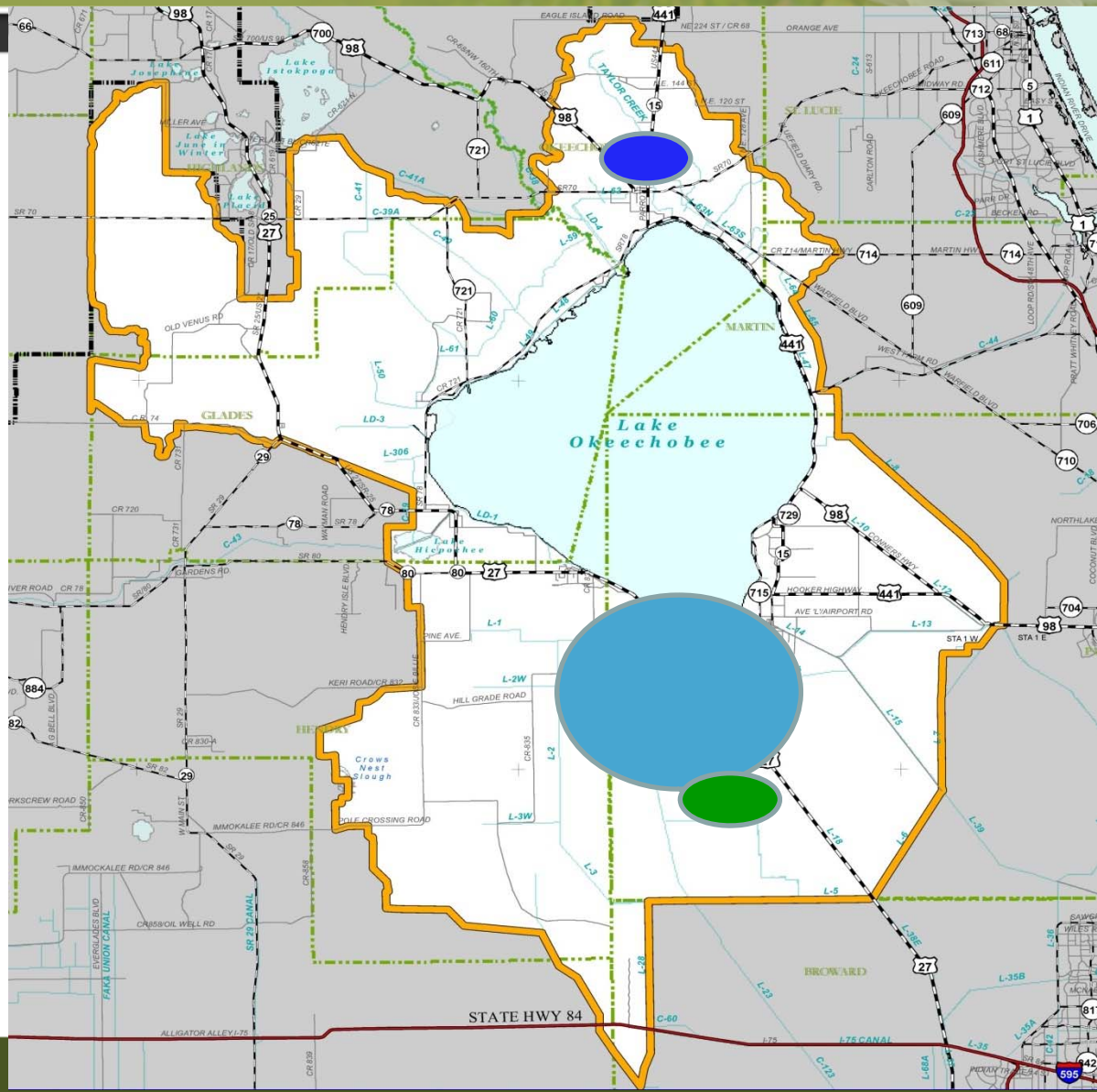
Shallow Wet Storage With STAs

Everglades Restoration
Low to Medium

EAA Wetlands
High

Cost Estimate
High

Land/Economics
High



Phase I Comparative Evaluation Summary of Combined Project Features

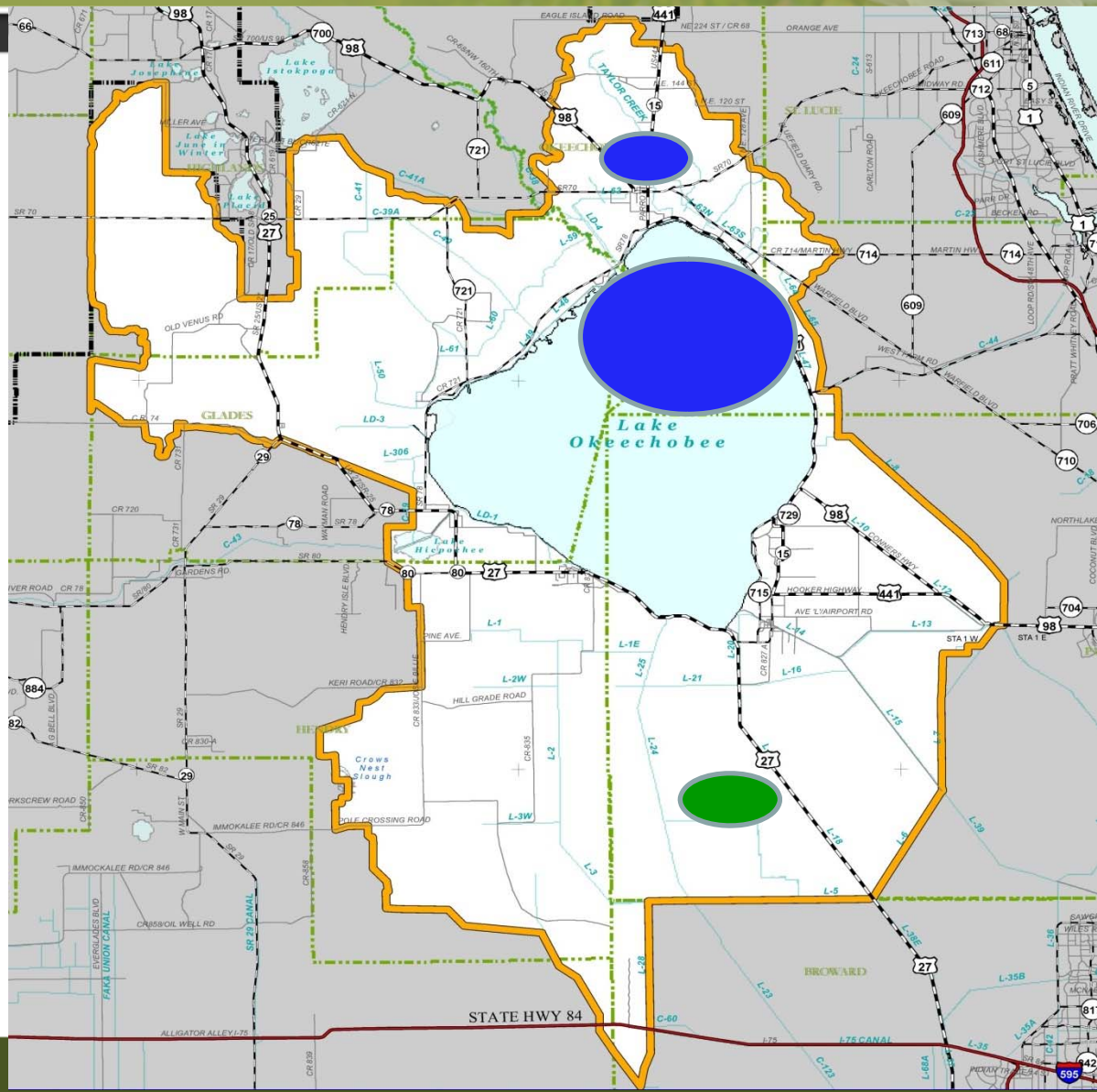
Deep Storage Within Lake Okeechobee With STAs

Everglades Restoration
Low

EAA Wetlands
Low

Cost Estimate
Medium

Land/Economics
Low



Phase I Comparative Evaluation Summary of Combined Project Features

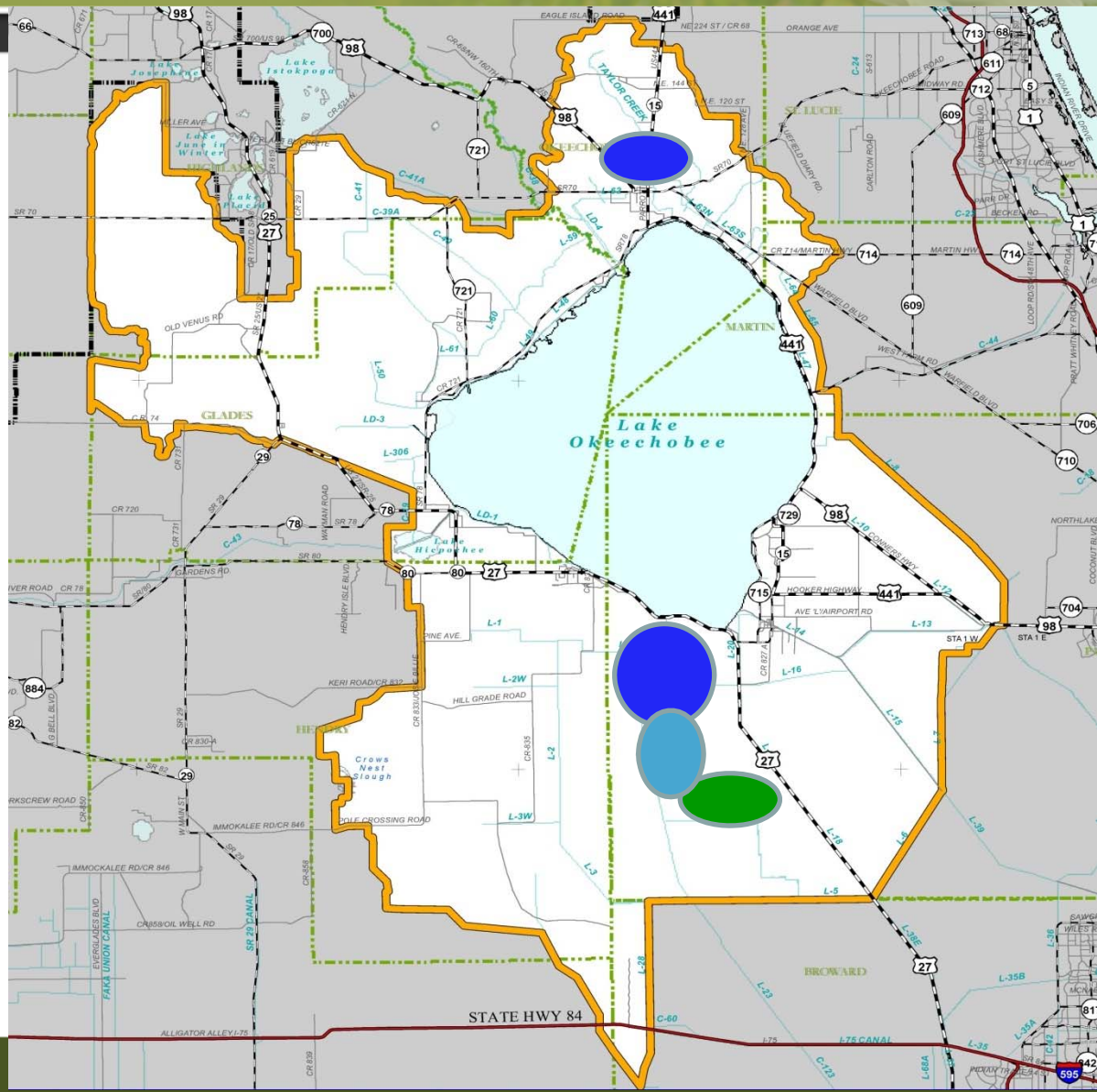
Deep Storage Reservoir and Shallow Storage With STAs

Everglades Restoration
Medium to High

EAA Wetlands
Low to Medium

Cost Estimate
Medium to High

Land/Economics
Medium to High



Common Project Elements with Nine Configurations

- Storage north of Lake Okeechobee
- Storage south of Lake Okeechobee
- Water quality treatment for additional flows to Everglades
- Features addressing flows/loads in excess of STA-1W and STA-1E treatment capacity
  - ECART canal conveyance improvements
  - Additional STA acreage for L-8/S-5A Basin Runoff

Common Project Elements with Nine Configurations

- No deep storage on EAA Talisman A1 site
  - Stormwater treatment area
  - Shallow storage
- Features addressing existing issues in East Caloosahatchee, S-4, and C-139 Basins
  - Lake Hicpochee storage and treatment
  - Disston Island/S-4 storage and treatment
  - C-139 storage and treatment

Phase II Planning

Phase II Considerations

- **Everglades Hydrologic Targets -** Refine revised target (~1.9 million acre-feet) while considering constraints through Target Workshop and more detailed modeling evaluation
- **Constraints and Phasing -** Evaluate constraints with detailed model and develop detailed phasing plan
- **Storage Targets and Feature Types -**
  - **Wet vs Dry Footprints -** Evaluate varying degrees of wet and magnitude of impact with detailed model
  - **Shallow vs. Deep Storage vs. Combination -** Reassess with refined Everglades target and detailed model to determine preferred approach/balance
  - **Total Storage Targets -** Refine storage target range (700,000-1,100,000 acre-ft) based on refined Everglades target and constraints

Phase II Considerations (continued)

- **Lake Okeechobee Performance and Northern Everglades Storage**
  - Lake's Low Stage Performance - identify opportunities to improve Lake's low stages beyond conditions with current Lake Okeechobee regulation schedule (LORS-2008)
  - Reassess Northern Everglades storage needs in consideration of low stage improvements and downstream constraints
- **Water Quality -** Improve performance estimates utilizing dynamic model and potential testing/additional data related performance for various features
- **Features and Combinations -** Identified 5 primary combinations of features, some or all of which can be further evaluated and optimized in Phase II to meet restoration needs/identify opportunities for incorporating additional attributes (e.g., recreation, increased wetland extent)

Phase II Considerations (continued)

- **Common Elements -** Identified features common to most restoration proposals, can consider moving these features more quickly into design and construction phases while detailed planning continues
- **Public Planning Process -** Utilized public planning process which has encouraged participation by stakeholders and staff and has improved communication and understanding. A similar process can be utilized in Phase II
- **Other Phase II Considerations -**
  - Hydraulic limitations
  - Sea level rise
  - Evaluation of economic impacts and values

Phase II Scope, Schedule and Evaluation Tools

Matt Morrison, Director, Project Coordination Division

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Phase II
Scope and Strategy

- Scope: Identify alternative plans while considering both objectives and constraints (options to include scenarios with land swaps and scenarios without)
  - Conduct public planning process
  - Build upon Phase I Planning and Due Diligence efforts
  - Utilize more extensive and detailed modeling and evaluation tools to evaluate system-wide performance and constraints not previously examined
  - In particular, within the remaining Everglades, additional information regarding water depths, the spatial distribution of depths, and water flows will be considered
  - Evaluate and optimize alternatives
  - Develop approximately 2-4 alternative plans (at least one without land swaps and one with land swaps)

Phase II
Schedule - Overview

Everglades Science Workshop
Goal: Define feasible Everglades operational inflow targets
(Nov 2009 and Jan 2010)

Develop ROG Phase II Planning Alternatives
(Summer 2010)

Selection ROG Phase II Alternative Plans
(Winter 2011)

We Need to Get to Here (18 Months)

Begin ROG Phase II Public Planning Process
(Dec 2009)

We Are Here

Develop ROG Phase II Evaluation Tools
(Spring 2010)

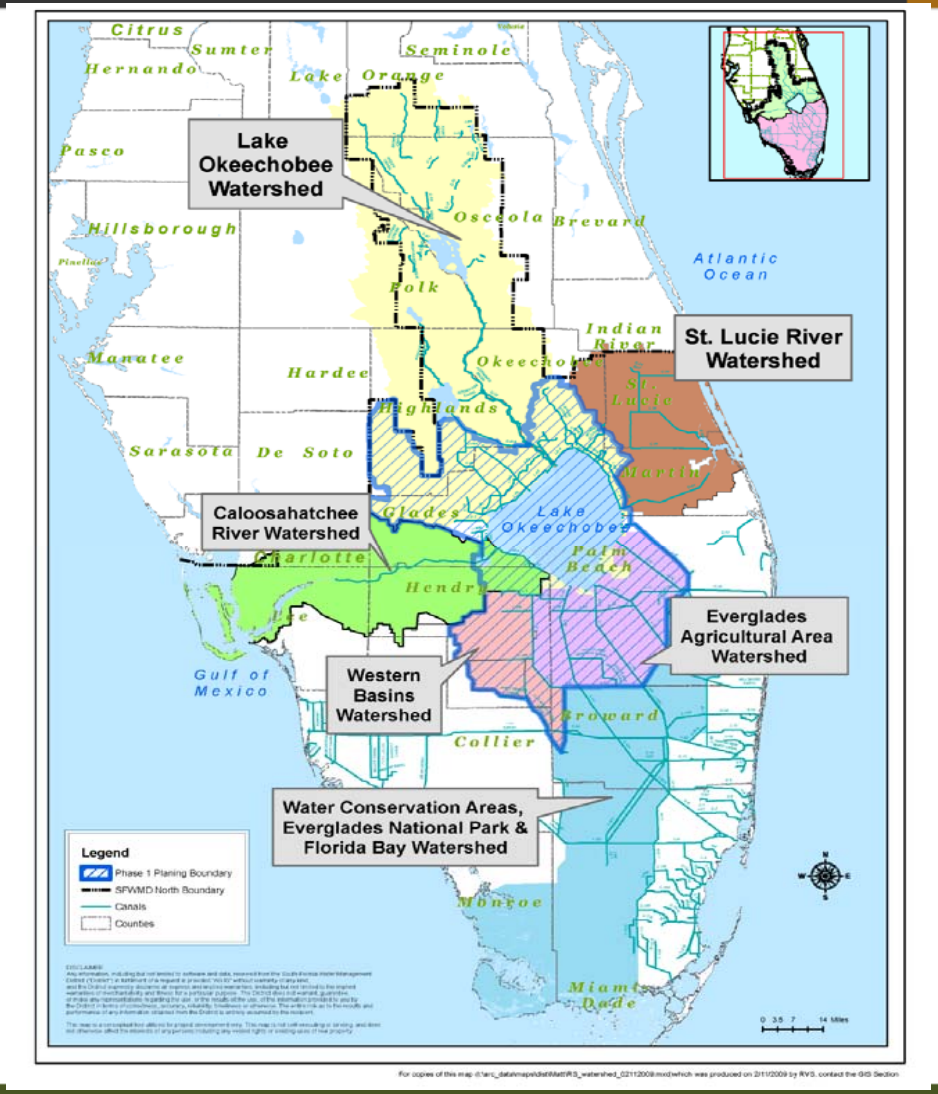
Optimize ROG Phase II Planning Alternatives
(Fall 2010)

Develop Phasing Plan and Initiate Detailed Project Planning and Design
(Spring 2011and Beyond)

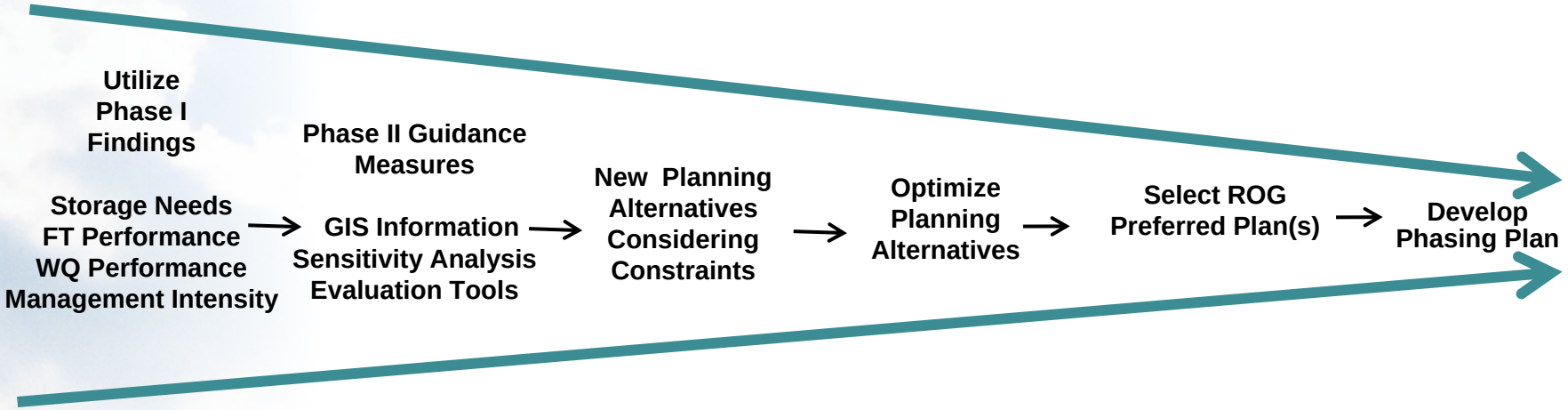
Option Lands - June 2013

Phase II
Planning Boundary

- North of Lake Okeechobee
  - Reservoir storage sizing will be optimized but without infrastructure details
  - Water quality will not be evaluated
- South of Lake Okeechobee
  - Identification of ROG Phase II Planning Alternatives
  - Consider various feature types for storing, treating, and delivering water to WCAs, ENP and Florida Bay
  - Feature types will improve performance in the northern estuaries and Lake Okeechobee



Alternative Formulation Overview



GOAL

2-4 alternative plans

At least one without land swaps and one with land swaps

Phasing of project components for plan implementation

Evaluation and Tool Overview

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Lead Engineer, Hydrologic and Environmental Systems Modeling

Modeling Tools

Walter Wilcox, Lead Engineer, Hydrologic and Environmental Systems Modeling

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ROG Phase II
Hydrologic Modeling Tools

Primary Objective: To simulate the rainfall-runoff process and flow routing within the ROG Phase 2 modeling domain consistent with existing and proposed features and assumed operating protocols

Overall Strategy: Use a decoupled link-node approach for the EAA, STAs and northern areas in combination with a detailed meshed implementation for the Glades-Lower East Coast areas

ROG Phase II
Hydrologic Modeling Tools

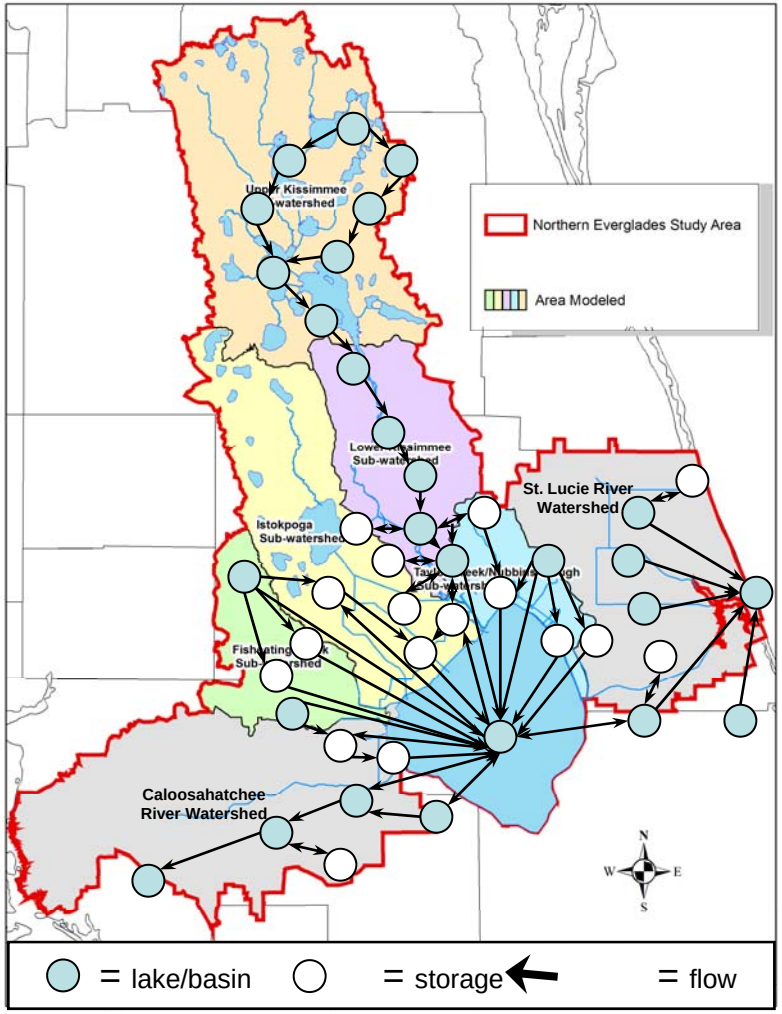
ROG Northern Link-Node Model:

- An expanded version of the Northern Everglades Regional Simulation Model (NERSM)
  - Will provide the connectivity between the EAA and the watersheds in the Northern Everglades Projects: Lake Okeechobee, the northern watersheds, and Caloosahatchee and St. Lucie River watersheds
  - Will provide greater detail than hydrologic modeling tool used in ROG Ph 1 (RESOPS)

ROG Phase II
Hydrologic Modeling Tools

RSM Link-Node Representation for the Northern Everglades Project

NERSM was successfully used in the Lake Okeechobee Phase 2 Technical Plan, and Caloosahatchee & St. Lucie River Watershed Protection Plans



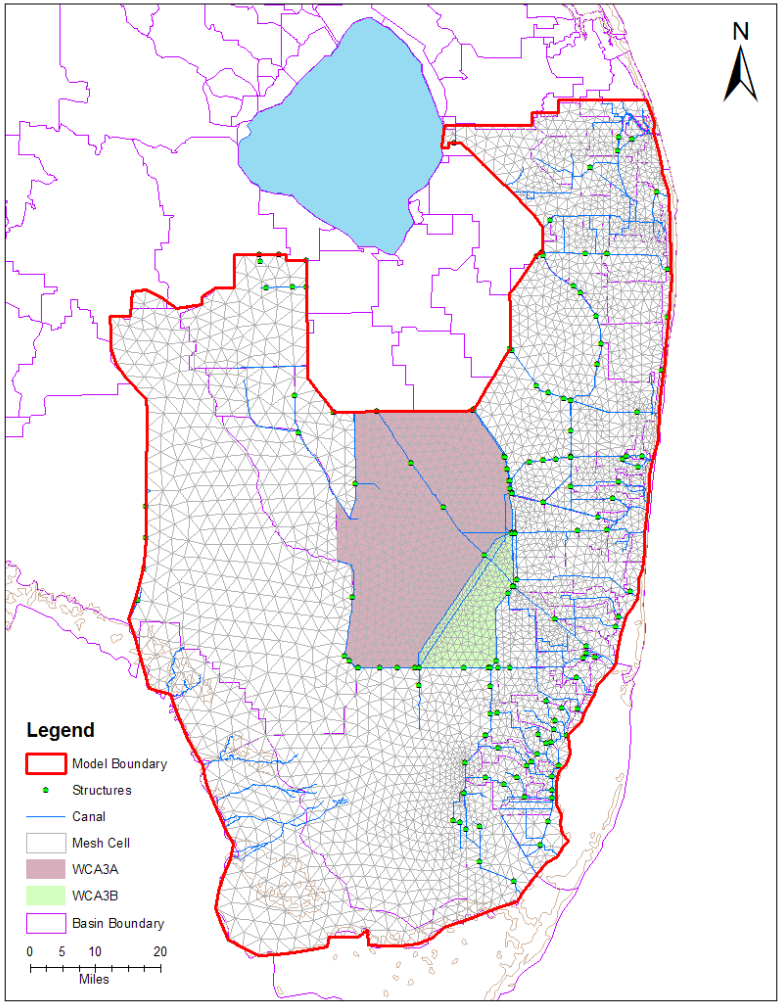
ROG Phase II
Hydrologic Modeling Tools

ROG Glades-LECSA Model

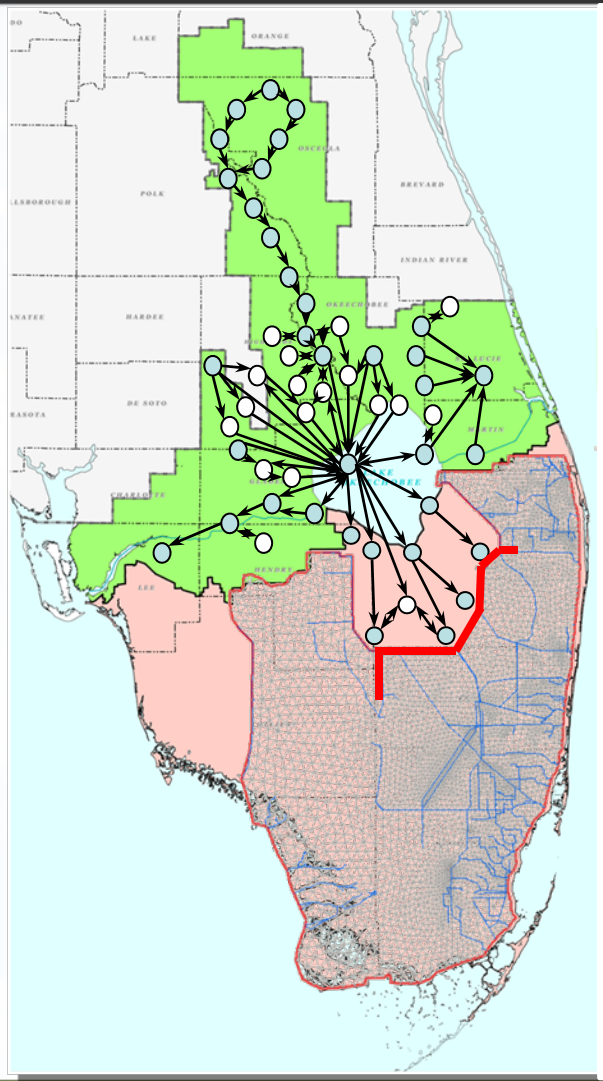
- A full mesh and canal network implementation of the Regional Simulation Model (RSM) concurrently under development for the CERP DECOMP project
  - Will provide detailed (cell-based) stage and flow information consistent with anticipated Glades-based performance measures
  - Calibrated and verified for the 1981-2000 period-of-record

ROG Phase II
Hydrologic Modeling Tools

RSM Mesh Representation for CERP Decompartmentalization Phase 1 Project



ROG Phase II Hydrologic Modeling Strategy



Stakeholder Input:

Identification of
ROG Phase II Planning
Alternatives

Interface ("Red Line"):

Identification of
Operational Flow Targets

Science Input:

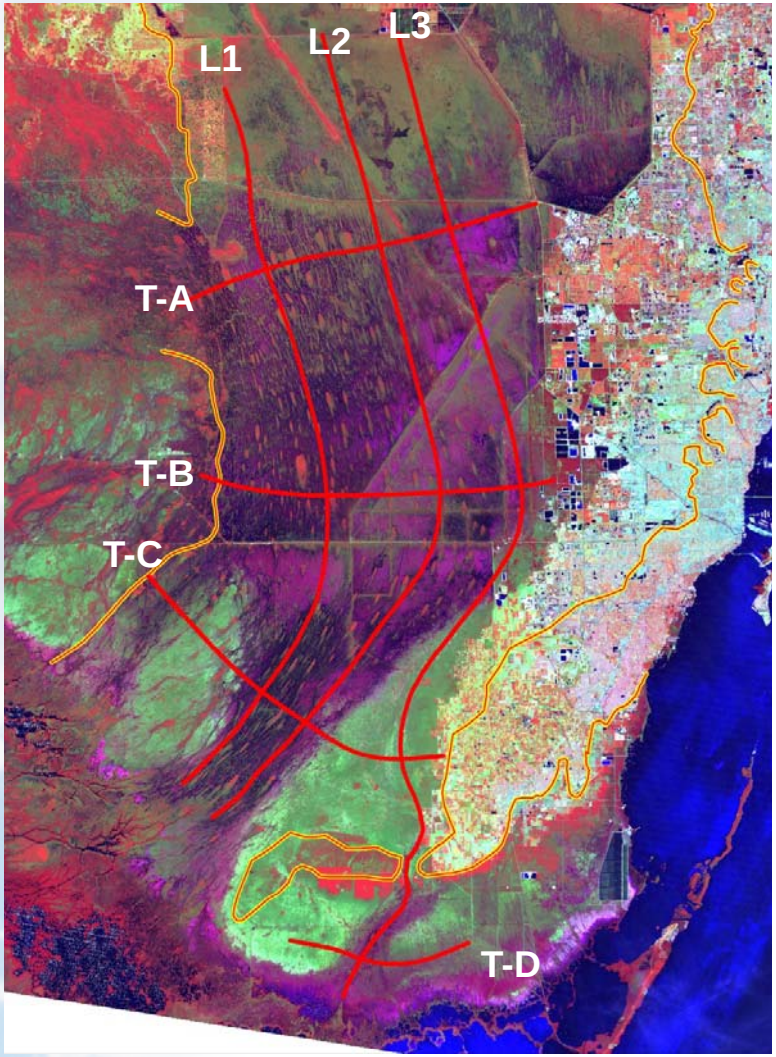
Identification of
Downstream Scenarios

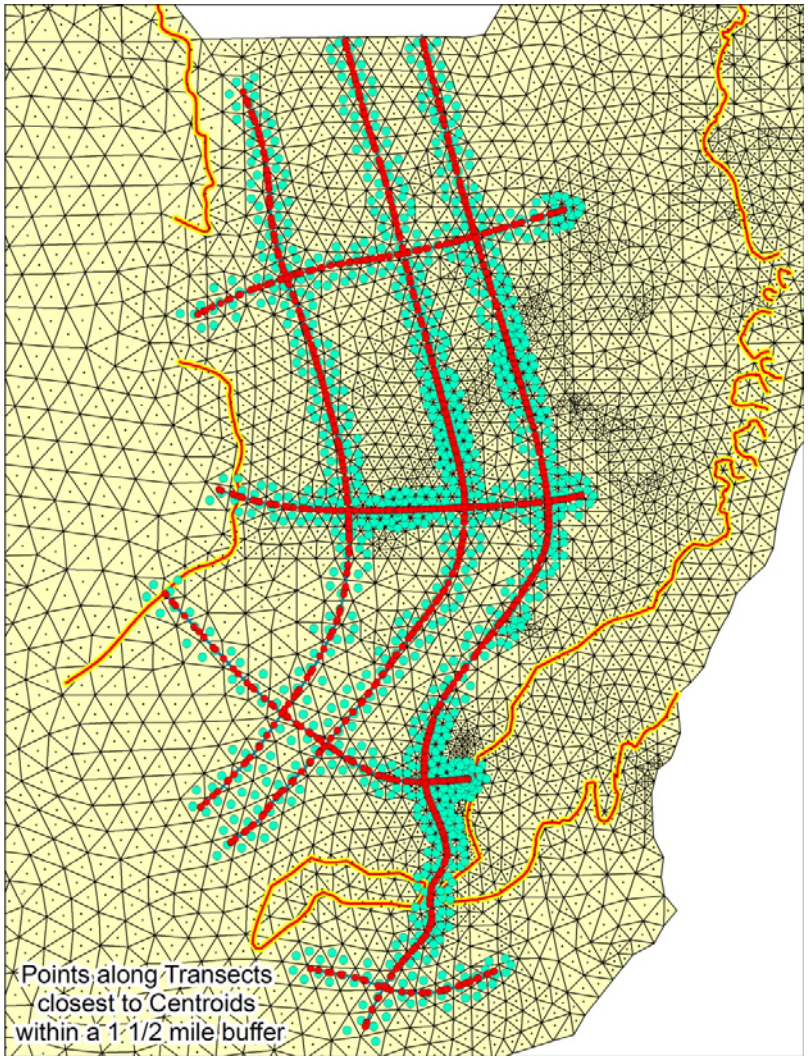
ROG Phase II Everglades Science Workshop

- November 17 and 18
  - Presentations on the latest scientific & modeling data for the Everglades and Southern Estuaries were provided
  - Ever-View windows, which facilitate system-wide Everglades analysis across multiple models, were introduced as a Phase II evaluation methodology
  - System objectives, constraints and hydrologic characteristics were discussed
  - A goal to identify a range of feasible Everglades scenarios through examination of various modeling outputs for use in ROG Phase II planning was established

"Ever Views"

Aligned with Landscape Directionality

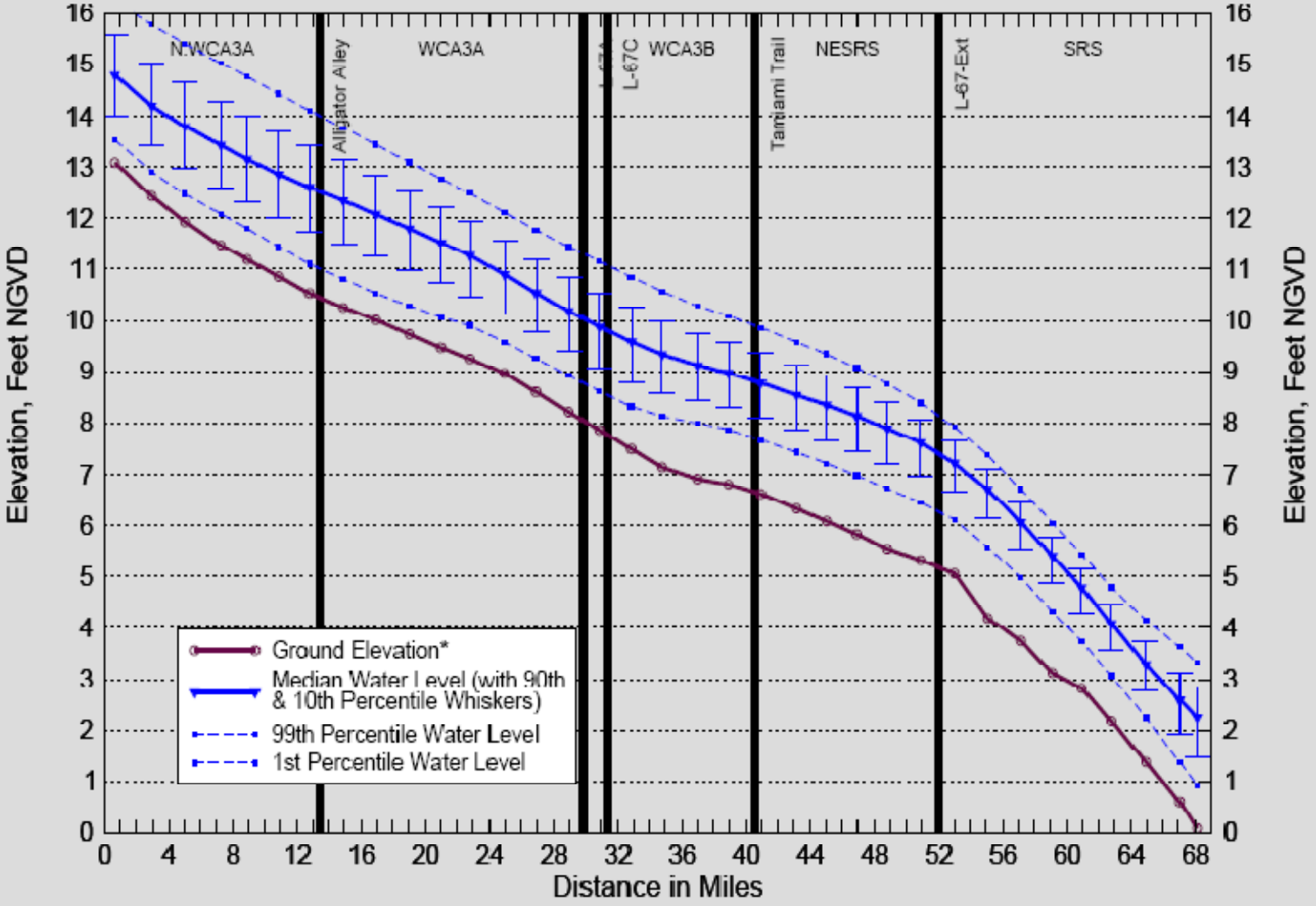




NSRSM
L2 Transect

Water Depth Viewing Window

Transect L2 for Pre-drainage NSRSMv3.3



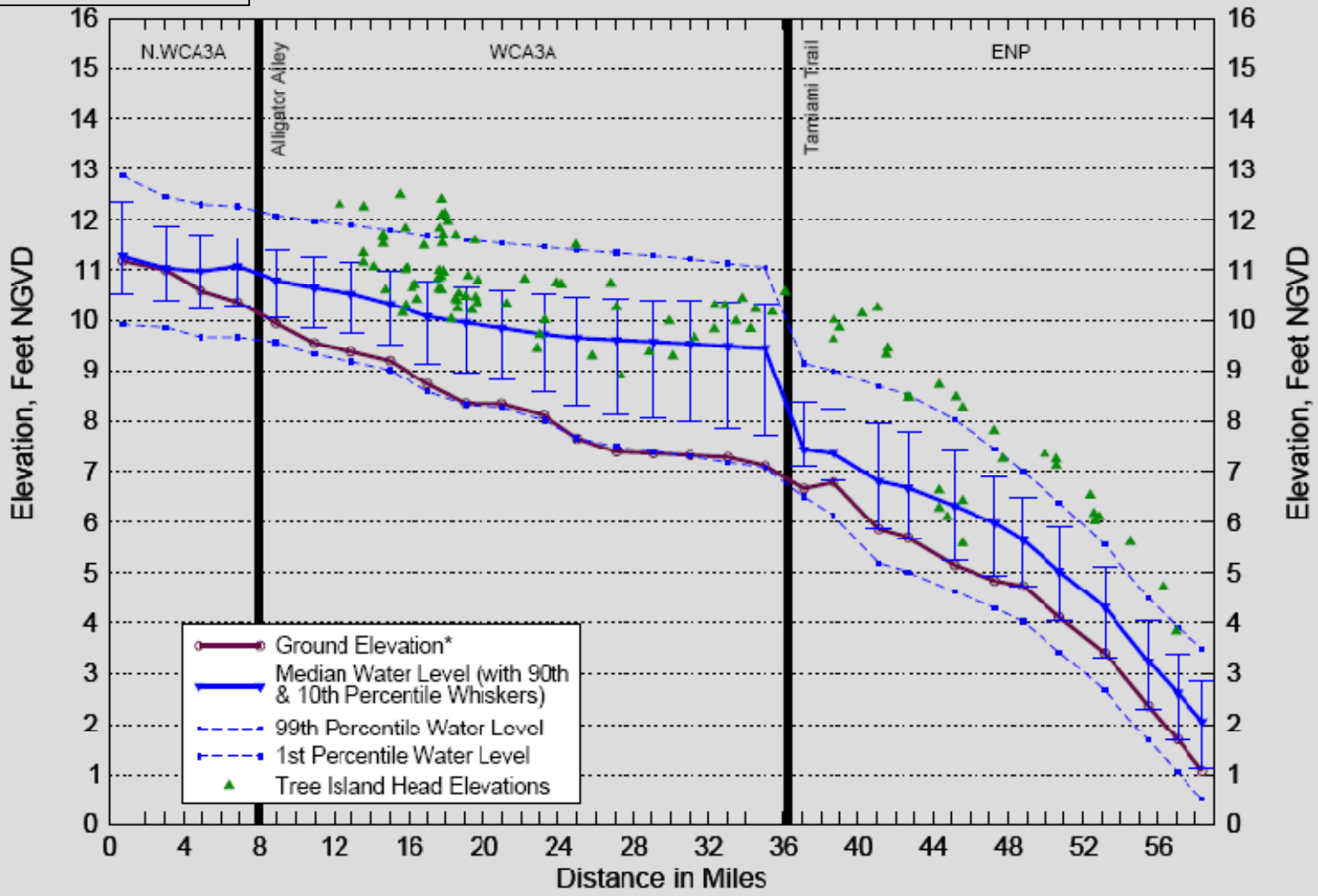
* Within the ridge & slough landscape, ground elevation = slough bottom.
For other landscapes, ground elevation = average model ground surface.

P.O.S. = 01-02-1965 to 12-31-2005
Script used: depth_transects.scr
Filename: depth_transects_L2_NSRSMv3.3.agr

CURRENT
L1 Transect

Water Depth Viewing Window

Transect L1 for Scenario RSM_PCB1_GLD_rev_4848



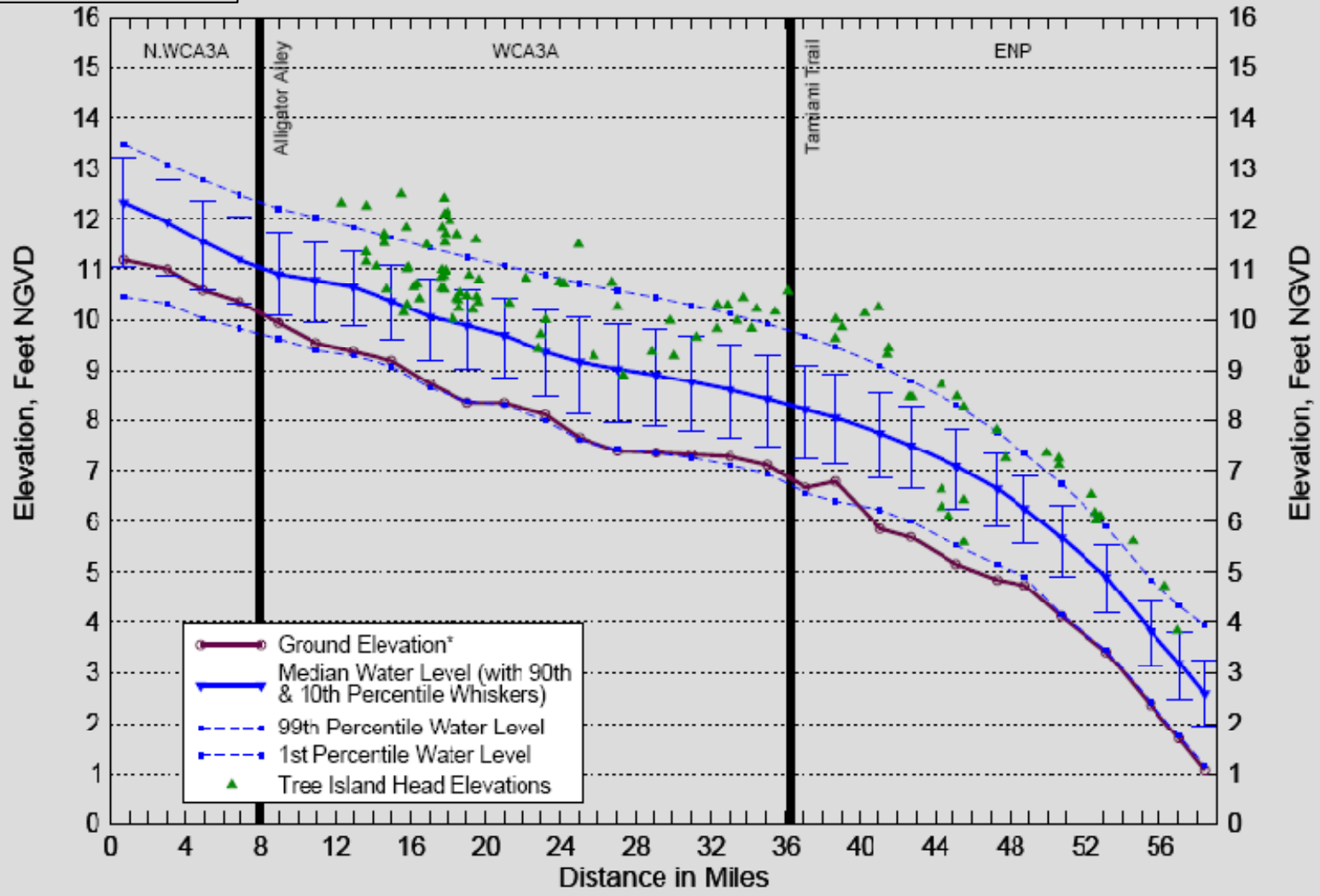
* Within the ridge & slough landscape, ground elevation = slough bottom.
For other landscapes, ground elevation = average model ground surface.

P.O.S. = 01-01-1965 to 12-31-2000
Script used: depth_transects.scr
Filename: depth_transects_L1_RSM_PCB1_GLD_rev_4848.agr

TEST 1
L1 Transect

Water Depth Viewing Window

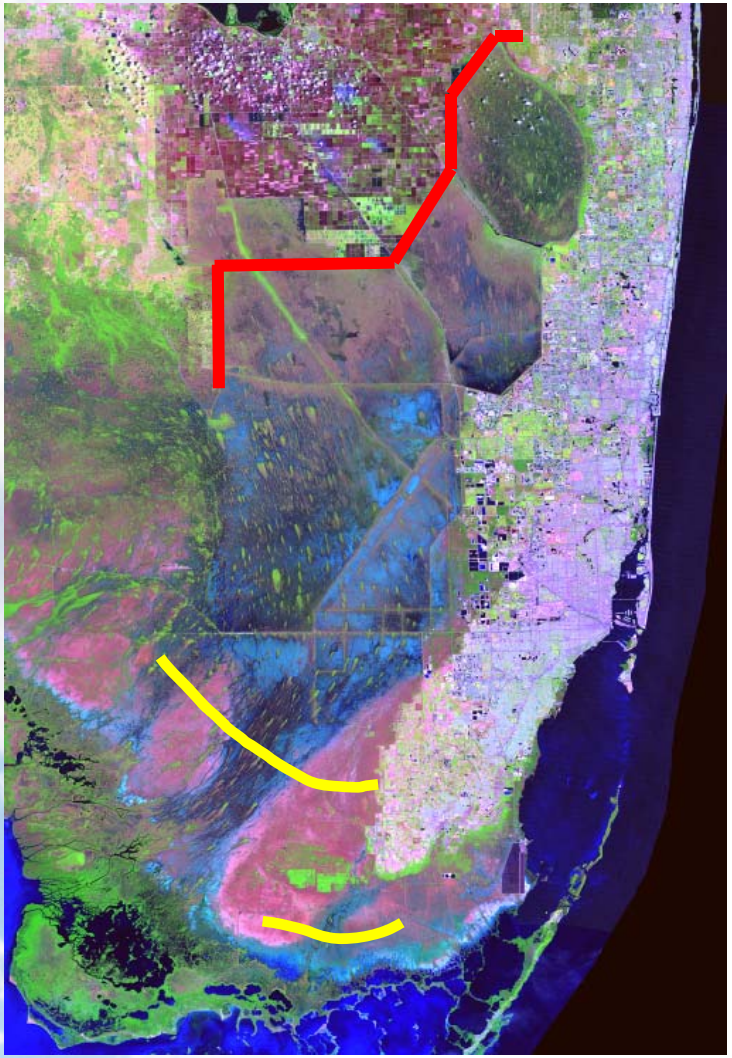
Transect L1 for Scenario RSM_deco_nsrsm_60_40_SA2B

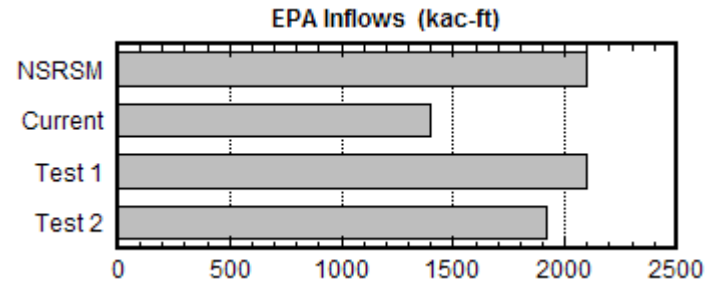


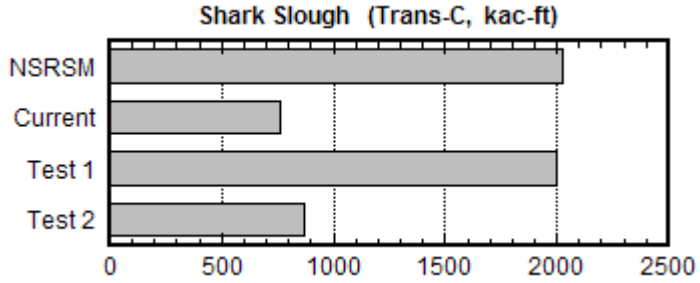
* Within the ridge & slough landscape, ground elevation = slough bottom.
For other landscapes, ground elevation = average model ground surface.

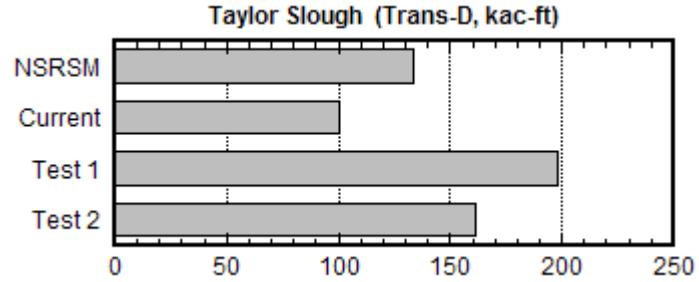
P.O.S. = 01-01-1965 to 12-31-2000
Script used: depth_transects.scr
Filename: depth_transects_L1_RSM_deco_nsrsm_60_40_SA2B.agr

Ever-View Discharge Viewing Window









ROG Phase II Everglades Science Workshop

- Between the November and the January science workshops, public input will contribute towards the development of four downstream scenarios:
  1. CERP flows and conditions (already defined)
  2. Pre-drainage like flows emphasizing marsh flow through the WCA3/ENP system
  3. Pre-drainage like flows allowing for a CERP-like eastern flow path (Central Lake Belt or equivalent)
  4. Scenario that emphasizes Wet Prairie / WCA3B / wading bird objectives
- Outcomes will be presented and discussed at the January workshop

ROG Phase II
Water Quality Modeling Tools

- In ROG Phase I, a steady state water quality analysis was performed
- ROG Phase II will take advantage of improved hydrologic modeling to perform water quality analysis utilizing a dynamic model (DMSTA2)
- Consistency between hydrologic and water-quality assumptions is critical particularly for sub-basin definitions and feature operational strategies

ROG Phase II
Hydraulic Modeling Tools

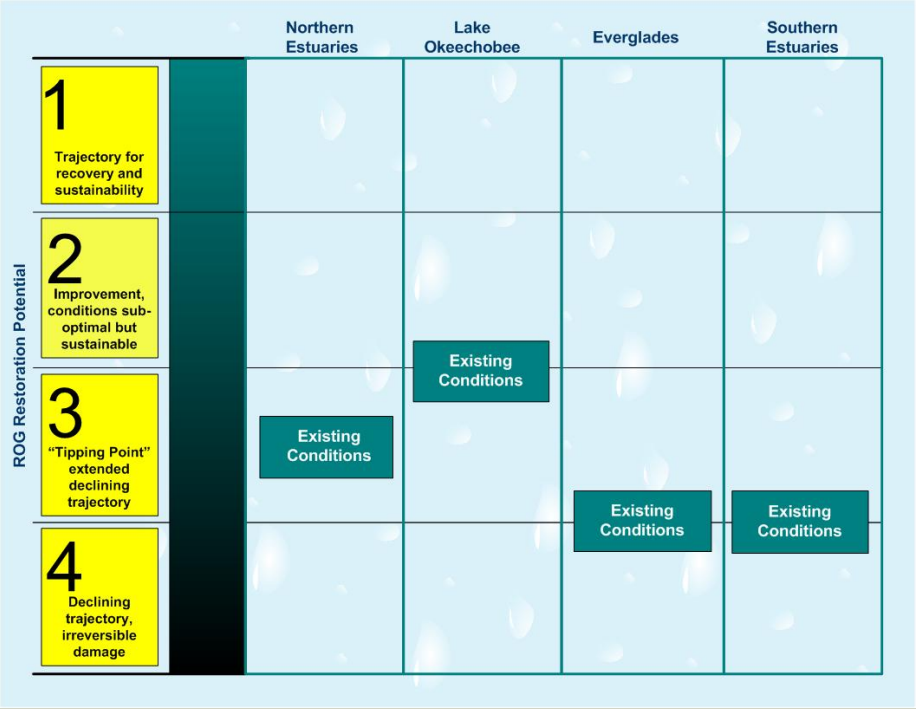
- A review of available hydraulic information and modeling (e.g. Mike11 model for the EAA) within the expanded areas of the NERSM is currently underway
- Evaluation of hydraulic limitations of proposed features and infrastructure including flow-way features will be performed using detailed hydraulic tools including:
  - Hydraulic Assessment Tool (HAT)
  - HEC-RAS, USACE hydraulic model

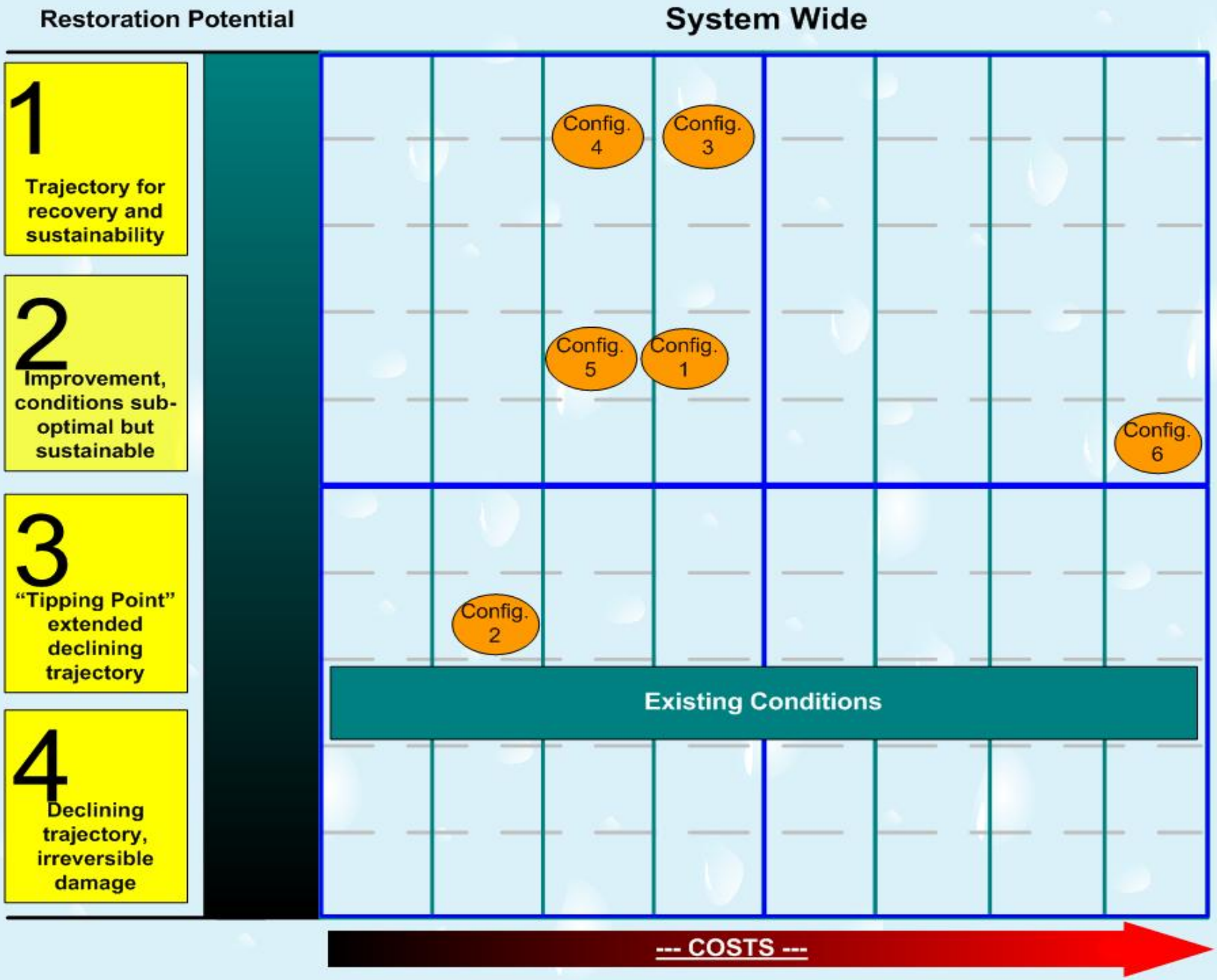
Benefits Evaluation

Matt Morrison, Director, Project Coordination Division

Phase II
Ecosystem Benefits Evaluation

- Update the incremental narratives for the benefits evaluation to include refined ecological performance measures as result of more detailed model output
- Ecological performance will be measured as a function of "Restoration Potential"
  - Northern Estuaries
  - Lake Okeechobee
  - Everglades
  - Southern Estuaries
- LOSA Demands "no harm"




Restoration Potential
System Wide
1
Trajectory for recovery and sustainability
2
Improvement, conditions sub-optimal but sustainable
3
"Tipping Point" extended declining trajectory
4
Declining trajectory, irreversible damage
Config. 4
Config. 3
Config. 5
Config. 1
Config. 6
Config. 2
Existing Conditions
--- COSTS ---

Planning Evaluation Tools

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Phase II
Planning Evaluation Tools

- What are they?
  - Compilation of land related information and other cost, risk and uncertainty data gathered to provide guidance measures in project planning
- Why use them?
  - Provide assistance to project teams in formulating cost effective and impact avoidant project footprints and alternatives
  - Allows us to quantify project costs and impacts for comparison against project benefits during the alternative screening and plan selection process

Phase II
Planning Evaluation Tools

- Land Ownership and Availability
  - USSC Only Lands and Potential Land Swaps
  - Works of the District
  - State, Federal and Tribal Lands

- Quantification of Costs and Potential Impacts
  - Real Estate Cost Estimates
  - Water Control Districts – 298 District flood control and water supply
  - Environmental Remediation
  - Capital Construction
  - Operations and Maintenance
  - Infrastructure – transportation, municipal, commercial, residential
  - Sugar Cane Crop Yield
- Other Considerations
  - Climate Change & Sea Level Rise
  - Threatened & Endangered Species
  - Valuation of Ecosystem Services

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

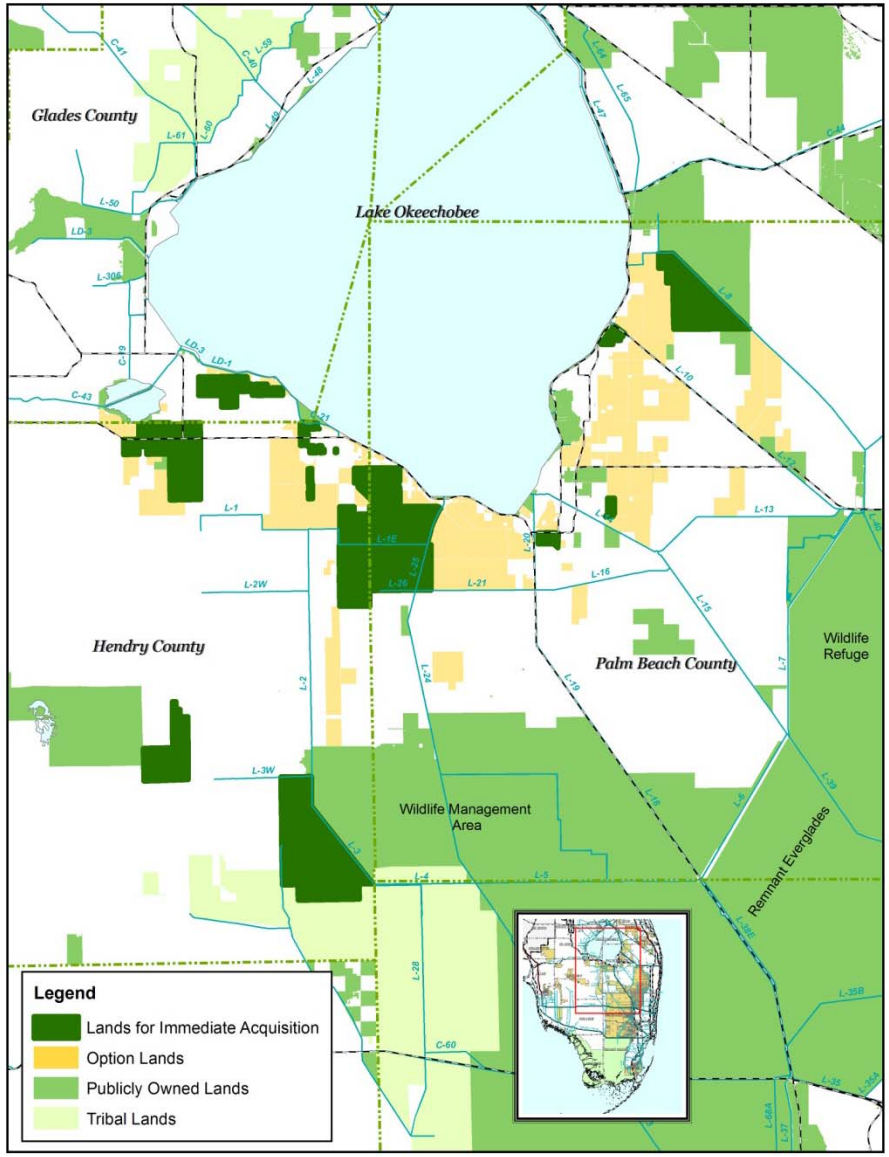
Planning Evaluation Tools
Land Ownership and Availability

sfwmd.gov/riverofgrass

RESTORATION PLANNING

Phase II – Planning Evaluation Tool
Land Ownership and Availability

- Land Ownership
  - Provides a general range of potential land availability
    - High Potential Availability - State and Federal Lands, United States Sugar Corporation Lands
    - Uncertain Availability - Private Lands, Utility Owned Lands, Urban Service Areas Outside of Municipal Boundaries
    - No Availability - Tribal Lands, Lands within Municipal Boundaries, Existing Projects, Project Under Construction



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Planning Evaluation Tools
Quantification of Costs and Potential Impacts

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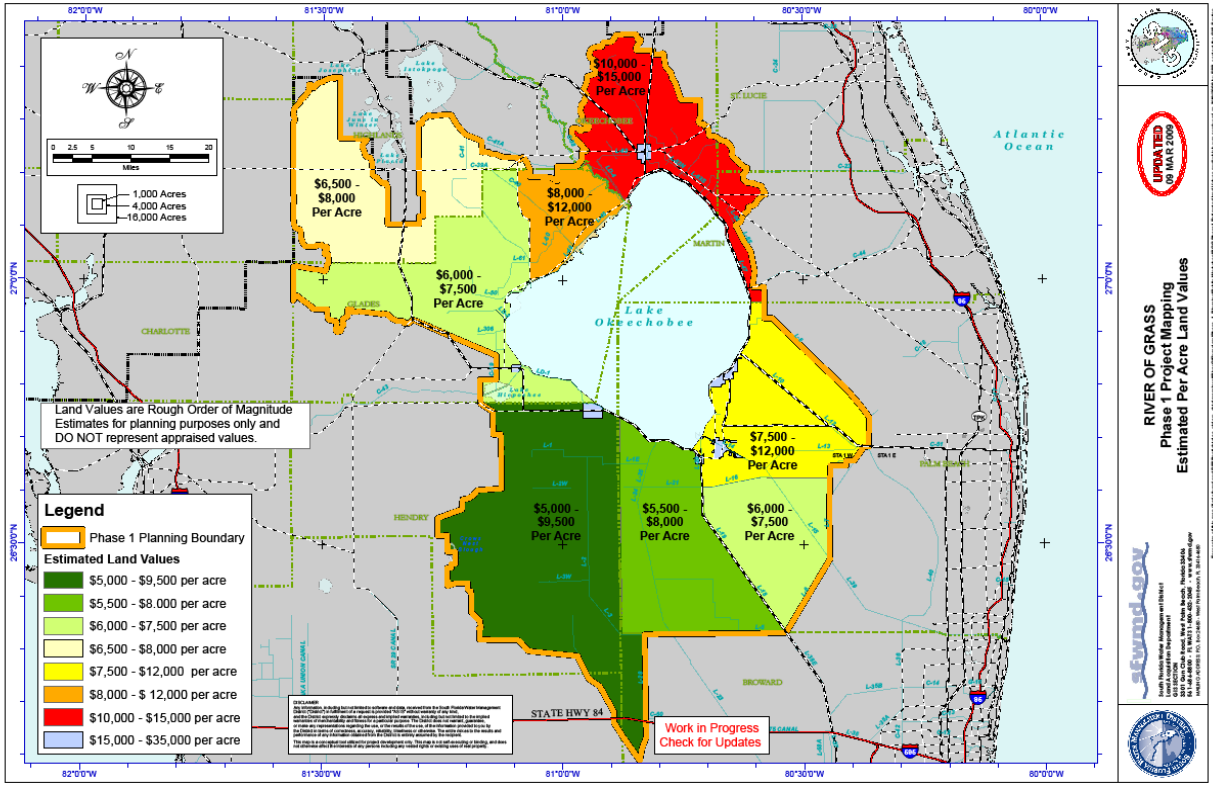
RESTORATION PLANNING

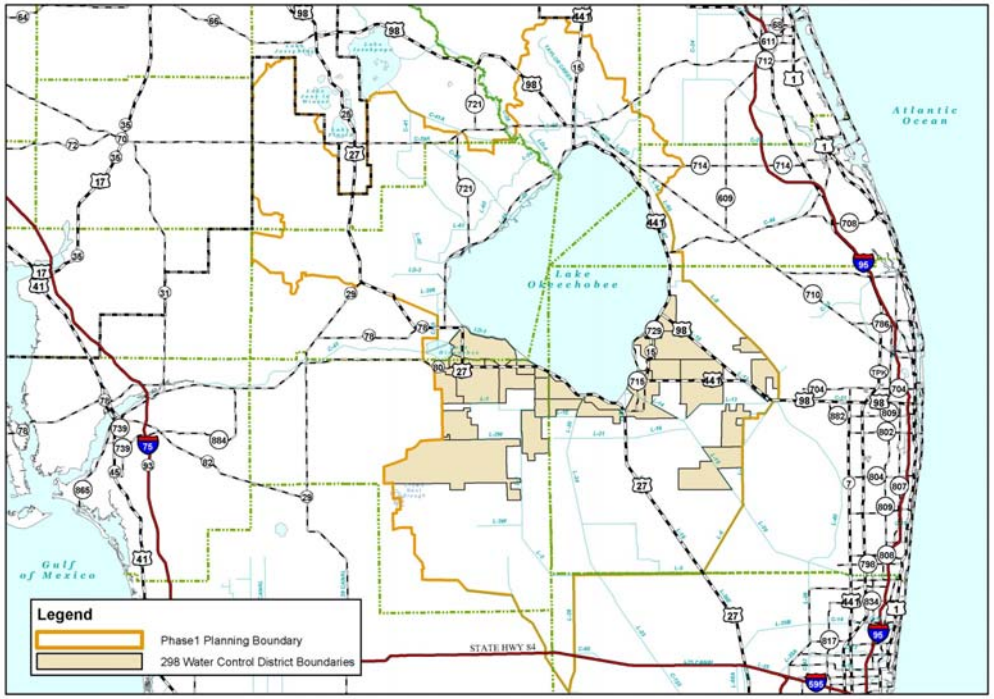
Phase II – Planning Evaluation Tool
Quantification of Costs and Potential Impacts – Real Estate Costs

- Create range of cost per acre for regions within the Planning Boundary
- Once alternative boundary is defined, provide detailed cost per acre based on current land use, available appraisals and market data
- Include contingency for Title Fees, Attorney Fees, and all Other Costs associated with land acquisition



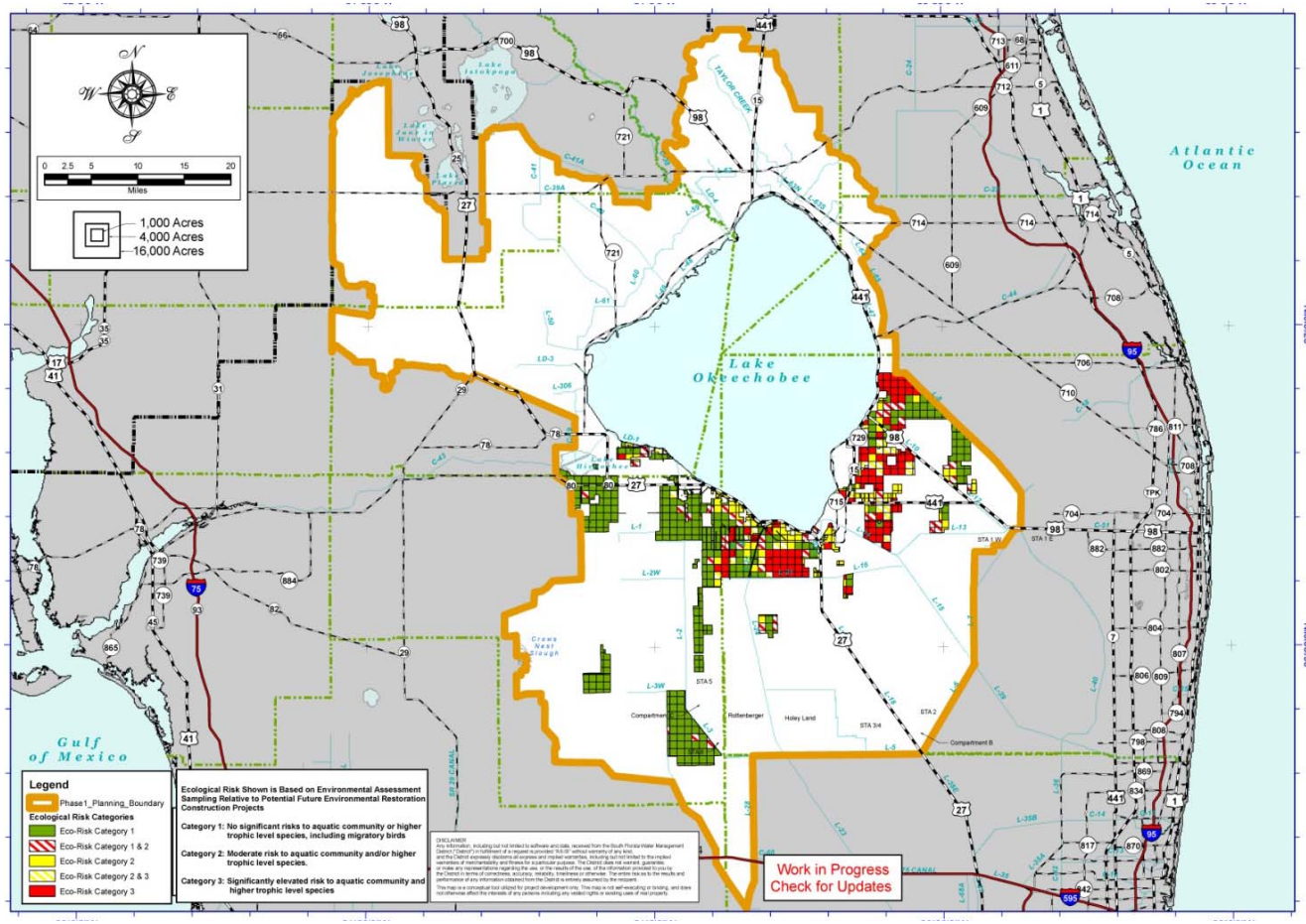
Phase II – Planning Evaluation Tool
Quantification of Costs and Potential Impacts – Water Control Districts

- Quantification of Impacts to 298 Water Control Districts and Other Special Districts
  - Ensure receive the same level of service
  - Provide necessary offsets for maintaining irrigation and flood control
- Quantify Costs
  - Identify segments of 298 Districts isolated from permitted inflow/outflows
  - Acreages included/excluded within potential alternative footprints
  - Pump Stations/Control structures that are impacted



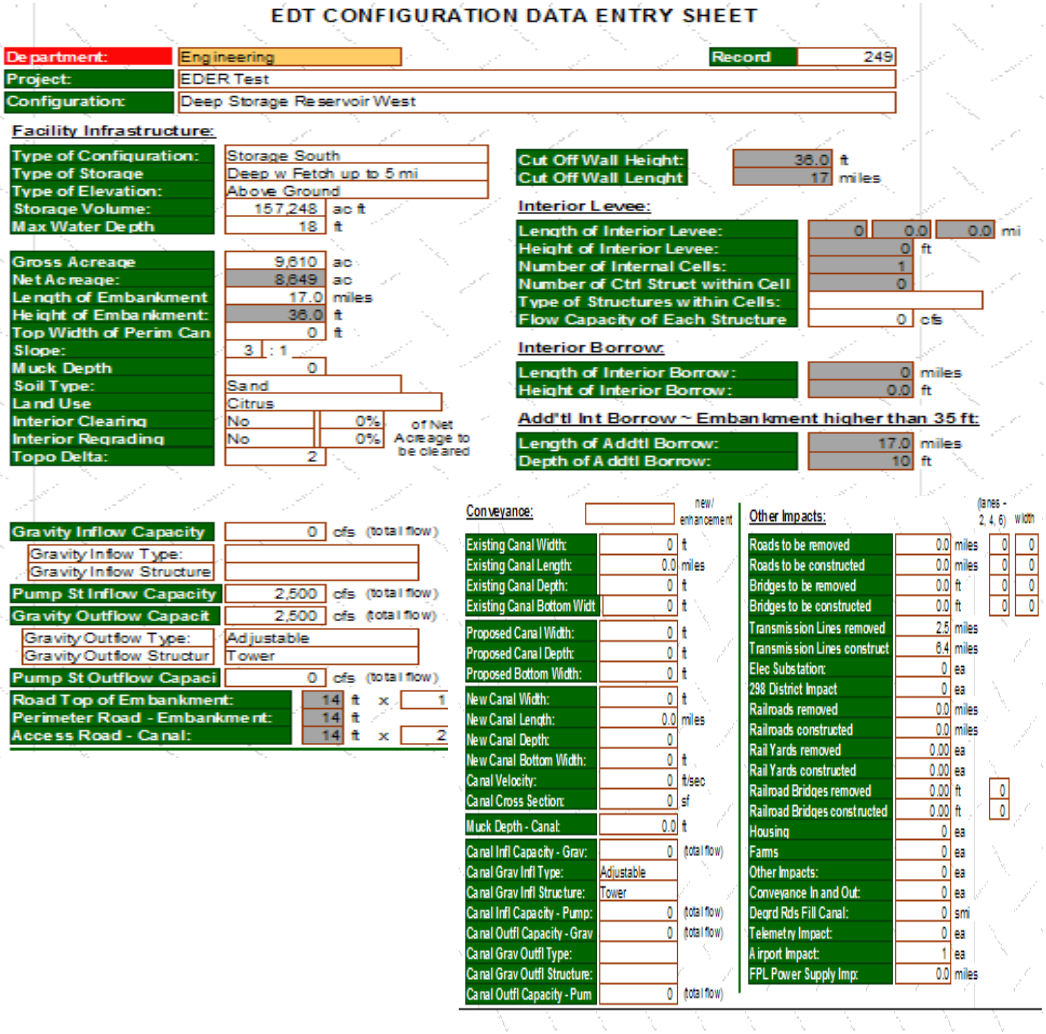
Phase II – Planning Evaluation Tool
Quantification of Costs and Potential Impacts – Environmental Remediation

- Corrective actions are often required when changing land use to a restoration project (current land use vs. restoration lands)
- Per acre cost estimates are based on similarities between land uses and cost of corrective actions



Phase II – Planning Evaluation Tool
Quantification of Costs and Potential Impacts – Infrastructure Impacts, Capital Construction and O&M

- Cost Estimating Database
  - Costs estimating tool for evaluation of different project feature types
  - Computes construction costs based on material quantities (miles of levees, height of embankments, water control structures and conveyance improvements)
  - Generates O&M cost reports
  - Includes fields on input sheets to account for additional costs to remove, widen, and/or relocate - Roads, Bridges, Railroads, Power Lines, Natural Gas Lines, Communication Towers



EDT CONFIGURATION DATA ENTRY SHEET

Department:	Engineering	Record	249
Project:	EDER Test		
Configuration:	Deep Storage Reservoir West		

Facility Infrastructure:

Type of Configuration:	Storage South	
Type of Storage	Deep w Fetch up to 5 mi	
Type of Elevation:	Above Ground	
Storage Volume:	157,248	ac ft
Max Water Depth	18	ft
Gross Acreage	9,810	ac
Net Acreage:	8,649	ac
Length of Embankment	17.0	miles
Height of Embankment:	36.0	ft
Top Width of Perim Can	0	ft
Slope:	3 : 1	
Muck Depth	0	
Soil Type:	Sand	
Land Use	Citrus	
Interior Clearing	No 0%	of Net Acreage to be cleared
Interior Regrading	No 0%	
Topo Delta:	2	

Cut Off Wall Height:	36.0	ft
Cut Off Wall Lenght	17	miles

Interior Levee:

Length of Interior Levee:	0	0.0	0.0	mi
Height of Interior Levee:	0	ft		
Number of Internal Cells:	1			
Number of Ctrl Struct within Cell	0			
Type of Structures within Cells:				
Flow Capacity of Each Structure	0	cfs		

Interior Borrow:

Length of Interior Borrow:	0	miles
Height of Interior Borrow:	0.0	ft

Add'tl Int Borrow ~ Embankment higher than 35 ft:

Length of Addtl Borrow:	17.0	miles
Depth of Addtl Borrow:	10	ft

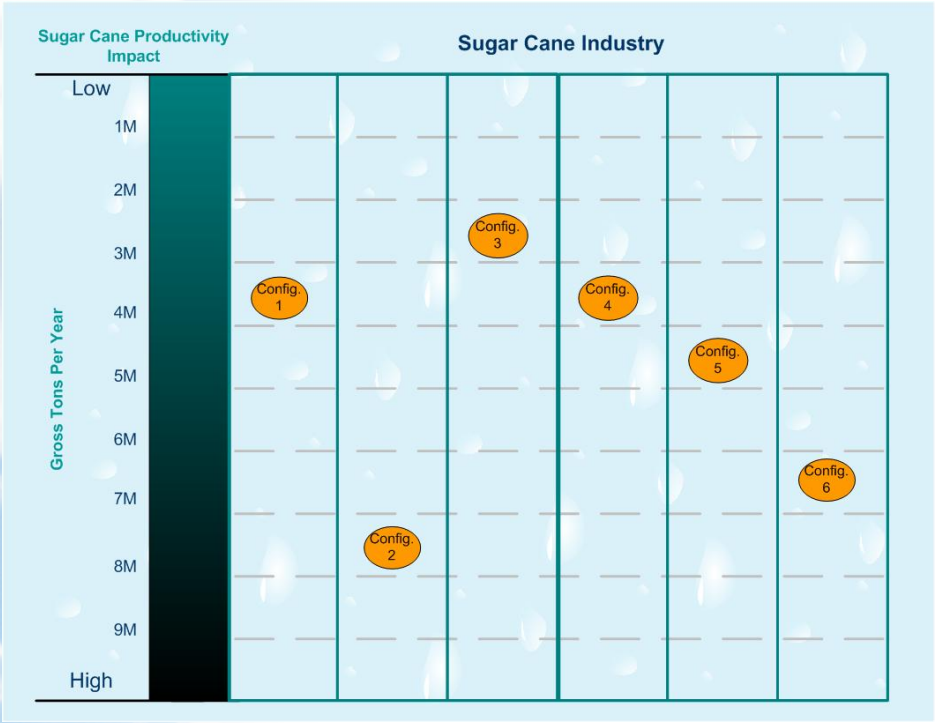
Gravity Inflow Capacity	0	cfs (total flow)
Gravity Inflow Type:		
Gravity Inflow Structure		
Pump St Inflow Capacity	2,500	cfs (total flow)
Gravity Outflow Capacit	2,500	cfs (total flow)
Gravity Outflow Type:	Adjustable	
Gravity Outflow Structur	Tower	
Pump St Outflow Capaci	0	cfs (total flow)
Road Top of Embankment:	14	ft x 1
Perimeter Road - Embankment:	14	ft
Access Road - Canal:	14	ft x 2

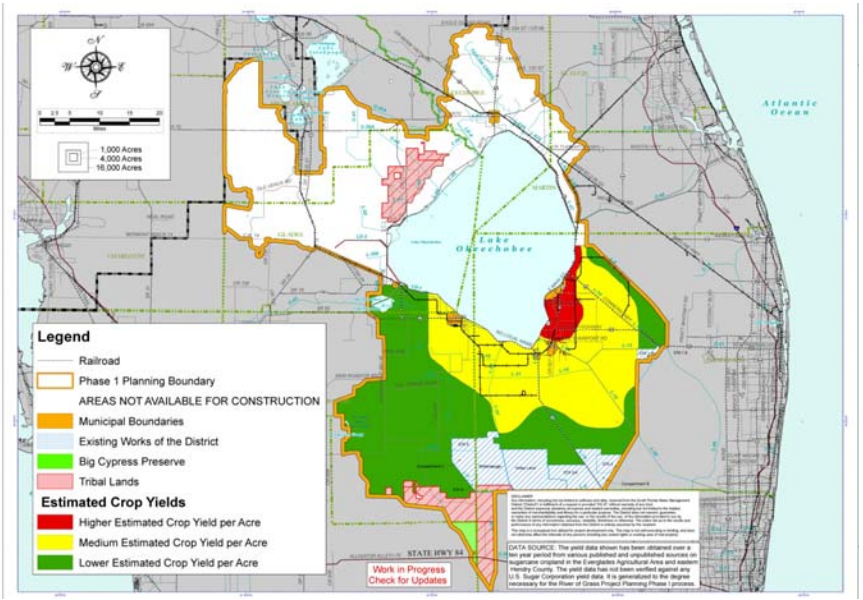
Conveyance:		new/ enhancement
Existing Canal Width:	0	ft
Existing Canal Length:	0.0	miles
Existing Canal Depth:	0	ft
Existing Canal Bottom Widt	0	ft
Proposed Canal Width:	0	ft
Proposed Canal Depth:	0	ft
Proposed Bottom Width:	0	ft
New Canal Width:	0	ft
New Canal Length:	0.0	miles
New Canal Depth:	0	
New Canal Bottom Width:	0	ft
Canal Velocity:	0	ft/sec
Canal Cross Section:	0	sf
Muck Depth - Canal:	0.0	ft
Canal Infl Capacity - Grav:	0	(total flow)
Canal Grav Infl Type:	Adjustable	
Canal Grav Infl Structure:	Tower	
Canal Infl Capacity - Pump:	0	(total flow)
Canal Outfl Capacity - Grav	0	(total flow)
Canal Grav Outfl Type:		
Canal Grav Outfl Structure:		
Canal Outfl Capacity - Pum	0	(total flow)

Other Impacts:			(lanes - 2, 4, 6)	width
Roads to be removed	0.0	miles	0	0
Roads to be constructed	0.0	miles	0	0
Bridges to be removed	0.0	ft	0	0
Bridges to be constructed	0.0	ft	0	0
Transmission Lines removed	2.5	miles		
Transmission Lines construct	6.4	miles		
Elec Substation:	0	ea		
298 District Impact	0	ea		
Railroads removed	0.0	miles		
Railroads constructed	0.0	miles		
Rail Yards removed	0.00	ea		
Rail Yards constructed	0.00	ea		
Railroad Bridges removed	0.00	ft	0	
Railroad Bridges constructed	0.00	ft	0	
Housing	0	ea		
Farms	0	ea		
Other Impacts:	0	ea		
Conveyance In and Out:	0	ea		
Degrd Rds Fill Canal:	0	smi		
Telemetry Impact:	0	ea		
Airport Impact:	1	ea		
FPL Power Supply Imp:	0.0	miles		

Phase II – Planning Evaluation Tool
Quantification of Costs and Potential Impacts – Sugar Cane Crop Yield

- Evaluate the potential impact to sugar cane productivity in gross tons per year utilizing estimates for cane acreage and yields within the restoration project footprint





Planning Evaluation Tools
Other Considerations

Phase II – Planning Evaluation Tool
Other Considerations - Climate Change and Sea Level Rise

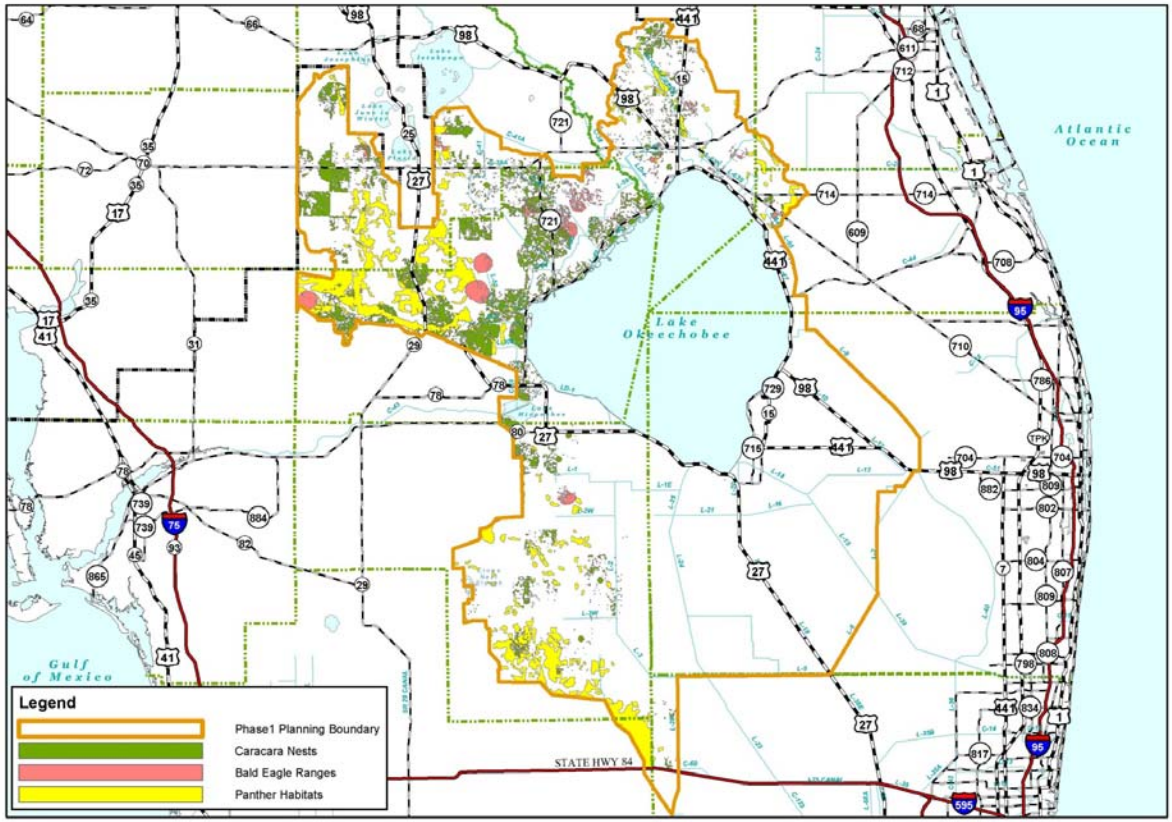
- SFWMD's internal climate change group completed a white paper and presented it to the Governing Board and WRAC
- Dimensions of Climate Change

Change Type	Drivers	Impacts
Natural Human Induced	Rising Seas Temperature & Rainfall Patterns Tropical Storms/Hurricanes	Direct impacts on the coast Water Supply Flood Control Restoration

- Many uncertainties in science. The District is taking a more measured approach focusing on more urgent issues such as sea level rise
- Immediate future actions:
  - Coordination with local, regional, federal and state agencies to agree on common planning parameters (e.g. Sea Level Rise)
  - Develop methodologies for dealing with uncertain climate change projections and the sensitivity analyses of proposed project features of River of Grass, CERP, and others
  - Develop and implement short term adaptation strategies

Phase II – Planning Evaluation Tool
Other Considerations - Threatened & Endangered Species Habitat

- Consideration of project location relative to Threatened and Endangered Species
- Complicates permitting process and often results in higher construction costs to off-set project impacts
- Examples include Panthers, Snail Kite, Rookeries, Caracara, Bald Eagles, etc.



Phase II – Planning Evaluation Tool
Other Considerations – Valuation of Ecosystem Services

- Environmental restoration and preservation can provide a wide range of economic and environmental benefits
- Ecosystem services are the valued outcomes that result from the physical, chemical and biological processes inherent in an ecosystem
  - clean water, harvesting of animals or timber, scenic views, etc.
- Services can be provided by natural and man-made systems
- The Challenge
  - Enumerating and measuring ecosystem services is difficult and controversial
  - The Everglades ecosystem is a multifaceted system with multiple natural systems to value
  - Valuing ecosystems is challenging, valuing incremental changes in an ecosystem is more difficult
  - Methods for valuing are primarily indirect
    - Monetary valuation (willingness to pay concept)
    - Non-monetary valuation (ranking or prioritizing

Plan Selection and Phasing

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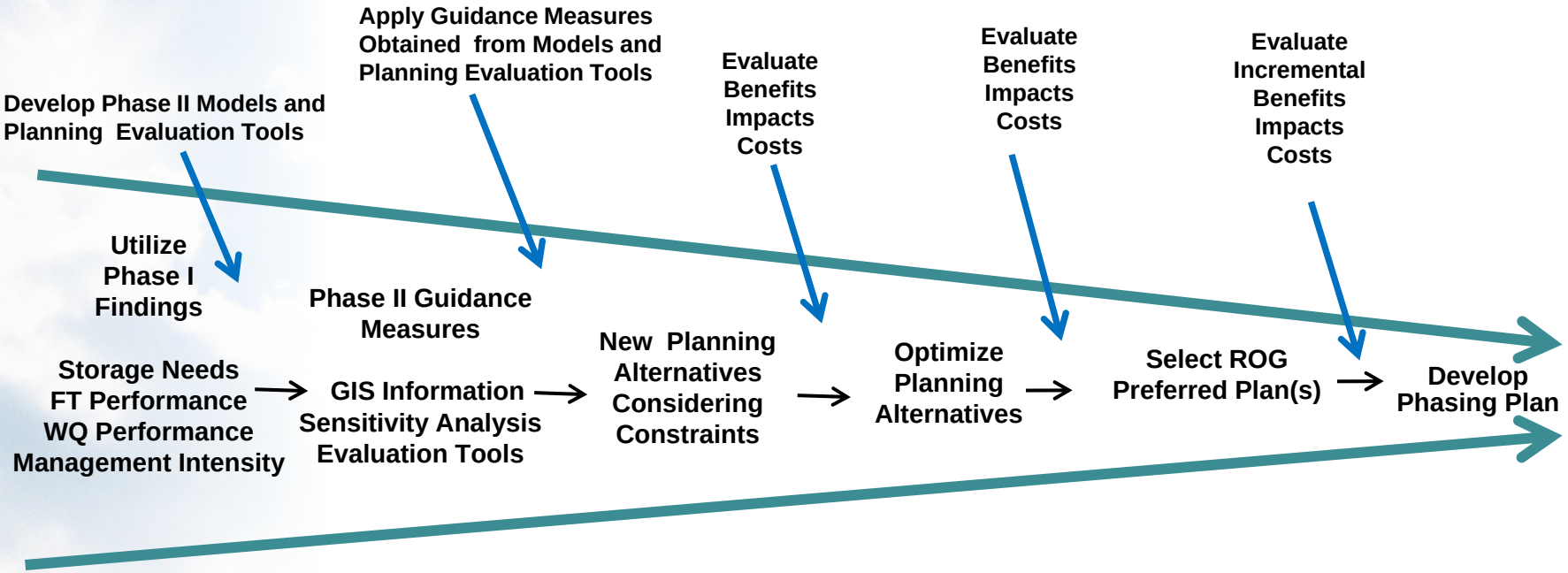
Plan Formulation
Tool and Evaluation Overview

- Provide stakeholders with an opportunity to develop Alternative Plans that they believe may best achieve restoration objectives while considering constraints and other relevant factors
- Utilize modeling information and evaluation tools as guidance measures when considering various options for storing, treating, and delivering water
- Utilize models and evaluation tools to evaluate alternative benefits, costs, and potential impacts
- Develop approximately 2-4 alternative plans (at least one without land swaps and one with land swaps)
- Identify common project elements of the alternative plans and assess components for incremental costs, impacts and benefits
- Use information gained during incremental assessment to develop a phasing plan for project implementation
- Present ROG Phase II information to the SFWMD WRAC and Governing Board at regular intervals during the 18 month planning process

Alternative Formulation Overview



GOAL

2-4 alternative plans

At least without land swaps and one with land swaps

Phasing of project components for plan implementation

Next Meeting/Future Meeting Topics

Next Meeting - Date and Location

Science Workshop #2

January 27-28

SFWMD Auditorium

Day 1: 10:30 a.m. – 4:00 p.m.

Day 2: 9:00 a.m. – 4:00 p.m.

WRAC Issues Workshop

February 18

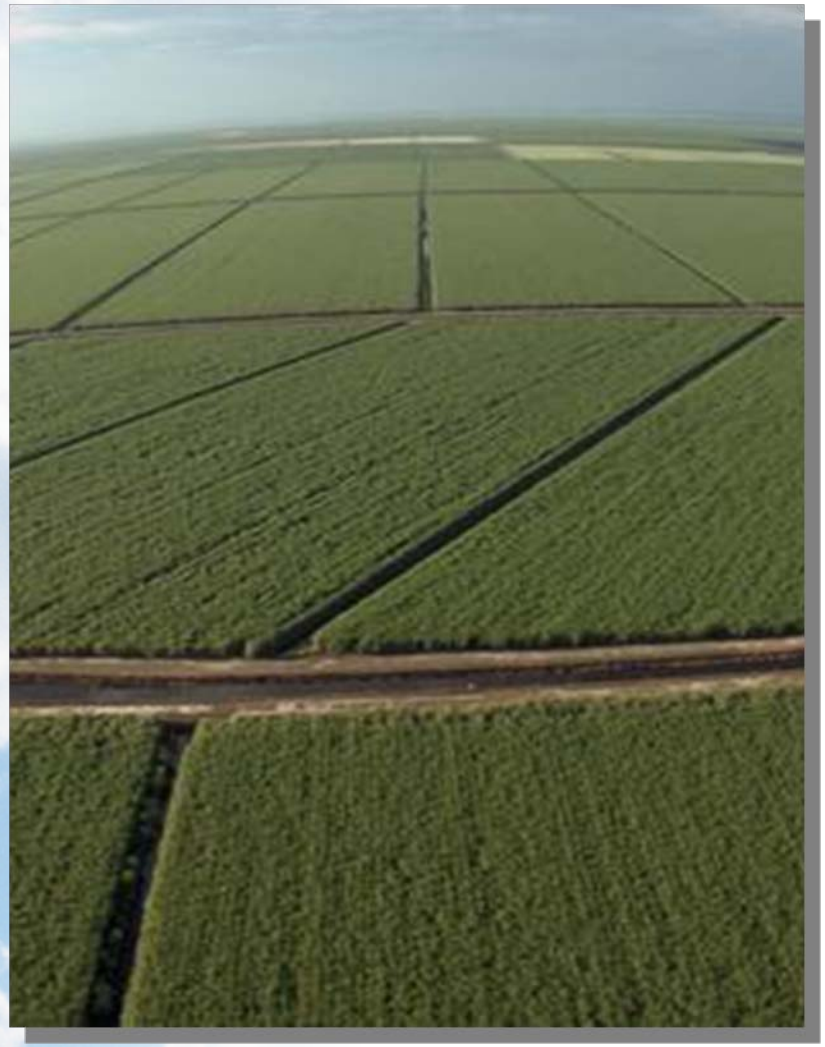
SFWMD Auditorium

10:00 a.m. – 4:00 p.m.

Science Workshop #2 – January 27-28
Meeting Topics

- Present any new information related to the Everglades science
- Review operational flow targets for feasible Everglades downstream scenarios
- Determine if there is consensus with regard to range of hydrologic characteristics/system constraints to be used in Phase II Planning

WRAC Issues Workshop – February 18
Meeting Topics



- Results of Science Workshop
- Phase II Water Quality Modeling Strategy
- Update on hydrologic and hydraulic model development
- Status report on Evaluation Tools progress

Phase I Planning
www.sfwmd.gov/riverofgrass

Questions?