WRAC Issues Workshop - Phase I Planning
August 4, 2009

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River of Grass Planning
Phase I

- January 2009 kickoff
- 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
- Public planning process
  - Encouraged involvement of stakeholders and staff
  - Mutual education and opportunity to identify knowledge gaps

Phase I Planning Process
Major Milestones

- Reviewed Everglades science, 2000-2009:
  - Clear need for increased Everglades and FL Bay flows (but without increasing maximum depths)
- Evaluated proposed stakeholder configurations:
  - Everglades performance varied most; largely independent of cost
- Evaluated influence of specific features and operations on Everglades performance
- Feature Summaries and Common Elements
- Phase I Findings and Phase II Considerations

Restoration Context:

The Original and Current Kissimmee-Okeechobee-Everglades (K-O-E) System

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K-O-E System: Pre-Drainage

Kissimmee Valley: 2,700,000 acres

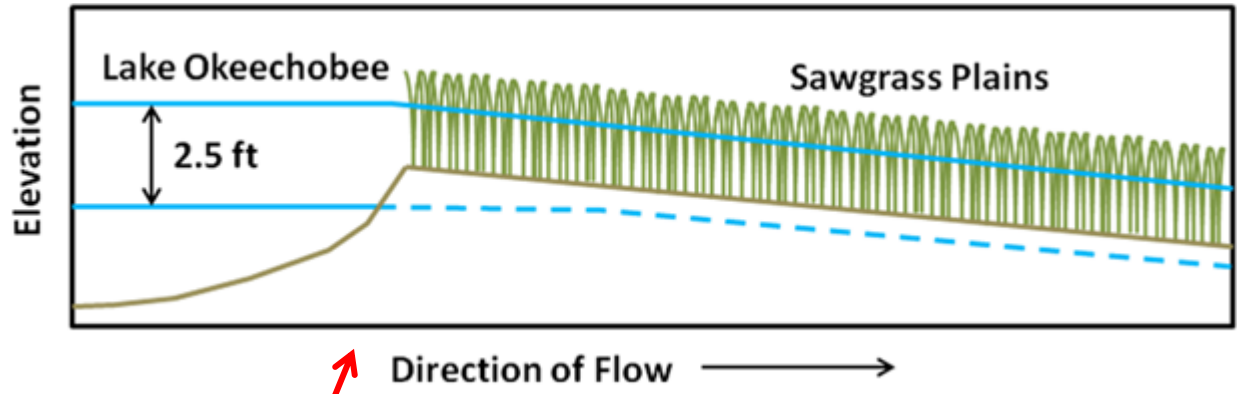
Lake Okeechobee: 500,000 acres

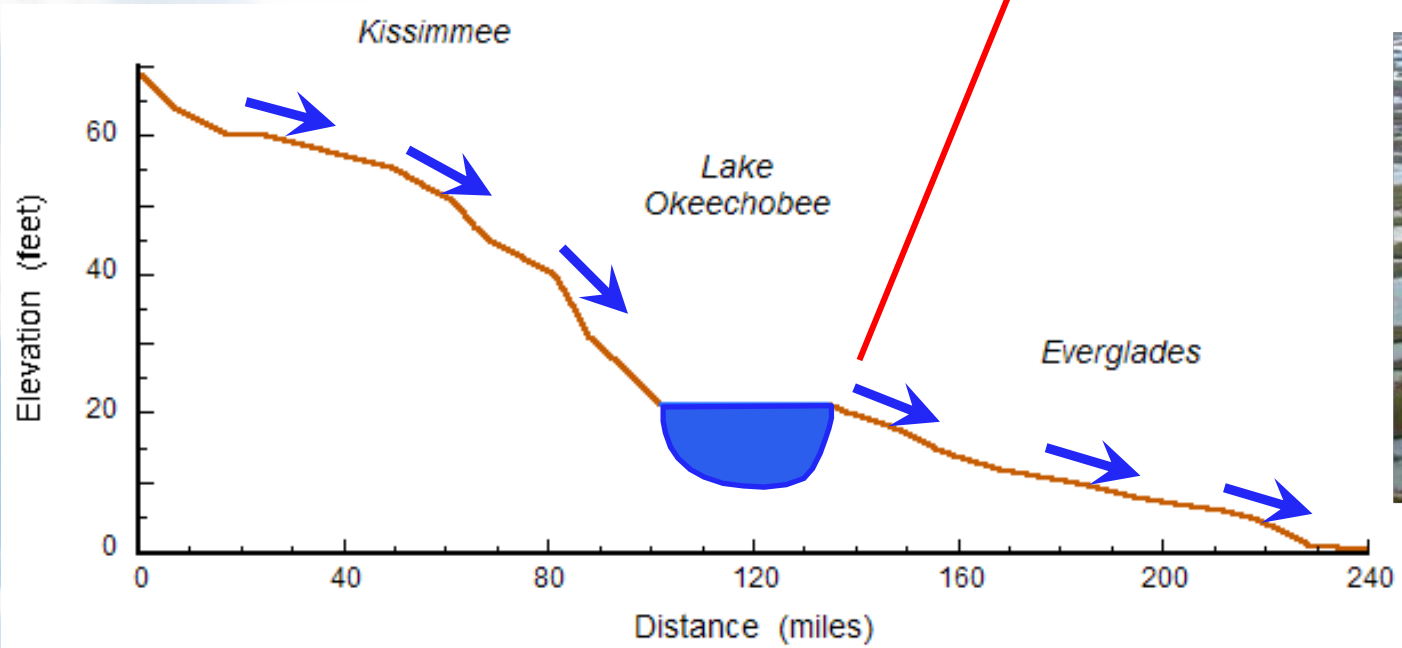
Everglades: 2,800,000 acres

<u>Outflows from Lake Okeechobee</u>:

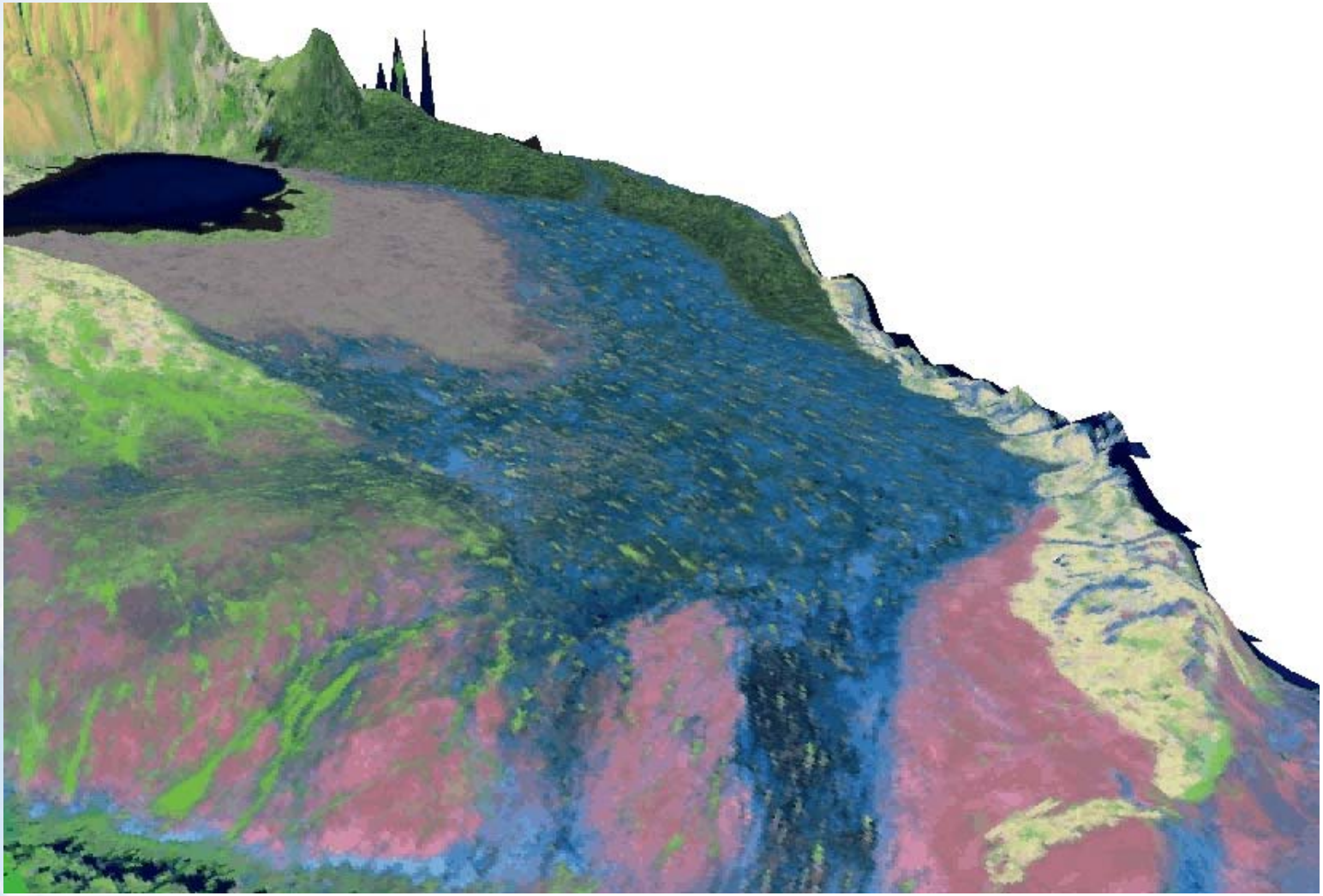
- East: *St. Lucie* - zero
- West: *Caloosahatchee* - small
- South: *Everglades* - large
- (*FL & Biscayne Bays*) - large

K-O-E System: Pre-Drainage

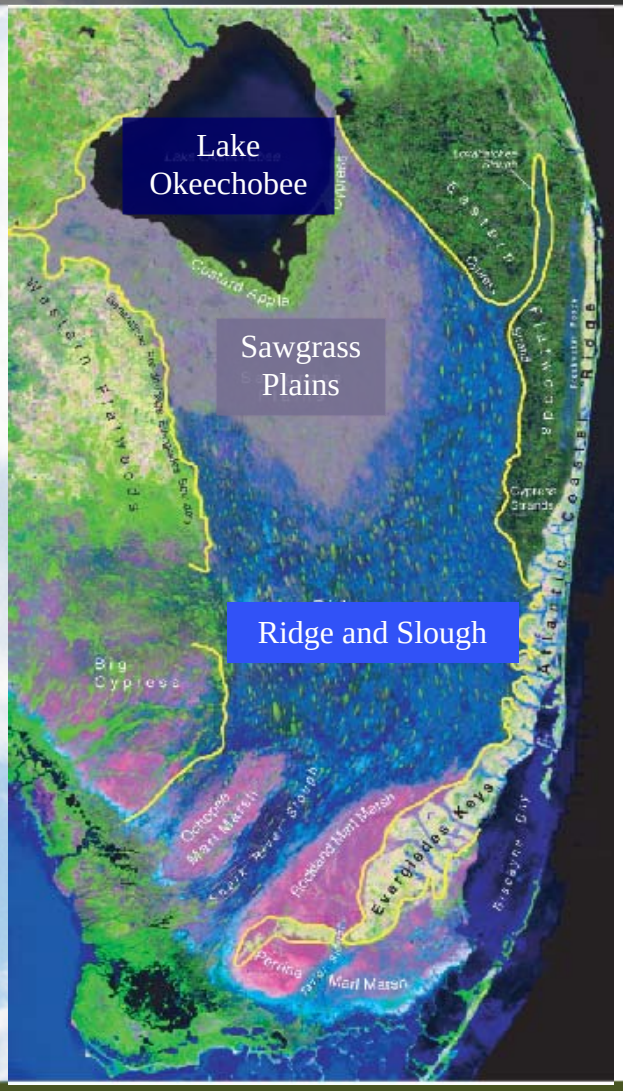




K-O-E System:
Pre-Drainage Topography

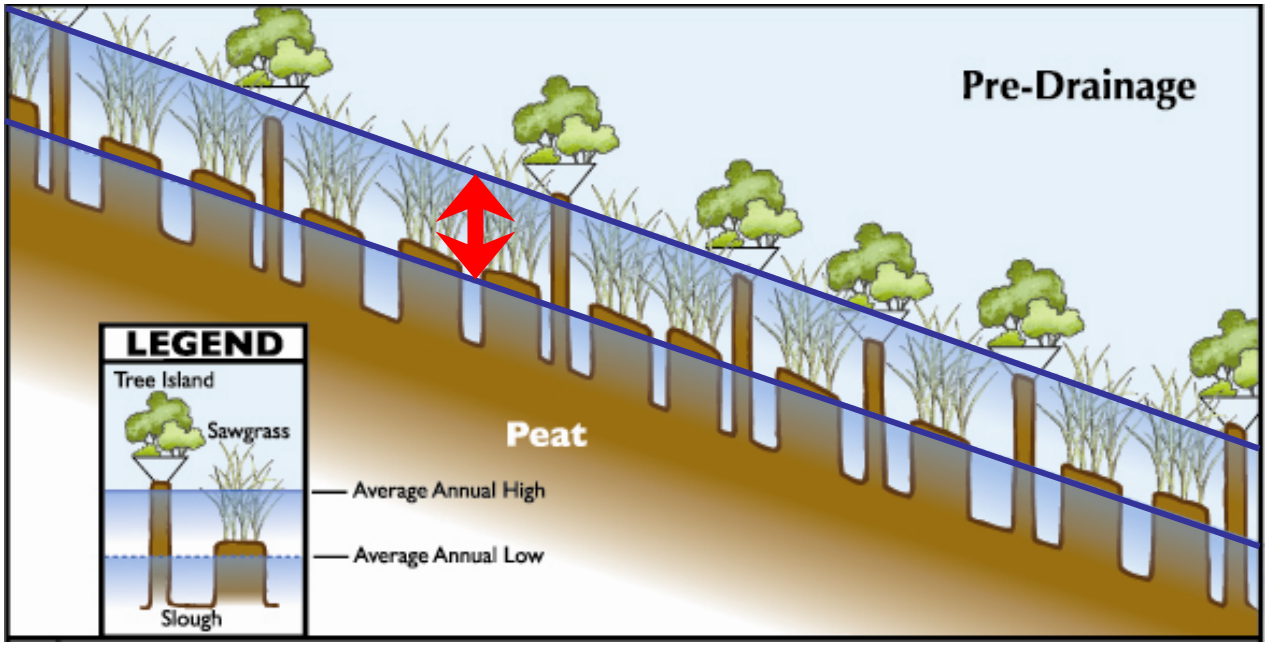


Everglades - Ridge & Slough : Pre-Drainage

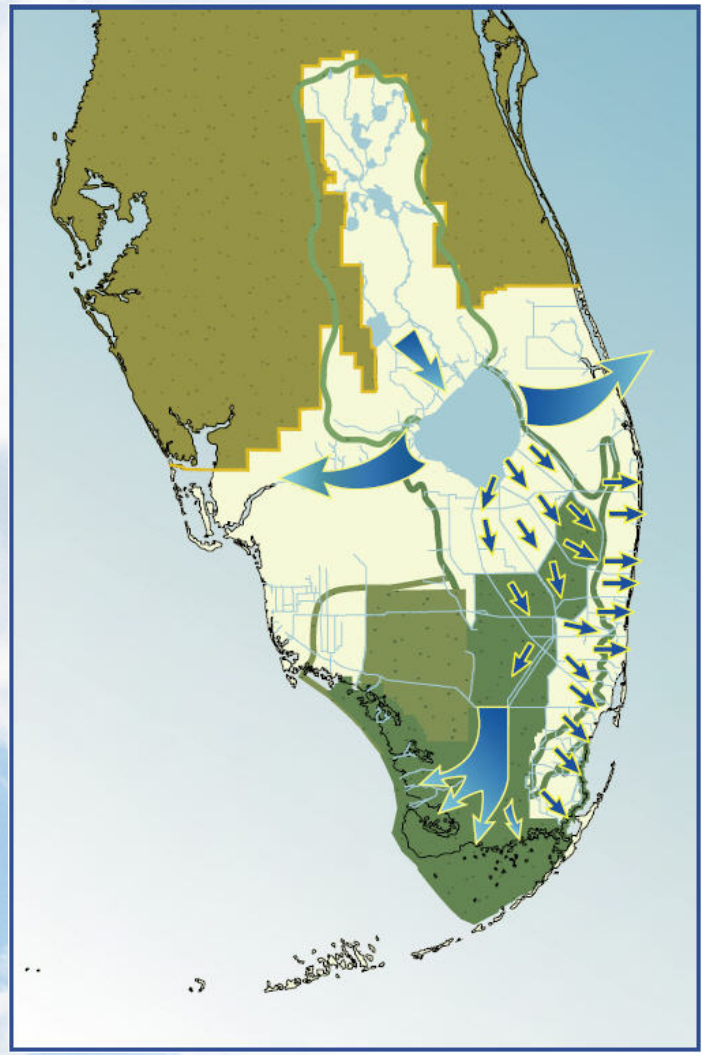


Pre-drainage Ridge & Slough landscape supplied by rainfall and slow release of water ("buffering") from:

Kissimmee Valley,
Lake Okeechobee, and
the *Sawgrass Plains.*



K-O-E System: Current



Flows:

From *Kissimmee Valley:*

- *Similar total volumes, but released much more quickly (less "buffering")*

To *Northern Estuaries:*

- *Much increased, both East and West*

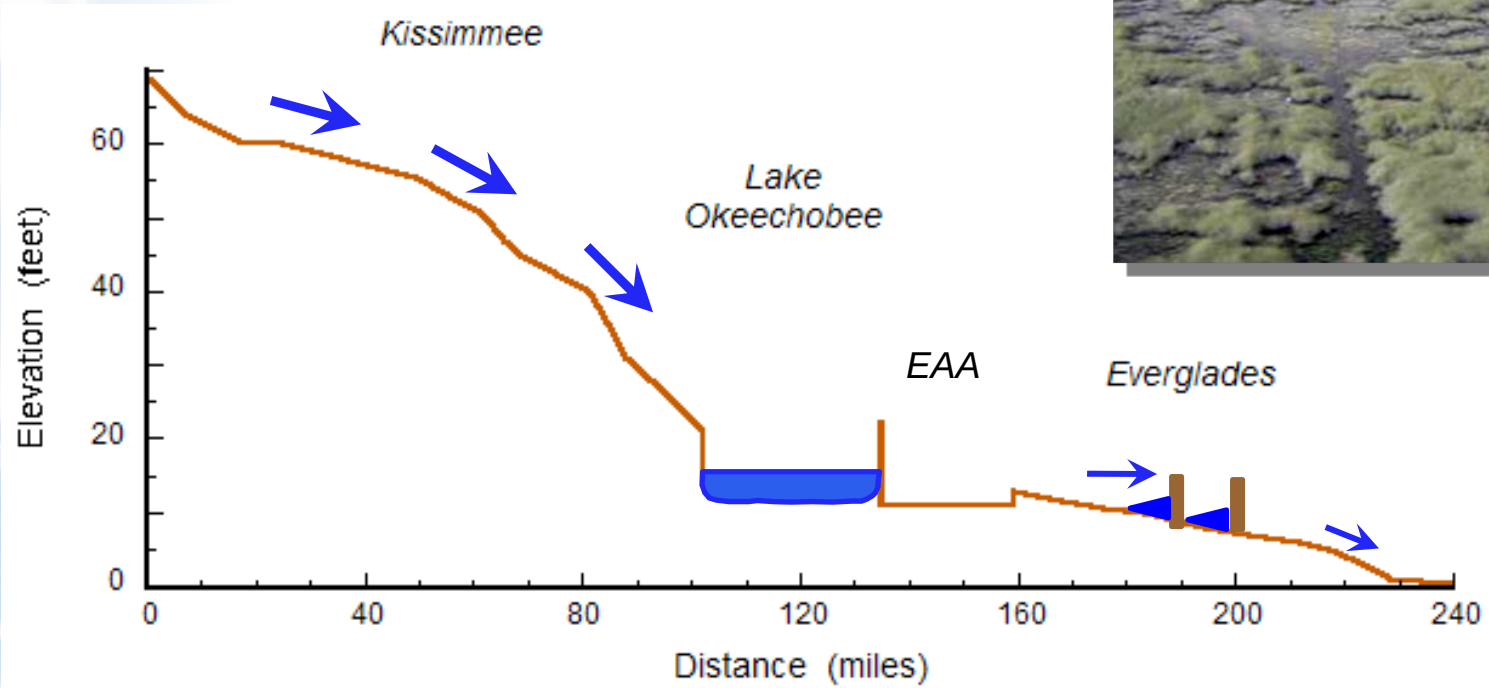
To *Everglades:*

- *Decreased*

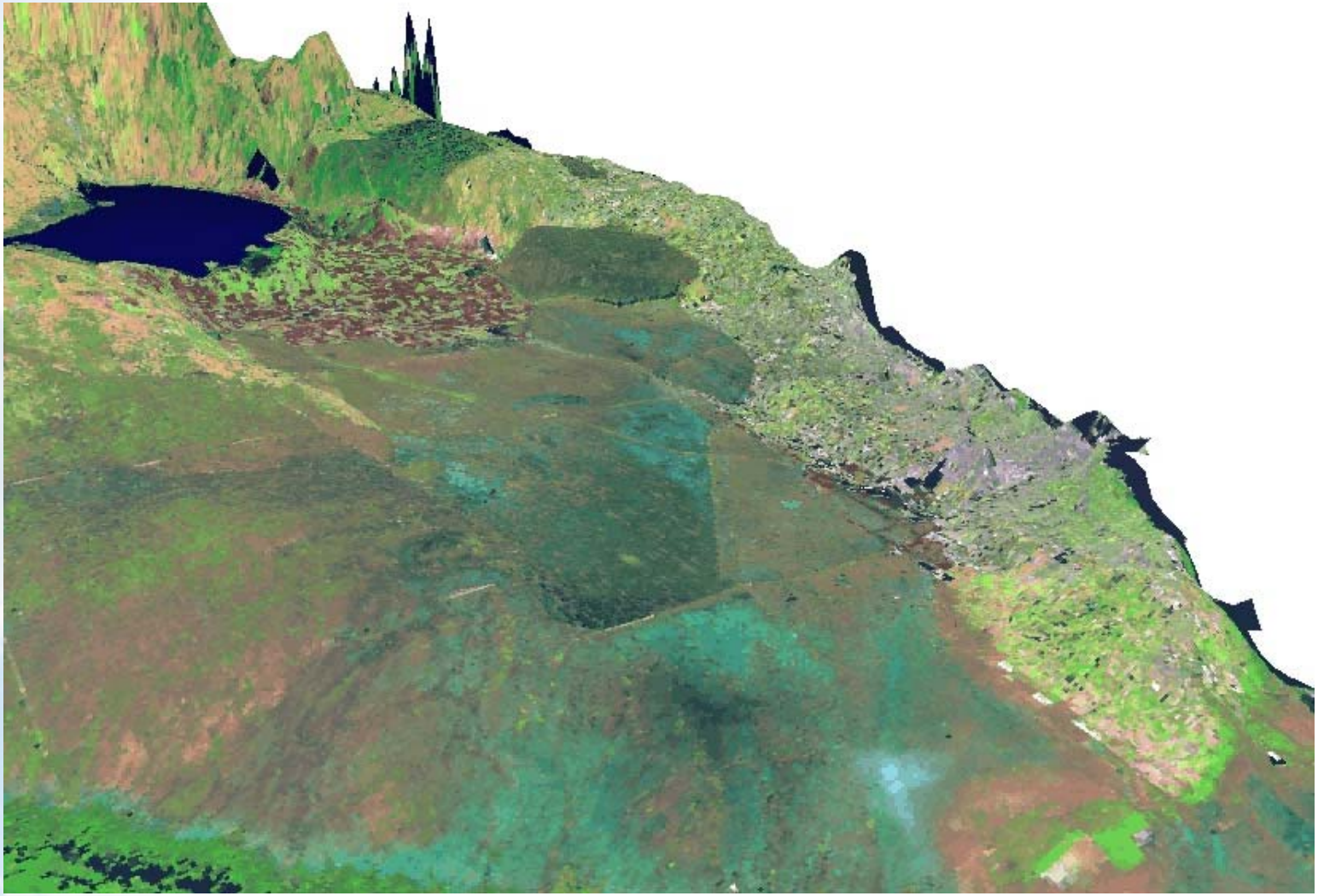
Lake Okeechobee:

- *Lower average stage*
- *Wider vertical range*

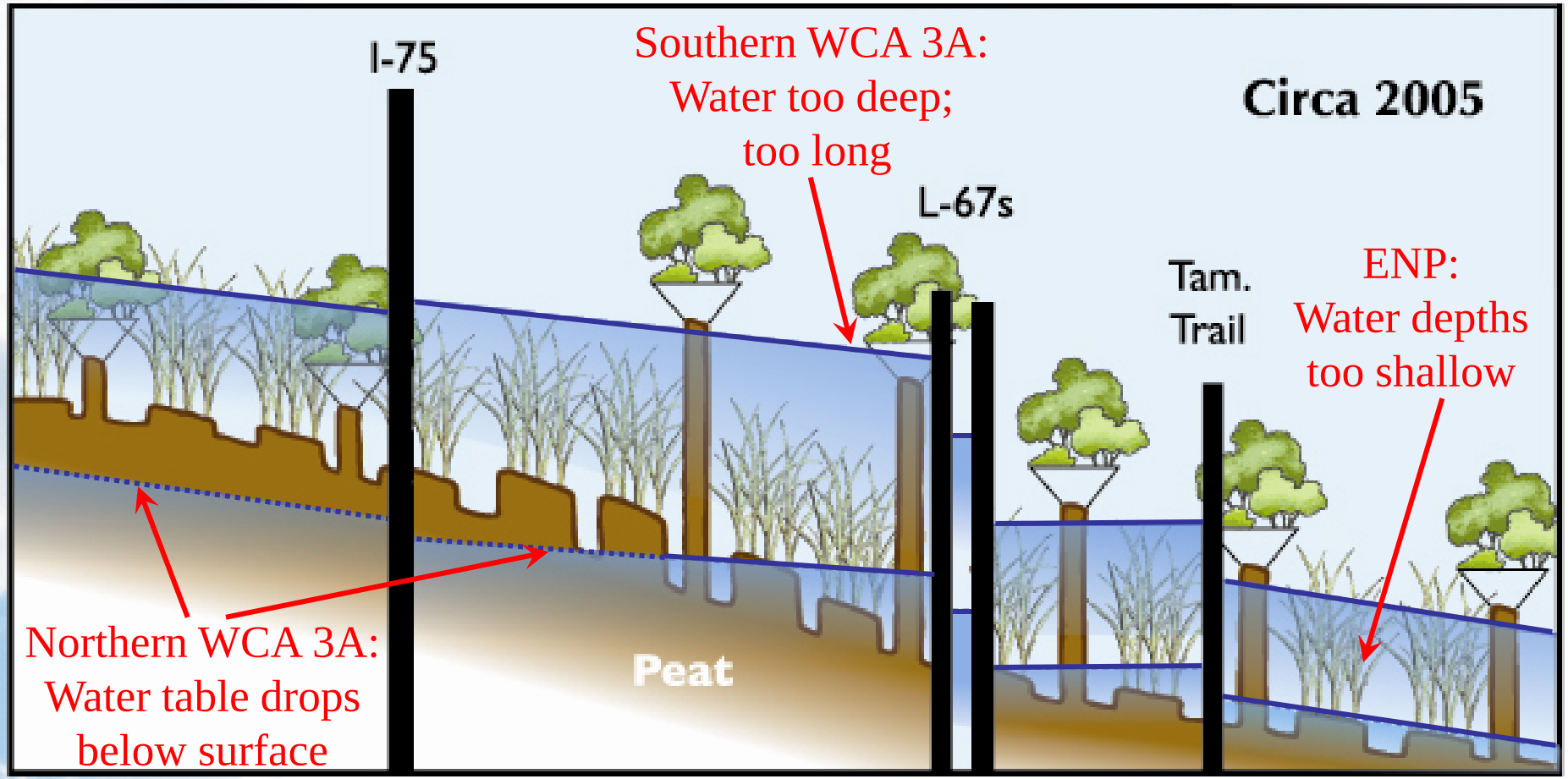
K-O-E System: Current



K-O-E System:
Current Topography



Everglades - Ridge and Slough: Current



Restoration Vision and Approaches

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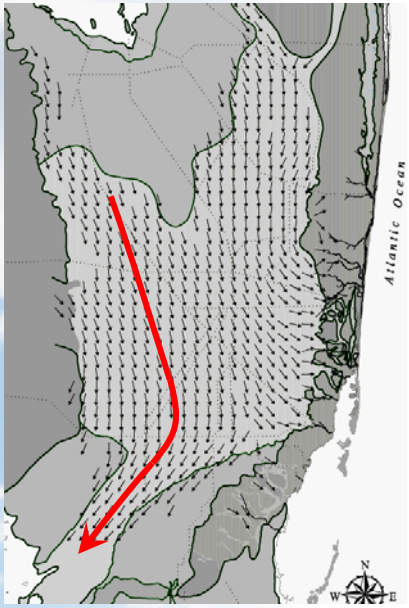
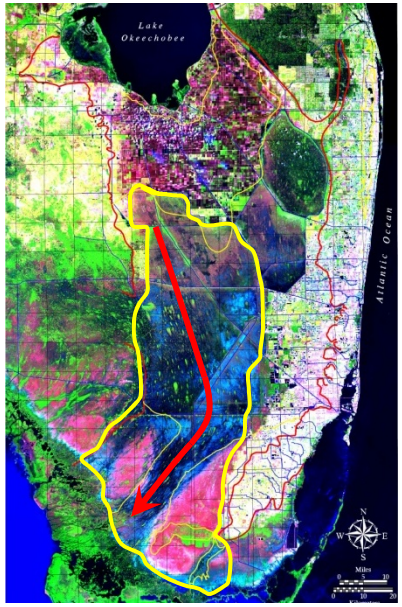
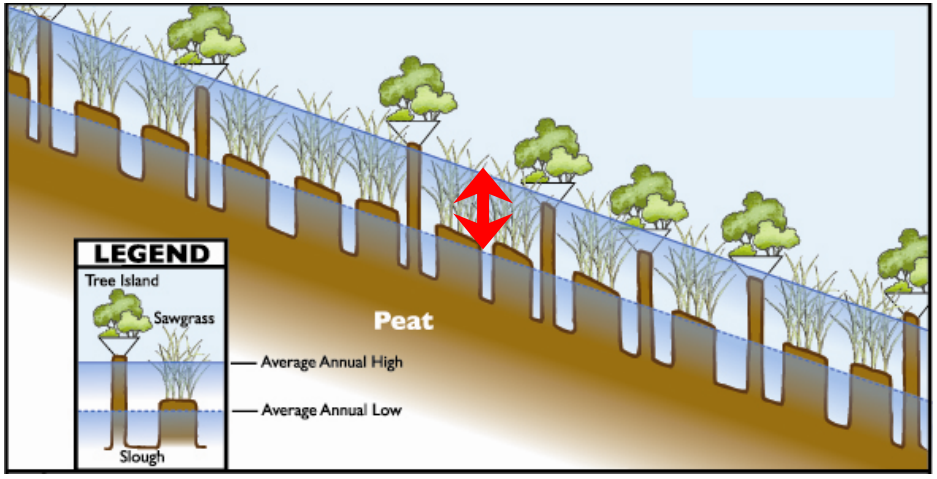
Everglades Restoration Concept:
- *Right flows, Right depths*

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



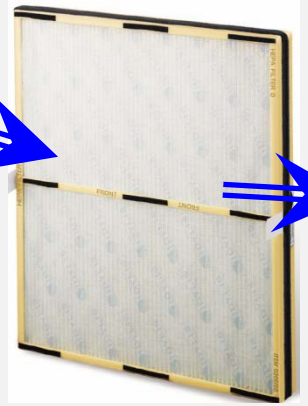




Everglades Restoration Concept: Storage, Treatment, and Delivery

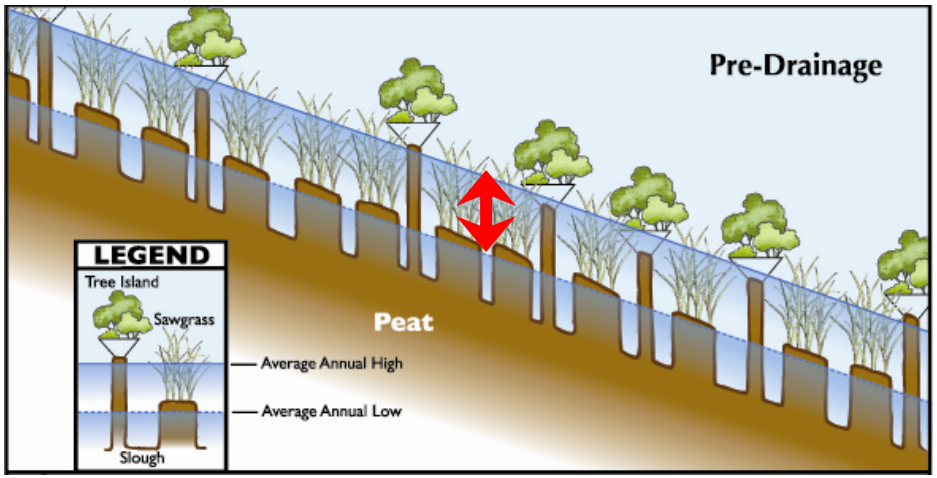
Storage

Filter / Treatment

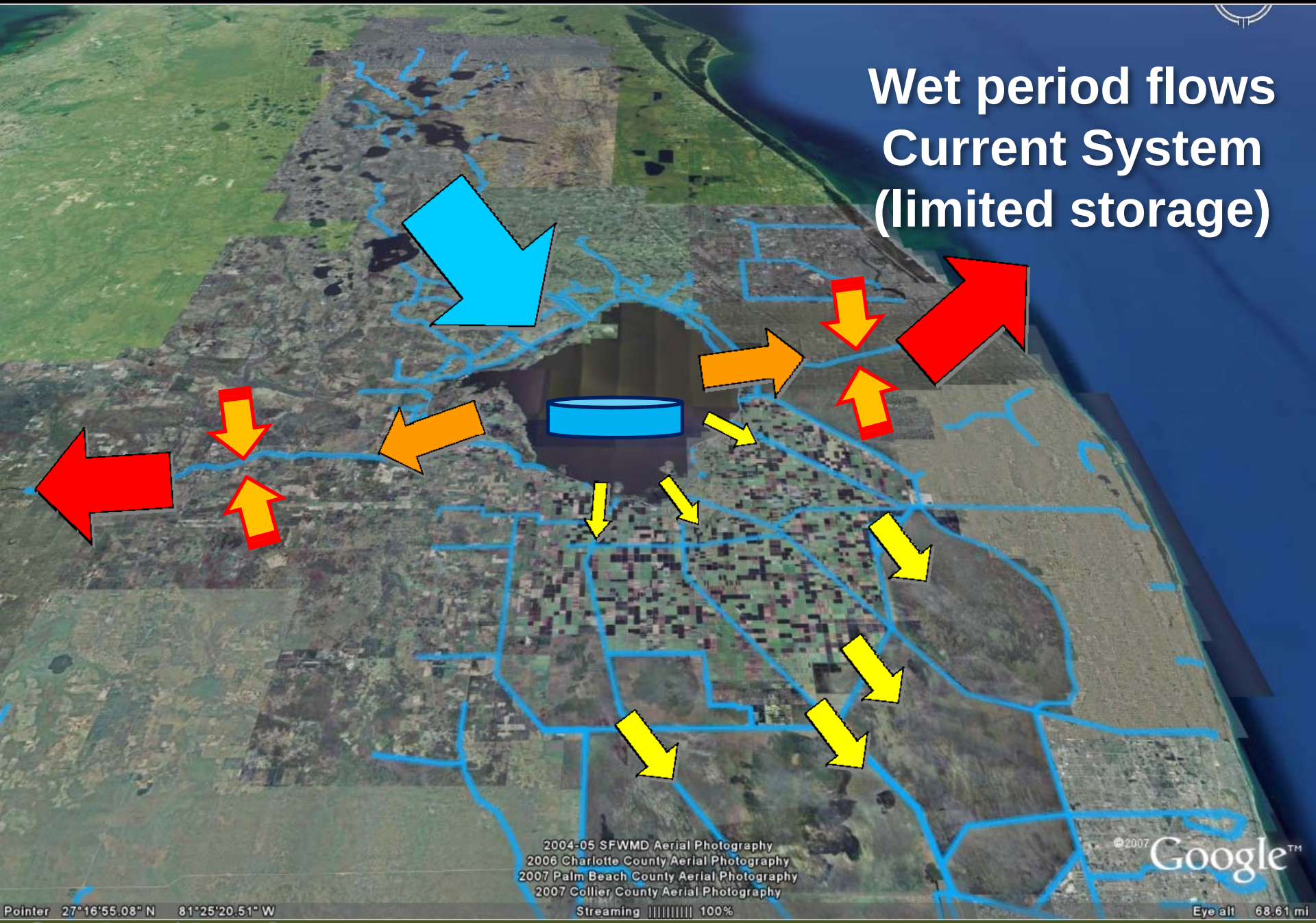


Delivery

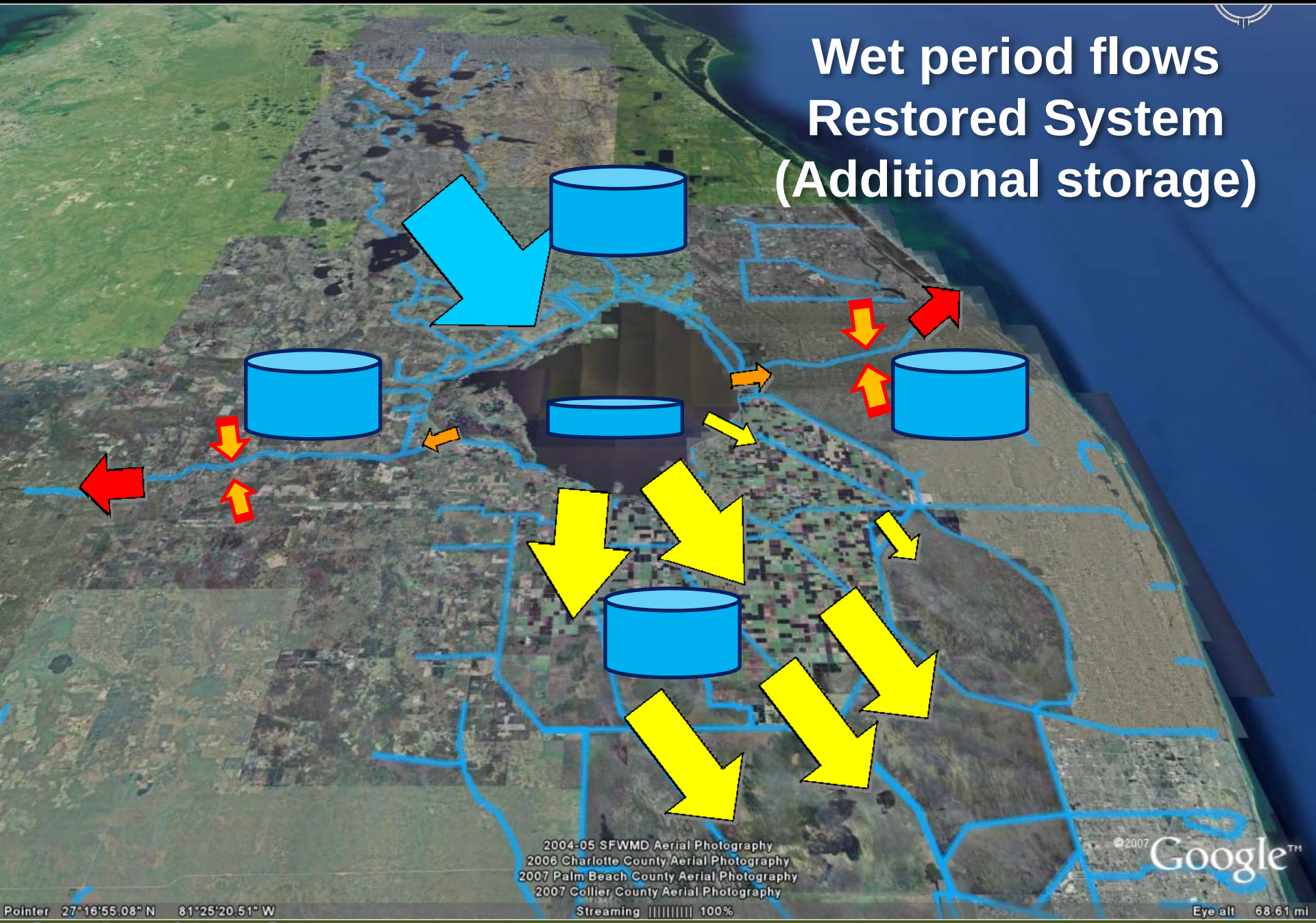
Ridge and Slough Everglades (sheet flow)



Wet period flows Current System (limited storage)



Wet period flows Restored System (Additional storage)



Previous Restoration Efforts: CERP and Northern Everglades

CERP

- Primary focus on Everglades water depths
- Limited by land availability in EAA (Talisman) – land needed for storage and treatment
- System constraints limited options for sending more water south

Northern Everglades

- Assumed no additional Lake Okeechobee flows to Everglades
- Northern Everglades identified need for 900,000-1,300,000 acre-ft of lake-related storage

River of Grass Restoration Opportunities

- Focus on both water depths and flows
- Estimated Average Yearly ROG flow needed: ~1.9+ MAF/yr
- Carryover storage to replace missing natural buffering:
  - Wet to dry season carryover
  - Multi-year drought carryover
- USSC land acquisition provides opportunities for additional storage and treatment in EAA
- Phase I intentionally did not include constraints; Phase II will address constraints and necessary phasing

Approaches for Storage, Treatment, and Delivery

- Primary Objective is Everglades Restoration
  - All approaches require storage, treatment (phosphorus), and delivery of water in order to meet Everglades restoration needs
  - Viable approaches must meet these restoration needs
  - While minimizing costs and economic impacts
- Opportunity to optimize approach for additional attributes
  - Land requirements and phasing
  - Habitat/Wetland spatial extent
  - Recreational opportunities
  - Sustainability

Approaches for Storage, Treatment, and Delivery

What is best use of new land in EAA?

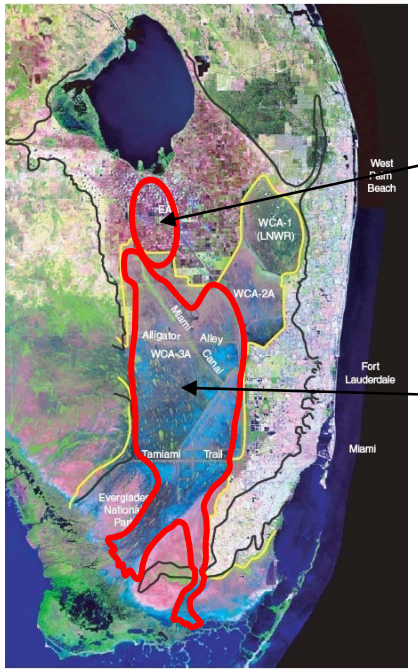
Land in EAA

Use to create new "Natural" landscape and increased wetland spatial extent

- Flow-ways
- Ecosloughs

Use to store or treat water for existing landscape

- Deep Reservoirs
- Shallow Impoundments
- STAs



Subsided Ag Land

Degraded Ridge & Slough

Can we do both? Do we need both?

Approaches for Storage, Treatment, and Delivery
Increased Spatial Extent

- Approach: Shallow, wetted, unmanaged natural wetland
- Benefits:
  - More passive management
  - Increased wetland spatial extent
- Challenges / Limitations:
  - Absence of pre-drainage ground slope (now flat)
  - Incoming [P] and Soil [P] much higher than pre-drainage concentrations
  - Extensive network of canals/ditches - $$$ to fill; short-circuiting if not
  - So. FL experience shows very little success in establishing sawgrass
  - Very large gardening project!
  - So. FL experience shows extensive and intensive management required to achieve [P] reductions
  - Wet footprint management and ET losses could impact ability to meet Everglades flow targets

Approaches for Storage, Treatment, and Delivery

Store/Treat Water for Existing Landscape

- Approach: Use EAA land to store and treat water for existing landscape
- Benefits:
  - Primary benefit is improving ability to meet downstream water quantity and quality targets
  - Focus is on getting available water to the Everglades
  - Reduces footprint size/land requirements and potential economic impacts
- Challenges / Limitations:
  - Footprint may be much less “natural”
  - Higher management level

Hydrologic and Ecologic Analysis and Targets

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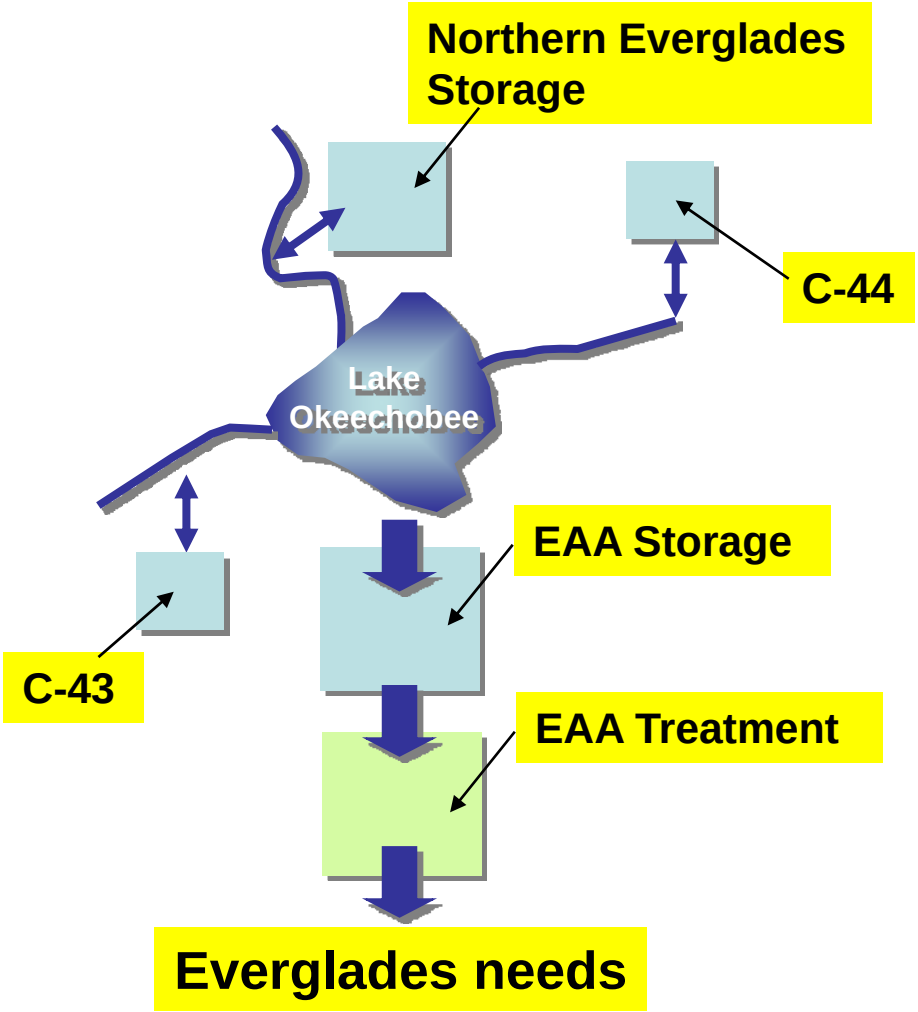
Hydrologic Analysis
RESOPS Model

- Used Reservoir Sizing and Operations Screening Model (RESOPS)
  - Water budget model, monthly time step
  - Does not simulate flows or stages in WCAs/ENP
  - Did not consider constraints in the WCAs/ENP
  - Modeled 9 stakeholder configurations and 2 due diligence configurations
  - Conducted sensitivity analysis and analyzed trends/tradeoffs

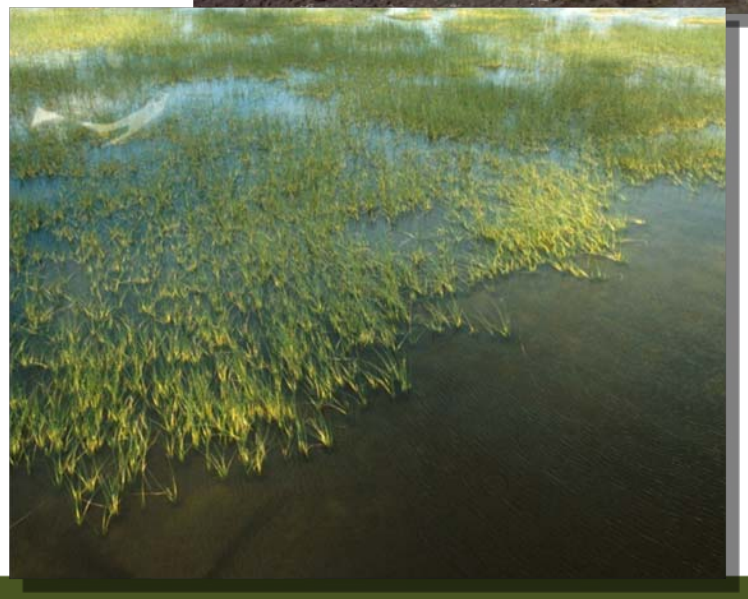


RESOPS Model
Peer Review Panel

- RESOPS Peer Review Panel- Three modeling experts who:
  - Reviewed Model Documentation Report and Due Diligence efforts
  - Participated in a 1-day model workshop
- Final Report of Peer Review Panel is posted on SFWMD web board
- *"Impressed with the performance of RESOPS and consider it an appropriate tool for screening alternative conceptual configurations of storage and transfer components for ROG Phase I Planning."*

Hydrologic Targets- Lake Okeechobee

- Manage the lake within desirable ecological water depth range:
  - Avoid extremes
  - Preferred stage envelope
- Phase I did not strive to improve low water level performance beyond that achieved by the existing Lake Okeechobee Regulation Schedule (LORS-2008) performance
- Phase II Analysis should optimize to improve Lake low stage performance



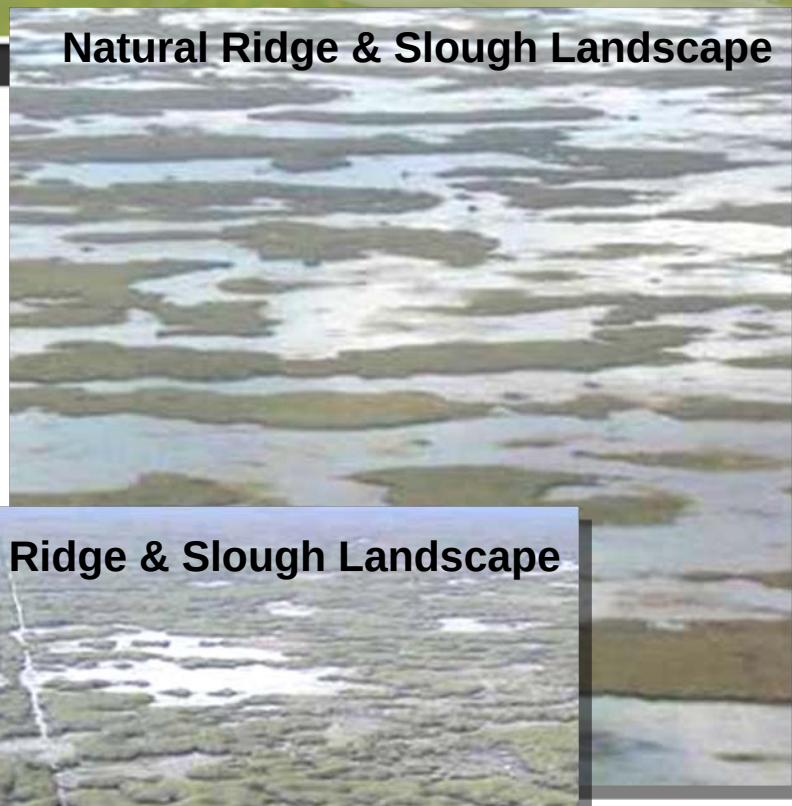
Hydrologic Targets- Northern Estuaries

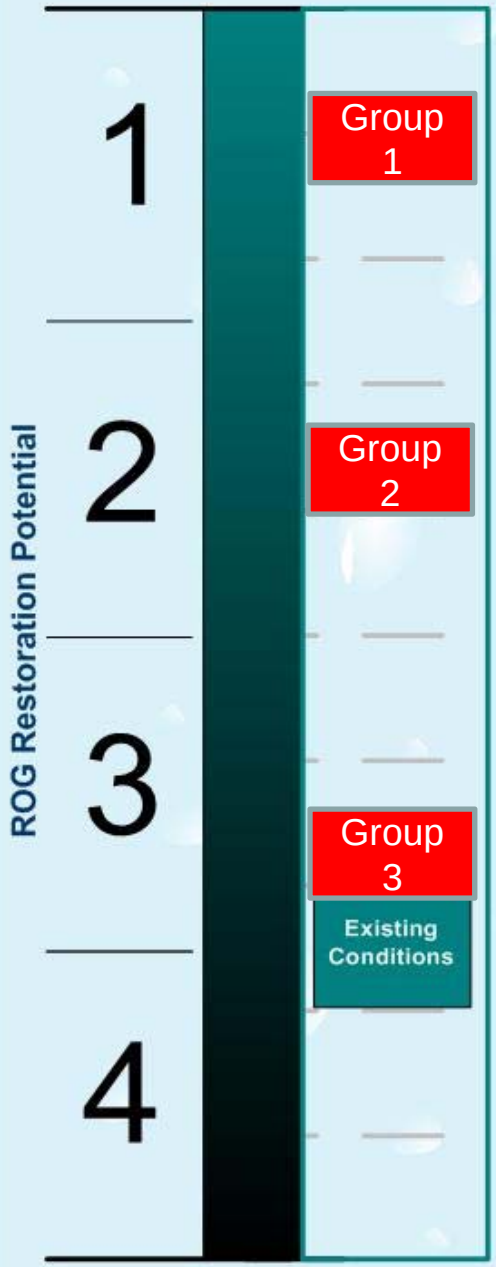
Caloosahatchee and St. Lucie Estuaries

- Manage for preferred salinities:
  - Preferred flow regime
  - Avoid extreme high flow events (preventing low salinity)
  - Caloosahatchee - maintain base flows (preventing high salinity)

Hydrologic Targets – Everglades

- Restore depths throughout western remnant Everglades
- Protect tree island hydroperiods
- Increase flows to Florida Bay and Biscayne Bay
- Improve dry period water depths and flows
- Estimated average annual need: Synthetic time series - 1.9+ MAF
- Current average annual flows - 1.4 MAF
- Need to refine Everglades target time series during Phase II





•1 Predrainage Conditions, Sustainable

- Water moves as unobstructed sheet-flow over full width of remaining landscape
- Long term average water depths match pre-drainage depths and depths and flows vary according to pre-drainage linkage to weather variation
- Depths and flows sustain peat processes and in turn sustain shapes, elevations, and vegetation of ridges and tree islands
- Populations of large multi-year fish persist; wading bird prey base present
- Flows into Florida Bay continue through most of the year, preventing hyper-salinity and sustaining diverse submerged aquatic vegetation, fish and shrimp

•2 Ecologically sub-optimal condition, but sustainable

- Hydrology cannot restore landscape to optimal condition, but can sustain in Condition 2
- Very strong sensitivity of Everglades ecology to hydrology means that Cond. 2 can be maintained only by hydrology that is very similar to Cond. 1 hydrology

•3 "Tipping point:" landscape on degrading ecological trajectory

- Ecologically, very different from Condition 2 because of downward trajectory
- Very strong sensitivity of Everglades ecology to hydrology means that Cond. 3 hydrology differs only slightly from Conditions 1 and 2 hydrology

•4 Loss of Characteristic Ecology

- Sloughs are dry (water depths zero) for more than four months of the year
- Flows zero for more than six months of the year; annual flows to FL Bay near zero
- Multi-year large fish populations eliminated; small fish populations greatly reduced
- Wading bird prey base essentially eliminated
- Widespread oxidation and/or burning of peat
- Elevations of ridges and tree islands reduced to level of sloughs (landscape flattened)
- Water lilies gone; sloughs invaded by sawgrass / dryland species; tree islands gone.

Water Quality Targets and Feature Performance

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Water Quality Targets

- Lake Okeechobee, St. Lucie, and Caloosahatchee Watersheds
  - Nutrient TMDLs have been established for the Lake Okeechobee and St. Lucie watersheds and are currently being adopted for Caloosahatchee watershed
  - Achievement of these TMDLs
    - Addressed in the Northern Everglades Protection Plans
    - Will also be addressed in FDEP's BMAPs for the St. Lucie and Caloosahatchee watersheds
    - Was not a planning objective for River of Grass, Phase I
- Everglades Protection Area
  - Everglades Total Phosphorus Water Quality Criteria - 10 ppb
  - Currently addressed through the Everglades Construction Project and Long Term Plan (LTP)
  - Evaluated in River of Grass Phase I planning since increased flows to the EPA will require additional treatment capacity

Water Quality Performance – Phase I Findings

Features

- STAs
  - The best performing STA (STA-3/4) achieves 13-23 ppb total phosphorus
  - Current optimal treatment utilizes multiple parallel flow-paths, maintained wet, with managed emergent vegetation cells (40%) followed by managed submerged aquatic vegetation cell (60%)
  - STA performance optimization: continuous and ongoing
- Reservoirs/Ecoreservoirs
  - Limited long-term TP removal performance data exist
  - Under ideal conditions, likely maximum TP removal is 15-25%
  - Under actual conditions, TP removal may be much less

Water Quality Performance – Phase I Findings
Features (continued)

- Flow-Way/Ecosloughs
  - The specific design features, operations, vegetation management requirements and performance of large constructed flow-ways are not well understood
  - 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
  - Under real world conditions, concentrations may be significantly higher
- Since reservoirs, flow-ways, and other 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

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Hydrologic, Ecologic, and Water Quality Performance Relationships

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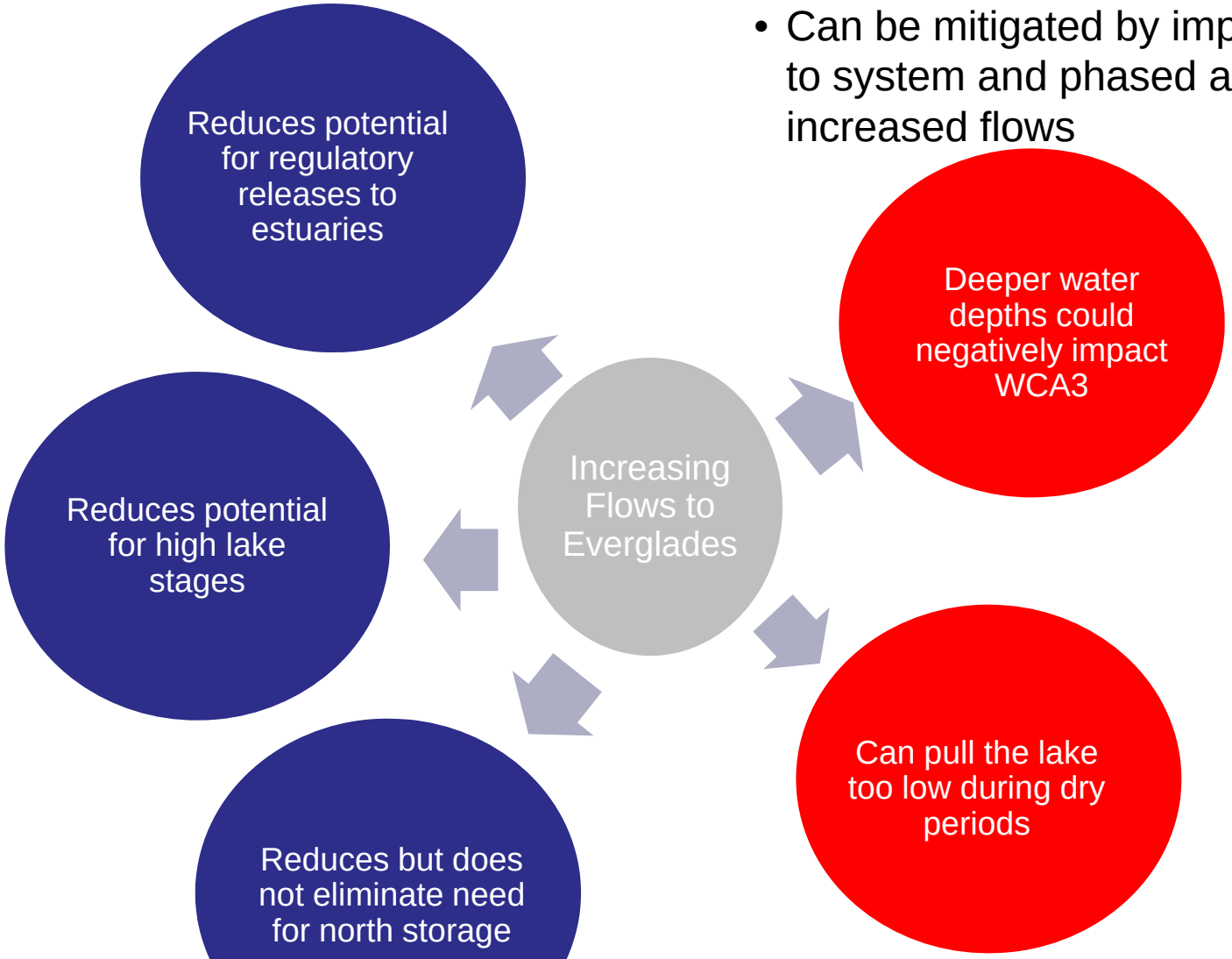
RESTORATION PLANNING

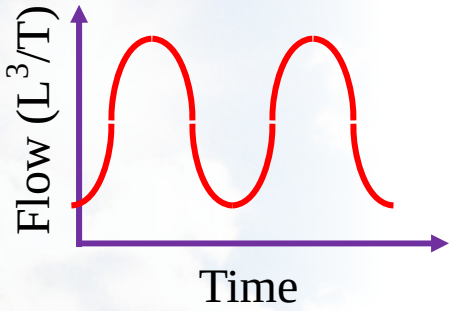
Hydrologic Relationships

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

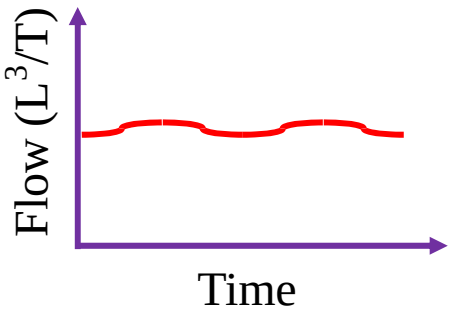


- Estimated ~450-575KAF of Northern Everglades storage needed

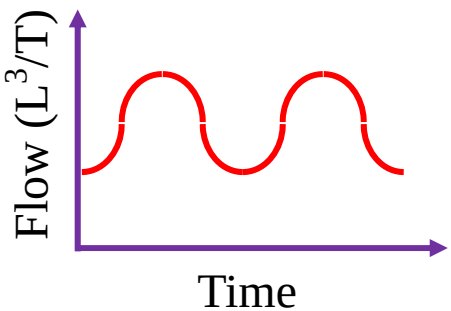
Water Quality Relationship to Hydrologic Targets



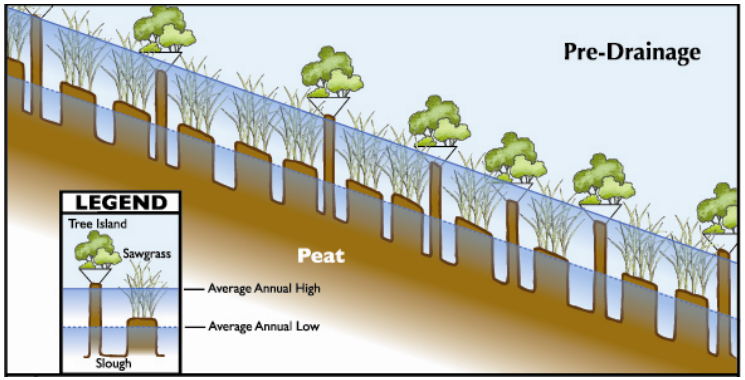
Storage- Inflows Highly Variable



Treatment- optimal at Steady-State Conditions

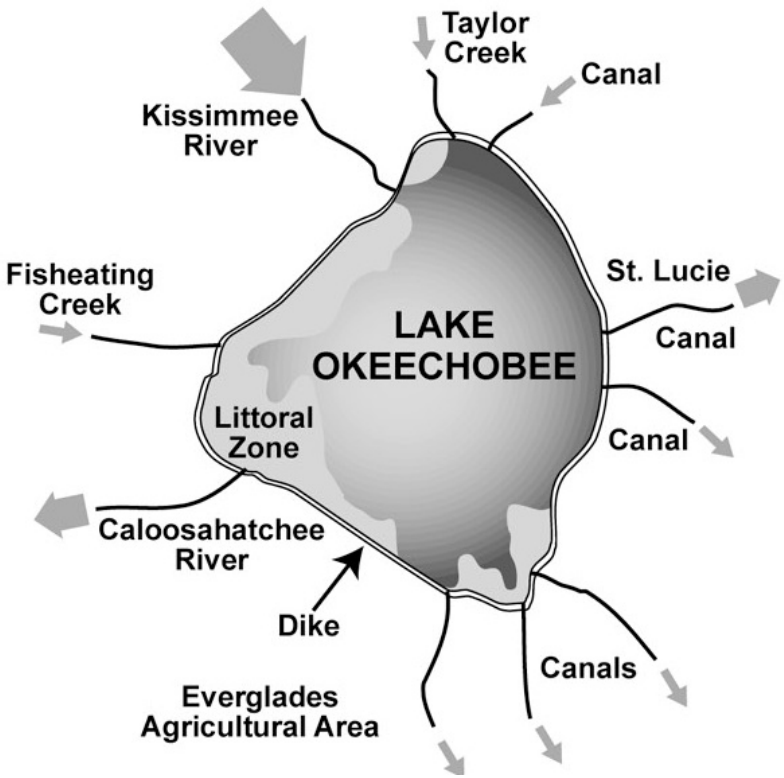


Target- Need to define peak flows, inter- and intra-annual variability (TBD in Phase II)



Lake Okeechobee Water Quality-
TP Concentrations in Lake Okeechobee Deliveries

- Assumed future Lake Okeechobee P concentrations significantly affect additional treatment area needed
  - Phase I analysis evaluated concentrations ranging from 40-200 ppb
  - STA acreage required can be 0% to 90% more at 200 ppb than at 40 ppb, depending on the base configuration
- Location of Lake Okeechobee deliveries influences TP levels
  - Eastern releases to West Palm Beach Canal ~41% higher than southern releases to North New River and Miami Canals



Water Quality Performance- Relationship between Management and Performance

- High management level required to achieve optimal water quality treatment performance
  - Water Level, Flow, and Vegetation
- Water quality performance is highly dependant on whether the feature is maintained in a wet condition
  - Ensures viability of the highest performing treatment vegetation
  - Avoids dry-out of the soil which can release TP upon rewetting
- Evaluation of configurations included best case scenario (maintaining wet conditions) and a worst case scenario (allowed to go dry such that no TP removal occurred), with a large range of results

Wet vs Dry Footprints

Should minimum water levels be maintained in features?

Maintaining Wet Footprint

Improves water quality performance

Improves habitat within feature footprint

Allowing Footprint to Go Dry

Increases available storage

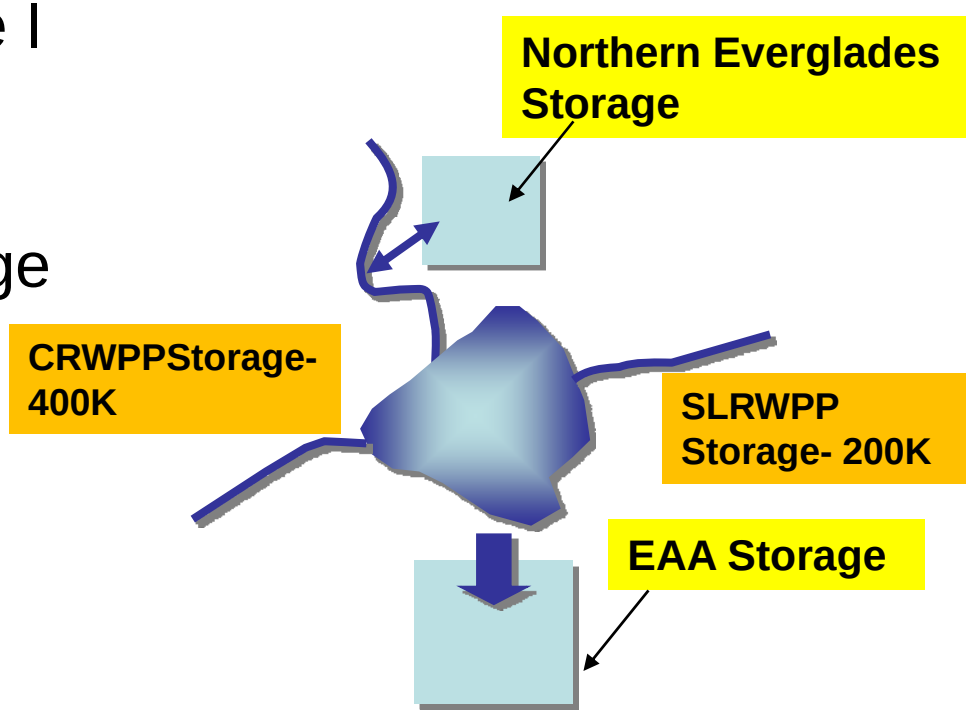
Stored water is available to meet targets

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

Storage Evaluation

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 <u>additional</u> acre-ft will be required



- Improving Lake Okeechobee low level performance will also require <u>additional</u> storage (amount TBD in Phase II)

North Everglades Storage vs. EAA Storage Summary

- Need ~450-575 KAF north to address low lake stages
- Balance of total storage can be sited south

	North Everglades	EAA
Land Availability	*Unknown; would need to identify willing sellers for regional scale projects*	*Pending contract with USSC; potential for land swaps*
Siting Issues	*Significant cultural resources and T&E issues*	*Limited cultural resources and T&E issues*
Operational Flexibility	*Increased delivery options when water is stored north*	*Have ability to capture EAA runoff*

A combination of Northern Everglades and EAA storage will be needed

Deep vs Shallow Storage Features- Shallow Storage

- Types - flow-ways, ecosloughs, shallow impoundments, and water management areas
- Most proponents of shallow storage prefer it because
  - Desire to increase **spatial extent** of Everglades-like habitat
  - Prefer more natural, less engineered approach
  - Want to reduce O&M - less managed features, gravity flows, reduced reliance on pumps and associated fuel needs
- Potential concerns with a shallow storage-only approach:
  - Increased land needs/larger footprints
  - Uncertainty regarding ability to create Everglades-like habitat within shallow storage features
  - Potential for higher O&M issues related to exotic management within large, shallow footprints
  - Performance capabilities/efficiency of shallow storage

Deep Storage vs. Shallow Storage – Phase I Findings

	Deep	Shallow
Spatial Extent	Smaller spatial extent per unit volume	Larger spatial extent per unit volume
ET	~ 15% to 30% of total inflow volume	~ 20% to 60% of total inflow volume
Design Criteria	Dam safety criteria; hardened slope protection; compartments may be required; seepage cutoff wall and collection system	Impoundment criteria; grass slope protection; no compartments required; may require seepage collection system
Costs	More expensive per unit volume than shallow	Less expensive per unit volume than deep; However if wet shallow storage, then will need significantly larger storage volume
Land Availability/ Economic Impact	Half as much land required per unit volume as compared to shallow	Twice as much land required; 1,000,000 ac-ft of shallow storage requires 278,000 acres of land

Features Comparison

Nine Proposed Stakeholder Configurations

- All configurations contained storage, treatment, and conveyance project features
- Ability to meet Everglades demand is the primary performance difference between configurations
- 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
- Land acquisition requirements ranged from 19,000 acres to 229,000 acres
- Construction costs ranged from $4.3 billion to $25.8 billion

Project Features

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

Feature Summary- Dispersed Storage

- Water retention/detention, load reduction, peak flow attenuation, and <u>onsite</u> hydrologic restoration
- Arrangement to use land for storage and treatment
- Potential to increase storage and evapotranspiration (ET)
- Limited modeling tools currently exist to evaluate hydrologic and water quality performance
- Uncertainty in obtaining Everglades benefits
- High uncertainty related to costs and costs-benefits

Should Dispersed Storage features be considered in regional Everglades restoration applications?

Feature Summary- Deep Storage Reservoir

- Provides regional offsite benefits; not intended to provide natural habitat within footprint
  - Interior embankments not vegetated for erosion protection
- Capture/hold both normal and peak flows; discharge when water required
- Ability to stack water higher if land availability is an issue
- High uncertainty in water quality treatment capabilities
- Concerns with ability to prevent water quality degradation within reservoir
- Engineered system with design and operational flexibility to address issues
- Limitations to recreational access
- Higher construction costs, lower land requirements per acre-foot of storage

How do we address public concerns related to engineering and water quality issues with deep reservoirs ?

Feature Summary- Reservoir within Lake Okeechobee

- Compartmentalize Lake Okeechobee to obtain more storage capability and regional offsite benefits
- No additional losses to evapotranspiration (ET)
- No additional land required
- Better able to manage water levels within remaining portions of Lake Okeechobee
- Does not mimic natural hydrology within the footprint
- Potential impacts to existing environmental, ecological, fishery, and recreational capabilities within footprint
- Loss of interaction with the remaining portion of Lake Okeechobee
- Complex construction

Should this concept be further evaluated for feasibility including potential environmental impacts, capabilities, and costs?

Feature Summary- Ecoreservoir

- Above ground storage feature intended to mimic a natural setting
- Shallow-slope vegetated embankments; 12 to 1 side slopes
- Maximum water depth of 6 feet
- Extensive land requirements
- Intensive recreational uses; ecotourism
- Provide additional habitat for birds, fish, reptiles and aquatic vegetation
- Allowed to go dry in order to meet downstream water demands and meet performance goals
  - resulting ecological impacts may limit operations
- Significant vegetation management and exotics removal
- Construction cost 3 times higher due to larger embankment cross-section than a Reservoir with same storage and embankment height

Should the ecological and recreational enhancements be incorporated into other more economical and performance based features instead of an Ecoreservoir?

Feature Summary- Flow-way

- Above ground shallow feature operated like a flowing wetland system
- Attempts to mimic the associated storage, water quality, hydraulics, and wildlife habitats within the footprint as envisioned by the historic River of Grass
- Potential operational constraints to protect created habitats
- Vegetated embankments; maximum water depth of 4 feet
- Unmanaged vegetation except for exotic removal, minimal engineered features, and existing topography within footprint
- Hydraulic limitations in meeting timing and quantity of Everglades water demands
- High uncertainty in water quality treatment capabilities
- Water requires further treatment prior to entering Everglades
- Recreational opportunities similar to other wetland habitat
- Lower construction costs, higher land requirements per acre-foot of storage

Should a flow-way pilot project or other testing be conducted to evaluate uncertainties related to flow-ways?

Feature Summary- Flow-way (Wet vs. Dry)

- Maintained Wet
  - Maintained in a wetted condition (1/2 foot minimum water depth)
  - Requires supplemental water
- Allowed to go Dry
  - Flowing wetland system allowed to go dry or a floodplain with wetting only occurring during extreme weather events
  - Better at achieving downstream restoration targets than wet flow-way
  - No supplemental water required
  - When dry, impacts to ecology and habitats; potential operational restrictions

Should both wet and dry flow-way operations be tested to evaluate relative hydrologic, ecologic, and water quality benefits?

Feature Summary- Ecoslough

- Above ground treatment feature intended to mimic a natural setting
- Vegetated embankments; 12 to 1 side slopes; Maximum water depth 4 feet
- Extensive land requirements
- Intensive recreational uses; ecotourism
- Unmanaged vegetation except for exotic removal, minimal engineered features, and existing topography within footprint
- Hydraulic limitations in meeting timing and quantity of Everglades water demands
- High uncertainty in water quality treatment capabilities
- Treats discharge from Ecoreservoir; requires further treatment prior to entering Everglades
- Construction cost 2 times higher due to larger embankment cross-section than a Flow-way with same storage and embankment height

Could the information obtained from a flow-way pilot project be applied to an Ecoslough?

Feature Summary- Wetlands Management Area

- Shallow features such as forested wetlands, emergent wetlands, or shallow lakes for the purpose of onsite restoration that are not designed to achieve a specific regional storage or treatment target
- Improves natural habitats
- Allowed to go dry but still actively managed
- Extremely high uncertainty in water quality treatment capabilities
- Water requires further treatment prior to entering Everglades
- High uncertainty of viable vegetation types if areas previously impacted by agricultural production or significant soil subsidence
- Compete for water with primary restoration features
- Recreational opportunities similar to other wetland habitat

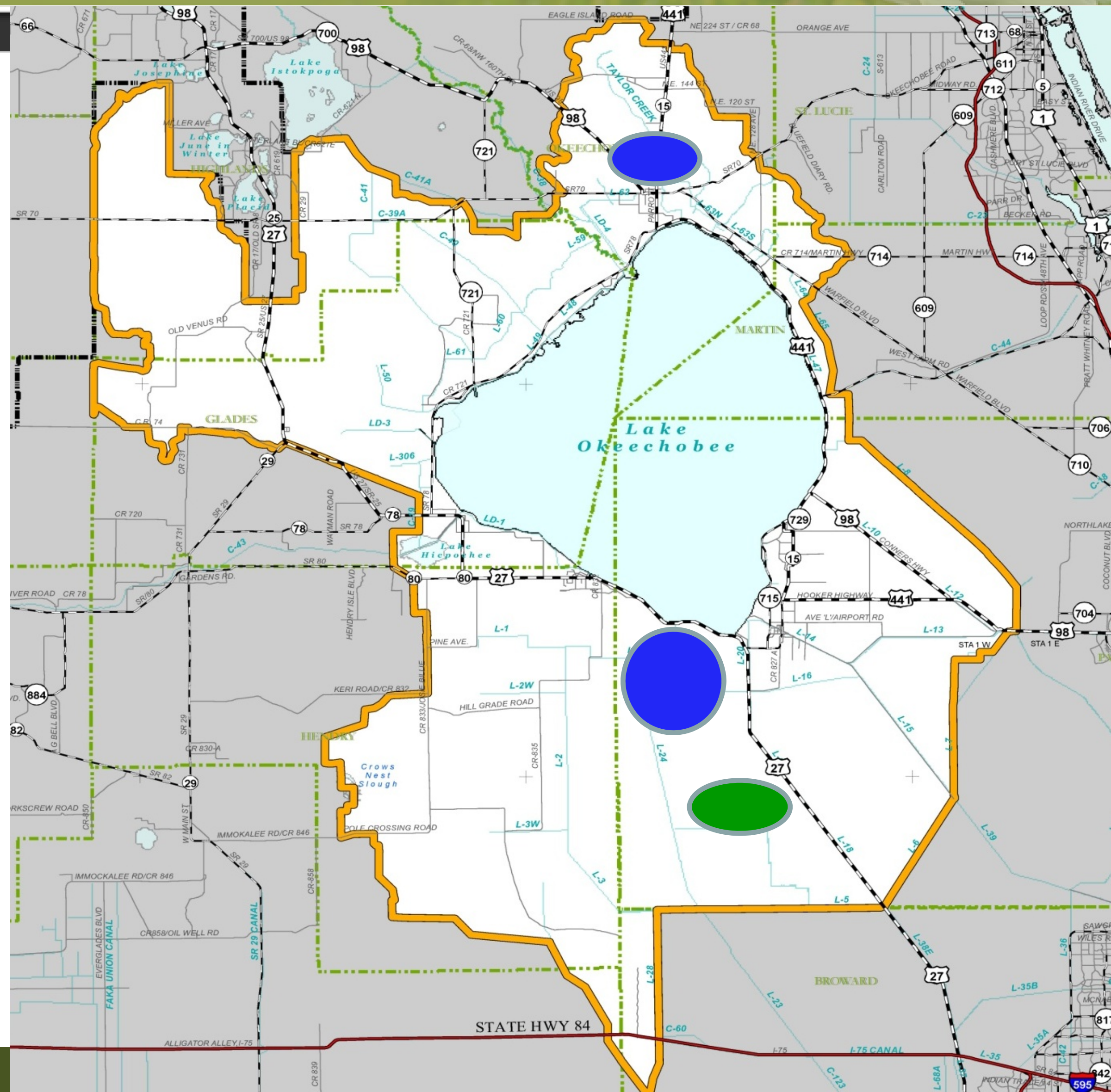
Should Wetland Management Areas be considered in targeted locations?

Feature Summary- Stormwater Treatment Area

- Constructed and managed shallow treatment wetlands primarily for removal of total phosphorus (TP)
- Vegetated embankments; maximum water depth of 4 feet
- Highly managed vegetation and engineered hydraulics
- Proven water quality treatment capabilities; no additional treatment required prior to entering Everglades
- Ancillary onsite benefit of high quality wildlife habitat which can result in operational constraints to address protected species issues
- Maintained in a wetted condition; requires supplemental water
  - to achieve optimal water quality treatment
  - to ensure viability of the highest performing treatment vegetation
- Recreational opportunities similar to other wetland habitat

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

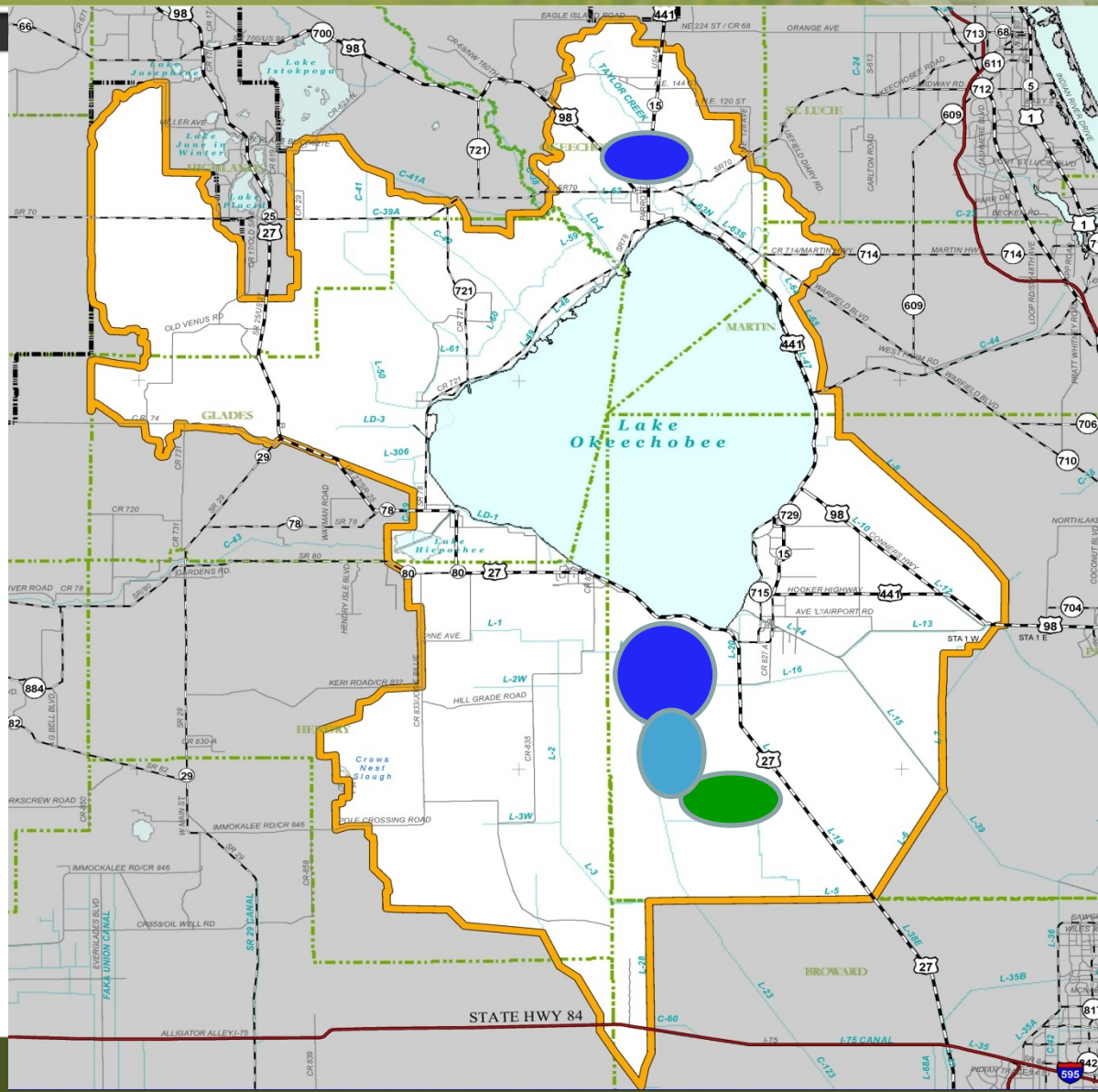
Deep Storage Reservoir and Shallow Storage With STAs

<u>Everglades Restoration</u>
Medium to High

<u>EAA Wetlands</u>
Low to Medium

<u>Cost Estimate</u>
Medium to High

<u>Land/Economics</u>
Medium to High



Phase I Comparative Evaluation Summary of Combined Project Features

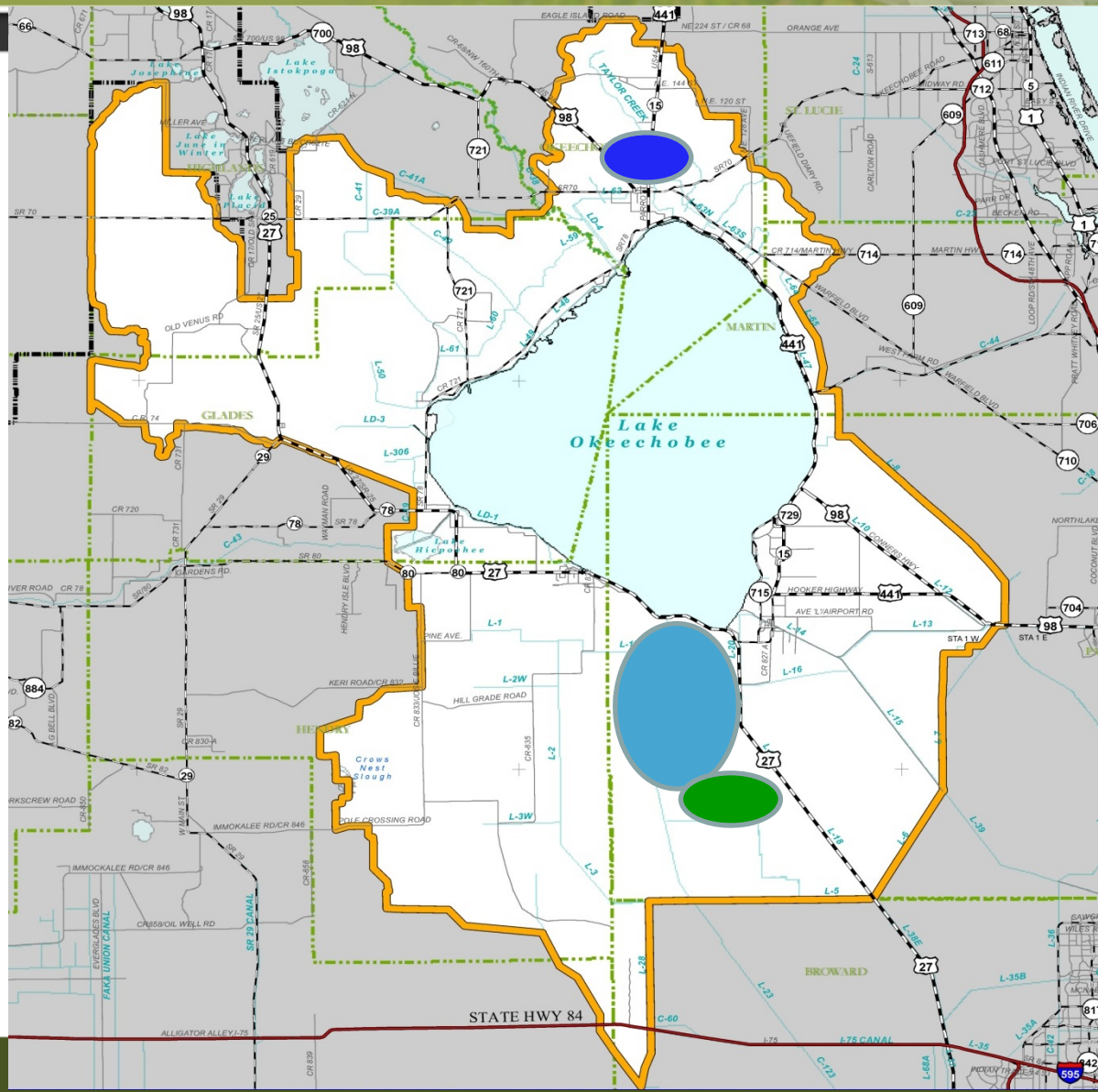
Shallow Dry Storage With STAs

<u>Everglades Restoration</u>
Low to Medium

<u>EAA Wetlands</u>
Low to Medium

<u>Cost Estimate</u>
Low to Medium

<u>Land/Economics</u>
Medium to High



Phase I Comparative Evaluation Summary of Combined Project Features

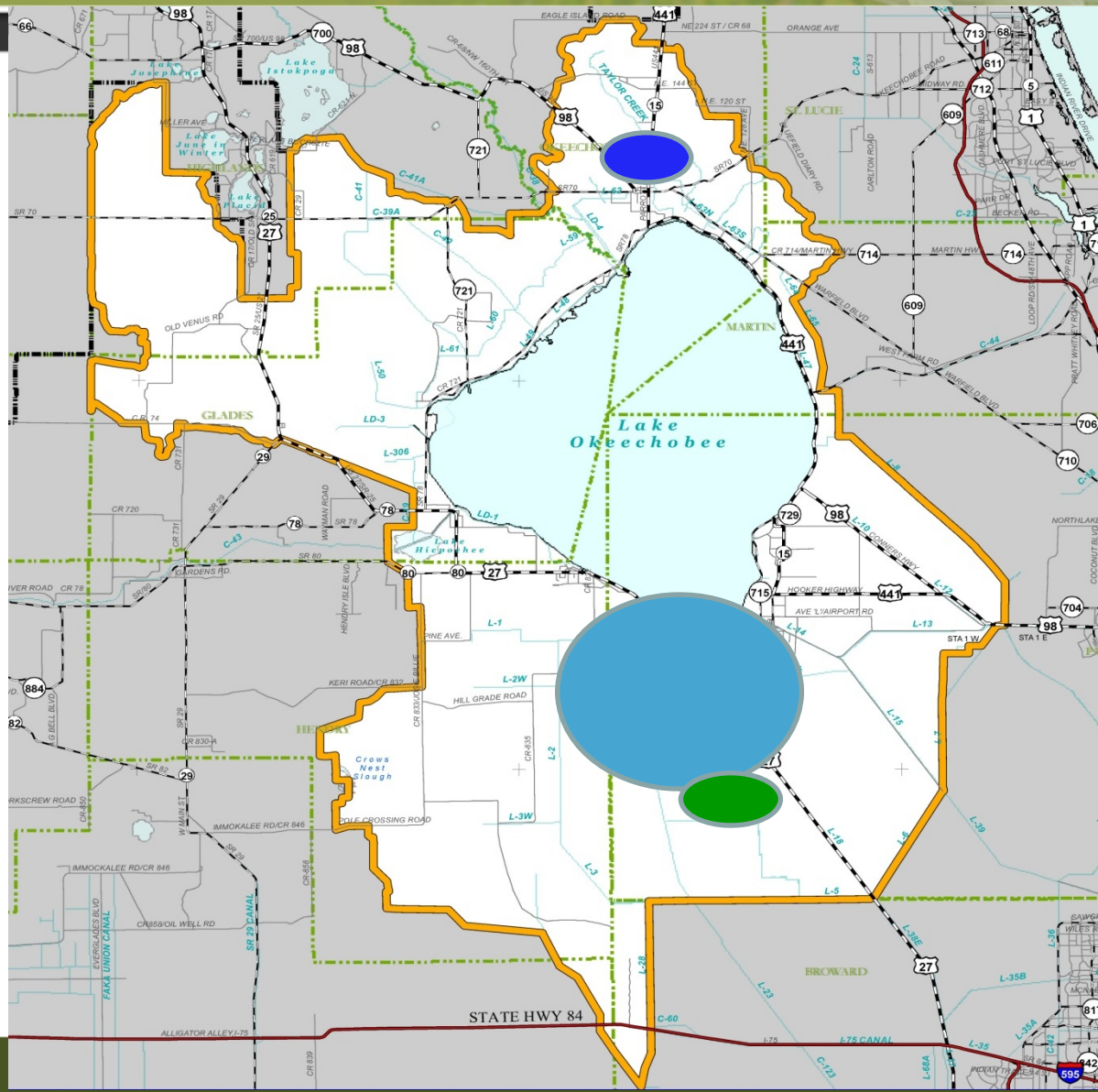
Shallow Wet Storage With STAs

<u>Everglades Restoration</u>
Low to Medium

<u>EAA Wetlands</u>
High

<u>Cost Estimate</u>
High

<u>Land/Economics</u>
High



Phase I Comparative Evaluation Summary of Combined Project Features

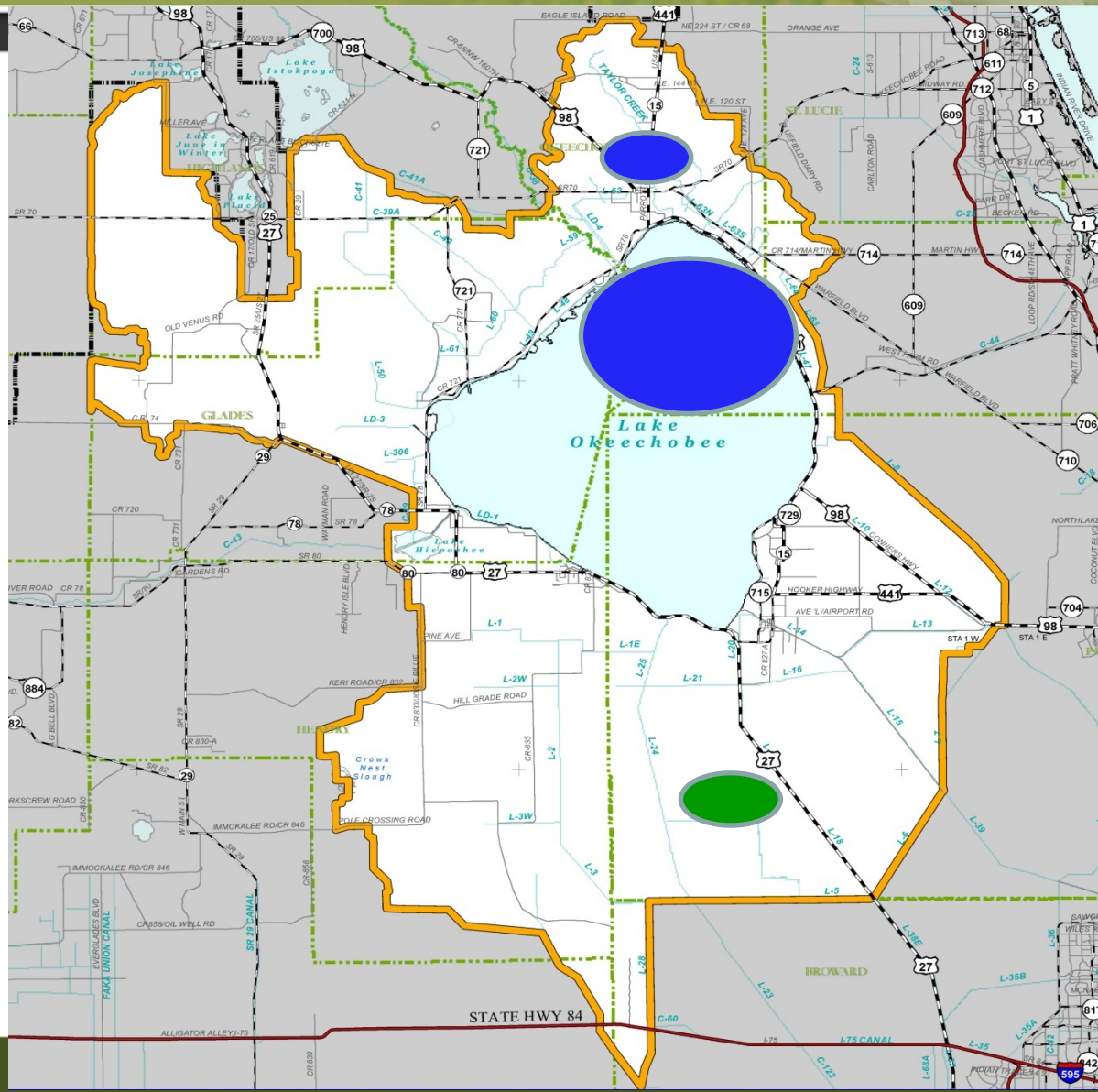
Deep Storage Within Lake Okeechobee With STAs

<u>Everglades Restoration</u>
Low

<u>EAA Wetlands</u>
Low

<u>Cost Estimate</u>
Medium

<u>Land/Economics</u>
Low



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

Moving from Phase I to Phase II Planning

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Phase I Findings and Phase II Considerations

- **Everglades Targets-** need for greater Everglades flows particularly during dry periods
  - Phase I- Utilized Synthetic time series; ~1.9+ MAF
  - Phase II- Refine target through Target Workshop and more detailed modeling evaluation; consider constraints
- **Restoration Approaches-** all approaches require storage, treatment, and delivery system, but vary with regards to other features/attributes
  - Phase I- Viable approaches must meet restoration needs first and then can consider additional attributes (e.g., recreation, increased wetland extent)
  - Phase II- Develop alternatives that meet restoration needs and identify opportunities for incorporating additional attributes

Phase I Findings and Phase II Considerations

- **Constraints and Phasing-** need to evaluate constraints and develop phasing plan
  - Phase I- Did not consider system or land availability constraints
  - Phase II- Evaluate constraints with detailed model and develop detailed phasing plan
- **Wet vs Dry Footprints-** is active management to maintain wet footprints desirable
  - Phase I- Wet footprints require significantly greater storage volume to achieve same downstream performance
    - For same acreage, flow-way or reservoir allowed to go dry followed by an STA achieves better downstream hydrologic and water quality results than a wet flow-way
  - Phase II- If desired, can evaluate varying degrees of wet and magnitude of impact with detailed model

Phase I Findings and Phase II Considerations

- **Water Quality-** new flows require additional treatment facilities; feature water quality performance evaluation
  - Phase I- Since reservoirs, flow-ways, and other non-STA features can not reliably achieve concentrations less than 25 ppb, their discharges require further STA treatment prior to delivery to the Everglades
    - Lake Okeechobee concentrations have a significant impact on treatment needs
  - Phase II- Improve performance estimates utilizing dynamic model and potential pilot projects/testing
- **Shallow vs Deep Storage vs Combination-** what is preferred approach
  - Phase I- Shallow storage ET volumes up to 2x deep ET volumes; 2x as much land required for shallow storage
  - Phase II- Reassess with refined targets and detailed model to determine preferred approach

Phase I Findings and Phase II Considerations

- **Lake Okeechobee Performance-** improving low and high stages
  - Phase I- improved high stages but did not improve low stages over existing LORS-2008 condition
  - Phase II- needs to consider improvements to Lake's low stages
- **Storage Targets**
  - Phase I- 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
    - Appears that a range between 450-575,000 acre-ft Northern Everglades storage may be needed to address low lake stages
  - Phase II- Refine storage targets based on refined Everglades flow target

Phase I Findings and Phase II Considerations

- **Features and Combinations-** feature type and operations has significant impact on performance and costs
  - Phase I- Evaluated impact of feature type and operations on Everglades performance
    - Identified 5 primary combinations of features and did a comparative evaluation
  - Phase II- Further evaluate and optimize these feature combinations to determine preferred approach
- **Common Elements-** features common to most restoration proposals
  - Phase I- Identified features/common elements that were common to most/all restoration proposals
  - Phase II- Consider moving these features more quickly into design/implementation phases while detailed regional planning continues

Other Phase I Findings and Phase II Considerations

- **Public Planning Process-** utilizing public planning process has encourage participation by stakeholders and staff and has improved communication and understanding
  - Restoration Vision and Value Systems
  - Targets and Inter-Relationships
  - Technical Issues and Challenges
- **Other Phase II Considerations-**
  - Role of ASR
  - Hydraulic limitations
  - Evaluation of economic impacts and values

Phase II Recommended Approach

- Public Planning Process similar to Phase I
  - Scope: Identify recommended conceptual plans including footprint (options to include scenarios with land swaps and scenarios without)
  - Kick-off: Fall 2009
- Prepare comprehensive Phase II work plan, budget, and schedule
- Develop modeling toolbox and evaluation criteria
- Refine targets and evaluate constraints
- Identify parameters for sensitivity testing
- Develop work plans for Common Elements and Other Phase II Considerations
- Develop and evaluate optimized Phase II configurations
- Identify recommended conceptual plans including footprint

Next Meeting- Date and Location

Next WRAC Issues Workshop

September 2, 2009

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL
10:00 a.m. – 4:00 p.m.

Questions?

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