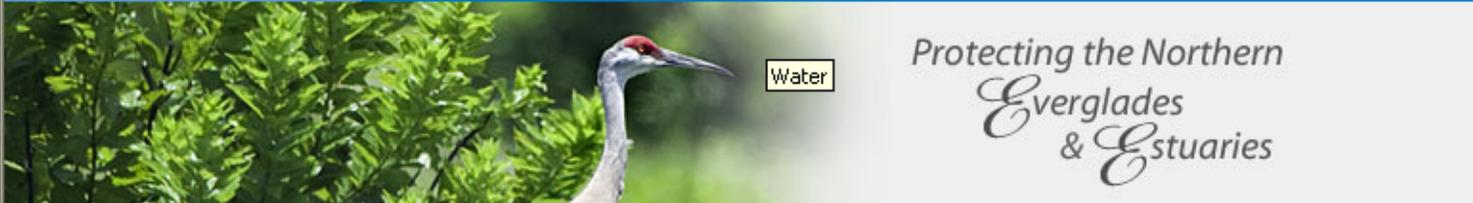




Lake Okeechobee Phase 2 Technical Plan Update
Tom Teets, Program Implementation Manager
Temperince Morgan, Lead Technical Program Specialist

Lake Okeechobee Interagency Group
October 17, 2007

https://my.sfwmd.gov/northerneverglades



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Northern Everglades

Underscoring the state's commitment to Greater Everglades Ecosystem restoration, the Florida Legislature in 2007 expanded the Lake Okeechobee Protection Act to strengthen protection for the Northern Everglades by restoring and preserving the Lake Okeechobee watershed and the Caloosahatchee and St. Lucie estuaries.

For a calendar of [Public Meetings](#) intended to involve and inform all of the interested public and stakeholders in this region, click the tab at the top of this page.

General Information

- » [Northern Everglades Legislation](#) [PDF]
- » [Just the Facts](#) [1 page PDF]
- » [Northern Everglades Presentation](#) [5.6 mb PPT]
- » [Everglades Ecosystem Map](#) [PDF]
- » [Northern Everglades Glossary & Acronyms](#) [PDF]



Lake Okeechobee Technical Plan Requirements

- **Identify facilities to achieve TMDL**
 - **Size**
 - **Location**
 - **Schedule**
 - **Budget**
 - **Costs**
- **Provide additional measures to increase water storage and reduce excess water levels in lake and discharges to tide**
 - **Identify storage goal to achieve desired lake levels and inflow volumes to estuaries while meeting other water related needs**

Phase II Technical Plan Lake Okeechobee Watershed

Management Measures

- **Initial step compile and sort management measures by levels**
- **Levels of management measures**
 - **Level 1- Already constructed/implemented or construction/implementation imminent**
 - **Level 2- Construction/implementation likely; Detailed design/activity development ongoing; Location well defined**
 - **Level 3- Implementation certainty unknown; Conceptual level of design/activity development complete; Location defined**
 - **Level 4- Implementation certainty unknown- Conceptual idea; May have rough order of magnitude cost and/or general basin location**
 - **Level 5- Implementation certainty unknown-Conceptual idea with limited information**

Water Quality and Quantity Analyses

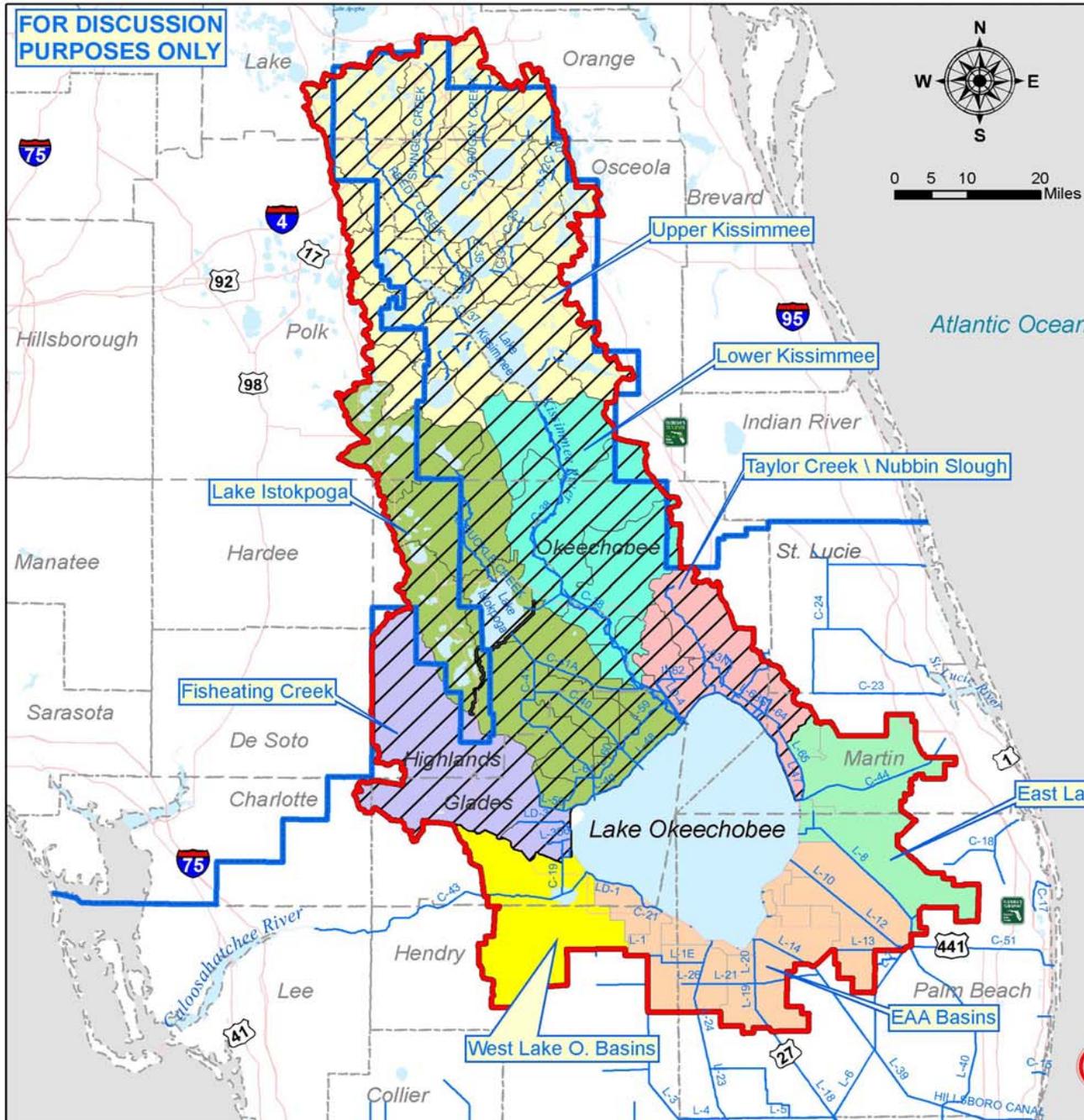
- **Water Quantity**
 - **Water Budget analysis using Regional Simulation Model**

- **Water Quality**
 - **Spreadsheet evaluation of phosphorus reduction**
 - **Builds upon 2007 Lake Okeechobee Protection Plan Update**

Water Quality Analysis

- **Spreadsheet analysis process**
 - **Period of record: 1991- 2005**
 - **Phosphorus reduction for each management measure estimated based upon best available information**
 - **Phosphorus reductions applied on a sub-watershed basis (9 sub-watersheds)**
 - **Shows incremental progress toward meeting Lake Okeechobee Total Maximum Daily Load**

**FOR DISCUSSION
PURPOSES ONLY**



**Northern Everglades Ecosystem
Phase II Lake Okeechobee
Watershed Construction Project**

- Roads
- SFWMD Northern Border
- Lake Okeechobee Watersheds**
- Caloosahatchee River
- EAA Basins
- East Lake O. Basins
- Fisheating Creek
- Lake Istokpoga
- Lower Kissimmee
- St. Lucie Estuary
- Taylor Creek/Nubbin Slough
- Upper Kissimmee
- West Lake O. Basins
- SFWMD Major Canals
- - - County Boundary
- LOPP Hydrologic Boundary
- Basins
- Regional Simulation Model - Sub Watersheds

This map is a conceptual tool utilized for project development only. This map is not self-executing or binding, and does not otherwise affect the interests of any persons including any vested rights or existing uses of real property and is not a survey.

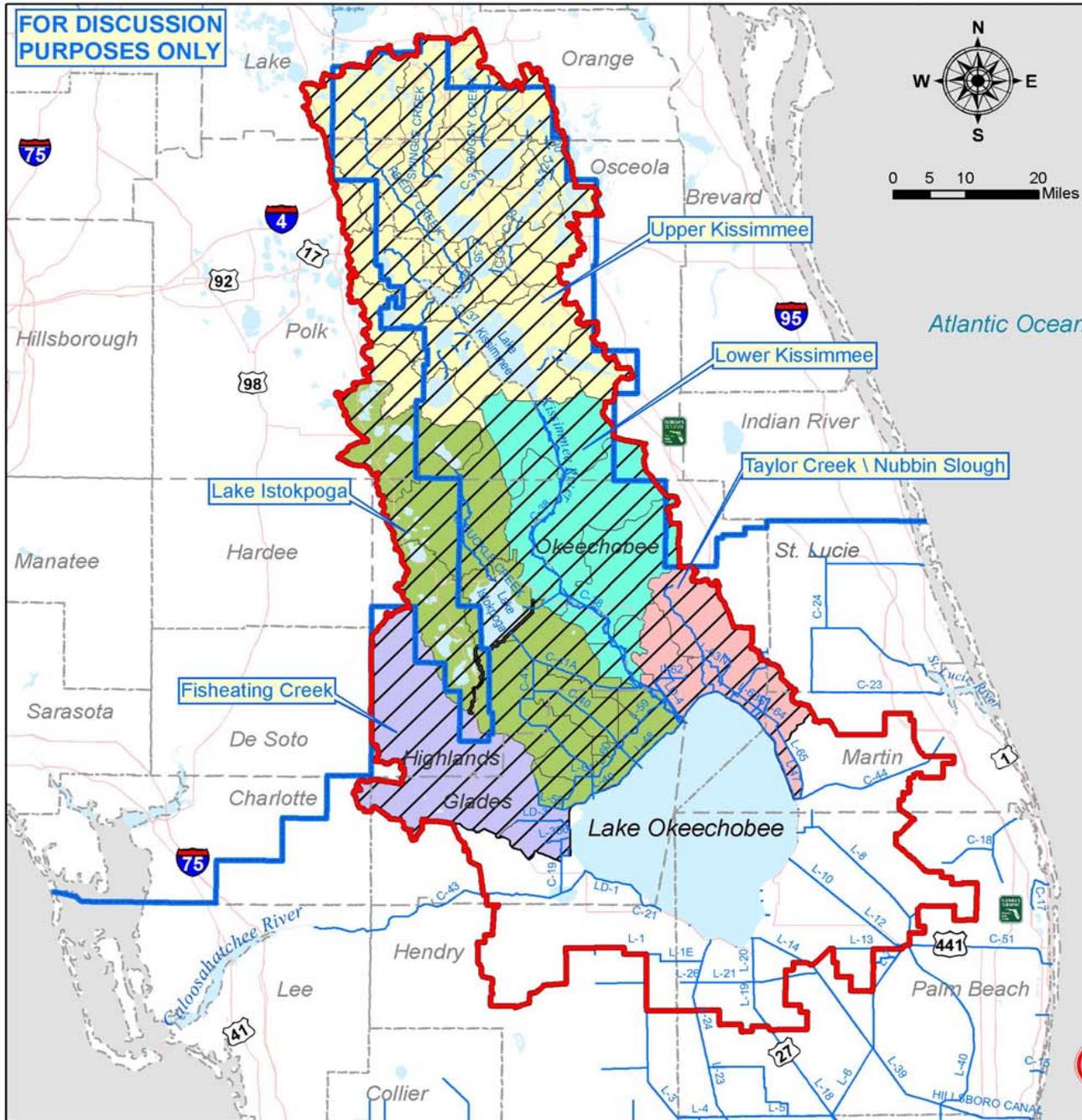
**UPDATED
11 SEP 2007**



Water Quantity Analysis

- **Water Budget analysis using Regional Simulation Model.**
- **Area north of Lake Okeechobee subdivided into 5 sub-watersheds**
 - **Upper Kissimmee**
 - **Lower Kissimmee**
 - **Lake Istokpoga**
 - **Fisheating Creek**
 - **Taylor Creek/Nubbin Slough**
- **Management measures with affect on water budget such as reservoirs or STAs are generally simulated as one facility per sub-watershed**

**FOR DISCUSSION
PURPOSES ONLY**



0 5 10 20 Miles

**Northern Everglades Ecosystem
Phase II Lake Okeechobee
Watershed Construction Project**

- Roads
- SFWMD Northern Border
- Lake Okeechobee Watersheds**
- Caloosahatchee River
- EAA Basins
- East Lake O. Basins
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- Basins
- Regional Simulation Model - Sub Watersheds

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UPDATED
11 SEP 2007



Summary of Alternatives

- **Alternative 1- Common Elements**
- **Alternative 2- Water Storage**
- **Alternative 3- Water Quality**
- **Alternative 4- Integrates Alternative 2 (Storage) and Alternative 3 (Water Quality)**

Alternative 1 Summary

- **Alternative 1 includes-**
 - **Level 1, 2, and 3 Management Measures**
 - **CERP Lake Okeechobee Watershed Project Tentatively Selected Plan features not in Levels 1-3**
 - **Kissimmee Reservoir**
 - **Istokpoga Reservoir**
 - **Istokpoga STA**

Alternative 1 Management Measures

- **Management measures applied throughout Lake Okeechobee Watershed**
 - **Source Control- Agricultural and Urban**
 - **Lake Okeechobee Works of the District**
 - **Lake Okeechobee and Estuary Watershed Basin Rules/Environmental Resources Permitting**
 - **Alternative water storage options**
- **Lower Kissimmee Sub Watershed- reservoir, ASR**
- **Taylor Creek/Nubbin Slough Sub Watershed- reservoir, ASR, STAs, water quality projects, stormwater facilities**
- **Lake Istokpoga Sub Watershed- reservoirs, ASR, STAs**

Alternatives 2, 3, and 4

- **Alternatives 2 and 3 build upon Alternative 1**
- **Alternative 2**
 - Focus on storage to meet Lake Okeechobee stage envelope and estuaries salinity envelopes
 - Additional storage in Lower Kissimmee, Lake Istokpoga and Fisheating Creek
 - ~1.3 million acre feet of storage
- **Alternative 3**
 - Focus on meeting Lake Okeechobee Total Maximum Daily Load
 - Taylor Creek/Nubbin Slough- Deep Injection Well, S-133 Water Quality Treatment
 - Lake Istokpoga and Fisheating Creek- STAs, Reservoir assisted- STAs
 - EAA- STA adjacent to S-4
- **Alternative 4**
 - Integrates Alternative 2 and 3



Alternatives 1, 2, 3 and 4 Water Quality Analysis



Water Quality Summary

- **For the period from 1991-2005**
 - **Average annual phosphorus loading= 514 metric tons**
 - **Average annual phosphorus concentration= 163 ppb**
- **Phosphorus TMDL for Lake Okeechobee**
 - **140 metric tons 5-year rolling average**
 - **35 metric tons attributed to atmospheric deposition**
 - **105 metric tons allowable from all surface water inflows**

Summary of Phosphorus Loading with Alternative 1

| | |
|--|----------------|
| Load reduction from Level 1 and 2 Management Measures | -239 mt |
| Load reduction from remaining Alternative 1 Management Measures | -62 mt |
| Total Load Reduction from Alternative 1 | -301 mt |

| | |
|--|----------------|
| Initial Annual Average P Load | 514 mt |
| TMDL Allocation | -105 mt |
| Remaining Load | 409 mt |
| Load reduction from Alternative 1 | -301 mt |
| Remaining Load To Be Addressed | 108 mt |

Summary of Phosphorus Loading with Alternative 2

| | |
|--|----------------|
| Load reduction from Alternative 1 | -301 mt |
| Load reduction from remaining Alternative 2 Management Measures | -15 mt |
| Total Load Reduction from Alternative 2 | -316 mt |

| | |
|--|----------------|
| Initial Annual Average P Load | 514 mt |
| TMDL Allocation | -105 mt |
| Remaining Load | 409 mt |
| Load reduction from Alternative 2 | -316 mt |
| Remaining Load To Be Addressed | 93 mt |

Summary of Phosphorus Loading with Alternative 3

| | |
|--|----------------|
| Load reduction from Alternative 1 | -301 mt |
| Load reduction from remaining Alternative 3 Management Measures | -63 mt |
| Total Load Reduction from Alternative 3 | -364 mt |

| | |
|--|----------------|
| Initial Annual Average P Load | 514 mt |
| TMDL Allocation | -105 mt |
| Remaining Load | 409 mt |
| Load reduction from Alternative 3 | -364 mt |
| Remaining Load To Be Addressed | 45 mt |

Summary of Phosphorus Loading with Alternative 4

| | |
|--|----------------|
| Load reduction from Alternative 1 | -301 mt |
| Load reduction from remaining Alternative 4 Management Measures | -59 mt |
| Total Load Reduction from Alternative 4 | -360 mt |

| | |
|--|----------------|
| Initial Annual Average P Load | 514 mt |
| TMDL Allocation | -105 mt |
| Remaining Load | 409 mt |
| Load reduction from Alternative 4 | -360 mt |
| Remaining Load To Be Addressed | 49 mt |

Phosphorus Results Summary

| | Load Reduction in Lake Inflows | Load Reduction from In-Lake Water |
|----------------------|---|--|
| Alternative 1 | 301 mt | 0 mt |
| Alternative 2 | 316 mt | 36 mt |
| Alternative 3 | 364 mt | 0 mt |
| Alternative 4 | 360 mt | 74 mt |

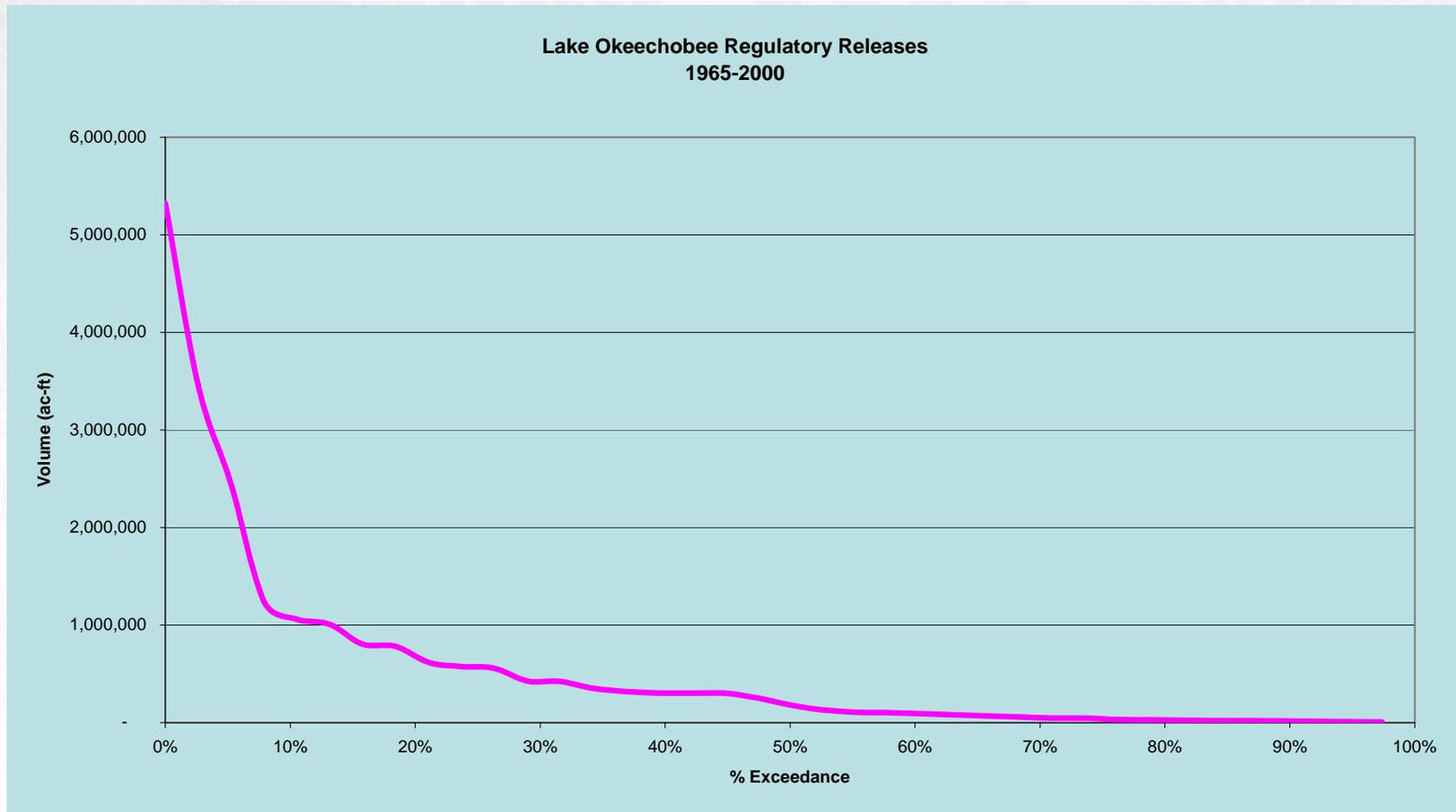


Alternative 1, 2, 3, and 4 Water Quantity Analysis



Defining the magnitude of the problem

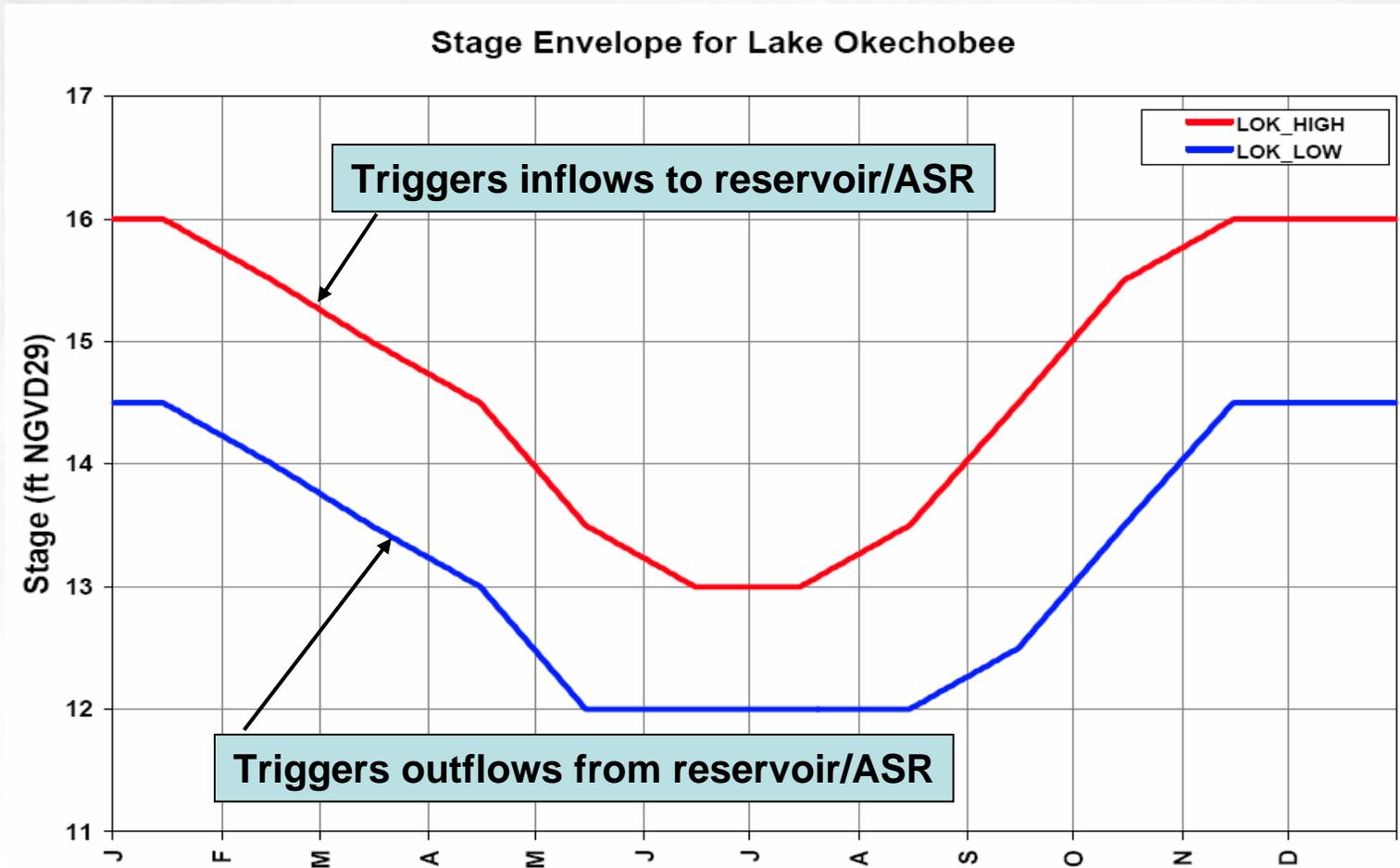
Lake Okeechobee regulatory releases based upon Restudy 2050 Future Base



Magnitude of Storage in Alternatives 1, 2, 3 and 4

- **Alternative 1- ~265,000 ac ft- surface storage**
- **Alternative 2- ~1,300,000 ac ft- surface storage**
- **Alternative 3- ~ 330,000 ac ft- surface storage**
- **Alternative 4- ~ 900,000 ac ft- surface storage**

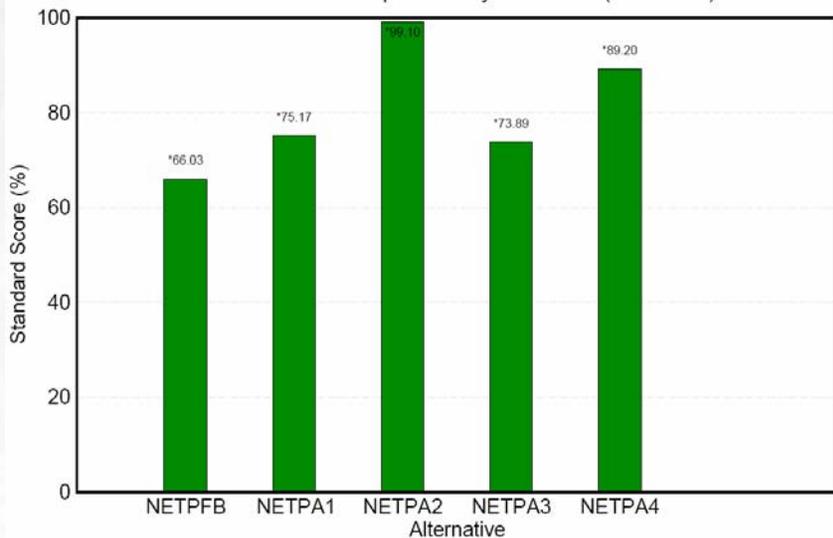
Regional Trigger For Inflows/Outflows Through Reservoir and ASR Management Measures



Lake Okeechobee Performance

Lake Okeechobee Stage Envelope

Score Below Envelope - Weekly Calculation (1970-2005)

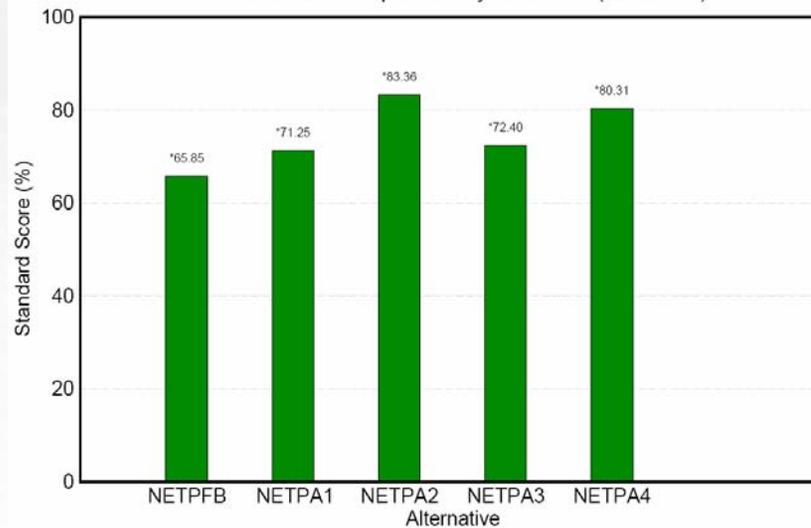


*Note: A score of 0% is the worst score. The stage falls below the envelope by 1 ft or more on average.
A score of 100% is the best score. The stage never falls below the envelope.

For Planning Purposes Only
Script Used: lo_generator.scr (ID386)
Filename: lo3_weekly_low_annualized.agr

Lake Okeechobee Stage Envelope

Score Above Envelope - Weekly Calculation (1970-2005)

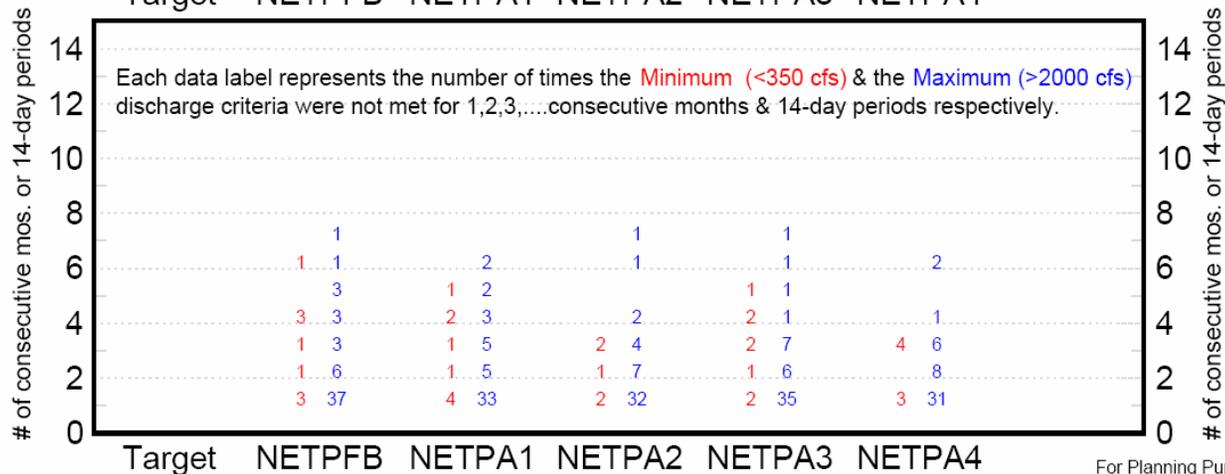
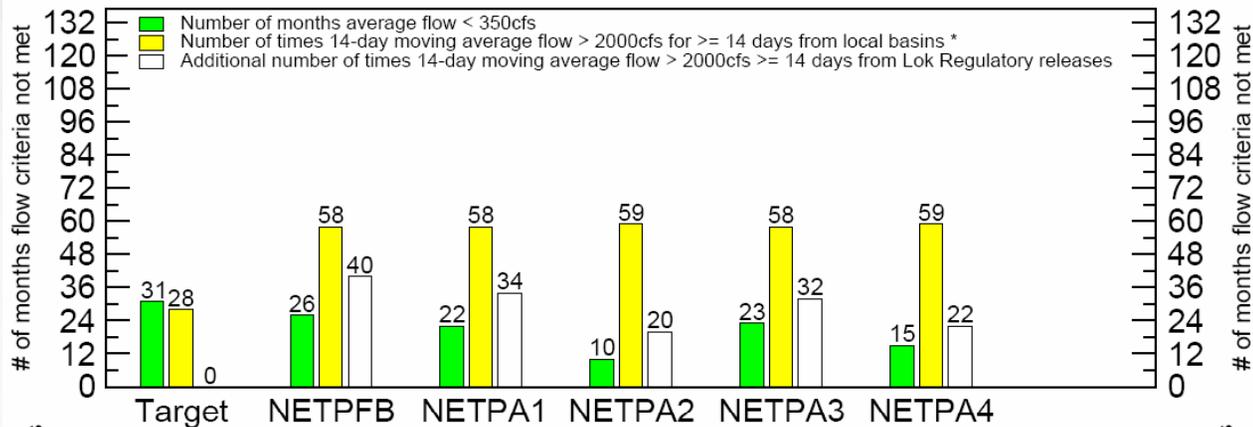


*Note: A score of 0% is the worst score. The stage exceeds the envelope by 1 ft or more on average.
A score of 100% is the best score. The stage never exceeds the envelope.

For Planning Purposes Only
Script Used: lo_generator.scr (ID386)
Filename: lo3_weekly_high_annualized.agr

St. Lucie Estuary Performance

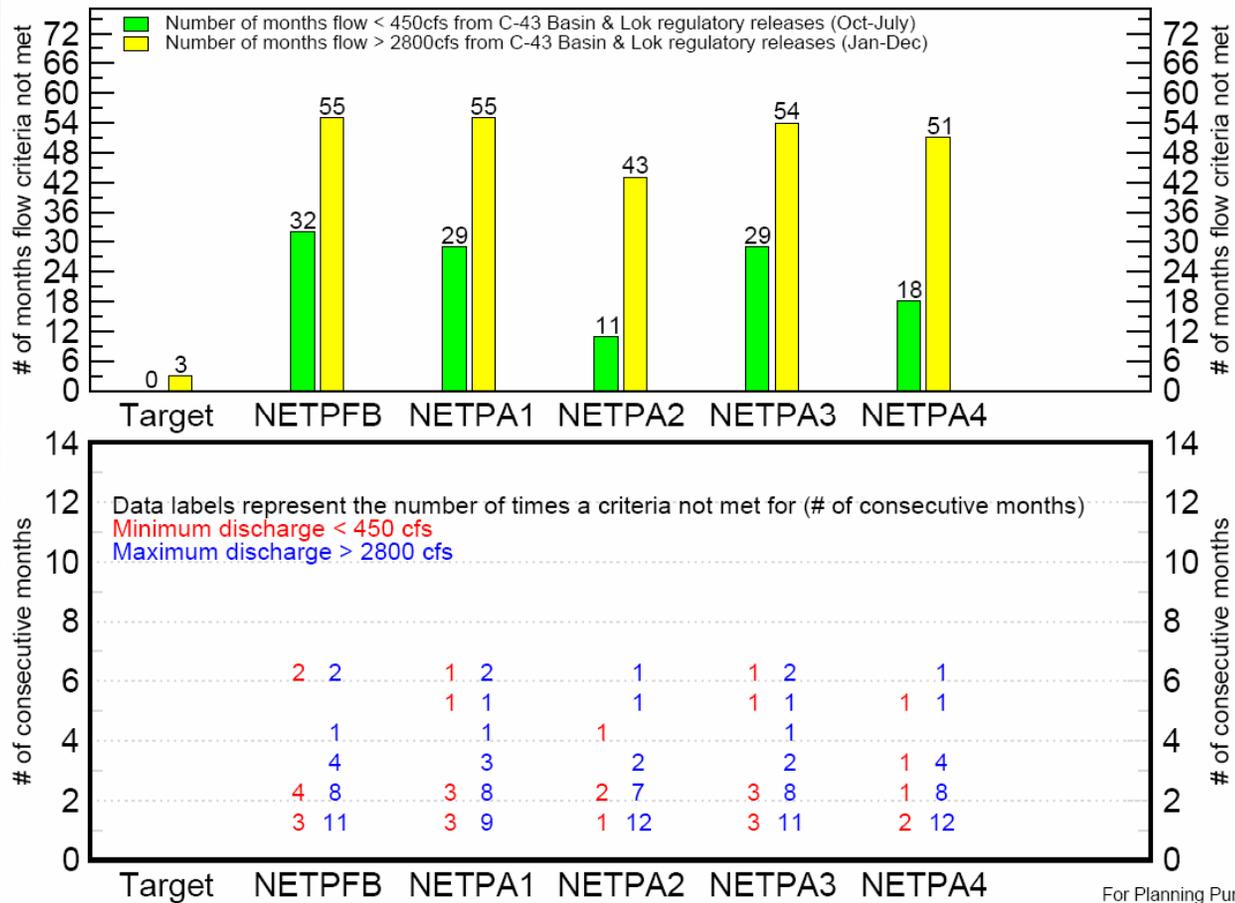
Number of Times Salinity Envelope Criteria NOT Met for the St. Lucie Estuary (mean monthly flows 1970 - 2005)



For Planning Purposes Only
 Script used: estuary.scr, ID496
 Filename: stluc_salinity_flow_bar.out.agr

Caloosahatchee Estuary Performance

Number of Times Salinity Envelope Criteria NOT Met for the Caloosahatchee Estuary (mean monthly flows 1970 - 2005)



For Planning Purposes Only
 Script used: estuary_scr_ID496
 Filename: caloos_salinity_flow_bar.out.agr

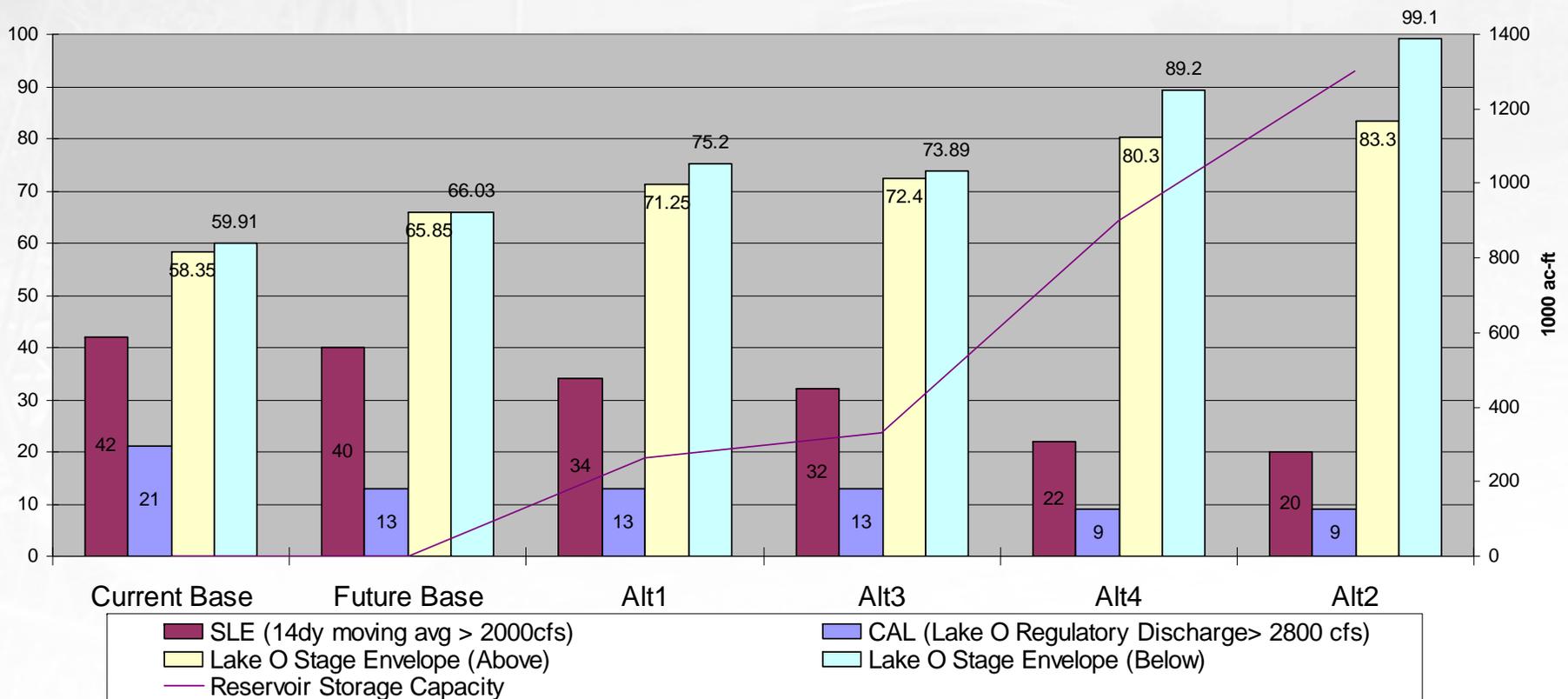
Caloosahatchee Estuary Performance

Number of months discharge >2800 cfs (432 month simulation)

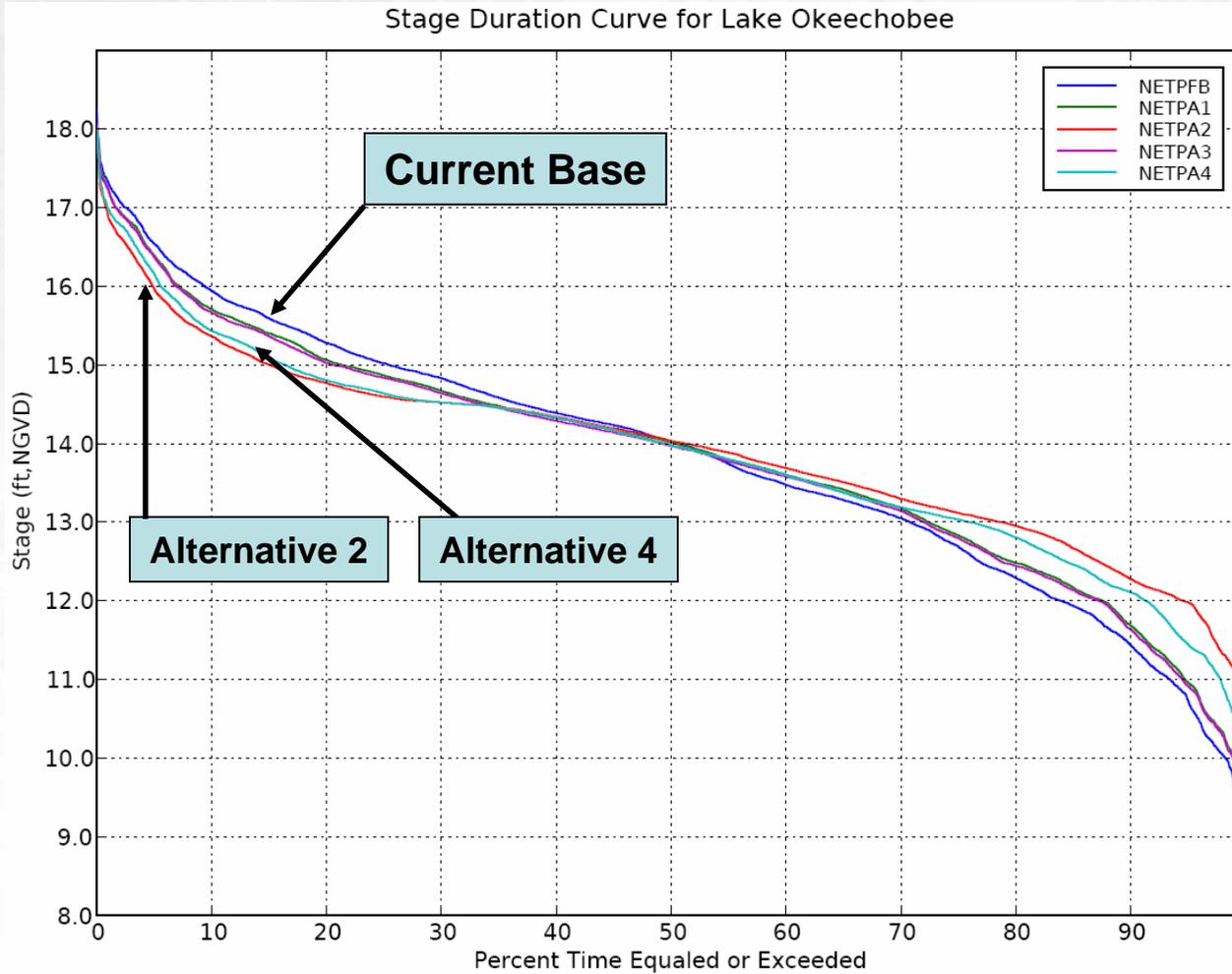
| | NETPFB | NETPA1 | NETPA2 | NETPA3 | NETPA4 |
|--|--------|--------|--------|--------|--------|
| Number of months Lake Okeechobee regulatory discharges > 2,800 cfs | 13 | 13 | 9 | 13 | 9 |
| Number of months Caloosahatchee Basin > 2,800 cfs | 28 | 27 | 26 | 27 | 26 |
| Number of months the combination of Lake O and Basin runoff discharges > 2,800 cfs | 14 | 15 | 8 | 14 | 16 |
| Number of months S-79 > 2,800 cfs | 55 | 55 | 43 | 54 | 51 |

Lake Okeechobee and Estuary Performance

Lake O Stage Envelope and Estuary Salinity Envelope

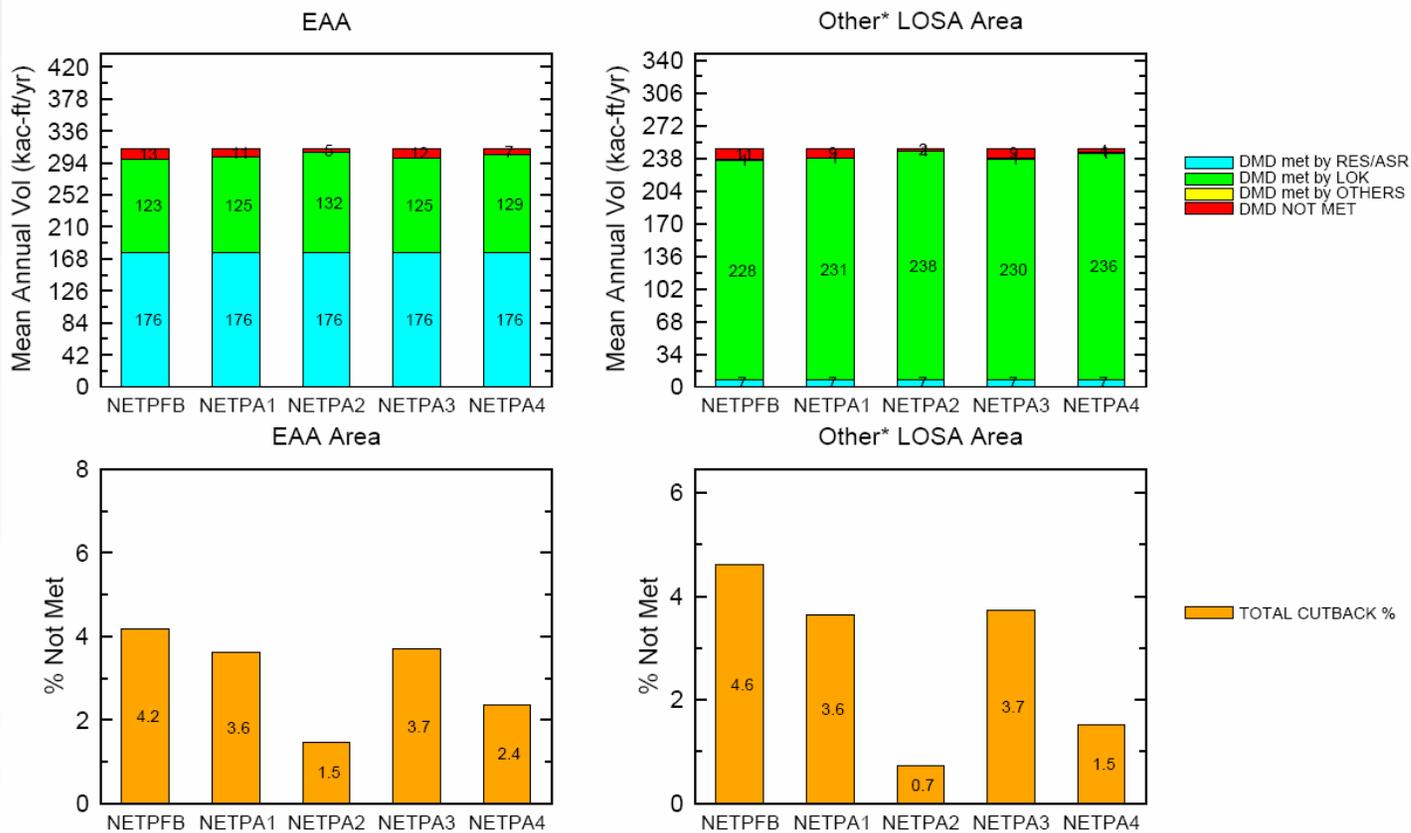


Stage Duration Curve for Lake Okeechobee



Water Supply Performance

Mean Annual EAA/LOSA Supplemental Irrigation: Demands & Demands Not Met for -



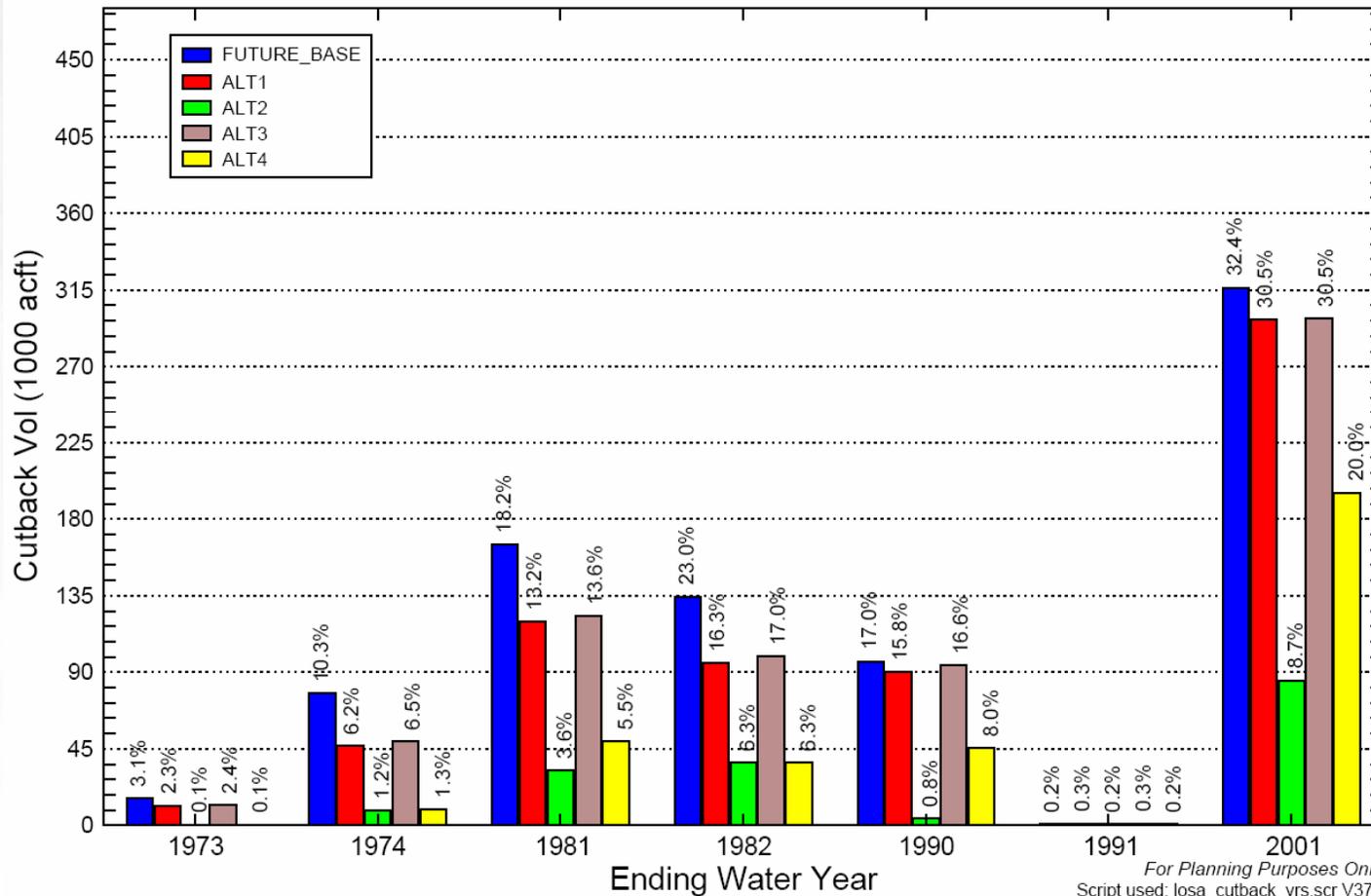
Other LOSA Areas: S236, S4, L8, C43, C44, North & Northeast Lakeshore, & Lower Istokpoga

For Planning Purposes Only
Script used: ssm_4in1.scr, ID327
Filename: losa_dmd_4in1.agr

Water Supply Performance

Water Year (Oct-Sep) LOSA Demand Cutback Volumes

for the 7 Years in Simulation Period with Largest Cutbacks



For Planning Purposes Only
 Script used: losa_cutback_yrs.scr V370
 Filename: losa_cutback_yrs_bar.agr



Storage Scenarios Water Quantity Analysis

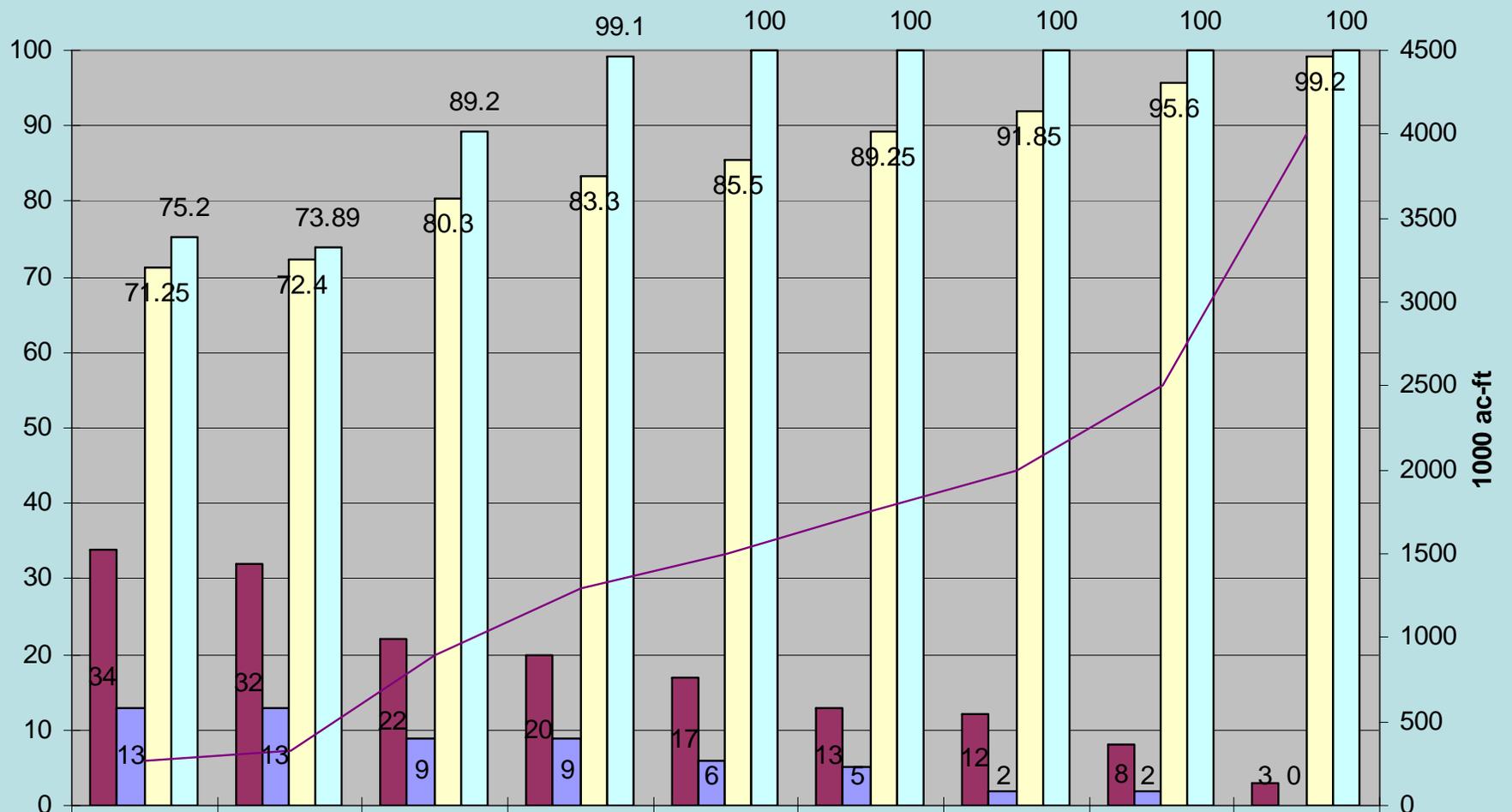


Storage Scenarios RSM runs

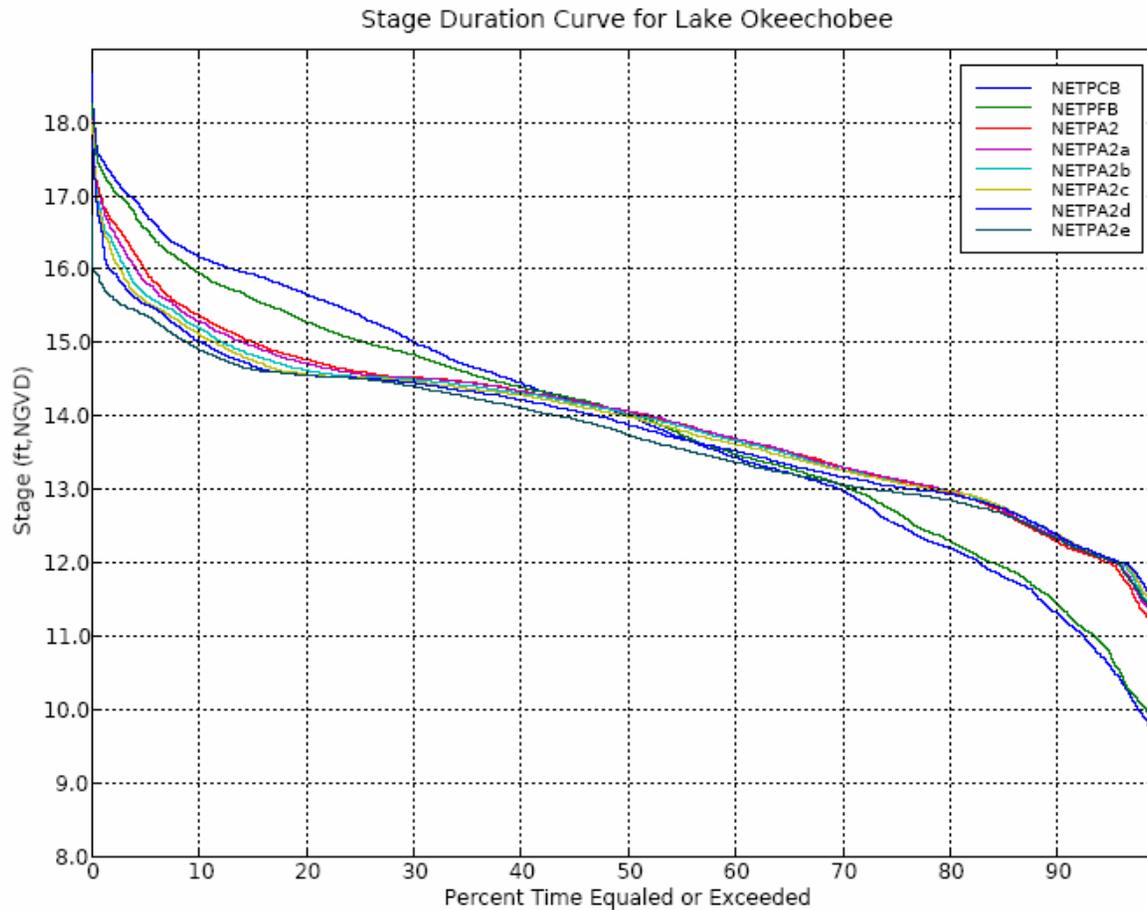
- **Storage Scenario model runs based upon Alternative 2 (1.3 Million Ac Ft of Storage)**
- **Reservoirs expanded spatially, maximum depth of 16 ft consistent with other storage in alternatives.**
- **Magnitude of storage in each scenario**
 - **Scenario 2A- 1.5 Million Ac Ft**
 - **Scenario 2B- 1.75 Million Ac Ft**
 - **Scenario 2C- 2.0 Million Ac Ft**
 - **Scenario 2D- 2.5 Million Ac Ft**
 - **Scenario 2E- 4 Million Ac Ft**

Lake Okeechobee and Estuary Performance- Storage Scenarios

Lake O Stage Envelope and Estuary Salinity Envelope

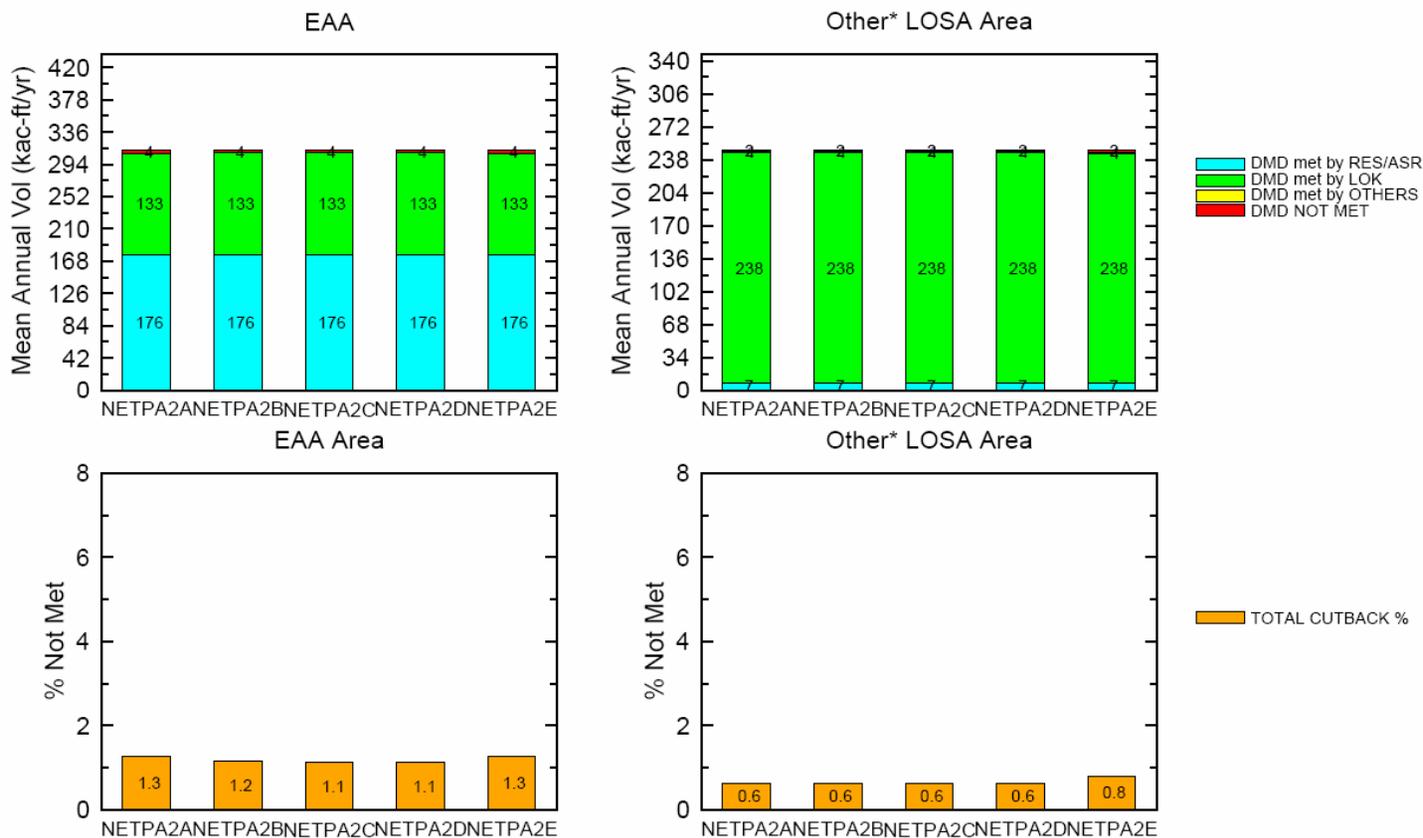


Stage Duration Curve for Lake Okeechobee- Storage Scenarios



Water Supply Performance

Mean Annual EAA/LOSA Supplemental Irrigation: Demands & Demands Not Met for 1970 - 2005



Other LOSA Areas: S236, S4, L8, C43, C44, North & Northeast Lakeshore, & Lower Istokpoga

For Planning Purposes Only
 Script used: ssm_4in1.scr, ID327
 Filename: losa_dmd_4in1.agr

Identification of Plan Best Meeting Legislative Goals

- **Builds upon Alternative 4**
- **Represents best plan that current technology allows us to implement**
- **Recognizes need to further optimize and refine plan features**
- **Builds upon existing and planned programs and projects**
- **Emphasizes low cost and locally applied features**
- **Includes carefully selected regional projects to complement and build upon local features**

Summary of Plan Features

- **Includes local features, regional features, and other projects**
- **Local Features**
 - **Source Control (Agricultural and Urban BMPs and regulatory programs)**
 - **Land Management Activities**
 - **Alternative Water Supply Projects**
 - **Florida Ranchlands and Environmental Services Program**
 - **Local Government Initiatives**

Summary of Plan Features

- **Regional Features**
 - **Reservoir Assisted Stormwater Treatment Areas (RASTAs)**
 - **Reservoirs**
 - **Stormwater Treatment Areas (STAs)**
 - **Aquifer Storage and Recovery Wells**
 - **Deep Injection Wells**
- **Other Projects**
 - **Managed Aquatic Plant Systems**
 - **Hybrid Wetland Treatment Technology**
 - **Chemical Treatment**
 - **Wetland Restoration**

Summary of Plan Features

- **Water Quality**
 - **Source Control**
 - **Stormwater Treatment Areas**
 - **Innovative Nutrient Control Technologies**
- **Water Quantity**
 - **900,000-1,300,000 ac-ft of storage**
 - **Alternative water storage on public and private lands**
 - **Reservoirs**
 - **134 MGD of ASR and Deep Injection Wells**

Process Development and Engineering

- **Roadmap for plan refinement**
- **Multiple components including-**
 - **Project Siting/Land Acquisition**
 - **Conceptual Design Studies**
 - **Sub-Watershed Conceptual Design Studies**
 - **Model and Technology Refinement**
 - **Hydrologic and Water Quality Model Refinement**
 - **Innovative Treatment Pilot/Testing Projects**
 - **BMP Optimization and Refinement**

Topics to be included in report

- **Background and Summary of Previous Studies and Ongoing Projects**
- **Review Water Quality of Basins flowing into Lake Okeechobee**
- **Water Budget Analysis**
- **Formulation of Alternatives**
- **Alternative Evaluation, Comparison, and Description of Plan**
- **Description of Plan Projects and Actions**
- **Plan Refinement and Revision**

Technical Plan Development Schedule

- **Draft Plan for Public Review** **Late October/Early
November 2007**
- **Review comments and revise draft** **Nov-Dec 2007**
- **Final Plan to Governing Board** **January 2008**
- **Submit Plan to Legislature** **February 1, 2008**

An aerial photograph showing a vast landscape. In the foreground, there are several large, rectangular green agricultural fields separated by dirt roads. A small cluster of buildings and a pond are visible in the middle ground. In the background, a large body of water, possibly a lake or bay, stretches across the horizon. A massive, bright white cumulus cloud formation dominates the upper half of the image, casting a large, dark shadow over the water and the fields below. The sky is a deep blue.

Questions