



Northern Everglades: River Watershed Protection Plans Update

***WRAC/WRAC Lake Okeechobee Committee Combined
Meeting- 09/16/08***

***Temperince Morgan, Northern Everglades Program Manager
Miao-Li Chang, Coastal Ecosystems Division Director***



Presentation Outline

- **Schedule**
- **Response to Question from July Lake O WRAC Mtg**
- **Pollutant Control Program and Construction Project-Formulation**
- **Caloosahatchee RWPP Preferred Plan**
- **St. Lucie RWPP Preferred Plan**
- **Research and Water Quality Monitoring Plan Summary**
- **Phasing and Costs**



River Watershed Protection Plans- Schedule

WRAC/Lake O WRAC	Sept 16
Release Draft Plan	End of Sept/Early Oct
Public Comment period/public mtgs/outreach	Oct
Lake O WRAC	Oct 29
Lake O WRAC/WRAC	Dec 3
Ten County Coalition	Dec 5
Final Plan to GB	Dec 11
Final Plan to Legislature	Jan 1



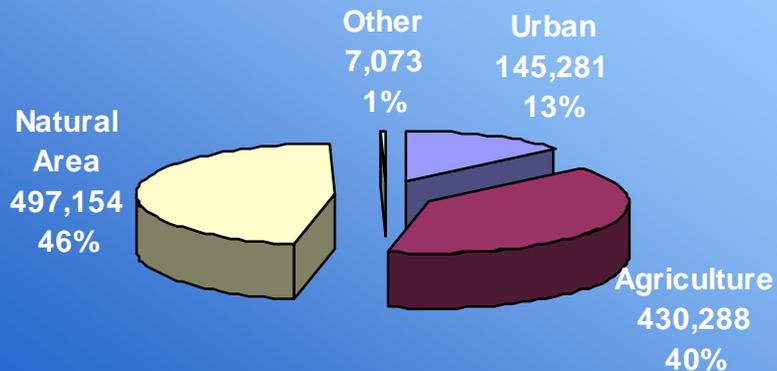
Question:
What is the breakdown of nutrient
levels by land use types?



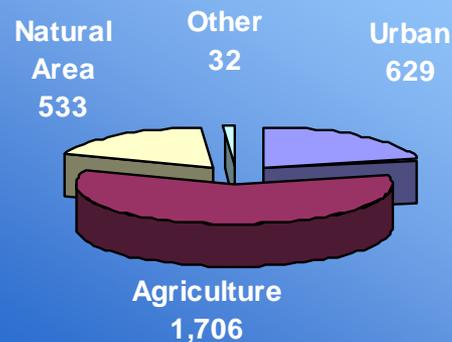


CRWPP- Total Nitrogen

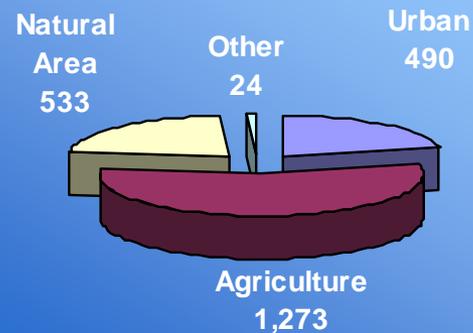
Land Use Distribution (acres)



Current TN Loads by Land Use Type (Mton/yr)



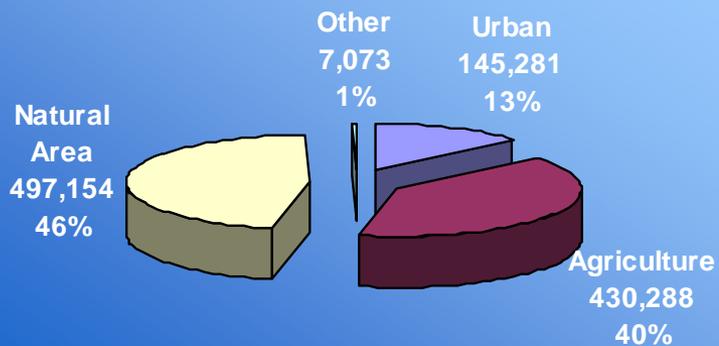
TN Loads from Land Use Types After BMPs (Mton/yr)



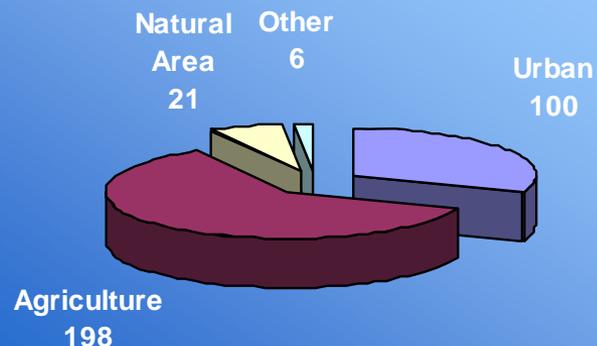


CRWPP- Total Phosphorus

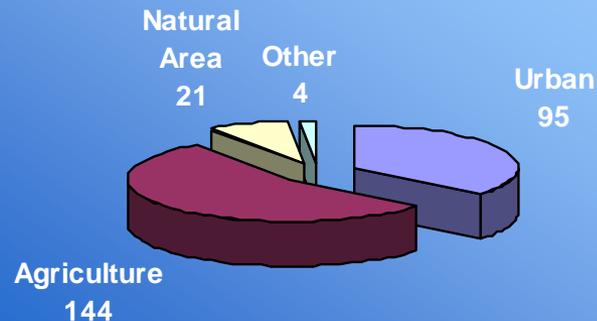
Land Use Distribution (acres)



Current TP Loads by Land Use Types (Mton/yr)



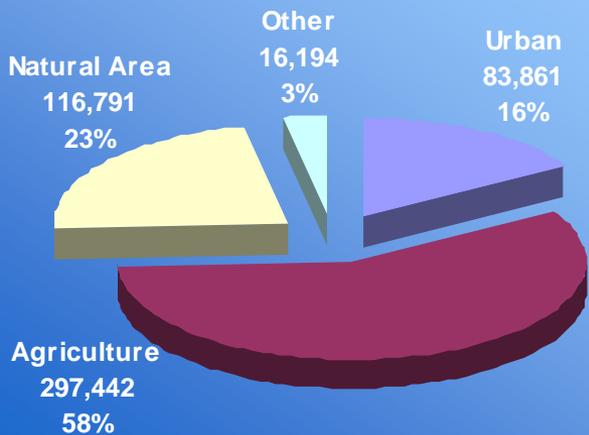
TP Loads from Land Use Types After BMPs (Mton/yr)



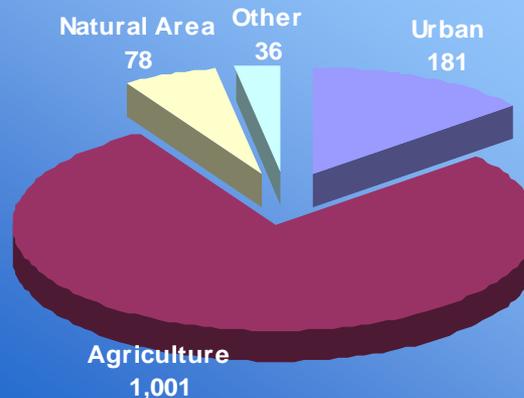


St. Lucie RWPP- Total Nitrogen

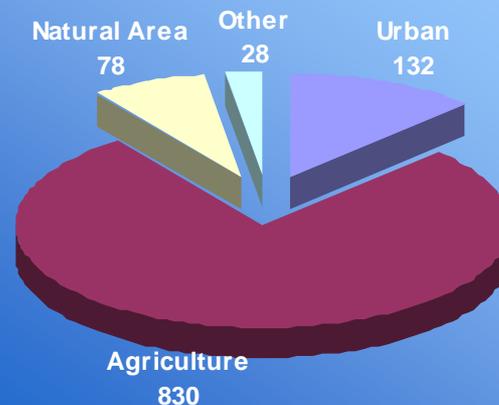
Land Use Distribution (acres)



Current TN Loads by Land Use Types (Mtons)



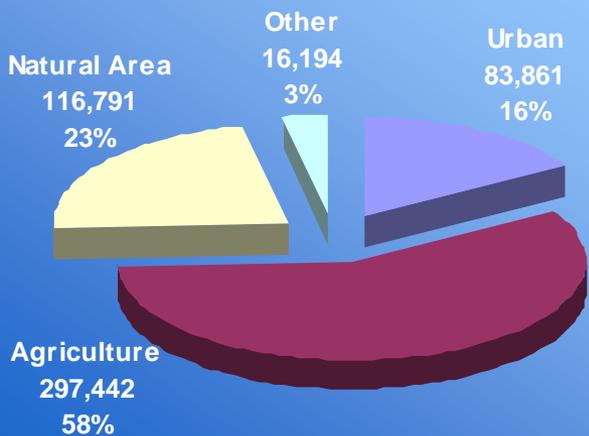
TN Loads from Land Use Types After BMPs (Mtons)



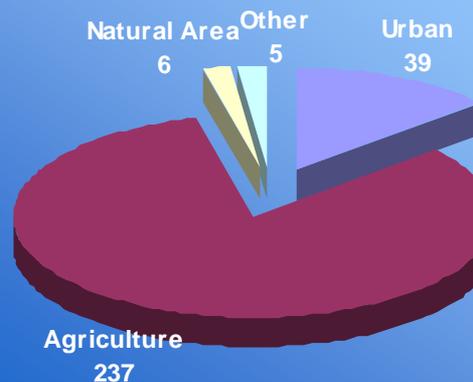


St. Lucie RWPP- Total Phosphorus

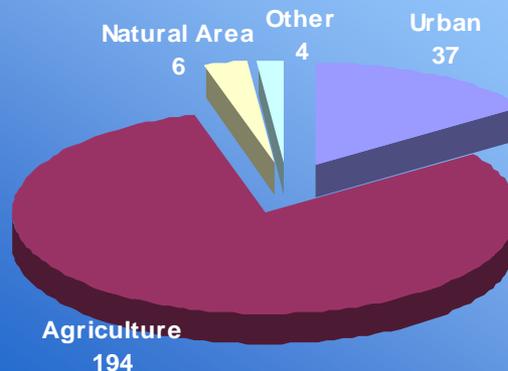
Land Use Distribution (unit: acres and %)



Current TP Loads by Land Use Types (Mtons)



TP Loads from Land Use Types After BMPs (Mtons)





River Watershed Protection Plans- Elements



- **Watershed Pollutant Control Program**
- **Watershed Construction Project**
- **Watershed Research and Water Quality Monitoring Program**



Pollutant Control Program and Construction Project- Formulation





Pollutant Control Program

- **Implementation of Agricultural and Urban Best Management Practices**
- **Revisions to Regulatory Programs**
 - **Environmental Resources Permitting (ERP) Program**
 - **Statewide Stormwater Rule**
 - **Northern Everglades Basin Rule**
 - **40E-61 Regulatory Source Control Program in Estuaries**



Alternative Formulation and Evaluation

- Formulated alternatives for each watershed using management measures
- Evaluated each alternative for
 - Nitrogen and phosphorus load removal
 - Water quantity performance

Alternative	Objective
1	Common elements (current, on-going and planned projects)
2	Maximizes water storage capacity
3	Maximizes phosphorus and nitrogen load reduction
4	Optimizes storage capacity and phosphorus and nitrogen load reductions – Selected as Preferred Plan



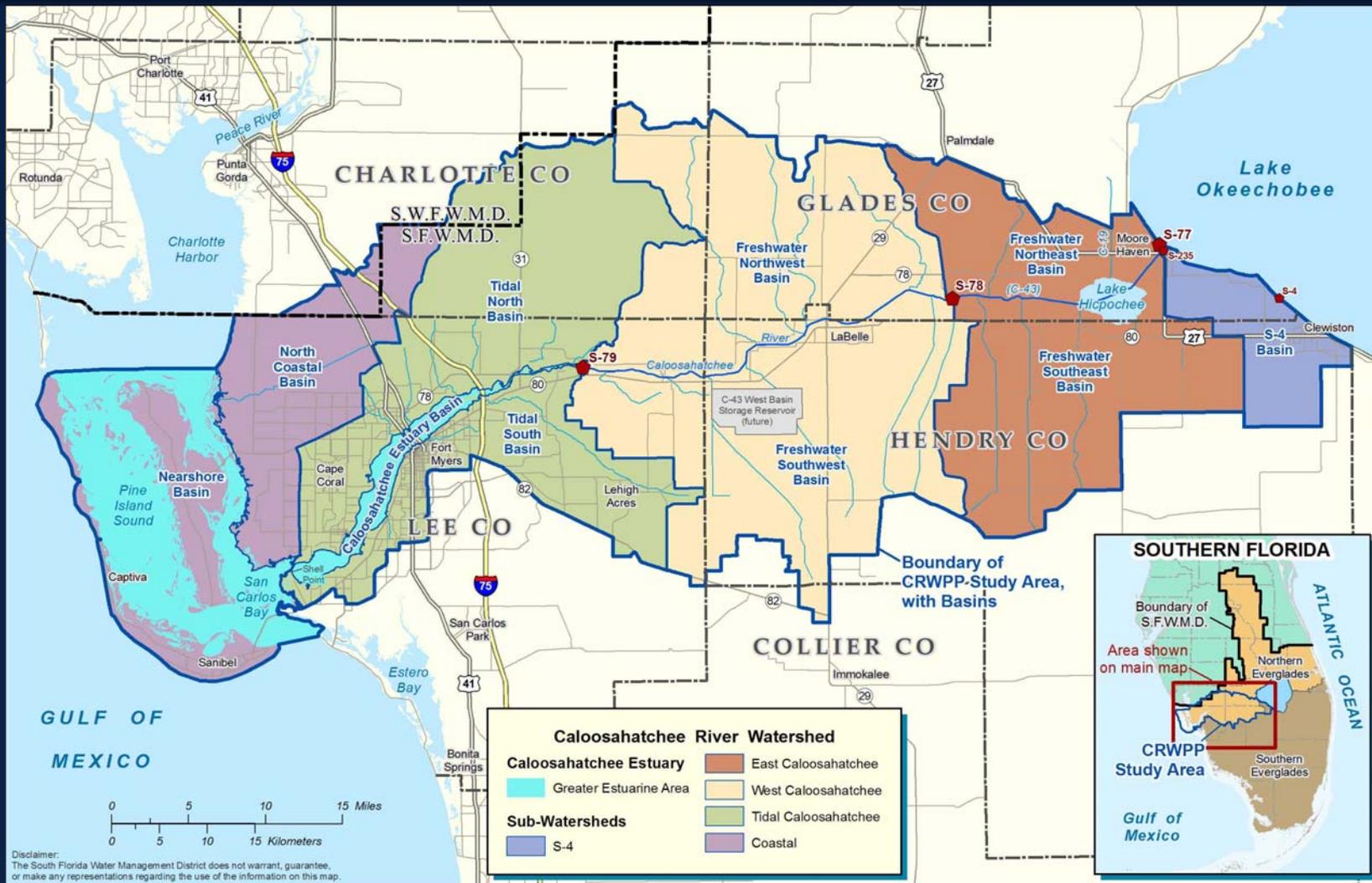
Alternative Evaluation Results



- **Alternative 4 was selected as Preferred Plan for both River Watersheds**
- **Alternative 4 builds upon Lake Okeechobee Phase II Technical Plan**
- **Water quality and quantity results reflect benefits provided by implementation of the Lake Phase II Technical Plan and the River Watershed Protection Plans**



Caloosahatchee Preferred Plan-Results





Caloosahatchee Preferred Plan- Water Quality Results

	Total Nitrogen	Total Phosphorus
Total Load Reduction¹	38%	39%
Watershed Load Reduction ²	36%	38%
Lake Okeechobee Load Reduction ³	38%	36%
Resulting Load	3011 mt	265 mt
Resulting Concentration	1.08 ppm	94 ppb

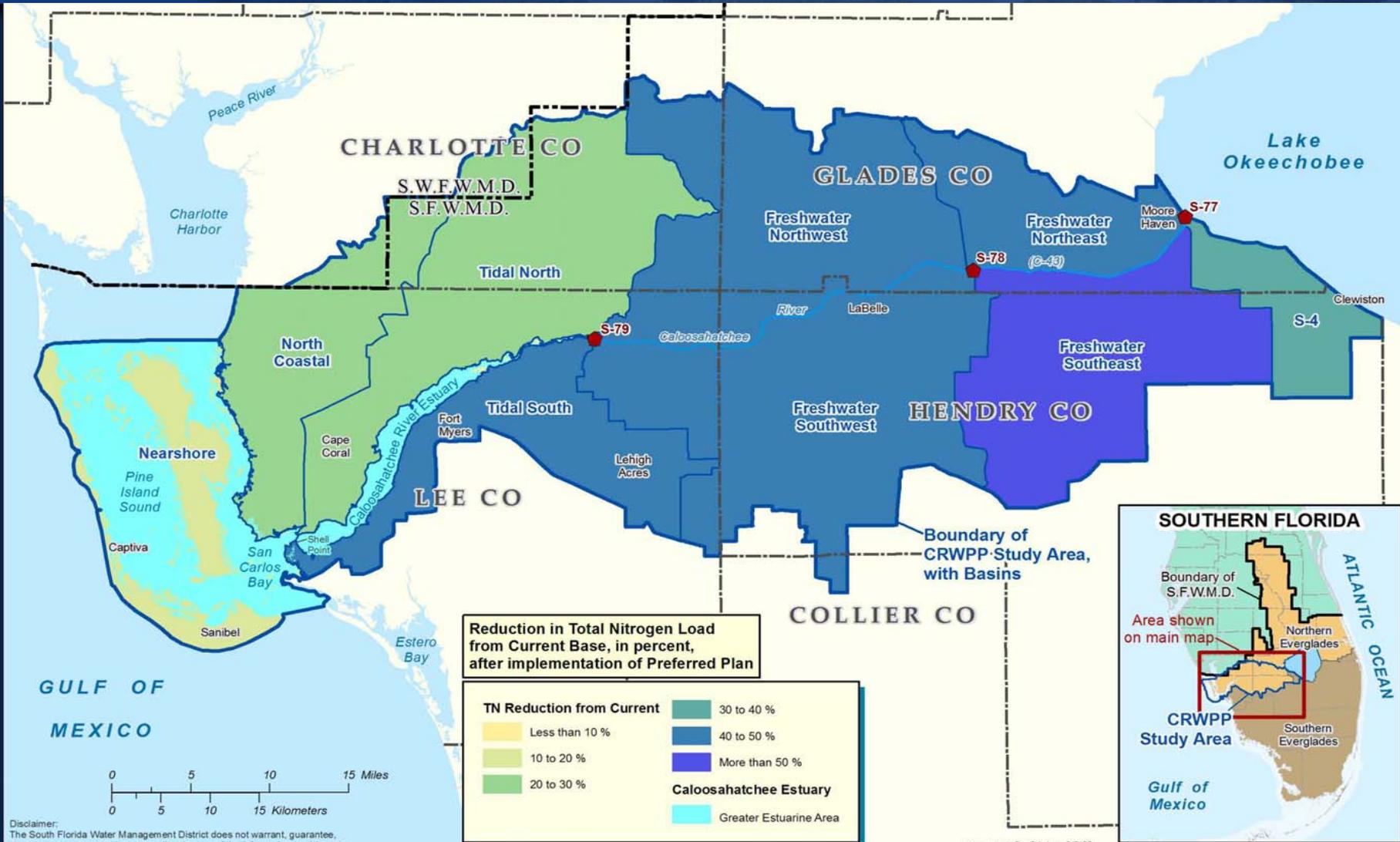
¹ Lake Okeechobee and CR Watershed Combined Load Reduction from Current Base

² Watershed Only Load Reduction from River Watershed Protection Plan Base

³ Lake Okeechobee Only Load Reduction from Current Base



Caloosahatchee Preferred Plan- Nitrogen Results

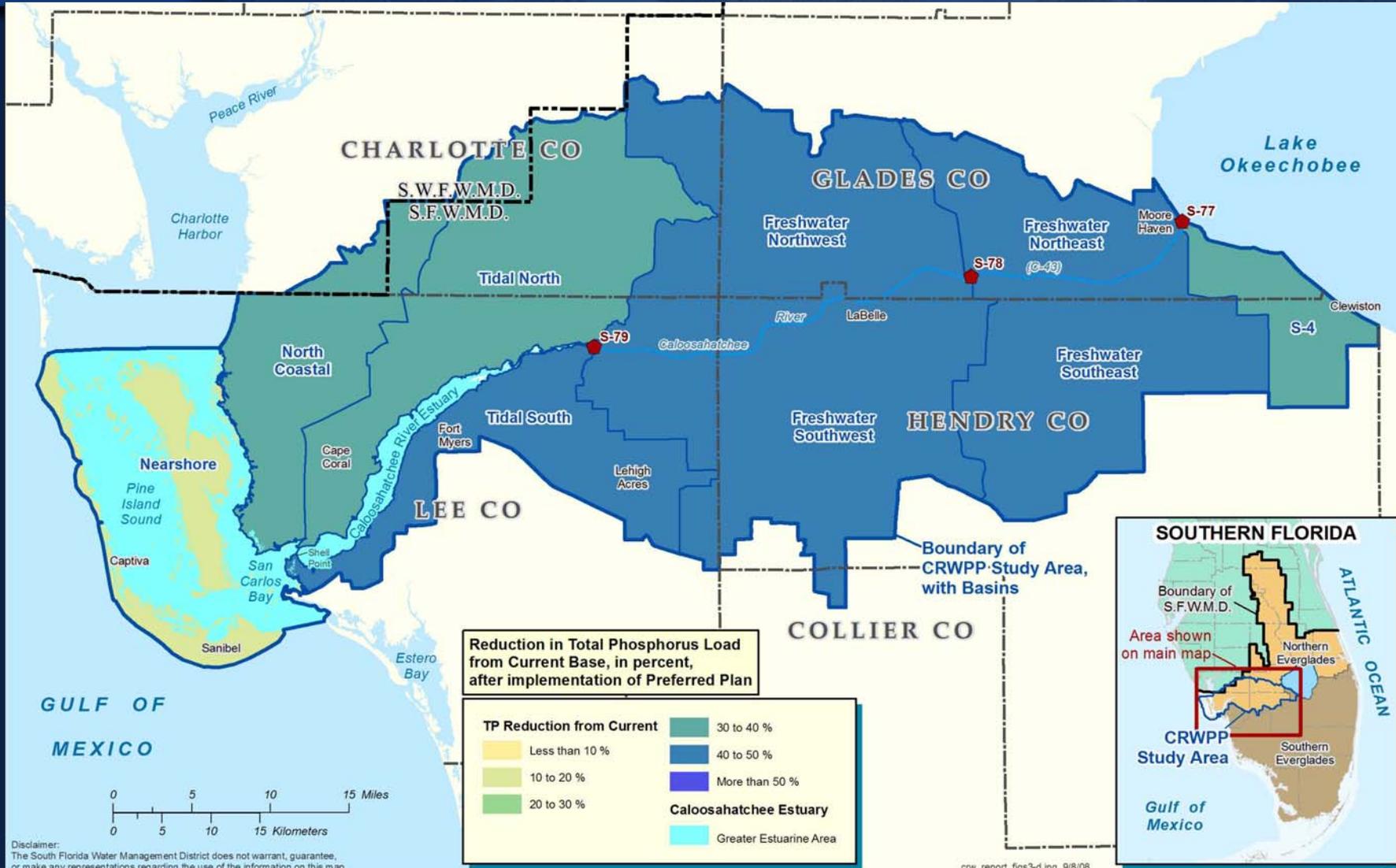


Disclaimer:
The South Florida Water Management District does not warrant, guarantee, or make any representations regarding the use of the information on this map.

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Caloosahatchee Preferred Plan- Phosphorus Results



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Caloosahatchee Preferred Plan- Storage Capacity (ac-ft/yr)

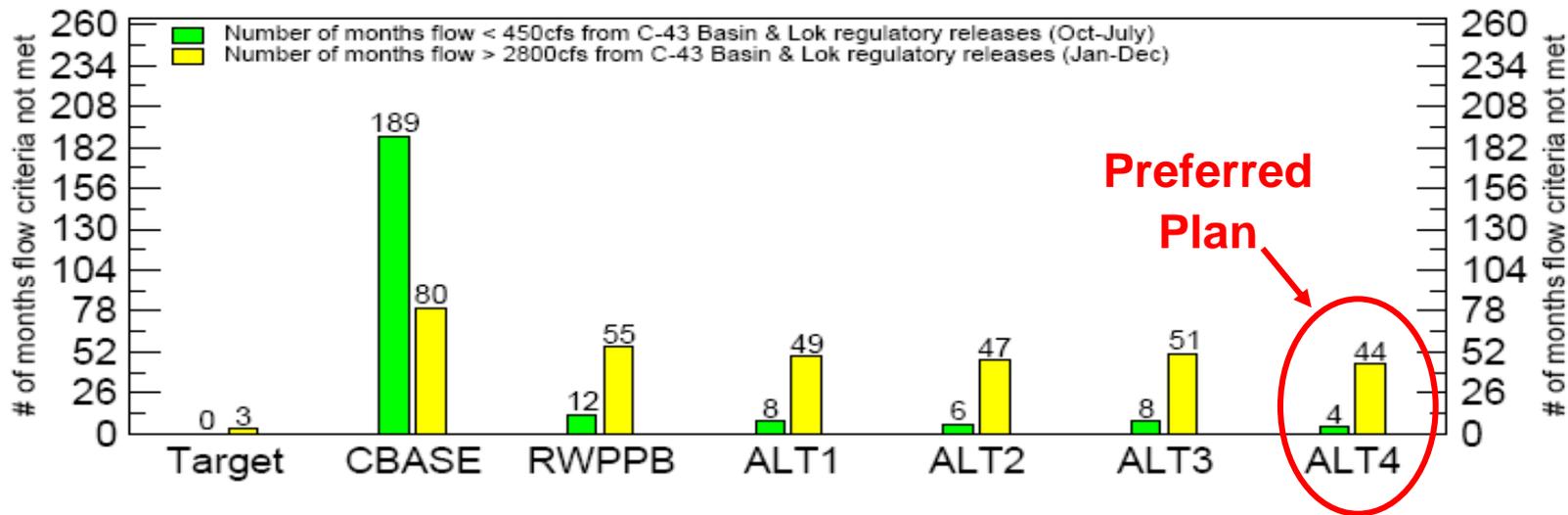
		Total Storage
CRWPP	<ul style="list-style-type: none">▪ Includes C-43 West Reservoir▪ Includes ~215,000 ac-ft additional storage	~400,000 ac-ft/yr

- This table reflects total watershed storage for the Preferred Plan
- This watershed storage is in addition to storage identified in the Lake Okeechobee Phase II Technical Plan (~900,000 ac-ft/yr)



Caloosahatchee Performance-Salinity Envelope

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



- Results show improvement toward established targets
- High flow- (compared to CBASE)
 - RWPPB greatly reduces **lake only** high flow events (from 21 months to 8 events);
 - Alt 4 greatly reduces **watershed only** exceedances (from 48 months to 20 months);
 - Remaining high flow events are caused by a **combination of lake and watershed flows** (16 events remaining)
- Low flow- Alt 4 reduces low flow exceedances from 189 to 4 months as compared to CBASE



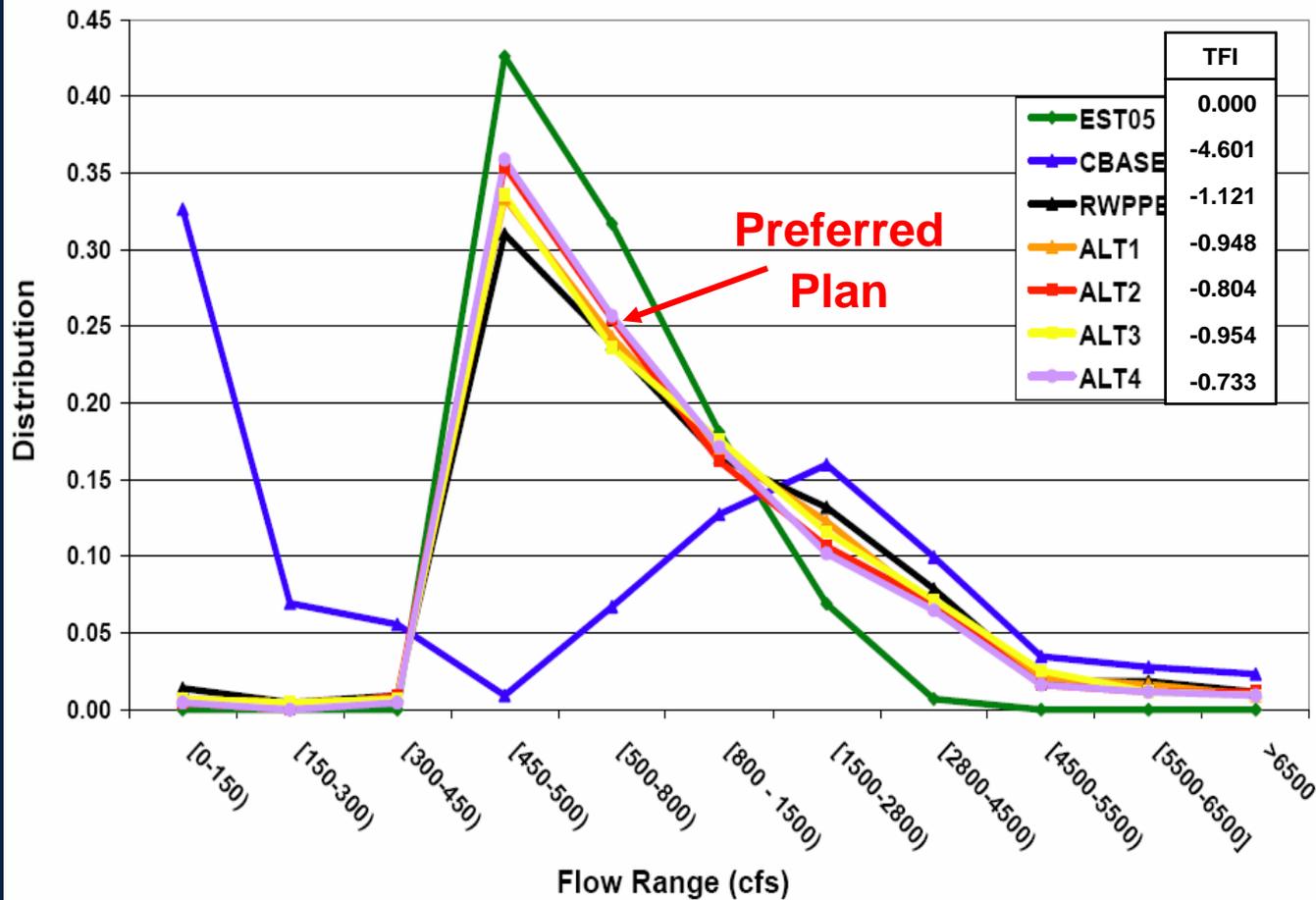
Caloosahatchee Performance-Target Flow Index

- Target Flow Index= preferred flow distribution shown by green line

Alt	Improvement*
1	79 %
2	82 %
3	79 %
4	84%

* Improvement compared to CBase

Target Flow Index (TFI) for C-43 at S-79





Caloosahatchee Preferred Plan- Water Quantity Results

High Flows

- Reduces high flow events caused by watershed alone by more than half (from 48 to 20 events)

Low Flows

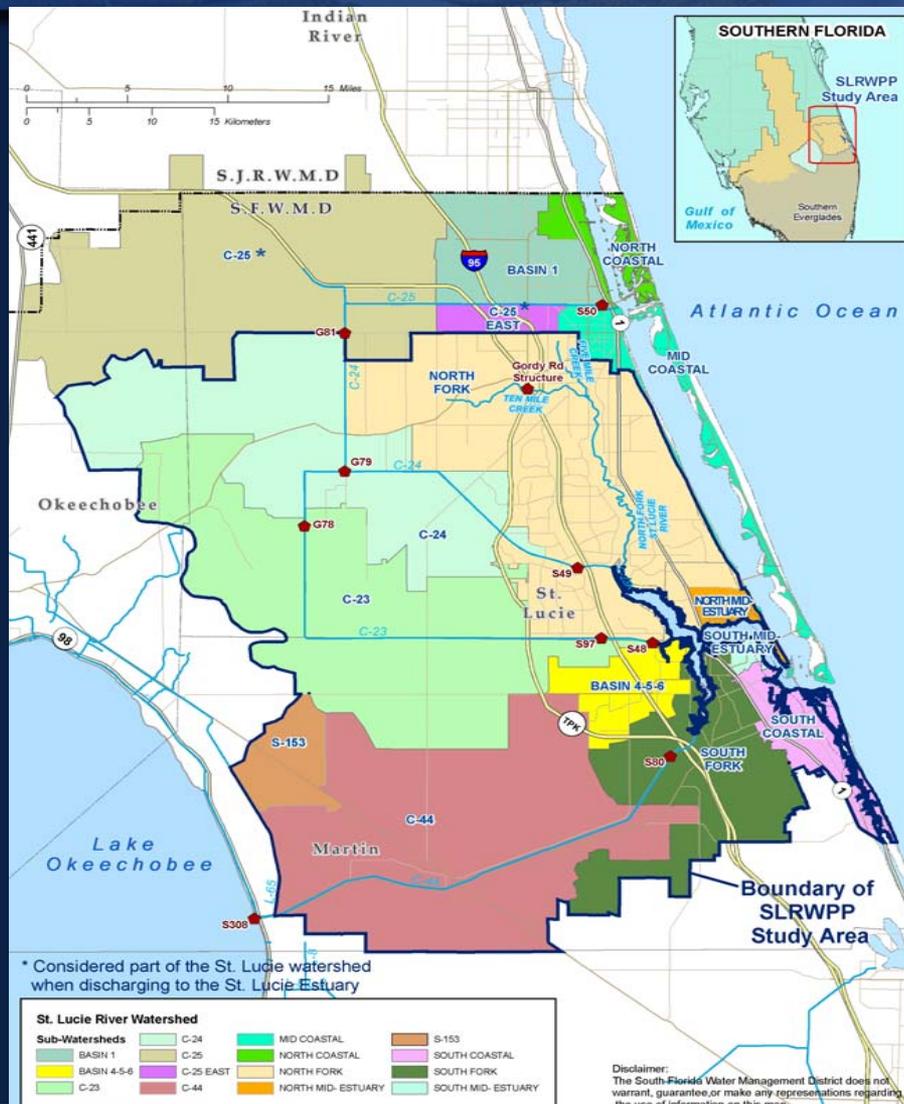
- Reduces low flow events from 189 events to 4 events

Ecological Assessment

- Target Flow Distribution- 84% improvement over current conditions
- Reduction in months with detrimental flows from 62% to 11%



St. Lucie Preferred Plan-Results





St. Lucie Preferred Plan- Water Quality Results

	Total Nitrogen	Total Phosphorus
Total Load Reduction	55%	56%
Watershed Load Reduction	40%	46%
Lake Okeechobee Load Reduction	70%	68%
Resulting Load	1009 mt	164 mt
Resulting Concentration	0.94 ppm	153 ppb

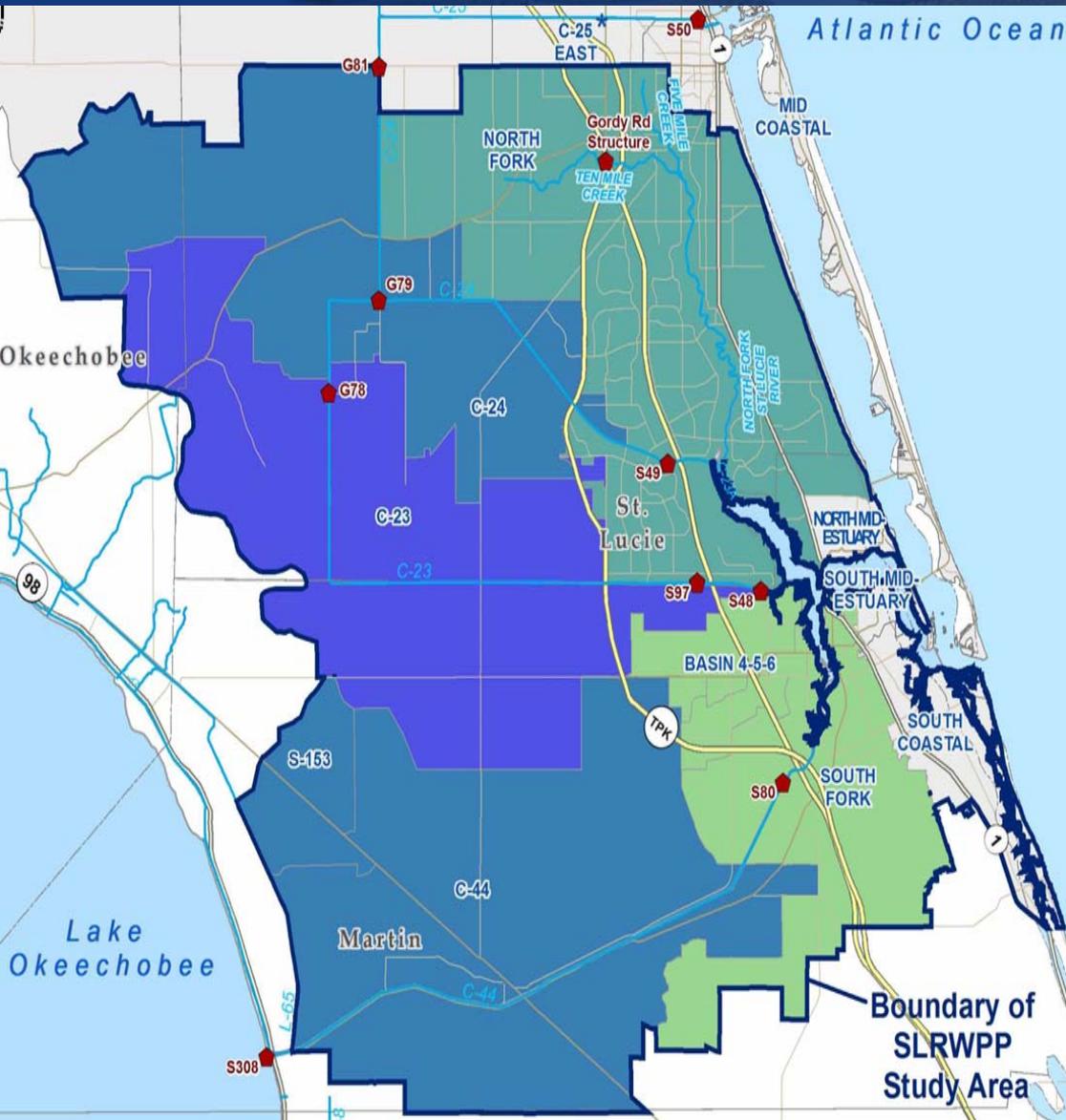
¹ Lake Okeechobee and SLR Watershed Combined Load Reduction from Current Base

² Watershed Only Load Reduction from River Watershed Protection Plan Base

³ Lake Okeechobee Only Load Reduction from Current Base



St. Lucie Preferred Plan- Nitrogen Results

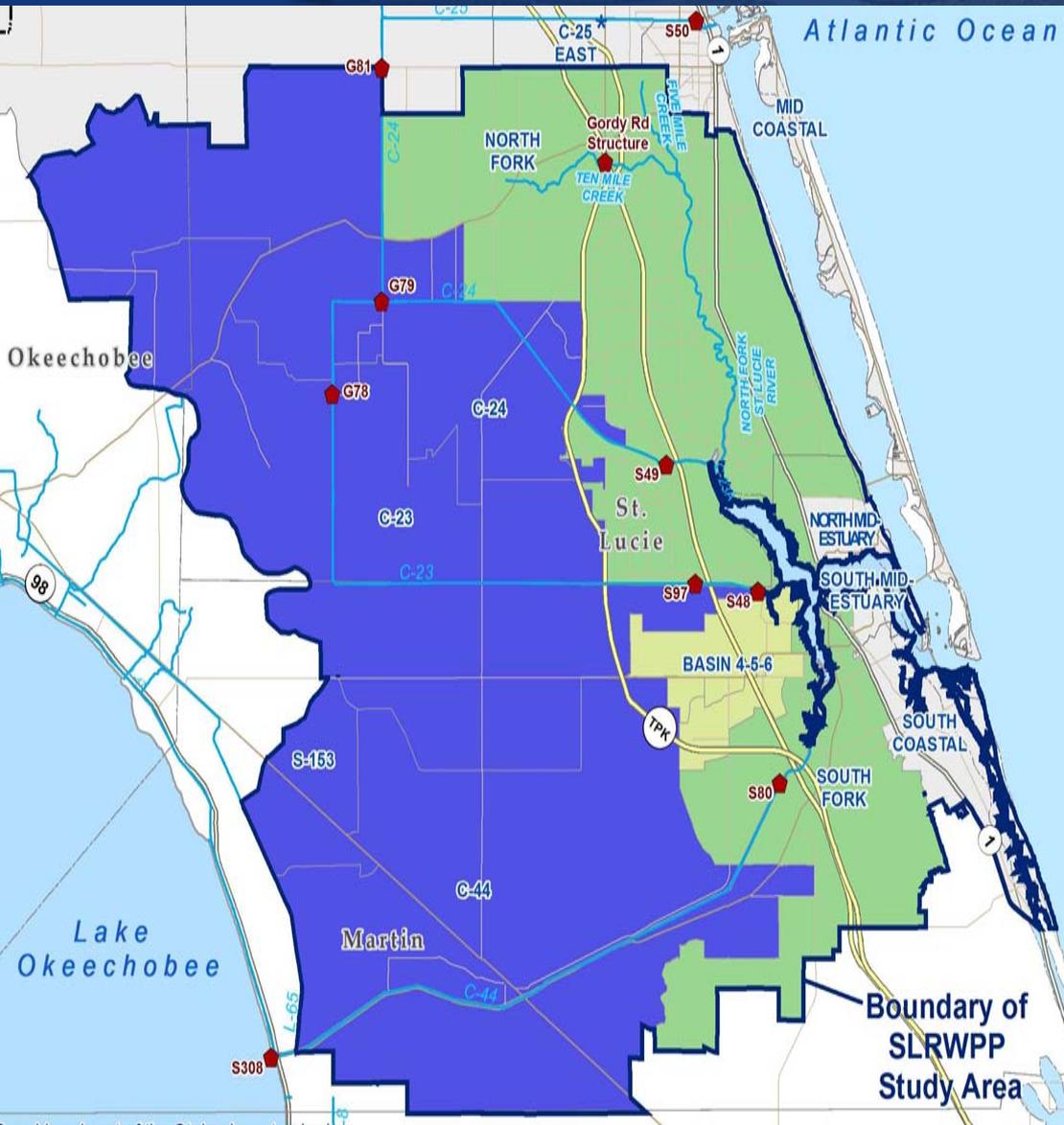


Reduction in Total Nitrogen Load from Current Base, in percent, after implementation of Preferred Plan

TN Reduction from Current	
	Less than 10 %
	10 to 20 %
	20 to 30 %
	30 to 40 %
	40 to 50 %
	More than 50 %
	Basin not quantified



St. Lucie Preferred Plan- Phosphorus Results



Reduction in Total Phosphorus Load from Current Base, in percent, after implementation of Preferred Plan

TP Reduction from Current	
	Less than 10 %
	10 to 20 %
	20 to 30 %
	30 to 40 %
	40 to 50 %
	More than 50 %
	Basin not quantified



St. Lucie Preferred Plan- Storage Capacity (ac-ft/yr)

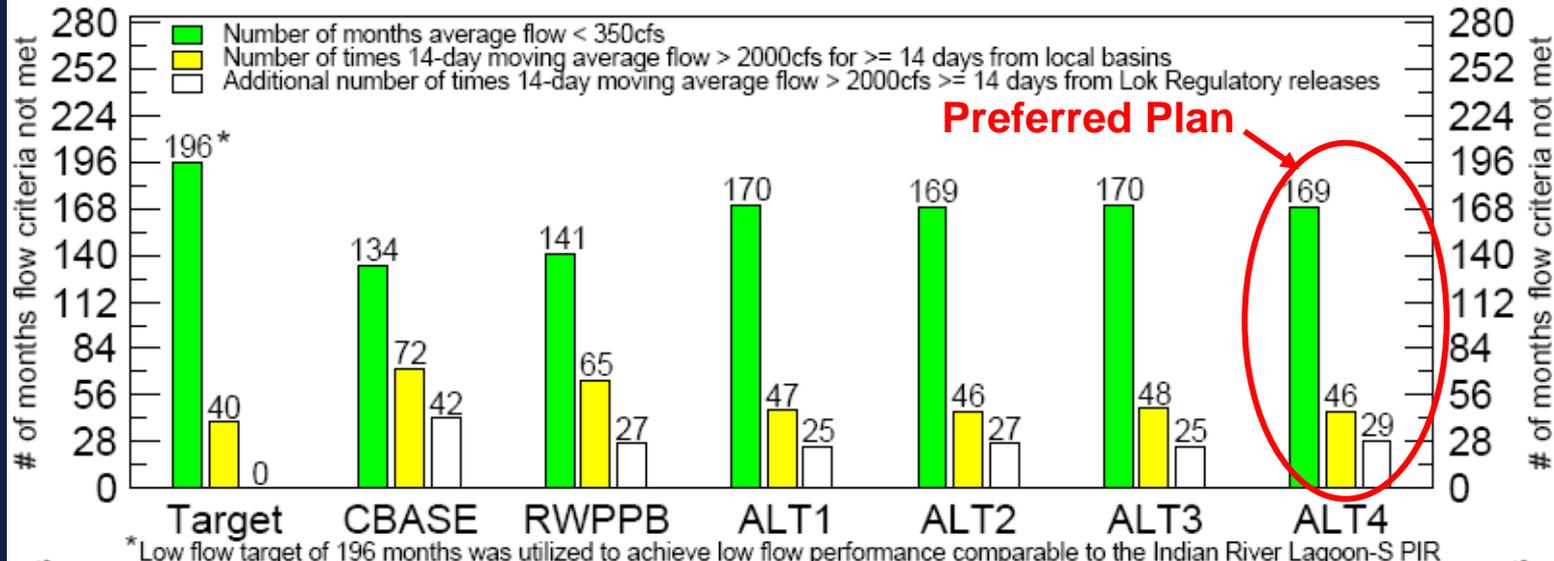
		Total Storage
SLRWPP	<ul style="list-style-type: none"> ▪ Includes IRL-S (C-44 Reservoir and C-23/24 Reservoir/STA) and Ten Mile Creek Critical Project ▪ No additional storage 	~200,000 ac-ft/yr

- This table reflects total watershed storage for the Preferred Plan
- This watershed storage is in addition to storage identified in the Lake Okeechobee Phase II Technical Plan (~900,000 ac-ft/yr)



St. Lucie Estuary Performance - Salinity Envelope

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



- No additional watershed storage Management Measures for St Lucie beyond Alt 1; minor changes resulting from storage in CRWPP
- High flow- Operational target for watershed surface flows is 17 months between 2000-3000 cfs and all alternatives reduce existing 23 months to target of 17; over 3000 cfs target is 5 events, Alt 4 reduces to 8



St. Lucie Preferred Plan- Water Quantity Results

High Flows

- Between 2000 and 3000 cfs- exceed target by 4 events
- Greater than 3000 cfs- exceed target by 11 events

Low Flows

- Improved performance- low flow is not a significant issue for the St Lucie Estuary

Ecological Assessment

- 45% improvement in number of years with oyster mortality
- Reduction in months with detrimental high flows from 15% to 9.7%



Preferred Plan Summary

St. Lucie	Caloosahatchee
<ul style="list-style-type: none"> • IRL-S • BMPS/Regulatory Programs • Additional regional phosphorus treatment in C-23/24 basin • Local quality/quantity projects (e.g., stormwater retrofits; septic conversions; Alternative Water Storage Facilities) 	<ul style="list-style-type: none"> • C-43 West Reservoir • BMPs/Regulatory Programs • Additional storage in eastern basins • Regional water quality projects- emphasis on nitrogen • Local quality/quantity projects (e.g., stormwater retrofits; septic conversions- Lehigh, Cape Coral; Alternative Water Storage Facilities) • Additional watershed monitoring in watershed
Summary	Summary
<ul style="list-style-type: none"> • ~200,000 ac-ft/yr storage (IRL and Ten Mile Creek) • Primarily phosphorus treatment 	<ul style="list-style-type: none"> • ~400,000 ac-ft/yr storage (including C-43 West Reservoir) • Primarily nitrogen treatment



Research & Water Quality Monitoring Plan Summary for St. Lucie and Caloosahatchee River Watersheds

Miao-Li Chang, Ph. D., Director, Coastal Ecosystems Division



Research and Water Quality Monitoring Program



- **Developed by SFWMD, coordinating agencies and local governments**
- **This program shall-**
 - **Build on SFWMD's existing research program**
 - **Implement, comply with, or assess the plans, programs, and other responsibilities**
 - **Assess water volumes and timing from Lake Okeechobee, and Rivers Watersheds and their relative contribution to the timing and volume of water delivered to the estuary**



UPDATES – Working Team Meetings and Draft Plan



Working Team Meetings:

- **St. Lucie**
 - Seven Interagency Working Team Meetings
 - One Ad-Hoc Group Meeting
- **Caloosahatchee**
 - Eight Interagency Working Team Meetings
 - Two Ad-Hoc Group Meetings

Draft Report:

- Review by District Internal Team and Interagency Working Team Completed



Monitoring Program – St. Lucie and Caloosahatchee River and Estuary





St. Lucie – Existing Water Quality/ Flow Monitoring Program



- **Watershed (at structures)**
 - **Flow and WQ: WQM of the District (7 stations)**

- **Tributary**
 - **Flow and WQ: SLT of the District (19 stations)**

- **Estuary**
 - **Water Quality: SE of the District (13 stations)**
 - **Salinity: SA of the District (8 stations)**
 - **Estuary Bacteria: 14 stations of St. Lucie County**

- **FDEP: 16 stations (new)**
- **UF/IFAS: 22 stations from 2002-2005**



St. Lucie Existing Aquatic Habitat Monitoring Inventory



- **Seagrass monitoring**
 - **SLE/IRL program – Freshwater impact on SAV**
 - **SAV Transect program – Establish Long-term Baseline information**
 - **SAV Aerial Survey -- Establish Long-term Baseline information**

- **Oyster Distribution – Establish Baseline Condition**

- **Benthic Surveys – Establish Baseline Condition**



St. Lucie Monitoring Program Assessment Summary

Water Quality and Flow Monitoring	Existing monitoring is adequate to meet the objectives. Recommend continuation
	Recommendations included to optimize the watershed network
	Additional water quality parameters are also recommended: Dissolved forms of organic nitrogen, BOD5 and TOC
Salinity Monitoring	Existing monitoring is adequate to meet the objectives. Recommend continuation
Aquatic Habitat Monitoring (Oysters and SAV)	Existing programs are sufficient to detect trends and assess status of seagrass and oysters. Recommend continuation



Caloosahatchee Existing Water Quality/Flow Monitoring Program – East of S79

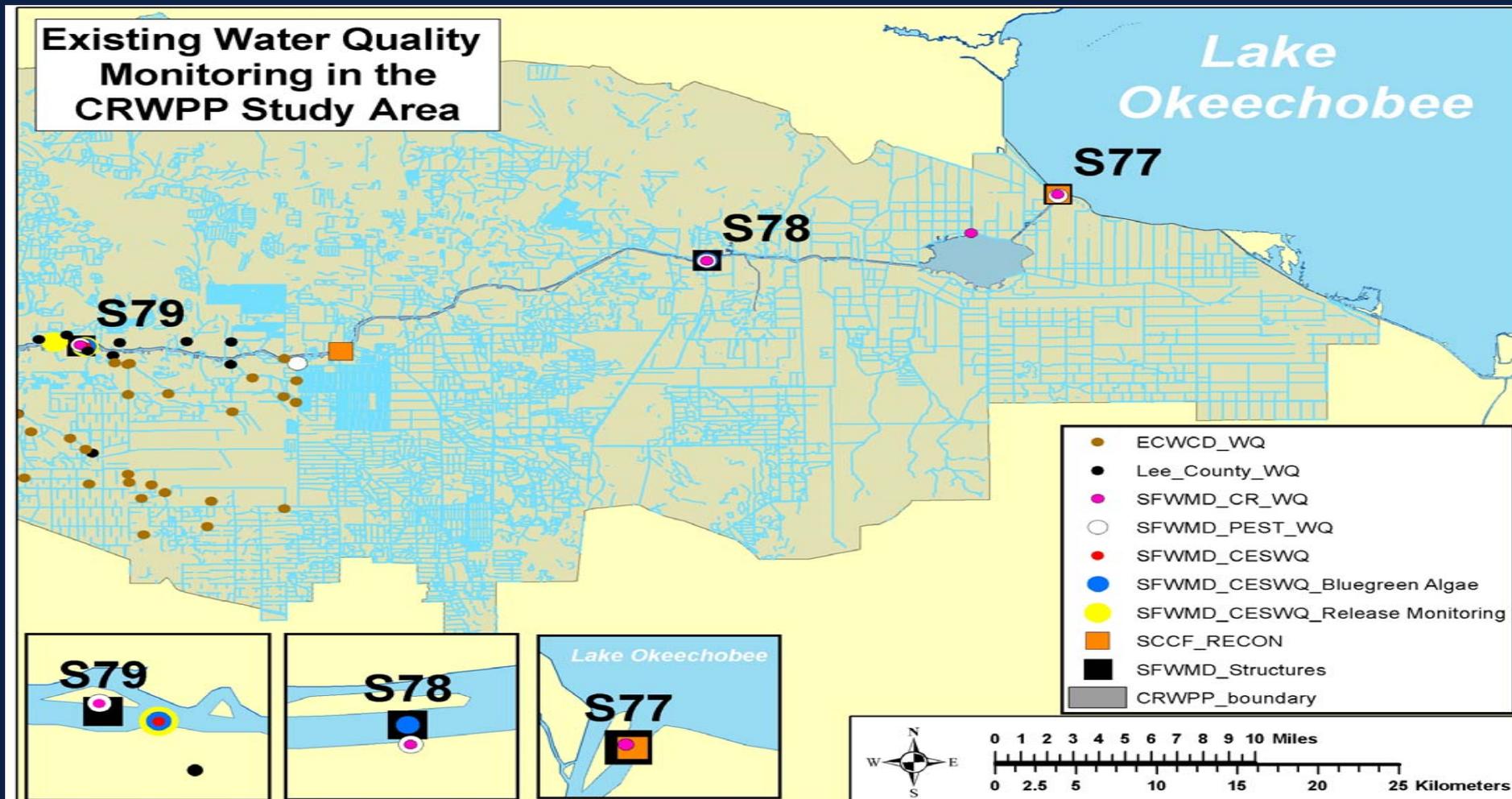
East of S79

- **Watershed (at Structures) - 4 fixed District CR stations**
- **Tributary - 6 fixed Lee County tributary stations (close to S79 within Lee County boundary)**
- **District PEST station – 3 fixed stations (selected water quality parameters only)**
- **East County Control District – 25 fixed stations (selected water quality parameters only)**
- **SCCF/RECON – 2 in-situ sites (Actively online)**





Caloosahatchee Existing Water Quality Monitoring Program – East of S79





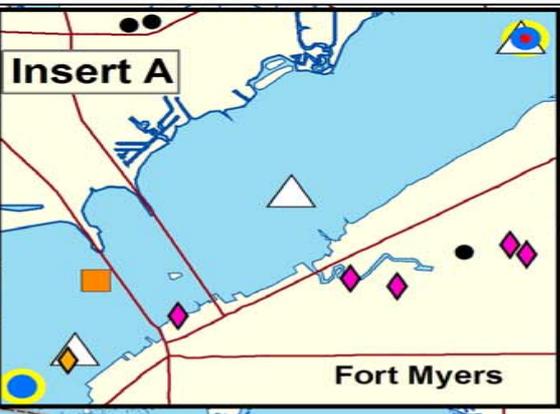
Caloosahatchee Existing Water Quality/Flow Monitoring Program - Estuary

West of S79 - Estuary

- District
 - CESWQ stations -8 fixed stations from 1999 – 2003. Reduce to 4 stations at present time.
 - FIU stations – 8 fixed stations from 1999 to present.
- CHNEP stations – 5 random sites in different regions
- Lee County – 14 fixed stations in Pine Island Sound & Matlacha Pass and 49 freshwater and tidal stations
- City of Ft. Myers – 9 tidal stations
- City of Cape Carol – 31 Freshwater and Saltwater Canals stations within City and 2 Caloosahatchee river stations
- FDEP/TMDL – 12 fixed stations (new)
- City of Sanibel – 12 fixed stations in Sanibel Island and Blind Pass
- FDEP-Charlotte Harbor Aquatic Preserve Data Sonde Program – 2 fixed sites in Matlacha Pass
- SCCF/RECON – 5 in-situ sites (Actively online)

Existing Water Quality Monitoring in the CRWPP Study Area

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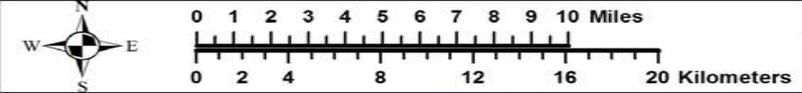
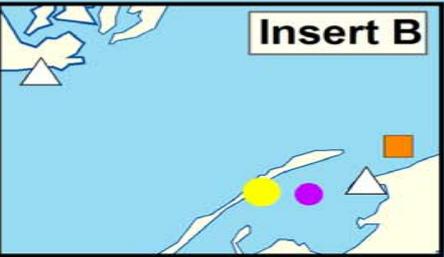


Fort Myers



- SFWMD_FIU_WQ
- SFWMD_CESWQ
- SFWMD_CESWQ_Bluegreen Algae
- SFWMD_CESWQ_Release Monitoring
- △ FDEP_TMDL_WQ
- ▲ FDEP_CHAP_WQ
- FDEP_CHAP_Datasonde
- ◆ City of Fort Myers
- ◆ City of Cape Coral
- City_of_Sanibel_WQ
- Lee_County_WQ
- SCCF_RECON
- FFWRI_MARVIN_PLATFORM
- SFWMD_Structures
- CRWPP_Boundary

Insert B



Caloosahatchee Existing Water Quality Monitoring Program - Estuary



Caloosahatchee Existing Aquatic Habitat Monitoring Inventory



- **Seagrass monitoring**
 - Sanibel Captiva Conservation Foundation (SCCF) Marine Lab
 - FDEP-
 - South District
 - Charlotte harbor Aquatic Preserve (CHAP)
 - ESTERO Bay Aquatic Preserve (EBAP)
 - South Florida Water Management District (SFWMD) – Hydroacoustic and aerial photo monitoring program

- **Oyster Distribution – District RECOVER Monthly Monitoring Program**

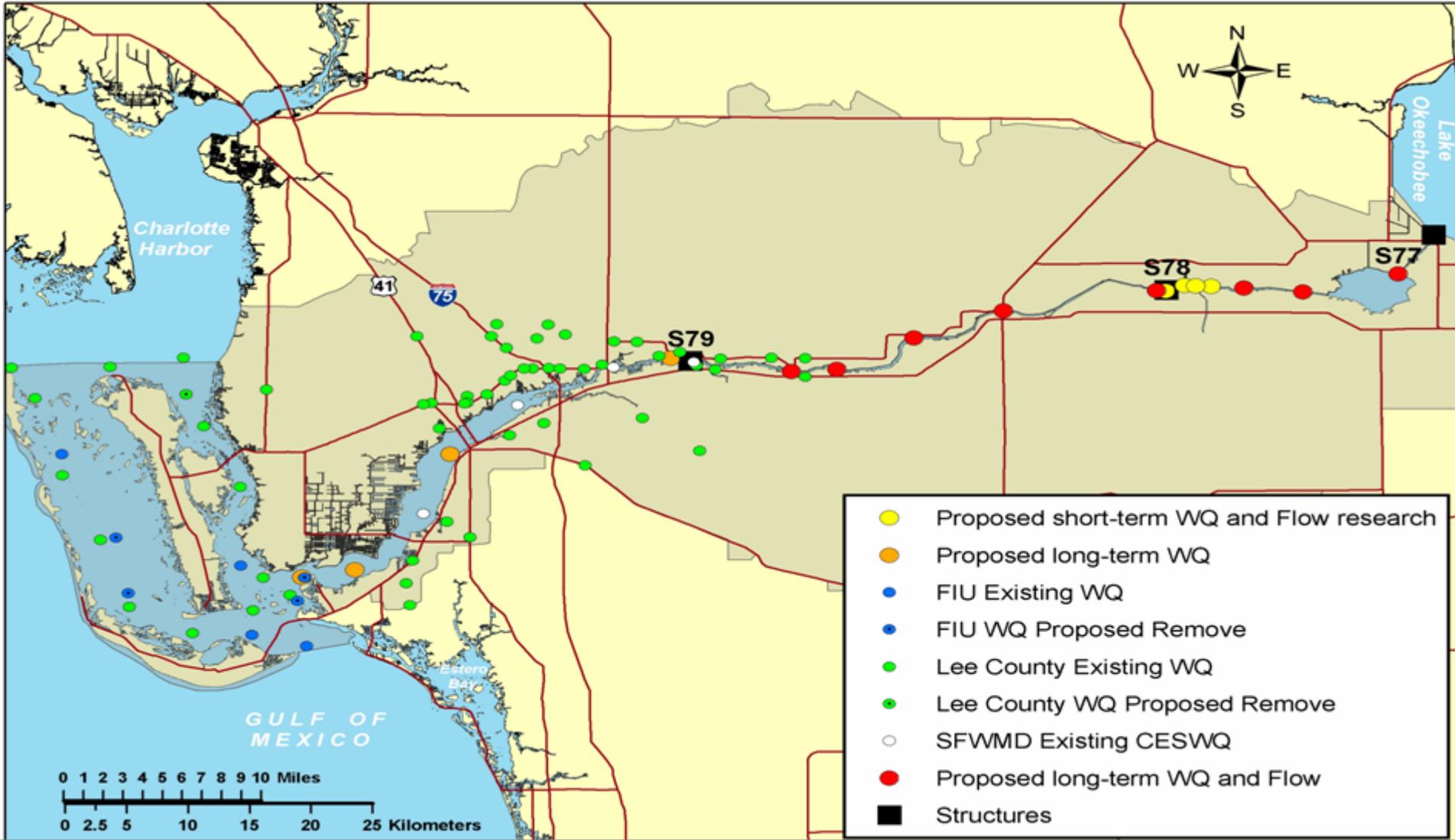


Caloosahatchee Monitoring Program Assessment Summary

Water Quality and Flow Monitoring	<p><u>East of S-79-</u> Lack of water quality and flow monitoring: Add eight long-term sites in the main stem of CR and four short-term sites in canal tributaries flowing into CR</p>
	<p><u>West of S-79:</u> Most of the estuarine portion of the study area is sufficient to assess status and trends. However spatial gaps exist: Propose to reinstate four historic CESWQ sites and to optimize the system by removing five SFWMD/FIU existing sites and one Lee County site</p>
	<p>Additional water quality parameters are also recommended: Dissolved forms of organic nitrogen and BOD5</p>
Salinity Monitoring	<p>Existing monitoring is adequate to meet the objectives. Recommend continuation</p>
Aquatic Habitat Monitoring (Oysters and SAV)	<p>Existing programs are sufficient to detect trends and assess status of seagrass and oysters. Recommend continuation</p>



Caloosahatchee Water Quality Working Team Summary - Long Term Water Quality and Flow Stations





Research Program – St. Lucie and Caloosahatchee River and Estuary



Research Projects



Research Topics

- **Nutrient Budget**
- **Dissolved Oxygen Dynamics**
- **Low Salinity Zone- Nursery Function**
- **Light Attenuation in San Carlos Bay***
- **Integrated Modeling Framework**

* For Caloosahatchee only



Research #1 Estuarine Nutrient Budget



- **Nutrient budget determines nutrient reduction approaches and evaluate and optimize project effectiveness.**
- **Terms in the nutrient budget will be determined by a variety of methods: Input, Cycling, Output.**



Research #2 Dissolved Oxygen Dynamics



- **DO – Health Indicator**
- **Understand DO dynamics helps understand impacts from the pollutant loads to estuarine ecosystems.**
- **The role of internal and external factors in determining the concentration of dissolved oxygen will be examined and studied.**



Research #3 Low Salinity Zone



- Provide primary ecological nursery function for early life stages of economically important fish and shell fish.
- Provide information needed for flow and salinity envelope refinements.
- The effects of freshwater discharge on production of fish larvae in the low salinity zone will be examined and studied.



Research - Caloosahatchee #4 Light Attenuation in San Carlos Bay



- **Caloosahatchee Value Ecosystem Component – Seagrass**
- **To identify the controlling factors (Colored dissolved organic matter -CDOM, Chlorophyll/nutrient, TSS/Turbidity) and determine their relative contributions to light attenuations.**



Research #5 Integrated Modeling Framework

- **Provide needed technical support for implementation and adaptive management**
- **Integrated Modeling Framework**
- **Examine existing modeling inventory and identify data or modeling needs**
 - **Watershed hydrology (surface and groundwater) and water quality models**
 - **Estuary hydrodynamic (salinity) and water quality models**
 - **Estuary Ecological (Seagrass, oyster, etc.) models.**
- **3 years plan and long term goal identified**



Phasing and Costs



Plan Implementation Strategy

- **Multiple Phases**
 - **Phase I- projects initiated 2009-2012**
 - **Phase II- projects initiated 2013-2018**
 - **Long Term Implementation Phase- projects initiated beyond 2018**



Caloosahatchee RWPP- Phase I

		Initiated	Completed
Construction Project	Powell Creek Algal Turf Scrubber		✓
	Alternative Water Storage Facilities- Barron Water Control District		✓
	Caloosahatchee Area Lakes Restoration (Lake Hicpochee)	✓	
	C-43 Water Quality Treatment Demonstration Project (BOMA)	✓	
	Spanish Creek/Four Corners Environmental Restoration Phase I	✓	
	C-43 West Reservoir	✓	
	Local-Stormwater Projects (e.g., treatment wetlands, conveyance and structural improvements, and stormwater recovery projects)	✓	✓
	Florida Ranchlands and Environmental Services Projects	✓	
	Farm and Ranchland Protection Program	✓	



St. Lucie RWPP- Phase I

		Initiated	Completed
Construction Project	Alternative Water Storage Facilities- Indiantown Citrus Growers Association Phase I and II		✓
	Florida Ranchlands and Environmental Services Projects (Alderman-Deloney complete)	✓	✓
	CERP-IRL South: C-44 Reservoir/STA	✓	
	CERP-IRL South: Allapattah Complex- Natural Storage and Water Quality Area	✓	
	Alternative Water Storage Facilities-Indiantown Citrus Growers Association- Phase III, Dupuis, Waste Management St Lucie Site, Caulkins	✓	
	Hybrid Wetland Treatment Technology Pilot Project	✓	
	Local-Stormwater Projects (e.g., retention/detention ponds, treatment wetlands, conveyance and structural improvements)	✓	✓
	Local-Wastewater Projects (e.g., sludge disposal management, sewage treatment and disposal systems)		✓
	Local- Habitat Restoration (e.g., muck removal, oyster balls)	✓	✓
	Florida Ranchlands and Environmental Services Projects	✓	
	Farm and Ranchland Protection Program	✓	



Cost Categories

- **Non-CERP Cost**
 - **Costs to be paid from State, SFWMD, and/or local sources**
- **CERP Cost**
 - **State CERP costs are eligible for 50 percent cost share with the federal government; may also include local cost share**
- **Local Cost**
 - **Costs that will be covered entirely by local government or may be cost shared with local government and State or SFWMD sources**
 - **\$5M per River Watershed per year was used for Phase I estimates (covers local projects and Alternative Water Storage Facilities)**



Caloosahatchee RWPP- Phase I Costs

		CERP	Non-CERP	Local
Construction Project		\$524-781M	\$117-175M	\$15M ^a
Pollutant Control Program	Agricultural		\$3.3-4.0M ^b	
	Urban		\$663-809M ^c	
Research and Water Quality Monitoring			\$5.2M ^d	

a \$15M reflects state's contribution

b Assumes 50% state contribution for capital costs only; all BMPs implemented by 2015

c Includes total capital costs

- No cost share assumptions included, but most costs will be borne by local and state programs and only a fraction of these costs will likely be borne by RWPPs
- No phasing assumptions included

d Reflects additional monitoring not ongoing monitoring



St. Lucie RWPP- Phase I Costs

		CERP	Non-CERP	Local
Construction Project		\$504-694M		\$15M ^a
Pollutant Control Program	Agricultural		\$1.64-2.0M ^b	
	Urban		\$393-479M ^c	
Research and Water Quality Monitoring			\$2.7M ^d	

a \$15M reflects state's contribution

b Assumes 50% state contribution for capital costs only; all BMPs implemented by 2015

c Includes total capital costs

- No cost share assumptions included, but most costs will be borne by local and state programs and only a fraction of these costs will likely be borne by RWPPs
- No phasing assumptions included

d Reflects additional monitoring not ongoing monitoring



Plan Refinement

- **Process Development and Engineering**
 - **Model Refinement**
 - **Technology Refinement**
 - **Innovative Nutrient Control Technology**
 - **Sub-watershed Conceptual Planning**
- **Annual Progress Reports**
- **Plan Updates- required every 3 years**

<https://my.sfwmd.gov/northerneverglades>



Questions?

