Lake Okeechobee Protection Plan Update

Northern Everglades Interagency Meeting
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Presentation Outline

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- Document Structure
- Section 1: Introduction - legislative mandates, watershed description, land use
- Section 2: Overview of Lake Okeechobee Phosphorus (P) Control Program
- Section 3: Current Status of the Lake
- Lake Okeechobee Protection Plan (LOPP) Update Schedule

Document Structure

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- Section 1: Introduction
- Section 2: Overview of Lake Okeechobee Watershed Protection Programs
- Section 3: Current Status of the Lake
- Section 4: Watershed Challenges
- Section 5: Past and Current Activities
- Section 6: Strategies for Moving Forward

Section 1: Introduction

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1.1 Purpose of Document

1.2 Legislative Mandate

1.3 Description of the Watershed

1.4 Land Use

1.5 Sub-Watersheds and Major Basins

Section 2: Overview of Lake Okeechobee Protection Programs

Section 3: Current Status of the Lake

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3.1 Ecological Status

Water levels, littoral zone vegetation, benthic invertebrates, fish communities, control of exotic vegetation

3.2 Water Quality Trends

3.2.1 Lake Phosphorus Reduction goals

3.2.2 Tributary P Loading Trends

3.2.3 In-Lake P Loading Trends

3.2.4 Internal P Loading Trends

3.2.5 Lake Discharge Trends

3.3 Internal Phosphorus Management Program

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4.2 Annual Phosphorus Imports

4.3 In-Lake Phosphorus Loading

4.4 Stormwater Treatment Areas in Northern Everglades

4.5 CERP Lake Okeechobee Watershed Projects

4.6 Funding Constraints

Section 5: Past & Current Activities

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5.1 Watershed Phosphorus Control Program

5.1.1 Overview of Watershed P Source Programs

5.1.2 Joint Phosphorus Source Control Programs

- Northern Everglades ERP Basins Rule
- FDEP State-wide Stormwater Rule

5.1.3 SFWMD Source Control Programs

- Lake Okeechobee Watershed Regulatory P Source Control Program
- Ongoing P Control and Management Projects

Section 5: Past & Current Activities (Cont.)

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5.1.4 FDACS BMP Program

- Source Control Implementation
- Urban Turf Fertilization Rule

5.1.5 FDEP Source Control Programs

- FDEP Agricultural Regulatory Programs
  - Dairy Rule/Concentrated Animal Feeding Operations
  - Biosolids/Domestic Wastewater Residuals Rule
- FDEP Non-Agricultural Programs
  - NPDES Permitting Program
  - Submerged Lands and Environmental Resource Program
  - Impaired Waterbody List and TMDLs
  - Basin Water Management Action Plans
  - Funding & Public Outreach
  - Other Permitting Programs

Section 5: Past & Current Activities (Cont.)

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5.1.6 FDOH Source Control Programs

- FDOH Septage Applications

5.2 Lake Okeechobee Construction Project – Phase II Technical Plan

5.2.1 Status of Ongoing Project Features

- Stormwater Treatment Projects
- Dispersed Water Management & Treatment Projects
- ASR Projects

5.2.2 Development of Sub-watershed Plans

- Fisheating Creek Feasibility Study
- Taylor Creek Feasibility Study

Section 5: Past & Current Activities (Cont'd)

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5.3 Research & Water Quality Monitoring Programs

5.3.1 Watershed and In-Lake Monitoring

5.3.2 Modeling Refinements

5.4 Lake Okeechobee Exotic Species Control Program

5.5 Lake Okeechobee Internal P Management Program

5.6 Other Related Activities

5.6.1 Kissimmee River Watershed Activities

5.6.2 CERP Lake Okeechobee Watershed Project

5.6.3 Lake Point Study

Section 6: Strategies for Moving Forward

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6.1 Action Plan for Control of P Imports, Legacy P and Reducing In-Lake P Loading

- 6.1.1 Phosphorus Source Controls and Import Controls
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- 6.1.3 In-Lake P Management Study

6.2 Strategic Projects and Promising Technologies

- 6.2.1 Regional Projects and Promising Technologies
- 6.2.2 Dispersed Water Management & Treatment Projects
- 6.2.3 Chemical Treatment & Hybrid Wetland Treatment Technologies
- 6.2.4 Sub-watershed Conceptual Plans
- 6.2.5 Research Projects
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Section 6: Strategies for Moving Forward (Cont.)

6.3 Action Plan Schedule & Funding

- 6.3.1 Proposed Water Storage Projects
- 6.3.2 Proposed Water Quality Improvement Projects
- 6.3.3 Plan Schedule
- 6.3.4 Budget and Funding Requirements

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SECTION 1: INTRODUCTION

Legislative Requirements

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- In 2000, the Legislature passed the Lake Okeechobee Protection Act (LOPA) to reduce phosphorus inflows into the Lake through a comprehensive, phased program linked to meeting the TMDL target by 2015.

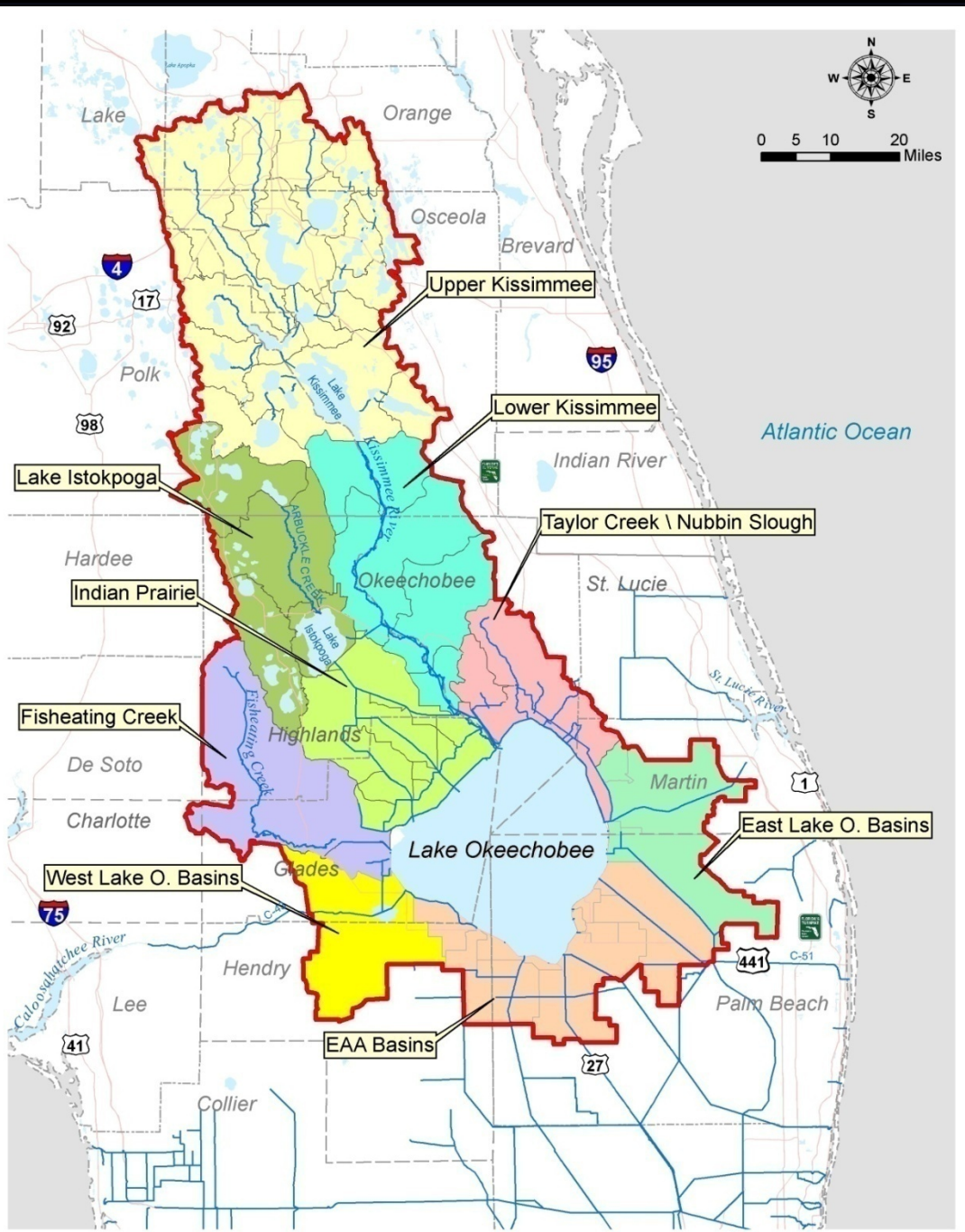
- The coordinating agencies submitted the initial **Lake Okeechobee Protection Plan** (LOPP) to the Legislature in 2004. ***LOPA requires the plan to be updated every three years .***

- In 2007, the Legislature expanded LOPA to also include protection of the Caloosahatchee and St. Lucie watersheds and estuaries (Northern Everglades and Estuaries Protection Program).

- This update covers the three-year period since submission of the Lake Okeechobee Watershed Construction Project Phase II Technical Plan to the Legislature in 2008. ***The LOPP Update will be submitted to the Legislature in early 2011.***

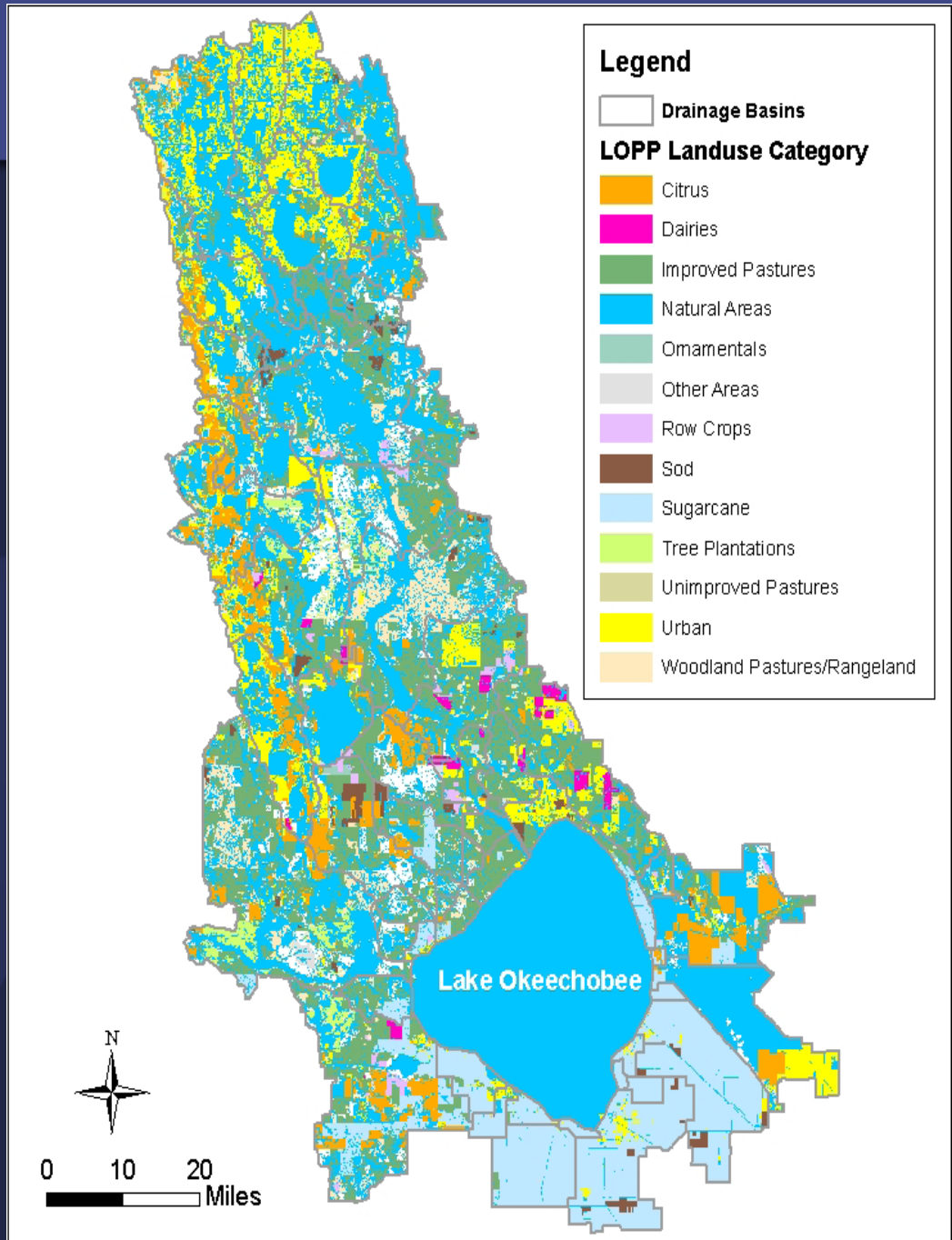
Watershed Description

- The Lake Okeechobee Protection Planning (LOPP) area, includes 61 drainage basins, spanning 10 Florida counties with a drainage area of over 5,400 square miles
- The LOPP includes nine sub-watersheds



Land Use (2006)

- Land use dominated by Agriculture (52%)
- Major land uses include:
  - Natural areas: 37.2%
  - Improved pasture: 19.5%
  - Sugarcane: 11.6%
  - Urban: 10.7%
  - Unimproved pasture/rangeland: 9.4%
  - Citrus: 6.8%
  - Other : 4.8%
- Major land use in northern watershed is pasture, while sugarcane production dominates south of Lake



SECTION 2: OVERVIEW OF LAKE OKEECHOBEE PROTECTION PROGRAMS

Section 2: Overview of Lake Okeechobee Protection Programs

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- Program includes seven key elements:
  - Lake Okeechobee Protection Plan
  - Watershed Construction Project
  - Watershed Phosphorus Control Program
  - Research and WQ Monitoring Program
  - Exotic Species Control Program
  - Lake Internal Phosphorus Management Program
  - Progress Reports published annually in the South Florida Environmental Report

Northern Everglades and Estuaries Protection Program

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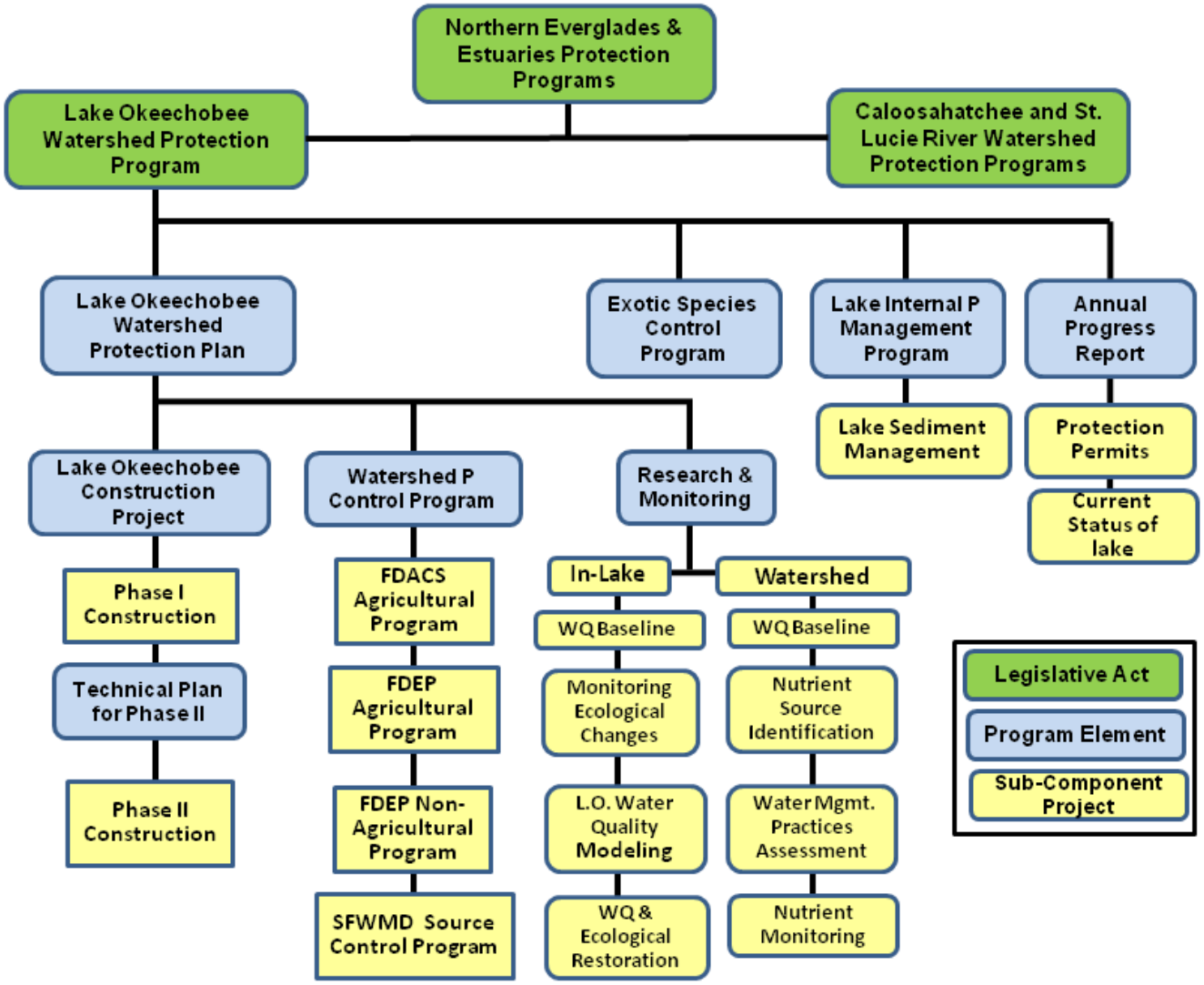

SECTION 3:
CURRENT STATUS OF THE LAKE

Current Status of Lake

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- Ecological conditions within Lake Okeechobee have improved since the 2007 update:
  - Lake levels are close to near average levels
  - Near-shore water clarity and P concentrations have improved relative to post-2004 hurricane conditions
  - No major algal bloom events reported; emergent and submerged vegetation have re-established and are comparable to pre-hurricane levels
  - Initial recovery of benthic invertebrates and forage fish populations
  - Current Lake levels and recovery of littoral zone vegetation have improved sport fish (Largemouth Bass) populations

Lake Water Levels

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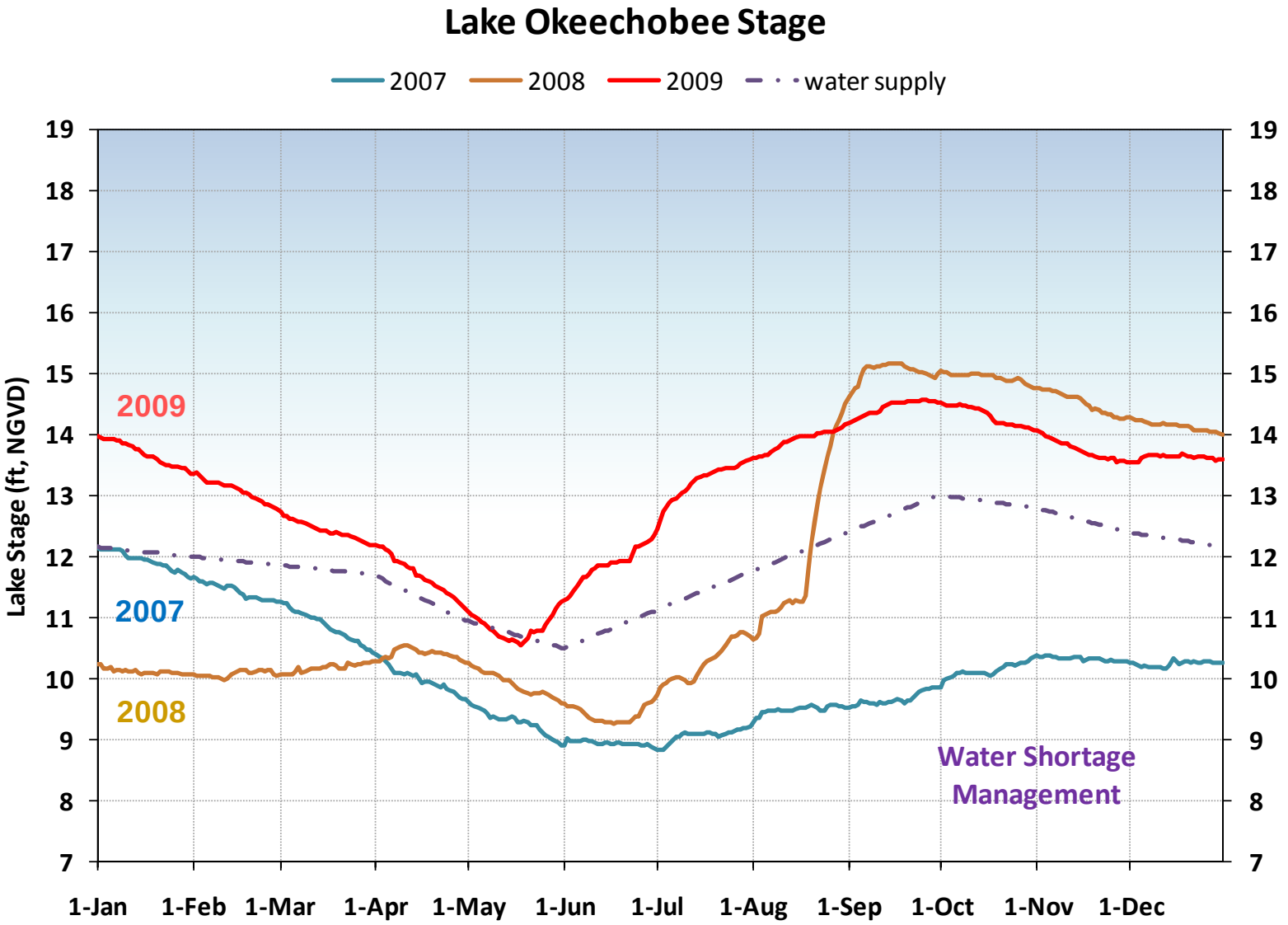

Lake Stage vs. Near-Shore Total Phosphorus

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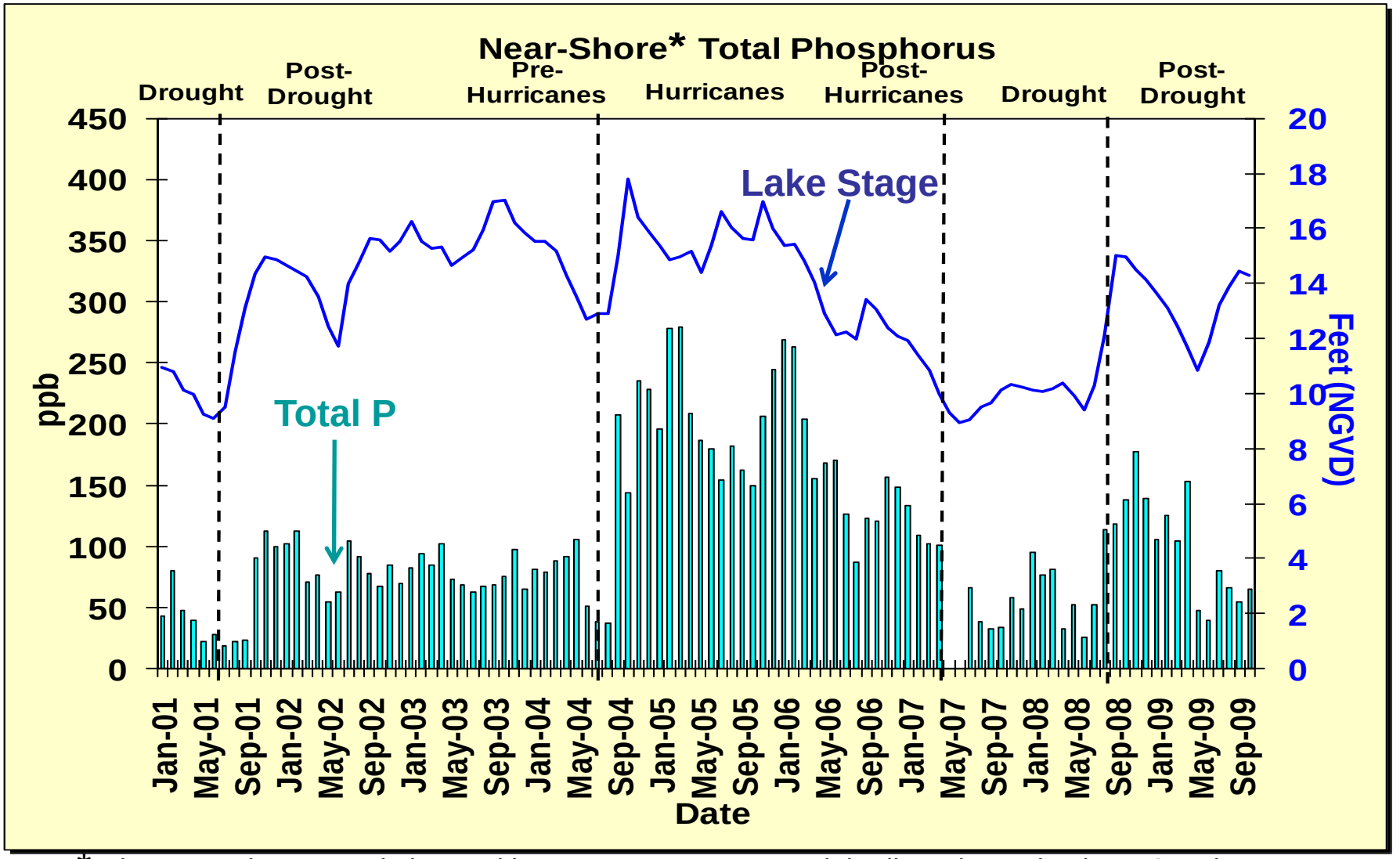

* The Near-shore area is located between open water and the littoral marsh where SAV is dominant. The area is typically wet down to around 12 to 11 feet stage (NGVD)

Lake Stage vs. Near-Shore Total Suspended Solids

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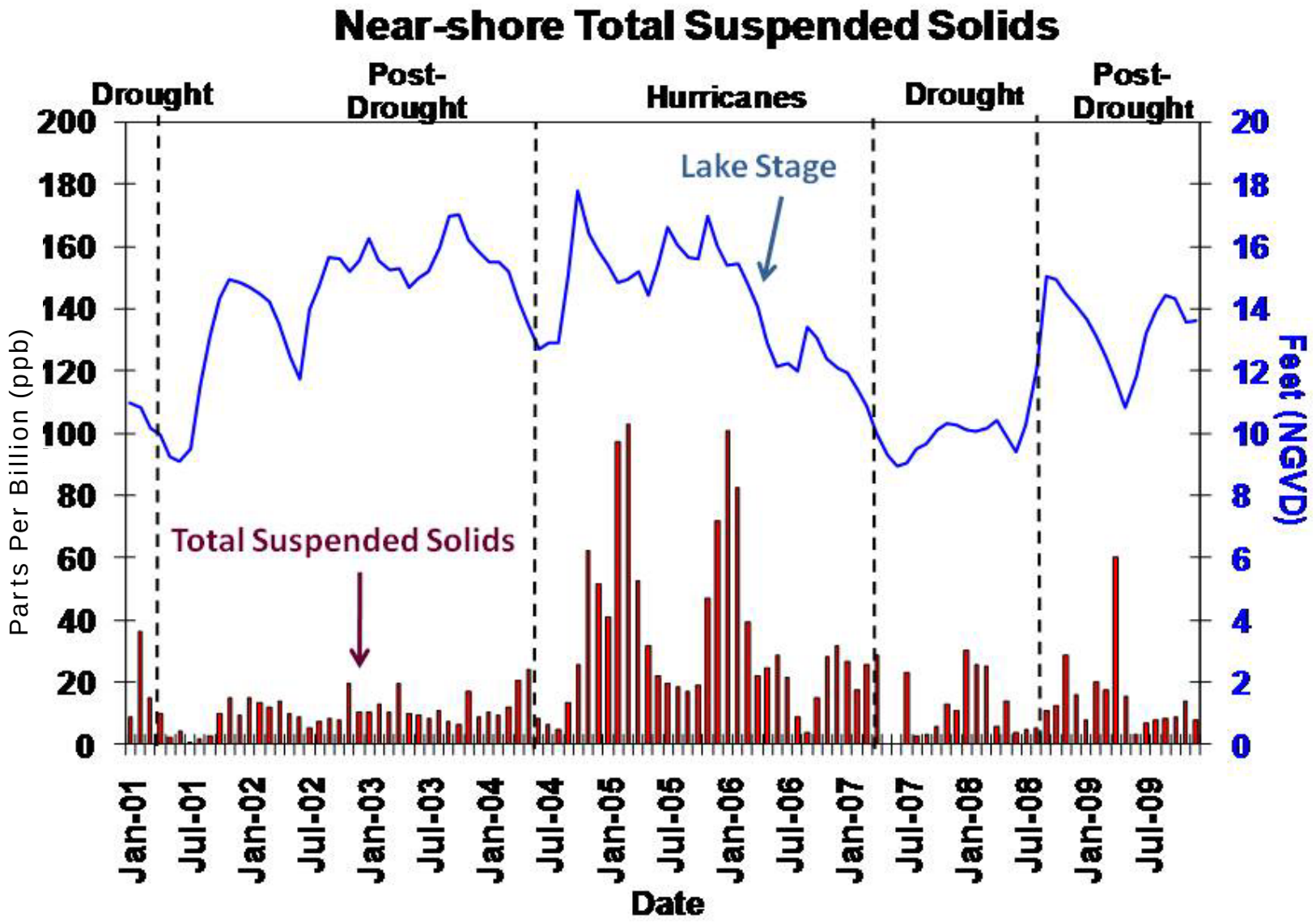

Algal Bloom Monitoring

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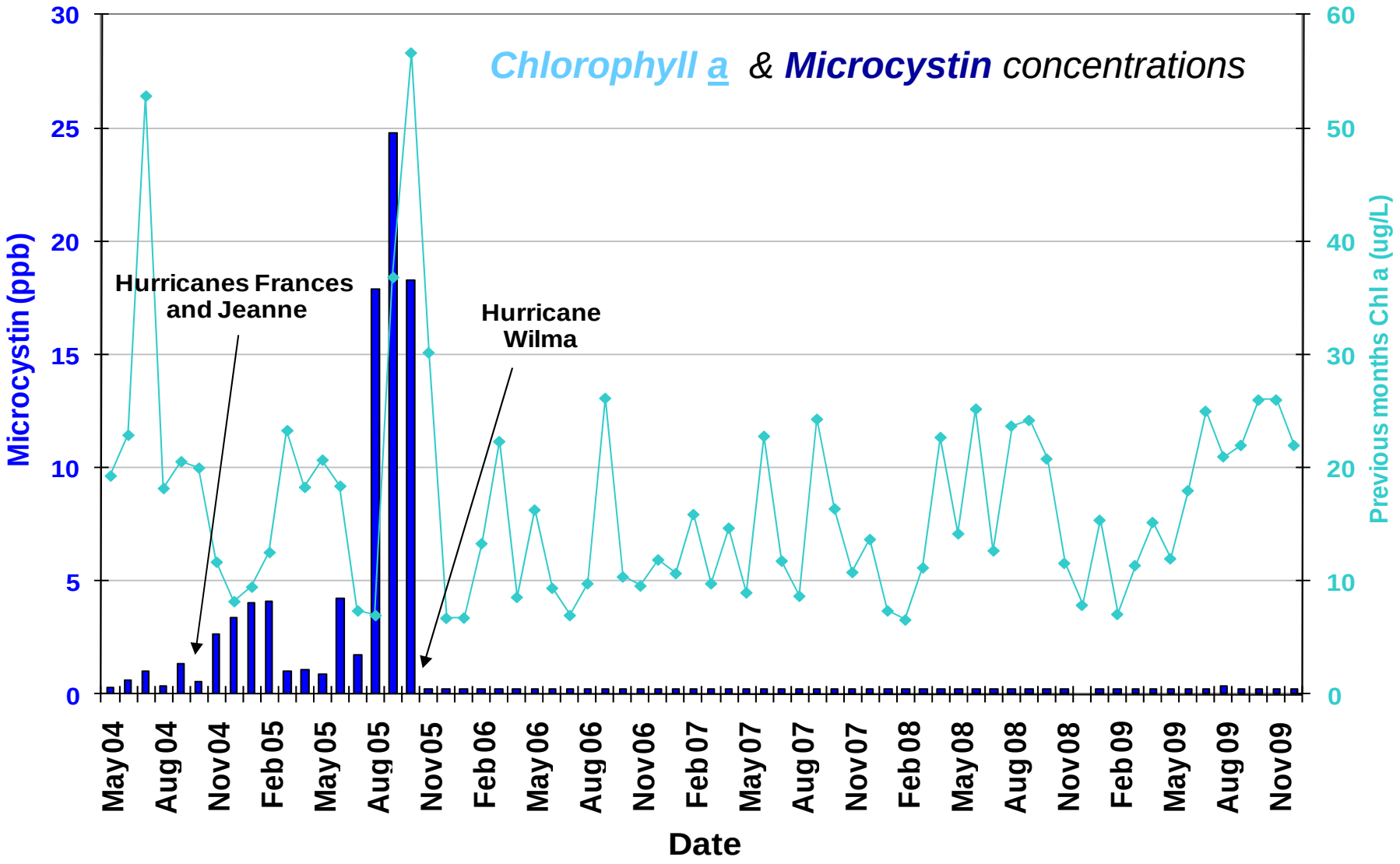
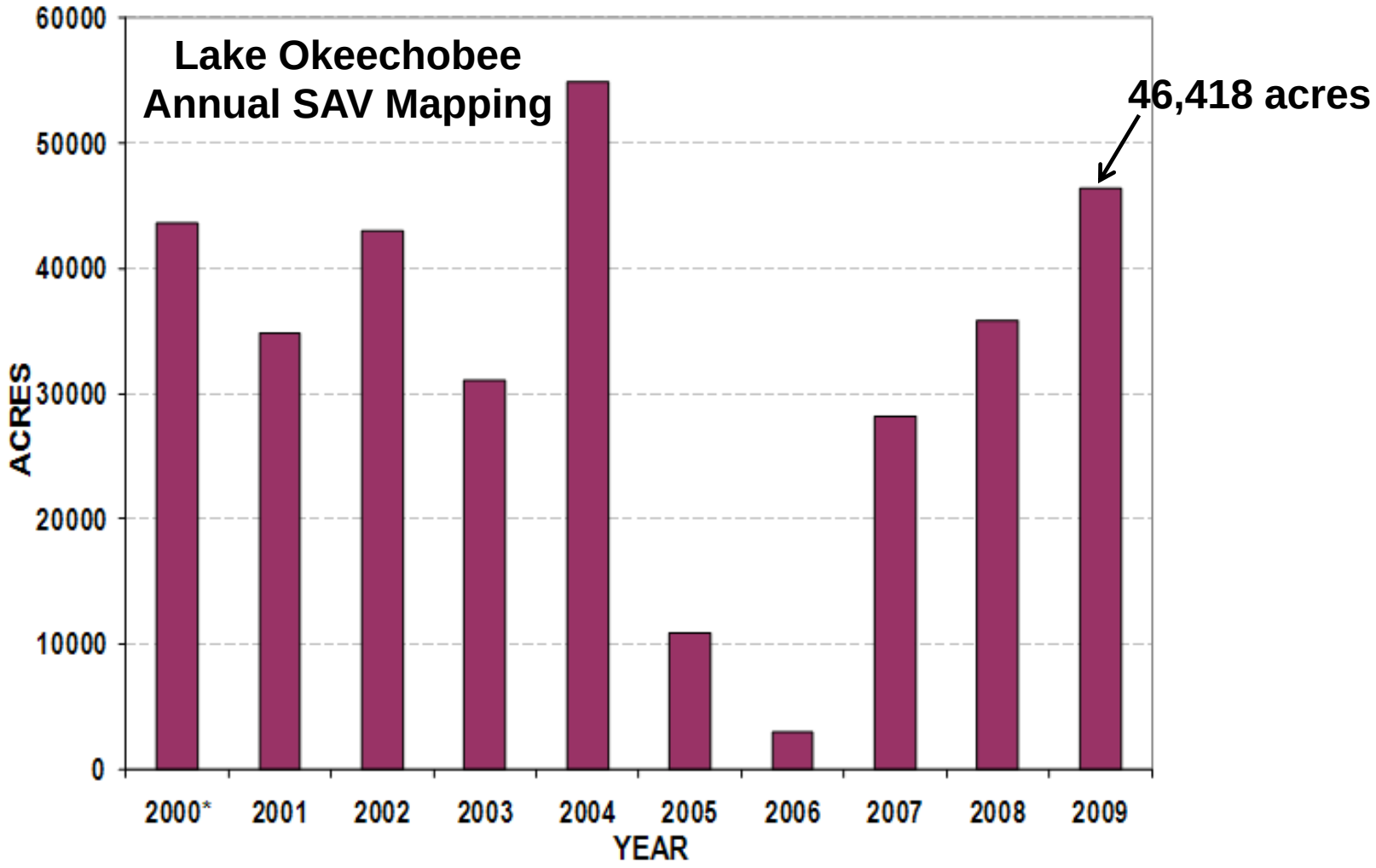


Submerged Aquatic Vegetation (SAV)



Acres of Total of SAV (includes both vascular and non-vascular species)

Current Ecological Conditions

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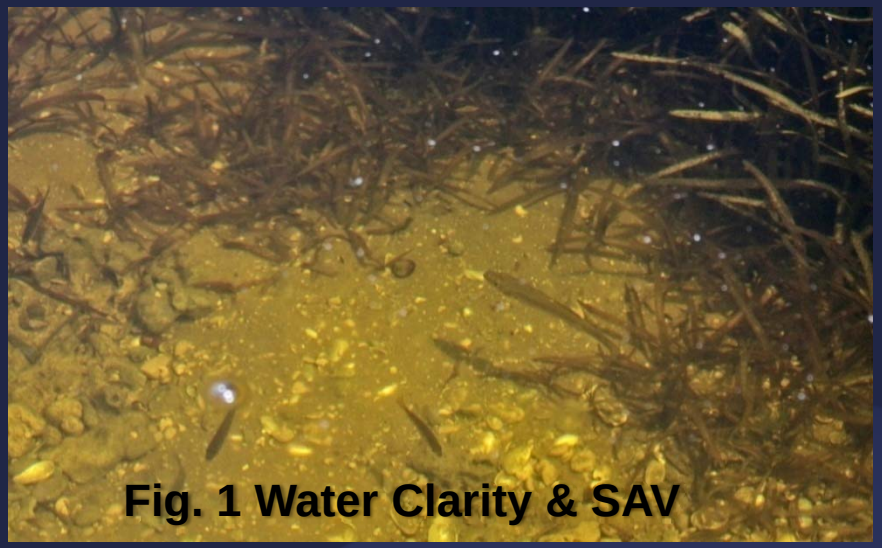

Fig. 1 Water Clarity & SAV

Fig. 2 Emergent Vegetation (Bulrush)

Fig. 3 Apple Snail Recovery

Fig. 4 Wading bird forging & nesting

Benthic Invertebrates

- Benthic invertebrate communities slowly recovered following recent hurricanes and drought, responding to reduced organic loading and transport of mud sediments from center of lake.
- Benthic species important to the lake's food web increased in terms of total number of taxa present, species diversity and density. Fastest recovery occurred in sand and peat sediments.

Descriptor	2005-2006	2006-2007	2007-2008
Total Taxa	48	68	94
Mean Species Richness	5.7	8.9	11.8
Mean Diversity	1.54	1.88	2.18
Mean Evenness	0.69	0.66	0.66
Mean Total Organisms/M^2	3,338	7,591	12,678

Source: Warren, FFWCC, 2009

Lake Okeechobee Fisheries

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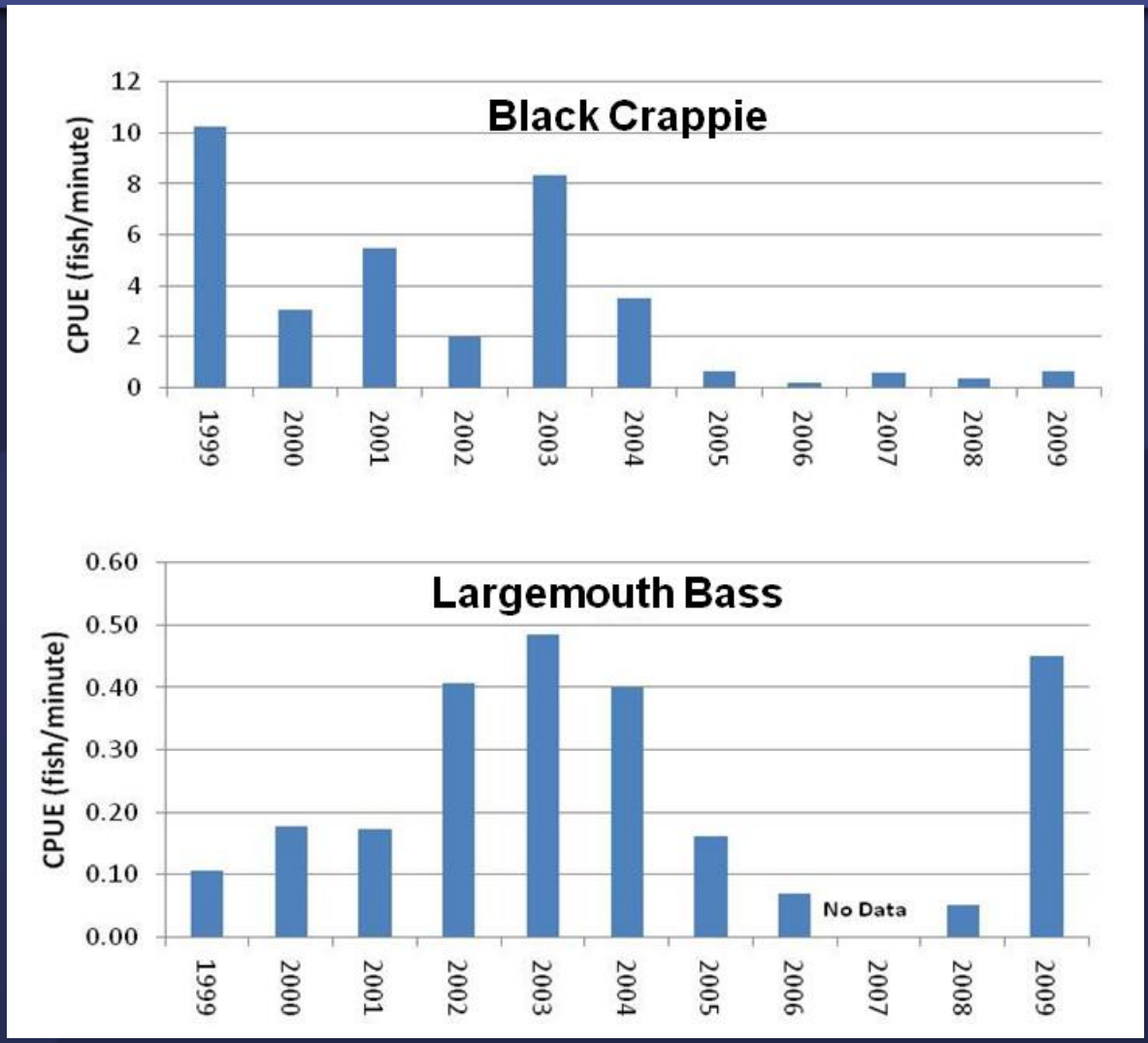
- The population, as depicted by catch per unit effort (CPUE) of Largemouth Bass and Black Crappie, declined following high water events in 2003
- There has been very little recruitment of Black Crappie since hurricanes of 2004-05
- Concurrent with improvements in near-shore habitat and water quality, there was strong recruitment of Largemouth Bass young of the year in 2009



Largemouth Bass data collected Oct-Nov; Black Crappie data collected Jan-Feb of each year. Source: FFWCC

Recovery of Littoral Zone Vegetation

Dry marsh conditions south of Indian Prairie canal (July 2008). Dog fennel and other terrestrial species became dominant across much of the marsh landscape.

New bulrush growth along the lakeward edge of marsh near Indian Prairie Canal (August 2009)

Control of Exotic Vegetation

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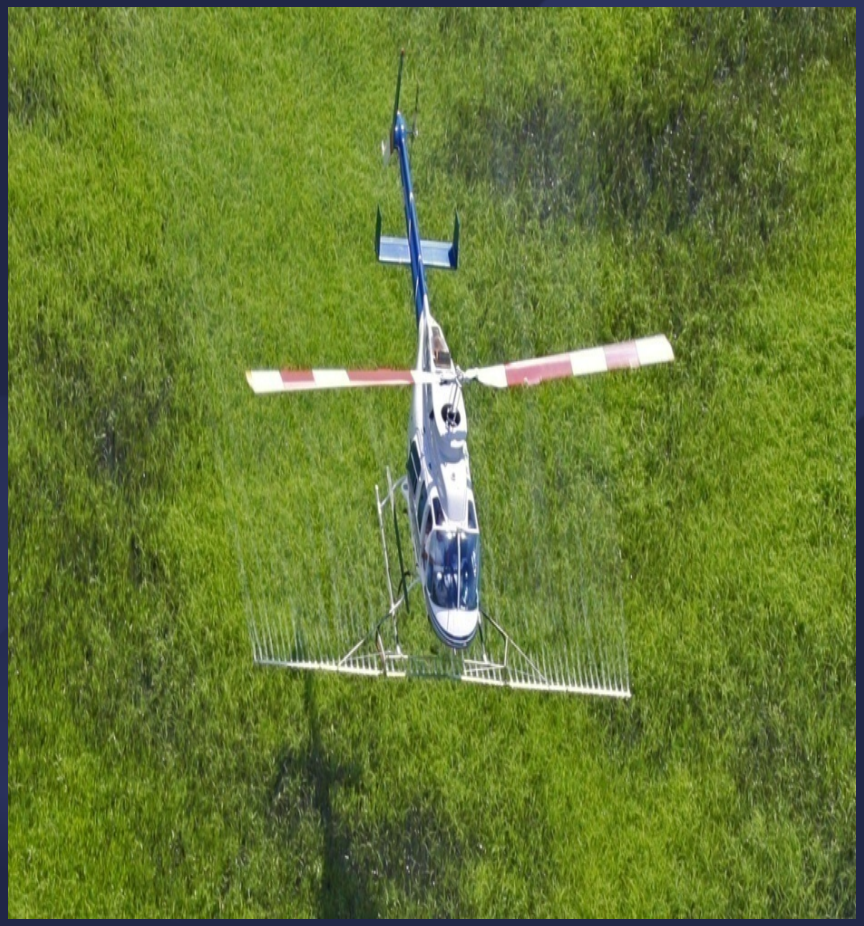
- Drought conditions experienced over past three years have allowed for more aggressive treatment of torpedograss. About 10,000 acres of torpedograss were treated during 2004 - 2006 compared to 20,000 acres during 2007 - 2009.
- Wildfires that burned the marsh in 2007 and 2008 removed thousands of acres of dead torpedograss and other dead plant material. Overall, torpedograss coverage on the Lake has decreased dramatically.
- Native plant communities have colonized some treated sites and wading bird surveys (2010) have documented thousands of birds foraging in shallow open water areas previously impacted by torpedograss

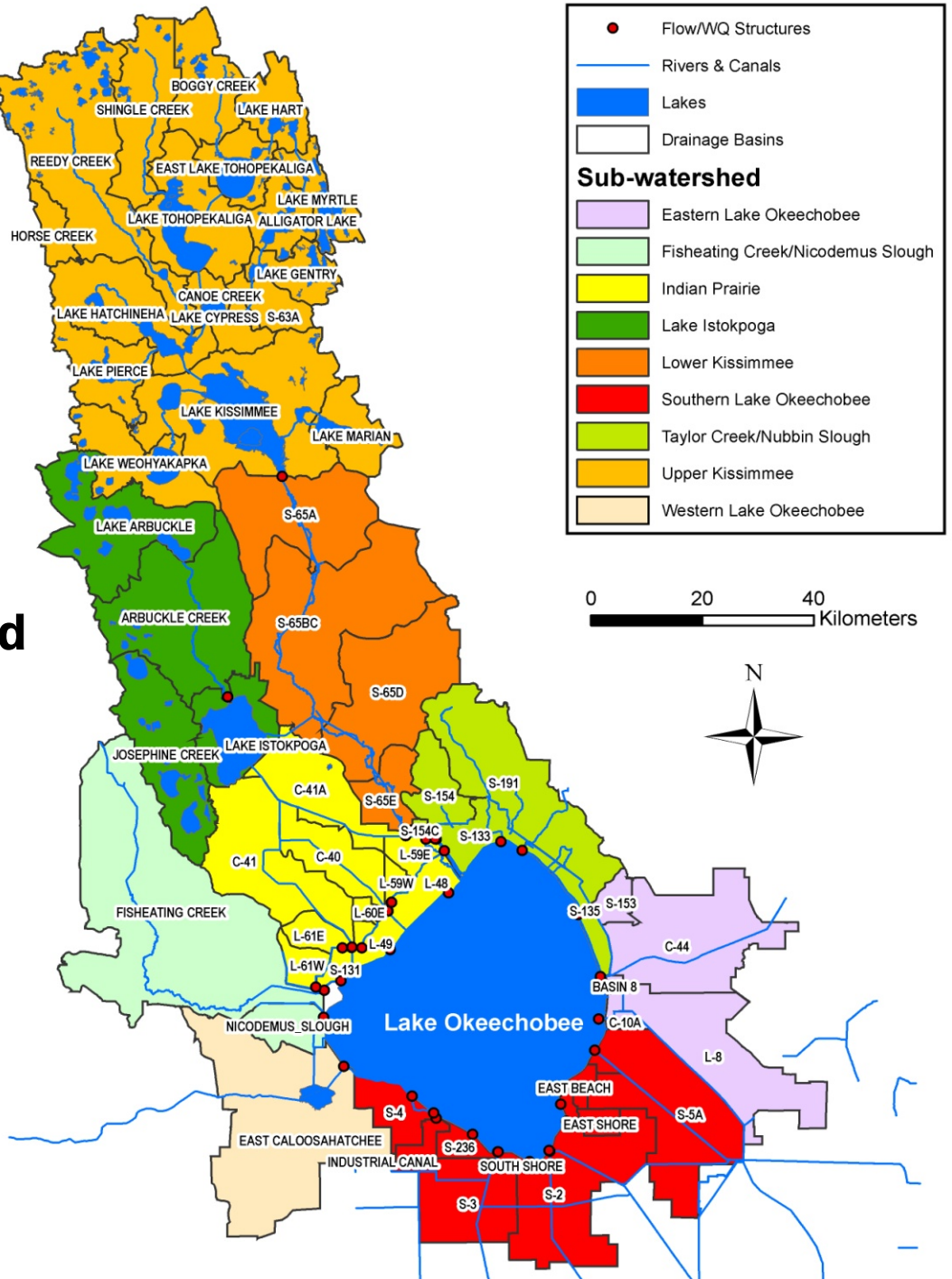
Control of Exotic Vegetation (Cont.)

- South American watergrass has become a serious problem in the Lake
- Nearly 600 acres were treated in Fisheating Bay in 2009
- Floating exotic plants such as water hyacinth and water lettuce continue to pose significant ecological harm to the marsh
- The aerial coverage of these plants rapidly expanded during the summer and fall of 2009. During that time, more than 11,000 acres of water hyacinth and 4,000 acres of water lettuce were treated



Luziola **Treatment in Fisheating Bay (2008)**

Lake Okeechobee Watershed showing the nine tributary sub-watersheds and associated water management structures



Tributary P Loading Trends (2001-2009)

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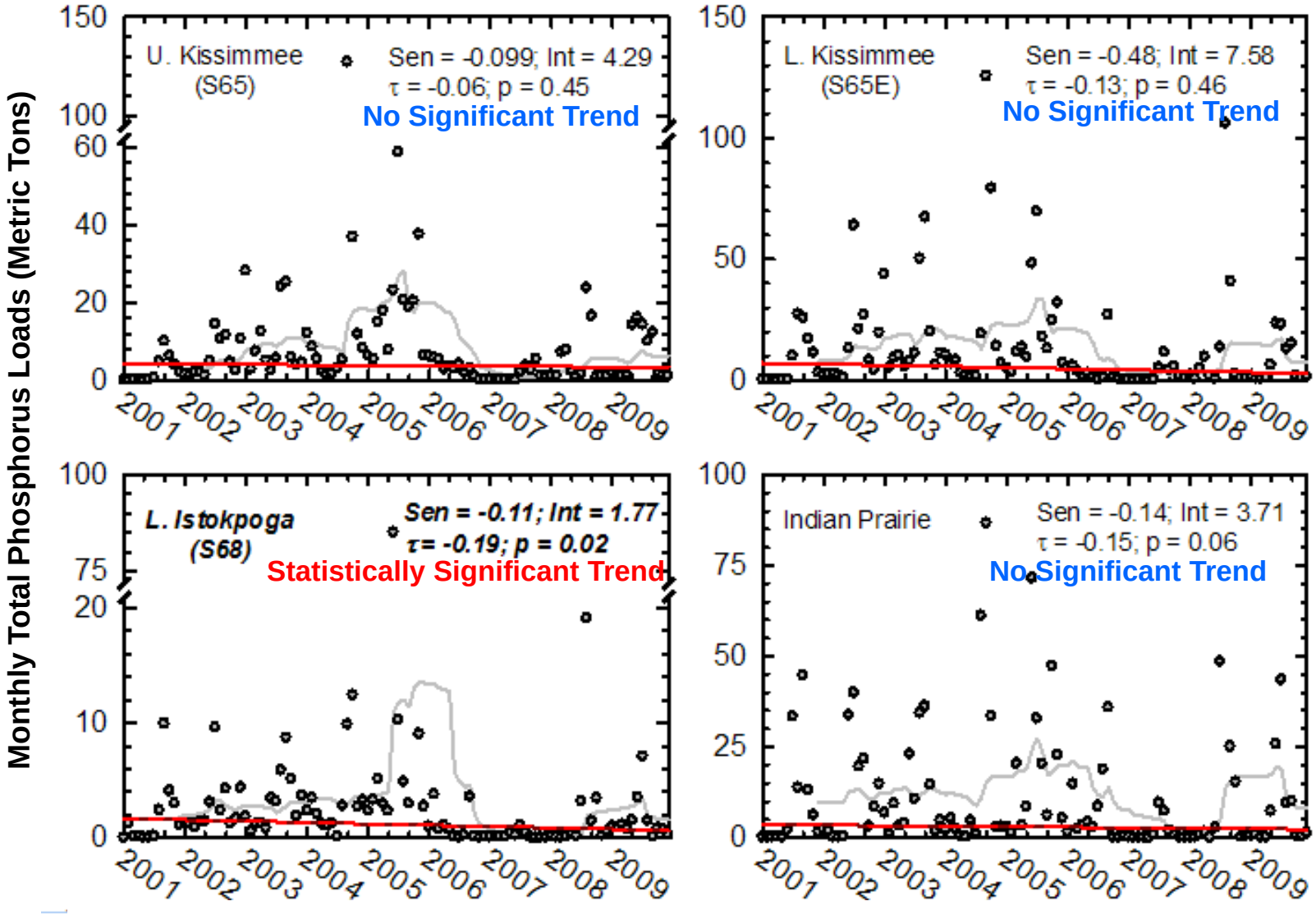
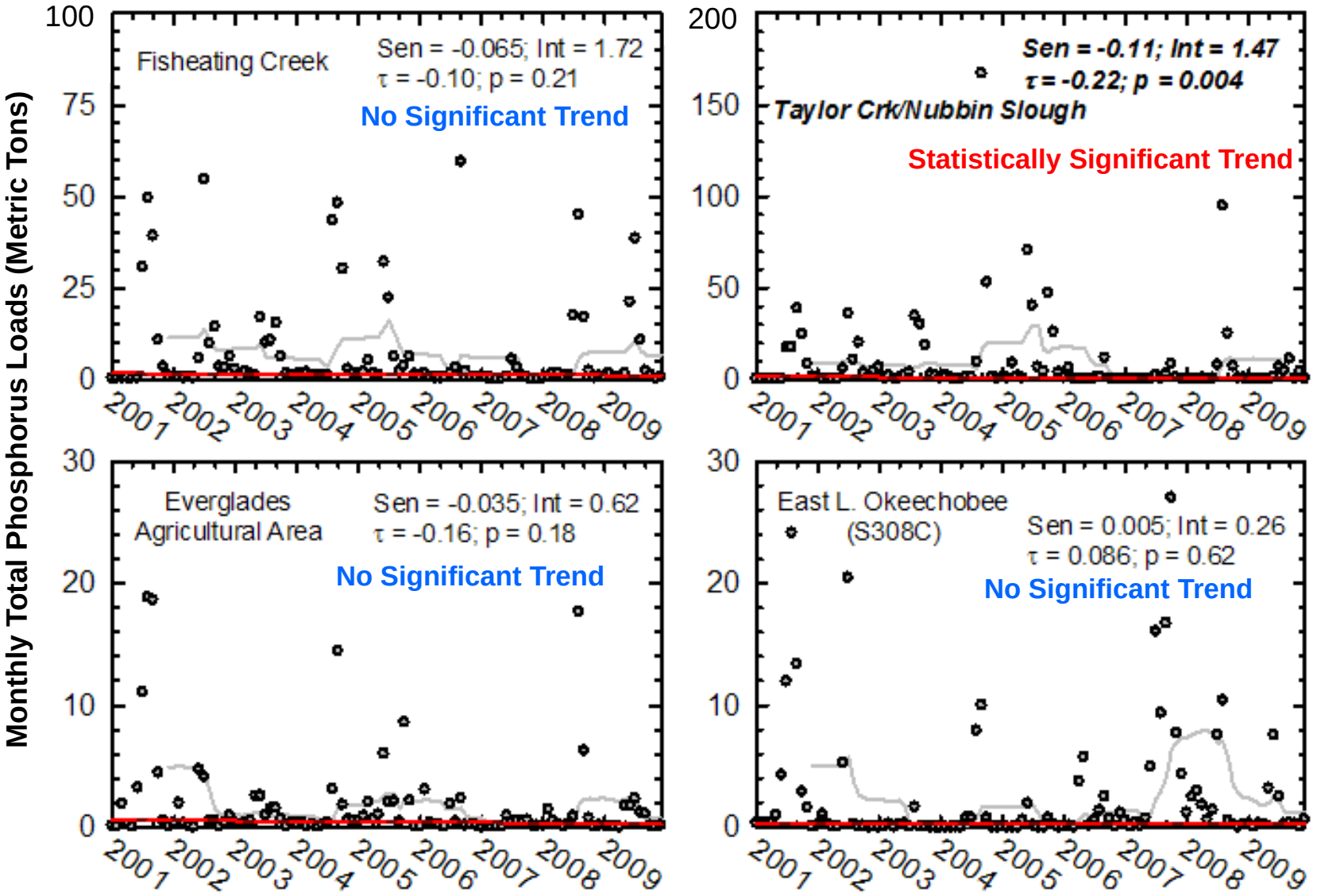
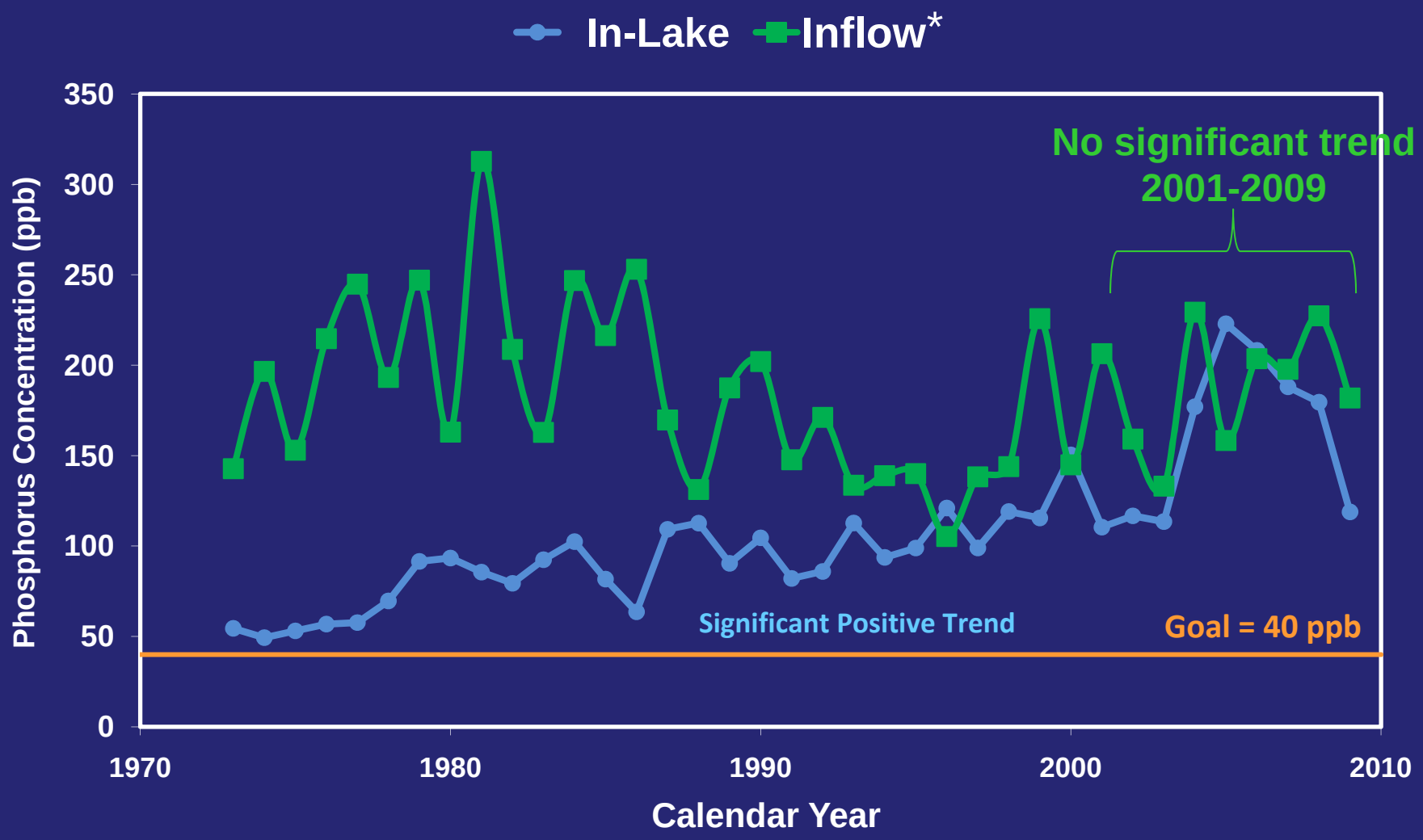


Tributary P Loading Trends (2001-2009) Cont'd



Inflow vs. In-Lake Phosphorus Concentrations (1973-2009)



* Inflow concentration = Yearly Sum of loads per year from all surface inflow points/Yearly sum of flow per year from all surface inflow points

In-Lake Phosphorus Loads (1973-2009)

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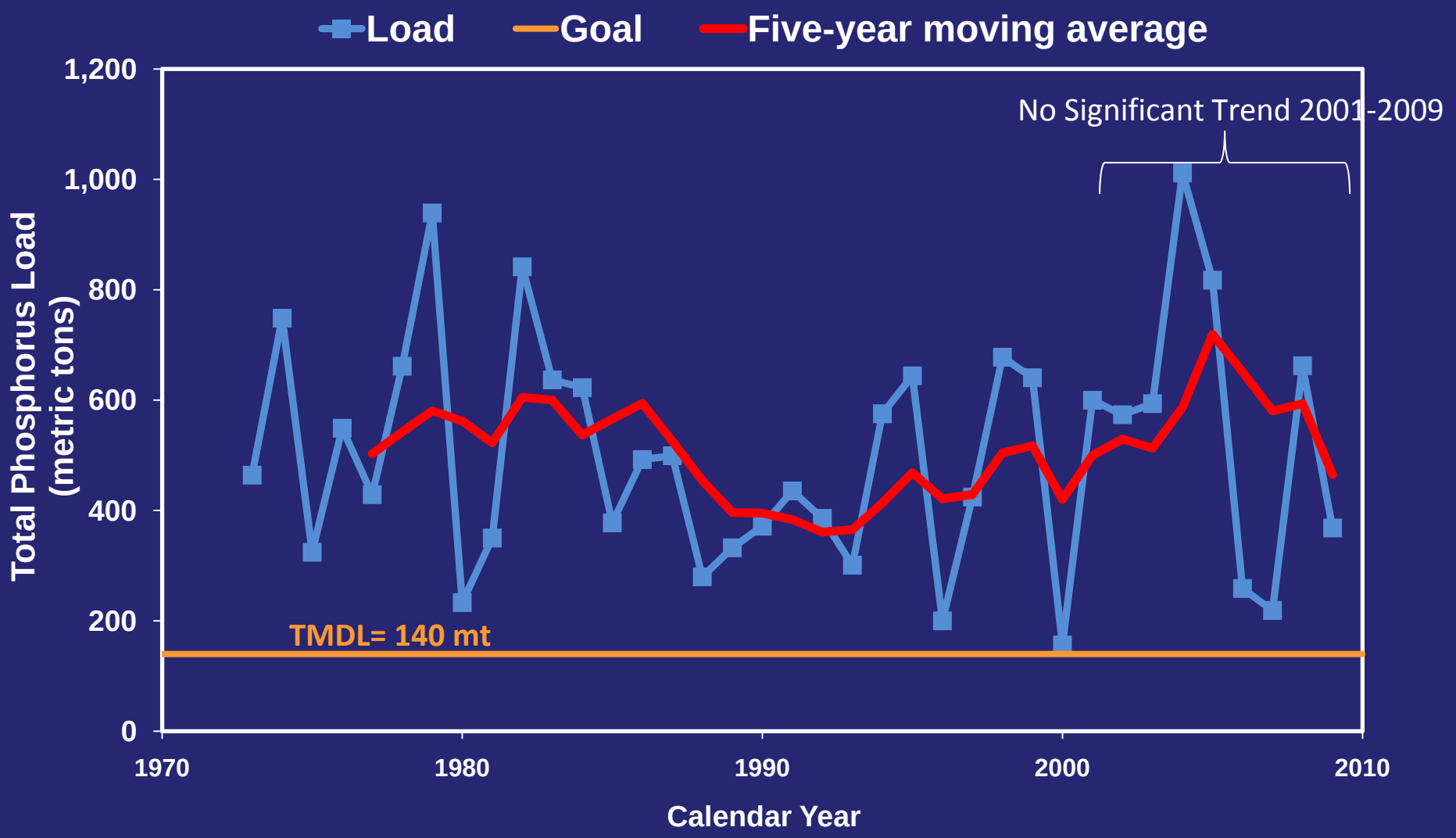

Internal P Loading Trends

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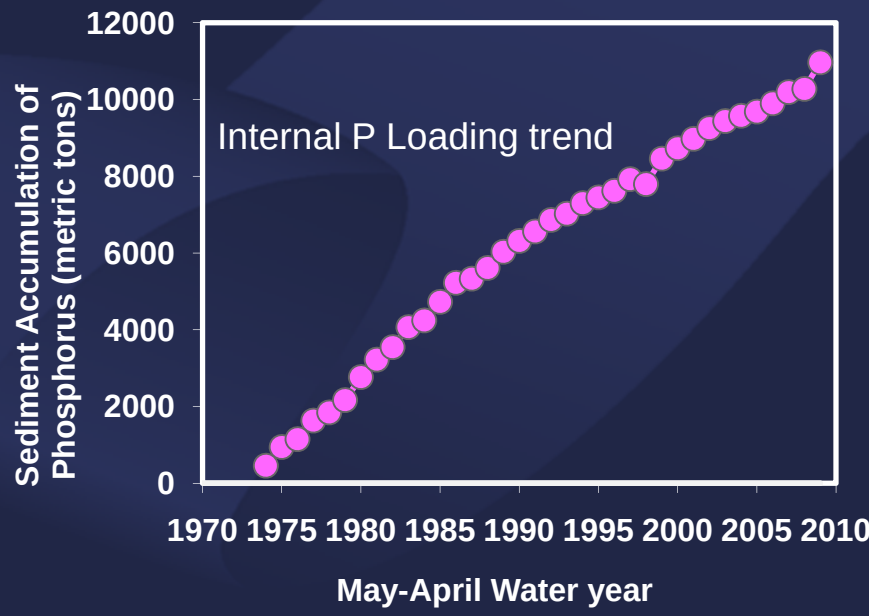
- Decades of excessive P loads have accumulated in Lake sediments that are currently near saturation with P
- Sediment P moves into water column through diffusion and re-suspension
- Results from previous studies concluded that sediment removal (dredging) is not practical or cost-effective. However, the problem of internal P loading remains a significant challenge
- Previous studies recommend external P load reduction as most feasible, cost-effective alternative



Internal Lake Phosphorus Management Program

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- 80,000 hectares of lake bottom covered by 260 million cubic yards of P-enriched mud sediment
- If Internal P loading is not addressed, the lake may not fully respond to external P load reductions
- In 2003, the District conducted a study addressing the feasibility of removing or treating the Lake's P-enriched mud sediments.

New Considerations

- Public may be unwilling to wait decades to experience restored water quality conditions within the Lake
- Sediments also contribute to high turbidity that affects SAV and downstream receiving water bodies.
- Everglades and estuary restoration more difficult to achieve without improving the quality of water discharged from the Lake.
- Release of P from lake sediments will remain a large source of P for many decades regardless of how the upstream watershed is managed

Internal Lake Phosphorus Management Program (Cont'd)

New Technologies

- Consideration of deep-well disposal of effluent water or the sediments themselves.
- Construction of in-lake islands or Littoral Zones near outlets

Proposed In-Lake P Management Study

- Review the recommendations from the 2003 Feasibility study
- New concepts and technologies would be evaluated and then compared against those from the previous report.
- Finally, new recommendations would be made for implementation

LOPP Update Schedule

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- NE Interagency Meeting - LOPP Update 07/10
- NE Interagency Meeting - Draft LOPP 08/10
- Lake Okeechobee WRAC Meeting - Draft LOPP 08/10
- Draft LOPP Public Release - 09/10
- WRAC Meeting - Draft LOPP 09/10
- GB Meeting - Draft LOPP 09/10
- End Public Comment Review Period - 10/10
- L.O. WRAC/ WRAC/GB Meetings - Final LOPP 12/10
- Final LOPP to the Legislature - 3/11


Questions?