Lake Okeechobee Sediment Management Feasibility Study

Outreach Meeting for Development of Alternatives
July 19, 2001

Lake Okeechobee Department
Watershed Research and Planning

BBL

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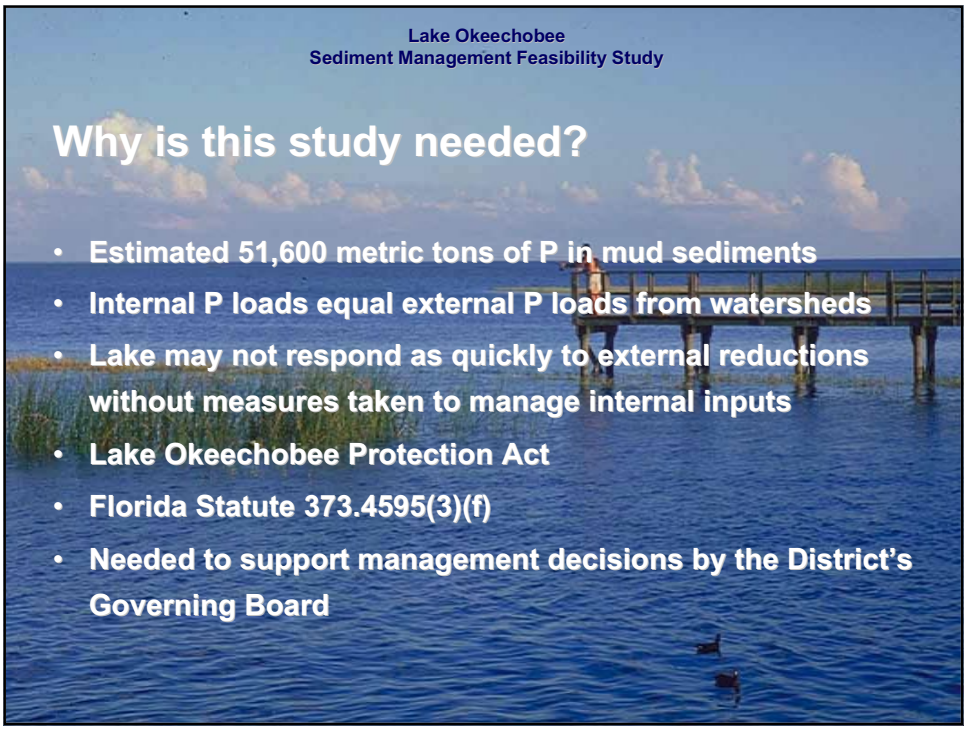
Sediment Management Feasibility Study

What is it?

- Three-year, desktop study conducted by the District under contract with Blasland, Bouck & Lee, Inc.

What is the main goal?

- Determine the best method of sediment management that will achieve maximum reductions in internal phosphorus (P) loads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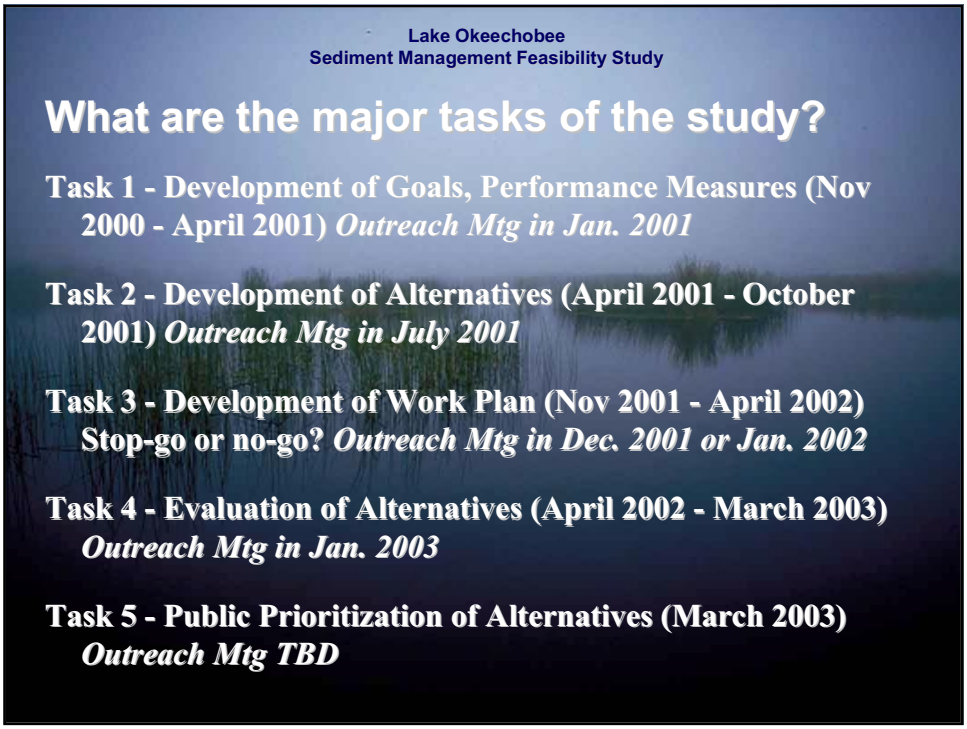
Why is this study needed?
• Estimated 51,600 metric tons of P in mud sediments
• Internal P loads equal external P loads from watersheds
• Lake may not respond as quickly to external reductions without measures taken to manage internal inputs
• Lake Okeechobee Protection Act
• Florida Statute 373.4595(3)(f)
• Needed to support management decisions by the District's Governing Board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What are the major tasks of the study?
Task 1 - Development of Goals, Performance Measures (Nov 2000 - April 2001) Outreach Mtg in Jan. 2001
Task 2 - Development of Alternatives (April 2001 - October 2001) Outreach Mtg in July 2001
Task 3 - Development of Work Plan (Nov 2001 - April 2002) Stop-go or no-go? Outreach Mtg in Dec. 2001 or Jan. 2002
Task 4 - Evaluation of Alternatives (April 2002 - March 2003) Outreach Mtg in Jan. 2003
Task 5 - Public Prioritization of Alternatives (March 2003) Outreach Mtg TBD


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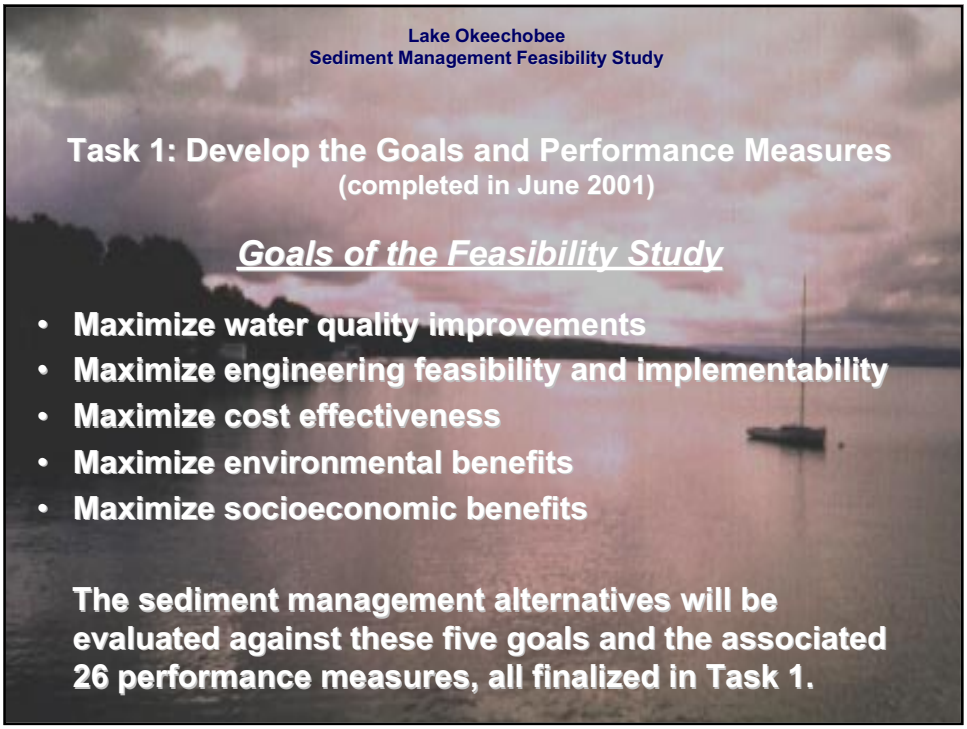
Other related studies:
• Dredging Pilot Testing (EA)
• Laboratory Sediment Core Evaluation (University of Florida)
The Sediment Management Feasibility Study will incorporate findings from both of these efforts.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Task 1: Develop the Goals and Performance Measures
(completed in June 2001)
Goals of the Feasibility Study
• Maximize water quality improvements
• Maximize engineering feasibility and implementability
• Maximize cost effectiveness
• Maximize environmental benefits
• Maximize socioeconomic benefits
The sediment management alternatives will be evaluated against these five goals and the associated 26 performance measures, all finalized in Task 1.


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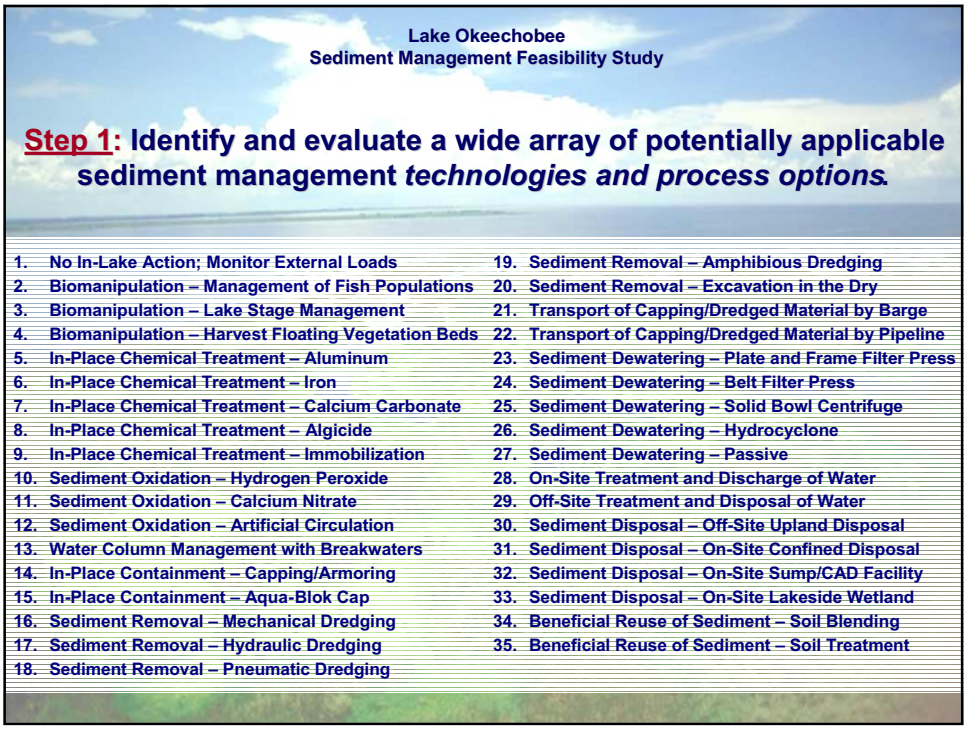
Task 2: Develop an array of sediment management alternatives
(to be evaluated in detail in Task 4)
Step 1: Identify applicable technologies
Step 2: Determine potential feasibility of technologies
Step 3: Combine retained technologies into alternatives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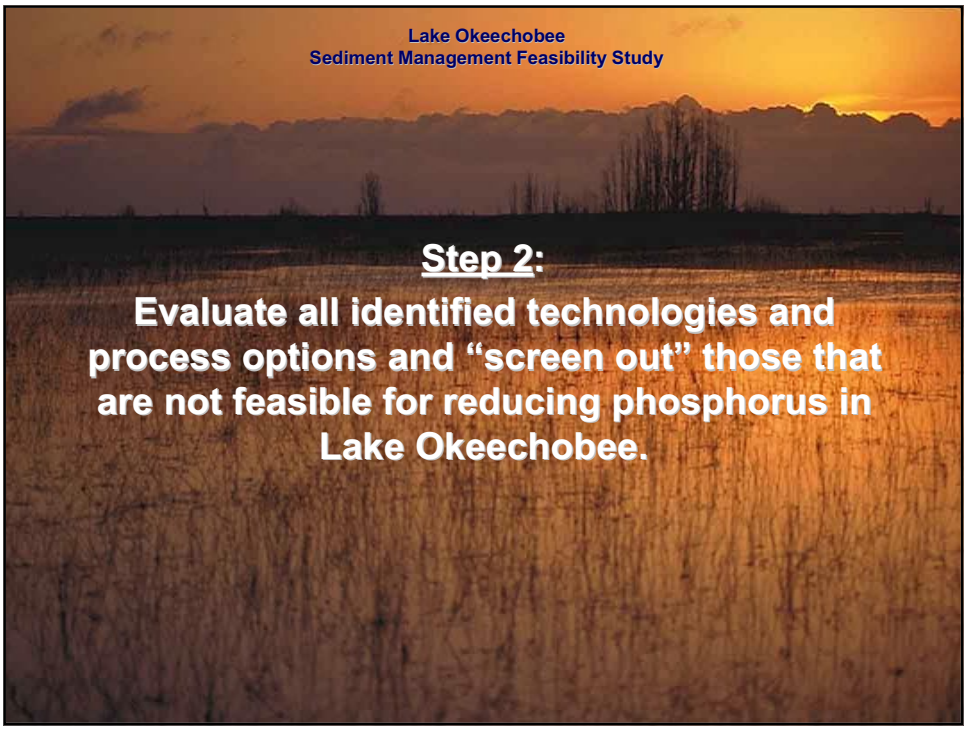
Step 1: Identify and evaluate a wide array of potentially applicable sediment management technologies and process options.
1. No In-Lake Action; Monitor External Loads
2. Biomanipulation – Management of Fish Populations
3. Biomanipulation – Lake Stage Management
4. Biomanipulation – Harvest Floating Vegetation Beds
5. In-Place Chemical Treatment – Aluminum
6. In-Place Chemical Treatment – Iron
7. In-Place Chemical Treatment – Calcium Carbonate
8. In-Place Chemical Treatment – Algicide
9. In-Place Chemical Treatment – Immobilization
10. Sediment Oxidation – Hydrogen Peroxide
11. Sediment Oxidation – Calcium Nitrate
12. Sediment Oxidation – Artificial Circulation
13. Water Column Management with Breakwaters
14. In-Place Containment – Capping/Armoring
15. In-Place Containment – Aqua-Blok Cap
16. Sediment Removal – Mechanical Dredging
17. Sediment Removal – Hydraulic Dredging
18. Sediment Removal – Pneumatic Dredging
19. Sediment Removal – Amphibious Dredging
20. Sediment Removal – Excavation in the Dry
21. Transport of Capping/Dredged Material by Barge
22. Transport of Capping/Dredged Material by Pipeline
23. Sediment Dewatering – Plate and Frame Filter Press
24. Sediment Dewatering – Belt Filter Press
25. Sediment Dewatering – Solid Bowl Centrifuge
26. Sediment Dewatering – Hydrocyclone
27. Sediment Dewatering – Passive
28. On-Site Treatment and Discharge of Water
29. Off-Site Treatment and Disposal of Water
30. Sediment Disposal – Off-Site Upland Disposal
31. Sediment Disposal – On-Site Confined Disposal
32. Sediment Disposal – On-Site Sump/CAD Facility
33. Sediment Disposal – On-Site Lakeside Wetland
34. Beneficial Reuse of Sediment – Soil Blending
35. Beneficial Reuse of Sediment – Soil Treatment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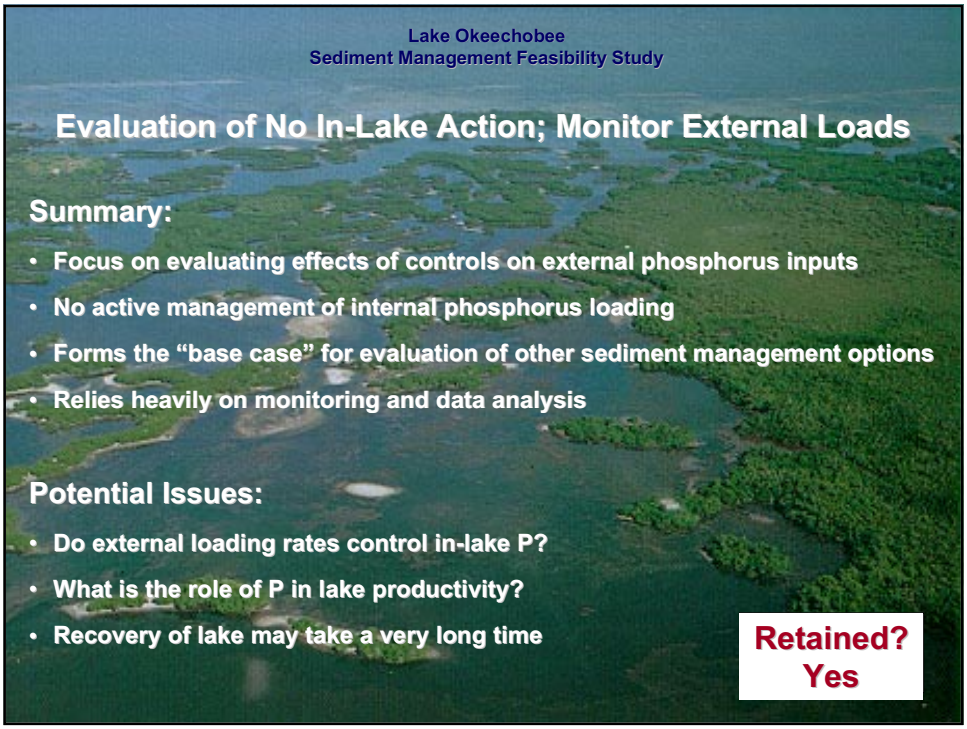
Step 2:
Evaluate all identified technologies and process options and "screen out" those that are not feasible for reducing phosphorus in Lake Okeechobee.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Evaluation of No In-Lake Action; Monitor External Loads
Summary:
• Focus on evaluating effects of controls on external phosphorus inputs
• No active management of internal phosphorus loading
• Forms the "base case" for evaluation of other sediment management options
• Relies heavily on monitoring and data analysis
Potential Issues:
• Do external loading rates control in-lake P?
• What is the role of P in lake productivity?
• Recovery of lake may take a very long time
Retained?
Yes

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Evaluation of In-Lake Chemical Treatment Options

Process Option	Evaluation Summary	Retained?
Aluminum compounds	• Nutrient inactivation, keeps P in the sediments • Largest track record for restoration success	Yes
Calcium Carbonate	• Nutrient inactivation, keeps P in the sediments • Important in the P cycle of the lake	Yes
Iron	• Nutrient inactivation, keeps P in the sediments • Subject to dissolved oxygen up-set	No
Algicide	• Controls algae • Potentially toxic to non-target organisms	No
Immobilization	• Solidify sediments • Not technically proven	No

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Evaluation of Other Options

Remedial Technology	Process Options & Summaries	Retained?
Biomanipulation	***Management of Fish Populations*** • No impact on sediment and limited impact on algal growth ***Lake Stage Management*** • Does not impact flux of P from sediments ***Harvest Floating Vegetation Beds*** • Not proven technology for P control	No
Sediment Oxidation	***Hydrogen Peroxide/Potassium Permanganate*** • High degree of risk for failure and non-target impacts ***Calcium Nitrate*** • Potential results uncertain ***Artificial Circulation/Air Injection*** • Little to no impact on overall P cycling	No
In-Place Containment	***Capping/Armoring*** • Would not entrap flocculent mud layer, hence not effective ***Aqua Blok™ Capping*** • Same problems as capping, with greater risk of adverse impacts	No

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Evaluation of Dredging Options

Process Option (Example)	Evaluation Summary	Retained?
Mechanical Dredging (Clamshell Bucket)	• Limited productivity • Won't capture fluid mud	No
Pneumatic Dredging (Pneumatic Pump)	• Low productivity • Limited effectiveness in shallow water • Won't capture fluid mud	No
Amphibious Dredging (Amphibious Vehicle with Dredge)	• Low productivity • Won't capture fluid mud • Lake size constraints	No
Excavation in the Dry (Porta-Dam with Excavation)	• Low productivity • Lake size constraints • Habitat impacts	No
Hydraulic Dredging (Suction Dredge)	• Higher productivity • More effective in capturing fluid mud • Used in other lakes for control of P	Yes

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Step 3: The retained technologies were used to create a draft set of sediment management alternatives:

- No in-lake action; monitor external loads
- In-place chemical treatment/inactivation
- Water column management
- Dredging
- Transport of materials
- Sediment dewatering
- Treatment of water from dredged material
- Dredged sediment disposal
- Dredged sediment reuse

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The draft sediment management alternatives developed for further evaluation are:

- Alternative 1 -- No In-Lake Action with Monitoring of External Loads
- Alternative 2 -- Water Column Management Using Breakwaters
- Alternative 3 -- In-Situ Chemical Treatment
- Alternative 4 -- Hydraulic Dredging with Disposal in Confined Disposal Facilities
- Alternative 5 -- Hydraulic Dredging with Disposal in In-Lake Sumps/Confined Aquatic Disposal Cells
- Alternative 6 -- Hydraulic Dredging with Beneficial Reuse of Materials