# *Dredging Management in Grand Lake O' The Cherokees, OK:*

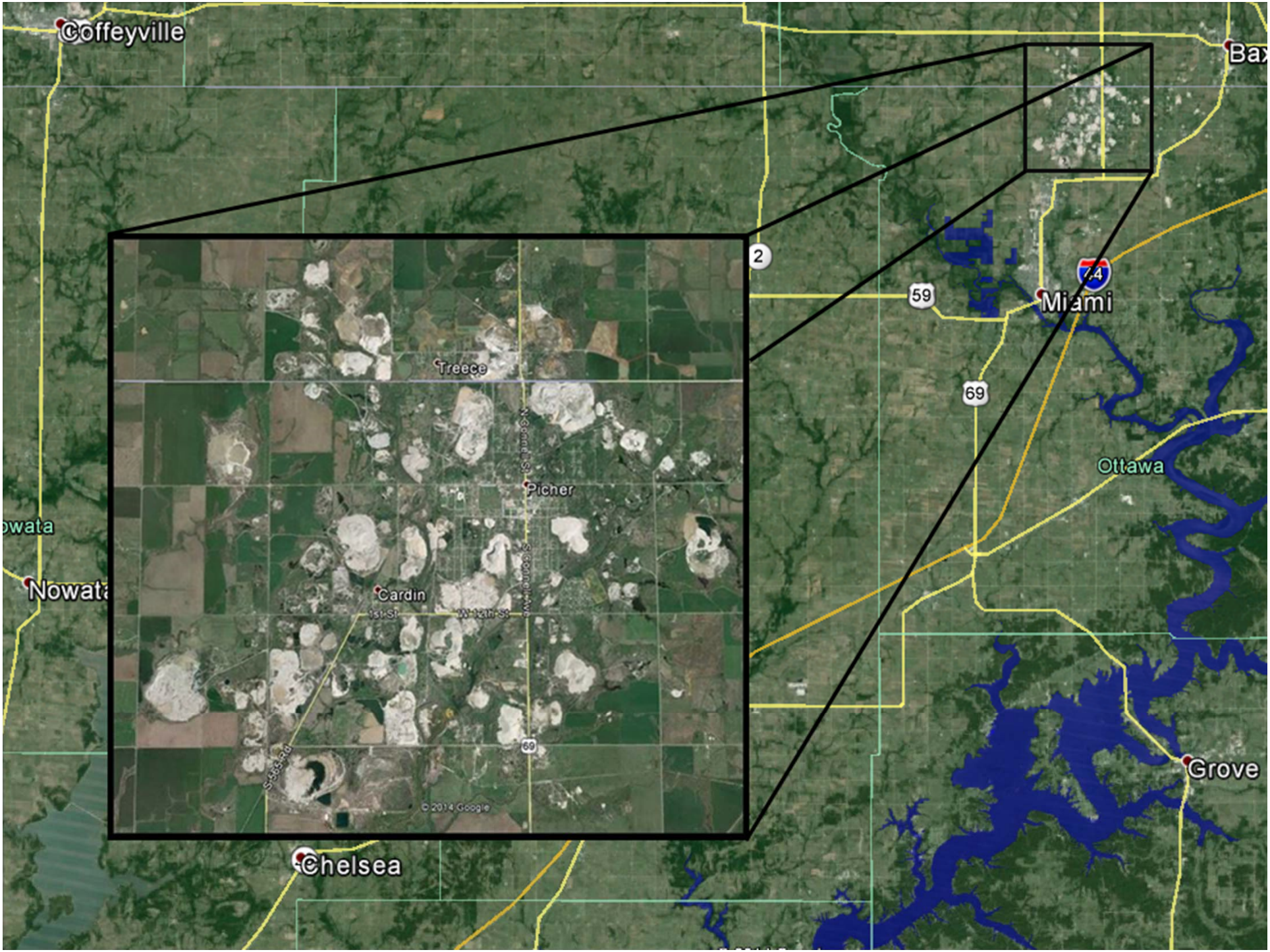
*Developing Permitting Strategies Using Shoreline Classifications, Substrate Characteristics and Contaminant Concentrations*

Stephen J .Nikolai

Grand River Dam Authority

GRDA

Grand River Dam Authority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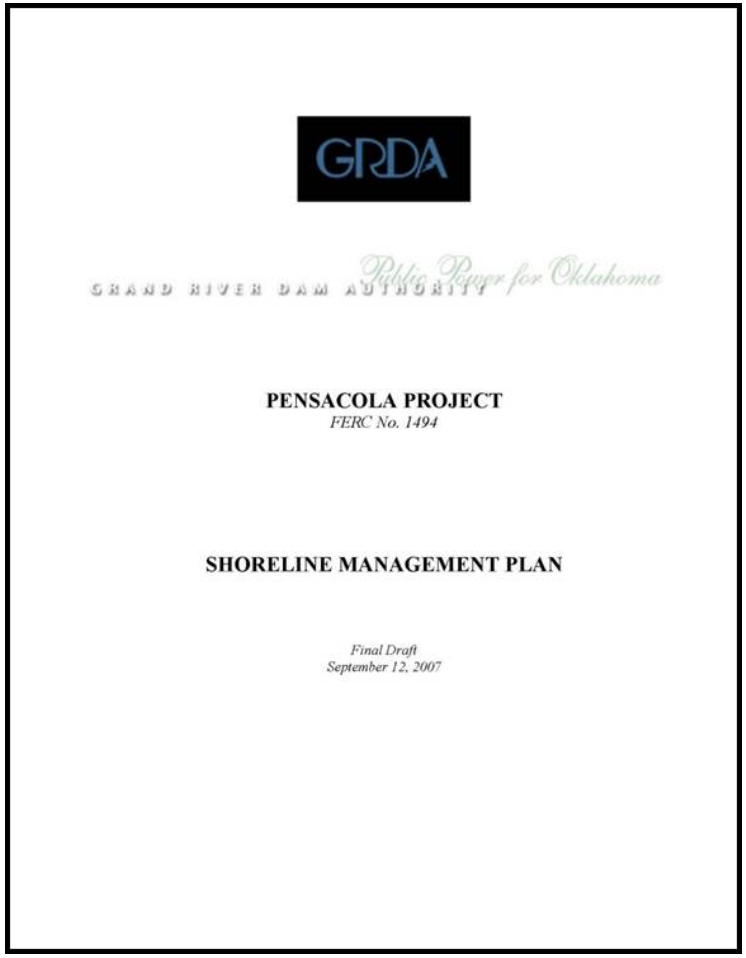
# Outline

- Introduction
- Current Dredging Management Plan
- Problems with the Plan
- Previous Research
- Current Research
- Planned Research
- Closing

# Shoreline Management Plan

- Comprehensive plan to manage project resources consistent with license requirements, project purposes, and operations.


GRDA

GRAND RIVER DAM AUTHORITY *Public Power for Oklahoma*

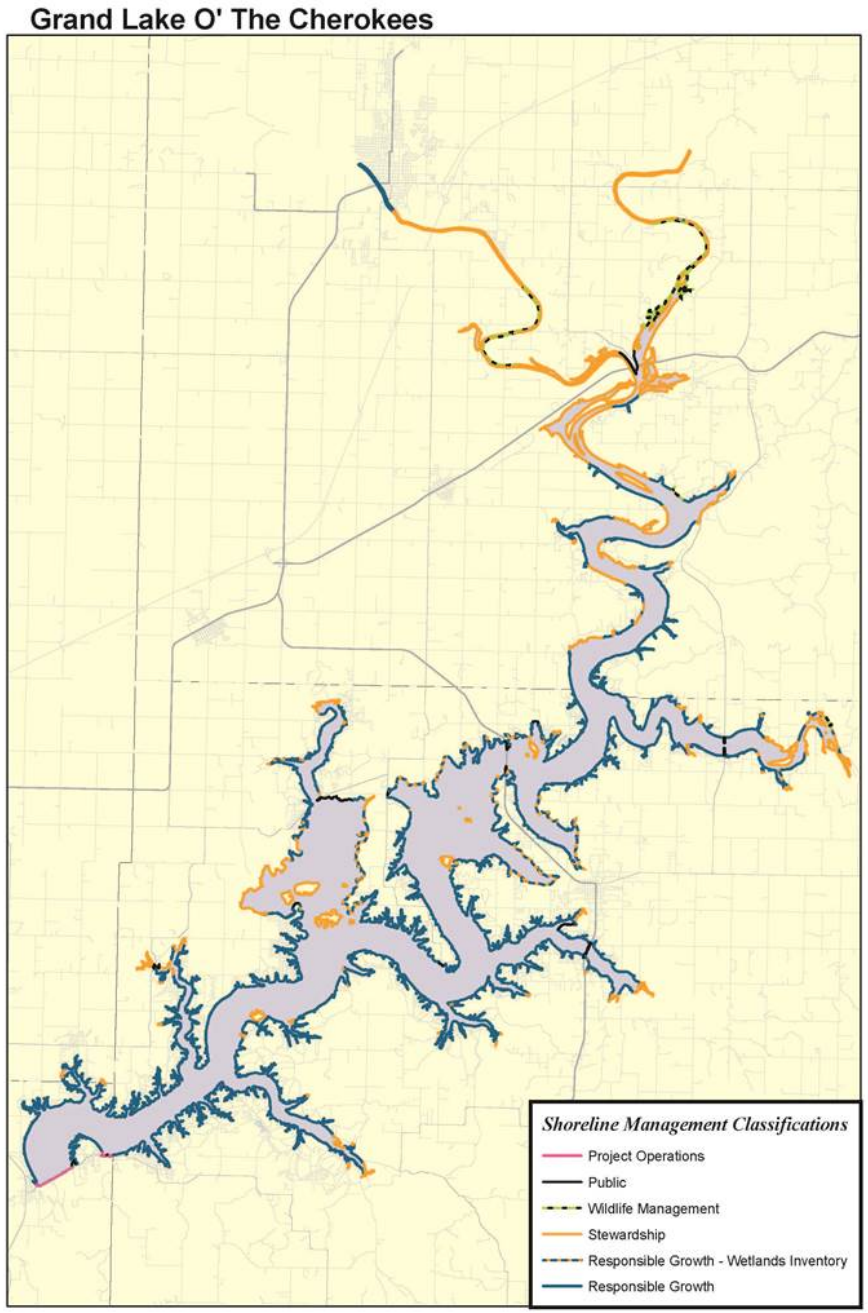
**PENSACOLA PROJECT**
*FERC No. 1494*

**SHORELINE MANAGEMENT PLAN**

*Final Draft*
*September 12, 2007*

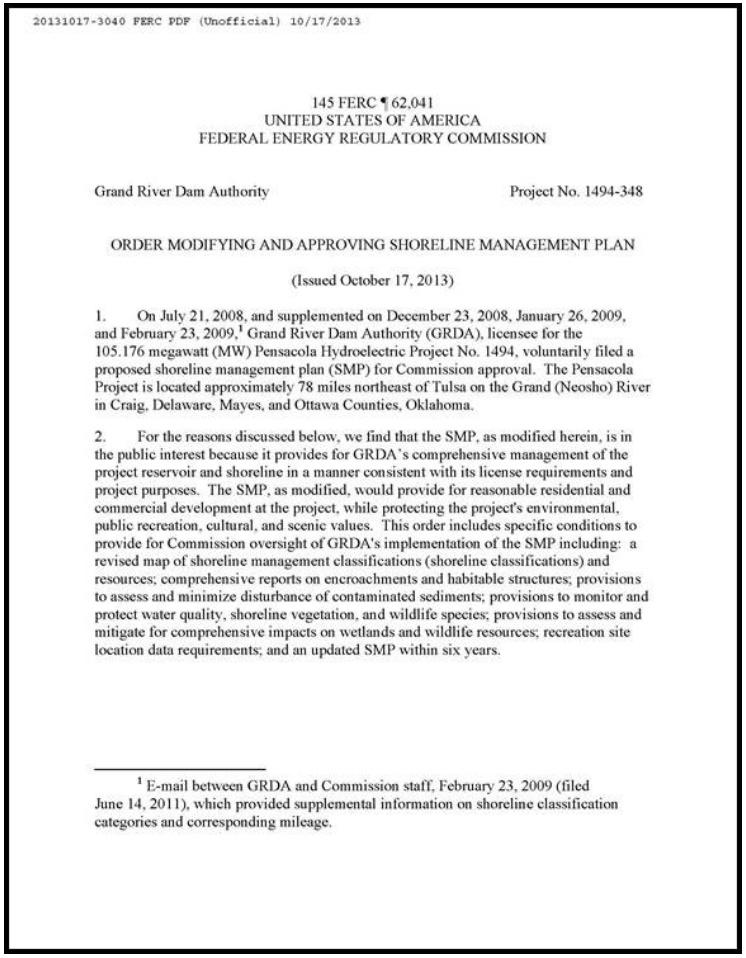
# Shoreline Classifications

- Responsible Growth
- Responsible Growth Wetlands
- Stewardship



# FERC Order Modifying and Approving the SMP

- Approved the SMP however requires GRDA to modify and provide more information on certain aspects.
  - Shoreline Classifications
  - Encroachments
  - Endangered Species
  - Vegetation Management Plan
  - Recreational Use/Water Quality
  - **Dredging**



20131017-3040 FERC PDF (Unofficial) 10/17/2013

145 FERC ¶ 62,041
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Grand River Dam Authority — Project No. 1494-348

ORDER MODIFYING AND APPROVING SHORELINE MANAGEMENT PLAN

(Issued October 17, 2013)

1. On July 21, 2008, and supplemented on December 23, 2008, January 26, 2009, and February 23, 2009,[1] Grand River Dam Authority (GRDA), licensee for the 105.176 megawatt (MW) Pensacola Hydroelectric Project No. 1494, voluntarily filed a proposed shoreline management plan (SMP) for Commission approval. The Pensacola Project is located approximately 78 miles northeast of Tulsa on the Grand (Neosho) River in Craig, Delaware, Mayes, and Ottawa Counties, Oklahoma.

2. For the reasons discussed below, we find that the SMP, as modified herein, is in the public interest because it provides for GRDA's comprehensive management of the project reservoir and shoreline in a manner consistent with its license requirements and project purposes. The SMP, as modified, would provide for reasonable residential and commercial development at the project, while protecting the project's environmental, public recreation, cultural, and scenic values. This order includes specific conditions to provide for Commission oversight of GRDA's implementation of the SMP including: a revised map of shoreline management classifications (shoreline classifications) and resources; comprehensive reports on encroachments and habitable structures; provisions to assess and minimize disturbance of contaminated sediments; provisions to monitor and protect water quality, shoreline vegetation, and wildlife species; provisions to assess and mitigate for comprehensive impacts on wetlands and wildlife resources; recreation site location data requirements; and an updated SMP within six years.

[1] E-mail between GRDA and Commission staff, February 23, 2009 (filed June 14, 2011), which provided supplemental information on shoreline classification categories and corresponding mileage.

# Dredging Management Plan

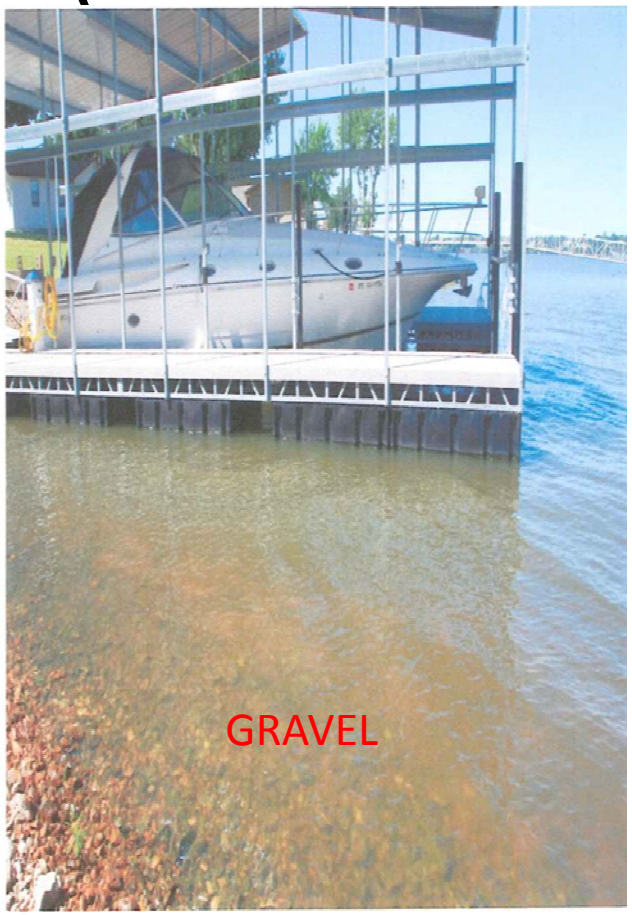
- Dredging Requires Permit from GRDA and USACE
- >2000 Cubic Yards Requires FERC Approval
- Prohibited
  - During Spawning Season
  - In Vegetated Wetlands (From Delineation)
  - On Shorelines Deemed “Sensitive”

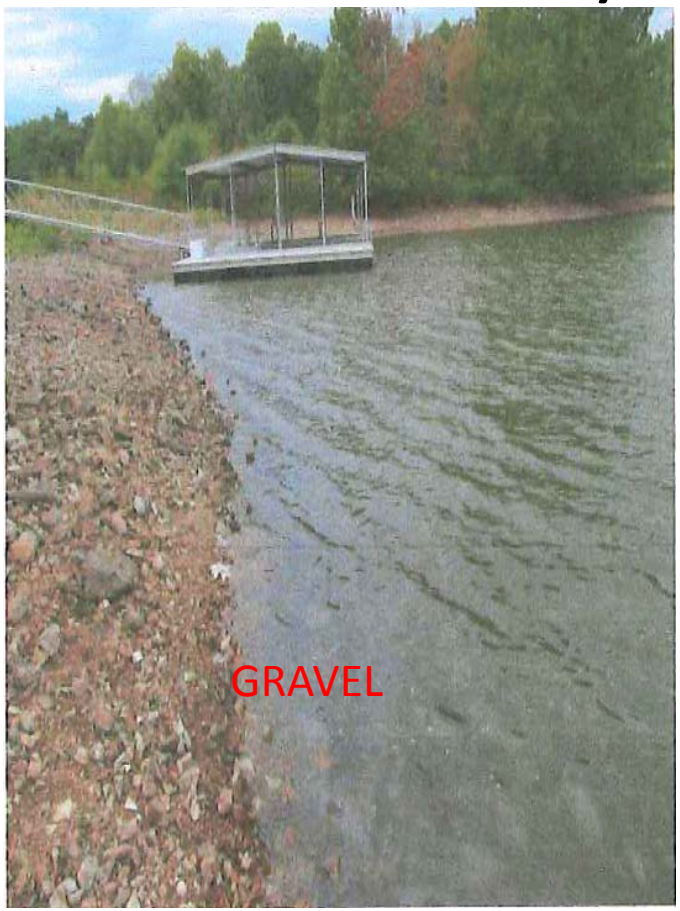
# Dredging Management Plan

- Sediment Testing
  - 4 Sediment Cores to 5 ft depth (or refusal) in dredging area for every 2000 Cubic Yards
  - Cores Homogenized and one sample sent to DEQ Lab for metals testing and USFWS approved Lab for particle size analysis.
    - COPCs: Cadmium, Lead, Zinc
  - Resource Agencies receive 30 day comment period on results.
  - Metals concentrations >TEC (Macdonald et al., 2000) will be submitted to FERC for final approval.

# Dredging Method (1 Step)


# Problems With Plan
# (From Consultant Comments)



# Define Sediment…

September 29, 2011

[redacted]

Dear [redacted]

Thanks you for reviewing the described dredging project proposal on behalf of [redacted] You have pointed out that photographs showed a sample being taken from the shoreline rather than from the exact area where dredging will occur. According to the sampling technician, no sample was obtainable from the area where the dredging will occur because it was all rock. He attempted to do cores and was unable to do so because it was rock. As you know, DEQ labs do not analyze rock. In order to try to have something representative he moved up to the shore line.

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Howe
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None

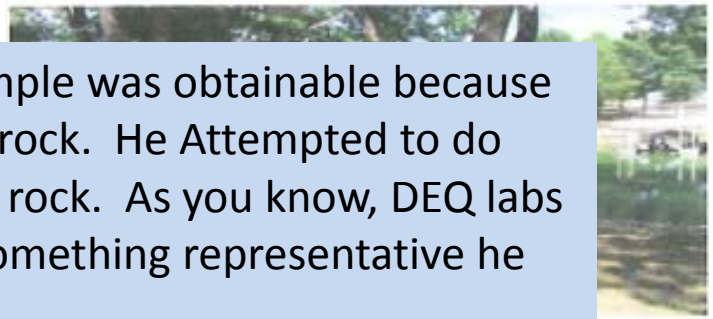
Thank you for your comments.

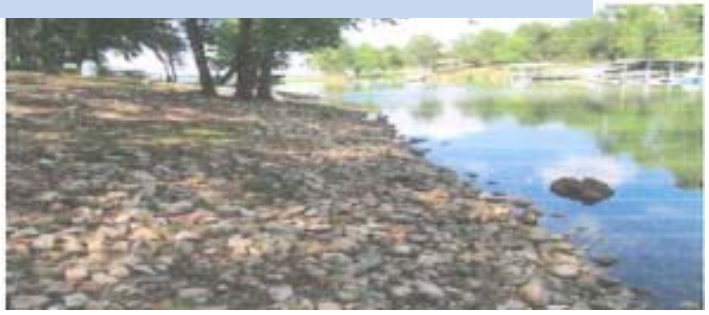
[redacted]

cc: [redacted]

RECEIVED
OCT 05 2011
ORDA
ECOSYSTEMS

[redacted]





"According to our sampling technician, no sample was obtainable because the area where dredging would occur was all rock. He Attempted to do cores and was unable to do so because it was rock. As you know, DEQ labs do not analyze rock. In order to try to have something representative he moved up the shoreline."

# Problems With Plan (Dated Information)

- Dredging Management Plan was written in 2005.
  - Based on TEC values from McDonald et al. 2000
  - The extent of contamination and toxicity of the sediments was unknown at the time, hence the cautious approach.

**Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems**

D. D. MacDonald,[1] C. G. Ingersoll,[2] T. A. Berger[3]

[1] MacDonald Environmental Sciences Ltd., 2376 Yellow Point Road, Nanaimo, British Columbia V9X 1W5, Canada
[2] Columbia Environmental Research Center, U.S. Geological Survey, 4200 New Haven Road, Columbia, Missouri 65201, USA
[3] 159-1410 Richmond Avenue, Houston, Texas 77006, USA

Received: 23 August 1999/Accepted: 13 January 2000

# Problems With Plan (Dated Information)

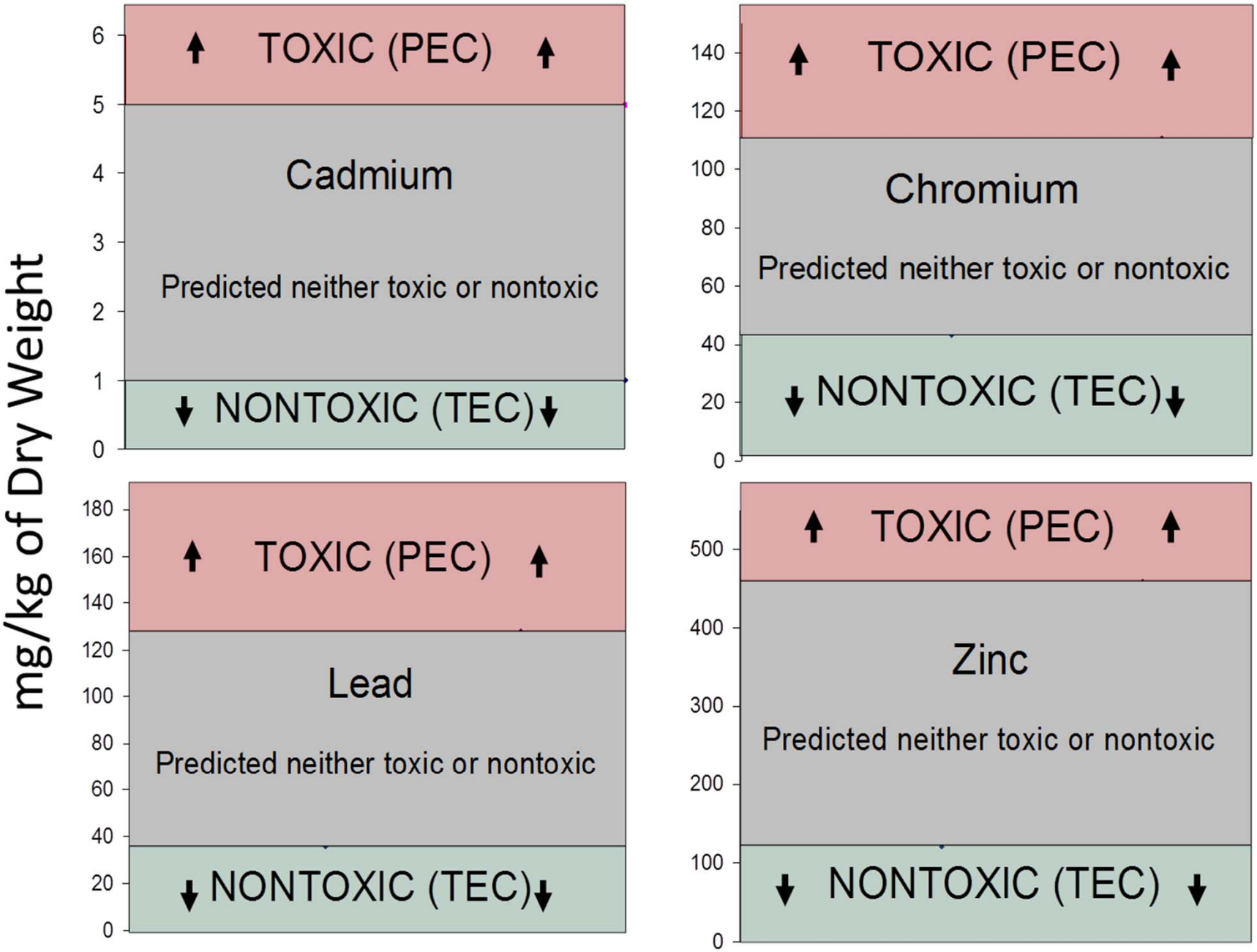
- Threshold Effects Concentration (TEC)
  - Intended to identify contaminant concentrations **below which** harmful effects on sediment dwelling organisms were not expected.
- Probable Effects Concentration (PEC)
  - Intended to identify contaminant concentrations **above which** harmful effects on sediment-dwelling organisms were expected to occur frequently.

# Current GRDA Screening Levels

| Analyte | TEC (mg/kg) | PEC (mg/kg) | TSMD Specific PEC |
|---|---|---|---|
| Cadmium | 0.99 | 4.98 | 11.1 |
| Lead | 35.8 | 128 | 150 |
| Zinc | 121 | 459 | 2,083 |

Samples with contaminant concentrations between the TEC and the PEC were neither predicted to be toxic or non toxic. **(i.e. the individual SQGs are not intended to provide guidance within this range of concentrations.)**

**-(MacDonald et al., 2000)**




MacDonald, D. D., C. G. Ingersoll, T. A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology:39 20-31.

# Data from Dredging Applications

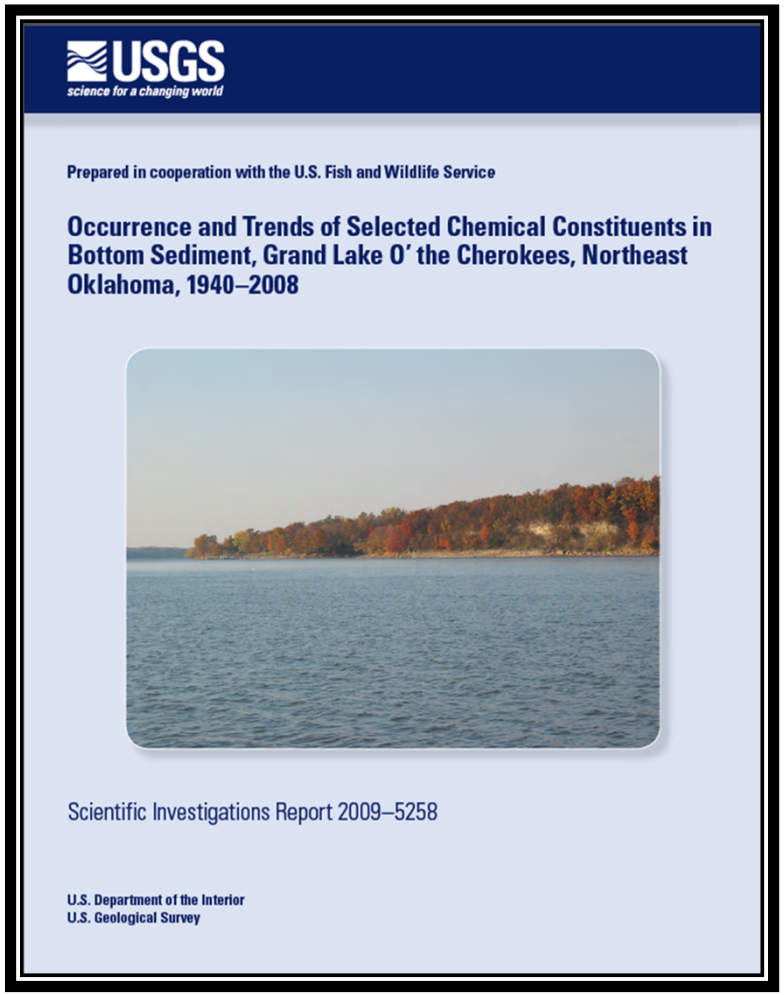
| Year | Permit # | Cd(mg/kg) | Pb (mg/kg) | Zn (mg/kg) | %Coarse | %Fine |
|---|---|---|---|---|---|---|
| 2010 | 1 | <1.0 | 13.3 | 40.1 | 61.63% | 38.37% |
| 2011 | 2 | <5.0 | <10 | **138** | 66.24% | 33.76% |
| 2012 | 3 | <1.0 | 29.9 | **299** | 66.24% | 33.76% |
| 2012 | 4 | <5.0 | 26.3 | **250** | 3.20% | 96.80% |
| 2012 | 5 | <5.0 | **41.9** | **122** | 77.85% | 22.15% |
| 2012 | 6 | <5.0 | 16 | 102 | 80.36% | 19.75% |

- Cd: <PEC (ODEQ ICP-OES method) <TEC (ODEQ ICP-MS method)
- Pb: Permit #5 between TEC and PEC
- Zn: Permit #2, #3, #4 between TEC and PEC

*Fifteen Permit Applications from 2009-Present.

# Previous Research

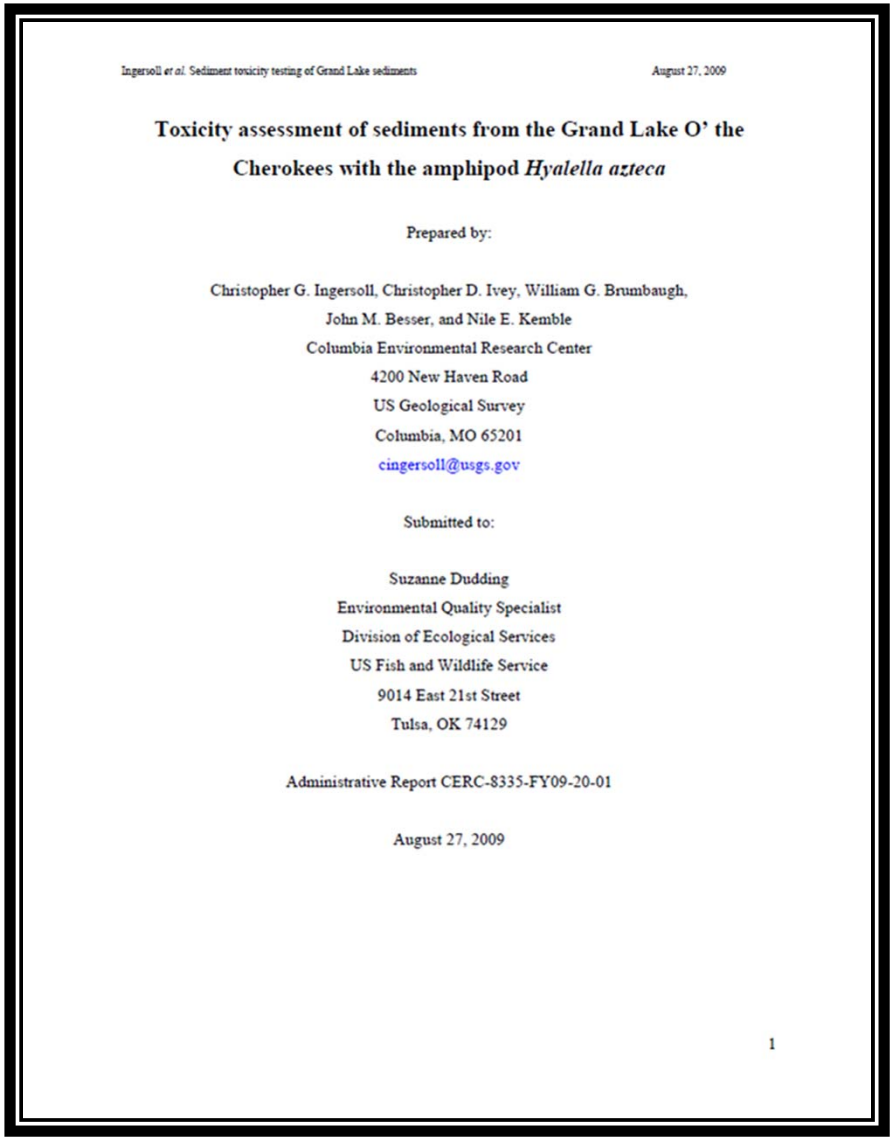
- Juracek and Becker (2009)
  - Cadmium and Lead concentrations between TEC and PEC and < TSMD PEC
  - Zinc typically exceeds PEC but is <TSMD PEC



# Previous Research

- Ingersoll et al., 2009
  - Results indicate that metals concentrations in Grand Lake Sediment samples were not high enough to reduce survival or growth of amphipods.
    - Samples Collected by USFWS, analyzed by USGS
  - 73% of Samples exceeded Zn PEC
  - 20% of Samples exceeded Cd PEC
  - 0% of samples exceeded Pb PEC

**Why are we still using general TEC's Again?**



Ingersoll *et al.* Sediment toxicity testing of Grand Lake sediments August 27, 2009

**Toxicity assessment of sediments from the Grand Lake O' the Cherokees with the amphipod *Hyalella azteca***

Prepared by:

Christopher G. Ingersoll, Christopher D. Ivey, William G. Brumbaugh,
John M. Besser, and Nile E. Kemble
Columbia Environmental Research Center
4200 New Haven Road
US Geological Survey
Columbia, MO 65201
cingersoll@usgs.gov

Submitted to:

Suzanne Dudding
Environmental Quality Specialist
Division of Ecological Services
US Fish and Wildlife Service
9014 East 21st Street
Tulsa, OK 74129

Administrative Report CERC-8335-FY09-20-01

August 27, 2009

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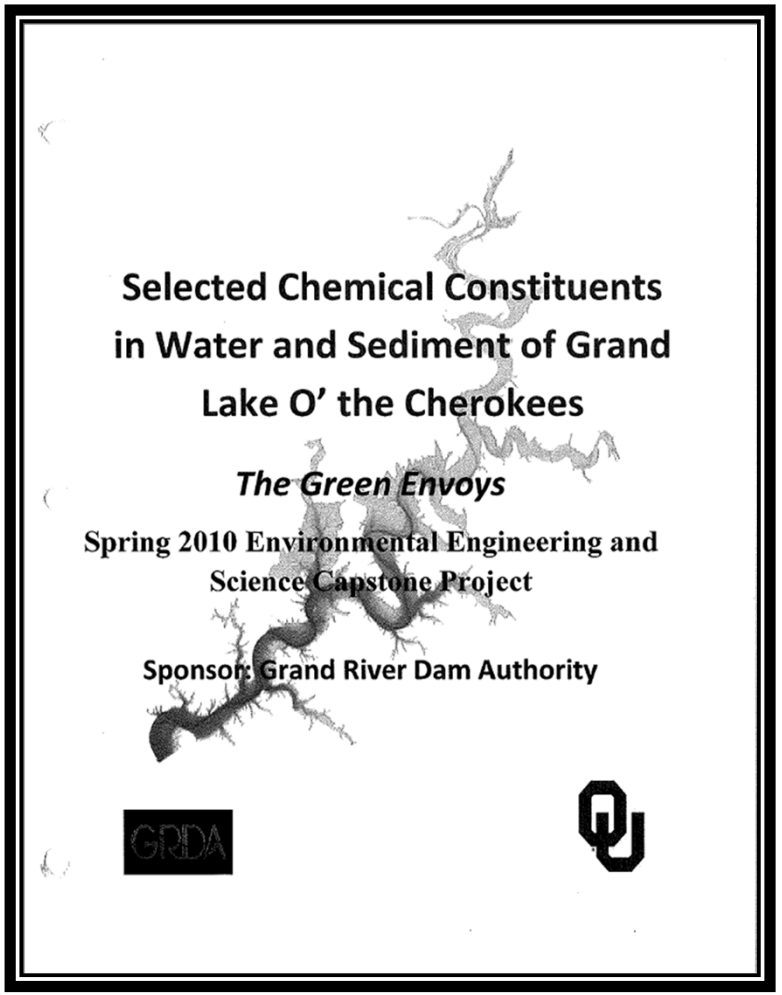
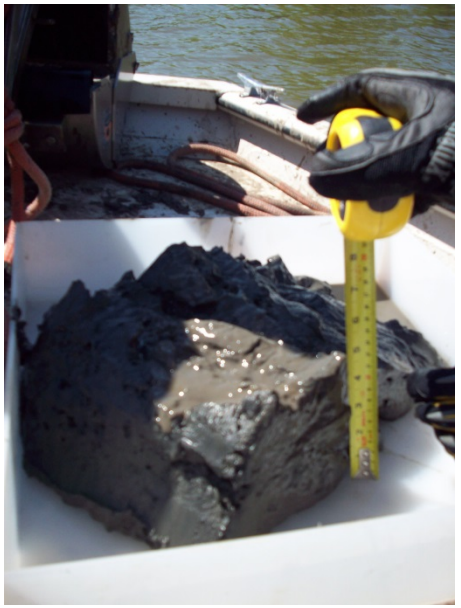
# Previous Research

- OU Capstone Course
  - Conducted TCLP on reconstituted sediment cores from different areas of the lake.
  - TLCP results indicate all contaminants near detection levels and far below RCRA regulatory levels.



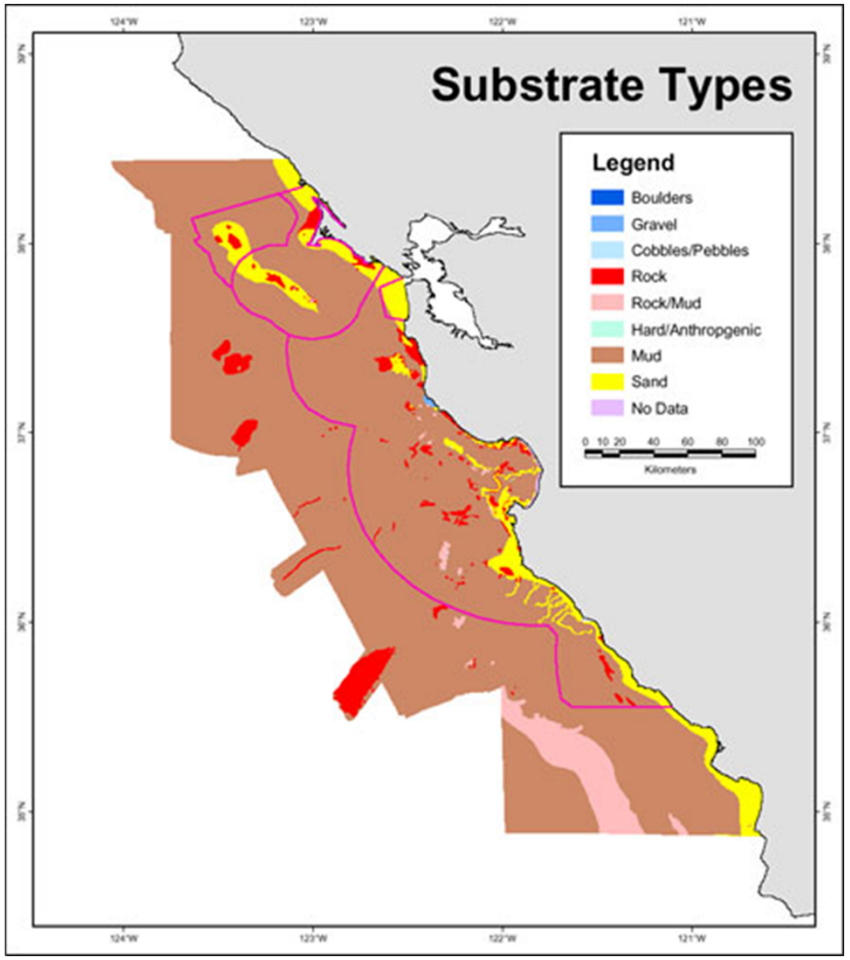
# Current Research

- Sediment assessment north of Sailboat Bridge (GRDA and OSU)
  - Testing Metals Concentrations
  - Toxicity & Bioaccumulations under aerobic and aerobic conditions.



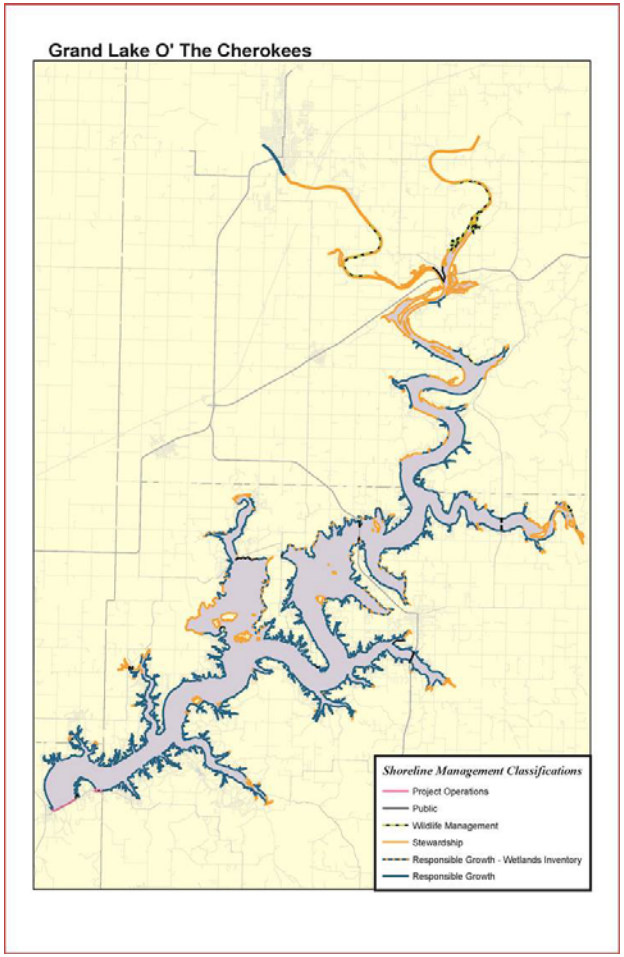
# Planned Research

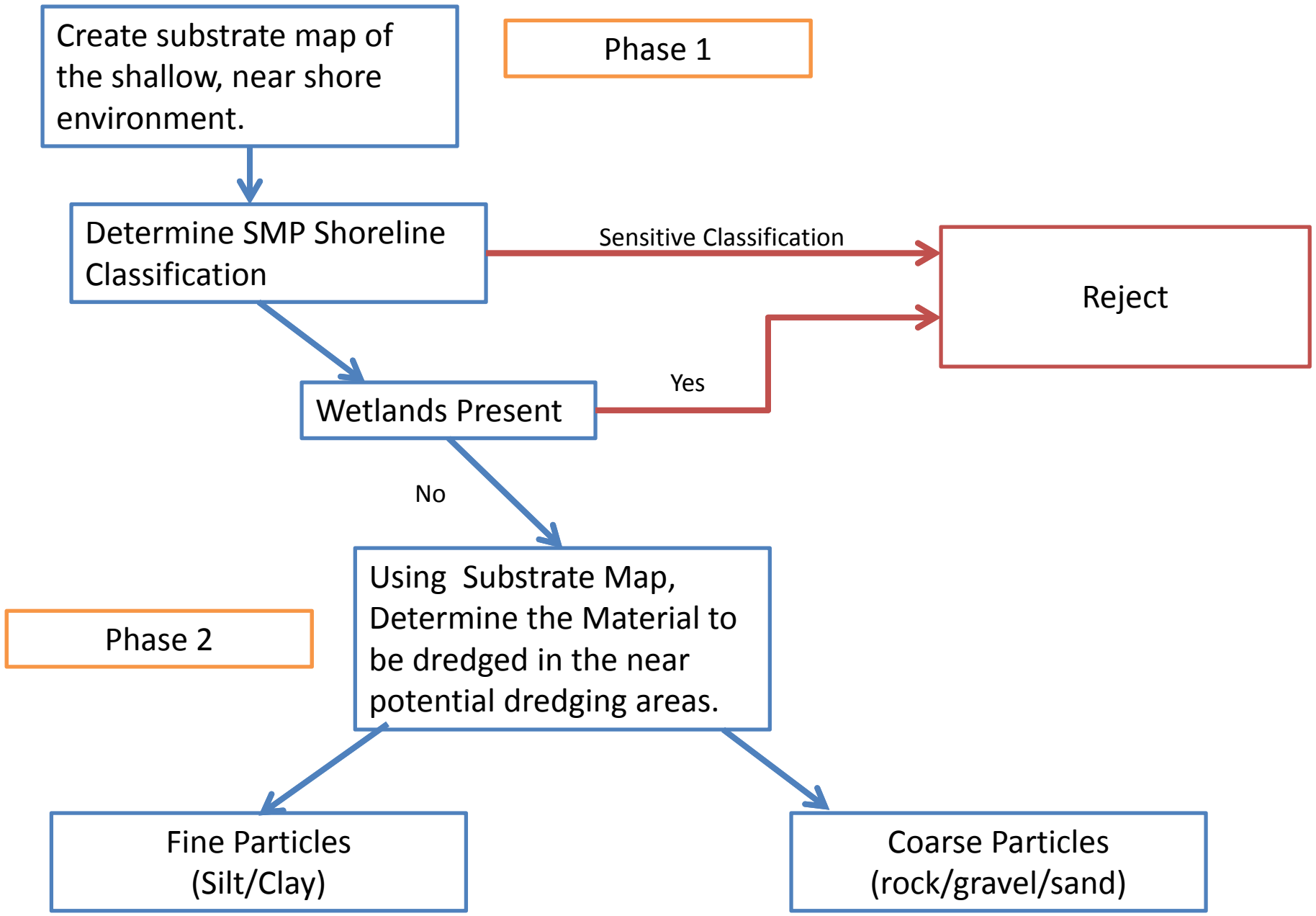
- Substrate Mapping (OWRB)
  - 10’ depth zone from 745’ Elevation
  - Provide information on substrate type and relative depth to parent material.
  - Assess Habitat Type
  - Direct Coring Efforts

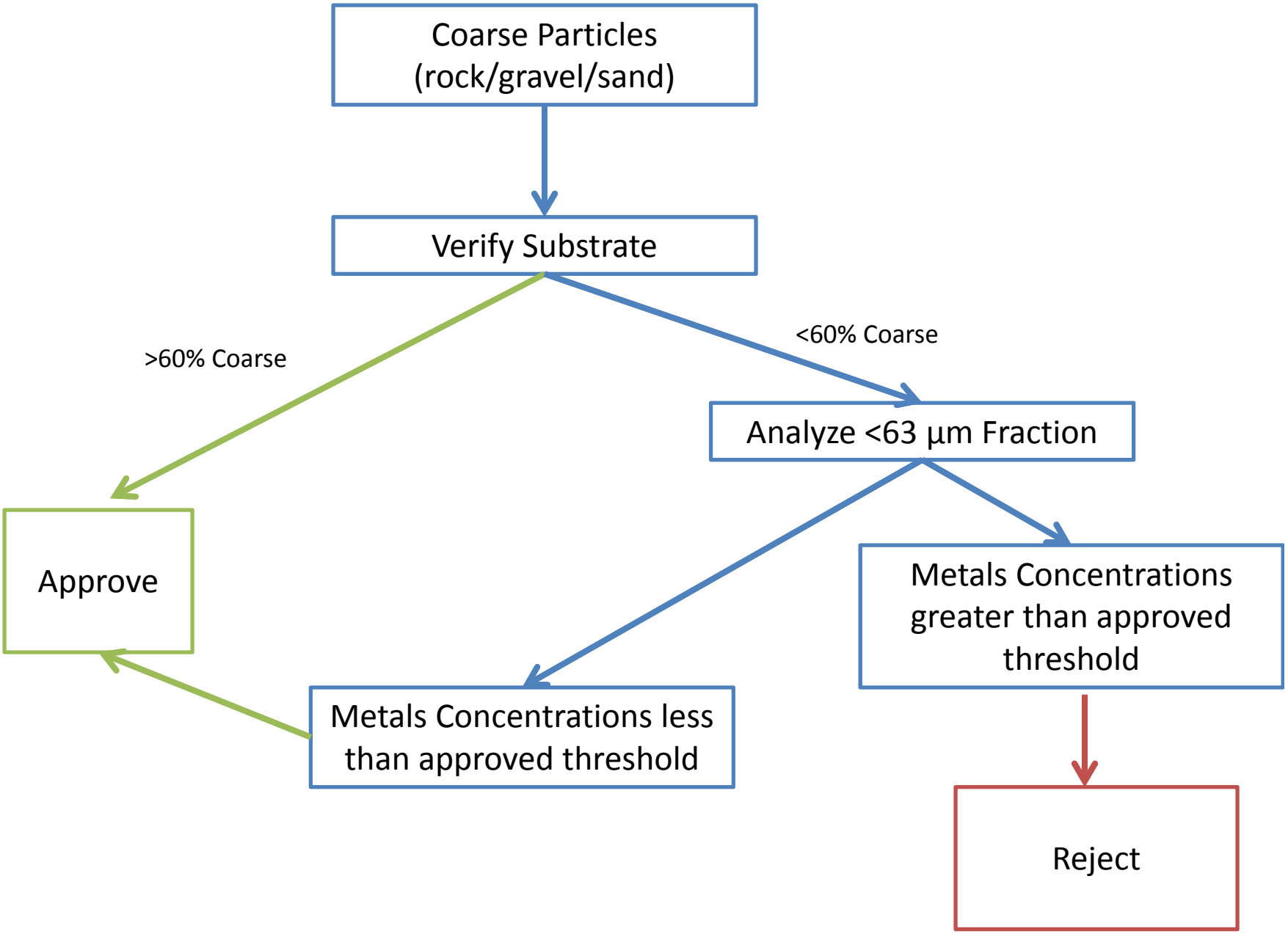


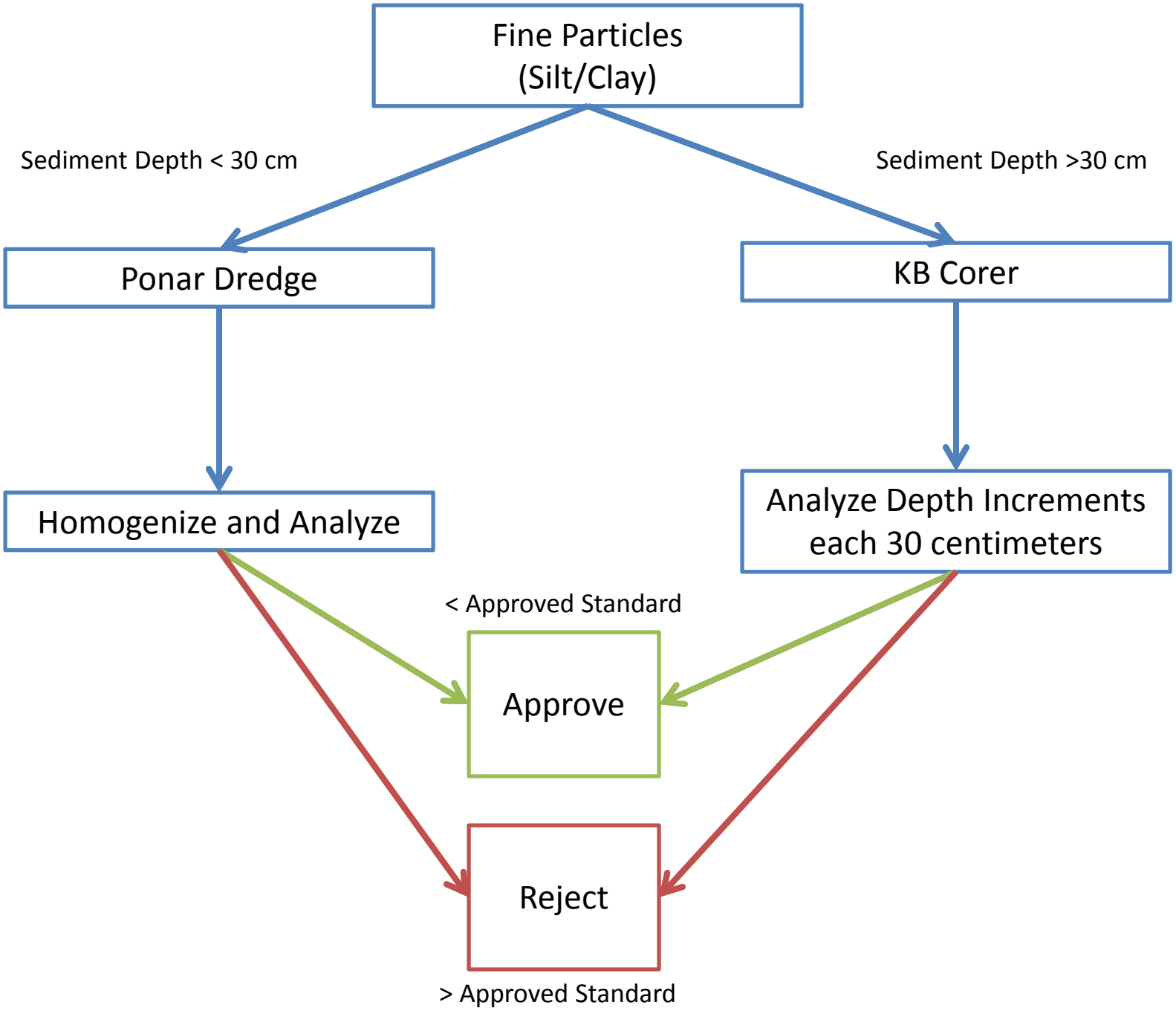
# Permitting Strategy

- Our overall Goal is to take much of the testing off the applicant.
- Incorporate the most up to date information and research into our permitting procedures.
- Create a dredging management map




Create substrate map of the shallow, near shore environment.
Phase 1
Determine SMP Shoreline Classification
Sensitive Classification
Reject
Wetlands Present
Yes
No
Phase 2
Using Substrate Map, Determine the Material to be dredged in the near potential dredging areas.
Fine Particles (Silt/Clay)
Coarse Particles (rock/gravel/sand)


Coarse Particles (rock/gravel/sand)
Verify Substrate
>60% Coarse
<60% Coarse
Analyze <63 µm Fraction
Approve
Metals Concentrations greater than approved threshold
Metals Concentrations less than approved threshold
Reject


Fine Particles
(Silt/Clay)
Sediment Depth < 30 cm
Sediment Depth >30 cm
Ponar Dredge
KB Corer
Homogenize and Analyze
Analyze Depth Increments
each 30 centimeters
< Approved Standard
Approve
Reject
> Approved Standard

# Closing

- The current dredging management plan has problems.
  - Contaminant thresholds need to be updated to provide a cutoff, not a grey area.
  - Creating “Dredging Management Zones” would allow the GRDA and other resource agencies to make better informed decisions regarding near shore dredging operations.