



# Dredging Advances in the Dredging Operations and Environmental Research (DOER) Program

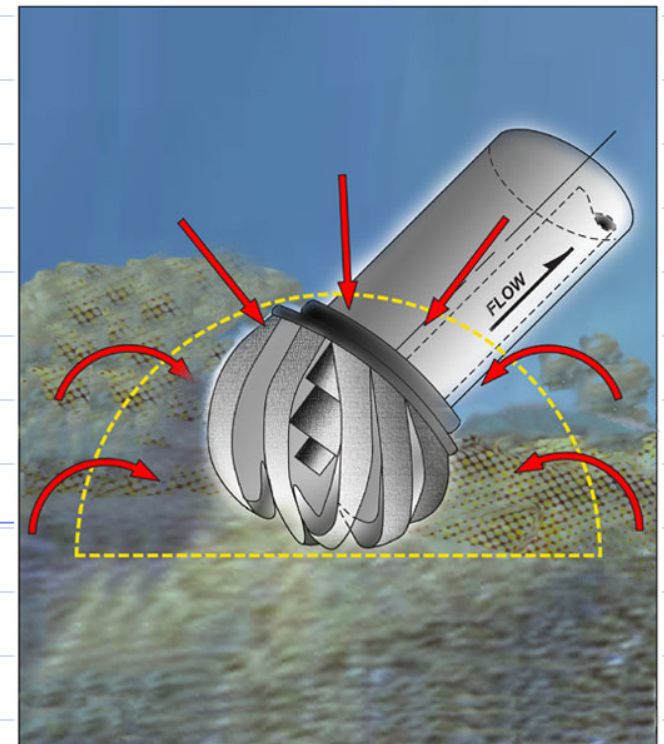
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AAPA HNE Seminar

June 7, 2006

Vancouver, BC





# Talk Outline

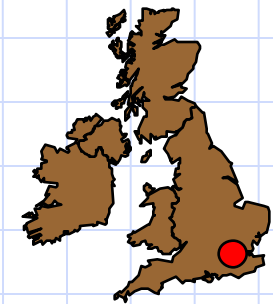
- ◆ ERDC Background
- ◆ DOER Background
- ◆ Dredging Operations Decision Support System (DODSS)
- ◆ Resuspension due to dredging
- ◆ Threatened and Endangered Species



Alaska Projects Office

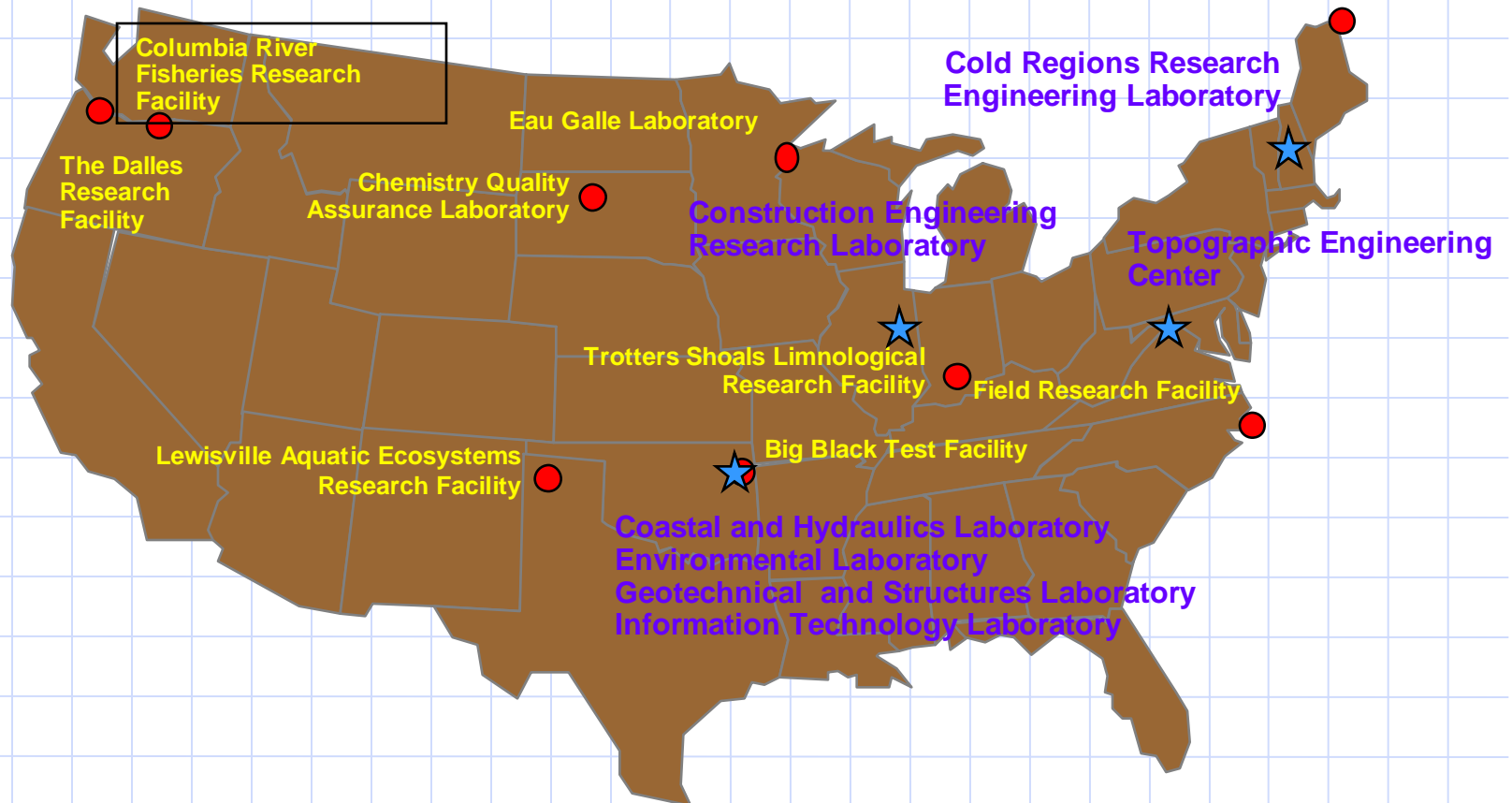
Anchorage Field Office

# Engineer Research and Development Center



European Research Office

Field Exposure Station





# Dredging Operations and Environmental Research (DOER) Program

- ◆ Began in 1997
- ◆ Continuing program - O&M Funded
- ◆ \$6M year
- ◆ Goal: Keep dredging cost-effective and environmentally sustainable
- ◆ Four Focus Areas
  - Innovative Technology,
  - Dredged Material Management,
  - Environmental Resource Projection,
  - Risk
- ◆ <http://el.erdc.usace.army.mil/dots/doer/>



# Dredging Operations Decision Support System - Motivation

- ◆ Manpower trends
- ◆ Loss of expertise to retirements
- ◆ Assimilating increased data and models
- ◆ Complexity of dredging process



# Dredging Business Process



Navigable Channels



Economics



Dredging



Placement



Dredging Business Process



# DODSS Objectives

- ◆ Schedule maintenance dredging
- ◆ Optimize cost-performance of dredging
- ◆ Anticipate episodic and emergency dredging
- ◆ Real-time planning for emergency response
- ◆ New work planning





# DODSS Questions & Answers

Who are the users?	Dredging Operations Managers
How does it work?	A continuously operating Web server that sends email advice
How will it help Dredging Managers?	Save time, heads up, more data & options
Who is the sponsor?	DOER program





# DODSS is NOT

- ◆ A spreadsheet
- ◆ A numerical model visualization
- ◆ An environmental impact planning tool
- ◆ A planning risk assessment tool.



# Decision Support System

- ◆ Synthesis of past and present data from databases
  - (SI, Hydrosurveys, weather, financial, etc)
- ◆ Executes mathematical models and simulations
- ◆ Reason with heuristic knowledge
- ◆ Evaluate multiple solutions
- ◆ Combined visual presentation



# Project Manager Interface

## ◆ Email

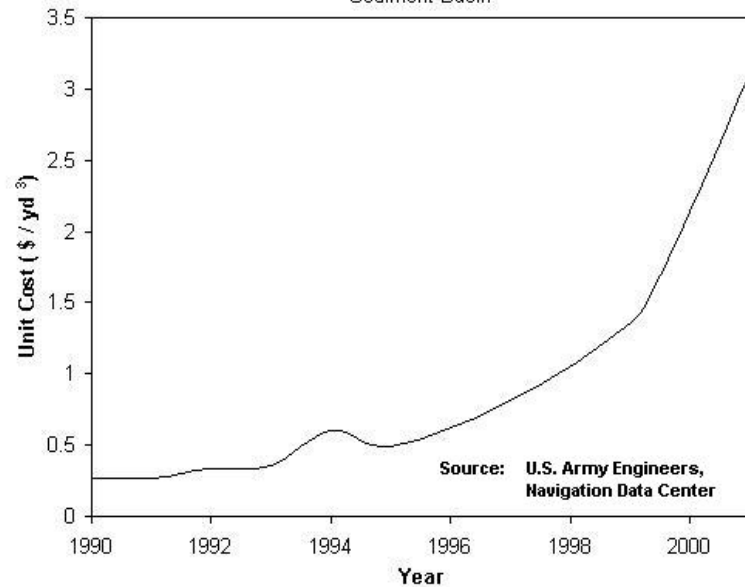
- Climate events
- High sedimentation predicted
- Navigation problems predicted
- Plant availability conflicts
- Survey recommended

## ◆ Web

- Project Status Page
- Customizable ala Yahoo, etc.
- Current predictions of all models
- Comparison with historical averages and trends



# Savannah Harbor King Island Turning Basin



- ◆ Disposal area distance increases costs.



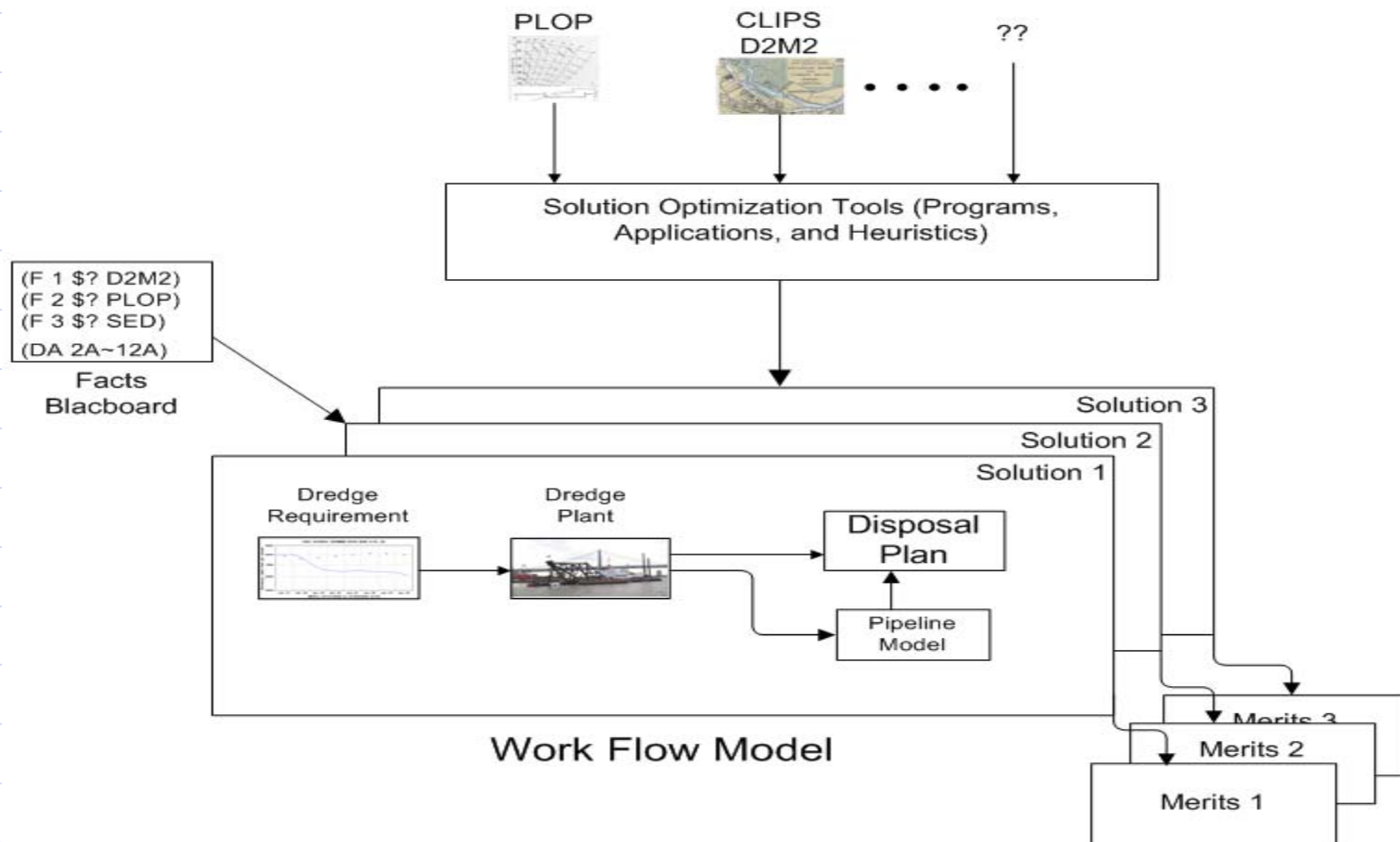


# Define Success

- ◆ Optimize the dredging schedule of the turning basin. The schedule incorporates historical dredging schedules compared with historical hydrologic forcings that cause sedimentation.
  - Optimize the pipeline system performance considering distance to disposal area
  - Optimize disposal area use

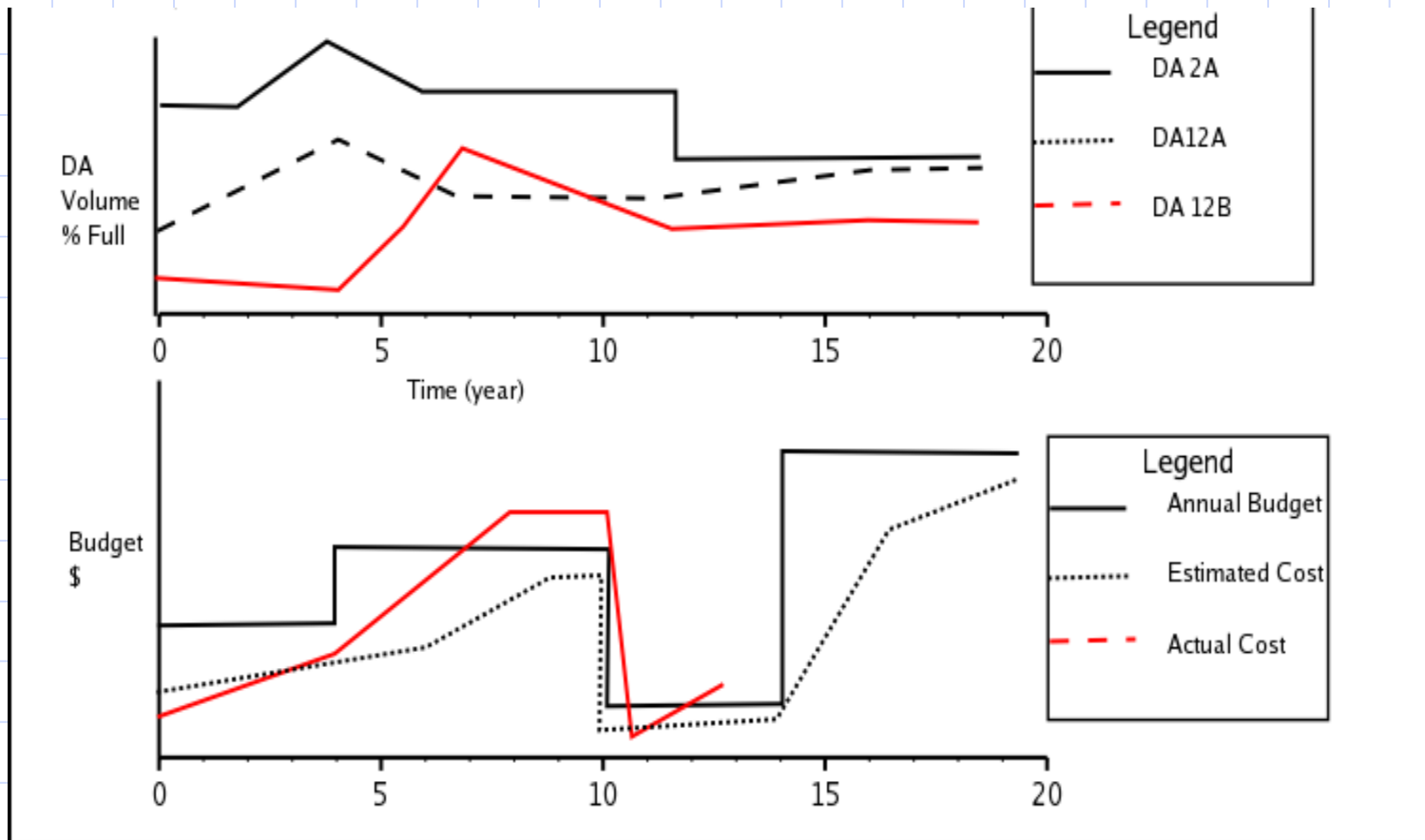


# King Island Turning Basin Confined Disposal Site Optimization





# Disposal Area Budget Projection





# Recommendations

- ◆ Long-term digital data enables modern management.
- ◆ Data beyond contract monitoring is required.
- ◆ Data housed in SI and SDS databases
- ◆ Monetize the value of data for Corps districts and contractors.

<https://dodss.wes.army.mil/>





# Resuspension Due to Dredging



We can see it but....

What is it that we see?

Is it important?



# Standard setting?



- ◆ Dredge contractors may have to conform to a standard that:
  - is not properly defined
  - cannot be measured
  - cannot be achieved
- ◆ Unreasonable restriction?
- ◆ Too lenient restriction?



# Resuspension Due to Dredging, Corps Research Goals

- ◆ Ability to predict TSS resulting from dredging
  - Full Range of Sediments
  - Full Range of Dredge Types
  - Full Range of Hydrodynamics
  - Full Range of Environments
    - ◆ Riverine
    - ◆ Estuarine
    - ◆ Coastal/Oceanic
- ◆ Contaminant losses
- ◆ Impacts of resuspended solids on the biological community



# DOER Resuspension Research Efforts

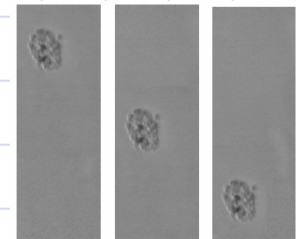
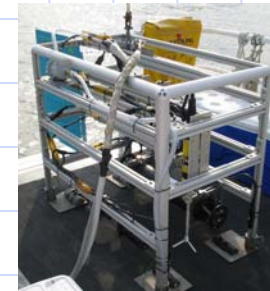
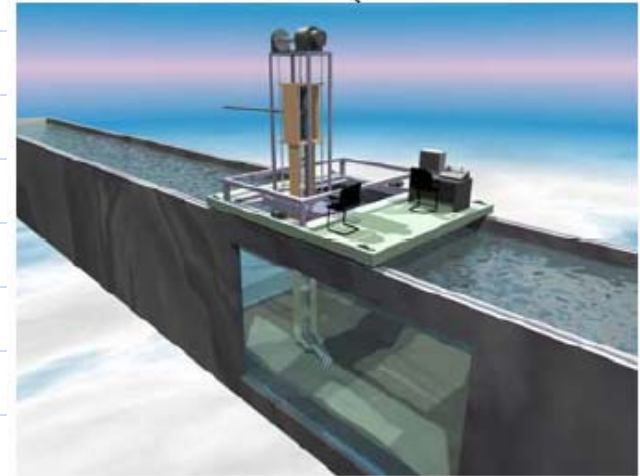
- ◆ Source Term
- ◆ Near field Modeling
- ◆ Far Field Modeling
- ◆ Field Monitoring (model validation)
- ◆ Dredged material mound erosion
- ◆ Biological Impacts
- ◆ ACCORD





# Resuspension Source Term Research

- ◆ Laboratory – 06 & 07
  - Small Scale
  - Medium Scale (Houdini Tank)
- ◆ TAMU Dredging Facility 08 (large scale)
- ◆ Settling of Cohesive Particles
  - Video Camera
- ◆ Field Monitoring Efforts
  - Baltimore Harbor Deepening
  - Providence Harbor Deepening
  - Richmond Harbor, CA (June 06)

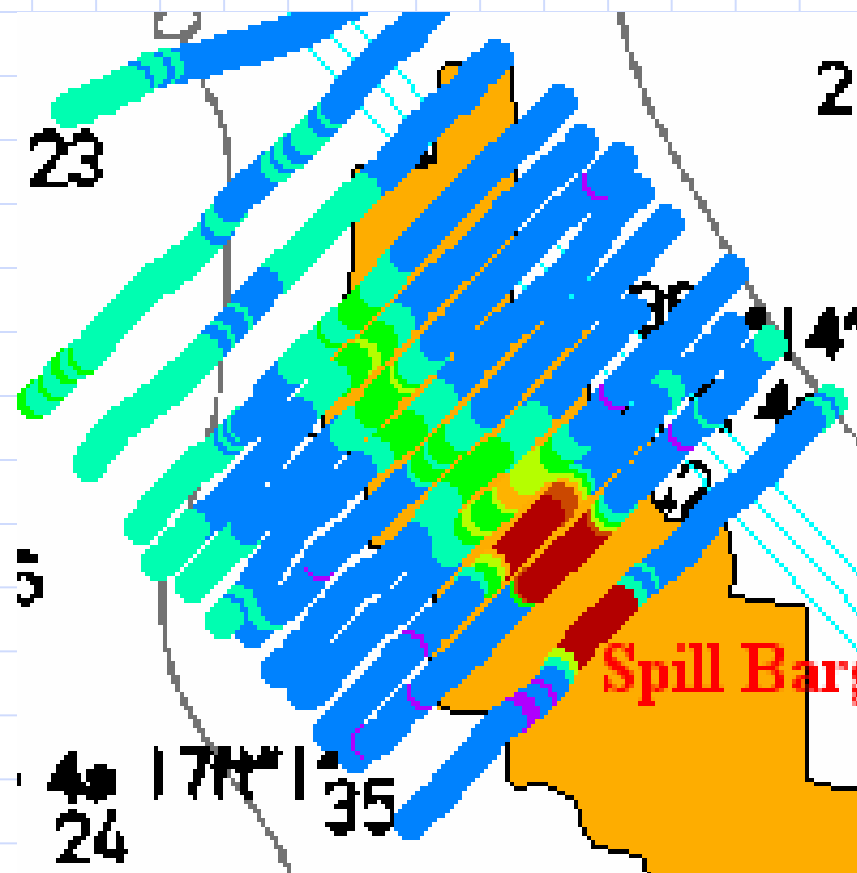




# Numerical Modeling

## ◆ Particle Tracking Model

- Successor to SSFATE
- Deposition and re-resuspension
- Water Quality - contaminants





# Environmental Impacts of Resuspension

## ◆ Laboratory and Field Studies

- Effects of burial
- Effects of resuspended solids in the water column
- ◆ Complete collaborative studies with NMFS and EPA (e.g., winter flounder)
- ◆ Expand database with data derived from partnered studies (e.g., walleye)
- ◆ Develop defensible methodologies for interpretation of SS data





# European Resuspension Research

- ◆ HR Wallingford, Rijkswaterstaat, SSB  
**Turbidity Assessment Software (TASS)**
  - Quality Software for Resuspension Predictions
- ◆ Field Monitoring of Mechanical and Hopper Dredges
- ◆ Hopper Emphasis
- ◆ Contract for Additional Hopper Field Trials
- ◆ Monitoring Protocols





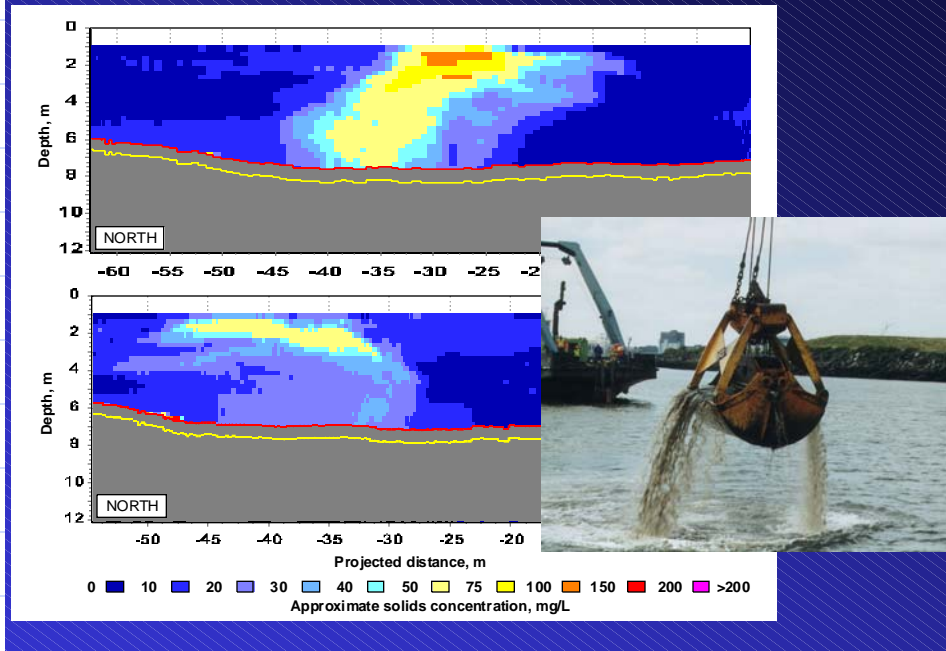
## Advice and Consultation Committee on Resuspension by Dredging (**ACCORD**)

- ◆ Initial Planning in 03
- ◆ Goal – Support Reasonable, Science based policies/standards for Resuspension Impacts
- ◆ Existing members HRW, RWS, USACE
- ◆ Corps Web Site
  - <http://el.erdc.usace.army.mil/dots/accord/index.html>
- ◆ ACCORD – stagnant since 04/05



# ACCORD

## Grab hoisting and grab leakage plumes



- ◆ Drafting updated charter
- ◆ Seeking Members to fund activities
  - US and European Secretaries
  - Disseminate Information (protocols, software, etc.)
    - Web site, publications, conferences, meetings
  - Develop Recommended Policies
  - Help to Coordinate Research



# ACCORD

- ◆ Suggested Membership Costs
  - Consulting firms, \$1K
  - Ports, \$5K
- ◆ Meeting to finalize charter – WEDA (June 06)
- ◆ POCs
  - Lead Secretary – Neville Burt (HRW)  
[tnb@hrwallingford.co.uk](mailto:tnb@hrwallingford.co.uk)
  - US – Tom Borrowman (ERDC)  
[thomas.d.borrowman@erdc.usace.army.mil](mailto:thomas.d.borrowman@erdc.usace.army.mil)
- ◆ Please contact us if you are interested



# DOER Threatened and Endangered Species (TES) Research





# TES Research

## ◆ High Priority Target Species

- Sturgeon ★
- Least Tern and Piping Plover ★
- Salmon
- FW Mussels
- Sea Turtles
- American Shad ★

## ◆ Tools and Technologies

- T&E Species Management System ★
- Tracking Technologies ★



## Research Task: *Migratory Shorebird Protection*

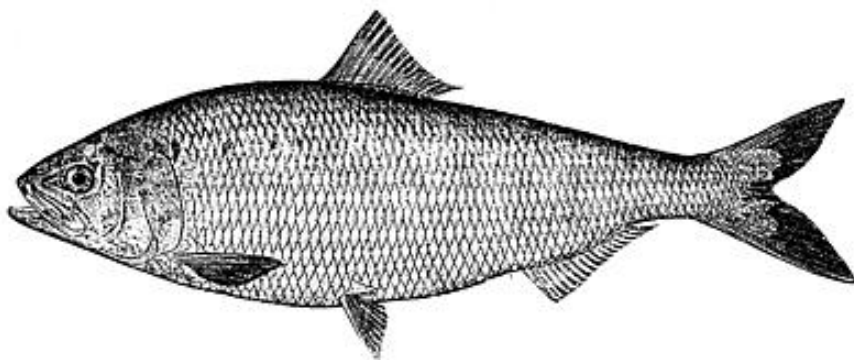


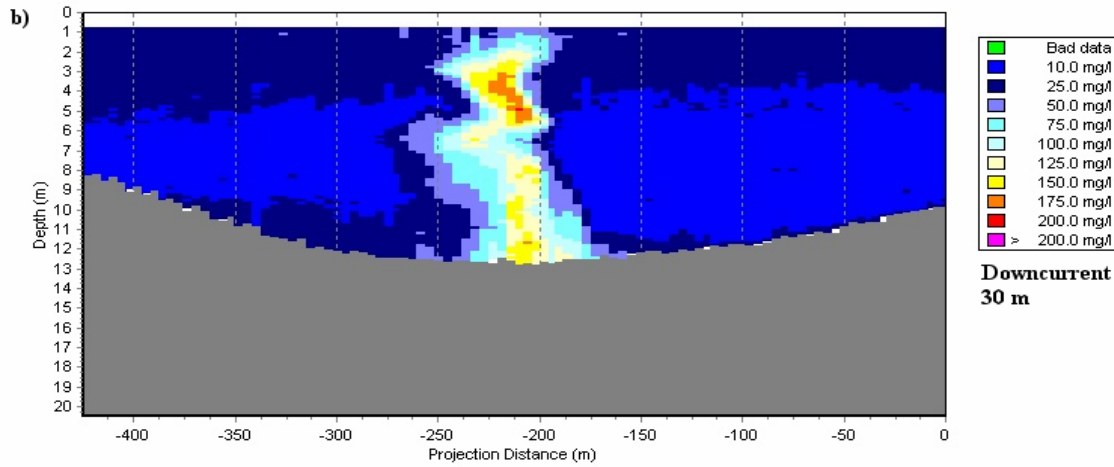
- **Comprehensive management plan lacking**
- **Conflicts associated with navigation projects undefined**
- **Need expanded knowledge base of habitat requirements, seasonality, behavior**
- **Collaborative efforts required, including NGOs (e.g., Amer. Bird Conservancy)**
- **Need Up-to-Date Guidance on Best Management Practices**

## Research Task: *Shad & Herring Protection*



- **Concerns for American shad and other anadromous herring species frequently lead to restrictions**
- **Migratory blockage often cited, but unsubstantiated**
- **Definitive field studies needed**
- **Extensive interagency coordination and collaboration required**





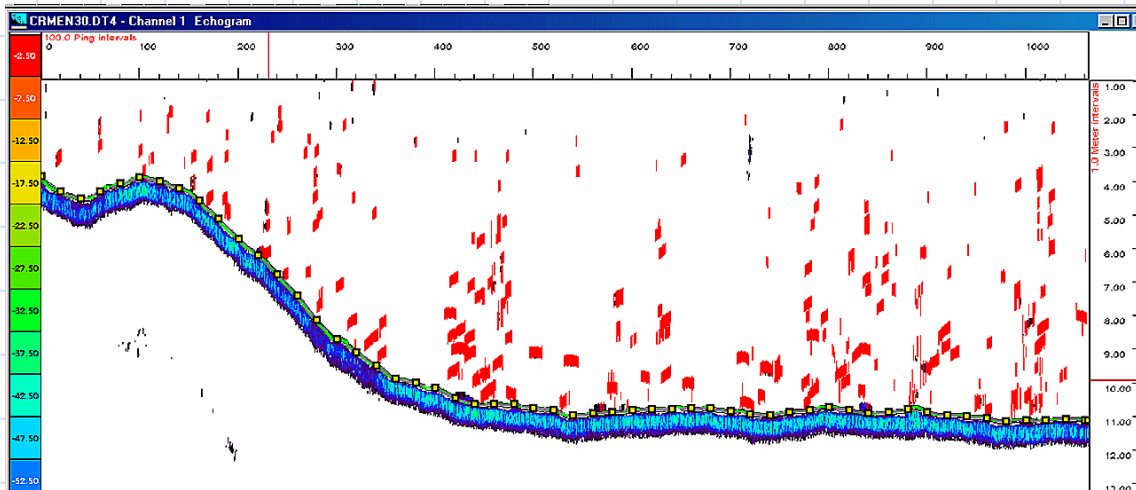
**PLUME  
DYNAMICS**

**FISH  
DISTRIBUTION**



**ADCP**

**SPLIT-BEAM  
HYDROACOUSTICS**







# Summary

- ◆ DODSS – Next Generation Software for Dredging Project Management
- ◆ Resuspension Due to Dredging – Progress in all phases – joint effort with Europeans
- ◆ ACCORD – Opportunity to Advance Sound Science and Policy on Resuspension
  - Soliciting membership by Ports
- ◆ TES – Science and engineering to reduce impacts, reign in costs, and expand windows
- ◆ **ERDC can work for Ports (State Agencies)**
- ◆ **Brochures on Registration Table**



# Questions?

