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

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Talk Outline

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

Navigation

Navigable Channels

Requirements

Planning

Dredging

Placement

Funding

Economics
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

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</thead>
<tbody>
<tr>
<td>Who are the users?</td>
<td>Dredging Operations Managers</td>
</tr>
<tr>
<td>How does it work?</td>
<td>A continuously operating Web server that sends email advice</td>
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<td>How will it help Dredging Managers?</td>
<td>Save time, heads up, more data &amp; options</td>
</tr>
<tr>
<td>Who is the sponsor?</td>
<td>DOER program</td>
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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

Solution Optimization Tools (Programs, Applications, and Heuristics)

PLOP
CLIPS D2M2

Solution 1
Solution 2
Solution 3

PLOP
CLIPS D2M2

Dredge Requirement
Dredge Plant
Disposal Plan
Pipeline Model

Merits 1
Merits 2
Merits 3

(F 1 $? D2M2)
(F 2 $? PLOP)
(F 3 $? SED)
(DA 2A-12A)
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 loses
- 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**
- **ACCORD** – stagnant since 04/05
ACCORD

- 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
- US – Tom Borrowman (ERDC)
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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
ADCP

SPLIT-BEAM HYDROACOUSTICS

PLUME DYNAMICS

FISH DISTRIBUTION

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?