

Navigation RD&T

ERDC

Engineer Research and
Development Center

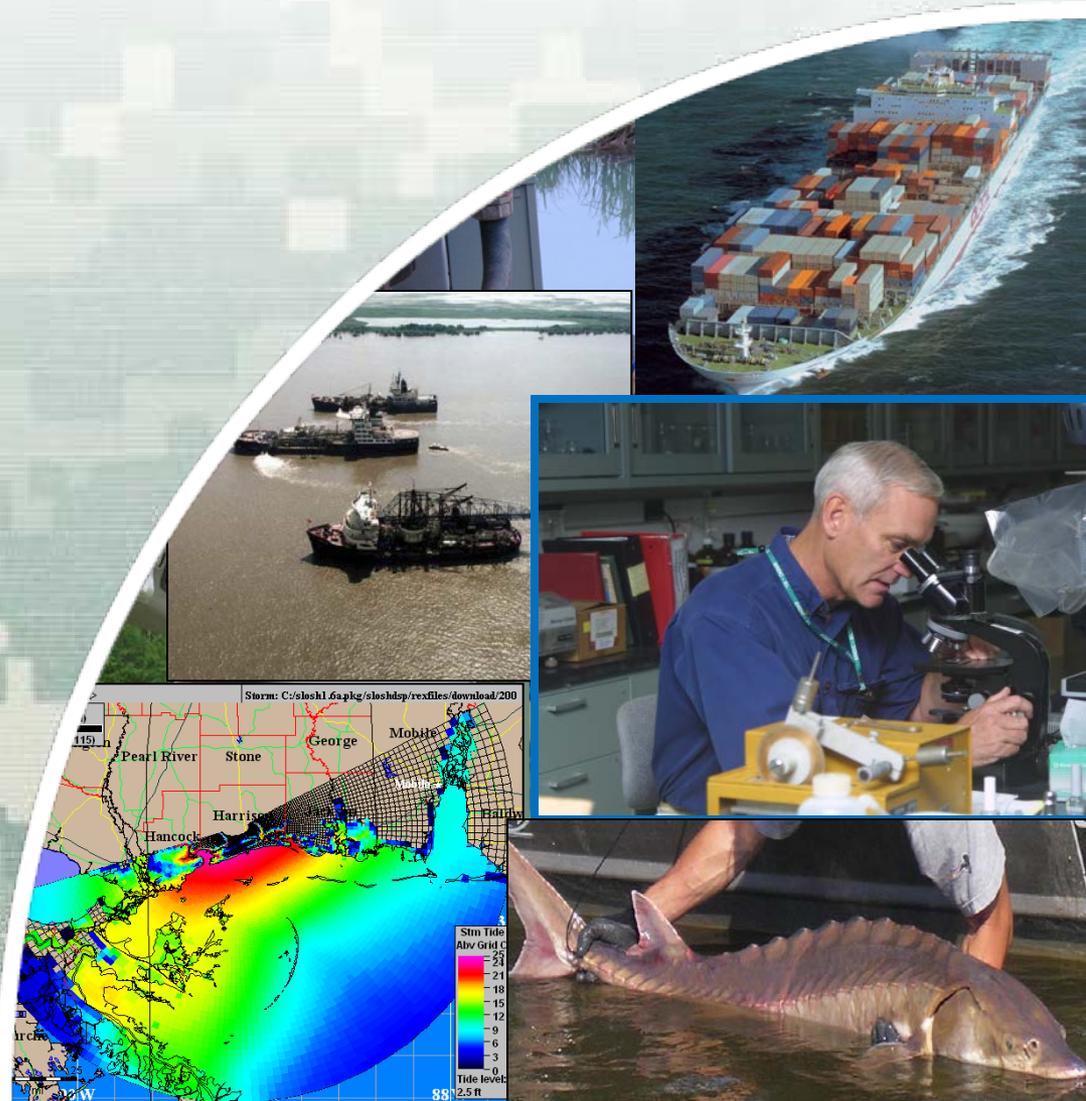
Jeff Lillycrop
Technical Director

*Advancing Science and Technology
in Support of Sustainable Solutions to
America's Water Resources Needs*

20 Aug 2013
RSM Annual Meeting



US Army Corps of Engineers
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CW R&D at a Glance

USACE Business Areas

- **Navigation** and Hydropower
- **Flood and Coastal**, Water Supply, Emergency Management
- **Environment** - Restoration, Regulation, Stewardship

- **FY13 Business Lines**



Infrastructure



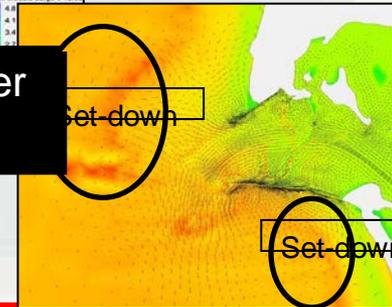
Navigation



Integrated Water Resources



Environment



Flood & Coastal



CW RD&T Technology Transfer

Summary of FY12 Products

**CW
RD&T**

38 Wiki Pages

55 Webinars

161 Tech Reports and Tech Notes

207 Conferences & Workshops

66 Software Releases

58 Journal Articles

61 Hosted Workshops

45 DOTS requests / 18 Districts

45 WOTS requests / 20 Districts

105 Federal Agencies Collaborations

92 State & Stakeholder Collaborations

79 University Collaborations

4 Guidance Documents

1 Patent

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Corps Navigation Mission

Provide safe, reliable, efficient, effective and environmentally sustainable waterborne transportation systems for movement of commerce, national security needs, and recreation.



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USACE Navigation Assets

COASTAL NAVIGATION

1067 Navigation Projects
19 lock chambers
13,000 miles of channels
929 navigation structures
844 bridges

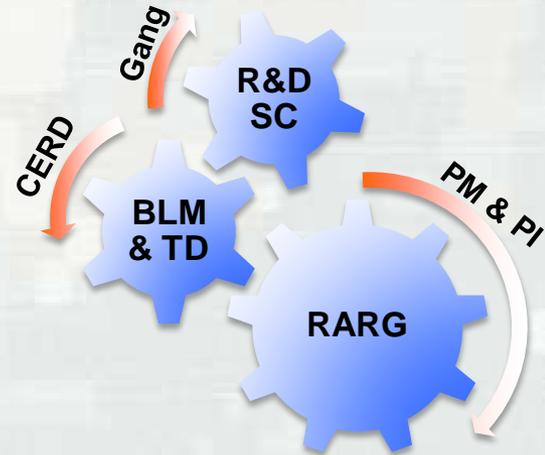
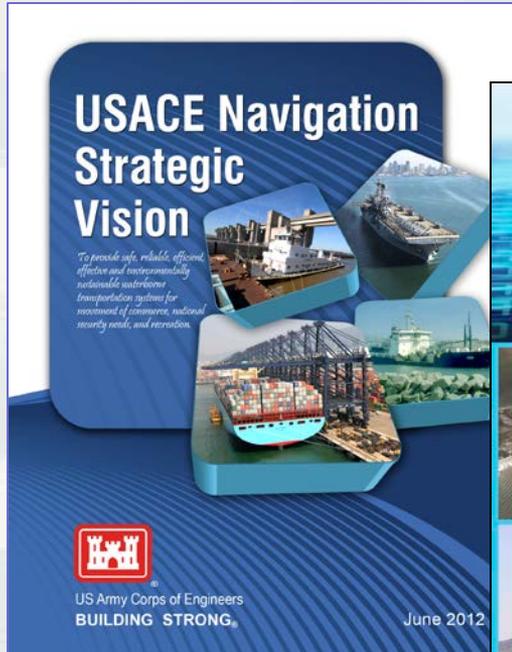


INLAND NAVIGATION

27 Inland River Systems
207 lock chambers @ 171 lock sites
12,000 miles of inland river channels



Navigation RD&T Guiding Documents



Navigation RD&T Strategic Needs & Priorities

FY13

- Extend the useful life of existing navigation infrastructure
- Operate and manage national waterborne transportation assets as an integrated system
- Optimize and prioritize channel availability for commercial freight movement
- Engineering with nature to enhance ecosystem and project processes, benefits and services
- Implement eNavigation throughout the National MTS
- Deliver sound engineering and scientific solutions to align with the Planning Modernization initiative



Navigation RD&T Portfolio

Dredging Operations and Environmental Research

Dr. Todd Bridges

Coastal Inlets Research Program

Dr. Julie Rosati

Navigation Structures

Navigation Systems

Mr. Eddie Wiggins

Regional Sediment Management

Ms. Linda Lillycrop

Monitoring Completed Navigation Projects

Dr. Lyn Hales

Dredging Operations Technical Support

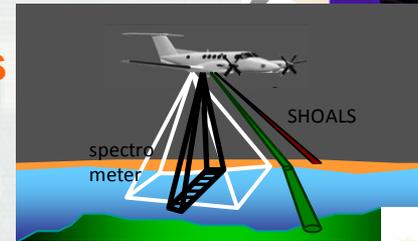
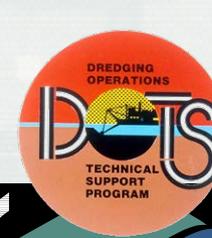
Ms. Cynthia Banks

Inland Electronic Navigation Charts

Dr. Bob Mann / Ms. Denise LaDue

National Coastal Mapping Program

Ms. Jennifer Wozencraft





Engineer Research and
Development Center

Dredging Operations Environmental Research (DOER)

Dr. Todd S. Bridges, ST
Senior Research Scientist,
Environmental Science



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Beneficial Use of Dredged Material

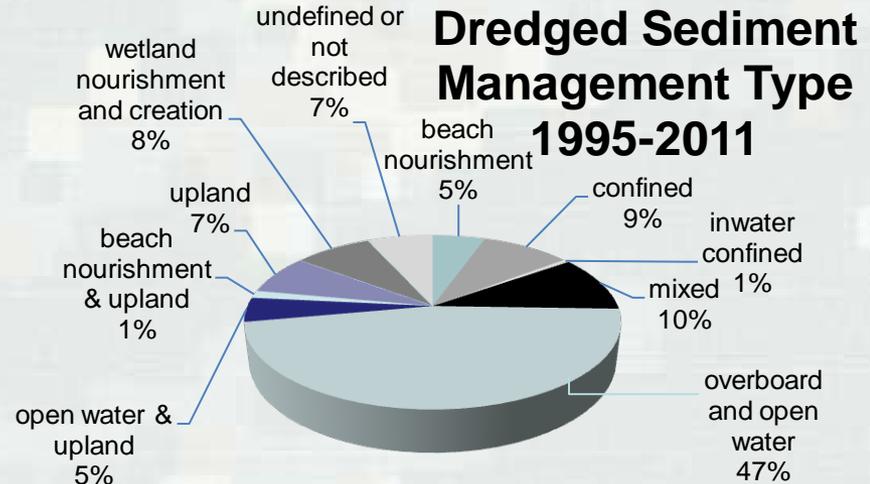
John Childs

Problem

- ▶ Corps generates/ manages ~250E6+ cy of DM each yr
- ▶ BU is necessary for sustainability of Nav. program
- ▶ IWR tracks DM management, but not beneficial use
- ▶ Funding is limited and incentives are needed for BU

Objective

- Increase BU
- Track DM Management and BU
- Technology transfer across Districts
- Identify feasible and cost effective management controls and engineering controls to allow for BU
- Identify BU incentives



Approach

- Bring together previous and current research into Guidelines
- Quantify environmental (and social) benefits
- Occupy RSM and EWN
- BU is a primary goal of the National Dredging Team

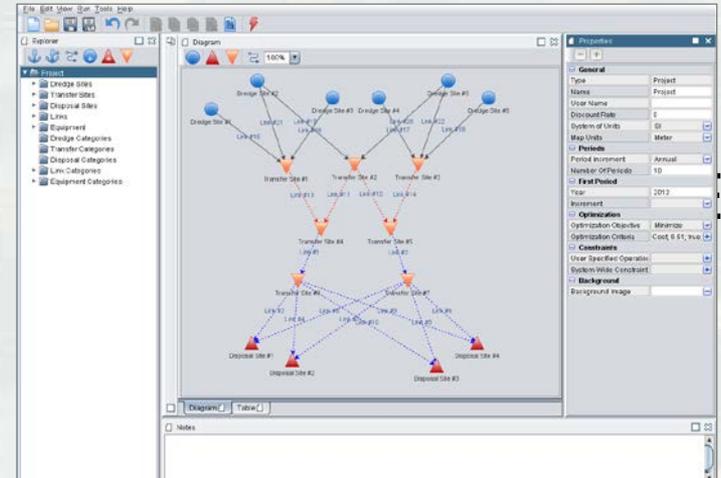


Dredged Material Disposal Management

Linkov & Bates

■ Problem

- ▶ Multi-objective dredging planning & sediment management is complex
- ▶ Existing optimization software was archaic, limited, and hard to use



Objective

- Improved user interface
- Improved multi-objective optimization functions
- GIS & decision support
- Open source software that is easy to maintain

Approach

- Three modules (GIS, Optimization, Decisions)
- Visual, customizable, interactive user interface
- Java code built on open source optimization tools



Engineering With Nature

Thomas J. Fredette

■ Problem

- USACE faces multiple challenges that affect delivery of safe and reliable navigation projects. These include:
 - Time and costs required to implement and operate projects increasing due to inter-agency coordination and consultation, regulatory compliance issues, market pressures, etc.
 - USACE infrastructure and operations are viewed by many stakeholders as being in conflict with environmental and social interests.
 - Environmental expectations and regulatory requirements for projects continue to steadily increase.
 - The effective budget for the USACE has been decreasing.

Objective

- Document, demonstrate, and monitor EWN sites.
- Highlight how these infrastructure development efforts provide economic, environmental, and social benefits – in a sustainable way – producing a “triple win”.
- Enable greater support by and collaboration with our partners and stakeholders by illustrating case studies that use natural processes to achieve a broad range of project objectives.
- Support and advance the USACE Environmental Operating Principles and Civil Works Strategic Plan.



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Approach

- Conduct technical data/literature search to identify existing projects.
- Survey USACE Districts to identify and document existing projects and their benefits.
- Develop an Interactive Geographic Site Database.
- Evaluate identified projects and develop technical approaches for improving implementation and performance.

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Coastal Inlets Research Program



Julie Dean Rosati

Program Manager

Jeff McKee

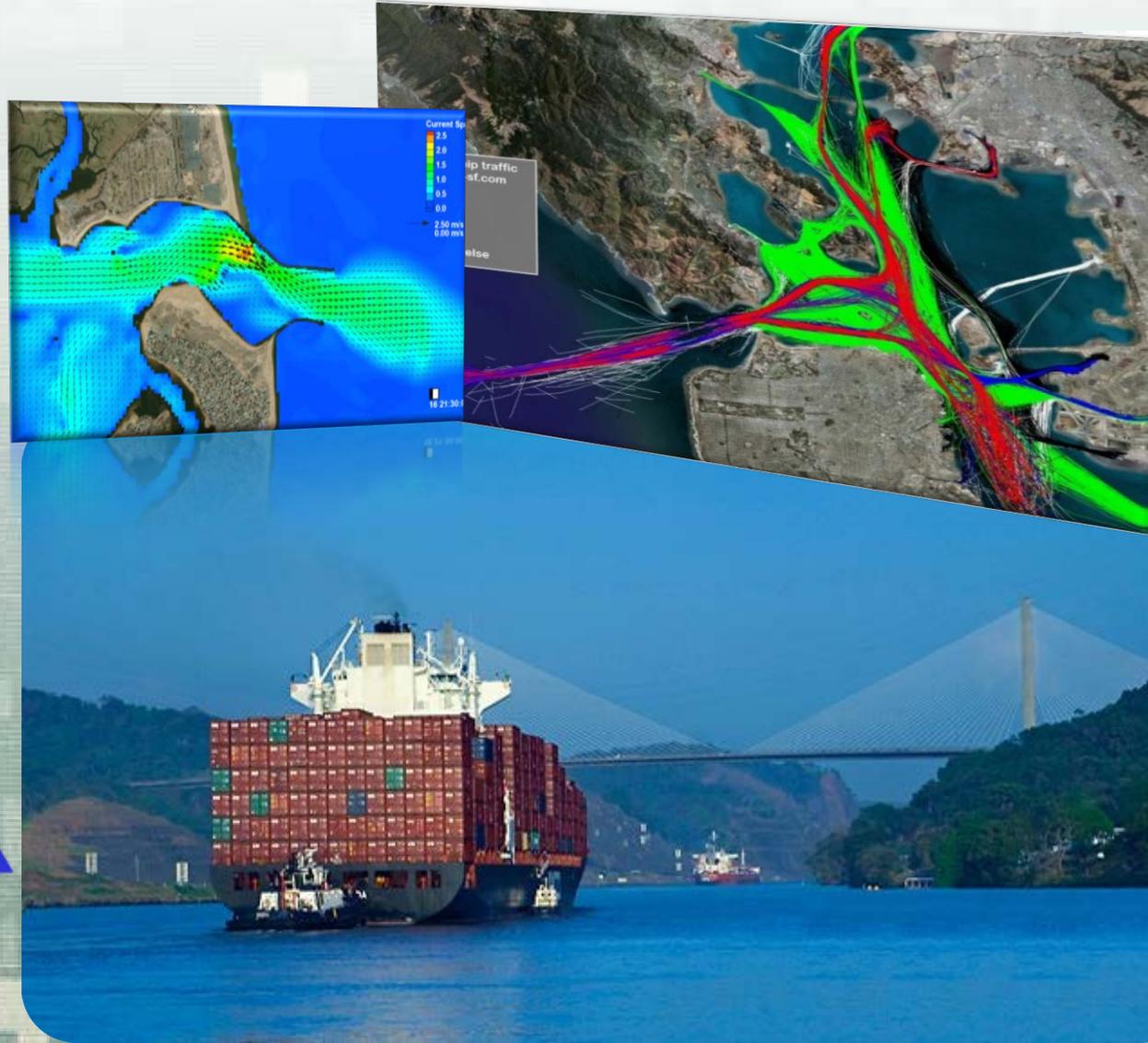
HQ Navigation
Business Line Manager

Jeff Lillycrop

Technical Director

Eddie Wiggins

Associate Technical Director



US Army Corps of Engineers

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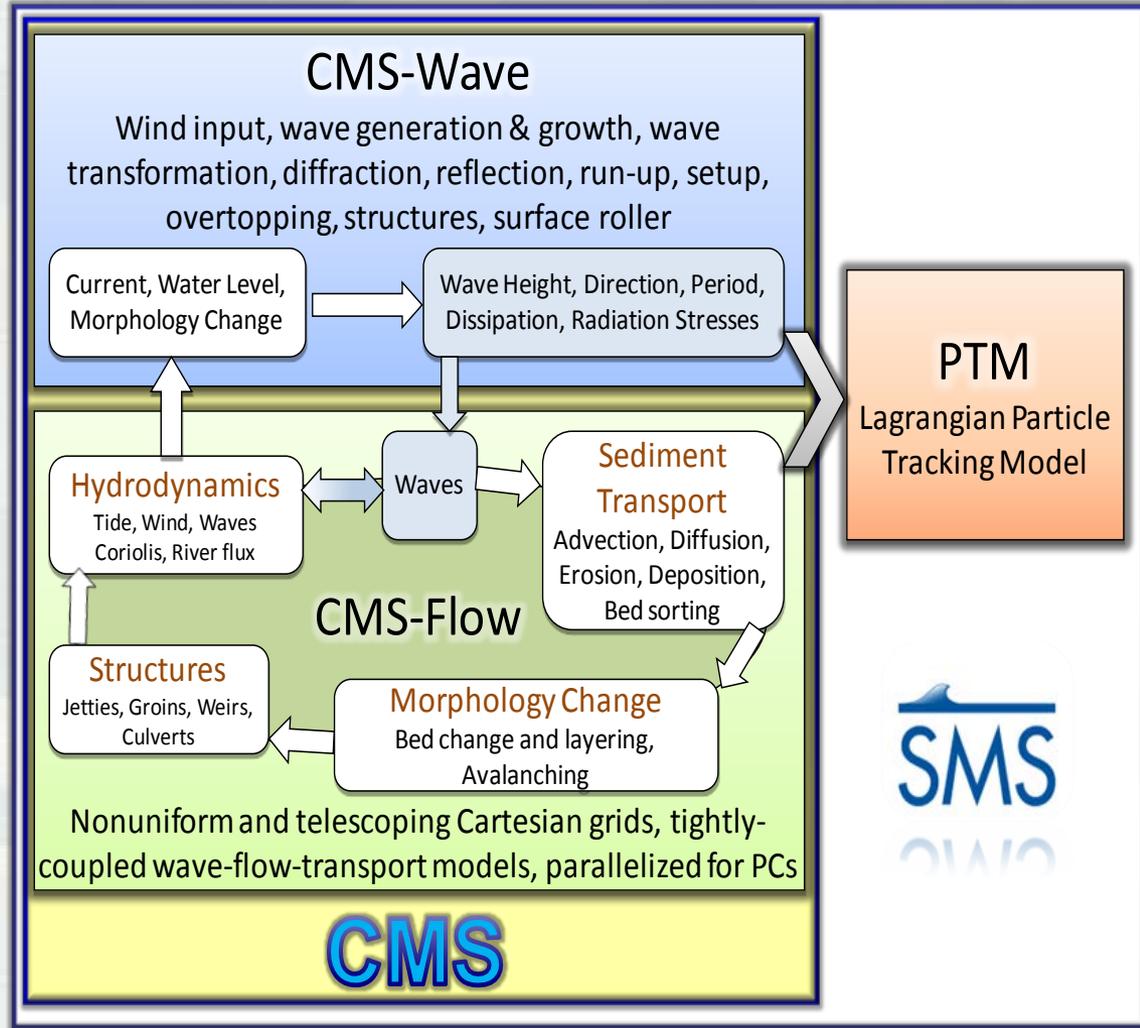
Coastal Modeling System

What is the CMS?

Integrated wave, current, and sediment transport model in the SMS

Includes:

- Application specific solvers
 - Implicit: $\Delta t \sim 10$ min
 - Explicit $\Delta t \sim 1$ sec for
- Multiple-sized sed. transport
- Grid options
 - Non-uniform and
 - Telescoping Cart. grids
 - Flexibility and efficiency
- Parallelization on PC's
- FVM - Conservative



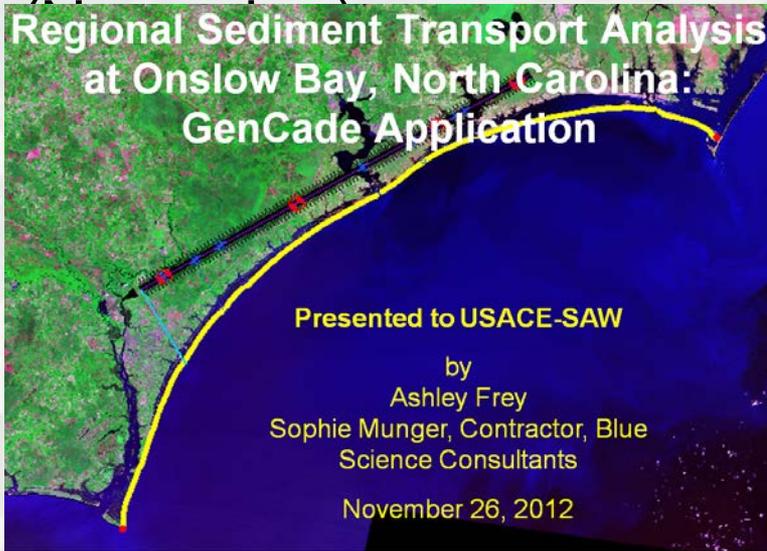
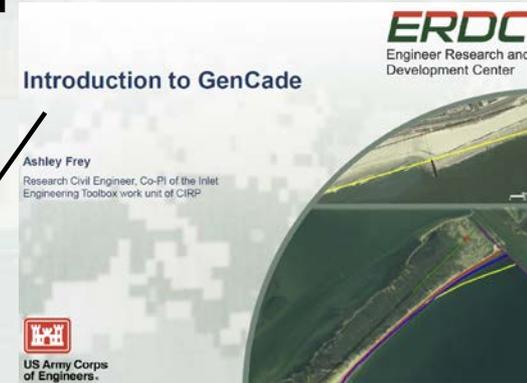
GenCade – Tech-Transfer & District Interaction



Webinars

Introduction to GenCade Webinar
(October, 6 hours)

Onslow Bay Webinar to SAW



Coastal Inlets Research Program

1

GenCade

Webinar occurred 16-18 June 2012

Agenda	Files
<p>16 October 2012 - Day 1</p> <ul style="list-style-type: none"> • Welcome • Introduction to GenCade • Introduction to GenCade in the SMS • Helpful Hints • GenCade Applications • Completed Project Demo • Simple Case Demo 	<p>Click <u>underlined</u> links on the agenda to access presentation material, CMS User's Guide, and data files.</p> <ul style="list-style-type: none"> • GenCade Executable • SMS 11.1 Beta (Full Installation) <ul style="list-style-type: none"> ◦ 32-bit Installer ◦ 64-bit Installer • Day 1 material • Day 2 material • Day 3 material
<p>17 October 2012 - Day 2</p> <ul style="list-style-type: none"> • Simple Case Demo (continued) • Inlets and Beach Fills Case • Complex Case (start) 	<p>Webinar Audio/Video Files</p> <ul style="list-style-type: none"> • Day 1 (~100 MB) • Day 2 (~113 MB) • Day 3 (~ 75 MB)
<p>18 October 2012 - Day 3</p> <ul style="list-style-type: none"> • Complex Case (continued) • Future Capabilities • Wave Conversion Tool 	





Nearshore Berms

RSM Leveraged

The Nearshore Berm Calculator

NEARSHORE BERM CALCULATOR

Login
Background
Definitions
References
Contacts
Calculation

Save Cross Section

Save Plan View

Units

Permitted Placement Boundaries

Placement Site Profile

Placement Site Hydrodynamics

Placement Material

Dredge/Placement Method

Navigational and Environmental Limits

LEGEND
Dredge Draft Safety Clearance: █

RESULTS
 D_{50B} : 0.18 mm
 D_{50} : 0.20 mm
 d_{inner} : -20.00 ft
 d_{Outer} : -35.00 ft
 Berm Volume: 562,140 yd³
 Elevation of Berm Crest: -6.04 ft
 Berm Crest Width: 100.00 ft



Sediment Budget Calculator

Auto-populate R's and L's

Enter minimum, maximum, and increment for the Right- and Left-directed longshore sand transport rates at the Right and Left boundaries of the budget region (see figure above). By clicking "Populate" these values will be entered into the input table below. To populate an example data set, click on Populate Sample.

Min: 100000 Max: 500000 Increment: 50000

Populate

Populate Sample

Which shoreline is downdrift OR of less certain volume change? Right Units: yd³ / year

R1 minimum: 100000	R1 maximum: 500000	increment: 50000
R2 minimum: 100000	R2 maximum: 500000	increment: 50000
L1 minimum: -100000	L1 maximum: -500000	increment: -50000
L2 minimum: -100000	L2 maximum: -500000	increment: -50000
V change, Left: -100000	Right: -300000	gross: 250000

Fraction of incident transport impounded at left (J1) and right (J2) jetties (0= transparent jetty, 1= impermeable jetty)

J1: 0 J2: 0

Local inlet-induced transport from left (m1) and right (m2) shorelines (expressed as a percentage of R1 and L2, respectively):

M1: 0.2 M2: 0.4

Mechanical transfer of sand from the inlet to the left (DL) and right (DR) shorelines, respectively:

DL: 0 DR: 0

Mechanical transport of sand from left shoreline to right shoreline (DB; positive if left to right, negative if right to left) or placement offshore (Do):

DB: 0 DO: 0

Transport of sand into inlet from upland sources

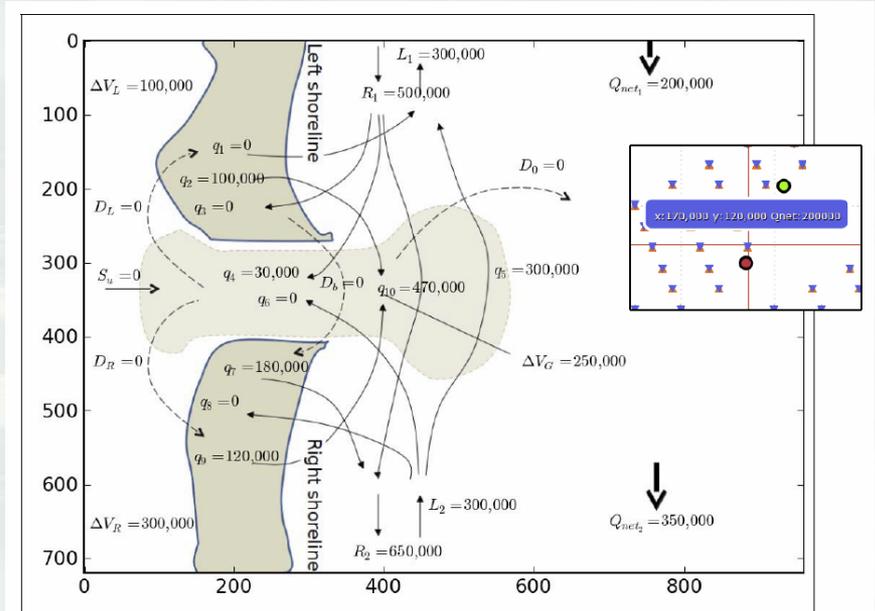
SU: 0

Calculate

(scroll down to view calculated chart)

An online web-tool that applies the Bodge Method of formulating an inlet and adjacent beach sediment budget through developing a Family of Solutions that satisfy user-defined constraints

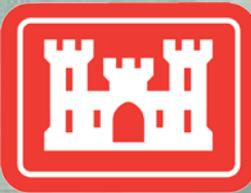
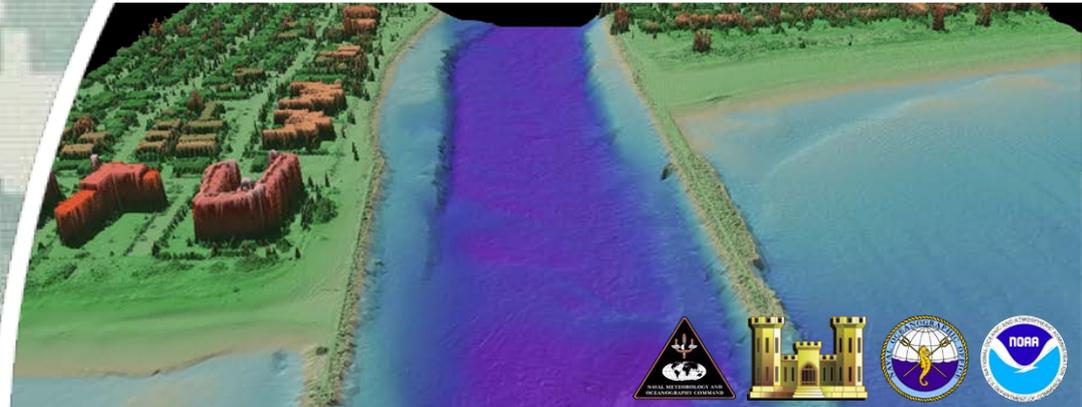
Webinar in July with 11 attendees from Districts



National Coastal Mapping Program

Jennifer M. Wozencraft

Director, Joint Airborne Lidar Bathymetry Technical Center of Expertise



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Joint Airborne Lidar Bathymetry
Technical Center of Expertise

National Coastal Mapping Program



Seabrook, NH, 2011 federal navigation project and backbay marsh

National Coastal Mapping Program

Coastal engineering indices

shoreline change rate index



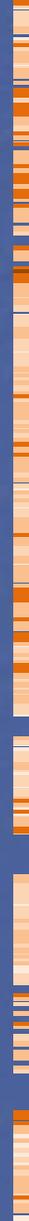
dune height index



beach width index



Combined geomorphology index

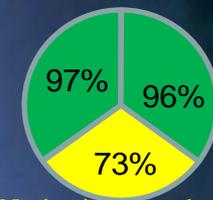
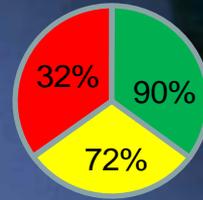


2004-2010

2010

2010

Geomorphology	Dune height Beach width Shoreline change
Inlets	Ebb shoal volume change Structure dimensions relative to design Navigability
Environment	Dune vegetation density Wetland density Submerged aquatic vegetation density
Human use	Impervious surface density



FY13 Product Development

- 11/8/2012 Site Visit, Carter's Lake, Penstock #3
- Challenges
 - ▶ Little / no light
 - ▶ Water / slippery surface in center
 - ▶ No surface features
 - ▶ Curved & inclined floor
 - ▶ Fe_2O_3 dust



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USACE Regional Sediment Management Program (RSM)

Linda Lillycrop
Program Manager

Jim Walker
HQ, Proponent
Navigation Business Line Manager

Jeff Lillycrop
Technical Director, Navigation

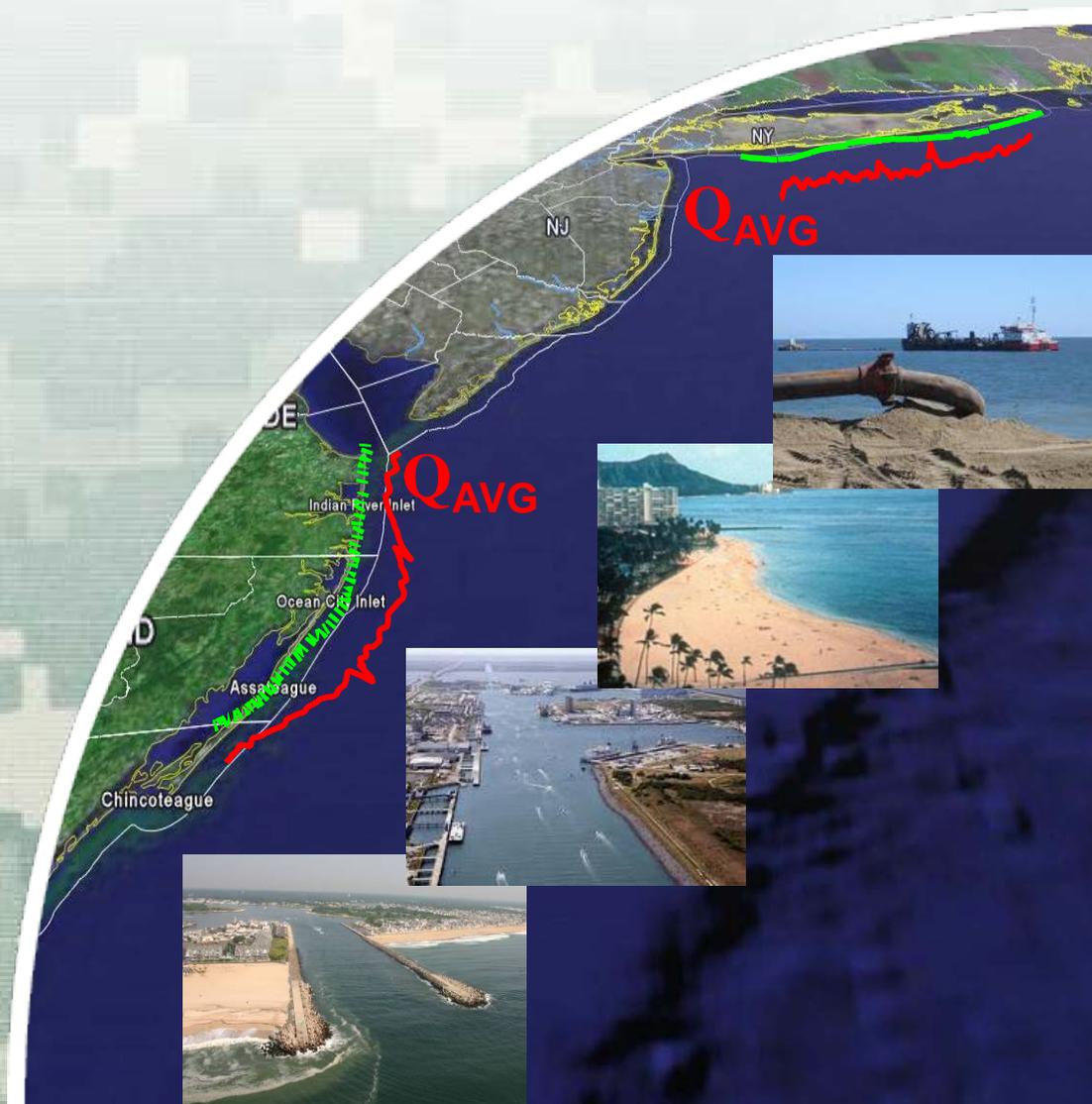
Eddie Wiggins
Associate Technical Director, Navigation

**Navigation RARG
Meeting
Vicksburg, MS
3-5 April 2012**

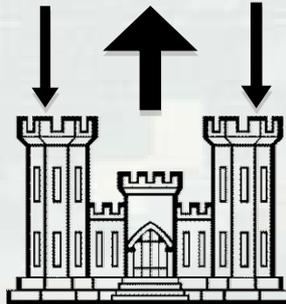


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Regional Sediment Management



Districts

Navigation/Dredging



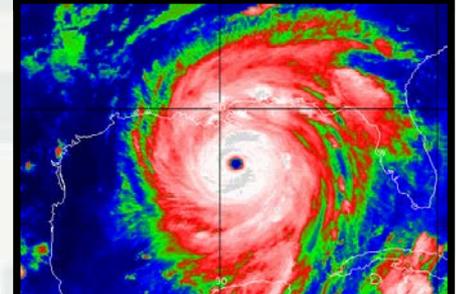
Flood Risk Management



Environmental Restoration



Emergency Response



RSM Products FY12 & FY13 - FY17

RSM.USACE.ARMY.MIL

RSM Technical Notes,
Reports, Manuals, Conference Papers

Regional Sediment Management (RSM) Program

Managing sediment to benefit a region potentially saves money, allows use of natural processes to solve engineering problems, and improves the environment. As a management method, RSM:

- Includes the entire environment, from the watershed to the sea
- Accounts for the effect of human activities on sediment erosion as well as its transport in streams, lakes, bays, and oceans
- Protects and enhances the nation's natural resources while balancing national security and economic needs

The Corps of Engineers holds in trust and manages lands and waterways across the U.S. Using regional sediment management concepts will significantly improve the Corps' mission accomplishment. The Corps' engineers and scientists develop new technologies through research to make management decisions more accurate and efficient. Simultaneously, they evaluate RSM concepts through projects that highlight and improve sediment management activities.

What's New?

- [Navigation Research, Development and Technology Strategic Needs and Priorities Document, v1.0](#)
- District Project Templates:
 - [Fact Sheets](#)
 - [Quarterly Reports](#)
- SBAS for ArcGIS 10
 - [Addin \(zip\)](#)
 - [User's Guide \(pdf\)](#)

Updated March 2012

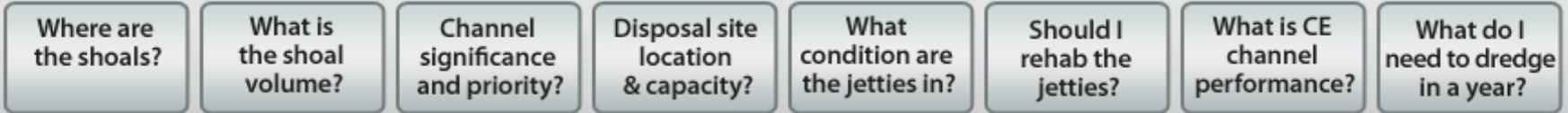


Bi-Monthly
RSM Conference Calls
Webinars

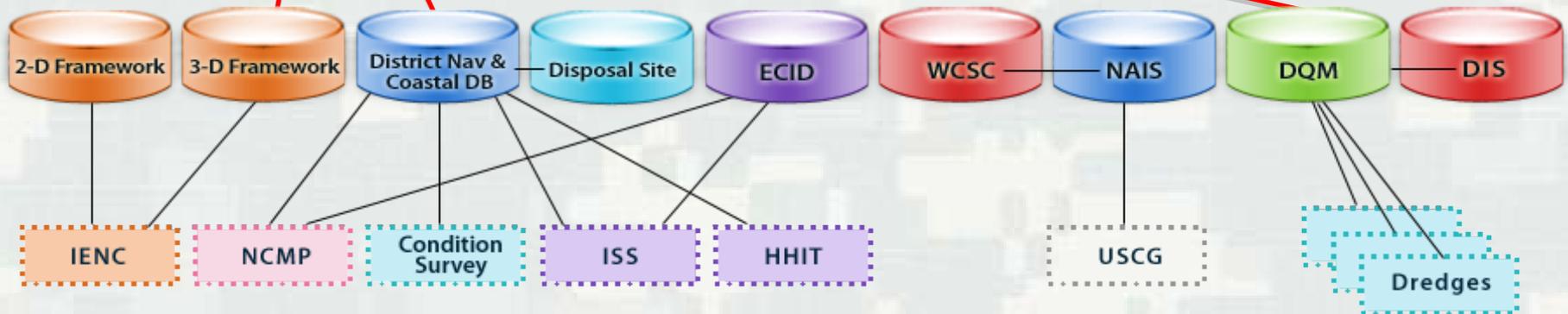


Navigation Data Integration Framework

Questions



Applications



Questions?



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