

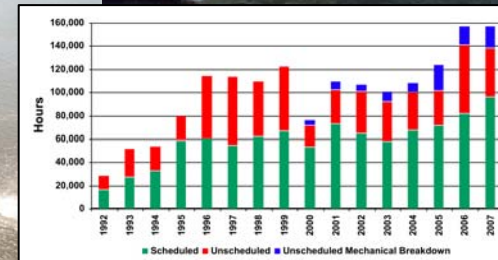
Navigation Research and Development

Michael G. Ensch
Operations & Regulatory
Headquarters
U.S. Army Corps of Engineers

Transforming the Marine Transportation System: *A Vision for Research and Development*
Irvine, CA
29 June 2010



US Army Corps of Engineers
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Agenda

U.S. Army Corps of Engineers Navigation R&D

- **Navigation Mission**
- **Navigation Research & Development Programs**
- **Research & Development in a Perfect World**
- **Summary**



U.S. Marine Transportation System

Foreign Trade

- Value of all foreign trade represents nearly 30% of nation's GDP (*vs 13% in 1970*)
- Overseas waterborne trade
 - 95% of overseas trade by volume
 - 75% of overseas trade by value
 - 8.4 million jobs
- About \$2 trillion in economic activity
- Cargo volumes projected to increase by 50% - containers to double by 2020



System Capacity

- Already a generation behind in channel improvements – but West Coast in better shape
- Capacity constraints increase transportation costs, pollution, congestion



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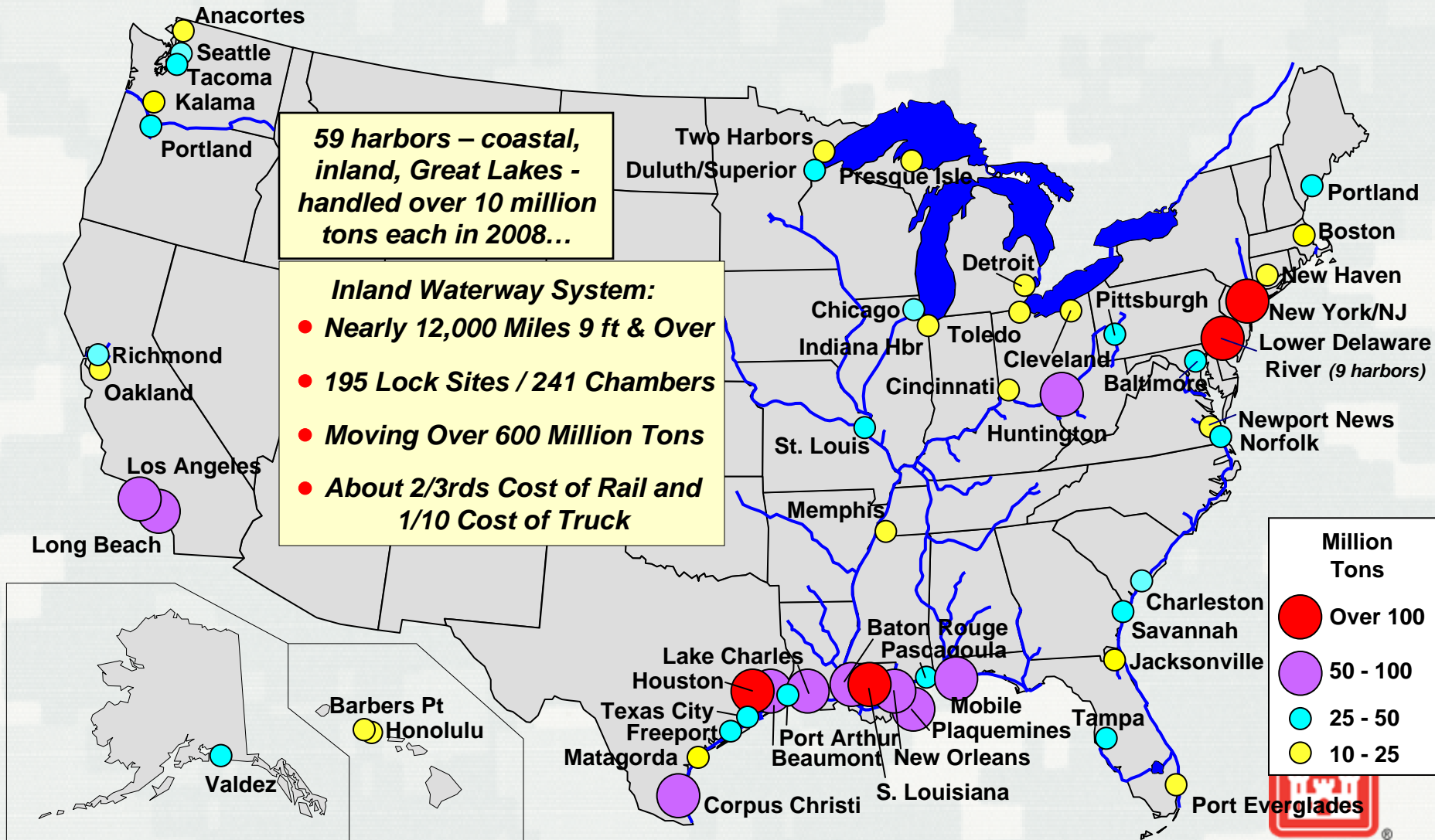
Corps Navigation Mission

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



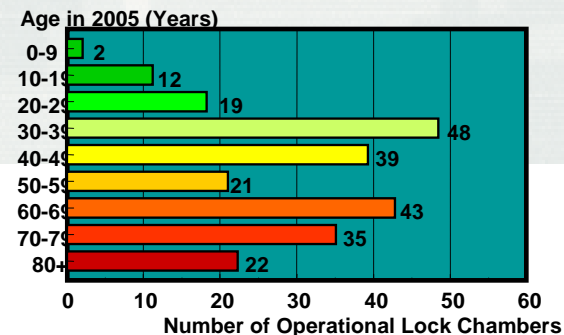
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U.S. Ports: Vital to Trade ...and to Our National Economy



Inland Navigation

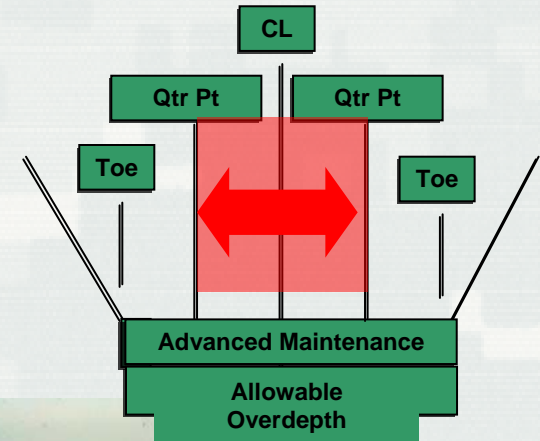
- 12,000 miles of inland channels
- 195 lock sites with 241 lock chambers
- Waterways are the only transportation mode with significant capacity remaining
- Most energy efficient of the 3 systems
- Inland infrastructure aging and in need of reinvestment
- More than half of the inland navigation locks have exceeded their 50-year service life.



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Coastal Navigation

- Each year the Corps moves 250-350 Million cu yd of sediment
- At a cost of more than \$700 Million per year
- **Initial Standard**
 - Full project depth
 - Half project width, 95% of the time
- **Trend**
 - FY 2005: 38%
 - FY 2006: 35%
 - FY 2007: 32%
 - FY 2009 – 2013 get to 95%



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Navigation R&D Programs

Dredging Operations and Environmental Research	\$7M
Coastal Inlets Research Program	\$3M
Navigation Systems	\$3M
Regional Sediment Management	\$2M
Monitoring Completed Navigation Projects	\$1.8M
Dredging Operations Technical Support	\$2M
Inland Electronic Navigation Charts	\$3.8M
National Coastal Mapping Program	\$7M
ARRA Improving Throughput & Safety	\$6.2M
Inland Navigation Safety Initiative	\$2.7M
Navigation Structures	<u>Proposed</u>
	\$38.5M



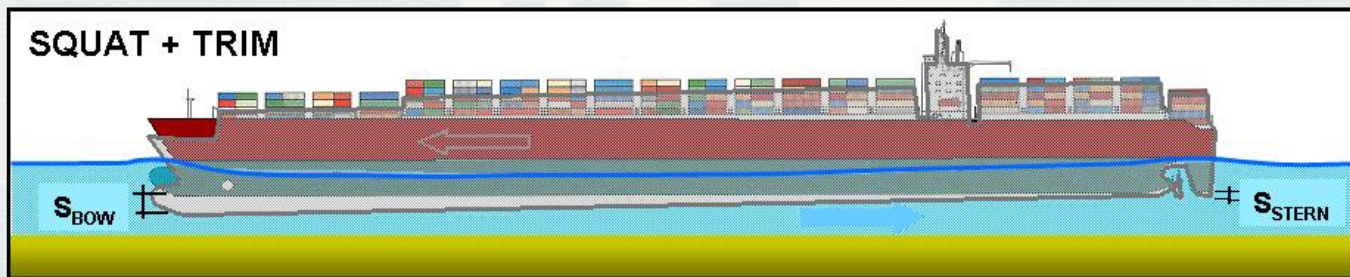
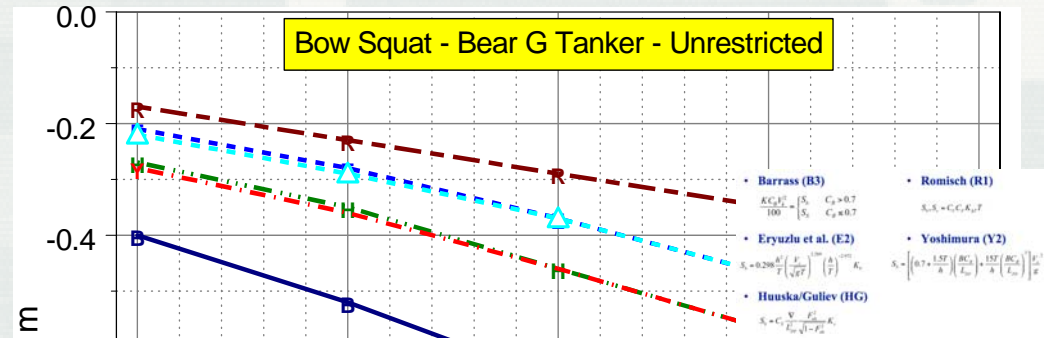
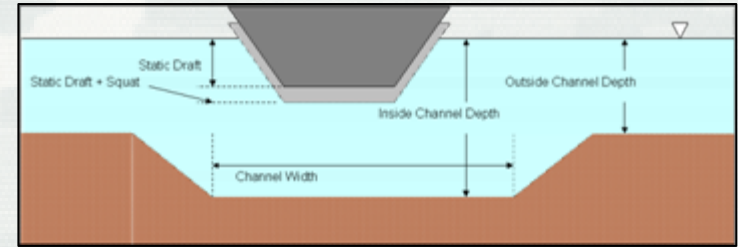
Navigation R&D Programs

Navigation Systems

- Channel Analysis and Design Evaluation Tool (CADET)

- Calculates underkeel clearance

- Validated with PIANC empirical formulas

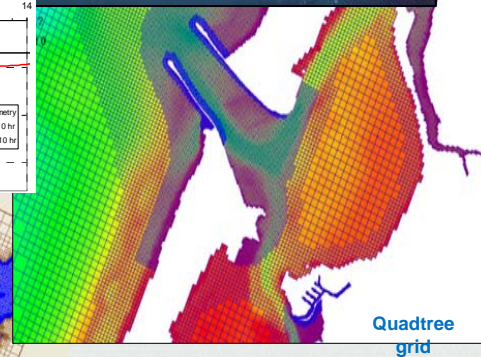
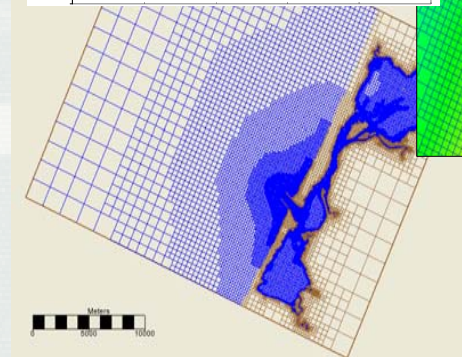
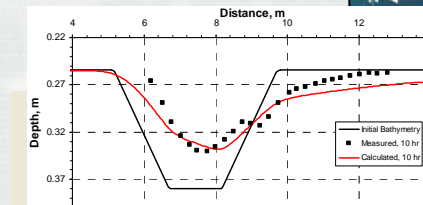
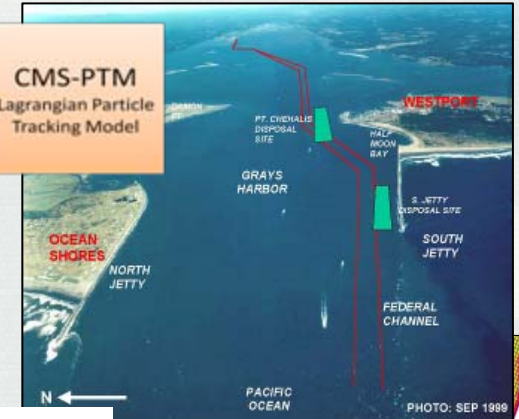
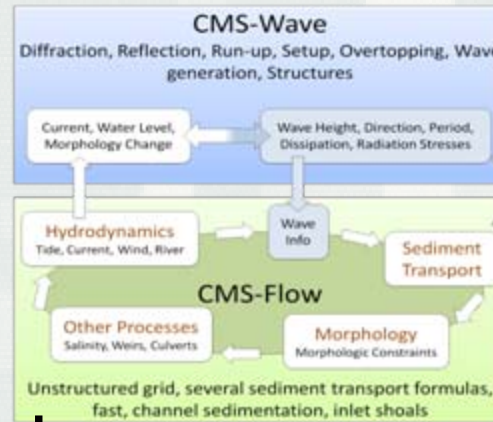


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Navigation R&D Programs

Coastal Inlets Research Program

- Coastal Modeling System
- Channels: Deepening, widening, lengthening, realigning
- Jetties: Lengthening, raising, rehabbing O&M: Placement areas berms, wetlands
- Processes: *Navigability* – waves and currents; *Environmental* – circulation, sediment transport



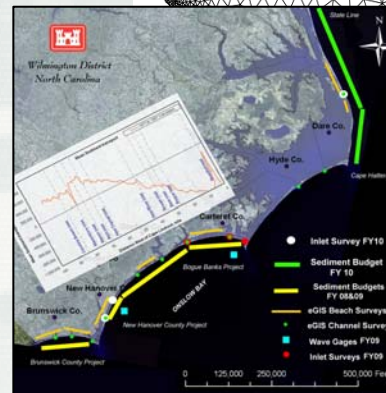
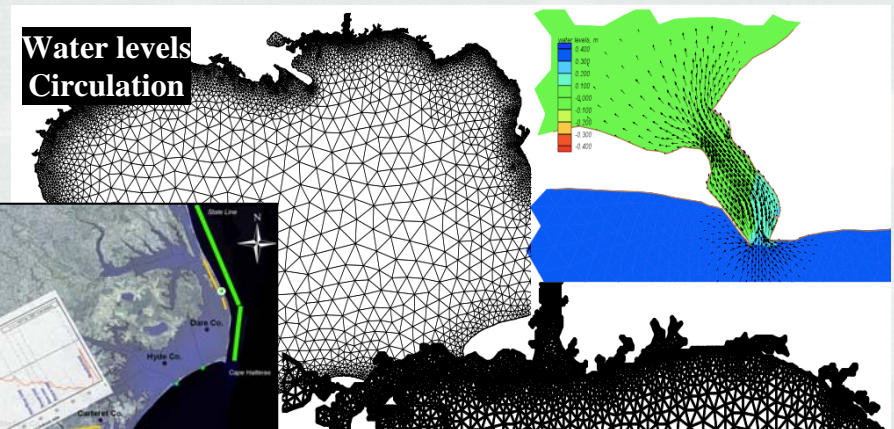
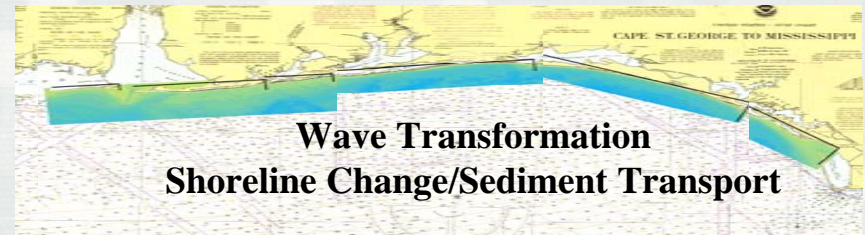
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Navigation R&D Programs

Regional Sediment Management

- Manage sediments and projects through a systems based approach
- Manage sediment resources as a regional scale resource
- Support sustainable dredging practices
- Adaptive management process for O&M



Waves, Circulation, Water levels, Sediment Transport, Shoreline Change

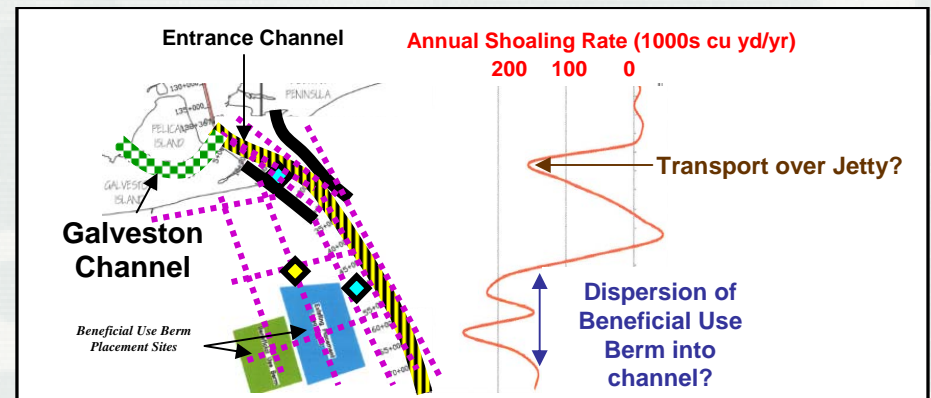
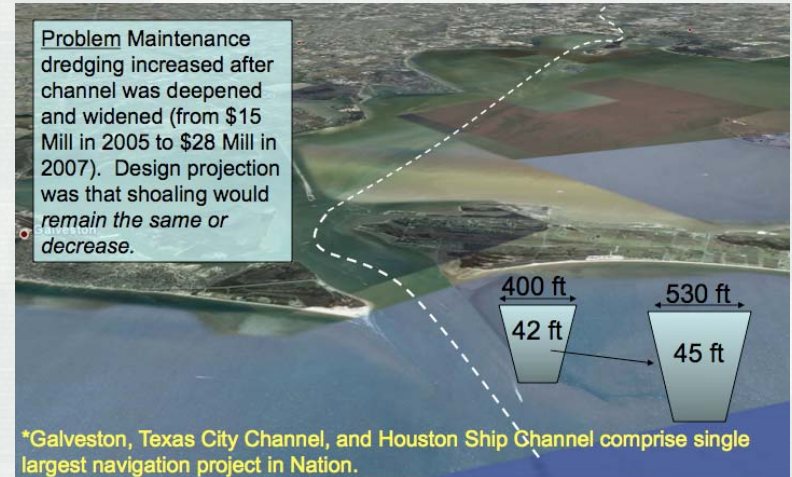


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Navigation R&D Programs

Monitoring Completed Navigation Projects

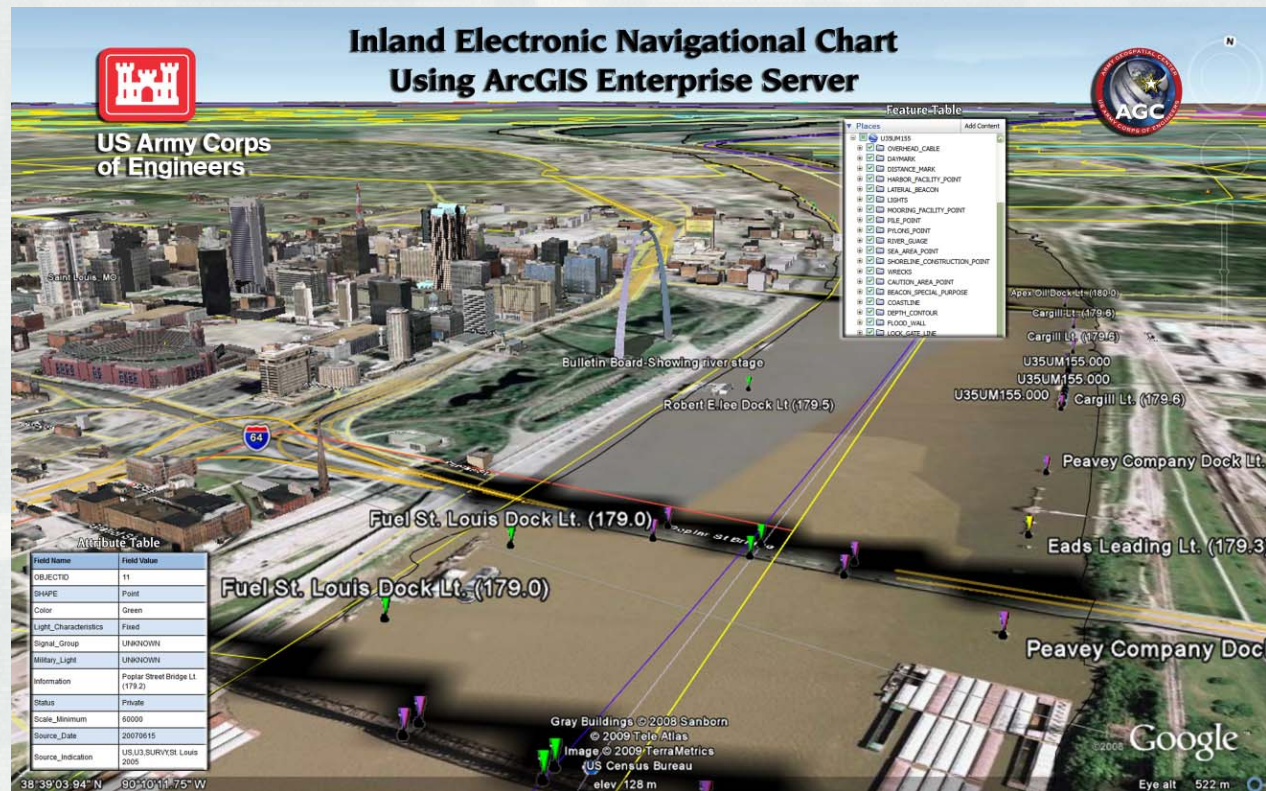
- Houston – Galveston Channel Deepening and Widening
- Depth – from 40 to 45 ft
- Width –from 400 to 500 ft
- O&M Dredging cost nearly doubled 2005 to 2007



Navigation R&D Programs

Inland Electronic Navigation Charts

- Authorized in 2002 following tow / bridge collision
- 7,297 miles of charted channels
- Operations and R&D
 - Chart production
 - International stds
 - Chart of the future



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Navigation R&D Programs

National Coastal Mapping

- Initiated in 2004 to monitor change and rates of change

- Operational mapping to measure and monitor engineering, environmental, and economic condition and characteristics

- R&D to develop next generation sensors

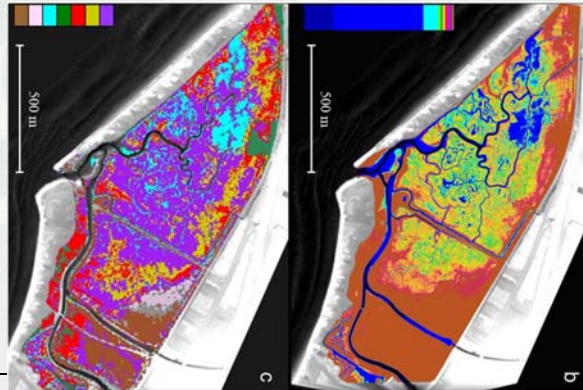
- R&D to develop new environmental and ecosystem data, tools, and products

Ecological Modeling

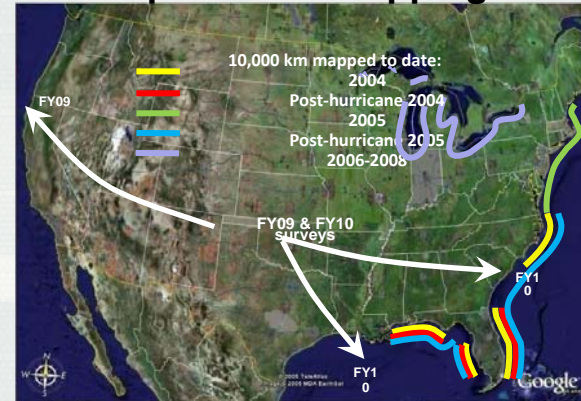


Potential Distribution

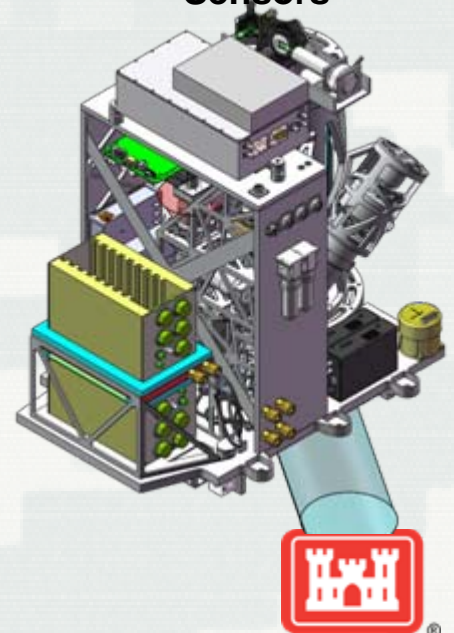
Wetlands/Beach Characterization



Operational Mapping



Next Generation Sensors

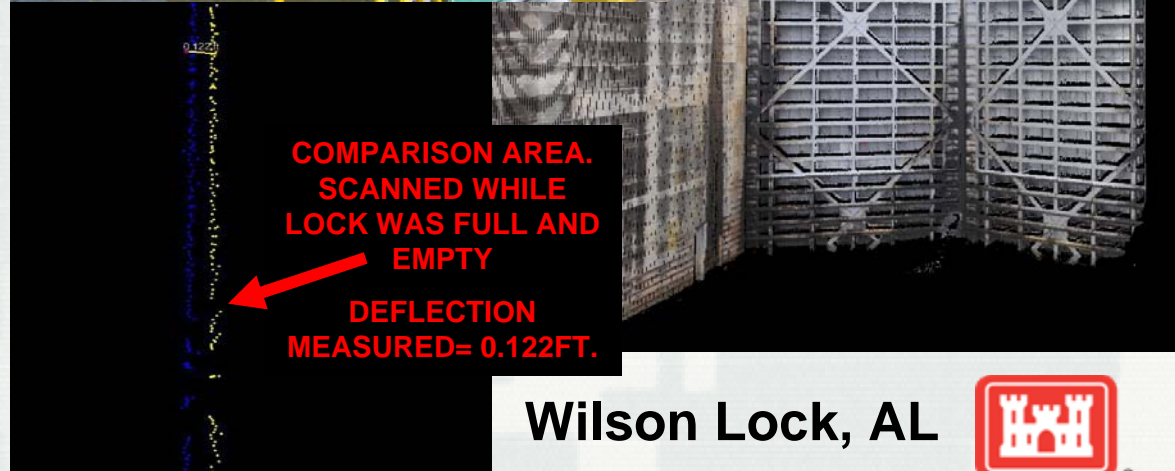


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Navigation R&D Programs

Inland Navigation Safety Initiative

- Non-Destructive Testing
- Measure Lock Gate Deflections using lidar
- Other NDT technologies
 - ultrasonics
 - acoustic imaging
 - strain gages
 - vibration sensors
 - adcp profilers



Wilson Lock, AL



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Navigation R&D Programs

ARRA Improving Throughput & Safety

Lock Operator Management Application

- **Improve Safety, Reliability & Efficiency**
- **Non-structural improvement**
- **National deployment in FY11**
- **e-Navigation & River Information Services (RIS) backbone**
- **Features and capabilities**
 - AIS foundation
 - Creates IT Architecture
 - Deploys Lock Operator Applications

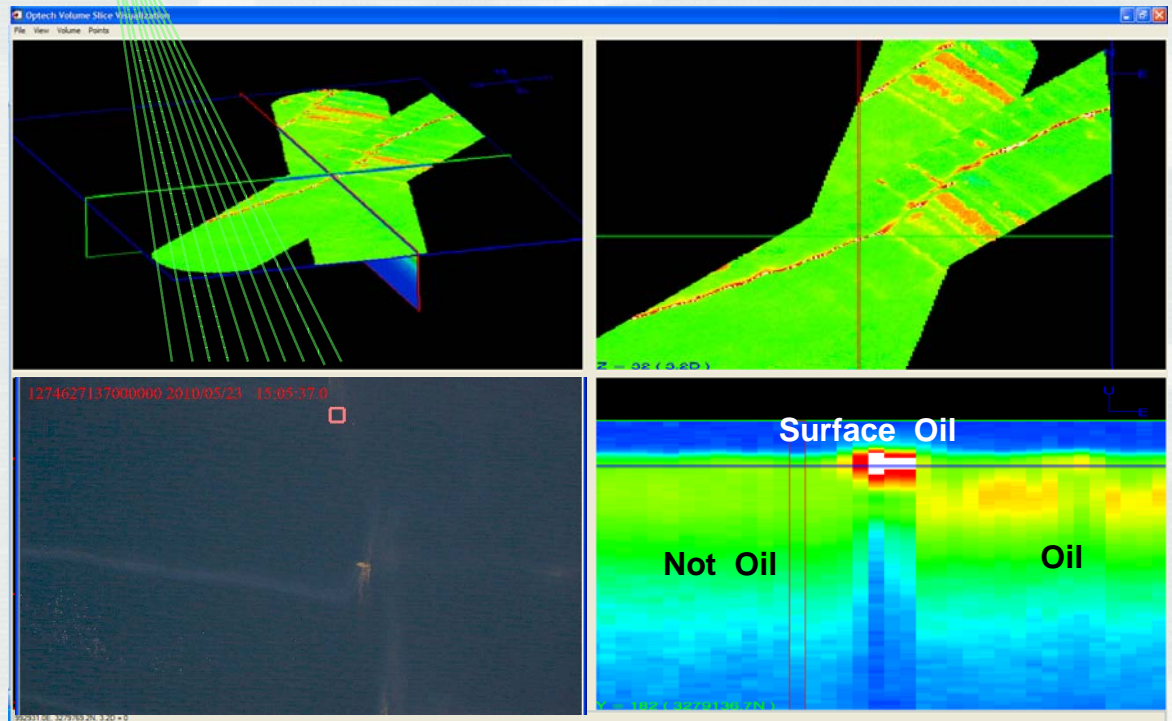


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Green Lidar Detection of Oil



- Habitat mapping and monitoring
- Ecosystem Restoration
- Contaminated Sediment Management
- Dredging Techniques
- Shallow water movement & forecasting



1. What do you see as the role of your agency in R&D to support the MTS?

Design: locks, dams, and coastal channels – concrete, steel, beneficial use of dredge material, river training structures, jetties, etc.

Improve Operations: safety, efficiency, reliability - Inland Electronic Navigation Charts, Lock Operator Management Application, dredging, Channel Portfolio Tool, etc.

Prediction of future Conditions: hurricane surge, river flooding, risk assessment, – numerical hydrodynamics, waves, sediment transport, and storm surges.

Adaptive Management: measure & monitor project and watershed / regional scale – SMART Gate, CZMIL, CMS, etc.



2. Can you describe a good business model for community-wide R&D collaboration?



3. What are your biggest technical challenges?

- 1. Inland waterway reliability.**
- 2. Coastal navigation network.**
- 3. Information sharing & use.**



Summary



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