

# The Connection of Navigation Infrastructure with the Environment

**W. Jeff Lillycrop**

Technical Director, Navigation

US Army Engineer Research and Development Center

## Presentation

- USACE & National Infrastructure
- Navigation Challenges
- Research Initiatives

21 May 2014

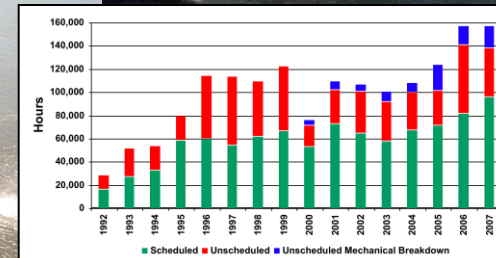
New Orleans, LA



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US Army Corps of Engineers

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# USACE 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



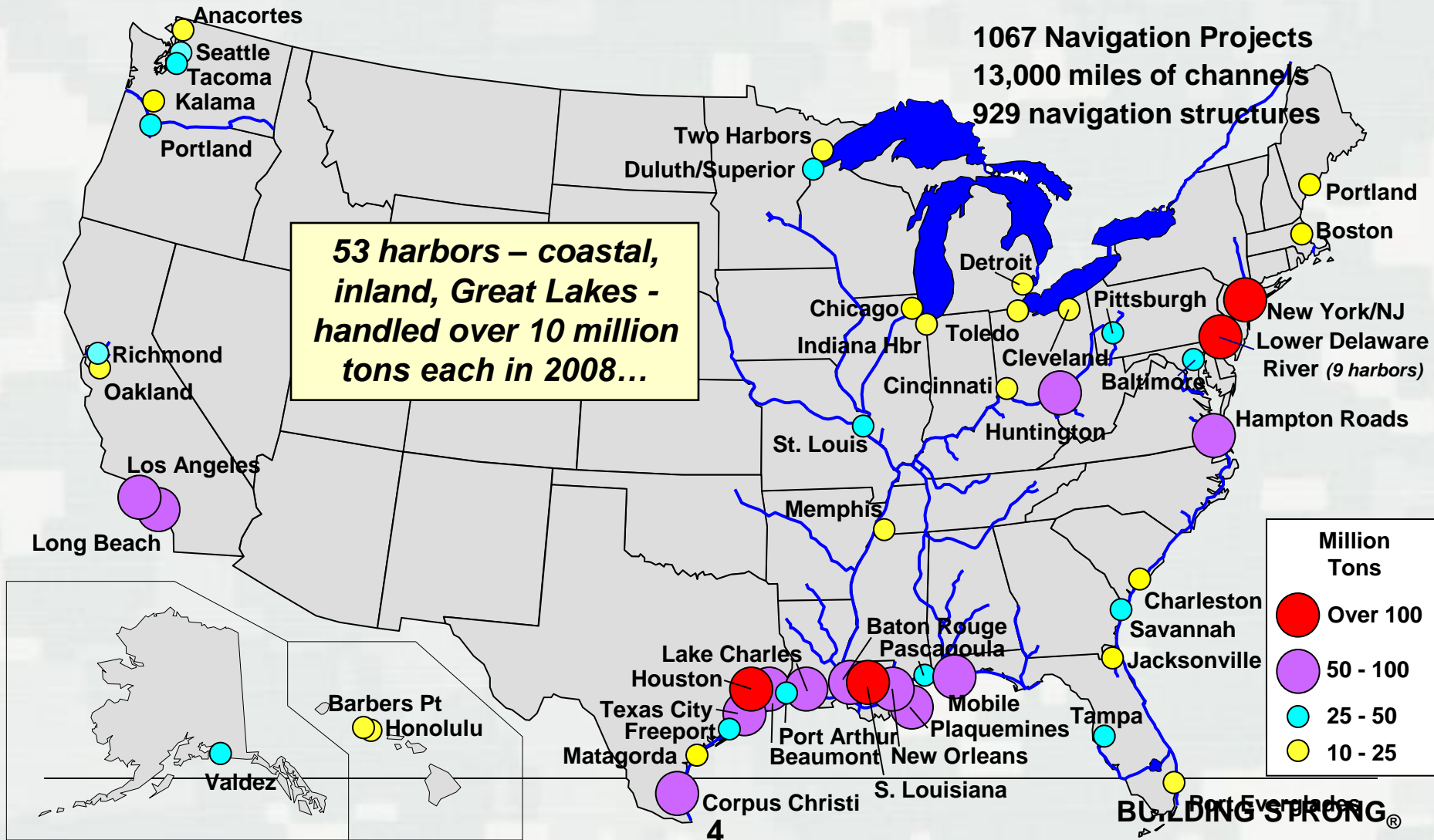
## INLAND NAVIGATION

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



# U.S. Ports: Vital to Trade and US National Economy

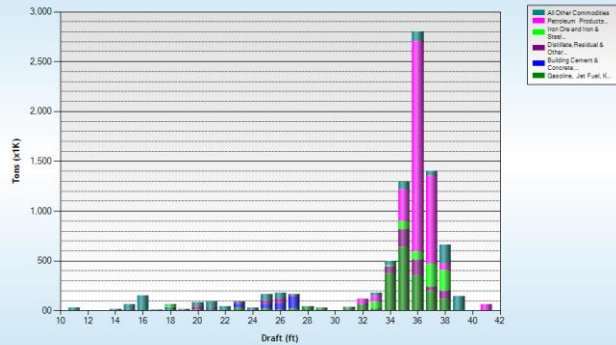
## COASTAL NAVIGATION





# Visualizing Port Utilization

Commodity Details Tons (Docked) for Mystic River, Ma (mile 0 To Mile 1) (377200) 2008

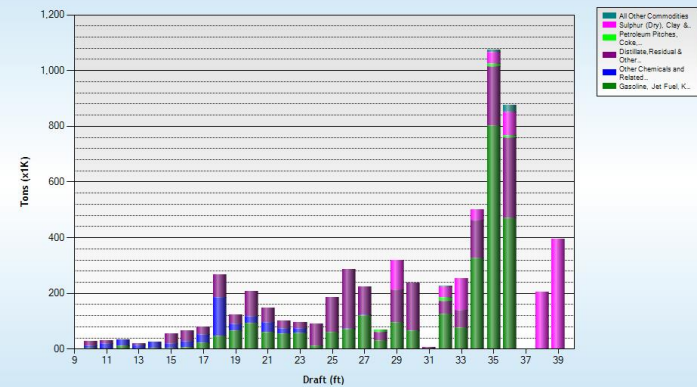


bors, and waterways and must be under 18 U.S.C. § 1905.

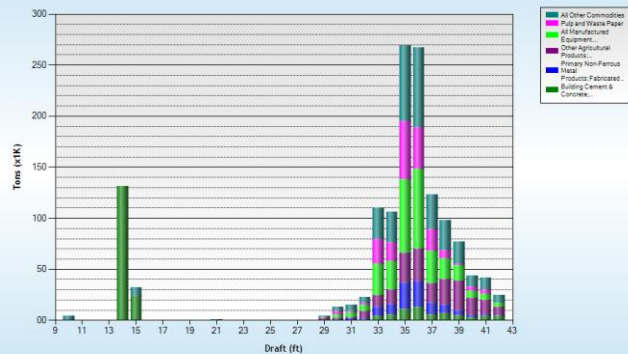
Chelsea River, Ma (377010)

Tons Affected: 6,360,108  
Dollars Affected: \$2,170,372,984

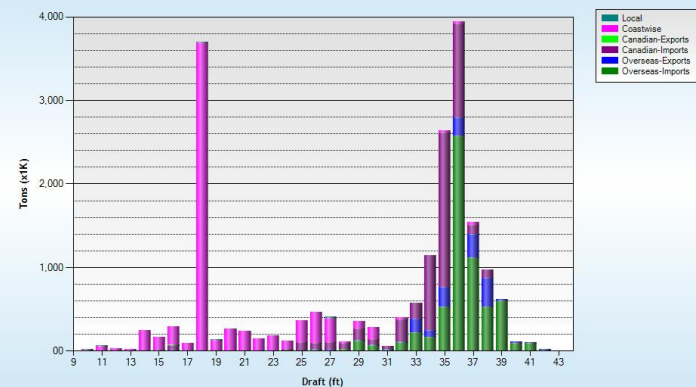
Commodity Details Tons (Docked) for Chelsea River, Ma (377010) 2008



Commodity Details Tons (Transit) for Reserved Channel (mile 0 To Mile 1) (374900) 2008



Cumulative Details Tons (Transit) for Main Waterfront (mile 0 To Mile 1) (376400) 2008

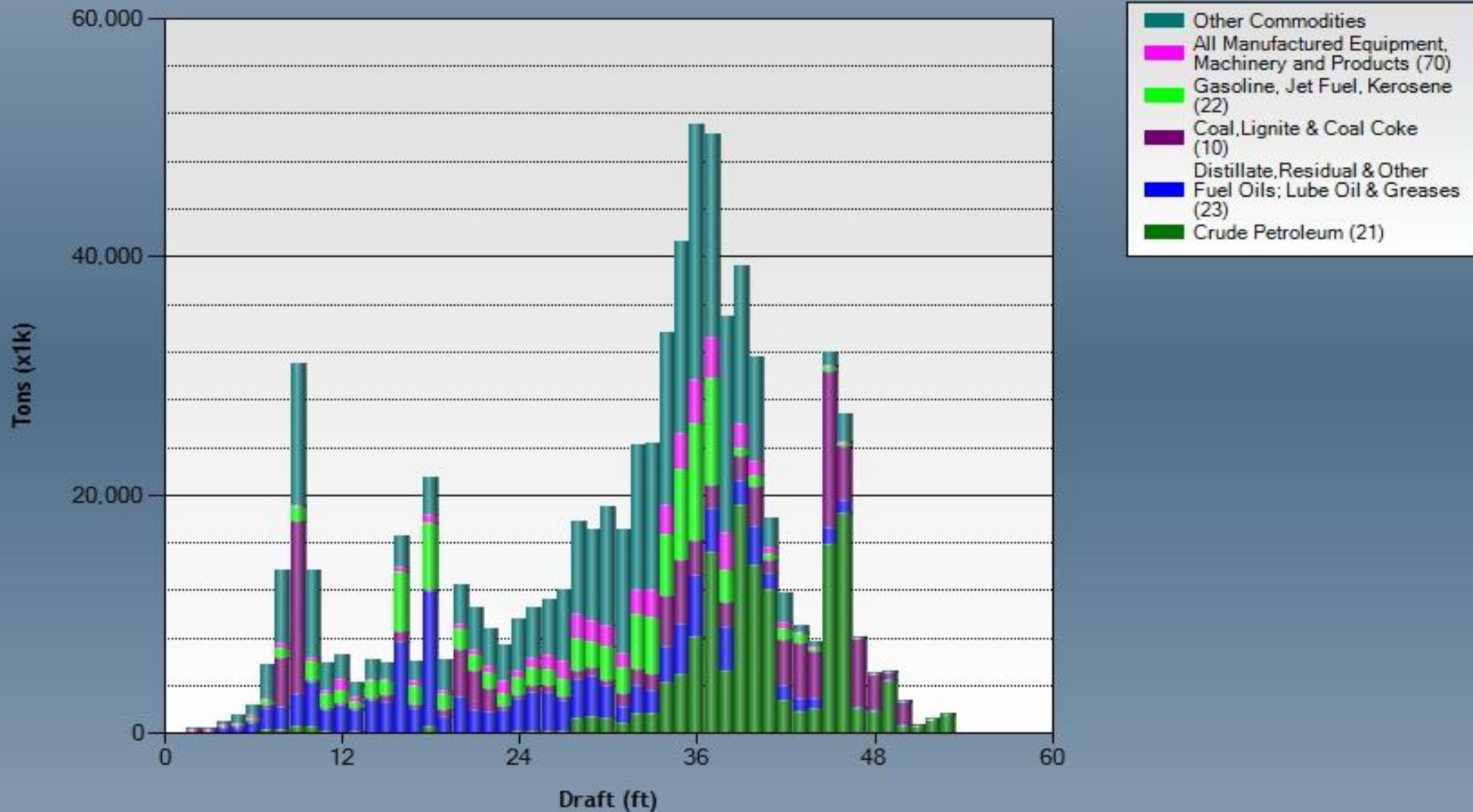


Data SIO, NOAA, U.S. Navy, NGA, C  
Image © 2011 TerraMetrics  
© 2011 Google

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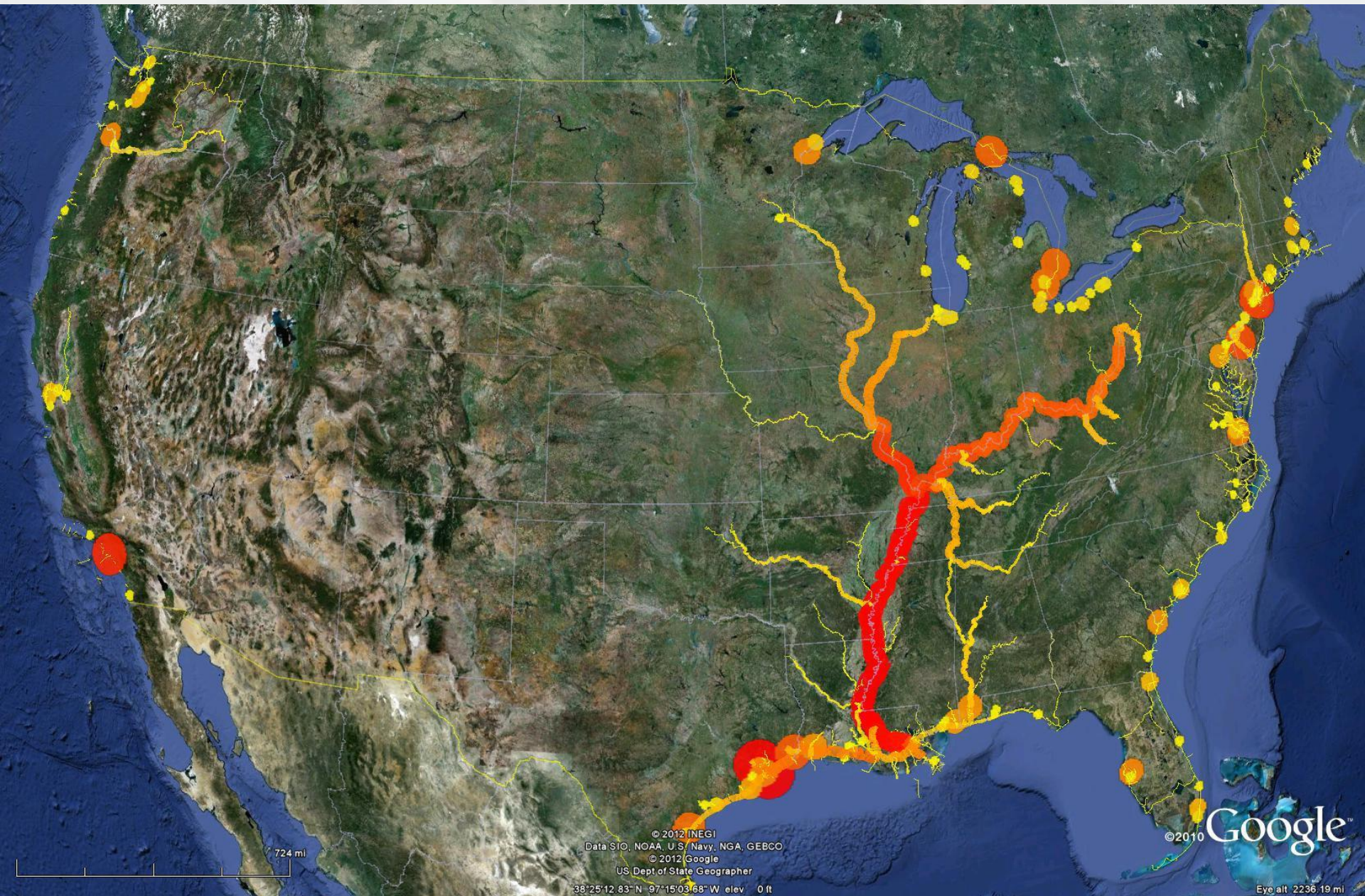
# Regional Movement

Rollup Division Commodity Draft vs. Average Yearly Tons for AllShipments





# The U.S. Navigation System





# The U.S. Navigation System

**WARNING** This page contains commercially sensitive statistics pertaining to rivers, harbors, and waterways and must be held in strict confidence as required by 33 C.F.R. § 209.320. Unauthorized disclosure could result in loss of employment, fines, and imprisonment under 18 U.S.C. § 1905.

**Lower Miss. River**  
Inbound corn, 2009

**Corps O&M activities must be coordinated in order to realize system-level efficiencies and maximize benefits to the Nation.**



★ Washington D.C.

450 mi

Data SIO, NOAA  
Image USDA Farm Service Agency  
© 2011 Google  
© 2011 INEGI

©2010 Google™

lat 37.378187° lon -87.805648° elev 445 ft

Eye alt 1584.30 mi



# Navigation Value to the Nation

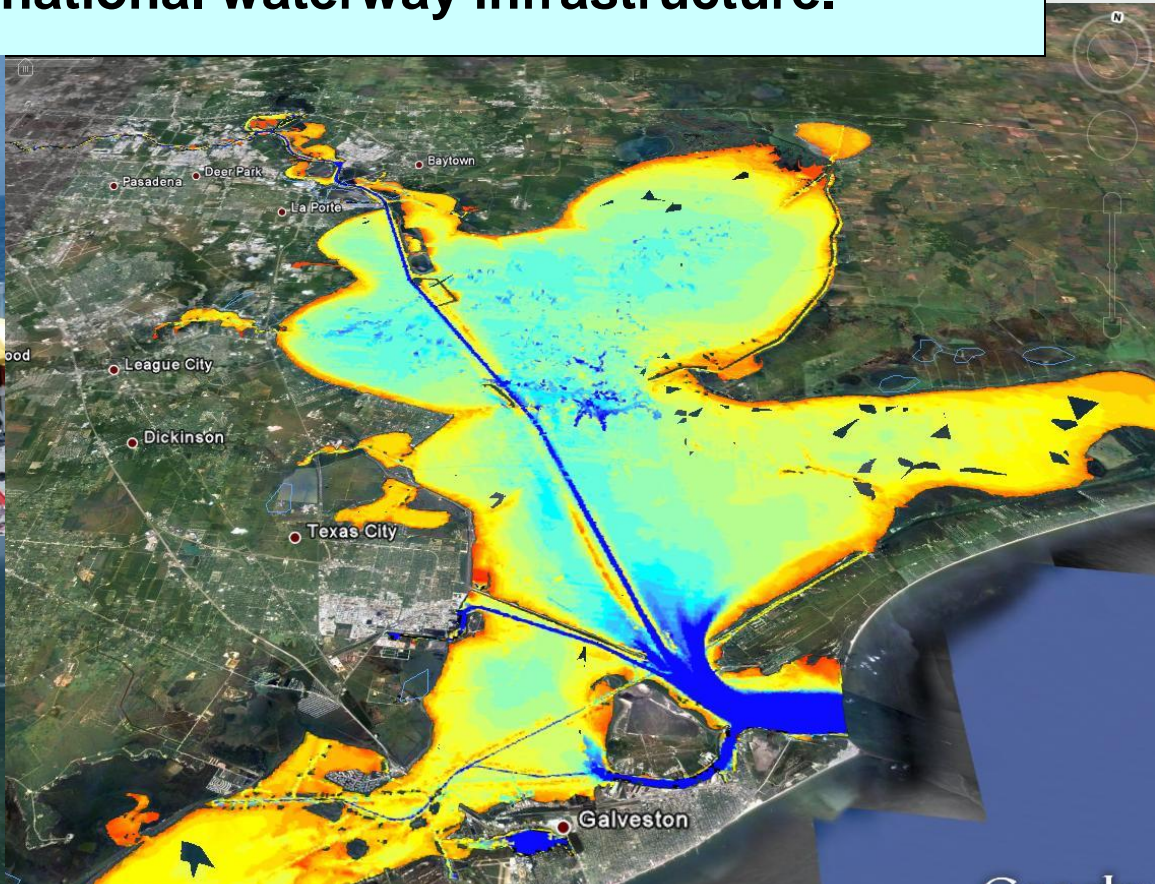
- MTS is a vital component of the US supply chain
- Supports more than 8 million US jobs
- 63,800 vessel calls at US ports
- 77% by weight of all imports
- Connects to 152,000 miles of RR and 45,000 miles of highway
- \$9.9 Billion contributed to US Gross Domestic Product (GDP)
- 147 million ferry passengers
- 18 million recreational boaters





# Navigation Challenges

Corps invests hundreds of millions of dollars annually in maintenance of our *hidden* national waterway infrastructure.

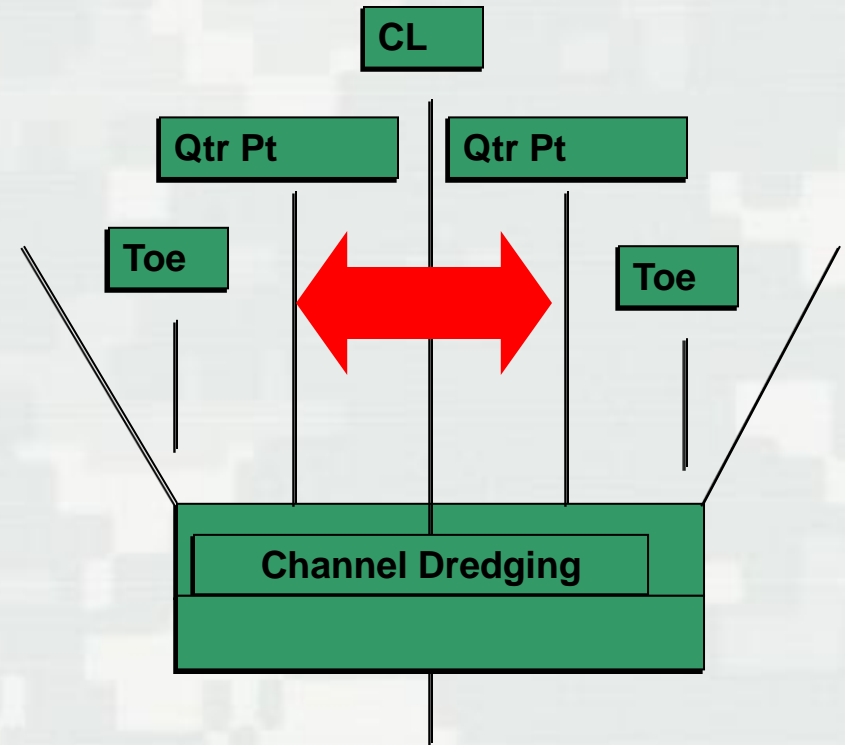


National dependence upon this vital infrastructure has not translated into full public awareness.



# Channel Performance

- High Use Projects, >10M tons/year
- Goal: Half channel width, 95% of time
- Actual: 35% of time
- Analogy to building a 2-lane road; Present funding allows one lane, one-third of the year



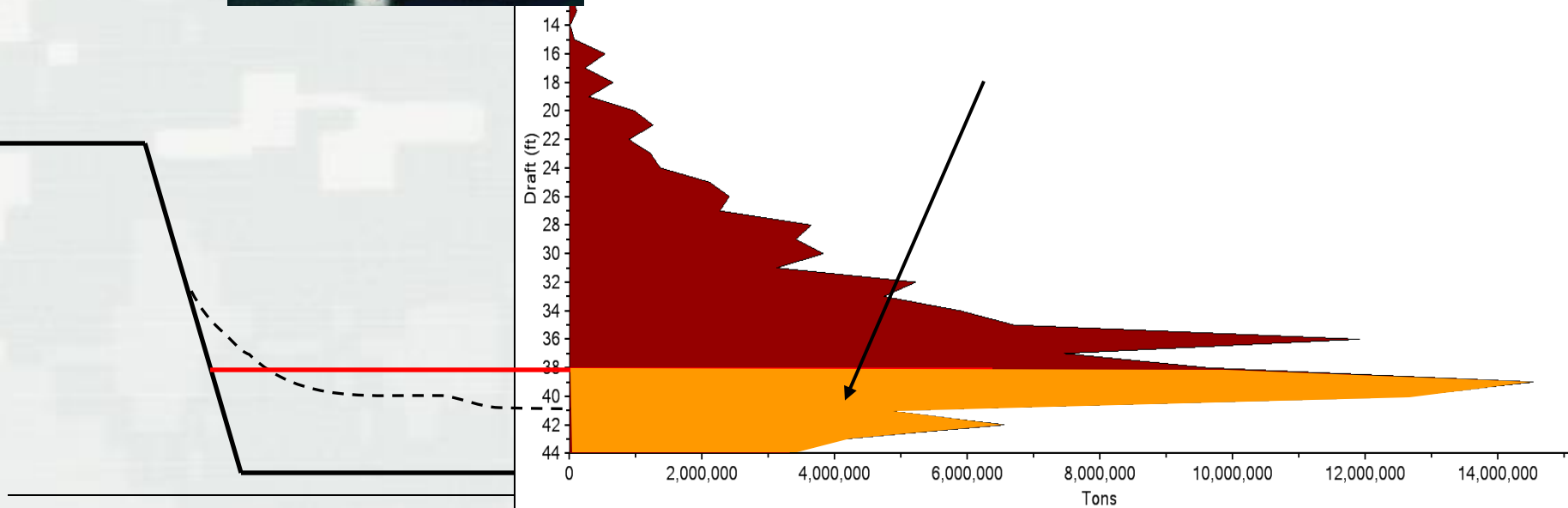


# Cargo Through a Channel



**CPT can generate depth-utilization profiles showing the distribution of cargo across the range of maintained depths for any system of navigation channels.**

**CPT then compares these tonnage-draft profiles to the segment controlling depths resulting from present shoaling conditions.**



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# National Summary

Vessel Type	Imports/ Exports	# of Additional Voyages Needed to Transport Disrupted Cargo (2-ft Shoaling Scenario)
Tanker	Imports	139
Tanker	Exports	15
Dry Bulk	Imports	83
Dry Bulk	Exports	58
Container	Imports	97
Container	Exports	59
	<b>Total:</b>	<b>452</b>



# Corps Dredging Program

- **237.9 MCY dredged (FY12)**
- **\$1.2B cost**  
(O&M, Sandy, New Construction)
- **\$3.99/CY avg cost**
- **138 contracts**
- **52% cutterhead**
- **37% hopper**
- **10% mechanical**



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# Coastal Dredging Challenges

- **Estimated 450 MCY needed annually over 5 years to restore to authorized dimensions for top commercial use projects.**
- **Additional 125 MCY needed annually over 5 years for low use commercial projects.**
- **Estimated 450 MCY needed annually after that to maintain authorized dimensions of both**





# Current Dredged Material Management Conditions



# Coastal Dredging Challenges

- Dredging costs are increasing
- Dredged material placement capacity decreasing
- Beneficial use of dredged material Corps policy says determine the least costly, environmentally acceptable method of dredged material placement. This is the Federal Standard
- Corps is willing to place the material at other locations, but someone must pay/or cost share the increased cost over the Federal Standard method
- Panama & Arctic global shipping patterns
- Environmental 'Windows' are increasing restrictions on when dredging can be performed
- [Opportunity to partner for innovative solutions](#)





# Navigation RD&T Strategic Needs & Priorities

## FY14

- 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



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# Coastal Engineering Resilience

**Resilience:** the ability of a ***system***\* to anticipate, resist, recover, and adapt to achieve functional performance under the stress of disturbances.

**Quantified as the joint probability of achieving two objectives:**

- Functional (design) objective (e.g., 100-year CSDR)
- **Recovery (temporal) objective (e.g., operational 1 week after disturbance)**

**\*System defined in context of...**

...components of a project

...a specific project

...reinforcing elements and projects within a coastal watershed

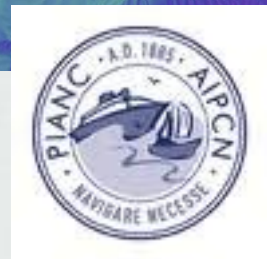
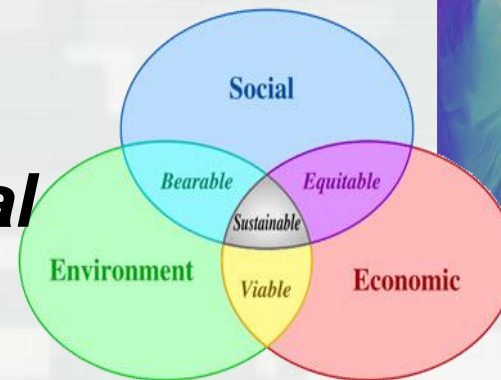
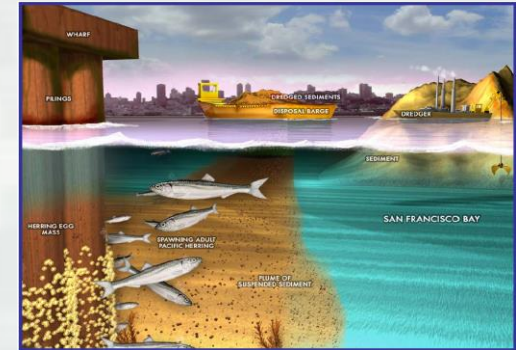
...USACE operations – Planning, Design, O&M

...ecosystem and communities within the coastal watershed



# Engineering With Nature

**Engineering With Nature**  
*is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits.*



Use of Natural and nature-Based Features in the USACE  
North Atlantic Coast Comprehensive Study – Todd Bridges

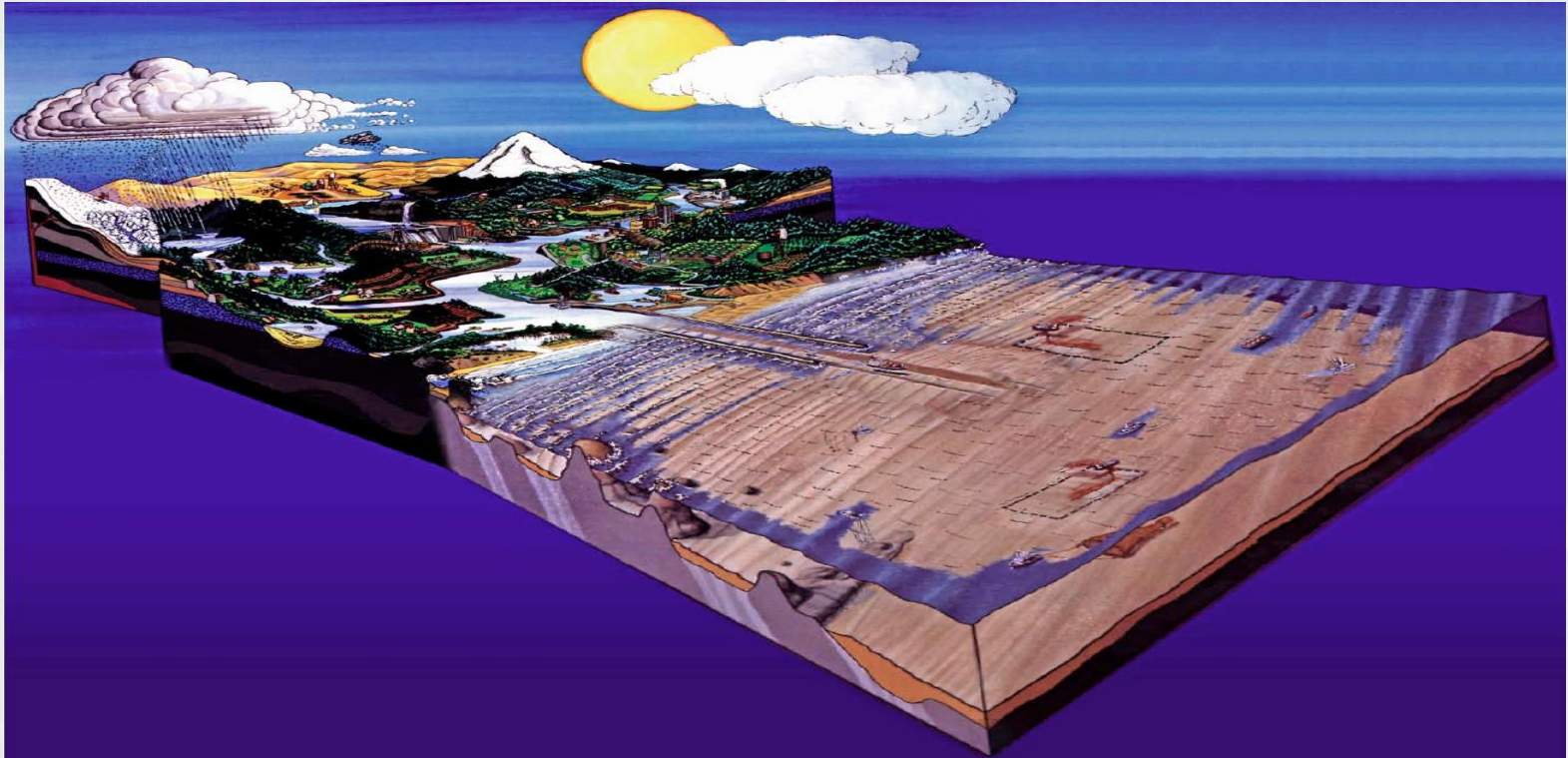
The USACE Engineering With Nature Program – Cynthia Banks

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# Regional Sediment Management

## *Objective*

To improve sediment management practices within the Corps by demonstrating how to implement a system-based approach and how such an approach provides opportunities to achieve greater effectiveness and efficiency.



Regional Sediment Management – Linda Lillycrop

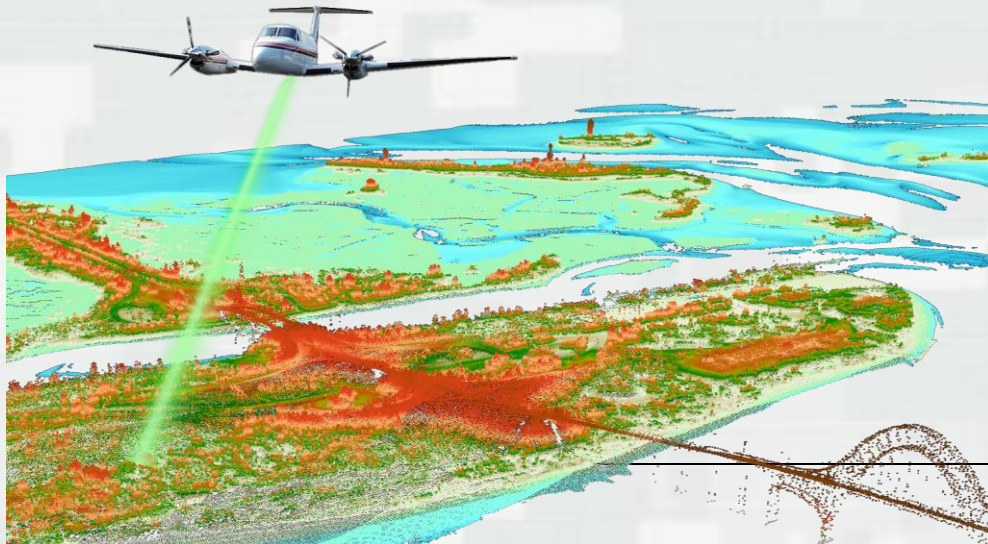


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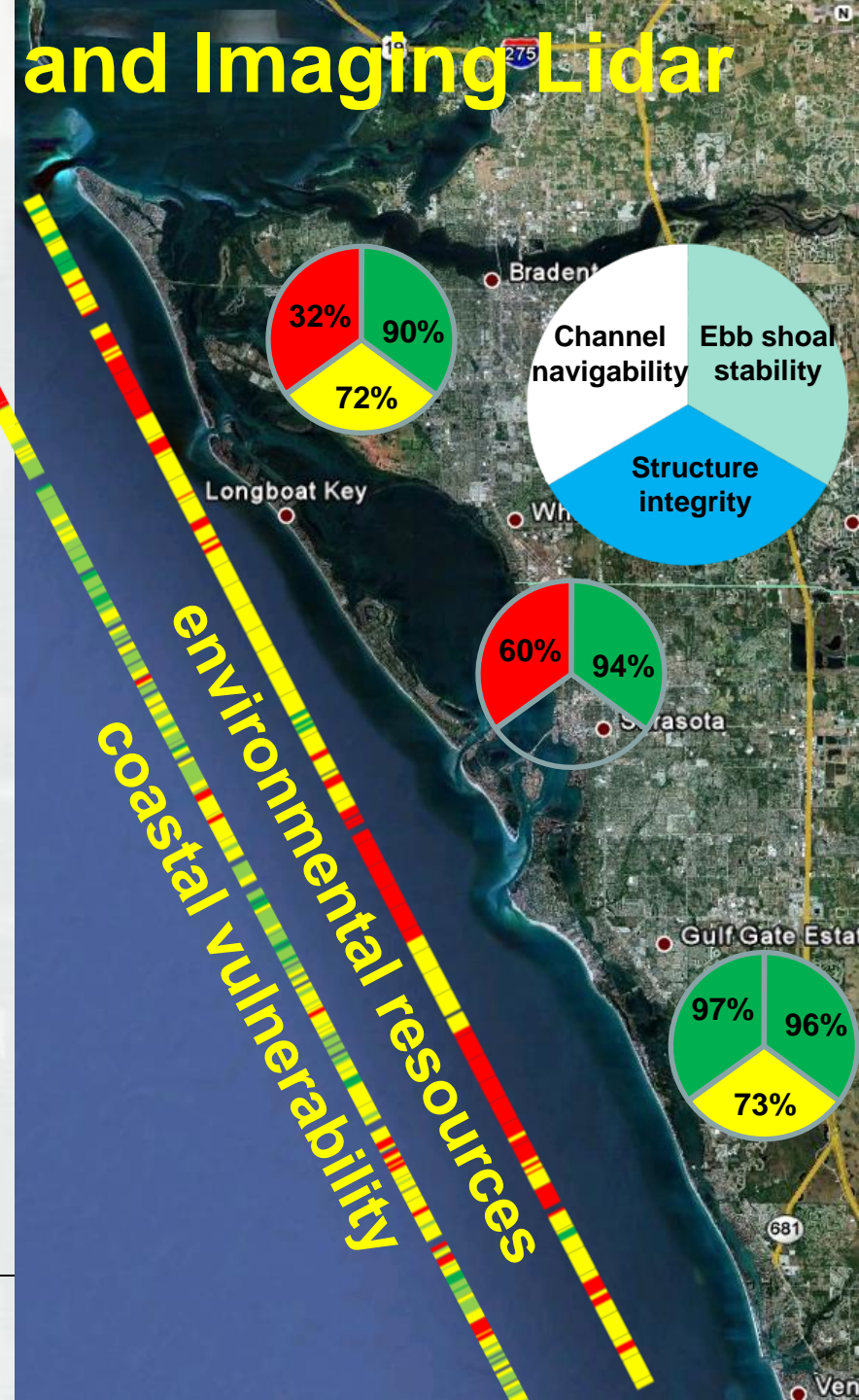


# Coastal Zone Mapping and Imaging Lidar

- Data to Knowledge and Decisions
- Assess condition, measure change, quantify rate of change
- Technical Challenges in Coastal Mapping – Jennifer Wozencraft & Mike Aslaksen



Gilgo Beach area of Jones Beach Island Post-Sandy



# Innovative Technologies for a Resilient Marine Transportation System

3<sup>rd</sup> Biennial Research & Development Conference

June 24-26, 2014 • Washington, DC

Conference website and registration:  
[www.TRB.org/Conferences/Innovation2014.aspx](http://www.TRB.org/Conferences/Innovation2014.aspx)

The conference will include three plenary sessions:

- **Innovative Technology for a Resilient Marine Transportation System**
  - **Impacts of eNavigation on the Marine Transportation System**
  - **Optimizing Freight Transportation System Performance**

Three breakout sessions will feature presenters on the following themes as they relate to innovative technologies and resilience:

- **System Performance • Asset Management and Maintenance Management • Safety and Security**
- **Environmental Stewardship • eNavigation**
  - **Data Management and Sharing**
  - **MTS Resilience**

This conference will serve as a forum to examine the use of emerging and innovative technologies and practices in maritime transportation and waterways management. It will foster partnerships between federal, state, private sector, and academic institutions with a shared interest in technological innovations and improved performance of the Marine Transportation System.

You are invited to share your knowledge and expertise. If you are interested in submitting a paper or presenting relevant research, please submit an abstract of 300 words or less. Those selected to participate will be notified in April 2014. Submit your abstract via email to [CMTSmeetings@cmts.gov](mailto:CMTSmeetings@cmts.gov).

#### Conference Location:

National Academy of Sciences  
 2101 Constitution Ave NW  
 Washington, DC 20418

#### Hotel Information:

The Melrose Georgetown  
 2430 Pennsylvania Ave NW  
 Washington, DC 20037

For more information, please contact:  
 Scott Brotemarkle, Senior Program Officer  
[SBrotemarkle@NAS.edu](mailto:SBrotemarkle@NAS.edu) or (202) 334-2167

Have a question about your conference registration?

Contact the TRB Meetings Department at [TRBMeetings@NAS.edu](mailto:TRBMeetings@NAS.edu)



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# Questions?

**W. Jeff Lillycrop**  
**Technical Director**  
**US Army Engineer Research and Development Center**  
**202-761-4229**  
**[jeff.lillycrop@usace.army.mil](mailto:jeff.lillycrop@usace.army.mil)**



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