

Quantifying the Impacts of Shoaling in Navigation Channels via Historical Waterborne Commerce Data

Kenneth Ned Mitchell, PhD

U.S. Army Engineer Research and Development Center

CAPT David MacFarland

NOAA

CMTS-TRB R&D Conference

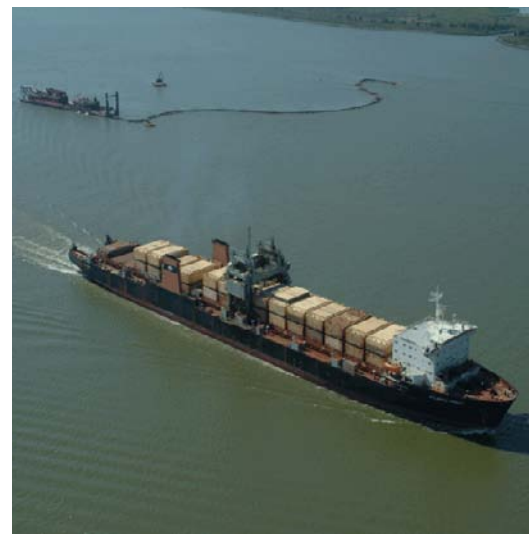
Washington, D.C.

June 26th, 2012



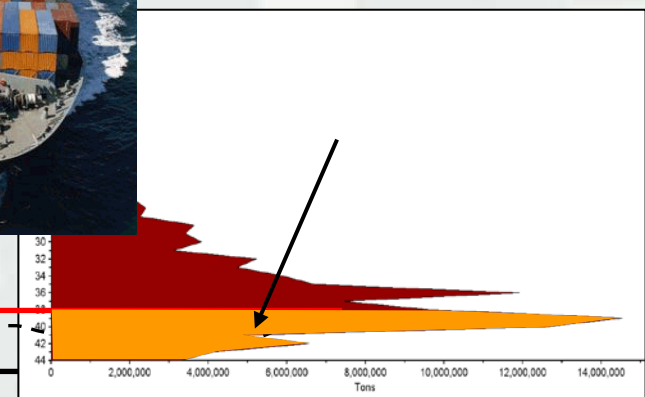
®

US Army Corps of Engineers
BUILDING STRONG®



USACE Maintenance Dredging

- USACE invests hundreds of millions of dollars annually in maintenance dredging of the deep-draft navigation project portfolio.
- Due to limited funds, difficult decisions must be made concerning where to direct maintenance dredging resources.
- Priority should be given to portions of the MTS with the greatest national benefits...right?



NOAA National Ocean Service

- NOAA's National Ocean Service seeks to promote the value of the MTS in supporting coastal communities, robust coastal economies, and environmentally sustainable utilization of marine resources.
- It is critical that the value of the NOAA-NOS mission be conveyed in terms of economic benefits of supported coastal port activity.



Access to MTS Commerce Data

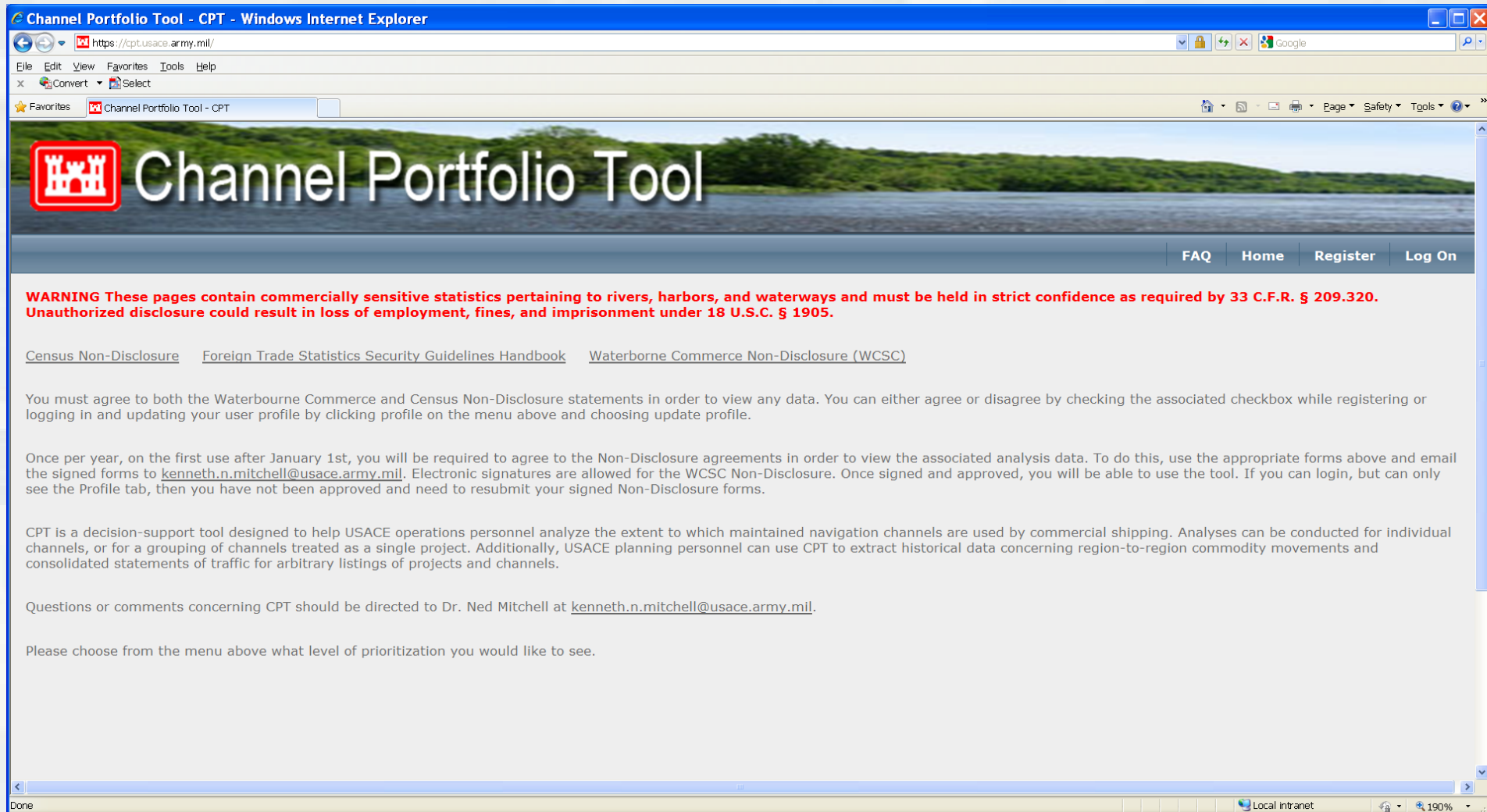
- The Corps' Waterborne Commerce Statistics Center (WCSC) collects and collates data from several sources concerning commercial use of US waterways.
 - ▶ Dock-level, origin-to-destination routing (Corps-use-only)
 - ▶ Includes tons, commodity types, vessel counts, drafts
 - ▶ Aggregated data already published at project level

<http://www.ndc.iwr.usace.army.mil/wcsc/wcsc.htm>

- Corps Ops community has not consistently used this data beyond project-level tonnage and ton-mile metrics for O&M budget development.
- Both USACE and NOAA-NOS can benefit from streamlined, interactive access to this rich data source.



Channel Portfolio Tool (CPT)

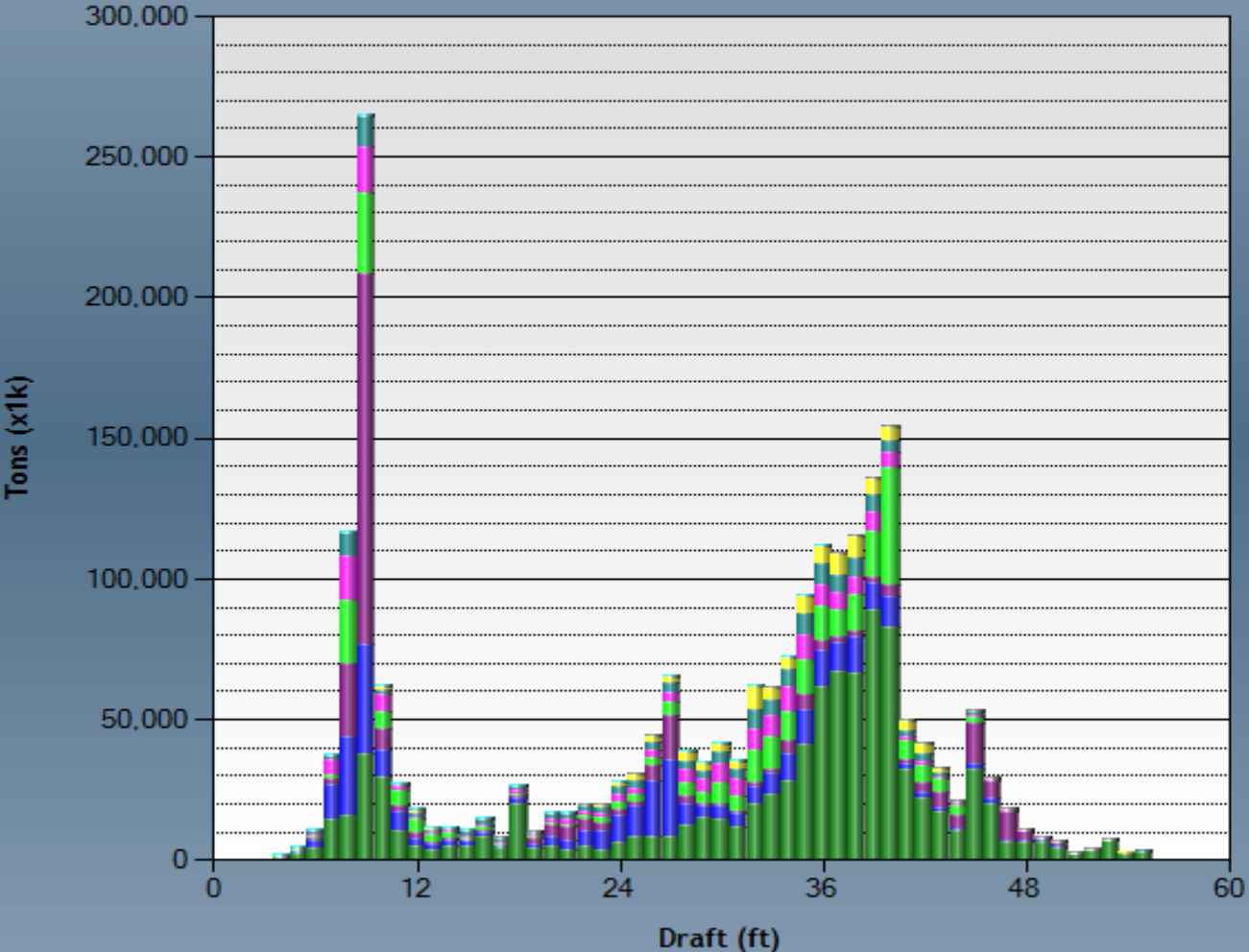


The screenshot shows a Windows Internet Explorer browser window displaying the Channel Portfolio Tool (CPT) website. The address bar shows the URL <https://cpt.usace.army.mil/>. The page features a header with the CPT logo (a red castle icon) and the text "Channel Portfolio Tool". Below the header is a navigation menu with links for "FAQ", "Home", "Register", and "Log On". A prominent red warning message states: "WARNING These pages contain 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." Below the warning are links for "Census Non-Disclosure", "Foreign Trade Statistics Security Guidelines Handbook", and "Waterborne Commerce Non-Disclosure (WCSC)". The main content area contains a disclaimer: "You must agree to both the Waterbourne Commerce and Census Non-Disclosure statements in order to view any data. You can either agree or disagree by checking the associated checkbox while registering or logging in and updating your user profile by clicking profile on the menu above and choosing update profile." It also states: "Once per year, on the first use after January 1st, you will be required to agree to the Non-Disclosure agreements in order to view the associated analysis data. To do this, use the appropriate forms above and email the signed forms to kenneth.n.mitchell@usace.army.mil. Electronic signatures are allowed for the WCSC Non-Disclosure. Once signed and approved, you will be able to use the tool. If you can login, but can only see the Profile tab, then you have not been approved and need to resubmit your signed Non-Disclosure forms." A description of the tool follows: "CPT is a decision-support tool designed to help USACE operations personnel analyze the extent to which maintained navigation channels are used by commercial shipping. Analyses can be conducted for individual channels, or for a grouping of channels treated as a single project. Additionally, USACE planning personnel can use CPT to extract historical data concerning region-to-region commodity movements and consolidated statements of traffic for arbitrary listings of projects and channels." At the bottom, it says: "Questions or comments concerning CPT should be directed to Dr. Ned Mitchell at kenneth.n.mitchell@usace.army.mil. Please choose from the menu above what level of prioritization you would like to see." The browser's status bar at the bottom shows "Done" and "Local intranet".



Depth-Utilization Profiles

Rollup Division Commodity Draft vs. Average Yearly Tons for AllShipments

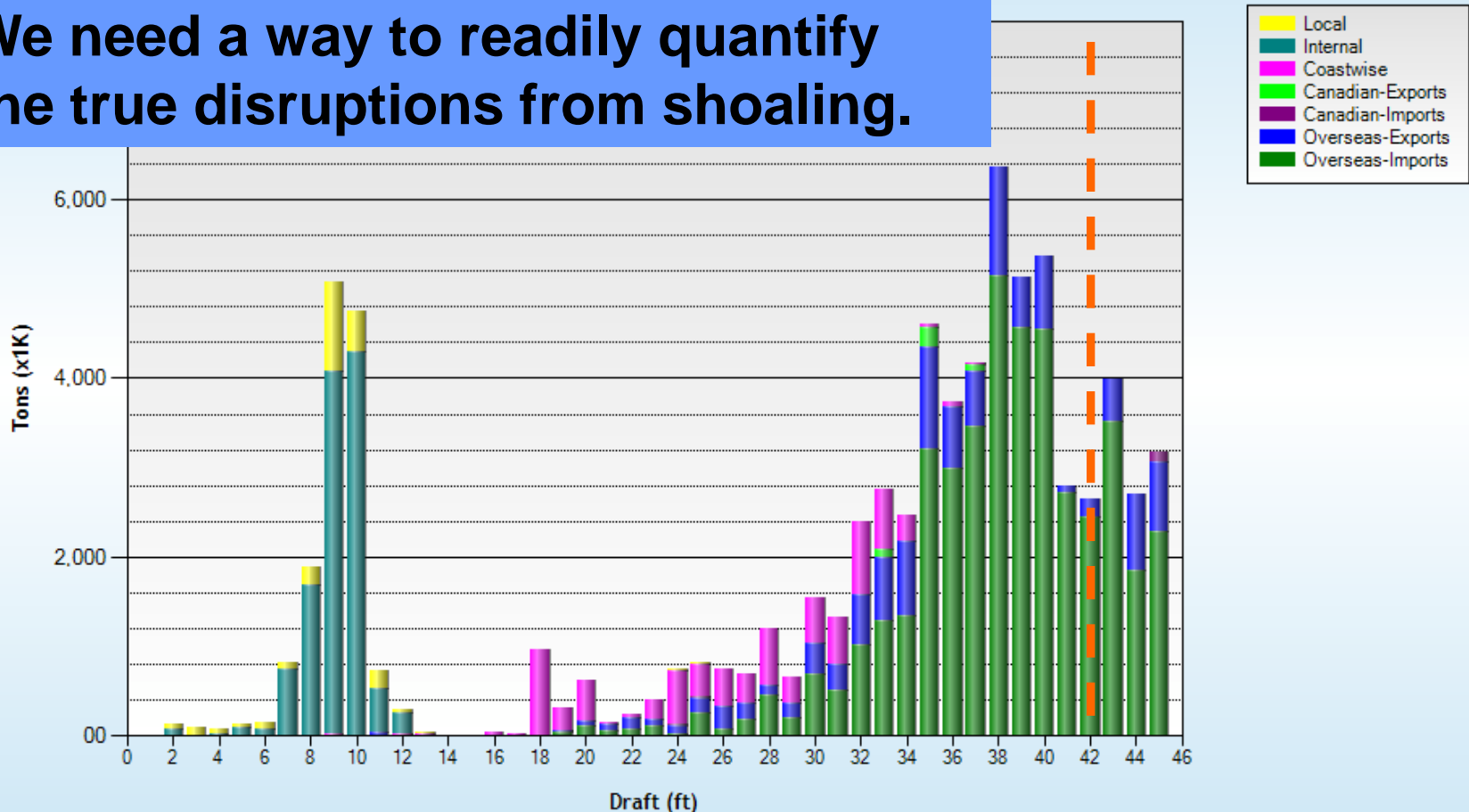


- Waste Material; Garbage, Landfill, Sewage Sludge, Waste Water (8)
- Unknown or Not Elsewhere Classified (9)
- All Manufactured Equipment, Machinery and Products (7)
- Primary Manufactured Goods (5)
- Chemicals and Related Products (3)
- Food and Farm Products (6)
- Coal, Lignite & Coal Coke (1)
- Crude Materials, Inedible Except Fuels (4)
- Petroleum and Petroleum Products (2)

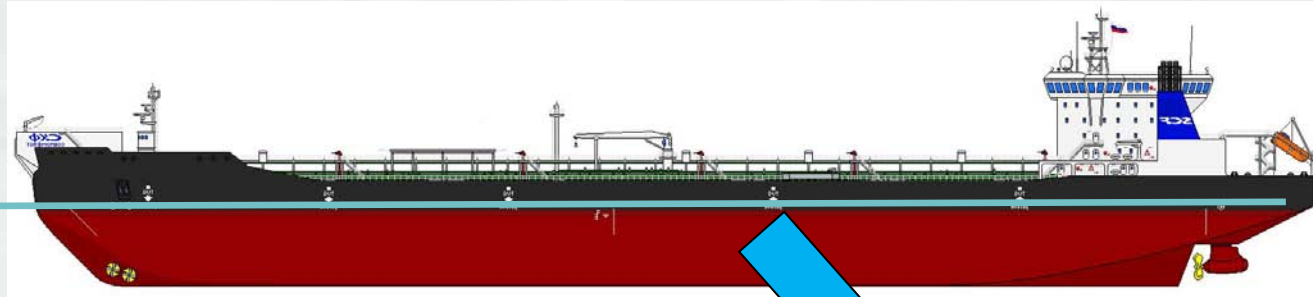
Focus on Shoal-vulnerable Cargo

Cumulative Details Tons (Transit) for Corpus Christi Ship Channel 2008

We need a way to readily quantify the true disruptions from shoaling.



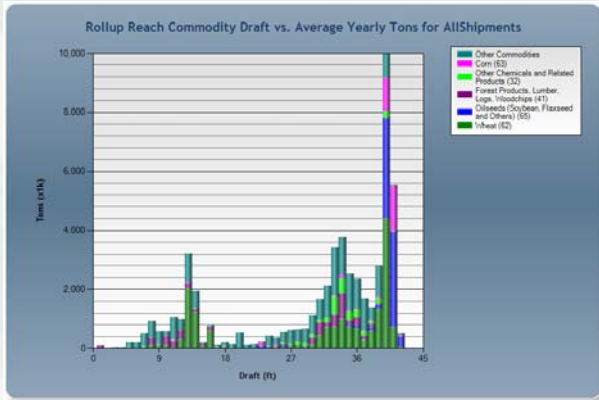
Need to Quantify Light-loaded Cargo



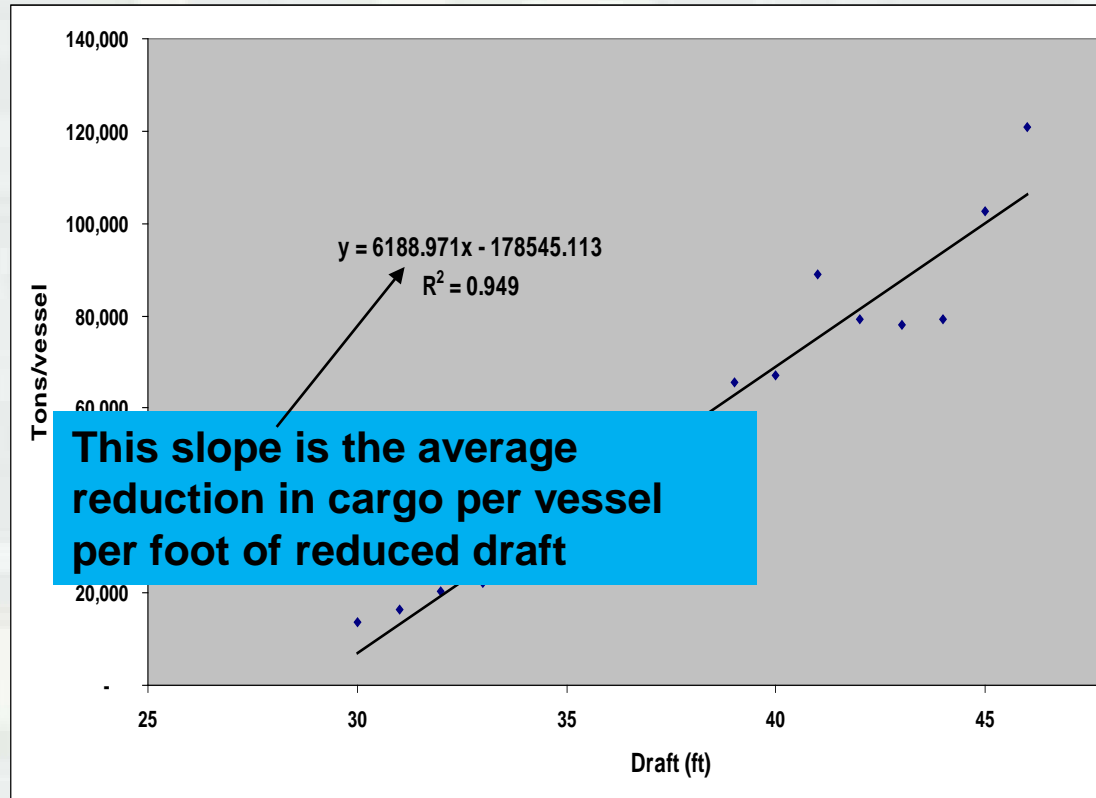
- Need to understand the relationship between depth of transit and cargo carried per voyage.
- CPT gives us a straightforward means of analyzing these relationships for scalable navigation systems.



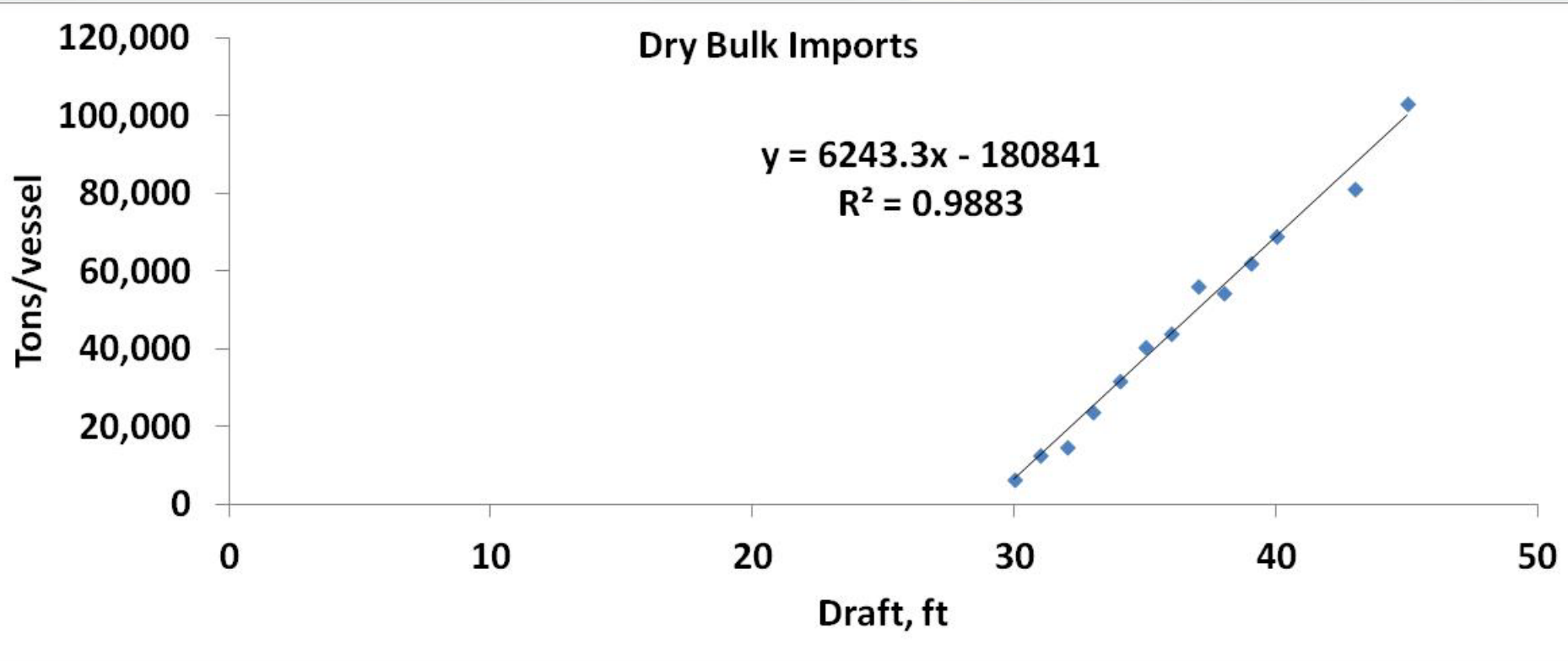
Need to Quantify Light-loaded Cargo



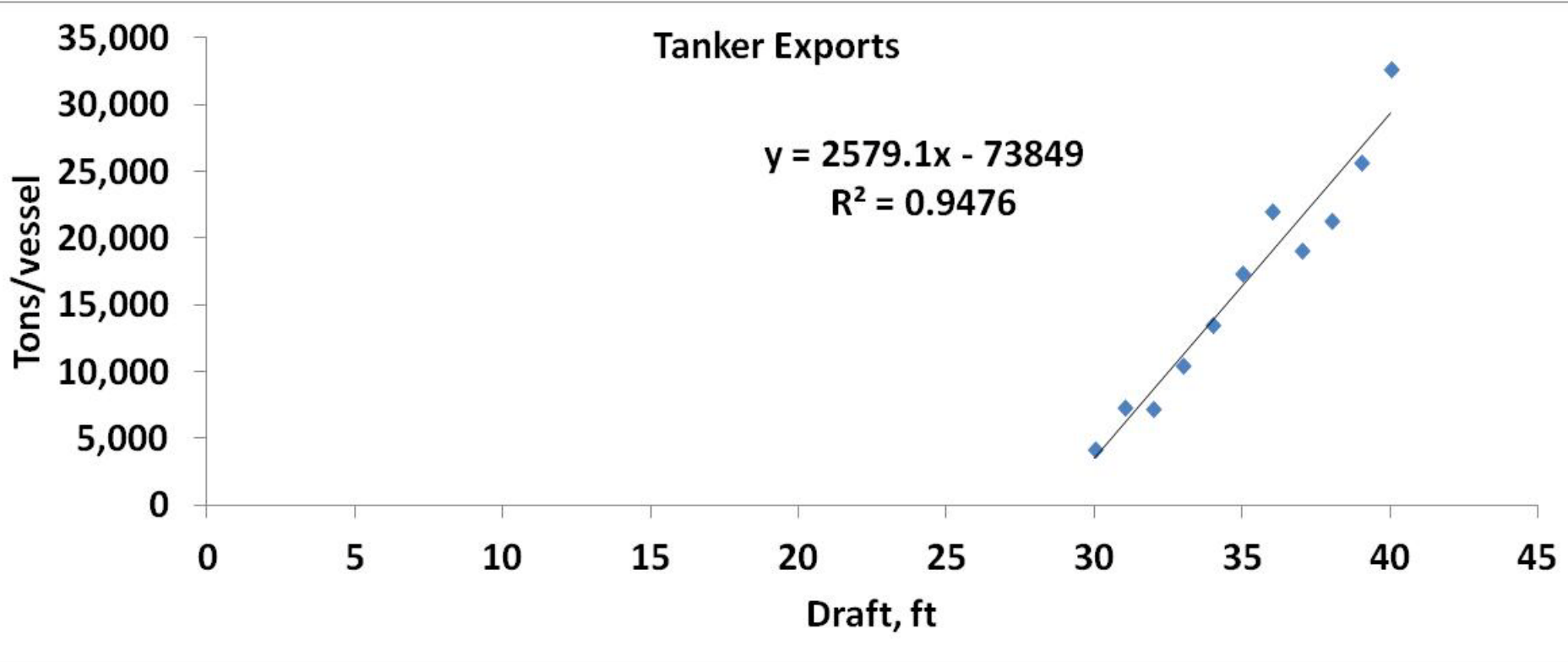
==



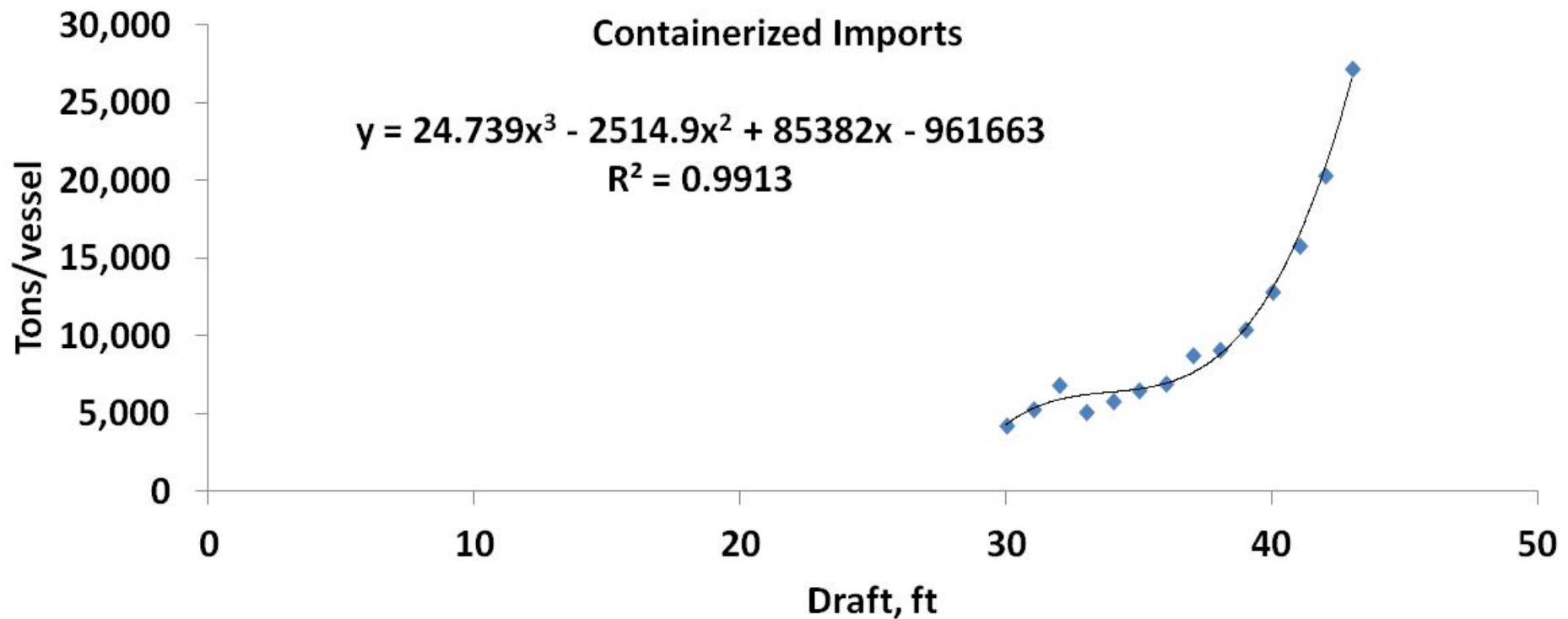
National Summary – Dry Bulk



National Summary – Tankers



National Summary – Containerized Cargo



National Summaries

Vessel Type	Imports/Exports	Avg. Tons/ft/vessel R ²
Tanker	Imports	6,858 (.95)
Tanker	Exports	2,579 (.95)
Dry Bulk	Imports	6,243 (.99)
Dry Bulk	Exports	4,665 (.98)
Container	Imports	$39.6x^2 - 2748x + 47720$ (.97) [5,049 at 42 ft.]
Container	Exports	$74.1x^2 - 5030x + 85382$ (.99) [2,273 at 42 ft.]



National Summaries

Vessel Type	Imports/ Exports	# Vessels Disrupted by 2-ft Shoaling Scenario	Thousand Short Tons Disrupted
Tanker	Imports	1,624	11,137
Tanker	Exports	147	379.1
Dry Bulk	Imports	801	5,001
Dry Bulk	Exports	742	3,461
Container	Imports	674	487.8
Container	Exports	555	1,418
		TOTAL:	21,885



National Summaries

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
	Total:	452



Lower Mississippi River


Average voyage distances, 2007-2008

US Census data on foreign countries of origin/destination for Lower Mississippi River used to estimate average distance per voyage:

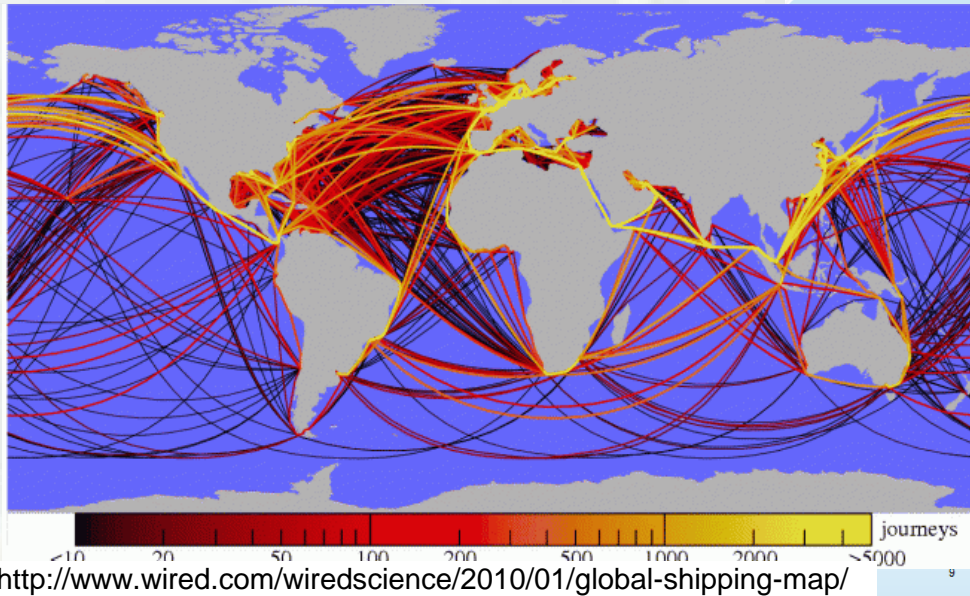
Sample Countries of Origin/Destination	Distance (mi)
Venezuela	1750
Estonia	6950
Mexico	650
Brazil	3750
Colombia	1650
India	13300
The Netherlands	5600
Spain	5100
United Kingdom	5300
Egypt	7300



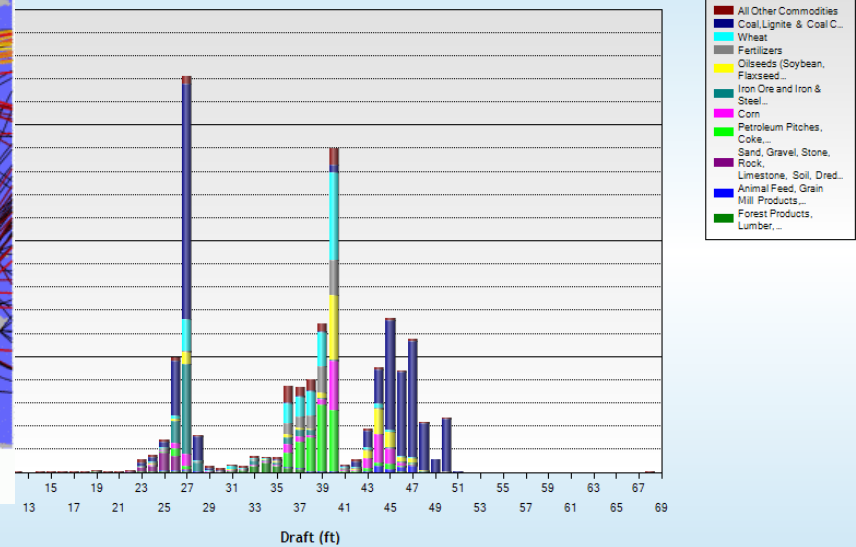
Average Voyage Distances

Tanker Imports: 3640 mi	Dry Bulk Imports: 4853 mi
Tanker Exports: 7311 mi	Dry Bulk Export: 6574 mi 

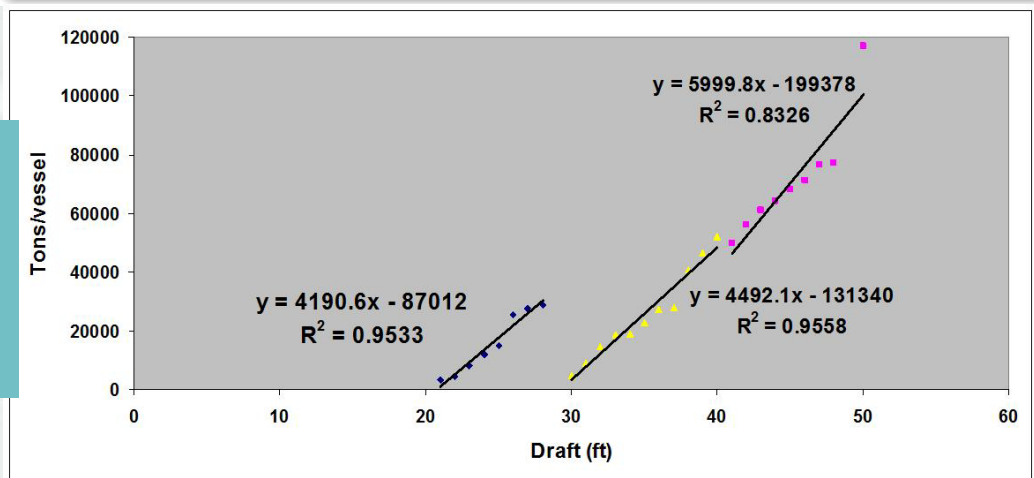
Further Automation of Metrics



Commodity Details Tons (Transit) for Rollup 2005-2008



Continued development of CPT will enable rapid, scalable metrics to estimate additional shipping costs due to shoaling.



Quantifying the Impacts of Shoaling in Navigation Channels via Historical Waterborne Commerce Data

Questions?

Dr. Ned Mitchell

Kenneth.n.mitchell@usace.army.mil

CAPT David MacFarland

David.macfarland@noaa.gov

