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


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US Army Corps of Engineers
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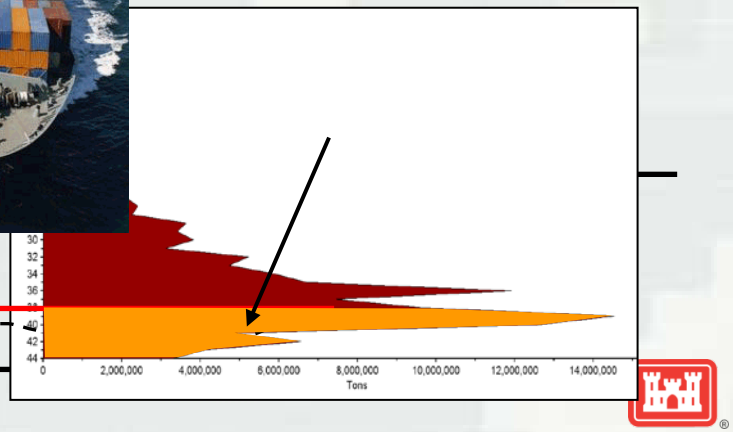
# USACE Maintenance Dredging

- 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.

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

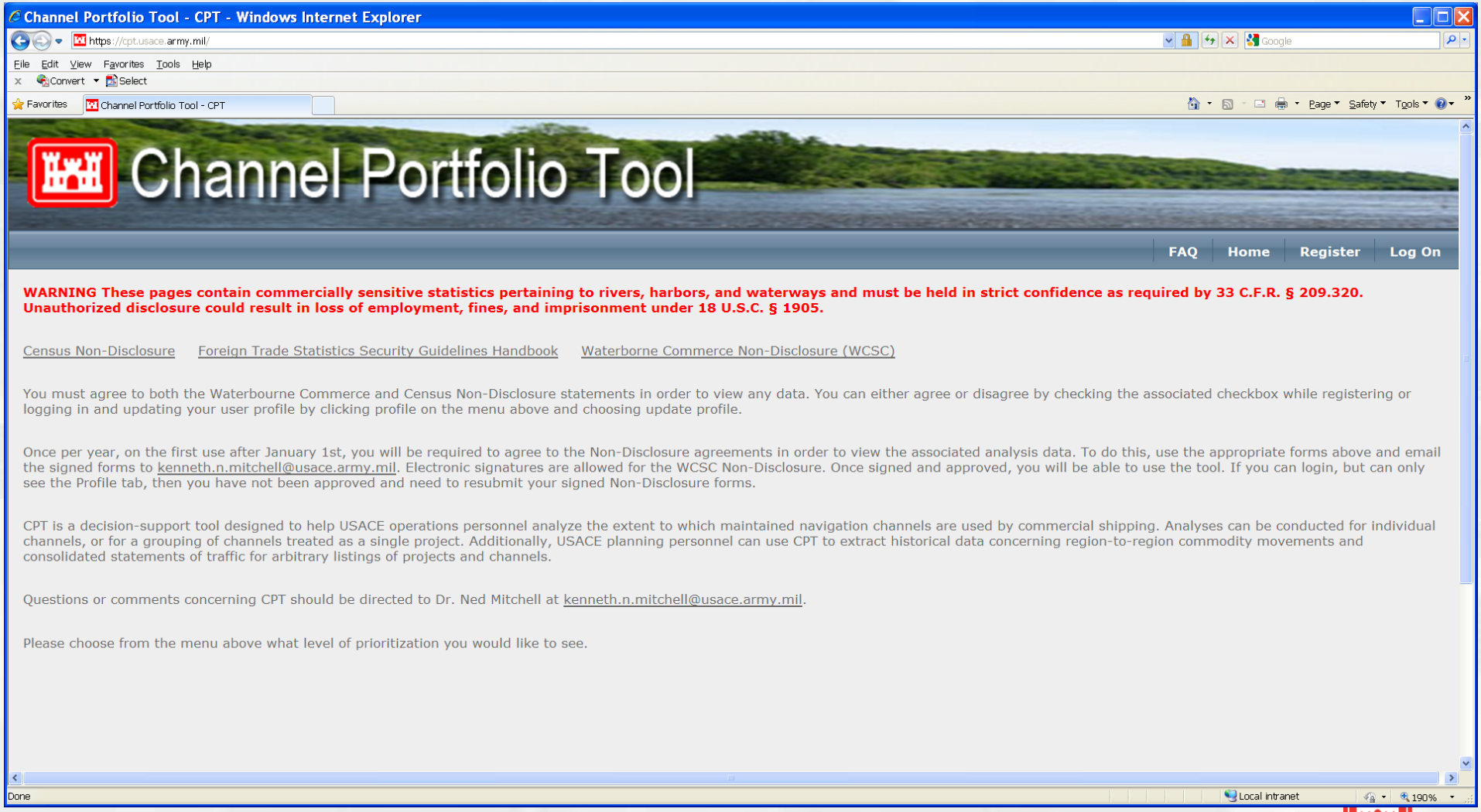
# Access to MTS Commerce Data

- 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

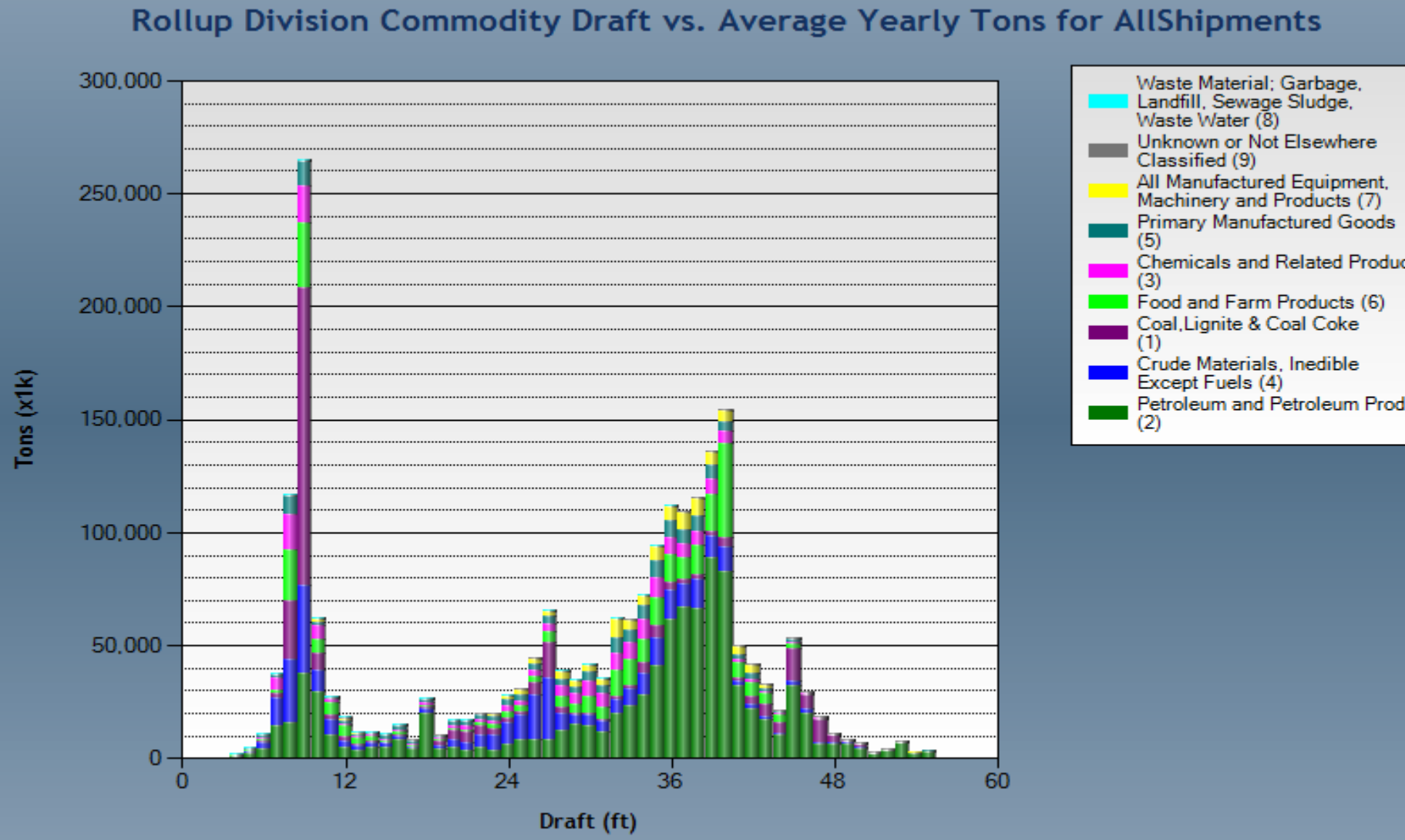
  **http://www.ndc.iwr.usace.army.mil/wcsc/wcsc.htm**

- 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)

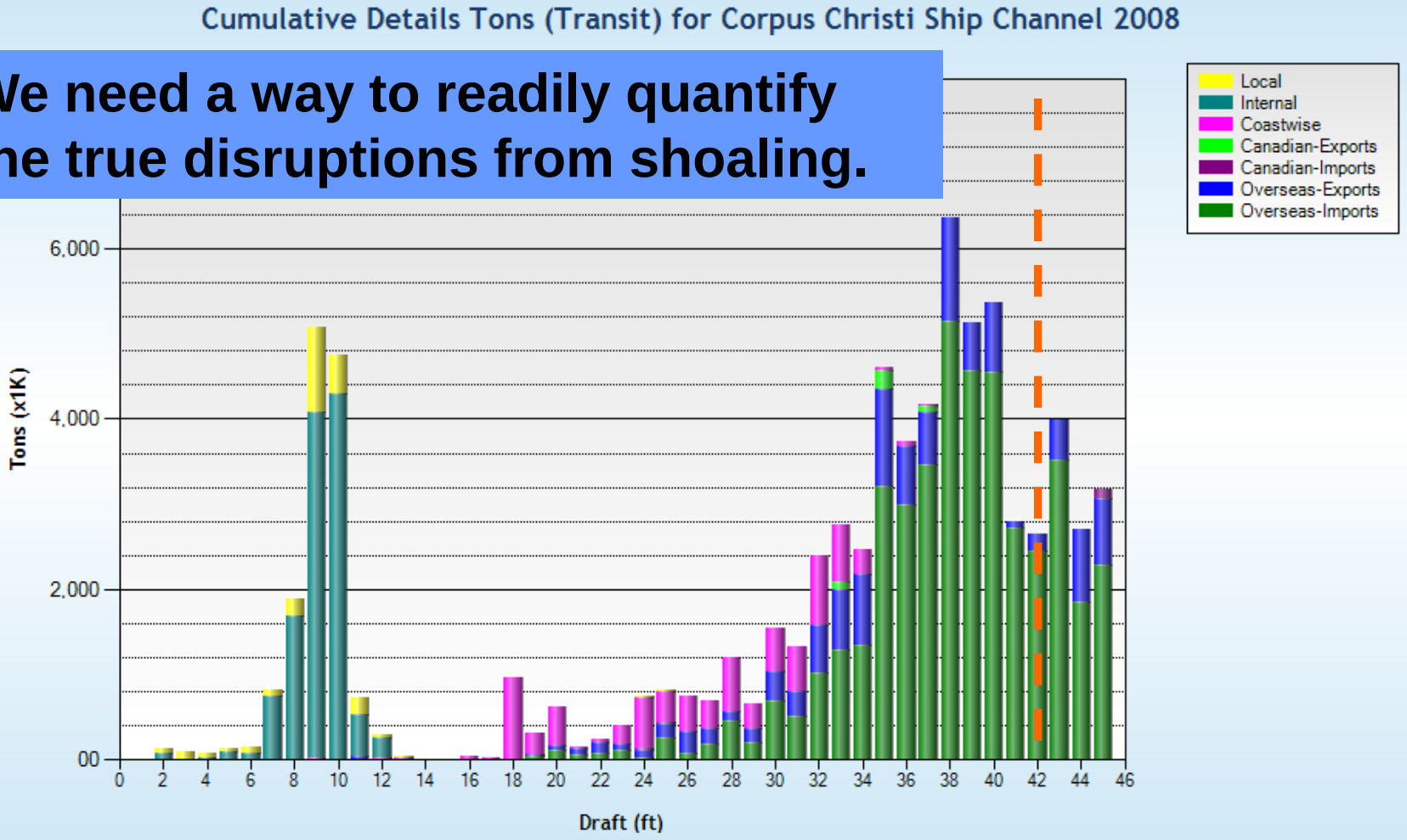


# Depth-Utilization Profiles

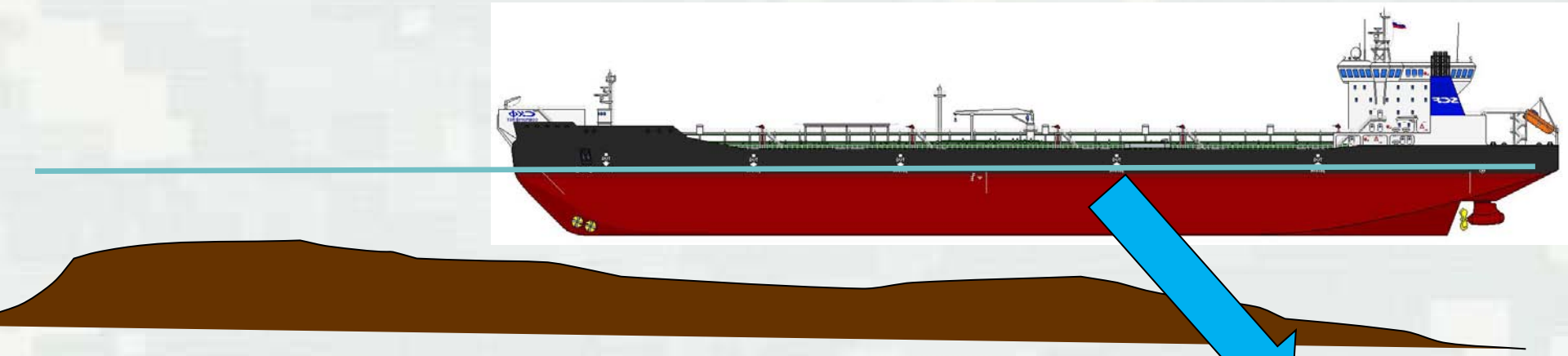


# Focus on Shoal-vulnerable Cargo

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

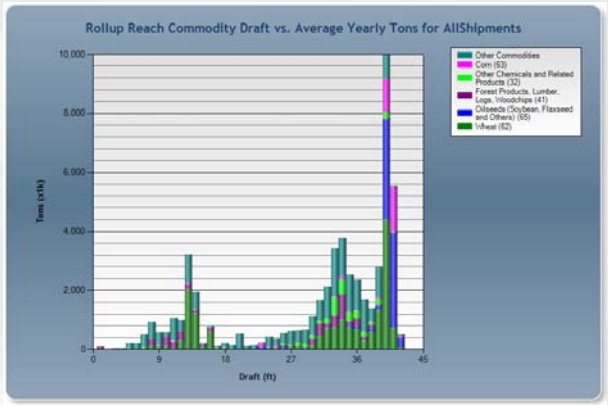


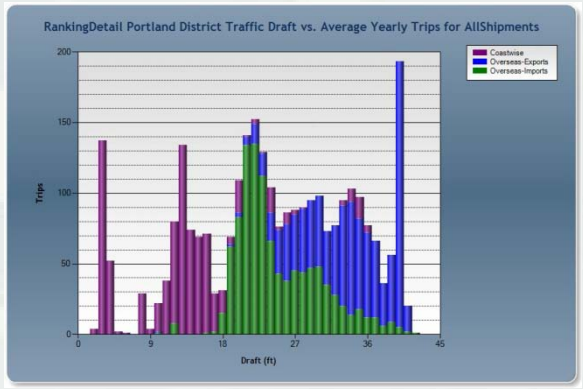
# Need to Quantify Light-loaded Cargo




- 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

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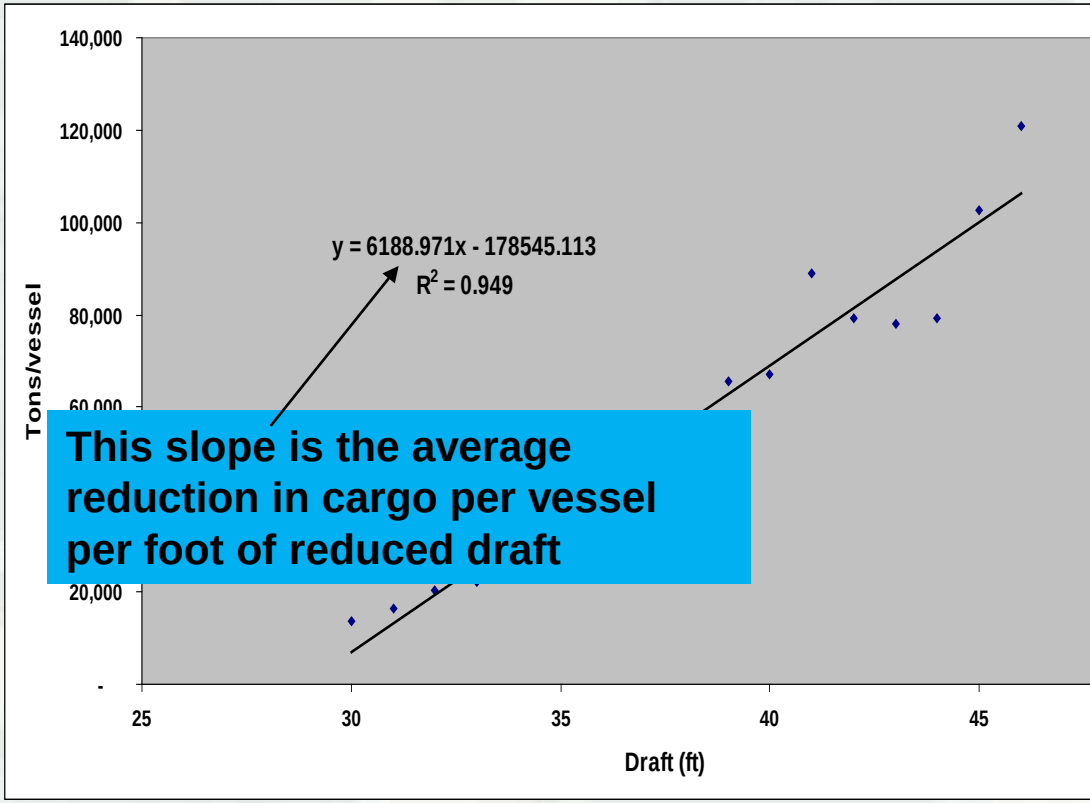
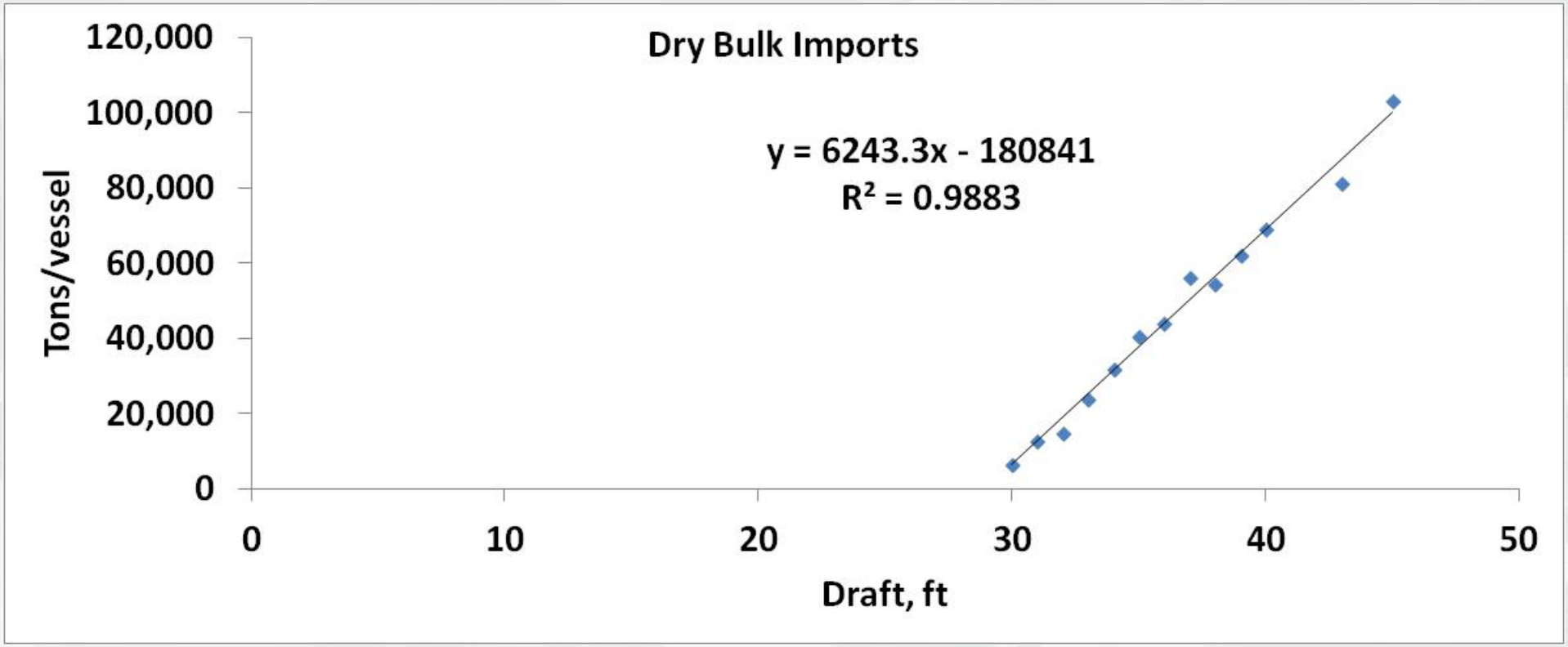
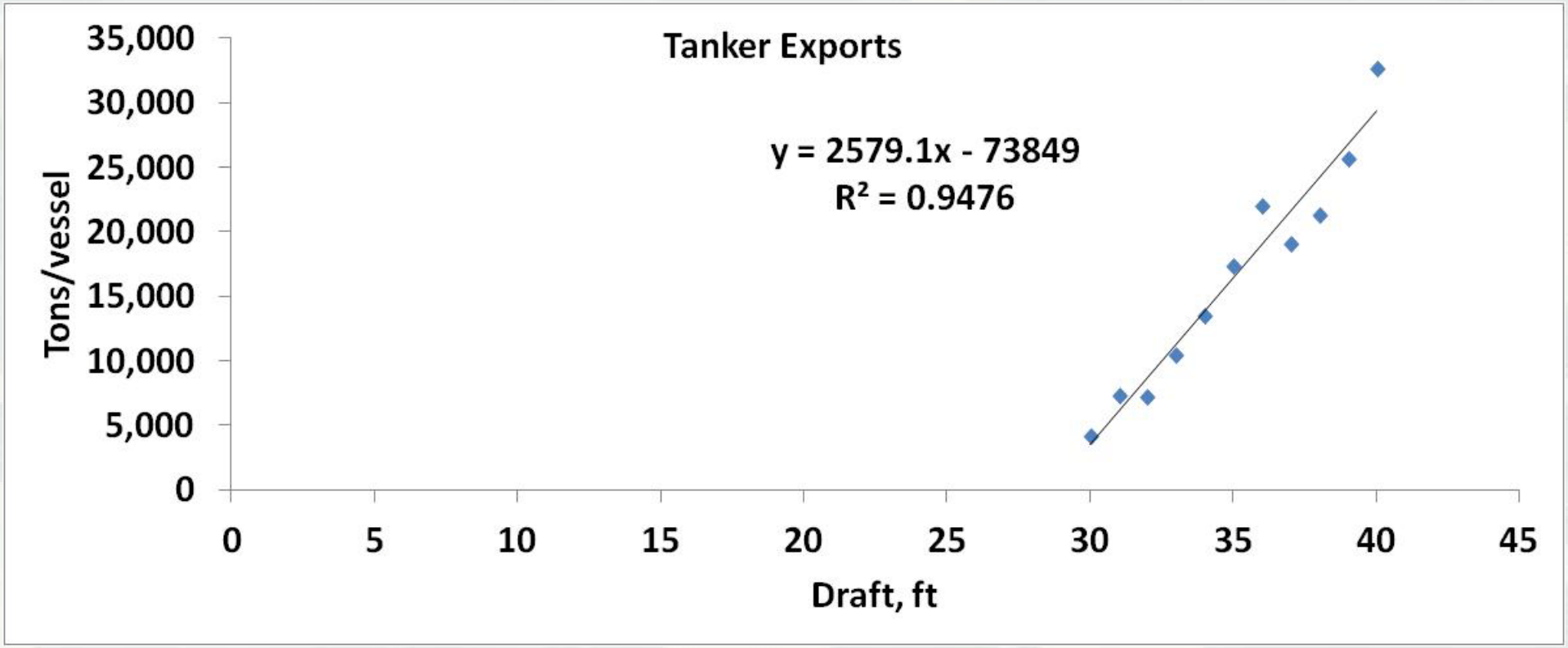


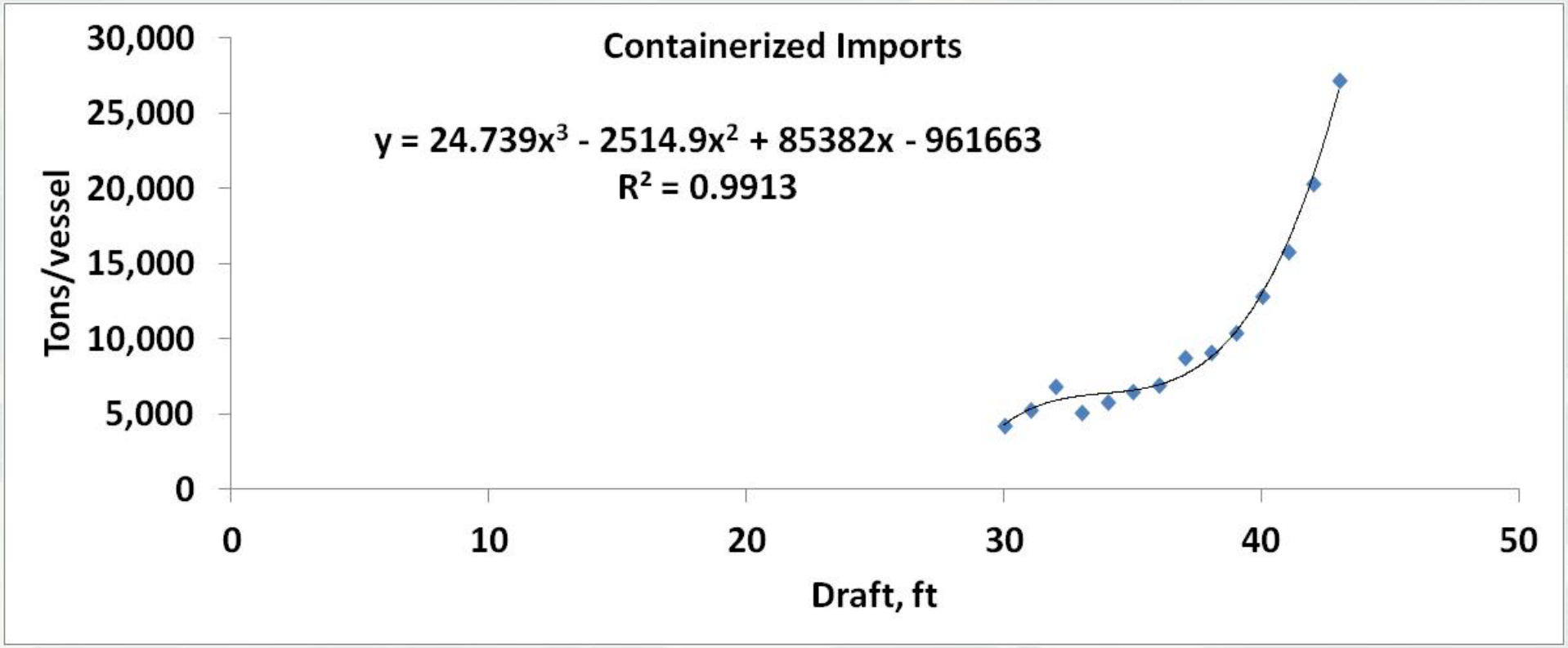
# National Summary – Dry Bulk



# National Summary – Tankers



# National Summary – Containerized Cargo



# National Summaries

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

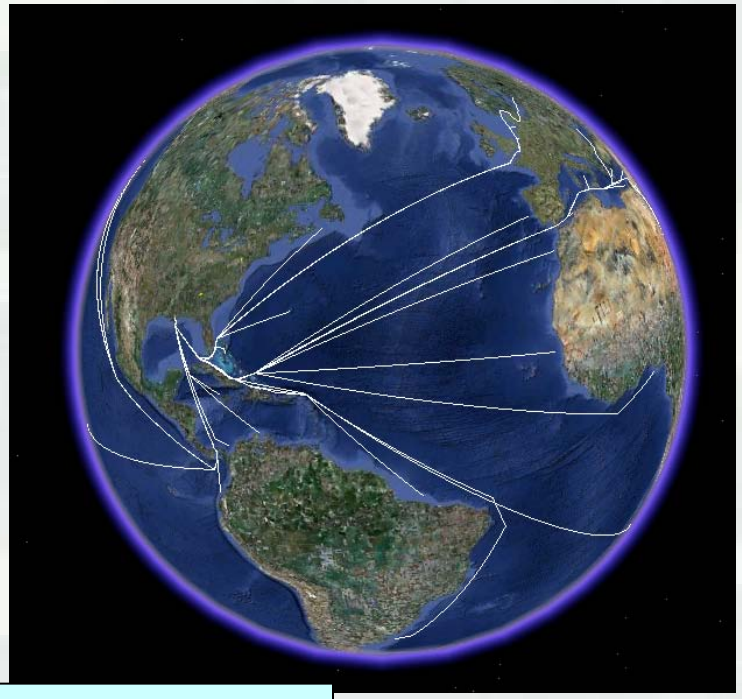
# National Summaries

| 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:

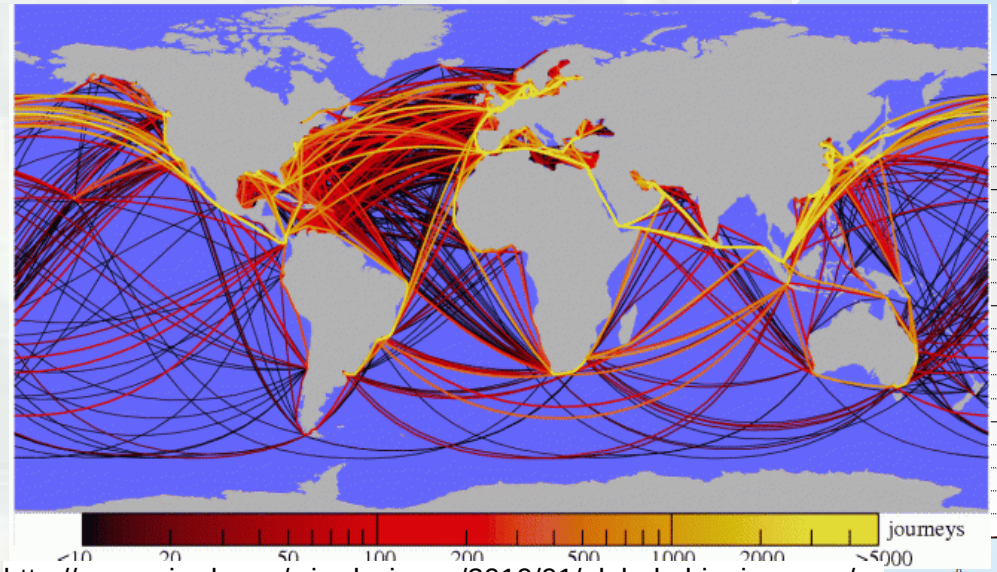
| Sample Countries of Origin/Destination | Distance (mi) |
|---|---|
| Venezuela | 1750 |
| Estonia | 6950 |
| Mexico | 650 |
| Brazil | 3750 |
| Colombia | 1650 |
| India | 13300 |
| The Netherlands | 5600 |
| Spain | 5100 |
| United Kingdom | 5300 |
| Egypt | 7300 |



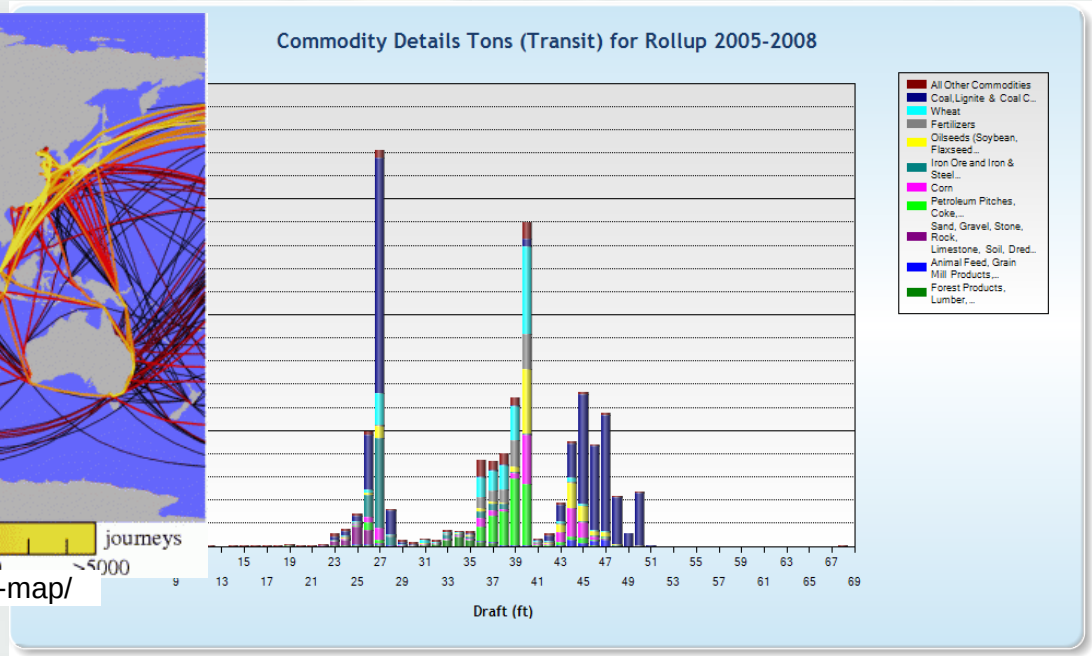
**Average Voyage Distances**

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

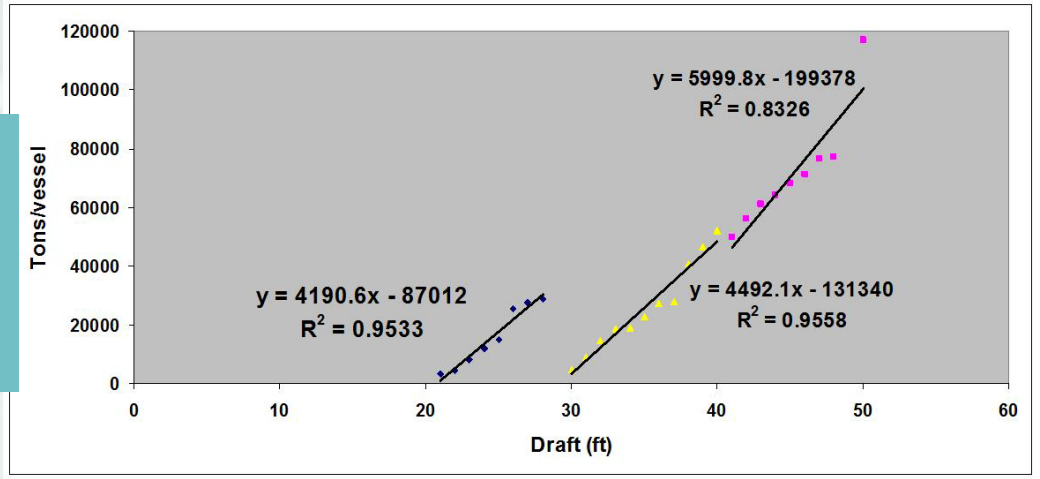
# Further Automation of Metrics




http://www.wired.com/wiredscience/2010/01/global-shipping-map/




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



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# Questions?

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