Using Historical Data to Quantify Regional Shipping Disruptions from Hypothetical Shoaling

ERDC
Engineer Research and Development Center

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From Sail to Satellite, TRB-CMTS
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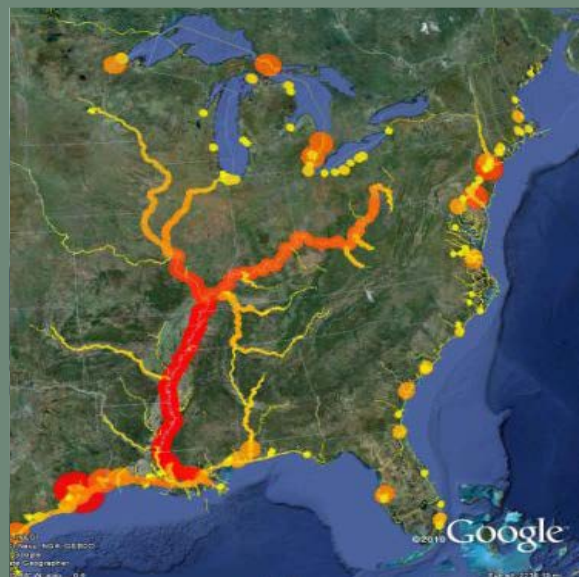
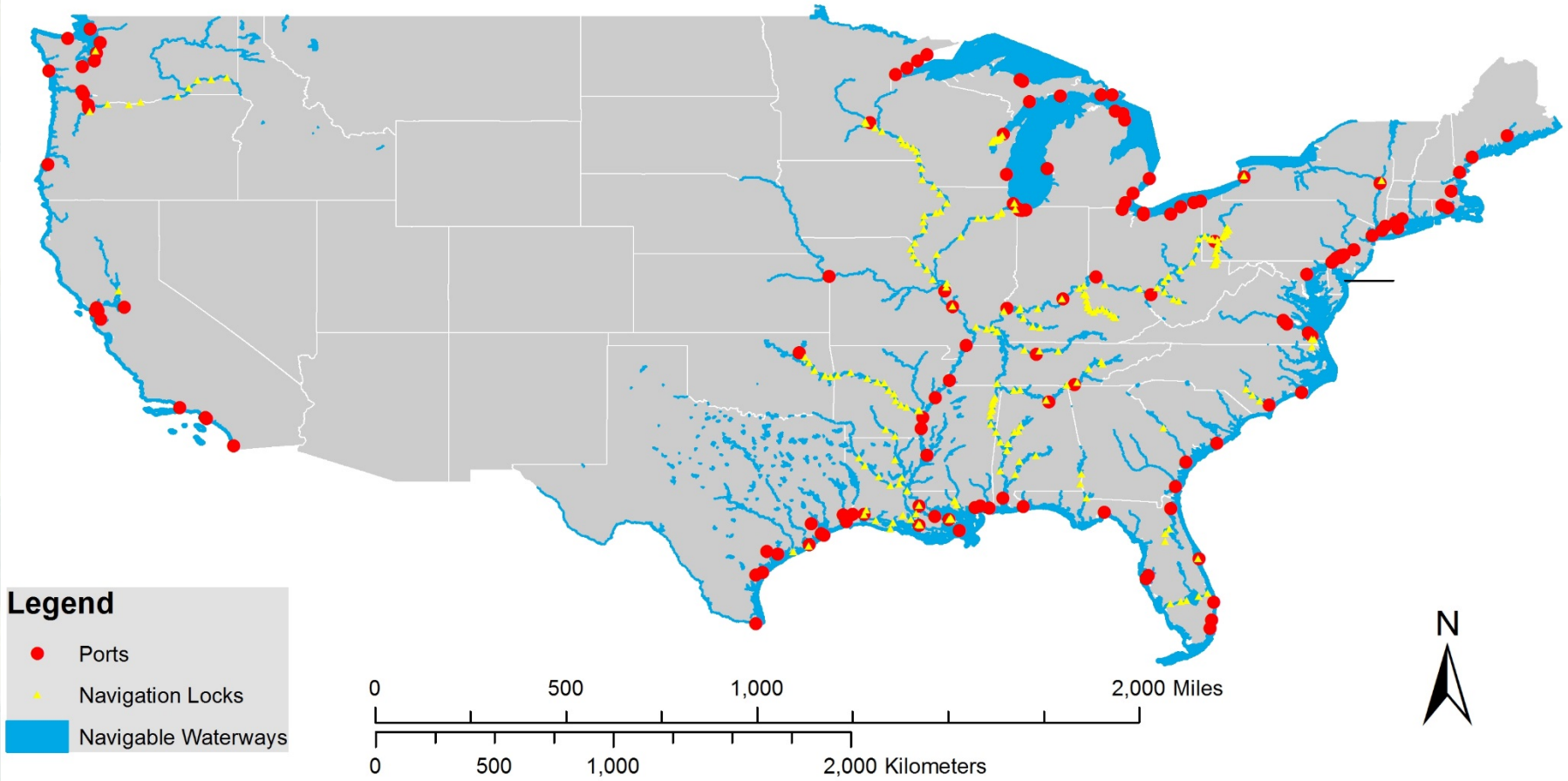


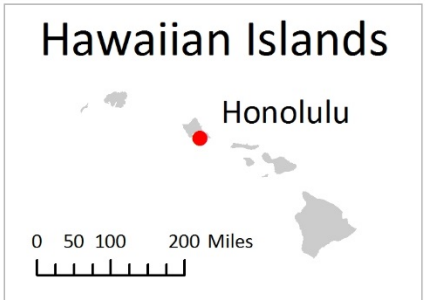
US Army Corps of Engineers®

Outline

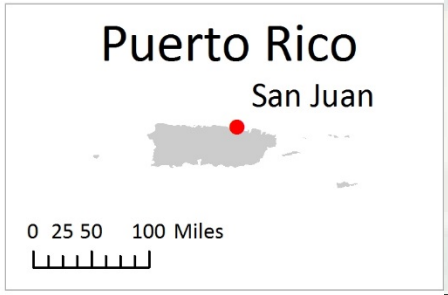
- Motivation
- Methodology
- Results of regional analysis for South Atlantic Div. and Southwest Division
- Conclusions

Select U.S. Port, Locks, and Waterways

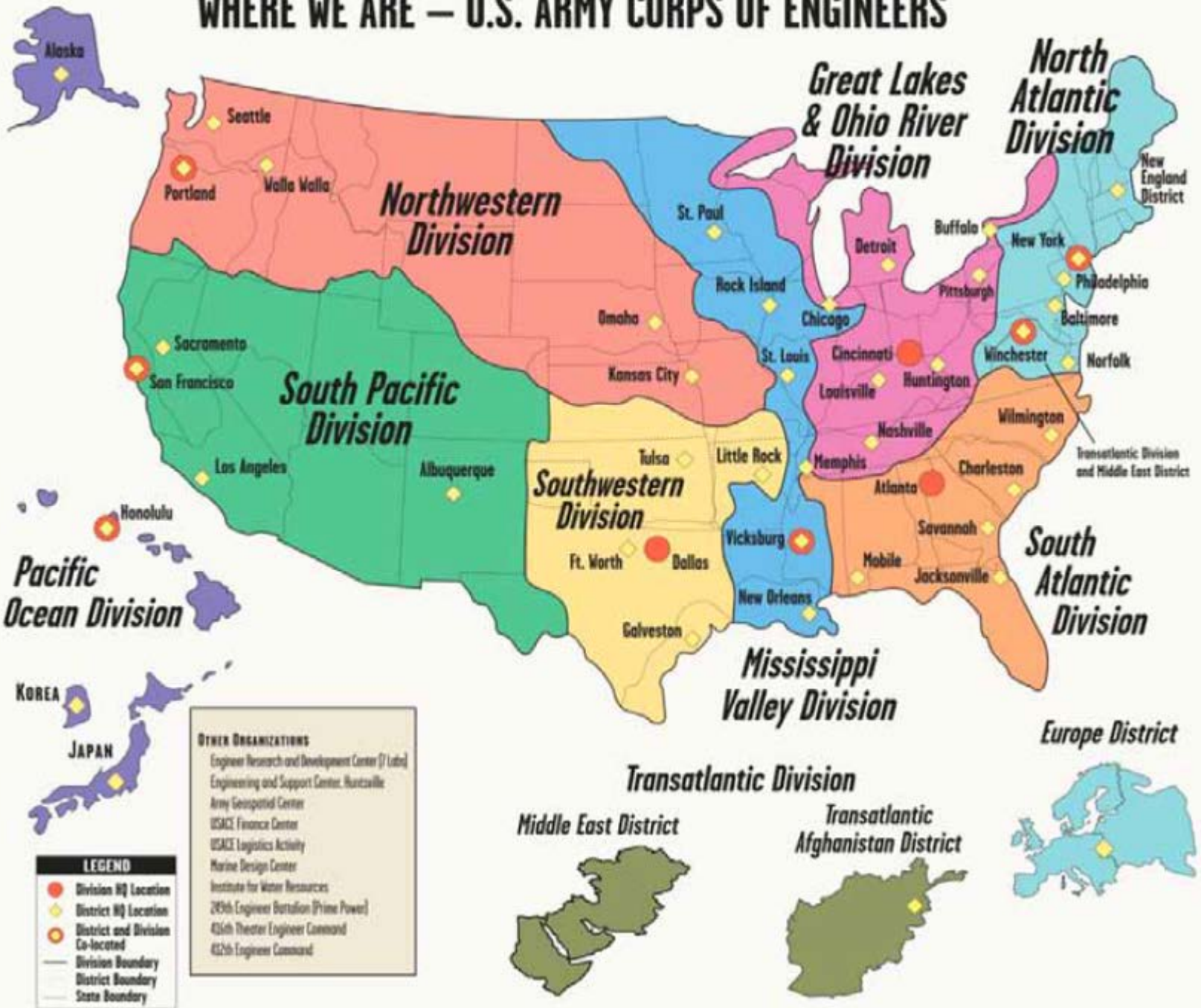




Source: U.S. Army Corps of Engineers
U.S. Department of Transportation
2015



WHERE WE ARE – U.S. ARMY CORPS OF ENGINEERS



	USACE Navigation Budget Percentages by Account			
	Investigations	Construction	Operations & Maintenance	Mississippi River & Tributaries
FY 17	1	18	79	2
FY 16	1	16	80	2
FY 15	1	15	81	2
FY 14	1	18	78	3
FY 13	1	20	76	3
FY 12	1	18	79	2
FY 11	1	18	78	3
FY 10	1	16	80	3
FY 09	1	26	71	2

Navigation focuses on high commercial use coastal harbors and channels with > 10 million tons of commerce; and inland and intracoastal waterways with > 3 billion ton-miles of commerce.

Waterborne Commerce Data

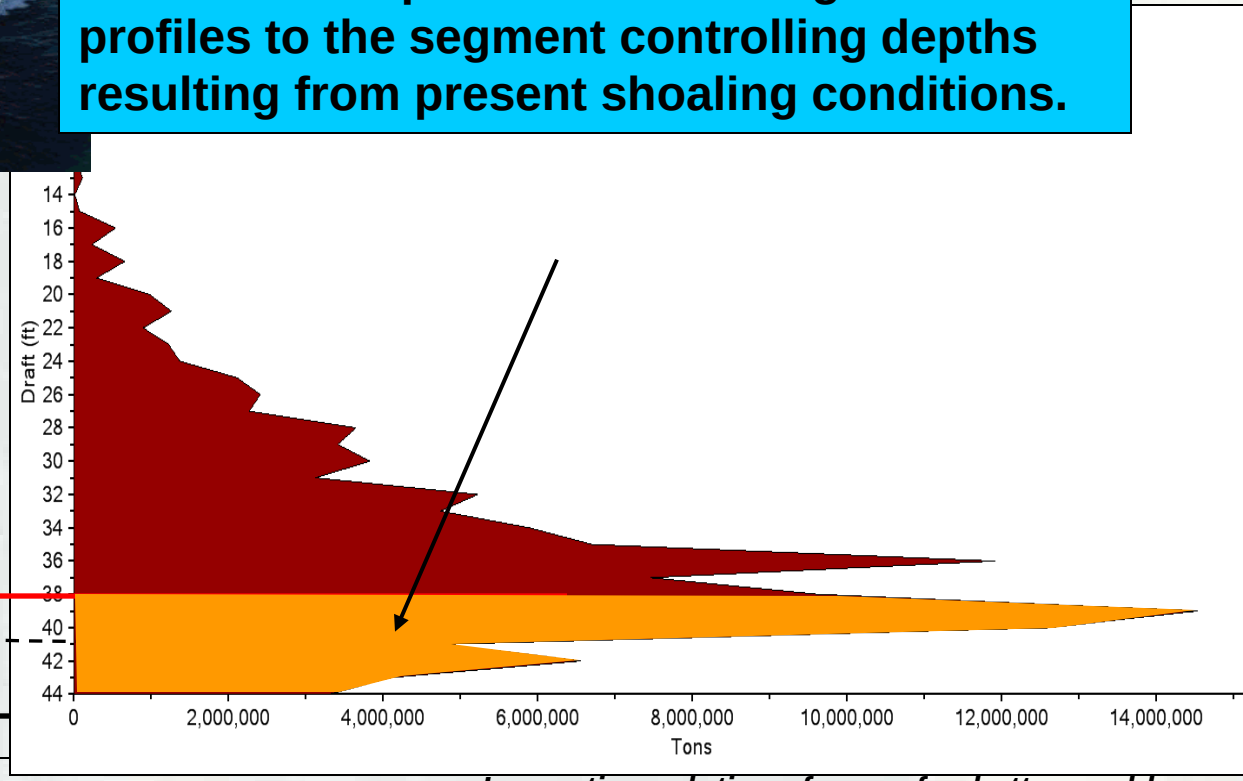
- The Corps' Waterborne Commerce Statistics Center (WCSC) collects and collates data from several sources concerning commercial use of US waterways.
  - Dock-level, origin-to-destination routing (Corps-use-only)
  - Includes tons, commodity types, vessel counts, drafts
  - Aggregated data already published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

- Corps Operations community has not consistently used this data beyond project-level tonnage and ton-mile metrics for O&M budget development.

Channel Portfolio Tool

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.



Question

- On a regional level, how much traffic would be disrupted by hypothetical shoaling scenarios?

  Caveats

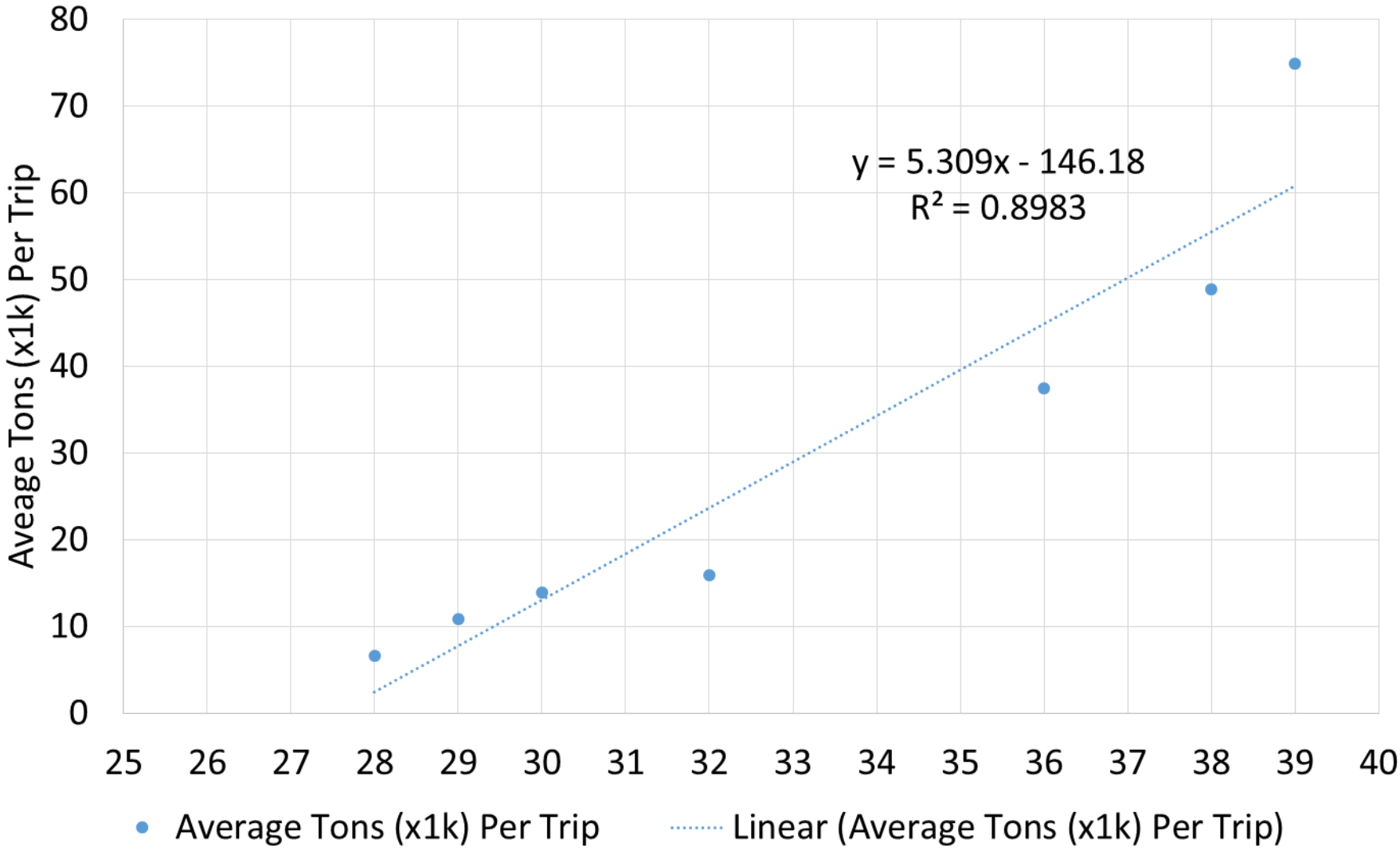
  - based on historical shipment data with a 2-year lag
  - Looking across years 2008-2014

- Step 1: Use CPT to isolate the quantity of tonnage carried by each foot of draft, for each vessel and traffic type combination.

South Atlantic Division (excl. VI), Average Tons (x1k) Per Trip

Tanker, Overseas-**Imports**

Drafts with 50+ trips between 2008-2014

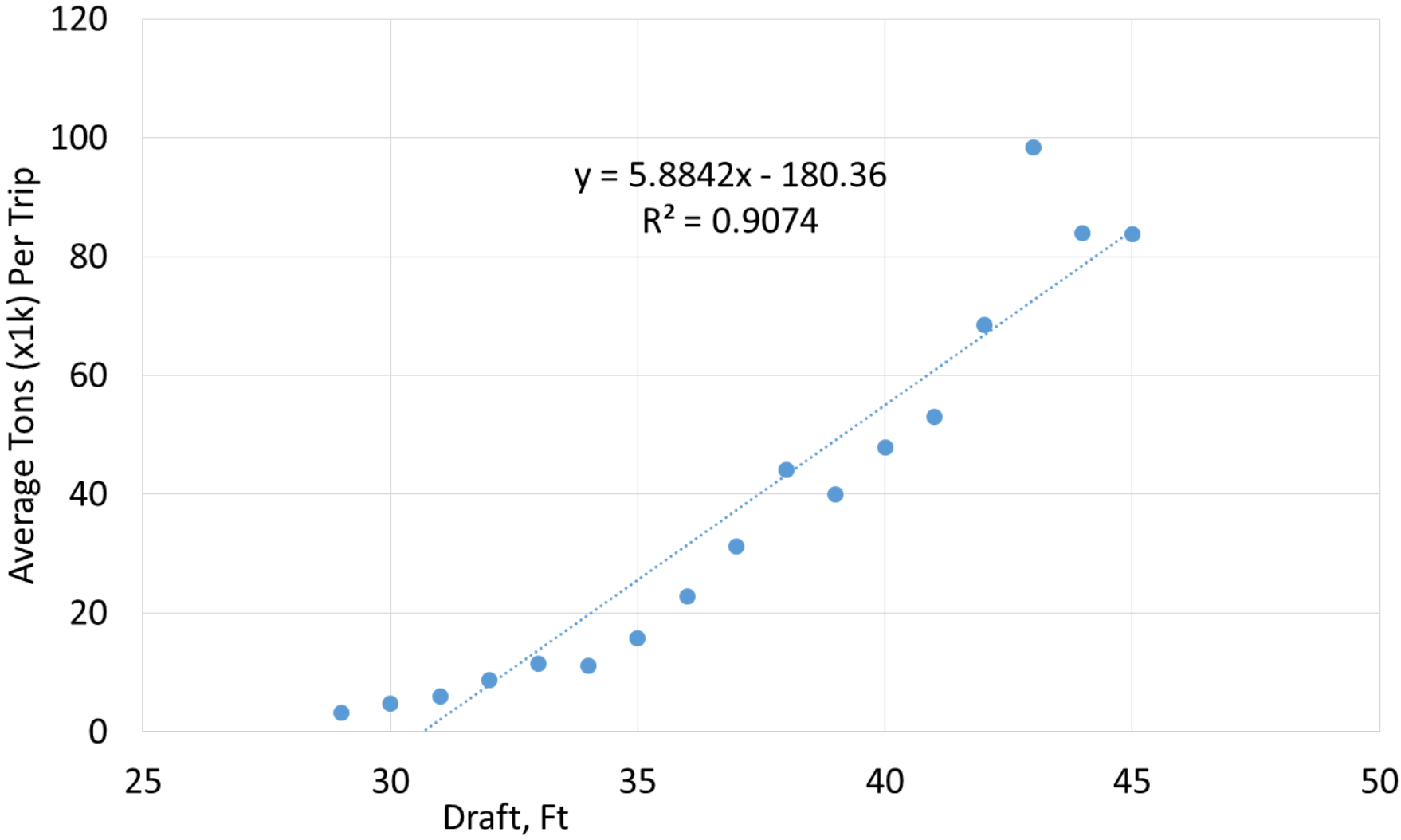


Data source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center. Processed by Channel Portfolio Tool

South Atlantic Division (excl. VI), Average 2008-2014

Dry Bulk, Overseas-**Imports**, Average Tons (x1k) Per Trip

(483 vessel calls)



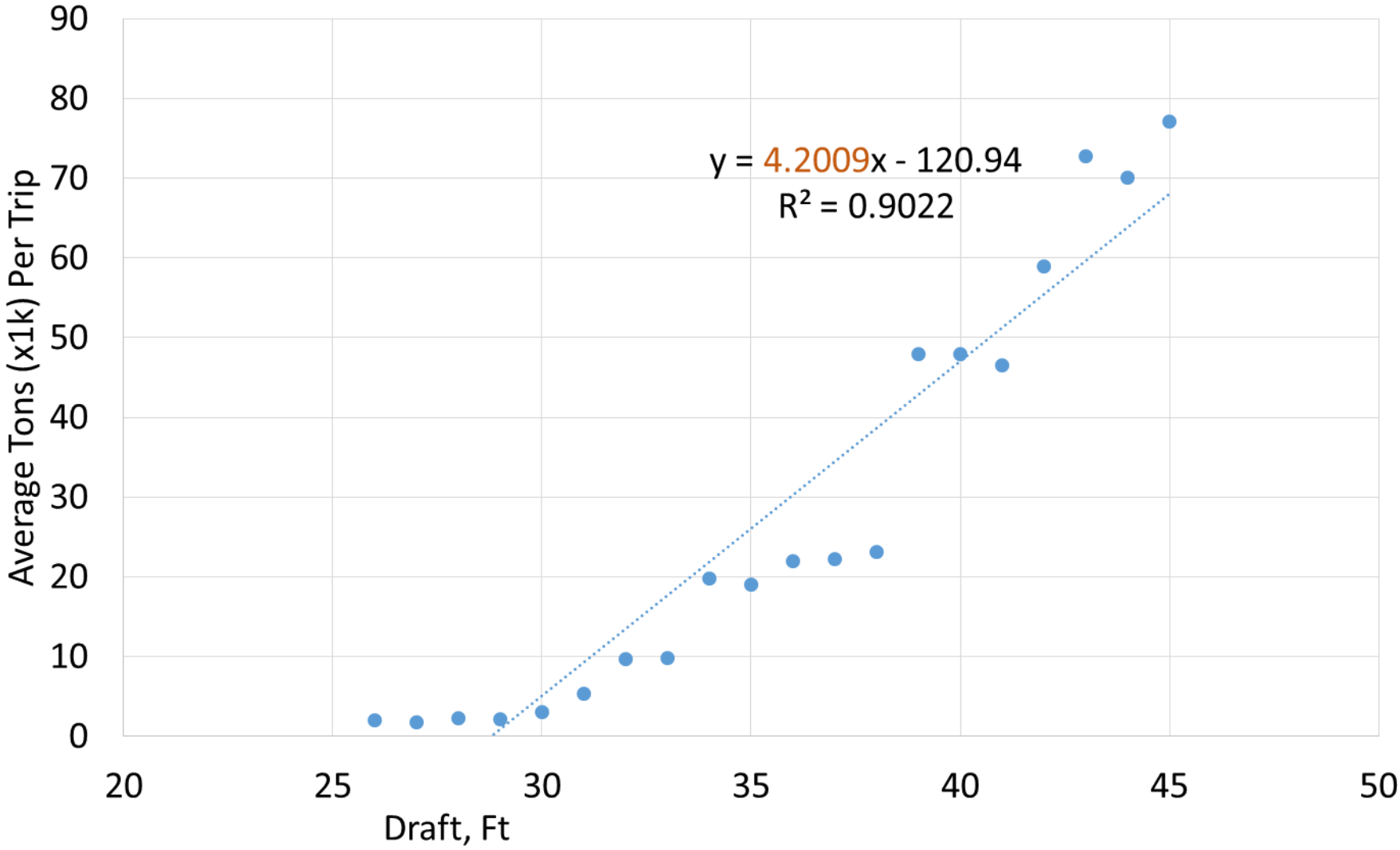
Data source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center

Processed using Channel Portfolio Tool

South Atlantic Div. (excl. VI), Average 2008-2014

Dry Bulk, Overseas-**Exports**, Average Tons (x1k) Per Trip

(1855 vessel calls)



Data Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center

Processed using Channel Portfolio Tool

South Atlantic Division (excluding Virgin Islands) Bulk Cargo Regional Summary, 2008-2014

Vessel Type	Imports/Exports	Avg. Tons/ft/vessel R^2
Tanker	Imports	**5309** (0.89)
Tanker	Exports	**3285** (0.7)
Dry Bulk	Imports	**5884** (0.9)
Dry Bulk	Exports	**4200** (0.9)

South Atlantic Div. (excl. Virgin Islands) Regional Summary, 2008-2014

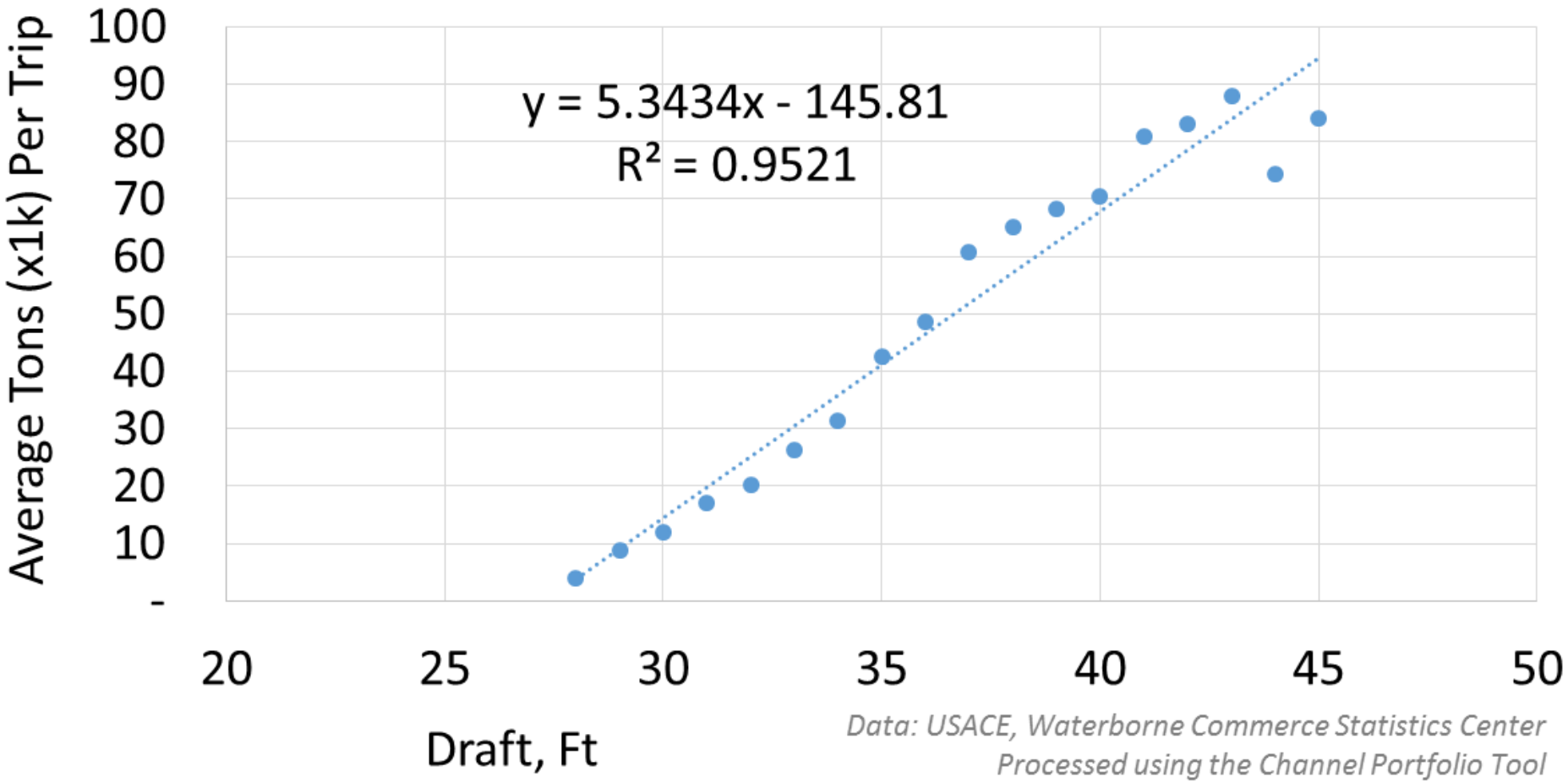
Vessel Type	Imports/ Exports	# Vessel trips disrupted by 1-ft shoaling scenario	Tons Disrupted (x1k)	# Vessel trips Disrupted by 2-ft Shoaling Scenario	Tons Disrupted (x1k)
Tanker	Imports	**2071**	**10,995**	**2342**	**23,428**
Tanker	Exports	**355**	**1,166**	**467**	**2,700**
Dry Bulk	Imports	**1679**	**9,879**	**2033**	**21,841**
Dry Bulk	Exports	**1973**	**8,286** (= 1973 * 4.2)	**2241**	**17,698** (= 8,286 + (2241*4.2))
		Total	**30,326**	**TOTAL:**	**65,668**

South Atlantic Div. (excl. VI) Regional Summary

Vessel Type	Imports/ Exports	# of Additional Voyages of a 38ft draft vessel needed to transport disrupted cargo (2-ft Shoaling Scenario)
Tanker	Imports	117
Tanker	Exports	22
Dry Bulk	Imports	98
Dry Bulk	Exports	110
	Total:	**347**

Southwest Division

Tanker, Overseas-**Imports**, Average 2008-2014



Data: USACE, Waterborne Commerce Statistics Center
Processed using the Channel Portfolio Tool

South Atl. & Southwest Divisions, 2008-2014

Vessel Type	Imports/ Exports	SAD Tons Disrupted (x1k), 2 ft shoaling, all drafts	SWD Tons Disrupted (x1k) at 2ft shoaling, all drafts	SWD # Vessel Trips Disrupted 2ft shoaling	SWD # Additional Voyages of a 38ft draft vessel need to transport disrupted cargo
Tanker	Imports	23,428	320,277	2,883	1,577
Tanker	Exports	2,700	54,180	881	414
Dry Bulk	Imports	21,841	62,822	1,073	390
Dry Bulk	Exports	17,698	67,001	1,073	436

Southwest Pass Draft Restrictions in Context

Project	2-ft (43-ft on Lower Miss.)	4-ft (41-ft on Lower Miss.)	6-ft (39-ft on Lower Miss.)	Notes
Lower Miss.	$27.2M	$67.8M	$180.4M	Impacts mostly from dry bulk exports and tanker imports
Galveston Entrance	$0.8M	$5.6M	$34.1M	Mostly tanker imports, then tanker exports
Norfolk/Newport News	$1.7M	$8.0M	$18.8M	All from coal exports; this considers a 48-ft, 46-ft, and 44-ft restriction since 50-ft project
New York	$2.8M	$11.8M	$17.6M	Roughly half from tankers (exports and imports), the rest from container traffic; trip chaining by container ships causes those impacts to be heavily discounted
Sabine-Neches	$12.2M	$41.8M	$100.8M	Mostly tanker imports, then tanker and dry bulk exports; this considers 38-ft, 38-ft, and 34-ft restrictions since 40-ft project
National Totals	**$122.1**	**$269.7**	**$625.8**	

Note: trip-chaining by container ships presents challenges for this approach. Other ERDC researchers are presently mining the Entrances and Clearances data from U.S. Customs to develop more refined (overseas only) trip counts for containerized cargo to expand this work.

POC: Dr. Ned Mitchell

Conclusions

- Continuing need to understand and communicate the value of every foot of available channel draft.
- Regional, national, or commodity-based analysis of channel utilization are possible using the Channel Portfolio Tool
- Initial analysis of South Atlantic & Southwest Division historical data revealed important distinctions between the expected ton-per-foot measure between vessel types and traffic direction
- Use caution when generalizing the impacts of shoaling across all traffic

Thank you for listening!

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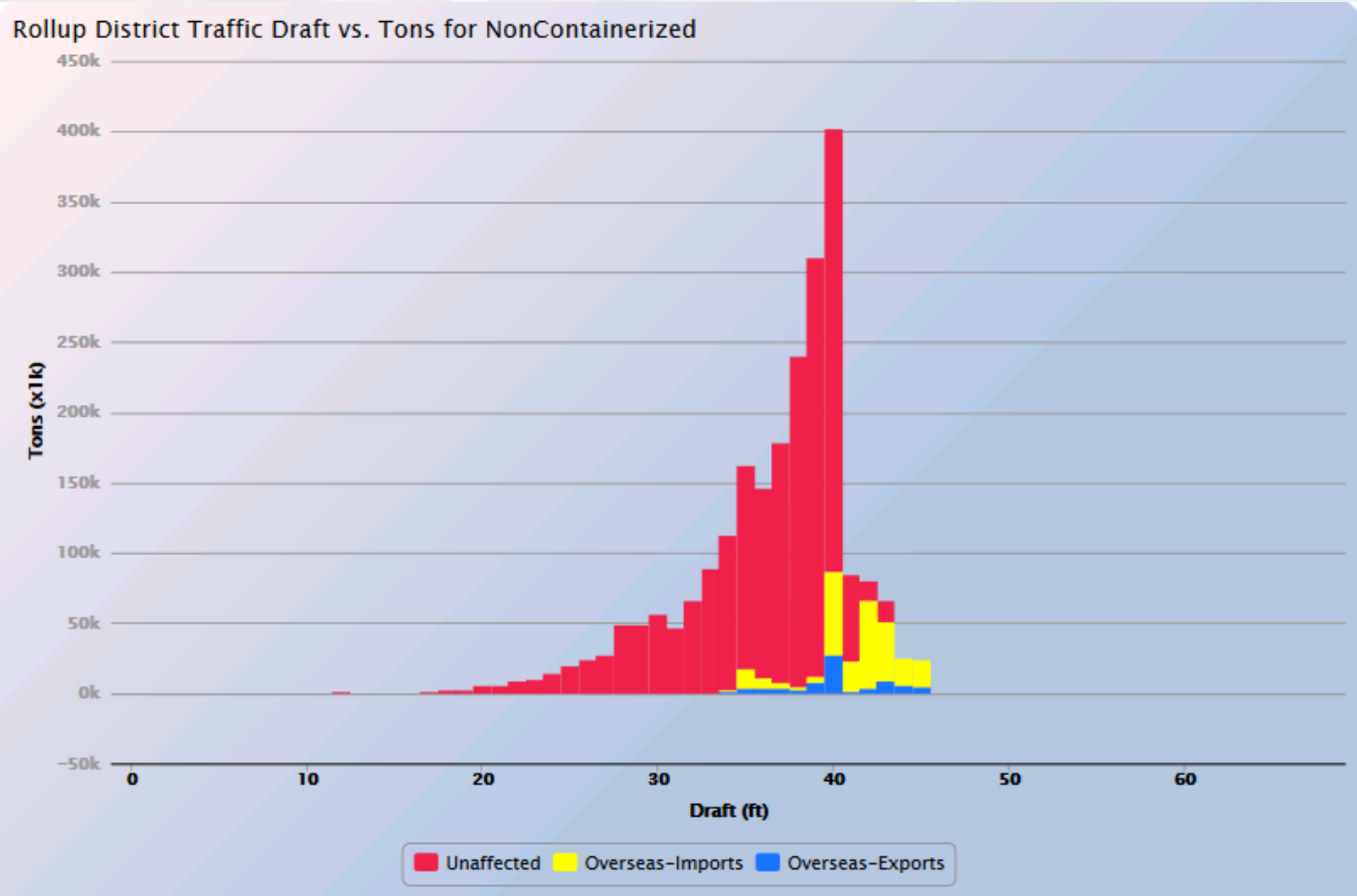
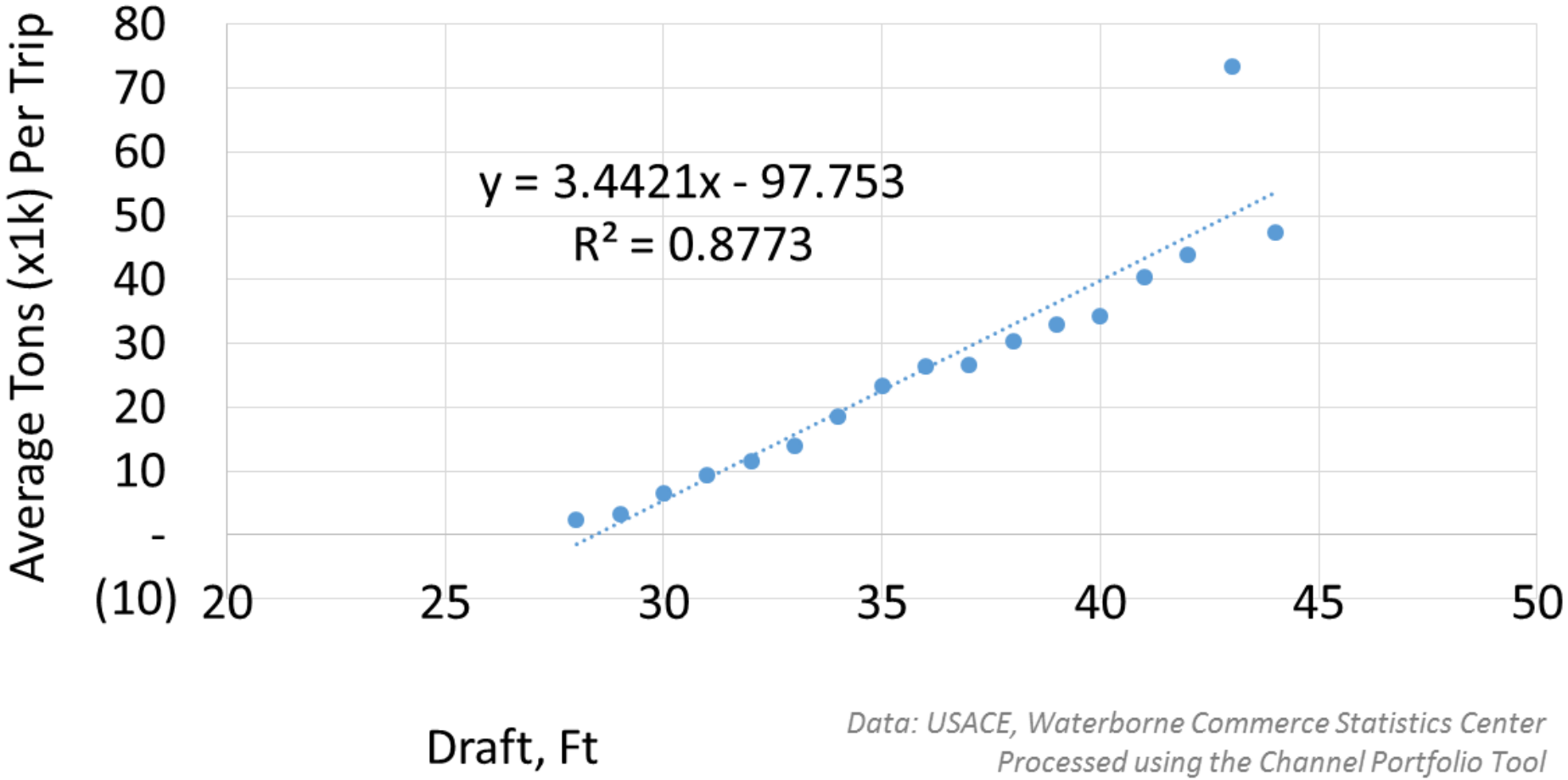
Southwest Div. 2 ft shoaling



Southwest Division

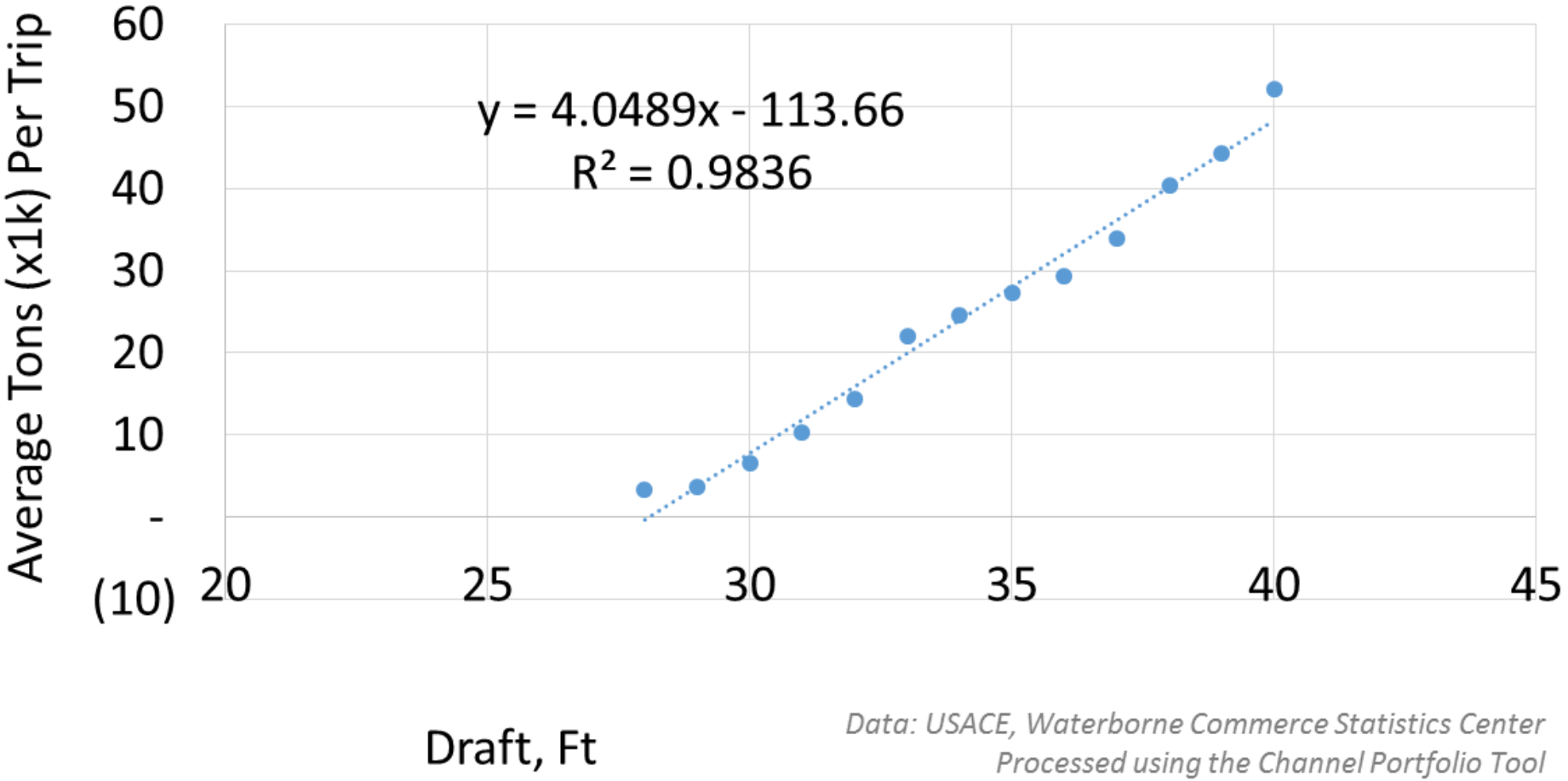
Tanker, Overseas-**Exports**, Average 2008-2014



Data: USACE, Waterborne Commerce Statistics Center
Processed using the Channel Portfolio Tool

Southwest Division

Dry Bulk, Overseas-**Exports**, Average 2008-2014



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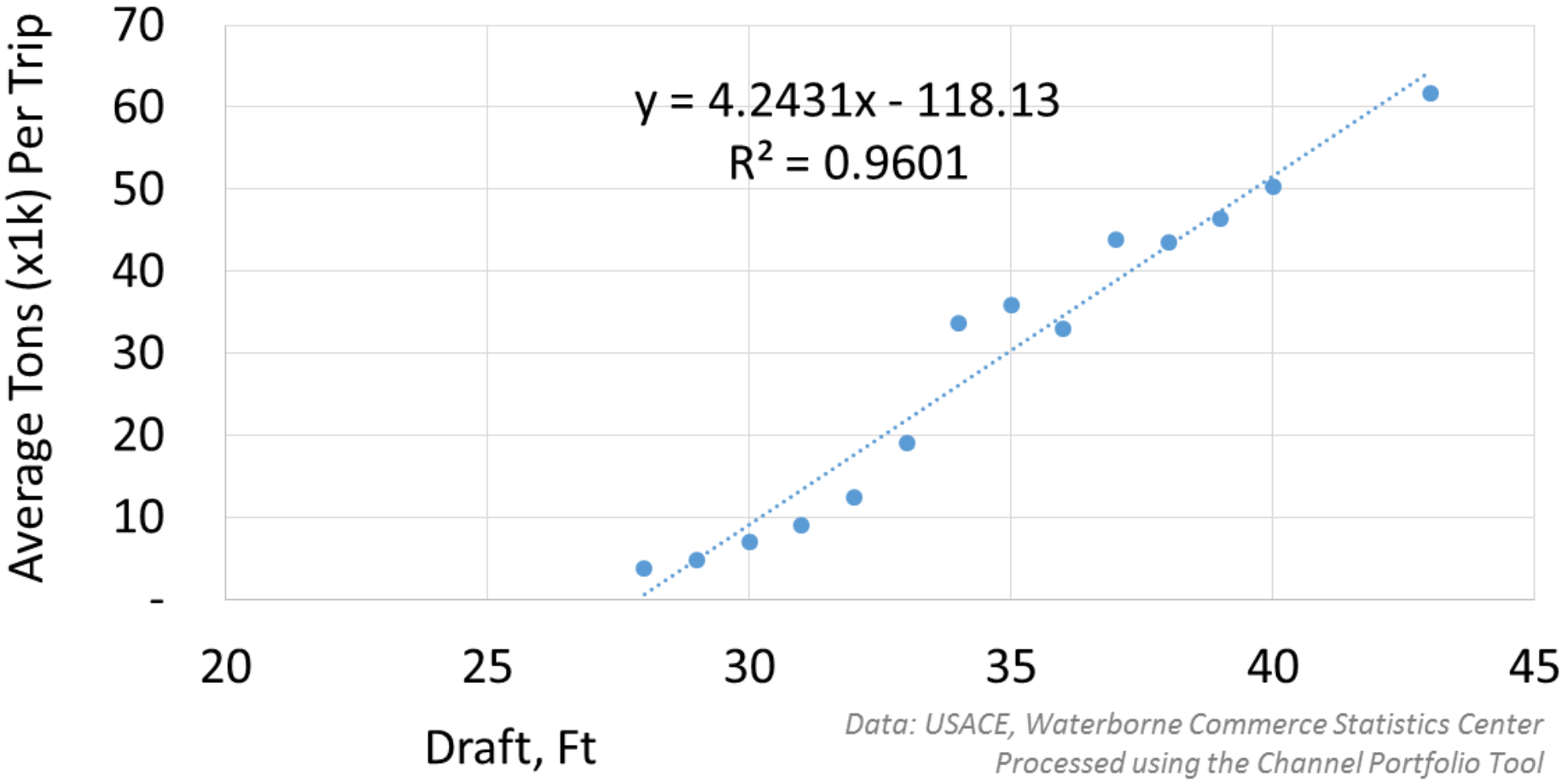
Southwest Division

Dry Bulk, Overseas-**Imports**, Average 2008-2014



Data: USACE, Waterborne Commerce Statistics Center
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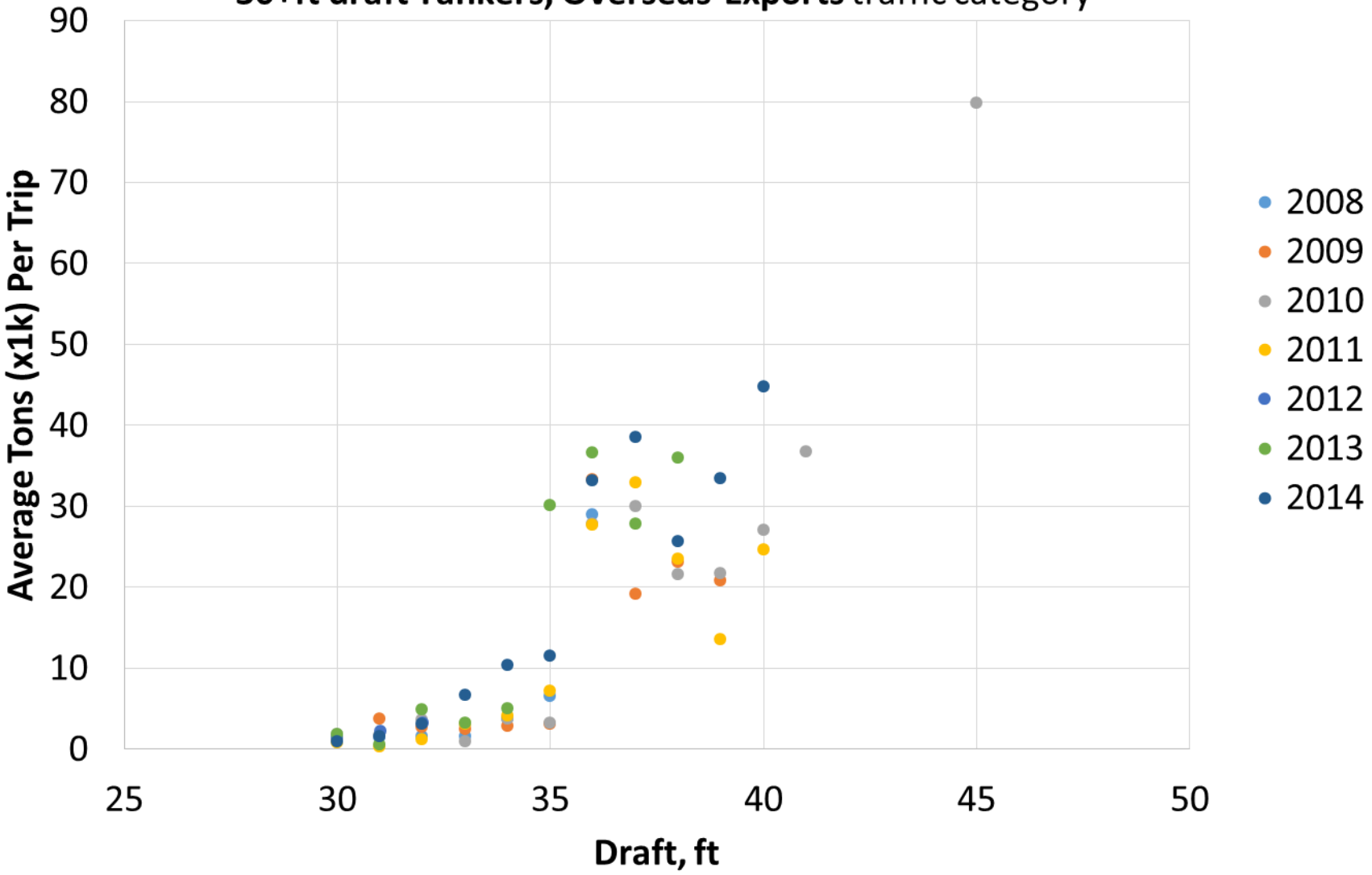
Year by Year Comparison of Average Tons (x1k) Per Trip
South Atlantic Division (excl. Virgin Islands),
30+ft draft Tankers, Overseas-Exports traffic category



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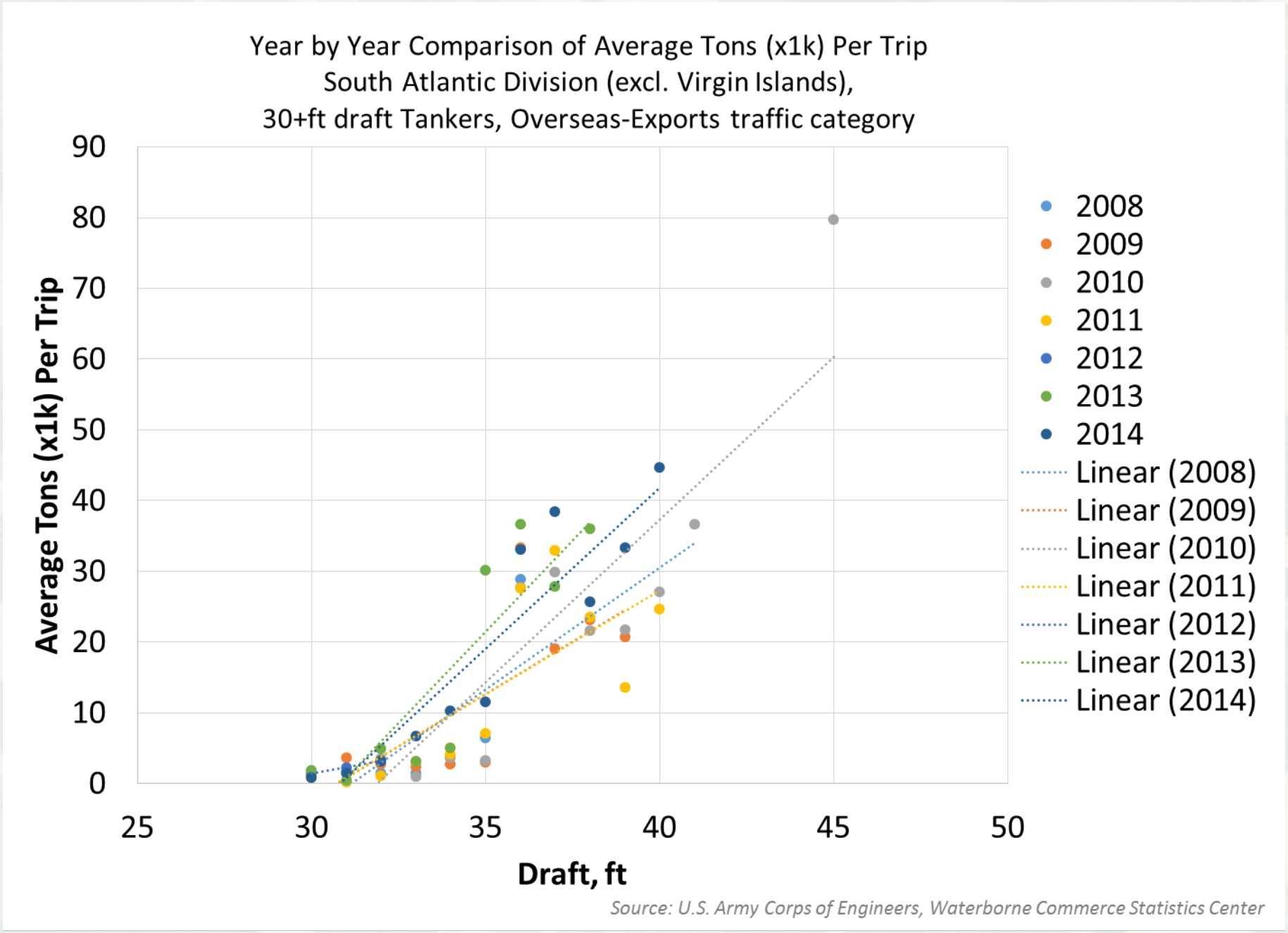

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