USACE Expanded Use of Archival Dredging Data





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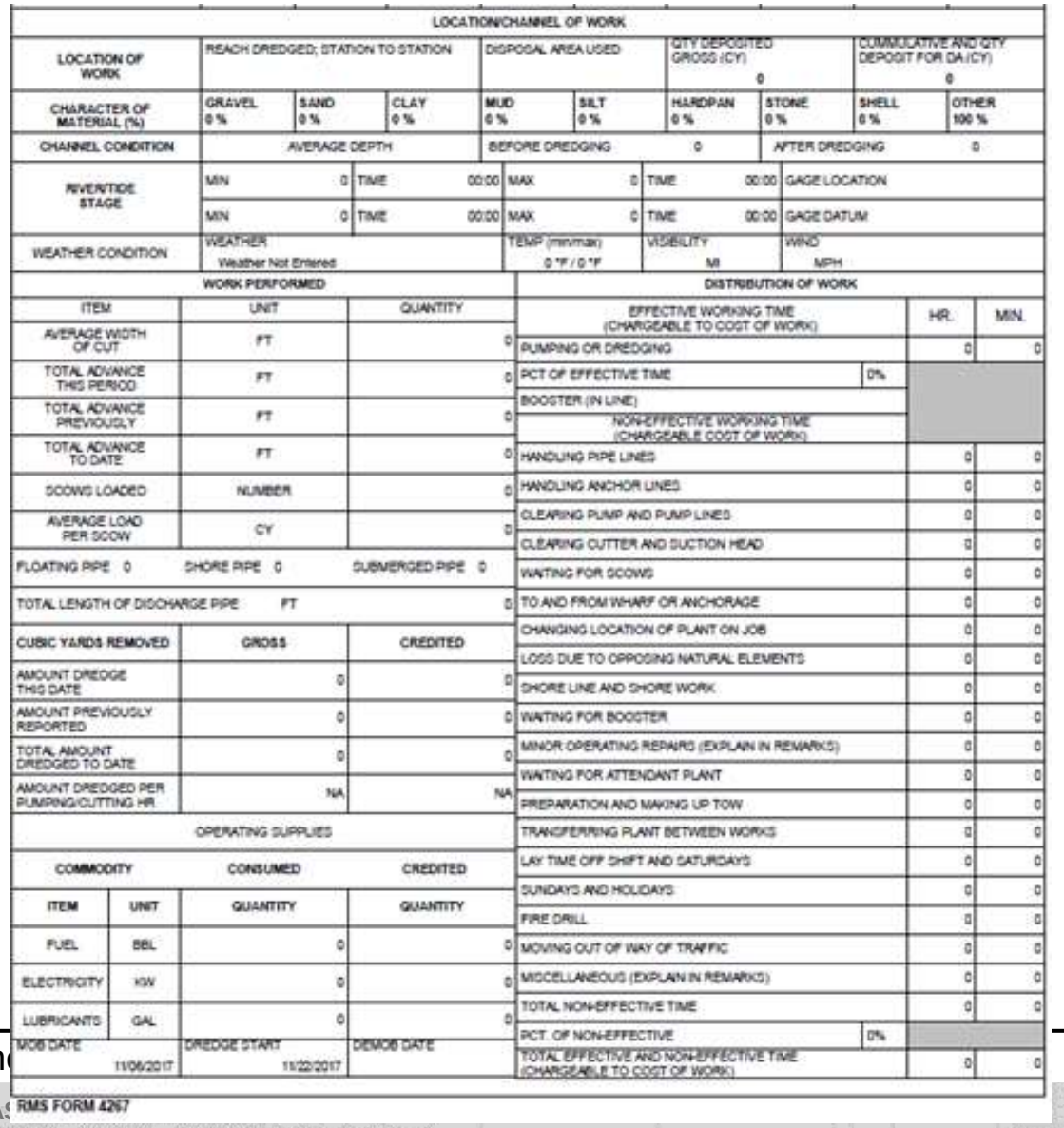
RESIDENT MANAGEMENT SYSTEM (RMS) DATA MINING FOR ADVANCED DREDGE DATA ANALYSIS

- **ERDC working to acquire any/all historic dredge production data from RMS for insight on productivity trend analysis across USACE**
- **Currently being utilized to inform Dredge Scheduling Optimization, Validation of Cost Engineering Dredge Estimating Program (CEDEP)**
- **Analyzing broad scale trends by dredge type, size, location to improve internal processes and assumptions**



LOCATION/CHANNEL OF WORK

LOCATION OF WORK	REACH DREDGED; STATION TO STATION	DISPOSAL AREA USED	QTY DEPOSITED GROSS (CY)	CUMULATIVE AND QTY DEPOSIT FOR DA (CY)
			0	0

CHARACTER OF MATERIAL (%)	GRAVEL	SAND	CLAY	MUD	SILT	HARDPAN	STONE	SHELL	OTHER
	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	100 %

CHANNEL CONDITION	AVERAGE DEPTH	BEFORE DREDGING	0	AFTER DREDGING	0

RIVER/TIDE STAGE	MIN 0	TIME 00:00	MAX 0	TIME 00:00	GAGE LOCATION
	MIN 0	TIME 00:00	MAX 0	TIME 00:00	GAGE DATUM

WEATHER CONDITION	WEATHER	TEMP (min/max)	VISIBILITY	WIND
	Weather Not Entered	0 °F / 0 °F	MI	MPH

WORK PERFORMED

ITEM	UNIT	QUANTITY
AVERAGE WIDTH OF CUT	FT	0
TOTAL ADVANCE THIS PERIOD	FT	0
TOTAL ADVANCE PREVIOUSLY	FT	0
TOTAL ADVANCE TO DATE	FT	0
SCOWS LOADED	NUMBER	0
AVERAGE LOAD PER SCOW	CY	0

FLOATING PIPE 0 SHORE PIPE 0 SUBMERGED PIPE 0

TOTAL LENGTH OF DISCHARGE PIPE FT 0

CUBIC YARDS REMOVED	GROSS	CREDITED
AMOUNT DREDGE THIS DATE	0	0
AMOUNT PREVIOUSLY REPORTED	0	0
TOTAL AMOUNT DREDGED TO DATE	0	0
AMOUNT DREDGED PER PUMPING/CUTTING HR	NA	NA

OPERATING SUPPLIES

COMMODITY		CONSUMED	CREDITED
ITEM	UNIT	QUANTITY	QUANTITY
FUEL	BBL	0	0
ELECTRICITY	KW	0	0
LUBRICANTS	GAL	0	0

MOB DATE	DREDGE START	DEMOB DATE
11/06/2017	11/22/2017	

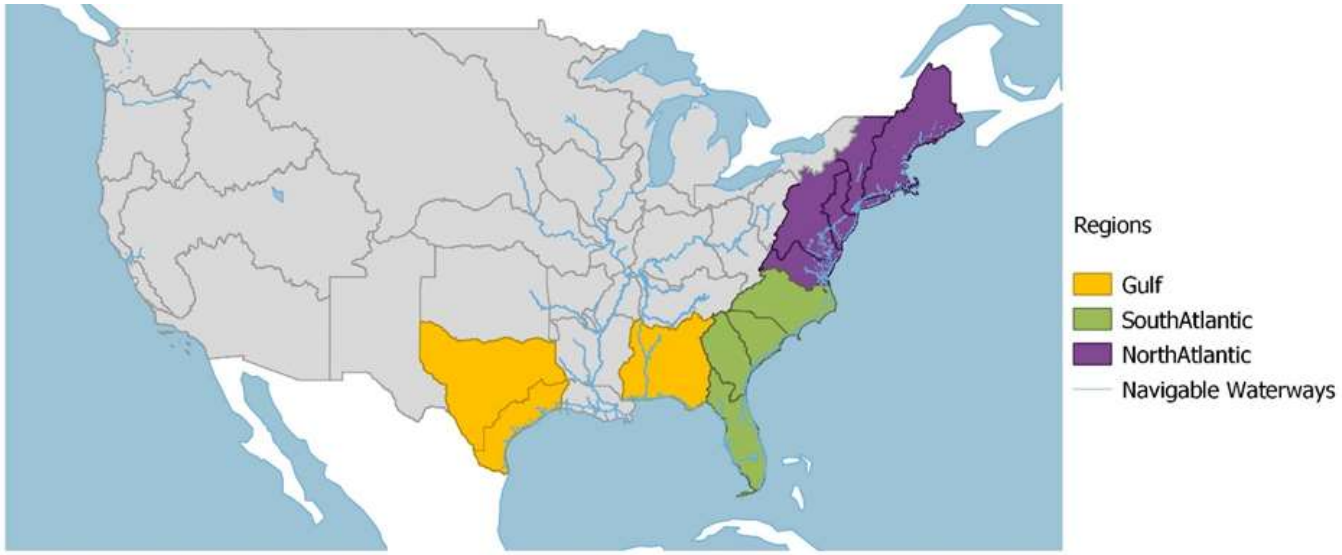
DISTRIBUTION OF WORK

EFFECTIVE WORKING TIME (CHARGEABLE TO COST OF WORK)	HR.	MIN.
PUMPING OR DREDGING	0	0
PCT OF EFFECTIVE TIME 0%		
BOOSTER (IN LINE)		
NON-EFFECTIVE WORKING TIME (CHARGEABLE COST OF WORK)		
HANDLING PIPE LINES	0	0
HANDLING ANCHOR LINES	0	0
CLEARING PUMP AND PUMP LINES	0	0
CLEARING CUTTER AND SUCTION HEAD	0	0
WAITING FOR SCOWS	0	0
TO AND FROM WHARF OR ANCHORAGE	0	0
CHANGING LOCATION OF PLANT ON JOB	0	0
LOSS DUE TO OPPOSING NATURAL ELEMENTS	0	0
SHORE LINE AND SHORE WORK	0	0
WAITING FOR BOOSTER	0	0
MINOR OPERATING REPAIRS (EXPLAIN IN REMARKS)	0	0
WAITING FOR ATTENDANT PLANT	0	0
PREPARATION AND MAKING UP TOW	0	0
TRANSFERRING PLANT BETWEEN WORKS	0	0
LAY TIME OFF SHIFT AND SATURDAYS	0	0
SUNDAYS AND HOLIDAYS	0	0
FIRE DRILL	0	0
MOVING OUT OF WAY OF TRAFFIC	0	0
MISCELLANEOUS (EXPLAIN IN REMARKS)	0	0
TOTAL NON-EFFECTIVE TIME	0	0
PCT. OF NON-EFFECTIVE 0%		
TOTAL EFFECTIVE AND NON-EFFECTIVE TIME (CHARGEABLE TO COST OF WORK)	0	0

RMS FORM 4267

RMS Dredging Data

-Quantity
-Type
-Location



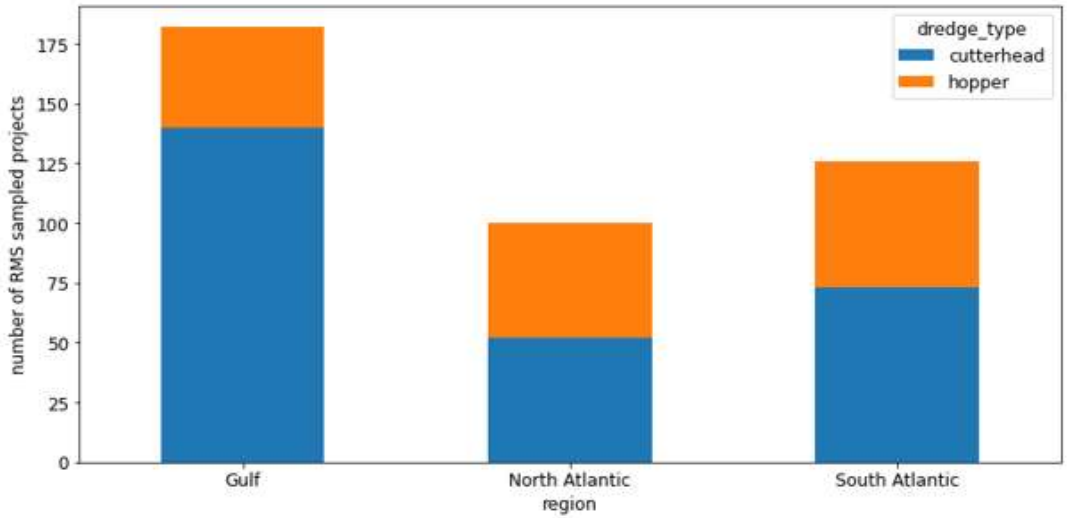


Figure 1. Number of RMS sampled projects, by region and dredge type

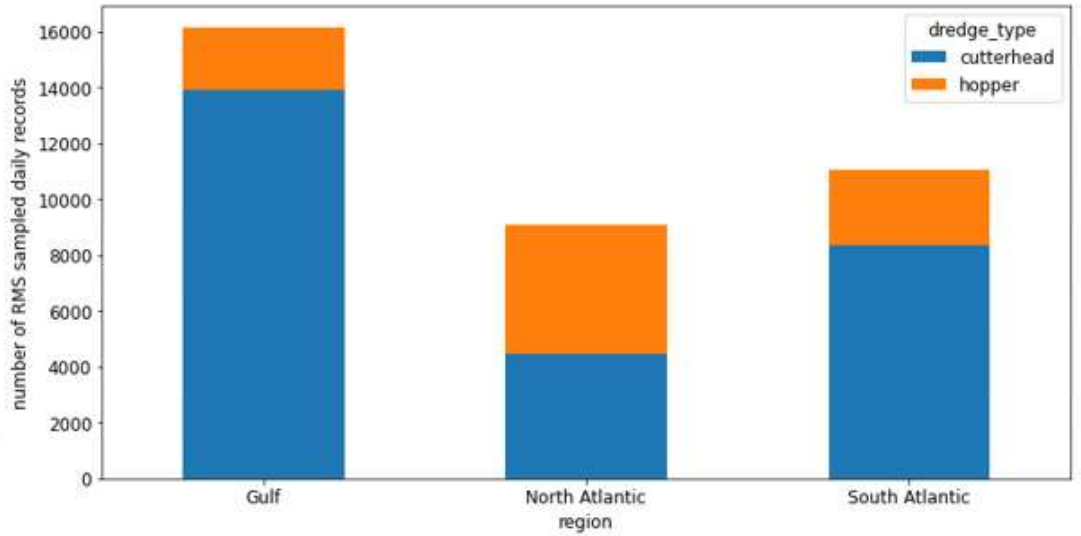
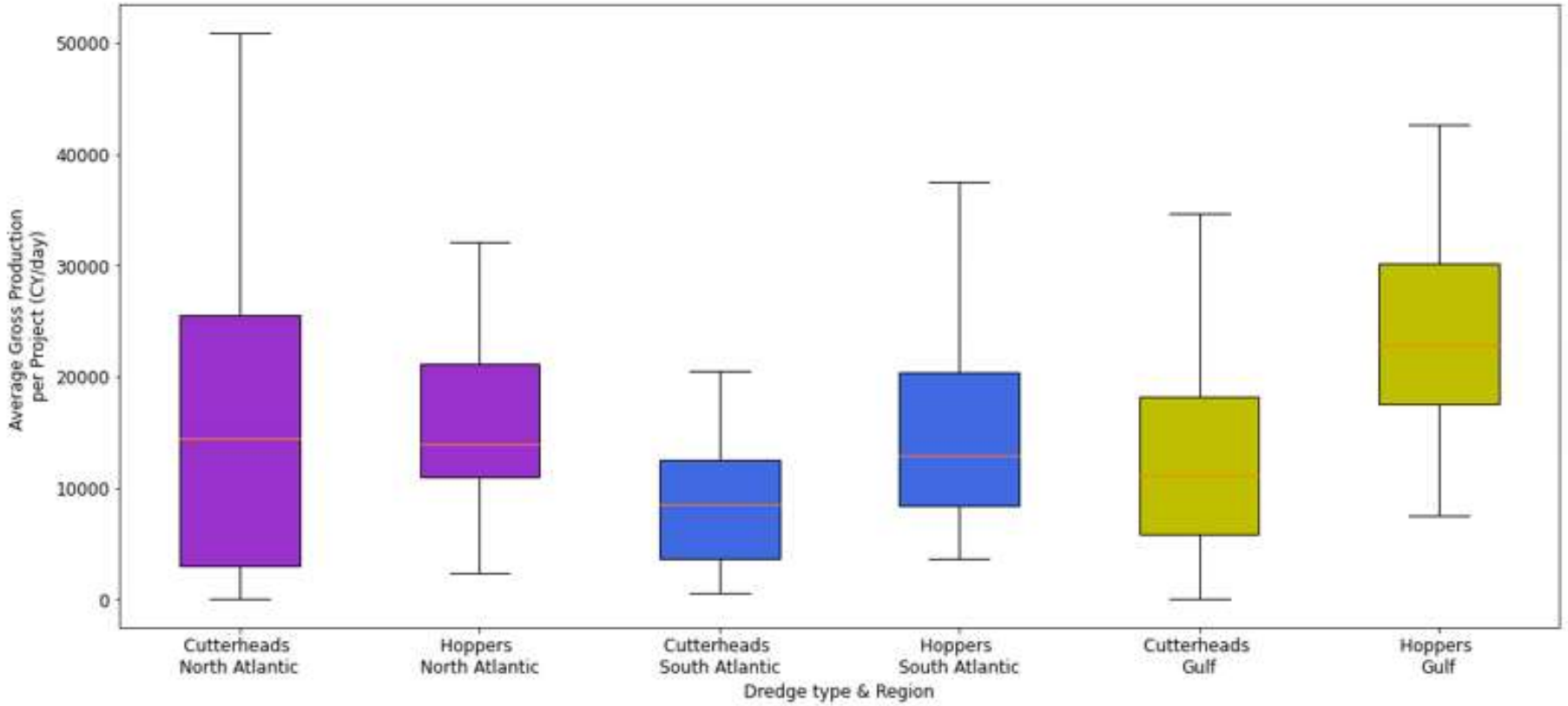


Figure 2. Number of RMS sampled daily records, by region and dredge type

Dredge Productivity by Type and Region

- **Hopper Production v. Cutterhead Production**
- **North Atlantic – Cutterheads more effective due to long Hopper placement distances**



RMS: Understanding production cycle and variables for Hoppers

Hoppers Dredging time = Operating time + Non-effective time + Lost time

Operating time = pumping time +
turning time +
time to dump +
dumping time +
time to cut +
connect time +
disconnect time

Our variables for production cycle analysis:
(calculated per day, as percentages of dredging time)

1. Effective time “Dredging” (%)= Pumping time / dredging time

2.a Effective Time “Transporting material” (%) = (turning time + time to dump + dumping time + time to cut + connect time + disconnect time) / dredging time

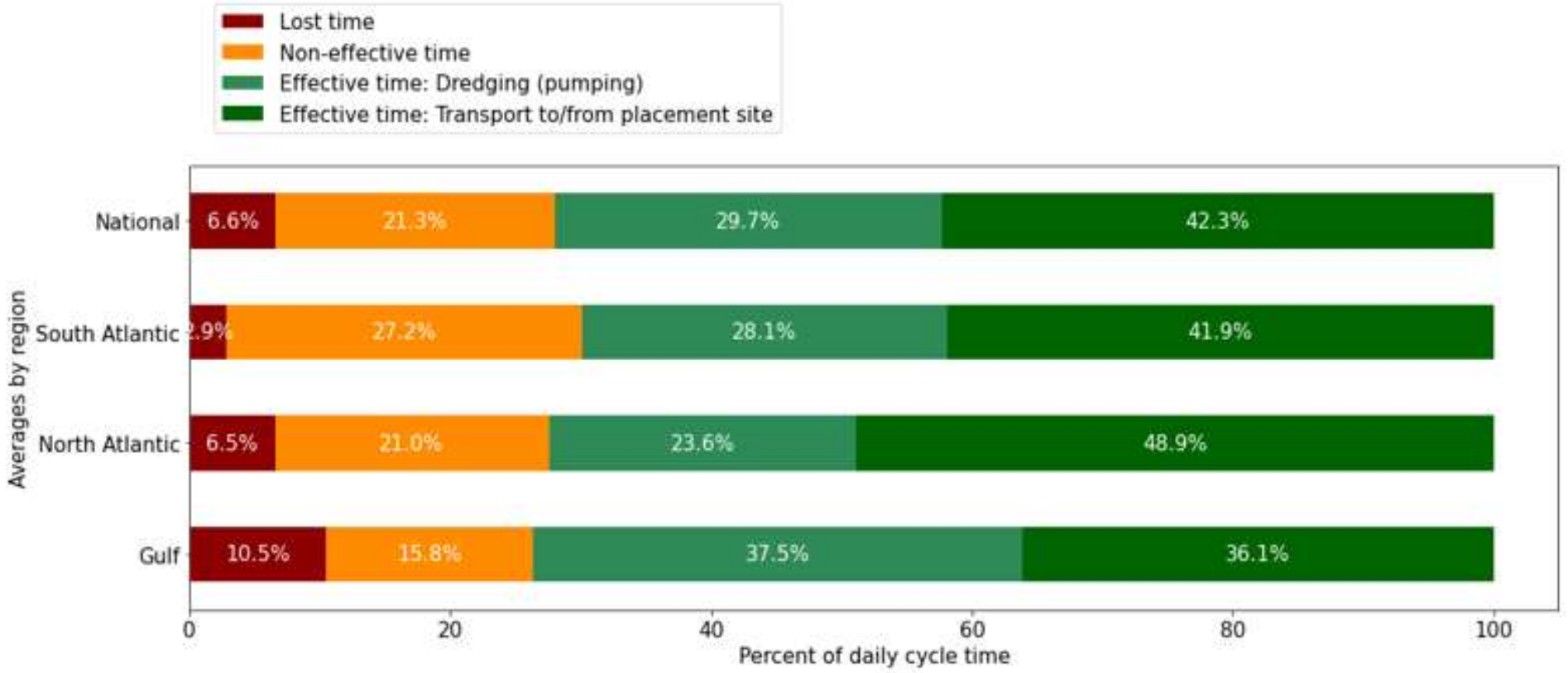
3. Non-effective time (%) = Non-effective time / dredging time

4. Lost time (%) = Lost time / dredging time

Hopper Dredging

Cycle Time Activities

-Long Haul Distances in the North Atlantic reflected by “Effective Time: Transport to/from Placement”



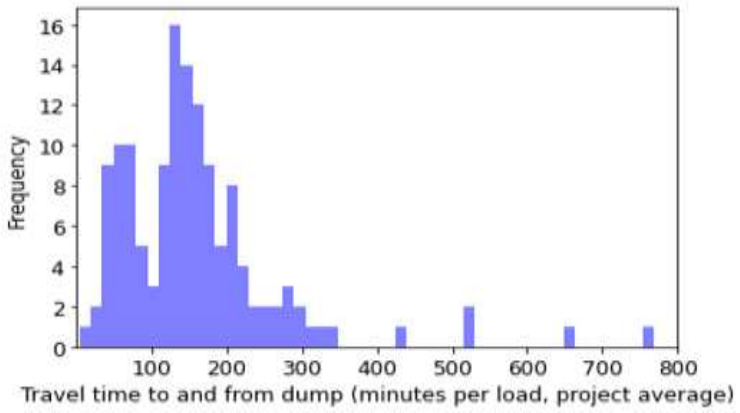
Hopper Dredging

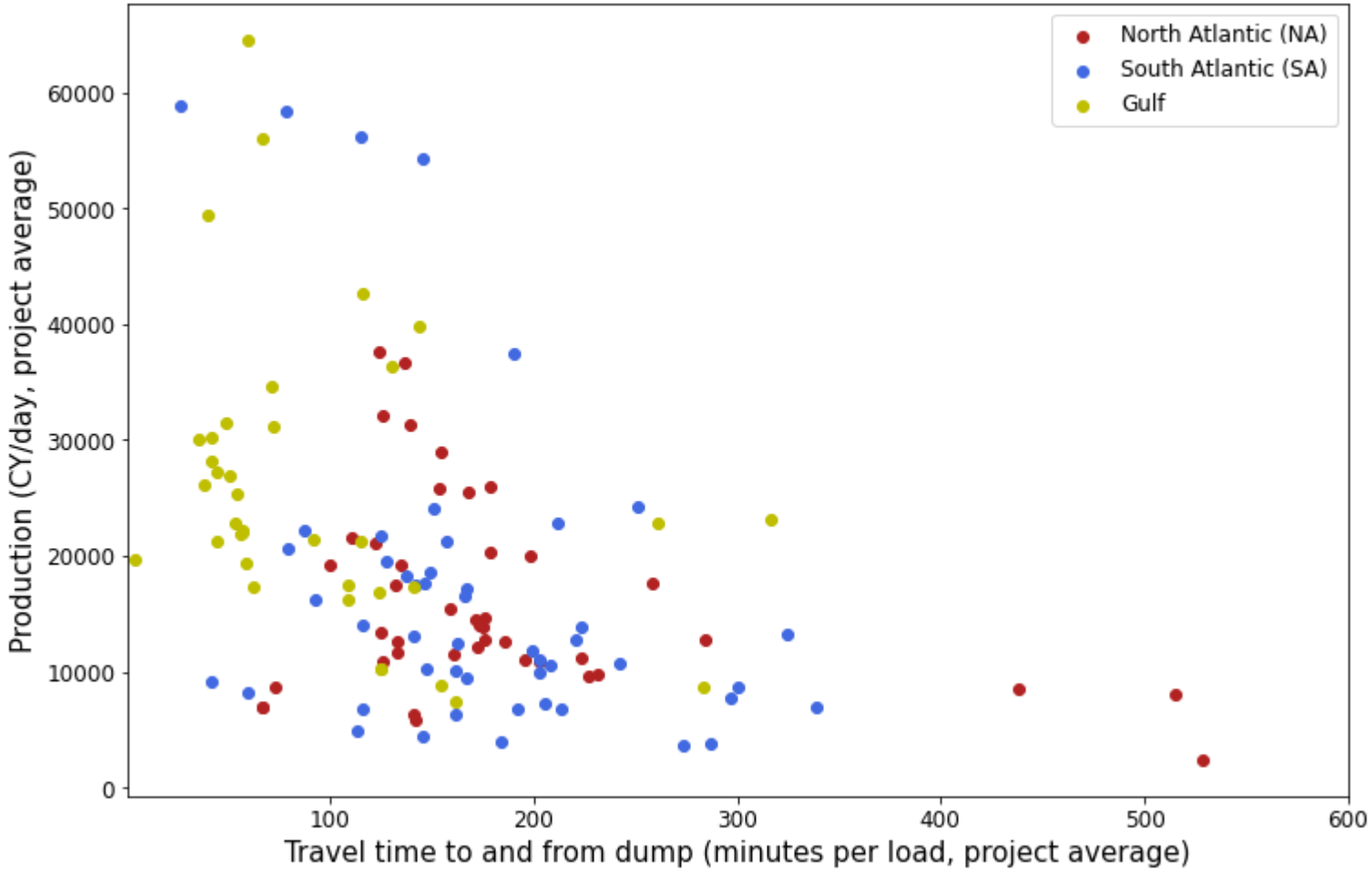
Productivity v. Haul Distance

Travel Duration used as proxy for hauling distance due to RMS records

Decline in productivity at longer hauling times. Less pronounced in North Atlantic

- **Ocean Disposal**
- **Riverine Settings (Gulf)**





RMS: Understanding production cycle and variables for Cutterheads

Our variables for production cycle analysis
(calculated per day, as percentages of dredging time

1. “Dredging” (%) = Pumping time / dredging time

2. “Changing Location” (%)= changing location of plant or job / dredging time

3. “Avoiding ship traffic” (%) = moving out of way of traffic / dredging time

4. “Work on lines and cutter/suction head”= (handling pipe lines + handling anchor lines + clearing pump and pump lines + clearing cutter or suction head) / dredging time

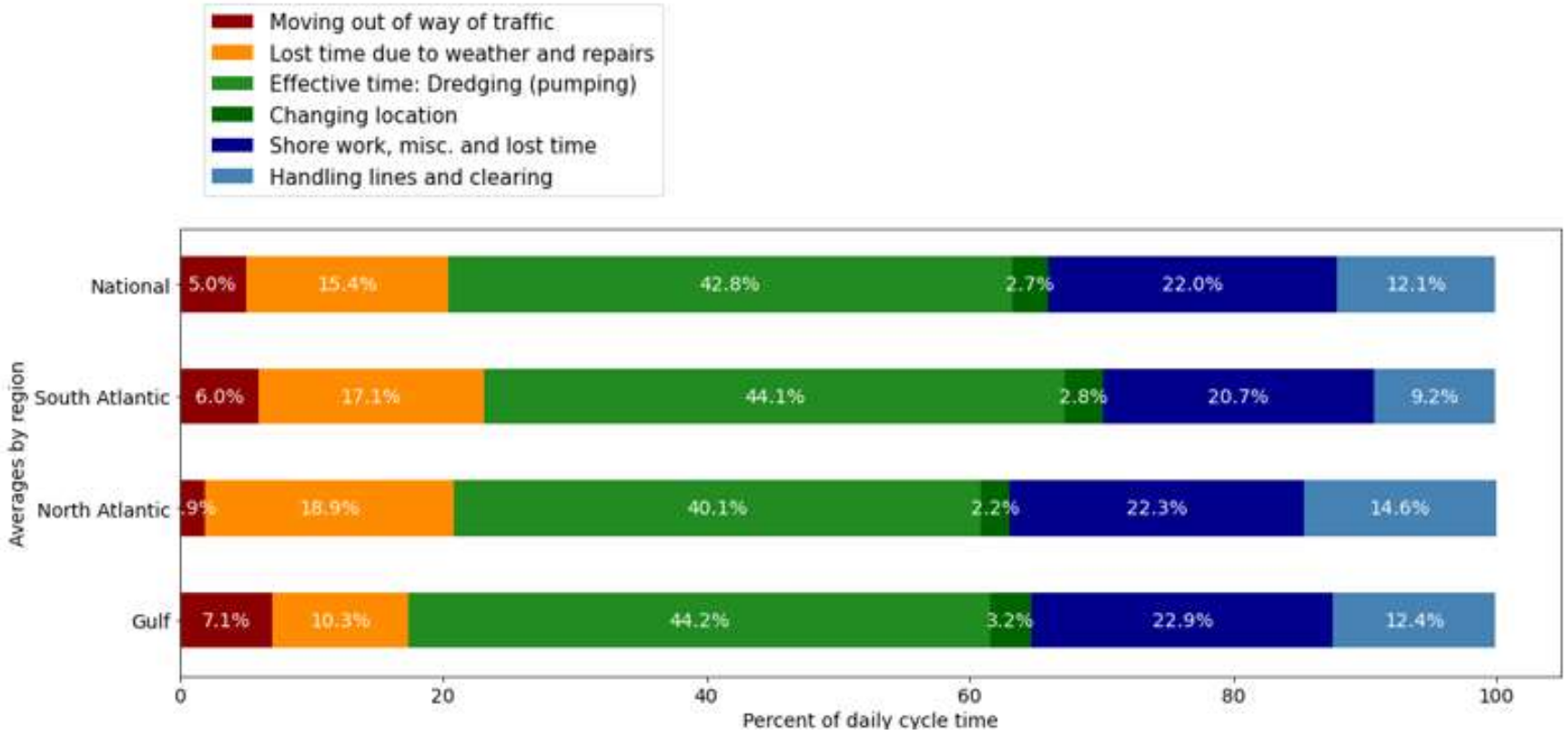
5. “Maintenance/weather delays” = (minor repairs + loss due to natural elements) / dredging time

6. “Other” = (shore line and shore work + miscellaneous + lost time) / dredging time

Cutterhead Dredging

Cycle Time Activities

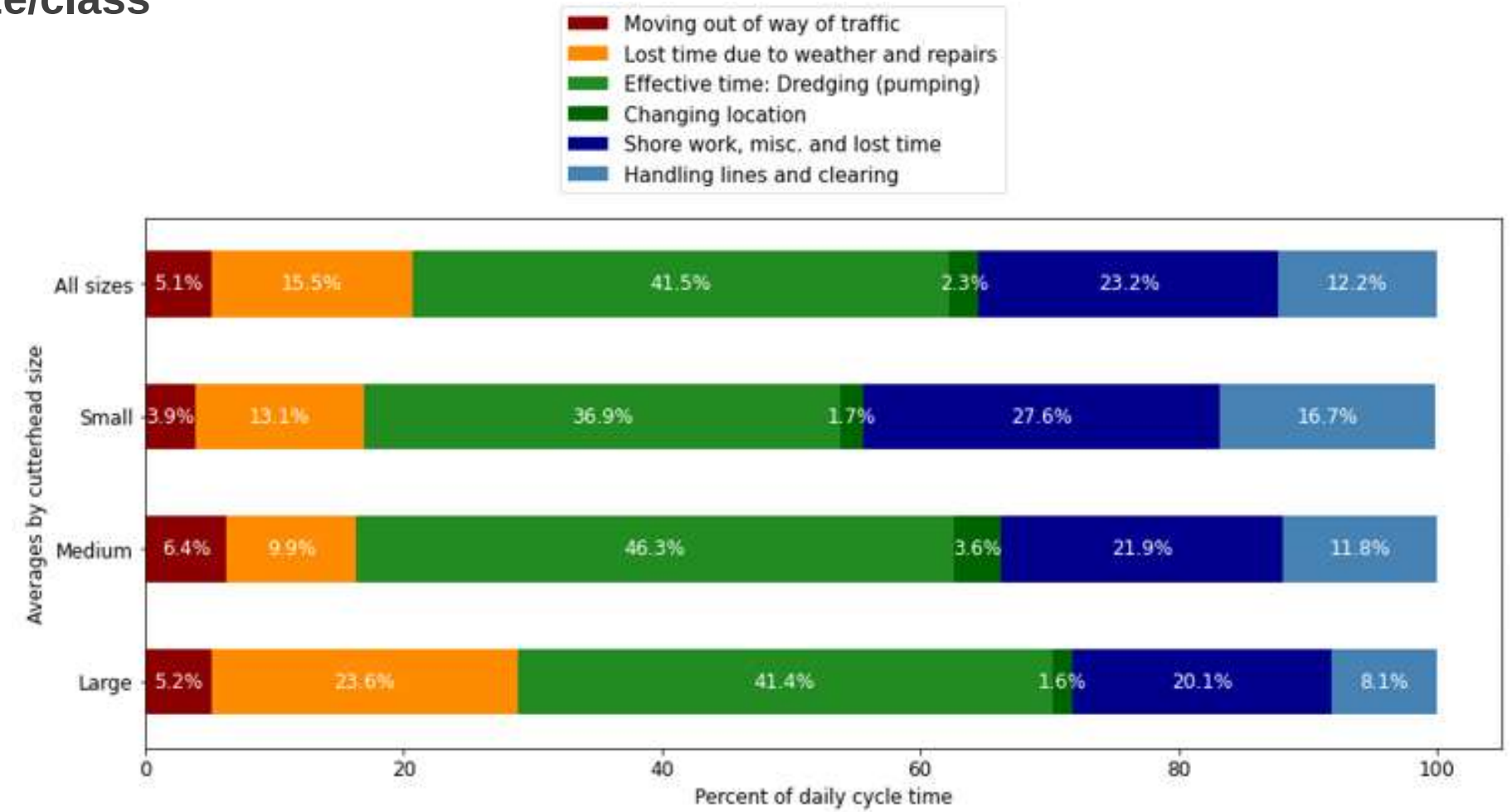
- Higher Traffic Delays in the Gulf/SA
- Seasonal analysis needed for scheduling optimization?
- Effective time consistent across all regions



Cutterhead Dredging

Productivity by size/class

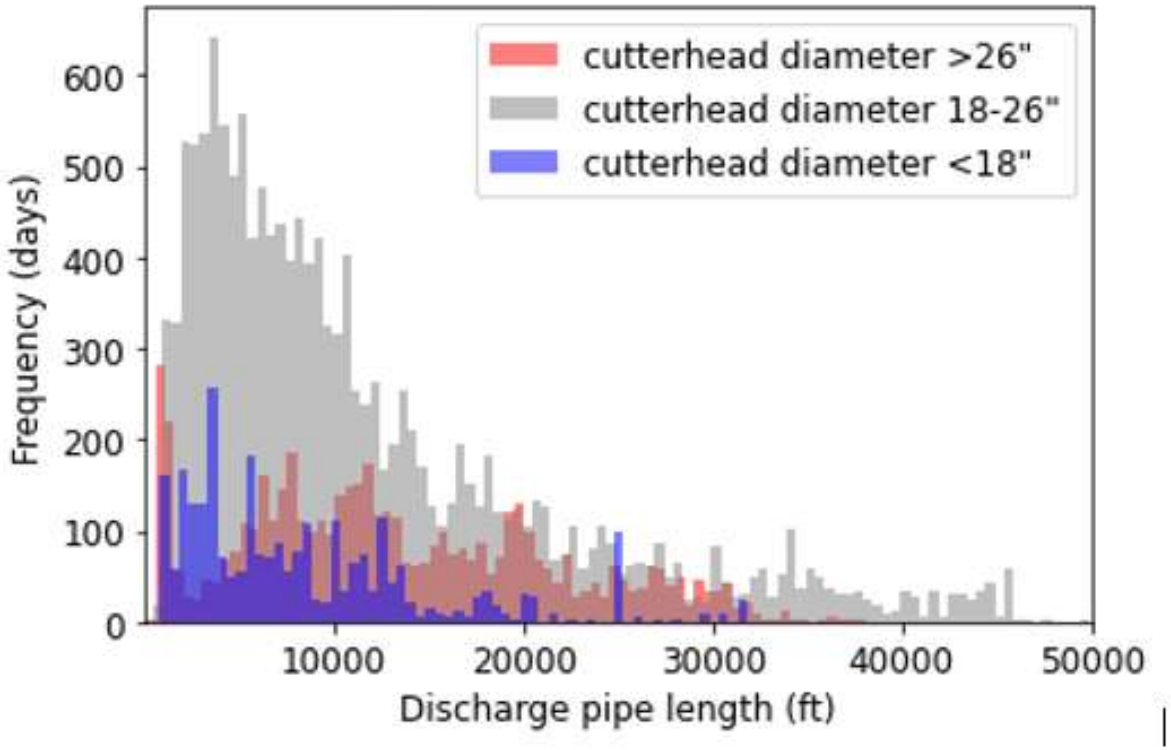
- **Small: <18”**
  Medium: 18-26”
  Large: 27”+
- **Medium class appears to be most efficient**
- **Lost Time significantly higher in Large Class, function of work complexity?**



Cutterhead Dredging

Discharge Pipeline Length by size/frequency

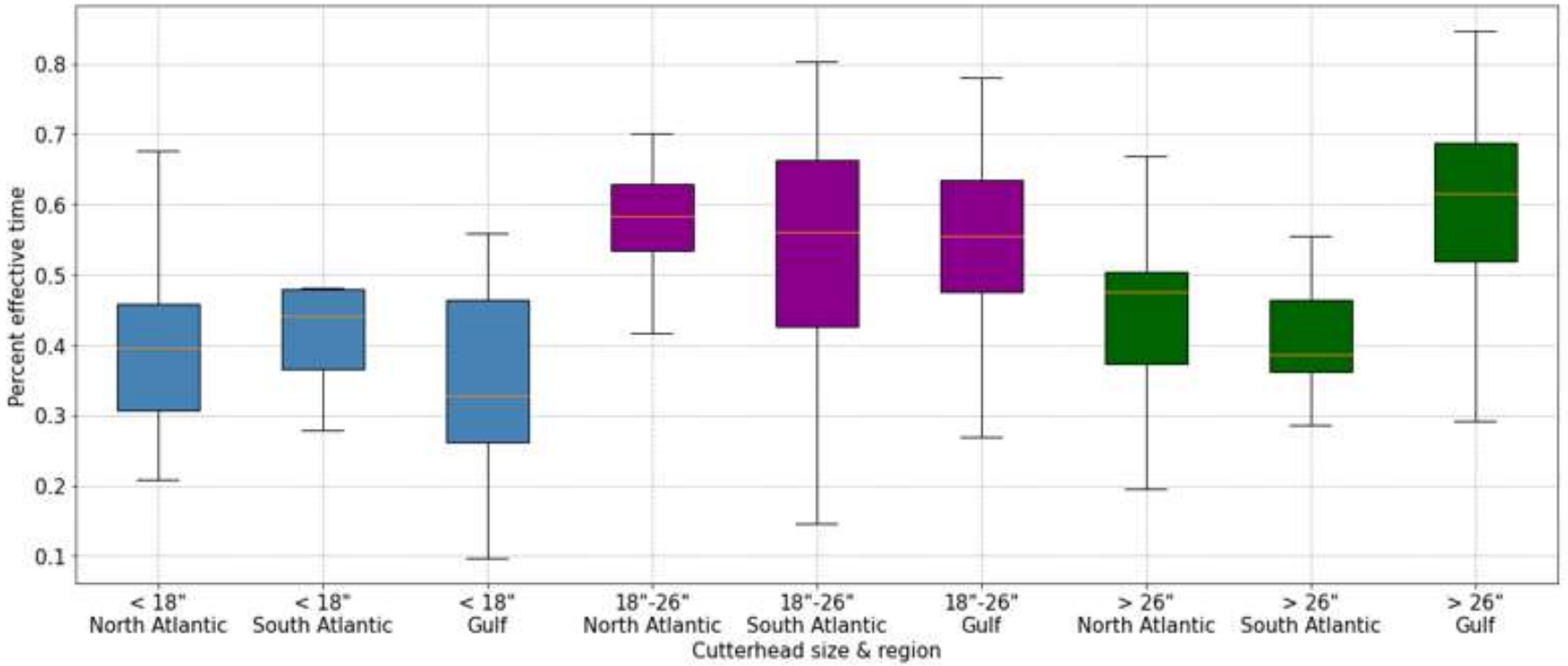
- Medium class cutterhead dredges most utilized class
- Medium class pumping material at the longest distances
- Majority of USACE projects requiring less than 20,000 LF of pipeline
- Some projects requiring 40,000+ LF pipeline or 7.5 miles!



Cutterhead Dredging

Percent Effective Time by Size/Region

- On average, Medium Class Dredges highest % effective working time
- Large class cutterheads in Gulf achieve highest percent of effective working times of all
- Medium Class dredge % effective time standard across all regions



RMS Dredging Data Analysis

Conclusions

- **CHL is continuing to acquire dredging records across nation to make analysis complete.**
- **This effort serves as a proof of concept of the type of analysis that can be derived from this data**
- **Can be utilized to support dredge selection, scheduling, and dredge cost estimation.**
- **THANK YOU!**
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  - **Ned Mitchell**
  - **Jase Ousley**
  - **RMS Team**

Questions?

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