Dredging Innovations Group

ERDC
Engineer Research and Development Center

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DIG
DREDGING INNOVATIONS GROUP

Dredging Innovations Group (DIG)

- Anticipate and identify priority problems, needs, and opportunities
- Address challenging Field and Program requirements
- Infuse ERDC R&D knowledge and technologies into practice
- Lower technical execution barriers under changing conditions
- Inform decision-making with credible, defensible science
- Build and sustain USACE institutional capacity

DIG Focus Areas & Program Roster

Channel Availability

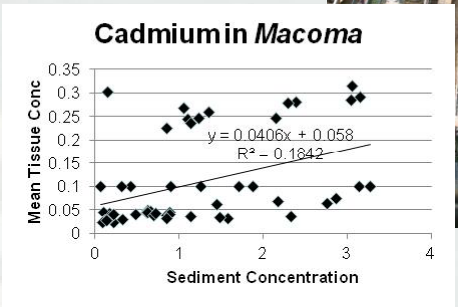
- Addressing Critical Operations: Duluth-Superior Harbor
- Threatened and Endangered Species Strategic Plan

Dredge Fleet Utilization

- Dredge Fleet Scheduling Optimization and Sensitivity Analysis
- West coast hopper fleet scheduling
- SAD comprehensive RSM plan

Operational Cost Efficiencies

- NIVOBOB and Automated Bin Measure
- Establishment of Bioaccumulation Testing Screening Levels
- DQM Macro Trends Analysis
- Non-nuclear densitometer evaluation



Workforce Capabilities

- Support for Strategic Navigation Initiatives (SNIs)
- Dredging for Executives video

Addressing Critical Operations: Duluth-Superior Harbor

Dr. Burton Suedel, ERDC-EL

- Problem
  - Support LRE EA for 21st Ave West Channel demo project in LRE FY13-14 dredging program. Includes BU of dredged material for capping Hg-contaminated sediments in deauthorized channel.

- Objective
  - Develop guidelines for Duluth Harbor recommending solutions helping Corps address local/regional issues providing a sustainable navigation dredging mission across GL harbors

- Approach
  - Provide technical support in developing monitoring plan
  - Model mercury flux and bioaccumulation as part of the monitoring effort
  - Communicate with diverse stakeholder group (MN and WI)

Establishment of Bioaccumulation Testing Screening Levels

Dr. Joe Kreitinger, ERDC-EL

- ## Problem

Bioaccumulation testing costs on USACE projects exceeds several million dollars annually. Research results over the last few decades suggest that many contaminants on which testing is conducted may provide little relevant information for decision making, yet regulators have yet to modify approaches.

- ## Objective

Develop technically defensible sediment screening levels by assembling and examining a large database from existing USACE District bioaccumulation testing and sediment chemistry data from projects around the nation.

- ## Approach
  - Data acquisition from Districts
  - Development of Data Analysis Routines
  - Analyze Data Relationships
  - Develop Screening Recommendations
  - Report

TES Species Listings Impact to Navigation Program

Dena Dickerson, ERDC-EL

- Problem
  - Need to proactively assess potential impacts of Federal ESA species listings to the CE navigation program and develop scientifically-based compliance strategies.
- Objective
  - Identify and prioritize proposed Fed. ESA species potentially impacted by CE nav. projects.
  - Identify the top 150 and 500 priority CE nav. projects vulnerable to Federal listing status of proposed species.
  - Compile species data by CE projects, Districts, Division, & geographic region.

Sand Tiger Shark – SoC
Photo: Jeff Kubina

Red Knot – PT
Photo: Greg Breese

- Approach
  - Evaluated 414 proposed species (308 USFWS, 106 NOAA) (1 May-15 Dec 2013) using Federal Register and supporting literature.
  - Identified the 150 and 500 priority (economics) CE nav. projects.
  - Identified 37 key species (8 corals) and the CE projects, Districts, Divisions, and geographic regions potentially impacted.

Dredge Fleet Scheduling Optimization

Dr. Ned Mitchell, ERDC-CHL
Dr. Corey Winton, ERDC-ITL

- Problem
  - Env. dredging windows effectively reduce fleet capacity, limit competition, and drive program-level cost increases.
  - Districts competing against each other for industry fleet availability in some cases
  - No quantitative way to prioritize env. work restrictions for more targeted R&D
  - Open questions remain concerning ideal composition of next-generation U.S. dredging fleet

http://static.bangordailynews.com/wp-content/uploads/2013/08/10040201_H4001662-600x400.jpg

http://www.dredgingtoday.com/wp-content/uploads/2014/02/USACE-Announces-Availability-c DEA-and-DSOC-for-Long-Beach-Project.jpg

- Objective
  - Formulate as constrained job assignment and scheduling optimization problem (University of Arkansas Industrial Engineering Department, POC: Dr. Chase Rainwater).
  - Compare optimal solution to typical real-world dredge-project assignments.
  - Via sensitivity analysis, identify most critical/disruptive environmental restrictions nationally, as well as next-gen dredge fleet requirements.

- Approach
  - Conduct robust sensitivity analyses with refined model parameters (sediment loads, dredge production rates, etc.); pinpoint most critical environmental restrictions
  - Determine impacts of reduced operating rates on overall dredge fleet availability
  - Extend problem formulation to multi-year budget cycles

NIVOBOB Automated Ullage Sensor and Bin Measure Payment System

Tim Welp, ERDC-CHL

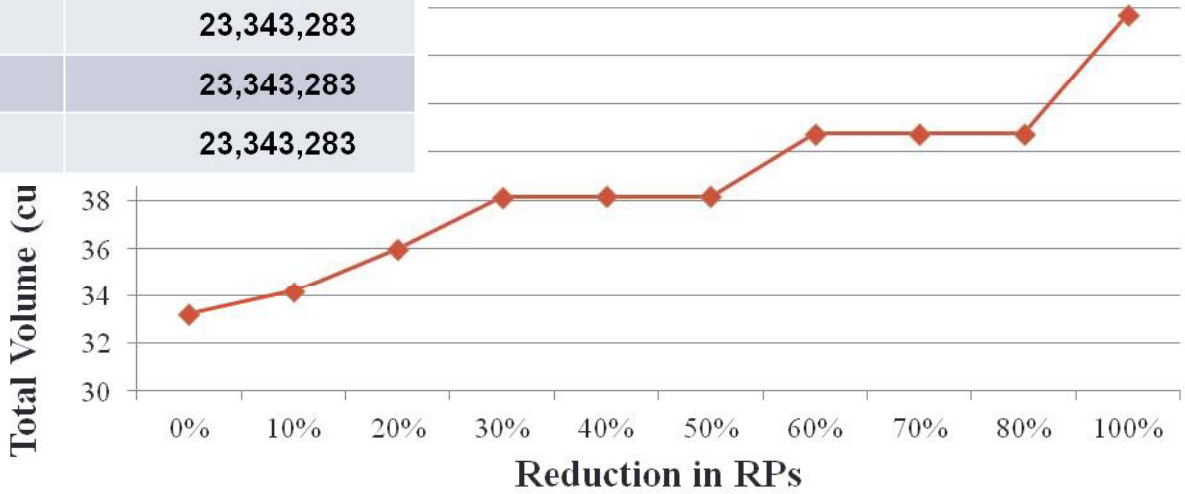
- Problems
  - NWP contract bin payment based on hopper loads used to require 24/7 (two inspectors) manual soundings
  - Unsafe to be manually sounding hopper at night on ocean bar in heavy seas
  - Rental contacts can apportion more risk to the Government
  - Do not provide incentives to the contractor to maximize production

- Objective
  - Deliver automated accurate and precise bin load measurement technology and contracting method
  - Reduce contract costs and increase safety.
  - Deliver automated accurate and precise bin load measurement technology and contracting method for sand and fine-grained DM.

Dredge Fleet Scheduling Optimization

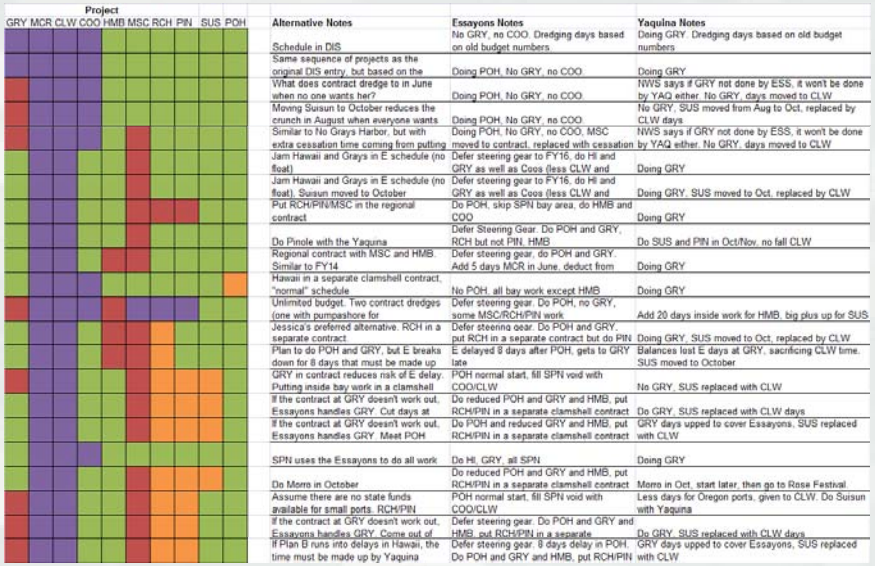
Dr. Ned Mitchell, ERDC-CHL
Dr. Corey Winton, ERDC-ITL

# of Dredges	Fleet Daily Capacity (CY)	Total Annual Capacity (CY)
10	21,599	7,170,764
10	336,535	44,086,063
20	84,844	22,746,682
20	194,004	28,023,948
20	476,148	45,210,241
30	144,302	23,343,283
40	167,606	23,343,283
50	237,084	23,343,283

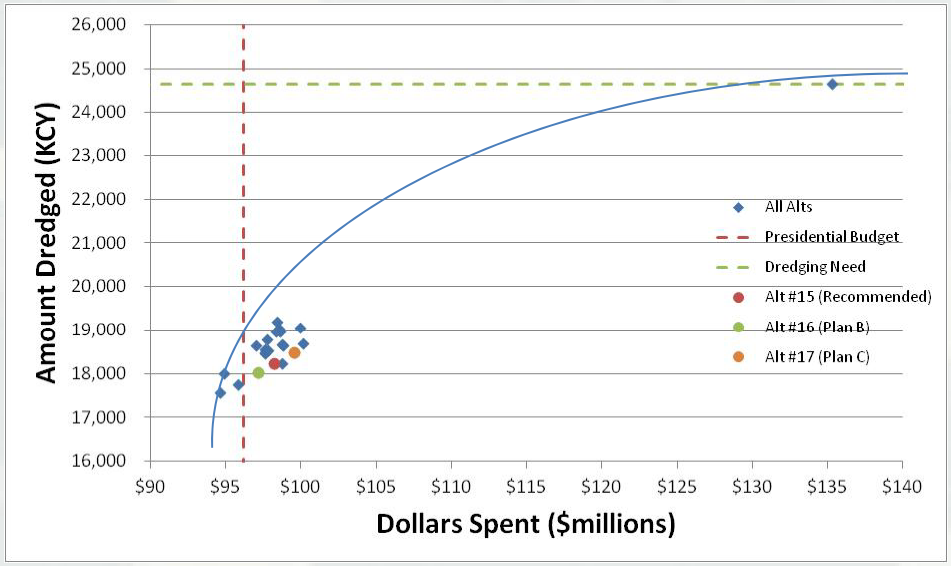


West Coast Hopper Dredge Scheduling

Mike Ott, NWP



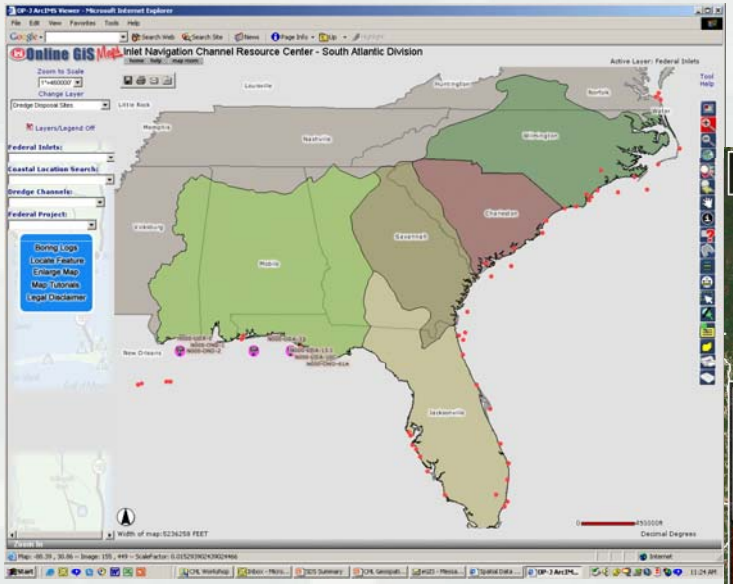
Alternative Notes	Essayons Notes	Yaquina Notes
Schedule in DIS	No GRY, no COO. Dredging days based on old budget numbers	Doing GRY. Dredging days based on old budget numbers
Same sequence of projects as the original DIS entry, but based on the	Doing POH, No GRY, no COO.	Doing GRY
What does contract dredge to in June when no one wants her?	Doing POH, No GRY, no COO.	NWS says if GRY not done by ESS, it won't be done by YAQ either. No GRY, days moved to CLW
Moving Suisun to October reduces the crunch in August when everyone wants	Doing POH, No GRY, no COO.	No GRY, SUS moved from Aug to Oct, replaced by CLW days
Similar to No Grays Harbor, but with extra cessation time coming from putting	Doing POH, No GRY, no COO, MSC moved to contract, replaced with cessation	NWS says if GRY not done by ESS, it won't be done by YAQ either. No GRY, days moved to CLW
Jam Hawaii and Grays in E schedule (no float)	Defer steering gear to FY16, do HI and GRY as well as Coos (less CLW and	Doing GRY
Jam Hawaii and Grays in E schedule (no float). Suisun moved to October	Defer steering gear to FY16, do HI and GRY as well as Coos (less CLW and	Doing GRY. SUS moved to Oct, replaced by CLW
Put RCH/PIN/MSC in the regional contract	Do POH, skip SPN bay area, do HMB and COO	Doing GRY
Do Pinole with the Yaquina	Defer Steering Gear. Do POH and GRY, RCH but not PIN, HMB	Do SUS and PIN in Oct/Nov, no fall CLW
Regional contract with MSC and HMB. Similar to FY14.	Defer steering gear, do POH and GRY. Add 5 days MCR in June, deduct from	Doing GRY
Hawaii in a separate clamshell contract, "normal" schedule	No POH, all bay work except HMB	Doing GRY
Unlimited budget. Two contract dredges (one with pumpashore for	Defer steering gear. Do POH, no GRY, some MSC/RCH/PIN work	Add 20 days inside work for HMB, big plus up for SUS
Jessica's preferred alternative. RCH in a separate contract	Defer steering gear. Do POH and GRY, put RCH in a separate contract but do PIN	Doing GRY, SUS moved to Oct, replaced by CLW
Plan to do POH and GRY, but E breaks down for 8 days that must be made up	E delayed 8 days after POH, gets to GRY late	Balances lost E days at GRY, sacrificing CLW time. SUS moved to October
GRY in contract reduces risk of E delay. Putting inside bay work in a clamshell	POH normal start, fill SPN void with COO/CLW	No GRY, SUS replaced with CLW
If the contract at GRY doesn't work out, Essayons handles GRY. Cut days at	Do reduced POH and GRY and HMB, put RCH/PIN in a separate clamshell contract	Do GRY, SUS replaced with CLW days
If the contract at GRY doesn't work out, Essayons handles GRY. Meet POH	Do POH and reduced GRY and HMB, put RCH/PIN in a separate clamshell contract	GRY days upped to cover Essayons, SUS replaced with CLW
SPN uses the Essayons to do all work	Do HI, GRY, all SPN	Doing GRY
Do Morro in October	Do reduced POH and GRY and HMB, put RCH/PIN in a separate clamshell contract	Morro in Oct, start later, then go to Rose Festival.
Assume there are no state funds available for small ports. RCH/PIN	POH normal start, fill SPN void with COO/CLW	Less days for Oregon ports, given to CLW. Do Suisun with Yaquina
If the contract at GRY doesn't work out, Essayons handles GRY. Come out of	Defer steering gear. Do POH and GRY and HMB, put RCH/PIN in a separate	Do GRY, SUS replaced with CLW days
If Plan B runs into delays in Hawaii, the time must be made up by Yaquina	Defer steering gear. 8 days delay in POH. Do POH and GRY and HMB, put RCH/PIN	GRY days upped to cover Essayons, SUS replaced with CLW

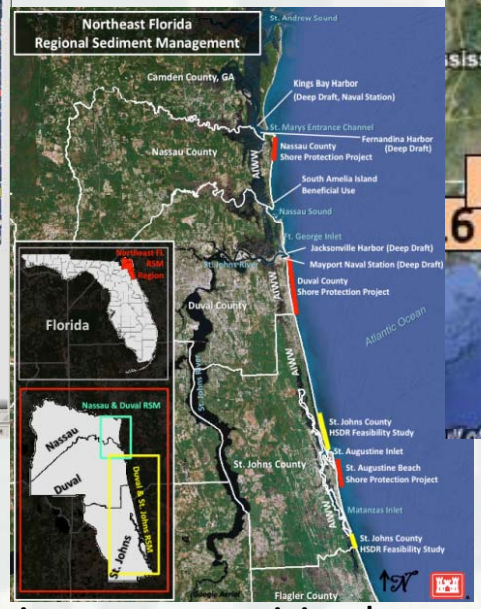


- PACNAVCOP conducts annual planning of west coast hopper fleet project assignments and schedules.
- Process informed by detailed records of project dredging requirements, dredge plant production rates, travel times between projects, and environmental work windows.
- Will employ enhanced dredge fleet scheduling code to inform FY16 fleet planning efforts (June 2015).

Fleet Scheduling for SAD Comprehensive RSM Plan

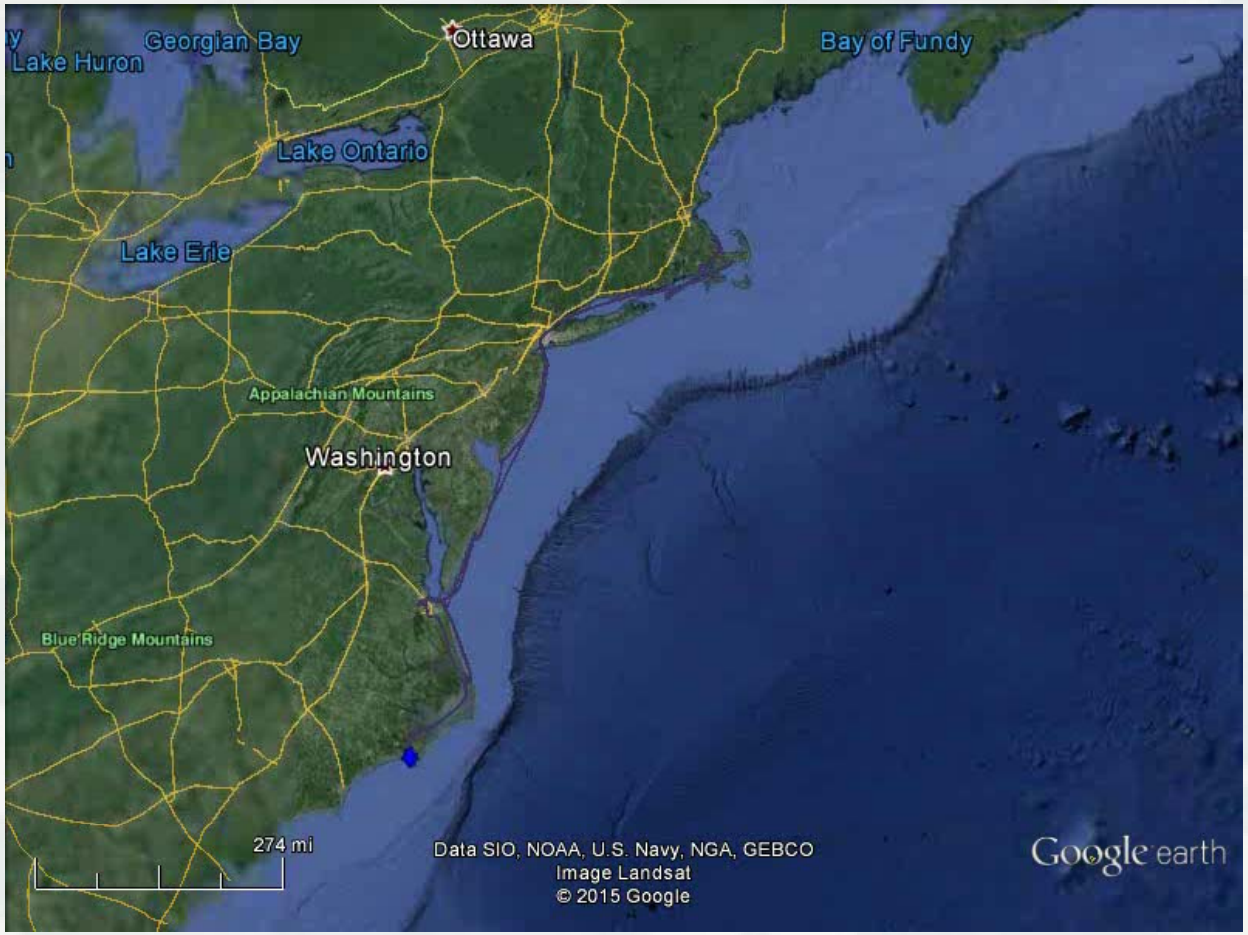
Linda Lillycrop, Jackie Kieser





- RSM approach will look for cost saving opportunities between Navigation and Flood Risk Management business lines across all of SAD.
- DIG will support this effort by providing additional insight into possible cost savings via the dredge fleet scheduling work.

Questions?



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