



Development of a Decision Support Tool To Reduce Sea Turtle Dredging Entrainment Risk

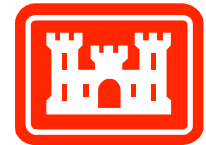


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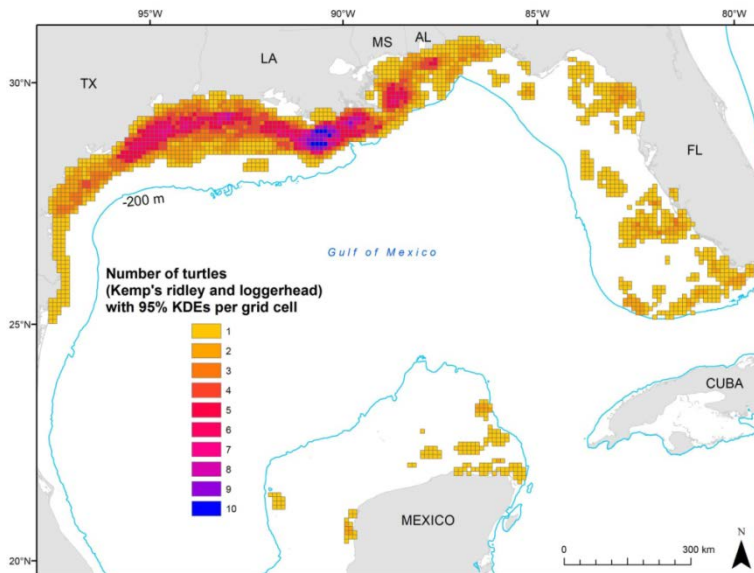


WEDA

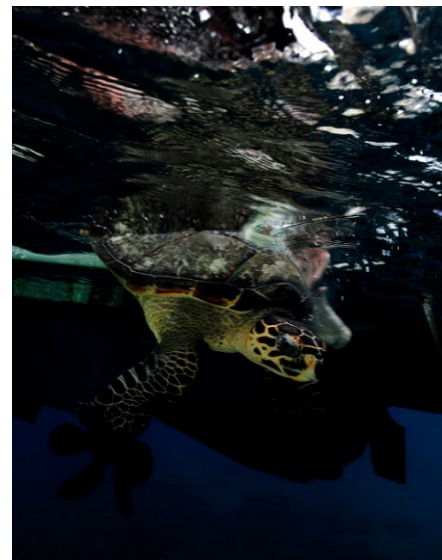
October 25th 2016

*See “Story Map” for More Information: <http://arcg.is/298s5BO>

- **Background**
- **Study Purpose**
- **Study Objectives**
- **Scope of Work**
- **Industry Meeting Outcomes**
- **Sea Turtle Expert Meeting Outcomes**
- **Next Steps – Phase II**
- **Discussion / Questions**



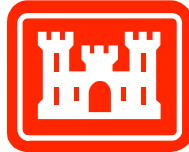
Source: Kristen Hart, USGS



Source: Jake Levenson, BOEM



Source: Jake Levenson, BOEM




- WEDA (2012, 2016)
- USACE Eastern Region Dredging Conference (2014)
- SE Regional Sea Turtle Meeting (2015 and 2016)
- National Dredging Meeting (2016)


Environmental Considerations in Dredging
Looking out on the horizon

WEDA
October 9-11, 2012

Doug Piatkowski
USACE-Wilmington District



Wilmington District



US Army Corps of Engineers
BUILDING STRONG.

BOEM
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Dredging Industry Engagement Meeting
September 13th 2016

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Coastal Resiliency Planning



Resource Management, Strategic Planning, and Applied Science

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Division of Environmental Assessment

U.S. Army Corps of Engineers Eastern Region Dredging Conference
October 14th – 15th 2014
South Atlantic Division Headquarters
Atlanta, GA



Marine Minerals Program: Responsible for managing development of OCS non-energy marine mineral resources

- **Authority:**
 - Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1331, et. seq.)
 - Public Law 103-426 (43 U.S.C. 1337(k)(2)) (1994)
- **National interest** in long term planning
 - Climate change and SLR scenarios
 - Increased storm frequency and intensity
- **Increased use** of OCS sand sources
 - ~120 mcy of OCS sand conveyed (e.g. Atlantic and Gulf)
- **Stewardship** of resources

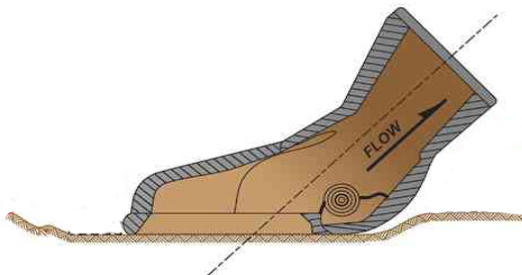


Source: Charles St. Martin, Rhode Island DOT



Source: Weeks Marine

- **Established Mitigation Measures:** Since the 1990's
- **Since 1996:** >20 sea turtle mortalities associated OCS dredging.
- **Residual Risk:** Limited consideration for project specific efficacy and no risk evaluation standard
- **BOEM Needs:** Minimize entrainment risk through a standardized risk assessment framework



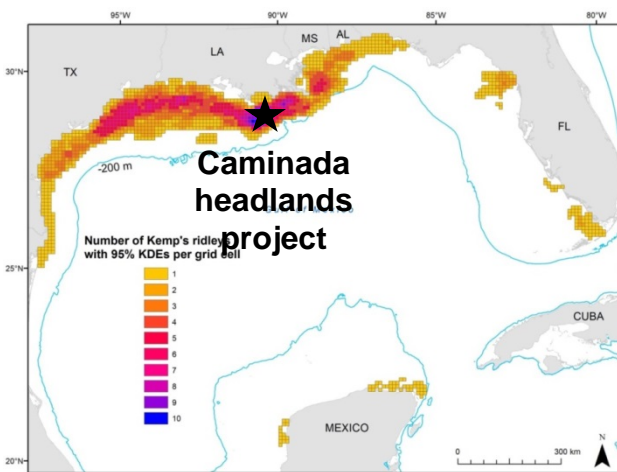
- **Minimize adverse effects to sea turtles associated with dredging operations in the OCS through:**
 - Deliberate project specific planning efforts
 - Implementation of relevant and effective mitigation measures
- **More informed decisions** could:
 - Minimize impacts to sea turtle species
 - Decrease dredging costs through reduced downtime, increased productivity, and potential “flexibility” of environmental windows
- **Develop a geographically and temporally based decision support tool for BOEM’s* use to:**
 - Support risk based planning
 - Standardized and consistent across a regional scale to assess project-specific dredging entrainment risk within a common framework



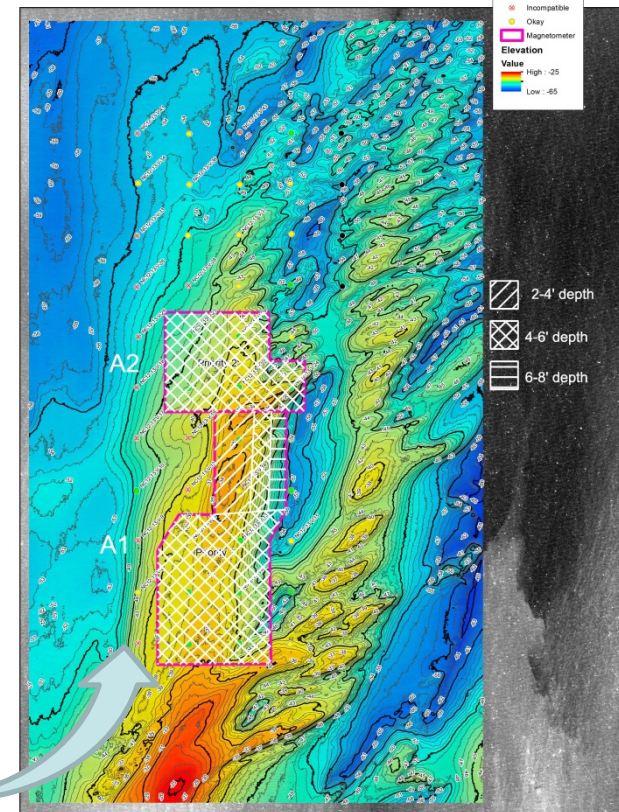
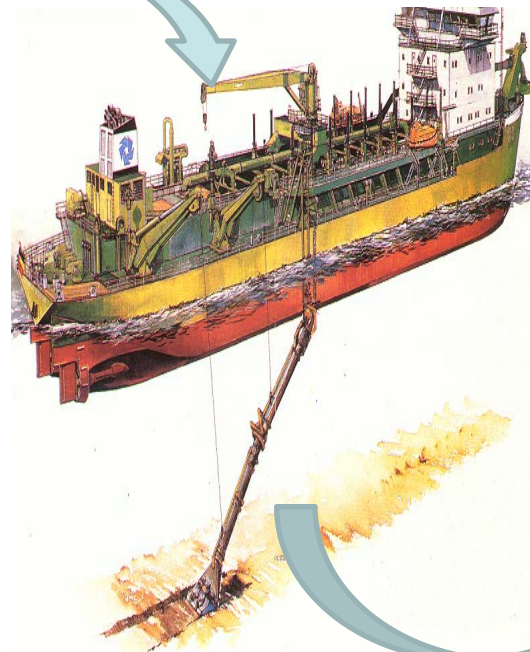
Source: USGS

* Opportunity to expand user base in the future

- Identify risk factors and authoritative data sources to support tool development
 - Temporal and spatial relationship of sea turtle behavior
 - Borrow area design relative to efficacy of existing mitigations



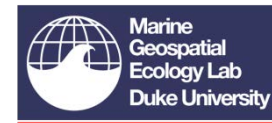
Source: Shaver et. al. 2013



Source: USACE Wilmington District

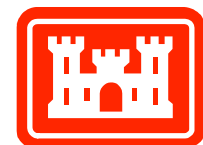
PHASE I (2015-2016):

- Literature Synthesis, Assessment of Existing Data, and Draft report (**Ongoing**)
- Convene Industry and Sea Turtle Technical Expert Meetings (**Completed**)
 - Identify dredging risk factors and sea turtle data availability:
 - Borrow area design considerations
 - Telemetry data - sea turtle distribution, abundance, and behavior



PHASE II (2016-2017):

- Develop requirements
- Design and Develop the DST
- Stakeholder demonstration / feedback
- Final Report (including meeting notes/conclusions)
- Presentation of Results



- Inform participants of the study and their contributing roles as **collaborative partners**
- **Solicit authoritative knowledge on project-specific risk factors** and rank the significance
- Solicit recommendations regarding **new mitigations and/or modifications of existing mitigations** to reduce entrainment risk



Sea Turtle Behavior

- Utilizing project areas differently (Just because turtles occur in an area does not mean they are spending time on the bottom and vulnerable to entrainment.)
- Behavior within a project area may vary depending on times of year, water temperature, etc. (i.e. predominant foraging/food resource)
- Habitat differences and relationship to features

Borrow Area Footprint

- Total borrow surface area acreage available relative to the total volume and associated dredge depths
- Orientation perpendicular to sea / wind and length of cut to minimize number of maneuvers

Borrow Area Design

- Consistent depth over borrow area
- Reasonable buffer (i.e. overdepth) from unsuitable materials
- Sediment Compatibility – resources with less fine material
- Geotechnical analysis – even below the desired cut depth
- Minimize corners

Post Dredging environment, Changed habitat use

- Bathymetry and impacts to deflector efficacy
- Are animals using trenches and steep slopes as habitat?

Median Grain Size

- Mud vs Sand
- Need more volume allotted for finer sediments

Sea Floor / Channel Bottom Profile

- Rugosity / trenching / “crabbing”
- Efficacy of Deflector

Other Risks:

- Entrainment via trunnion port when drag arm is disengaged?
- Lack of data / information about in-water turtles. Much more data are needed to fine tune management decisions.
- Reduced production rates increase the overall time dredging
- How are current practices causing problems / leading to increased risk of entrainment
- Duration of project vs time of year
- Relocation Trawler - effort as it relates to operational run times "no trawl, no dredge"

“Tickler Chains”

- 25’ chain curtain connected to drag arm ahead of deflector
- Used in combination with or replacing deflector depending on project

Borrow Area Design BMPs

- Surface area acreage available relative to the total volume and associated dredge depths
- Orientation perpendicular to sea / wind and length of cut
- Consistent depth
- Educating engineers on efficient borrow area design to minimize risk (i.e., reducing sharp corners in design volume)

Flexibility for Innovation Based on Project Specific Factors

- Windows based on science and operational logic
- Removing deflector when conditions don’t promote efficacy
- Support / incentivize industry innovation as it relates to drag head and turtle deflector design and utilization

Water Injections

- Water jets installed ahead of dragheads

Bed Leveling

- Allow for use of efficient bed leveler designs where applicable

Adjustable Ground Pressure

- Pre-defining ground pressure to improve draghead contact with bottom in varying sediment types.

Relocation Trawling Alternatives

- Non-capture trawling
- “Tickler chains” on trawlers
- Side Scan Sonar technology to assess abundance

Education

- Coordinating with practitioners regarding use of DST
- Promote regional collaboration in research community to support decision making

Strategic Investments to “Fine Tune” Management Decisions

- Purchasing tags and regional coordination to take advantage of opportunistic tagging opportunities
- Building flexibility in Biops as alternative to Section 10 permits

- Inform participants of the study and their contributing roles as **collaborative partners**
- **Solicit authoritative knowledge on sea turtle telemetry data** and other spatial/temporal data layers to support the tool
- **Identify significant data gaps** relative to understanding sea turtle entrainment risk and opportunities to fill them



Discerning Behavioral Patterns of Sea Turtles in the Northern GOM to Inform Management Decisions

Interagency Agreement: BOEM / USGS

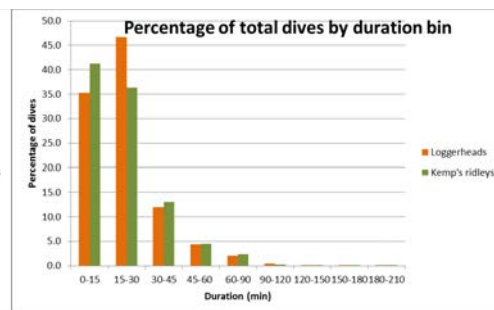
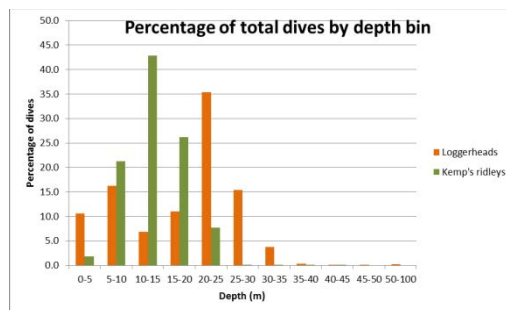
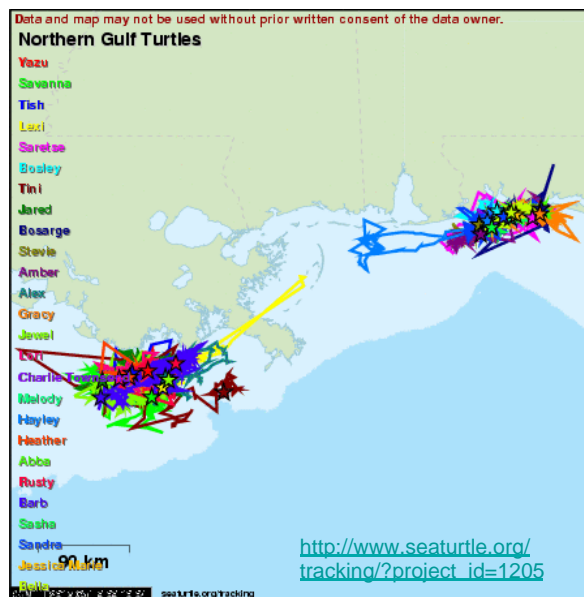
Objective: Tag sub-adult, juvenile, and adult sea turtles in the Northern GOM

Specific goals:

- Distribution and seasonal site fidelity
- Characterization of dive profiles
- Characterization of habitats
- Assess the population structure and isotopic signatures
- Status of abundance and distribution

Status:

- Ongoing
- A total of 26 turtles tagged
- Higher density ≠ higher turtle takes (i.e., Caminada Headlands Project)



Atlantic Marine Assessment Program for Protected Species (AMAPPS)

Multi-Agency Initiative: NOAA, BOEM, USFWS, and Navy (ongoing / Multi-year)

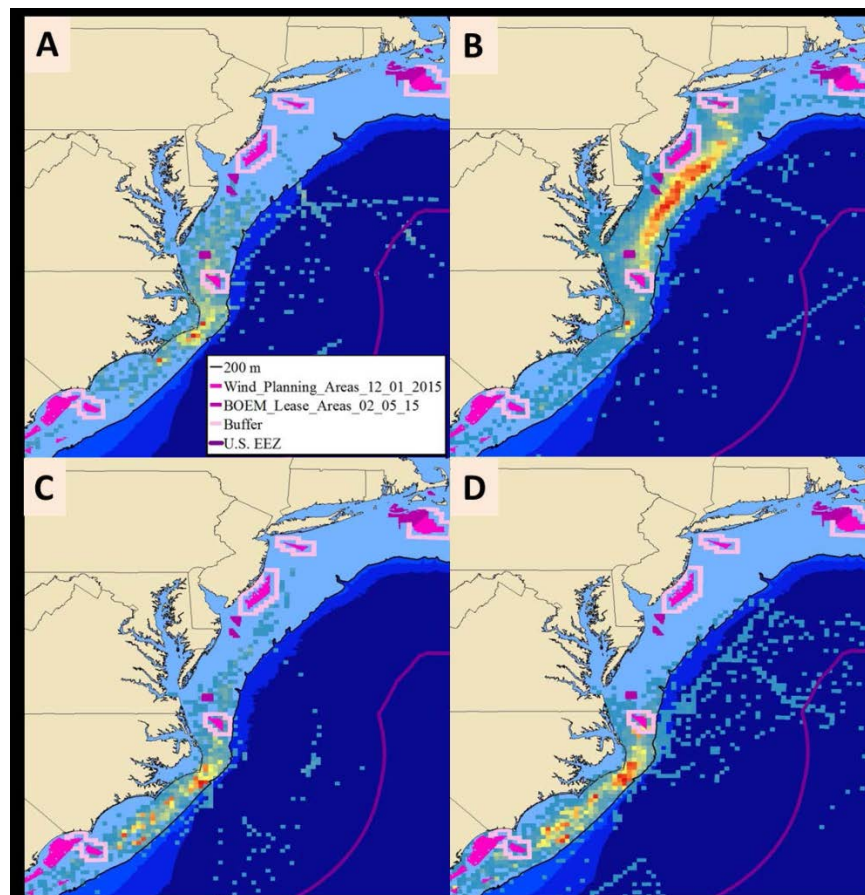
Objective: Assess sea turtle abundance and spatial distribution in U.S. waters of the western North Atlantic Ocean

Specific goals:

- Develop models and associated tools to provide seasonal, spatially-explicit density estimates incorporating habitat characteristics
- Seasonal distribution and abundance using aerial and shipboard surveys and telemetry studies.
- Collect data on habitat use and life history, residence time, and frequency of use

Status:

- Ongoing
- Data - NE Atlantic loggerheads spending significantly more of their time at the surface



Source: Haas et al, chapter in internal NMFS report in review at NEFSC

Sea Turtle Behavior

- Distribution within the water column
- Relative densities/counts (within a particular area as opposed to discrete numbers)
- OBIS-SEAMAP and/or seaturtle.org are the go to sources for turtle data (telemetry, directed surveys)
- Turtle takes per unit effort (need to determine if takes occur more often on large projects or projects with long time to completions)
- Potential to use nesting/bycatch data as density proxies in areas without sufficient telemetry or survey data
- No large scale dataset related to turtle behavior is currently available
- Habitat models currently available are outdated, new models are in development by UCF, Navy, VA Aquarium

Temperature

- SST is important element to distribution
- Water temperature may affect how deep and how long turtles dive (most relevant to dredging)
- Photosynthetically Active Radiation (PAR) may be indicator as well (measure of solar radiation)
- Need to find a source of bottom temperature since that may be a better indicator of their behavior on the bottom

Bottom Type

- Navy has database of bottom types they may be willing to share. Contains combinations of best available data
- Need to define habitat/bottom type preferences for turtles

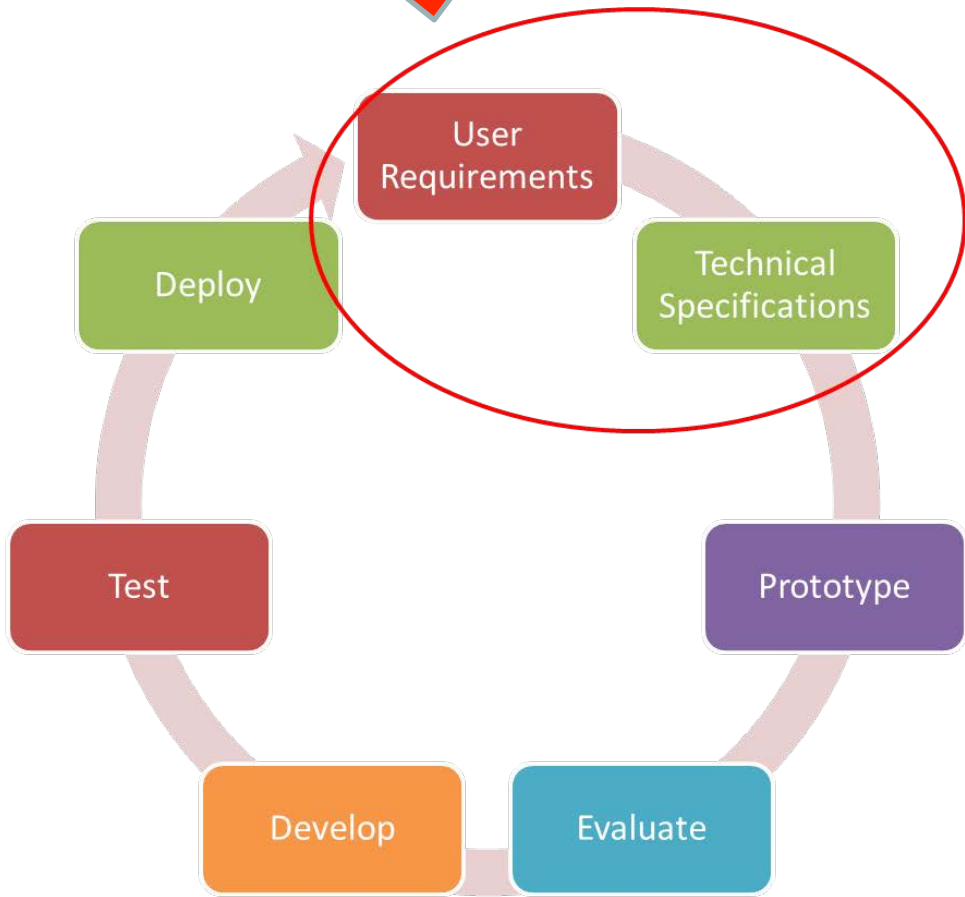
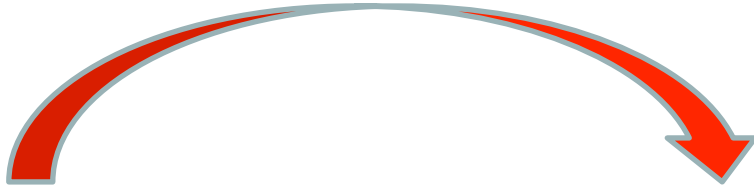
Sea Floor / Bottom Profile

- Geomorphology, Slope, Rugosity important indicators of sea floor use
- Rugosity is the finest scale
- Anecdotal evidence implies turtles prefer high rugosity areas for resting in troughs and valleys. Higher risk of entrainment when dragheads skip over holes
- High slope areas (near ledges) allow easier access to deeper water for thermoregulating.

Other Factors:

- Depth – Not enough information currently to make assumptions about depth limitations
- Chlorophyll-a – may represent pelagic foraging, but not benthic foraging so may be less important to this project
- Existing Critical Habitat Designations – significant work went into these, should not be discounted
- Ocean Currents

	Step 2	Step 3	DD
	Dataset (Layer)	Priority	
Sea Turtle Data	Behavior/Distribution Within Water Column (telemetry)		●
	Dedicated Survey (abundance/density)		●
	Dredge Entrainment Events		●
	Take per Unit Effort (related to cubic yards dredged/relocation)		●
	Location/Movements (telemetry)		●
	Opportunistic Surveys/Other Observations (presence/behavior)		
	Predicted Density (habitat models)		
	Relocation Trawling Data (captures)		●
Environmental Data	Bottom type (Hard Bottom)		●
	Chl-a		
	Climate		
	Critical Habitat Designations		
	Depth (Bathymetry)		●
	Distance to Shoreline		
	Fronts		
	Geomorphology		●
	Habitat Areas of Particular concern		
	Human Impacts		
	Mesoscale Eddies		
	Ocean Circulation		
	Ocean Currents		
	Photosynthetically Available Radiation (PAR)		
	Rugosity (Bathymetry)		
	Salinity		
	Sea Surface Height		
	Sea Surface Roughness		
	Seagrass		
	Sediment Type (Sand)		●
	Slope (Bathymetry)		●
	Temperature		●
Tides			
Water Masses			
Water Velocity			
Wind			



“Using available science, data, and dredging operational knowledge to inform decisions”

*See “Story Map” for More Information: <http://arcg.is/298s5BO>

