BOEM Bureau of Ocean Energy Management

Data Needs for Developing Informed Environmental and Spatial Planning Decisions

April 2, 2024

Deena Hansen and Ana Rice | COSA Spring 2024

Objective

- Resource value (high quality, sufficient volume, in demand) and ecology are important, at both the project scale and for multiuse planning
- Decisions rely on ecological factors and economic drivers
- Research to support decisions is based on gaps and recommendations

How do we combine ecological and resource stewardship to better conserve sand and sediment during multiuse planning?

MMP Decisions

- Leasing: negotiations between BOEM and project proponent
- Mitigation measures: requirements provided by other agencies, executed by BOEM
- Deconflicting: negotiations within BOEM and with industry and other agencies

Origin of Studies

- Assessments
  - Internally, ongoing dredge projects
  - Internally, through forecasting
  - From external resource management agencies
- Stakeholder and Partner Engagement
- Other Studies
  - Literature reviews recommend priority areas of research
  - First phase of field studies reviews data to develop methods

Assessments Rely on Study Results

The percentage of assessments that cited at least one BOEM report or publication varied year to year. Older assesments cited fewer reports or publications. The average across all years was 75 percent.

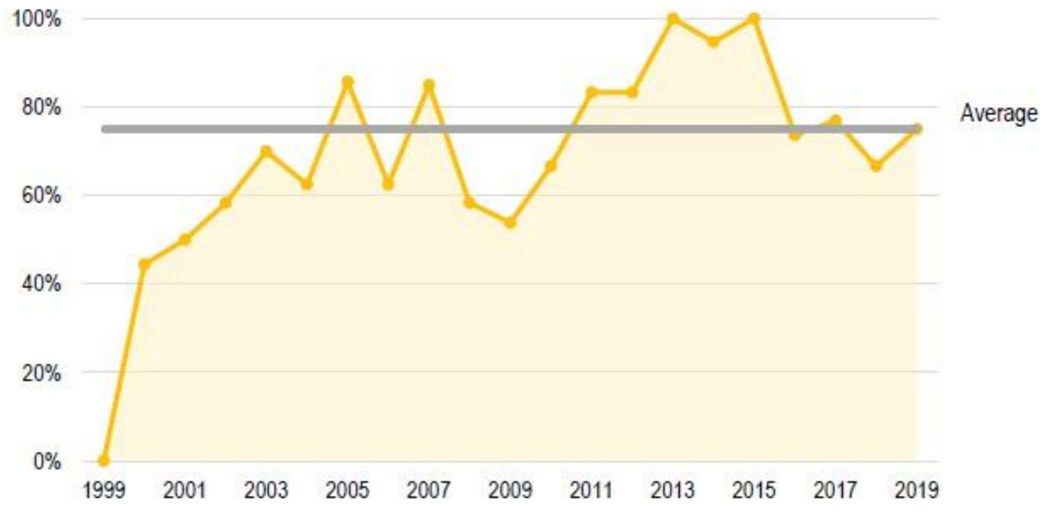
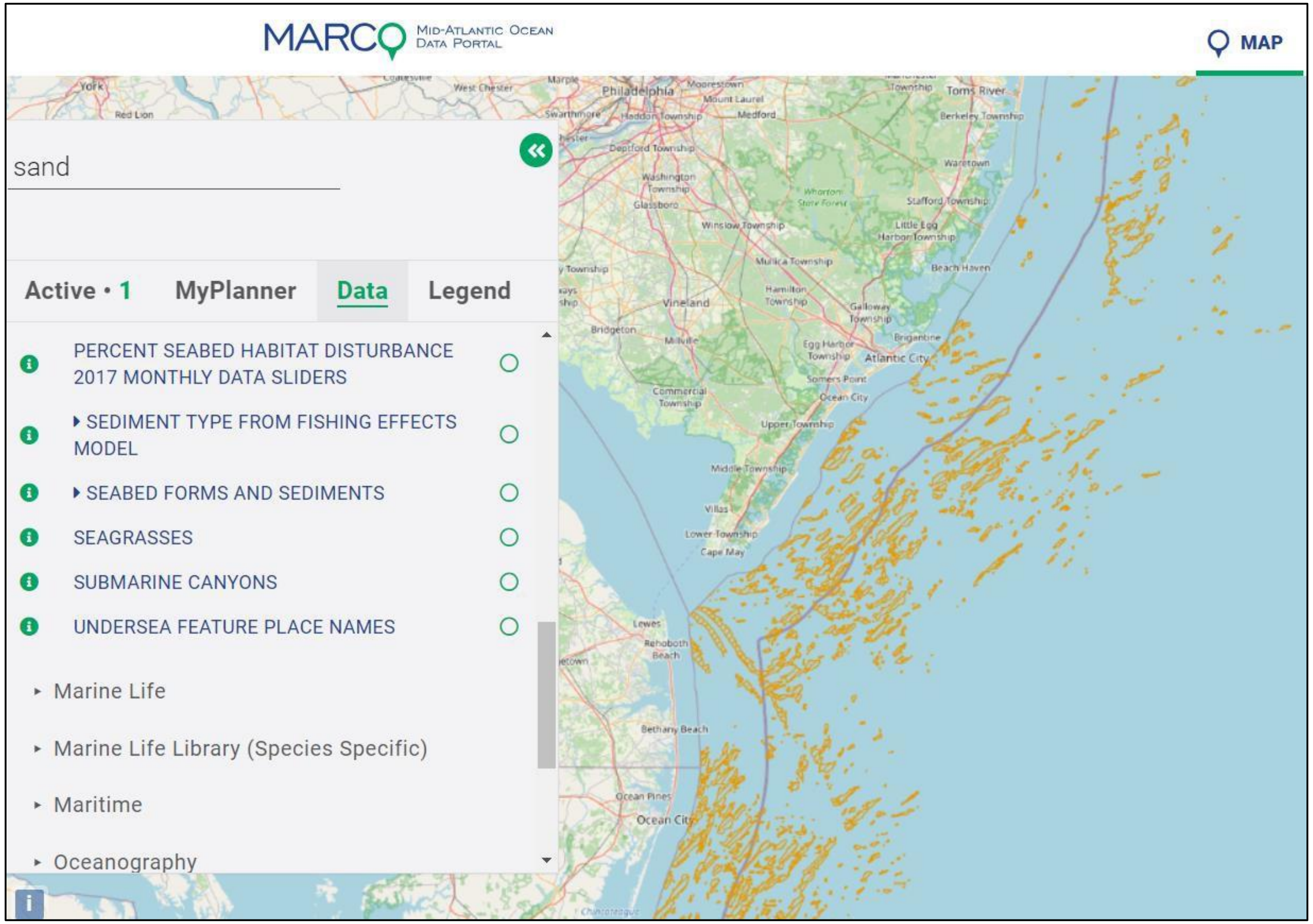


Figure 6. **Ratio of BOEM assessments that cite at least one BOEM study product over time.**
See Appendix F for more information on the citation analysis.

- Assessments
  - NEPA integrates both physical and biological baselines and impacts
  - Created NMFS-approved EFH Assessment template and incorporates new, more accurate fish distribution models
  - ESA impacts estimated based on BOEM-funded acoustics research
- Assessments cited 79% of MMP studies at least once (Kaufman et al. 2023)

Partners Apply Studies

- Operators
  - Input from dredgers and biologists provide specific actions to minimize risk of sea turtle entrainment
- External Decisionmakers
  - Mid-Atlantic Ocean Data Portal houses MMIS and shoal layers
  - SAFMC Dredge Policy cites BOEM-funded research
- Improve stakeholder awareness and accessibility of study or assessment (Kaufman et al. 2023)



Partnerships and Stakeholder Relationships

- Execute research
- Leverage investments
- Locate sand resources
- Manage conflicts
- Exchange information

Sand Resource Habitat Value

Deena Hansen

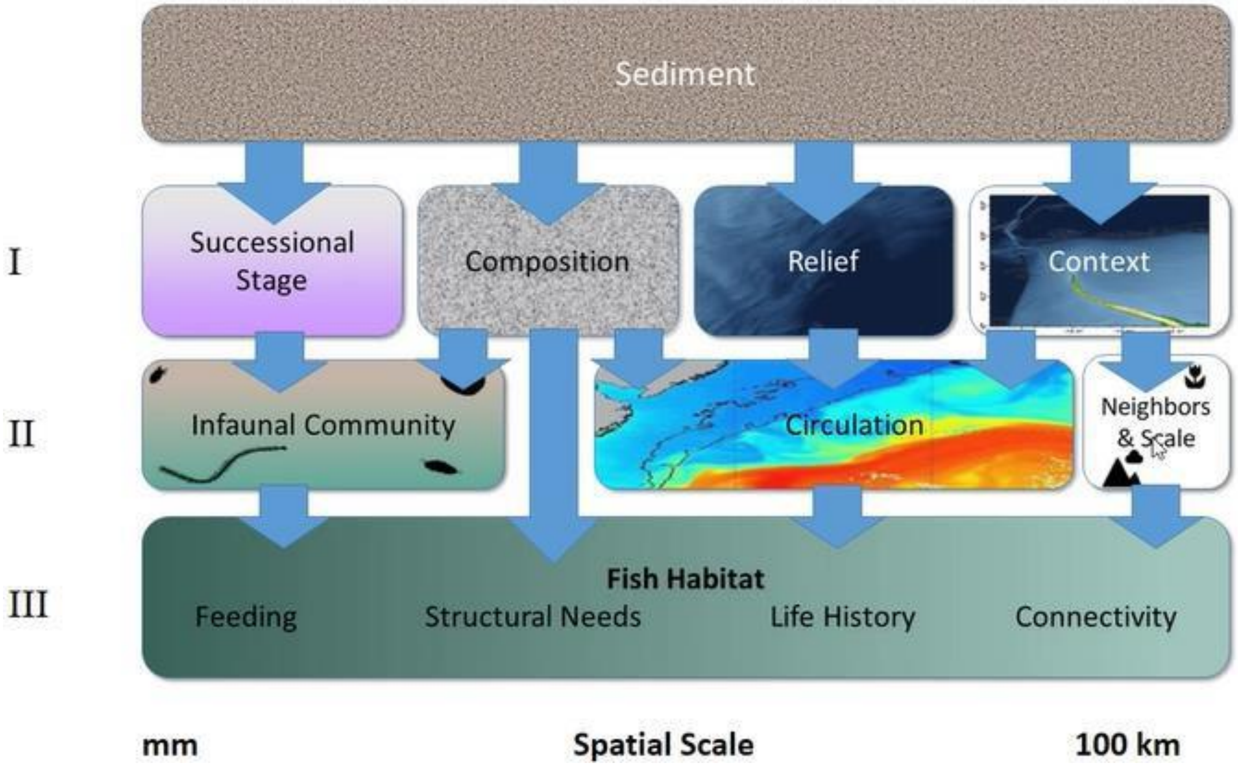
Introduction

- Aim to conserve higher value habitat or appropriately mitigate impacts
- Quantify bio-physical coupling and influence of environmental factors
- Measure dredge-related responses
- Recent studies focus on project footprint

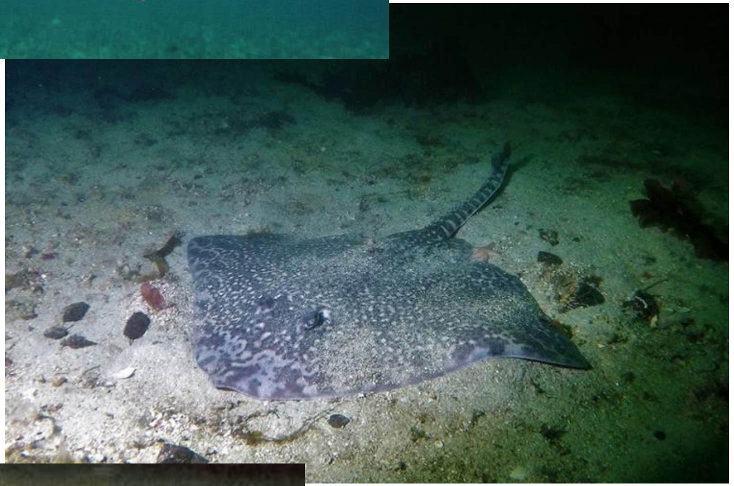
- Questions
  - What else should we consider when prioritizing study concepts?
  - When do we have enough information across studies to synthesize a greater understanding than from individual studies?
  - Is a topic ever saturated?

Methods

- Characterize general ecology
  - Quantify bio-physical coupling
  - Species Distribution Models
  - Investigate multiple trophic levels and lifestages
  - Account for inter- and intra-annual variability
- To distinguish relative value, compare
  - On vs off shoal
  - Shoal vs different shoal
  - Dredged vs undredged
- Measure changes in communities during and after dredging



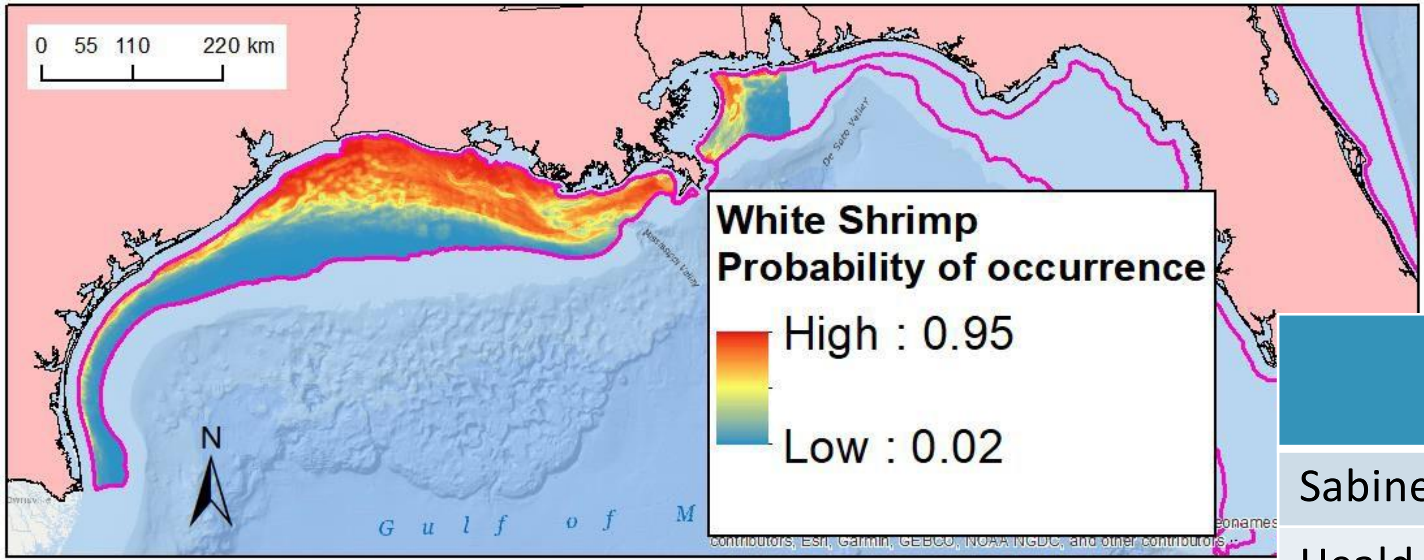
General Habitat Associations

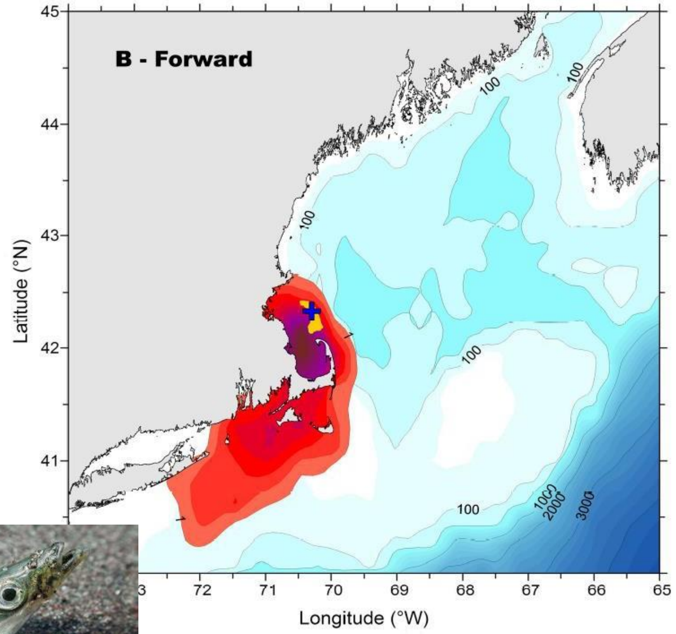


- Benthic community influenced by sediment composition and natural perturbations, can be physically or biologically dominated, or both (Cutter and Diaz 1998)
- For the most abundant fishes off VA, no differences in habitat utilization, but broad preference for sandy habitat (Diaz et al. 2006)
- Lower catches on shallower shoal ridges than in surrounding habitat in the South Atlantic; may use shoals more during the day (Iafrate et al., 2019)
- Oceanographic features (e.g., season/temp, depth, distance from shore) have bigger influence on fish distribution (Pickens 2020; Grothues et al., 2021; Slacum et al, 2010; Iafrate et al., 2019)

Individual Shoal Value

- Similar fish composition at four shoals (including a dredged site) (Iafrate et al., 2019)
- Pelagic larvae connect shoals over large distances (Suca et al., 2022)
- Internal fish habitat tool (Pickens et al., 2020) compares fish abundance on shoals; e.g., white shrimp in fall:

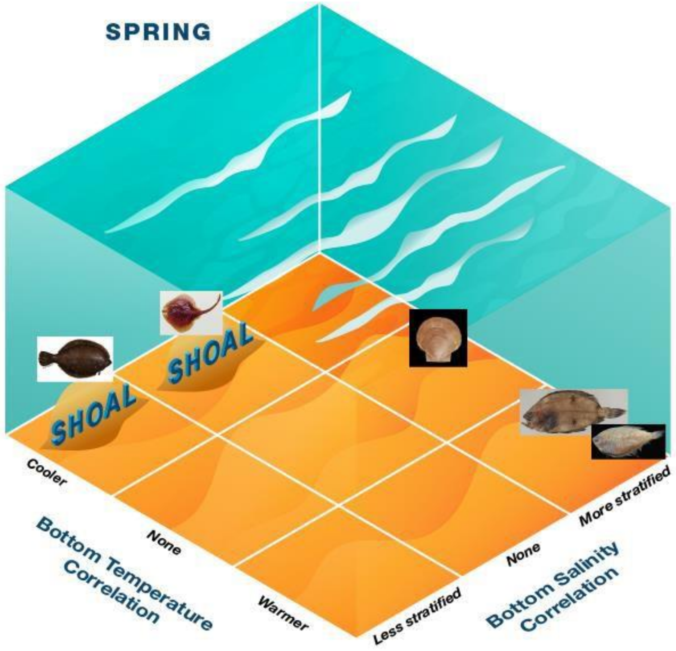




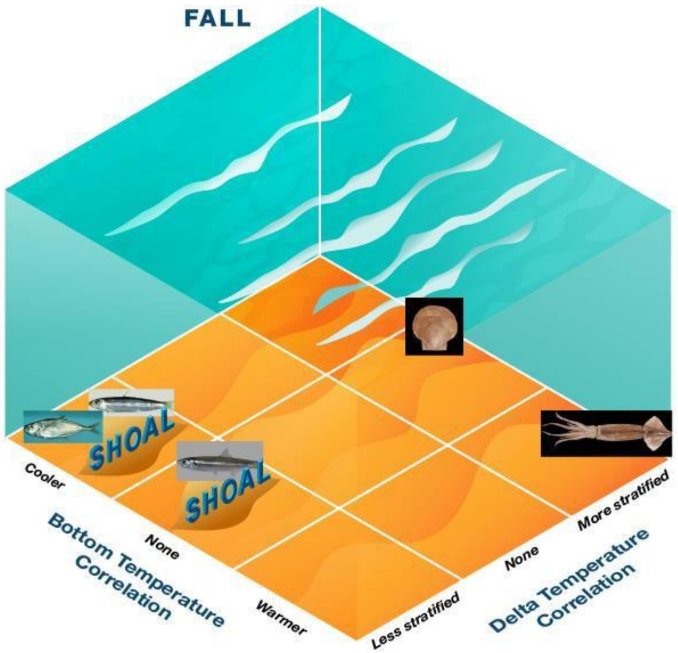
	Within Shoal	Within 20 km	Within GOM
Sabine Bank	19.6	20.2	4.2
Heald Bank	5.3	7.6	4.2

Fish Species on Shoals

- In the New York Bight, several pelagic and demersal fishes had a significant, albeit small, “on” or “off” relationship with a shoal (Grothues et al., 2021)
- Blacknose and Sharpnose sharks prefer deeper water (Iafrate et al., 2019); shallow water and seafloor slope did not correlate with any species distributions



Species (clockwise from left): winter flounder, little skate, Atlantic sea Scallop, fourspot flounder, gulfstream flounder

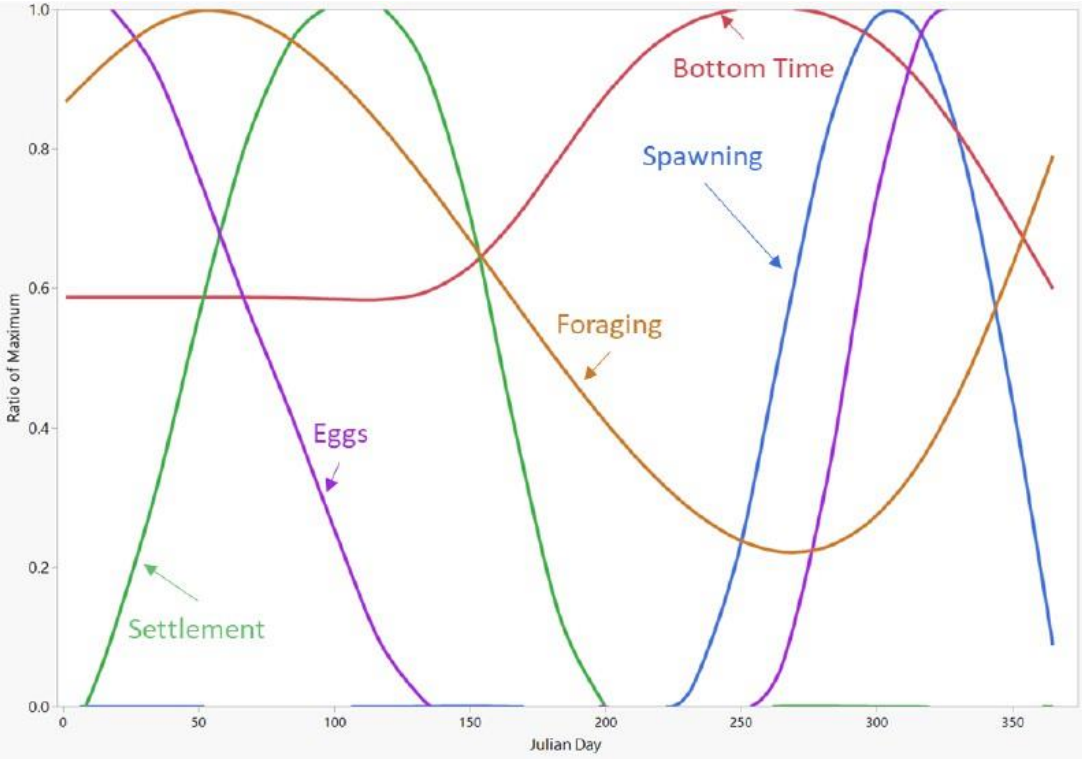


Species (clockwise from left): striped anchovy, rough scad, round herring, Atlantic sea scallop, longfin squid

Fish Lifestages on Shoals

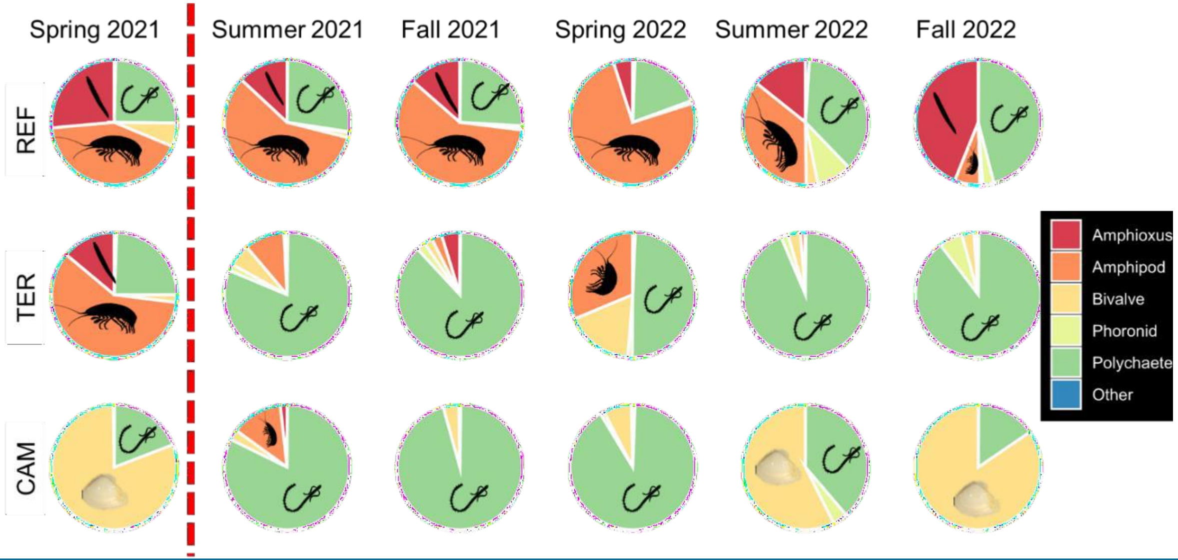
- Blue crab spawn on Ship Shoal and nearby during winter (Condrey and Gelpi, 2010)
- Sand lance use shoals differently throughout the year (Kaufman et al., 2022)
- Indicates regional or inshore-offshore link

Sand Lance



Benthic Response to Dredging

- Bottom morphology and currents may change
- Post-dredge changes in sediment composition affects recolonization
- Biomass decreases after dredging; biomass recovers in 3-6 months; composition after ~1-2 yrs (ERDC, 2022; Michel et al. 2013)
- Multiple repeat dredge sites have not showed statistically significant post-recovery differences from non-dredge sites if same sediment
- Terrebonne (Nelson et al, ongoing)
  - After dredging at Terrebonne lease area (dashed line), biomass recovers more quickly than composition
  - Natural variation in undredged areas



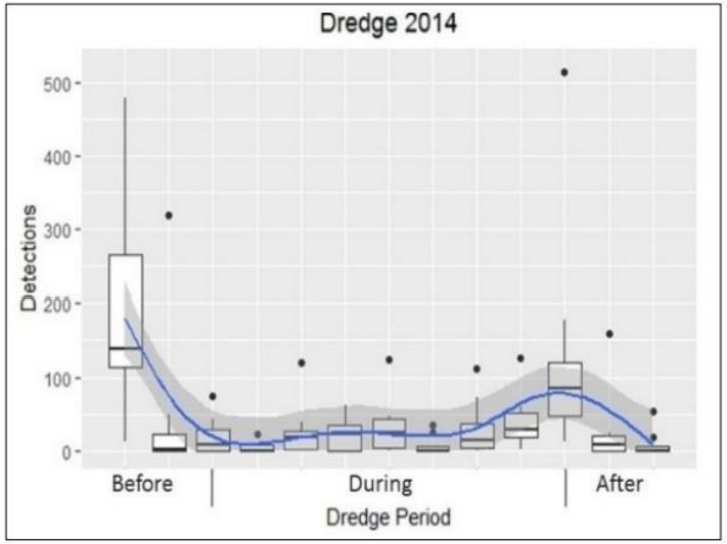
Fish Response to Dredging

Canaveral Shoals (Iafrate et al. 2021)

- Off the FL Atlantic coast, fish detections decreased during dredging, possibly indicating avoidance
- Outside of dredging, no difference between fish communities at the dredged site (active since 2000) and the control site

Sandbrige Shoal (Diaz et al. 2006)

- Two months after dredging, smallmouth flounder, pinfishes, and butterfishes showed no preference for non-dredged vs dredged; spotted hake greater in non-dredged areas; sea robins greater in borrow area



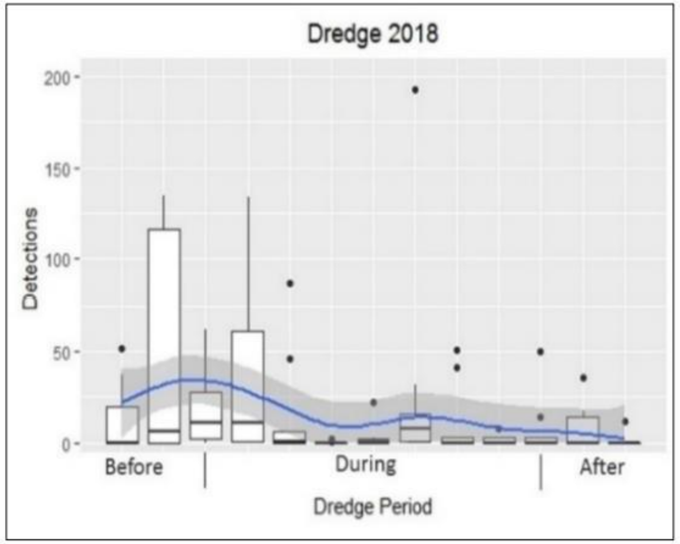
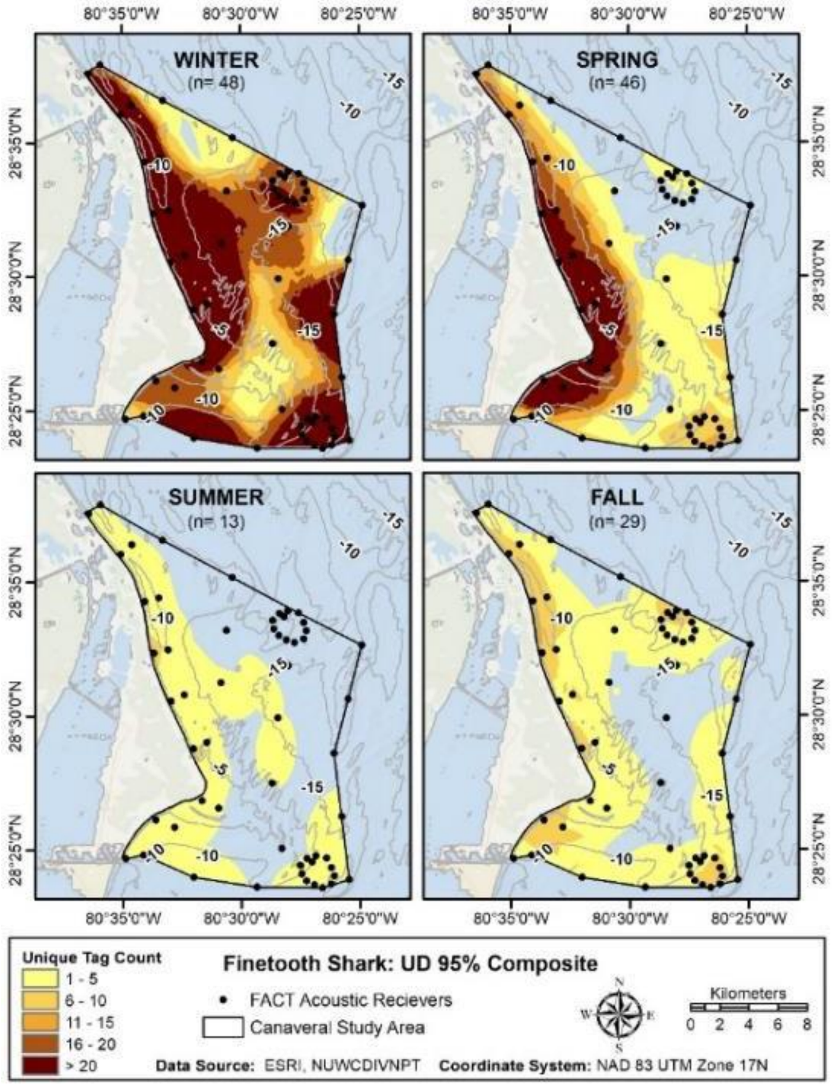


Figure 37. GAM comparison of fish detections during the 2014 and 2018 dredge events
Box plots for individual time blocks are shown grouped by before, during, and after the dredge event. Shaded areas represent 95% confidence interval. Dots represent outliers in the data.

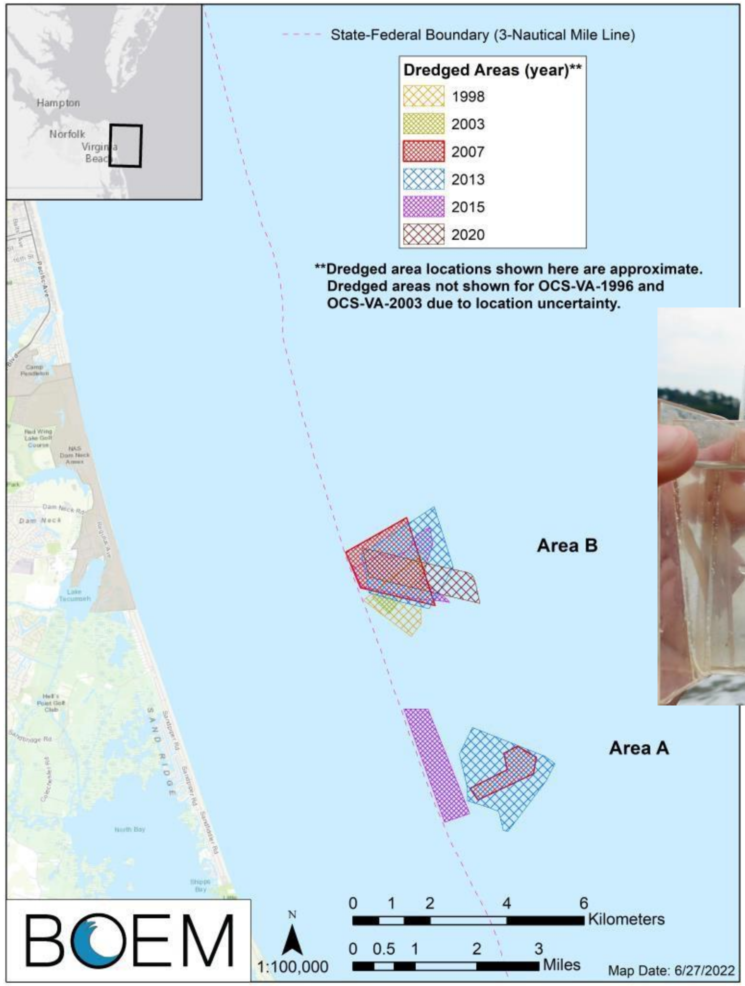
Summary of Recent Findings

- Oceanographic factors like season, temperature, and stratification often influence fish distribution more than shoals
- Shoals and troughs might be important together
- Dredging might mimic natural perturbations like storms
- Seasonal migrations and annual patterns persist
- Species/guilds have vulnerabilities based on life history, distribution, prey type
- Most studies have not detected long-term, cumulative effects



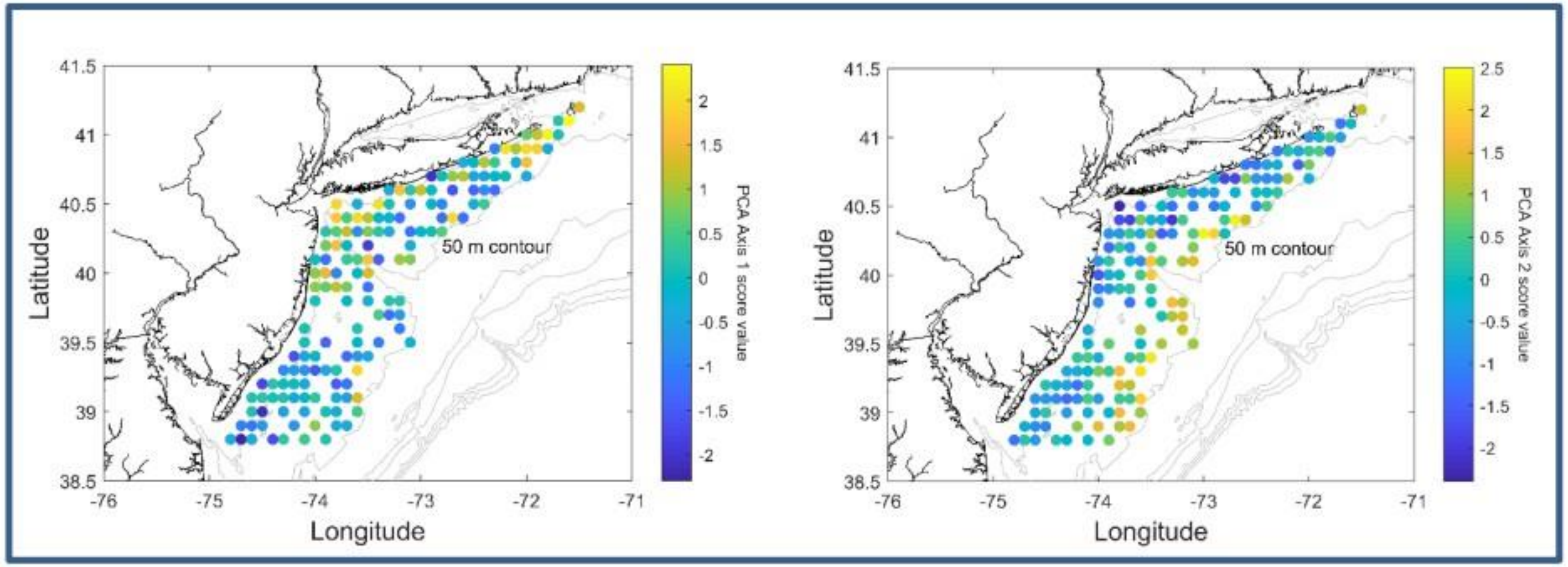
Mitigation and Compliance

- BOEM Practices
  - Maintain sediment characteristics
  - Limit dredge depths in anoxia-prone environments
- Adopt external mitigations
  - Conserve shoal integrity
  - Monitor benthos and fishes
  - Minimize harassment and take of protected species



Continuing Ecological Research

- Compare habitat associations across geographies
- Link habitats (e.g., inshore-offshore, inter-shoal, spawning, foraging)
- Find vulnerabilities in habitat, species, lifestages
- Consider scale of research relative to scale of impacts



Discussion

- What else should we consider when prioritizing study concepts?
- When do we have enough information across studies to synthesize a greater understanding than from individual studies?
- Is a topic ever saturated?

Resource Stewardship in Multiuse Planning

Ana Rice

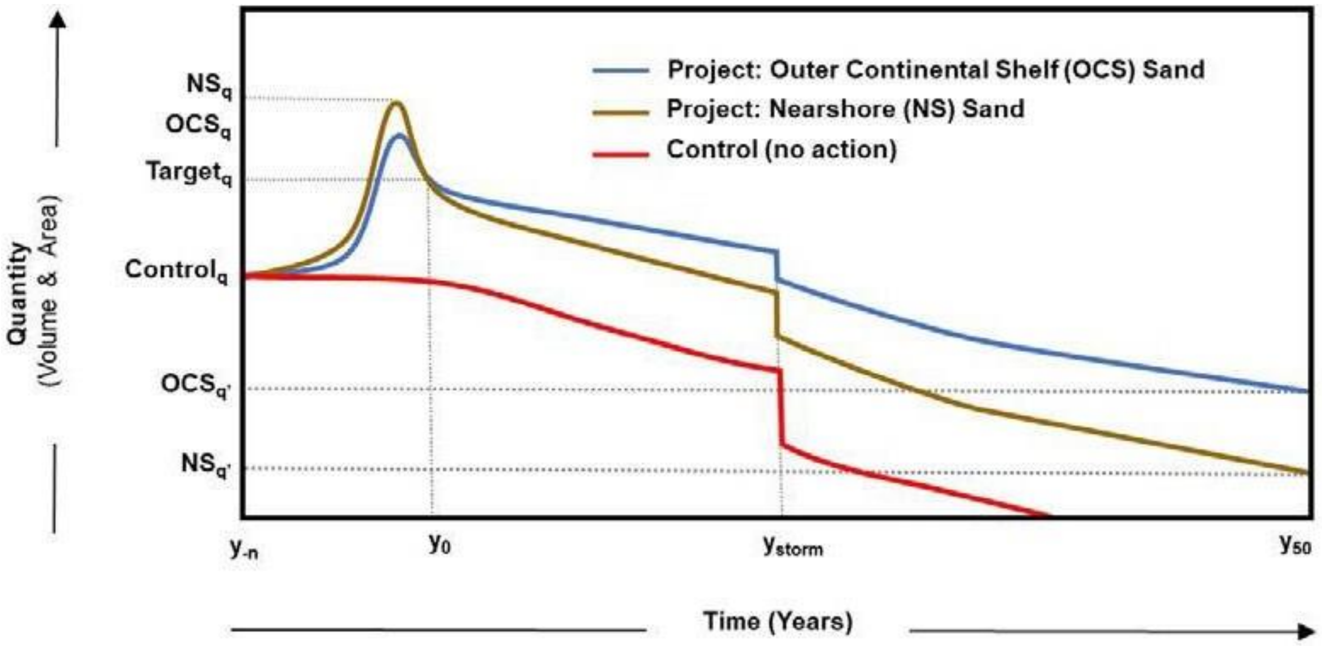
Introduction

- For multiuse planning, economic drivers may hold greater weight in decisions than ecological factors
- GOM and Atlantic regions use different designations to characterize availability and useability of a sediment
- Infrastructure buffers play a significant role in determining resource availability

- Questions
  - How do we conserve sand resources if there is high uncertainty in the value or demand?
  - What information would be useful to aid multiuse decisions?
  - How do we combine ecological and resource stewardship to better conserve sand and sediment during multiuse planning?

Economic and Geomorphic Comparison of Outer Continental Shelf Sand and Nearshore Sand for Coastal Restoration Projects

Objective: To develop a coupled, geomorphic and economic framework for the assessment of nearshore (NS) and Outer Continental Shelf (OC) sediment in dedicated dredging projects in coastal Louisiana

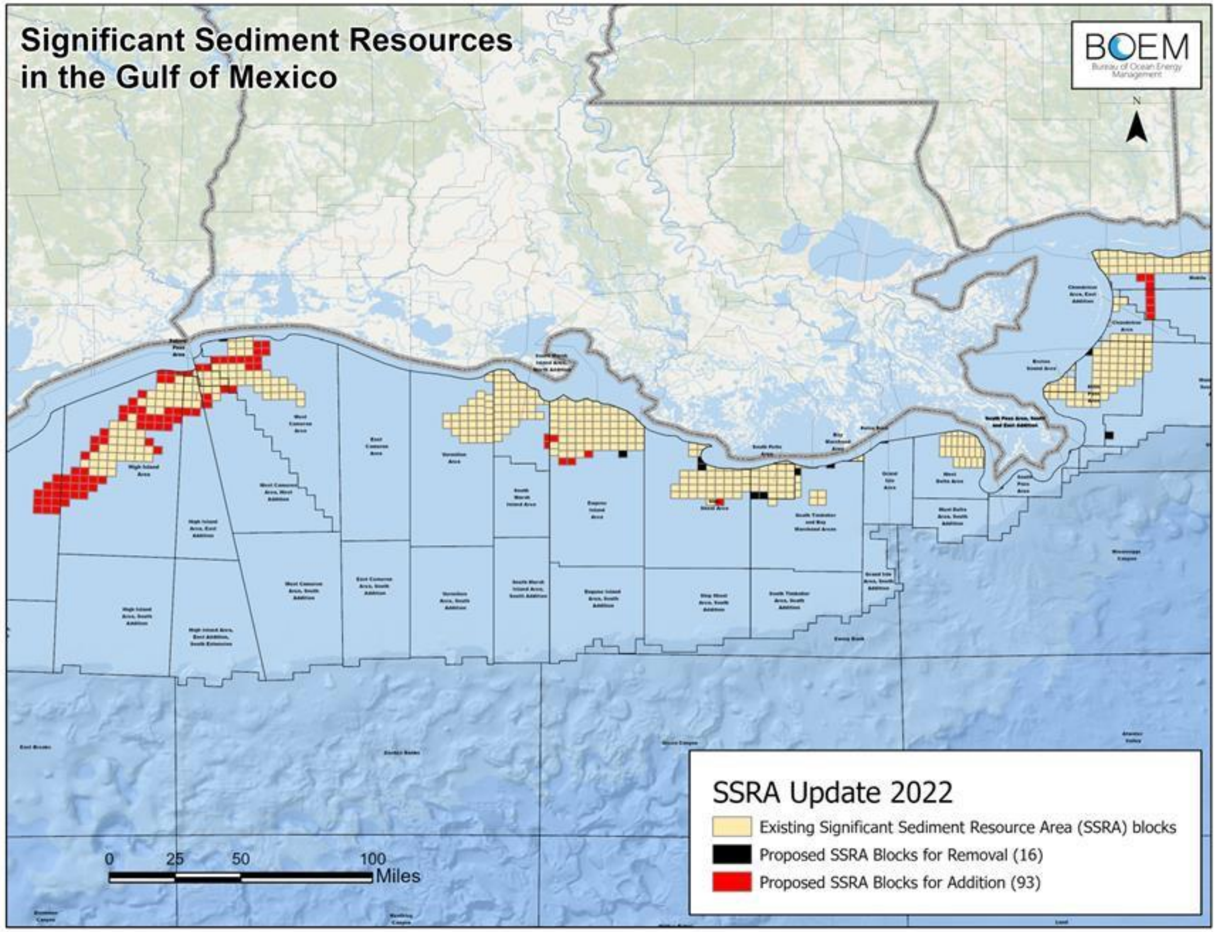


Caffey et al. (2020)

Conclusions: The higher cost of sediment transport for OCS- sourced restoration projects can be offset in certain cases by the reduced handling losses and increased resilience of larger diameter sands.

Gulf: Significant Sediment Resource Area (SSRA) Blocks

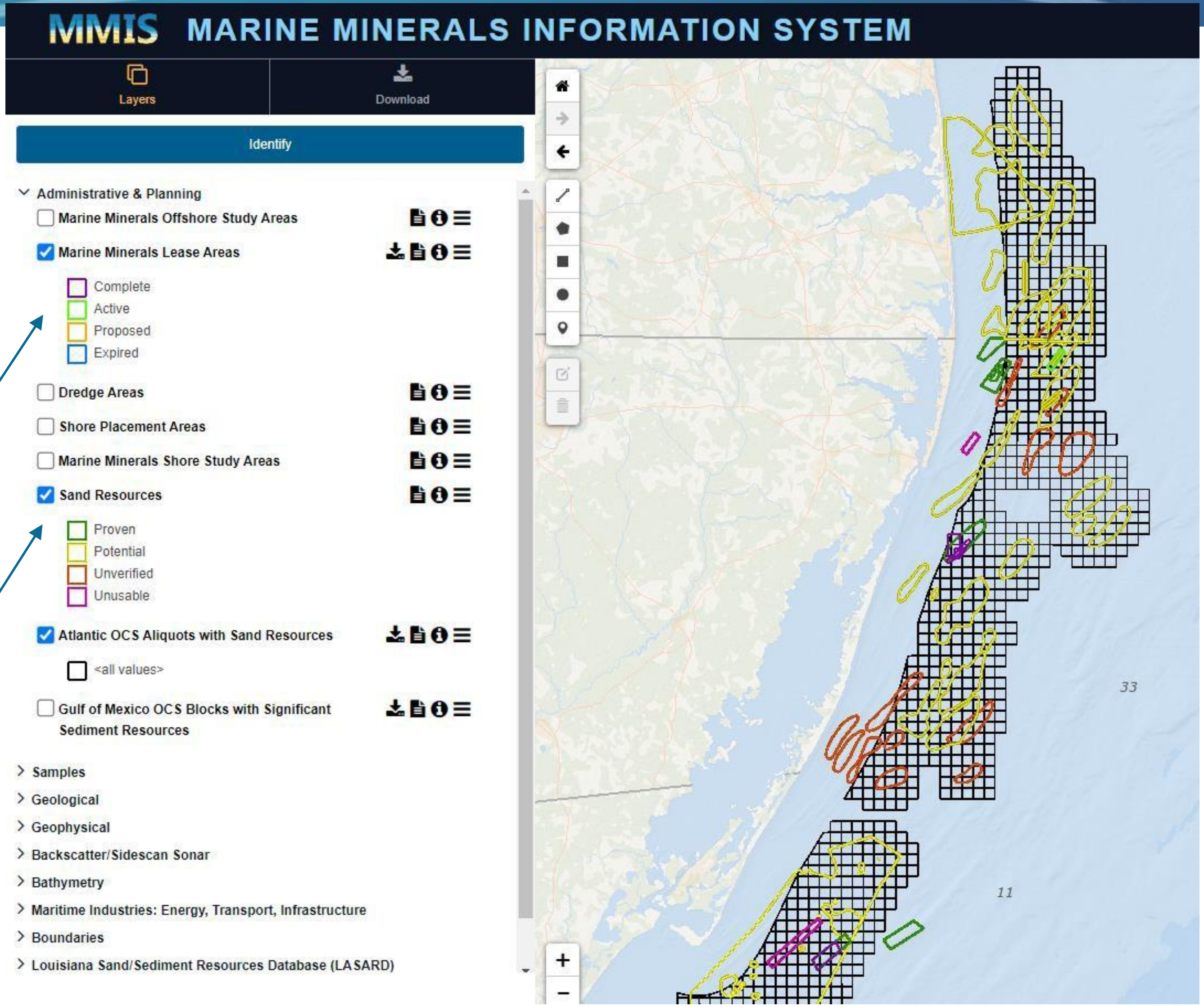
- In continuing BOEM's mission to facilitate access to mineral resources, MMP evaluates data collected with public and private partners to determine areas of significant reserves of surface and shallow subsurface mineral deposits.
    - In the Gulf, BOEM designates these areas as Significant OCS Sediment Resource Areas (SSRAs).
    - BOEM funds studies and uses public and industry data to identify potential mineral resources to prevent multiuse conflicts.



Office of Leasing and Plans · Mapping and Automation Section | MAS202200256 | 11 July 2022

Atlantic: Sand Aliquot Blocks

The Atlantic Sand Aliquots dataset contains OCS block aliquots (1/16th of OCS protraction grid block) that lie at least partially within a 1 statute mile buffer of where OCS sand resources have been identified through reconnaissance and/or design-level studies.



Marine minerals lease areas (active, completed, expired, and proposed)

sand resource areas (proven, potential, unverified, unusable)

Gulf of Mexico: Managing Multiple Uses

Gulf Infrastructure within SSRAs

U.S. Outer Continental Shelf, Gulf of Mexico Region

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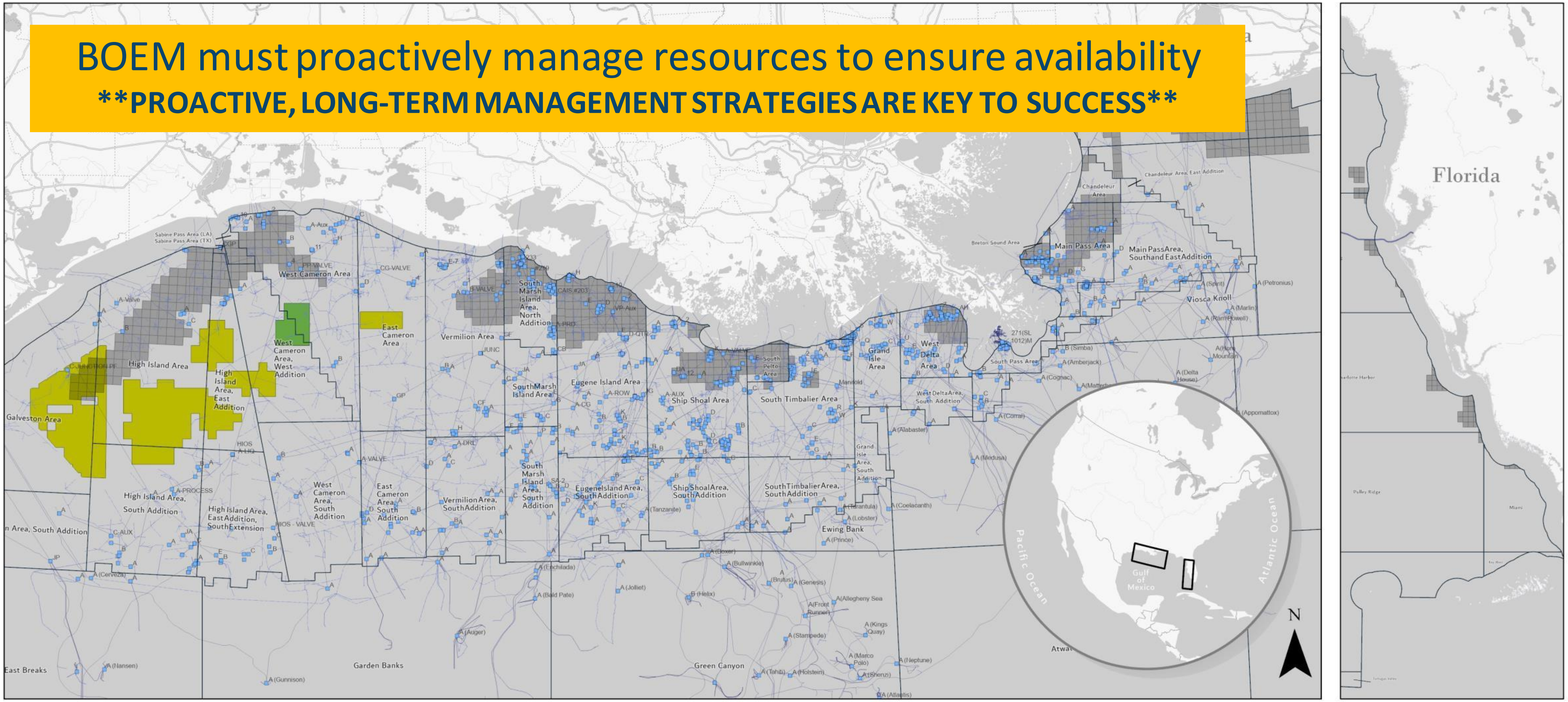
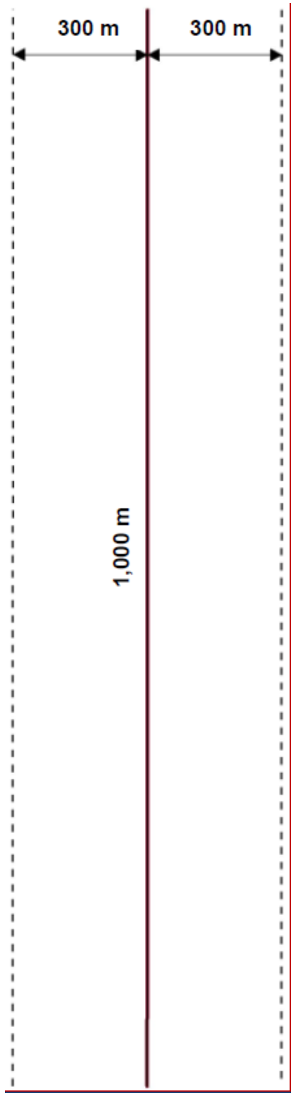
BOEM must proactively manage resources to ensure availability

****PROACTIVE, LONG-TERM MANAGEMENT STRATEGIES ARE KEY TO SUCCESS****



- O&G Platform Structure
- Active O&G Pipline
- Abandoned O&G Pipline
- Significant Sediment Resource Area (SSRA) Block
- GOM Final Wind Energy Areas (WEAs)
- OCS-G37334 Lease Area
- GOM Protraction Diagram (NAD27)

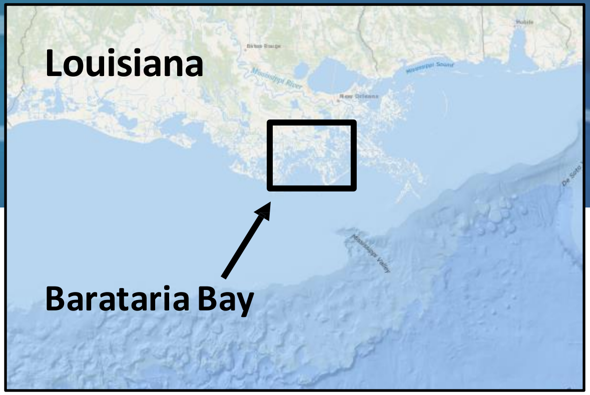
Gulf of Mexico: Impact of Pipeline Buffers in Louisiana



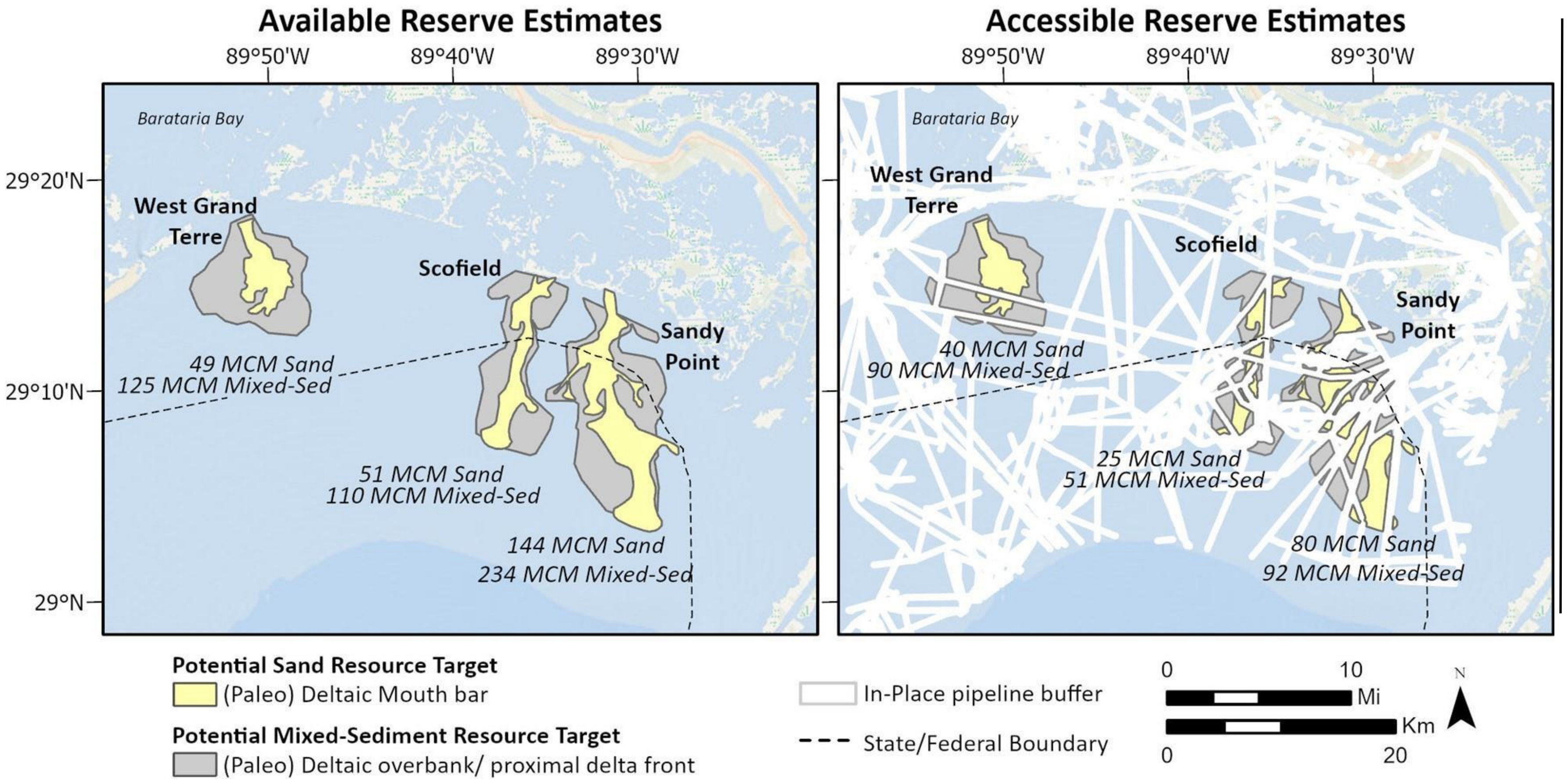
- Volume and value of sand unavailable based on 1,000-meter pipeline
  - It will occupy 1,000 x 600 sq. meter = 600,000 sq. meter of significant sediment resources area
  - It will prevent access to about 600,000 x 3 meter (thick) = 1,800,000 sq. meter or 1.8 MCM/2.4 MCY of sediment
  - Average economic value of sediment – $21 per meter cubed
  - Economic value of 1.8 MCM/2.4 MCY – ~$37.8 million

- Courtesy of Syed Khalil, Louisiana CPRA (2019)

Pipeline Buffer Impact: Example



Accessible resource estimates decrease as a result of pipeline buffers in coastal Louisiana

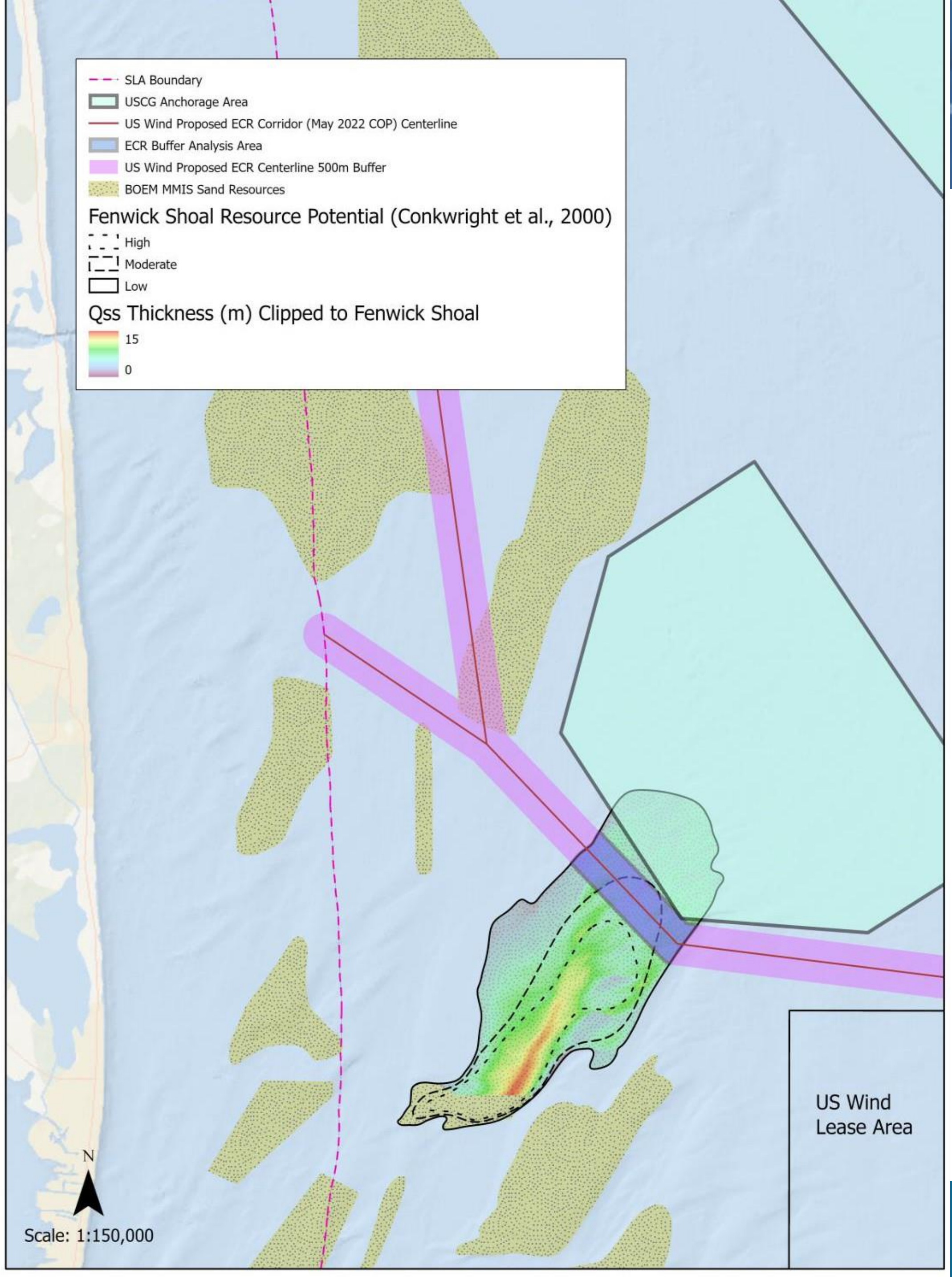


*Courtesy of Rob Hollis, WIG

Offshore Wind: Industry-Recommended Buffers

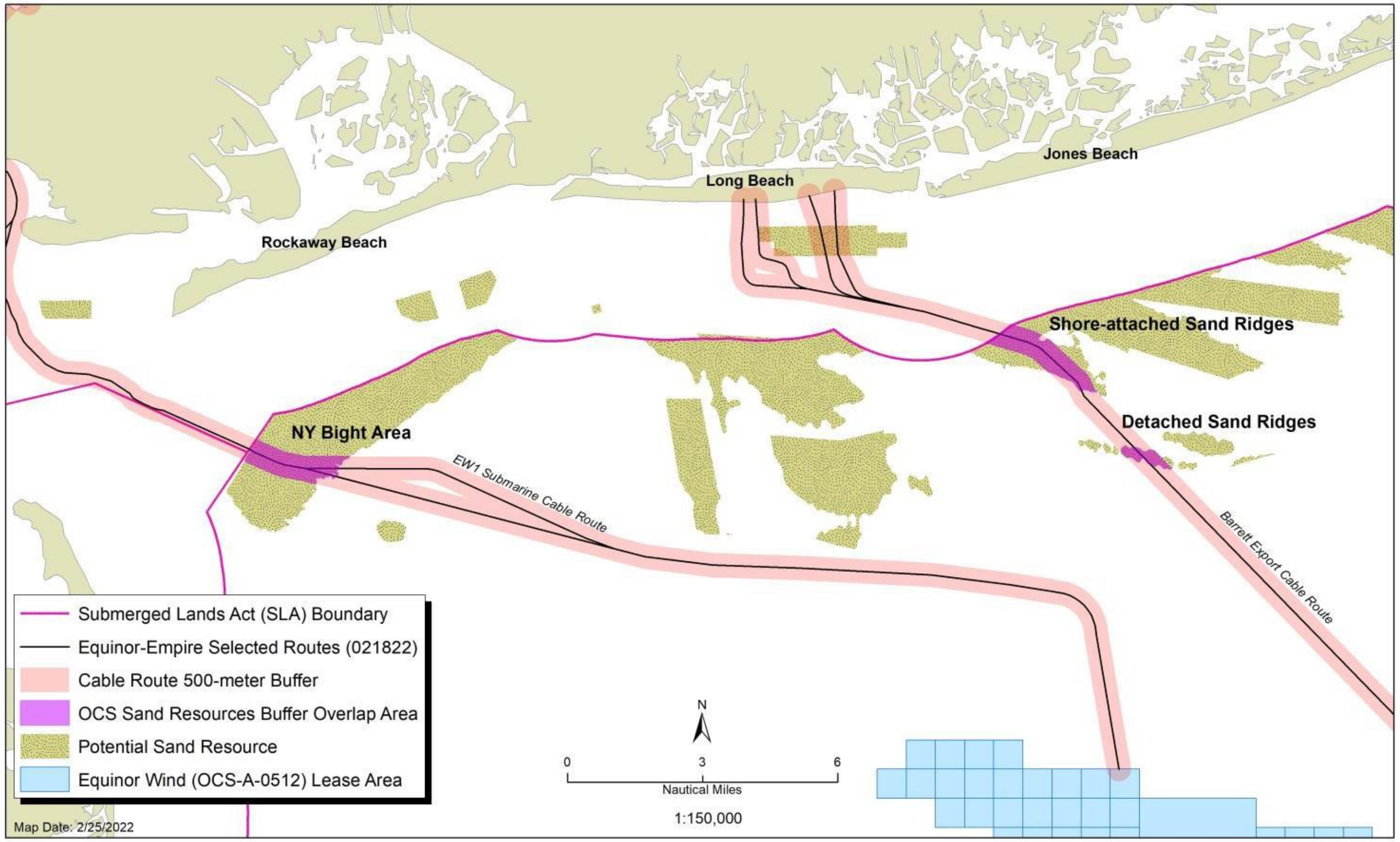
- The CSRIC submarine cable working group* recommends:
  - For water depths up to 75 meters, a separation distance of 500 meters (on both sides of cable)
- BOEM uses buffers and available data (e.g., sand thickness) to
  - assess the impacts of proposed renewable energy export cables on potential sand resource areas (e.g., calculate volume of sand that may become inaccessible),
  - mitigate conflicts, &
  - inform siting of proposed cables.

** The Communications, Security, Reliability and Interoperability Council IV (FCC, BOEM, FERC, industry reps)*



Example: Impacts Analysis - Empire Wind (OCS-A-0512)

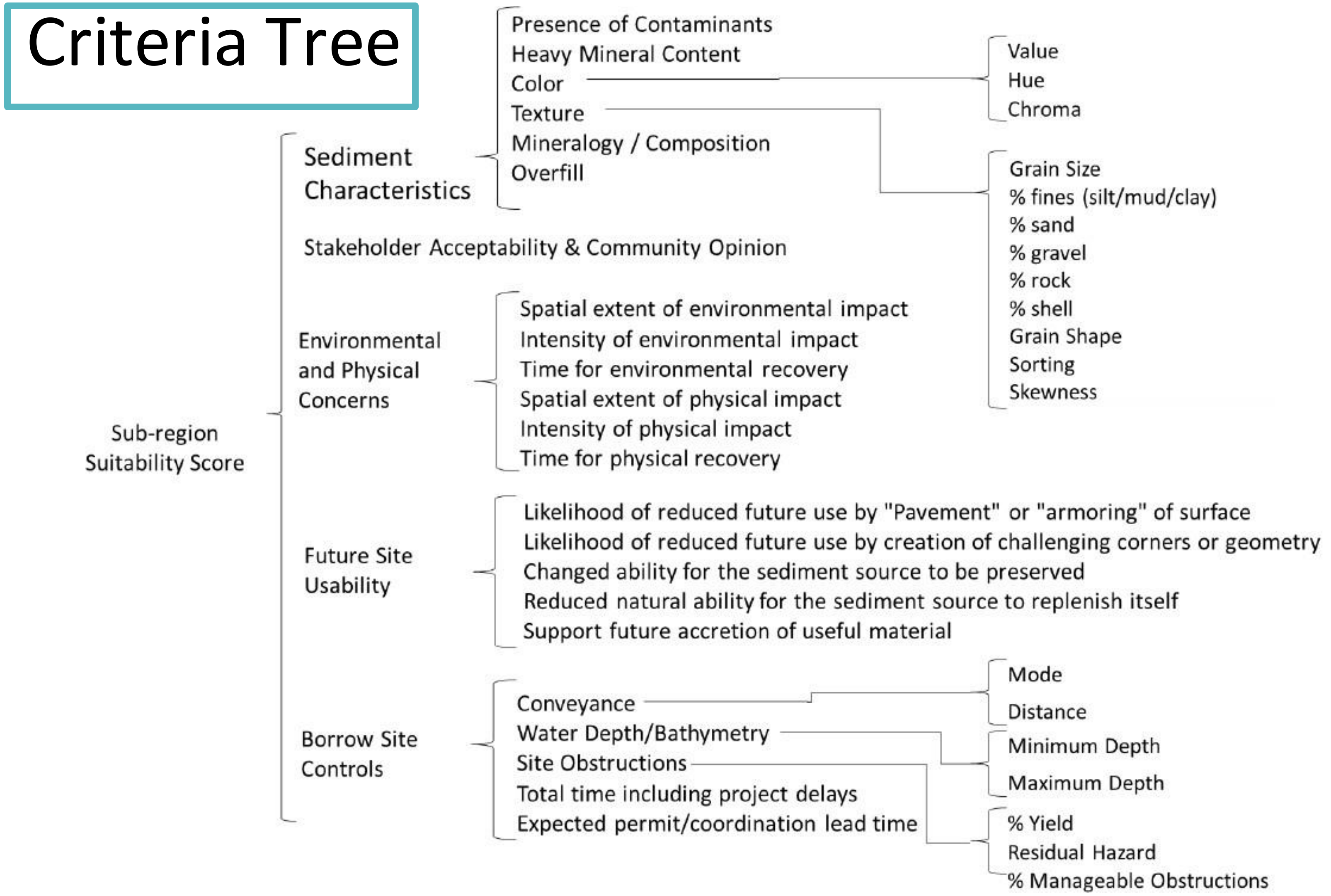
Initial MMP review – DEC 2020
Impact analysis – FEB 2022



OCS Sand Resource Area[1]	Overlapping ECR Name[2]	500-m Buffer Overlap Area[3] (ft^2)	5-ft thickness volume[4] (yd^3)
NY Bight Area	EW1 Submarine Cable Route	39,440,265	7,303,753
Shore-attached Sand Ridges	Barrett Export Cable Route	41,687,344	7,719,879
Detached Sand Ridges	Barrett Export Cable Route	8,511,195	1,576,147
		Total 5-ft thickness volume (yd^3)	16,599,779

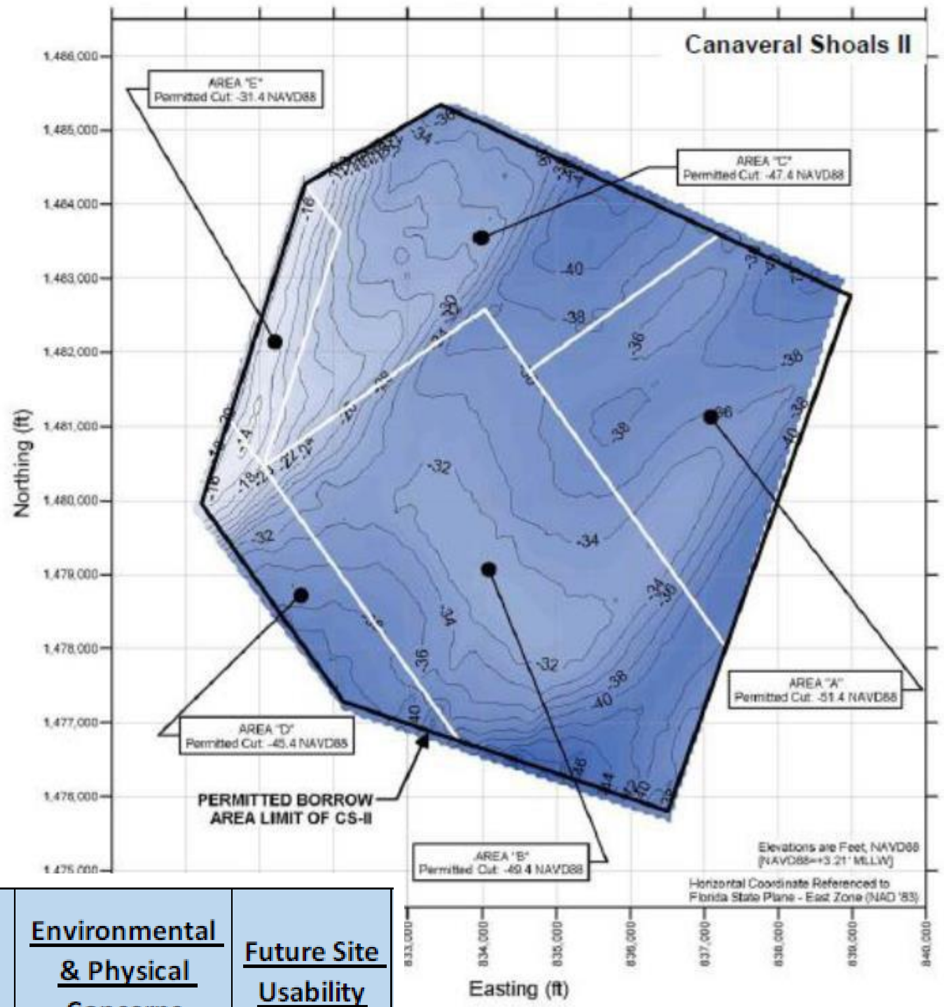
Managing Dredge Impacts by Optimizing the Use of Sand Resource

- Create a reproducible planning process for long-term, multiple-events, must balance engineering, economics, and environmental/social factors (Coor et al. 2018)
- Excel spreadsheet with tutorial, reference, and dictionary relies on user inputs



Case study: Canaveral Shoals II

- Similar sediment/homogenous
- Area C – lowest future usability since farther and less material
- All areas are good options, though Area E may be slightly better



Names of Borrow Site Alternatives	Quantity Available in Millions of Cubic Yards (MCY)	Approximate or Estimated Cost	Overall Score	Sediment Characteristics*	Borrow Site Controls	Stakeholder Acceptability & Community Opinion	Environmental & Physical Concerns	Future Site Usability
A	6.01	$$$	0.689	0.66	0.71	0.13	0.80	0.88
B	8.08	$$	0.687	0.68	0.68	0.13	0.85	0.81
C	7.71	$$$	0.661	0.66	0.65	0.13	0.85	0.75
D	1.65	$	0.688	0.62	0.69	0.13	0.85	0.88
E	1.14	$$	0.697	0.67	0.65	0.13	0.85	0.88
2014	19.5	$$	0.683	0.67	0.69	0.13	0.85	0.81
1998	24.59	$$	0.684	0.67	0.69	0.13	0.85	0.81

Discussion

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- What information would be useful to aid multiuse decisions?

- How do we combine ecological and resource stewardship to better conserve sand and sediment during multiuse planning?

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Deena Hansen and Ana Rice