

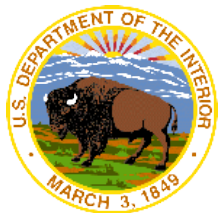


# Stewards of the Sand BOEM's Marine Minerals Program

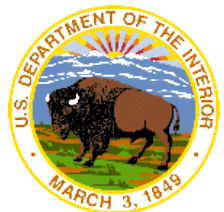
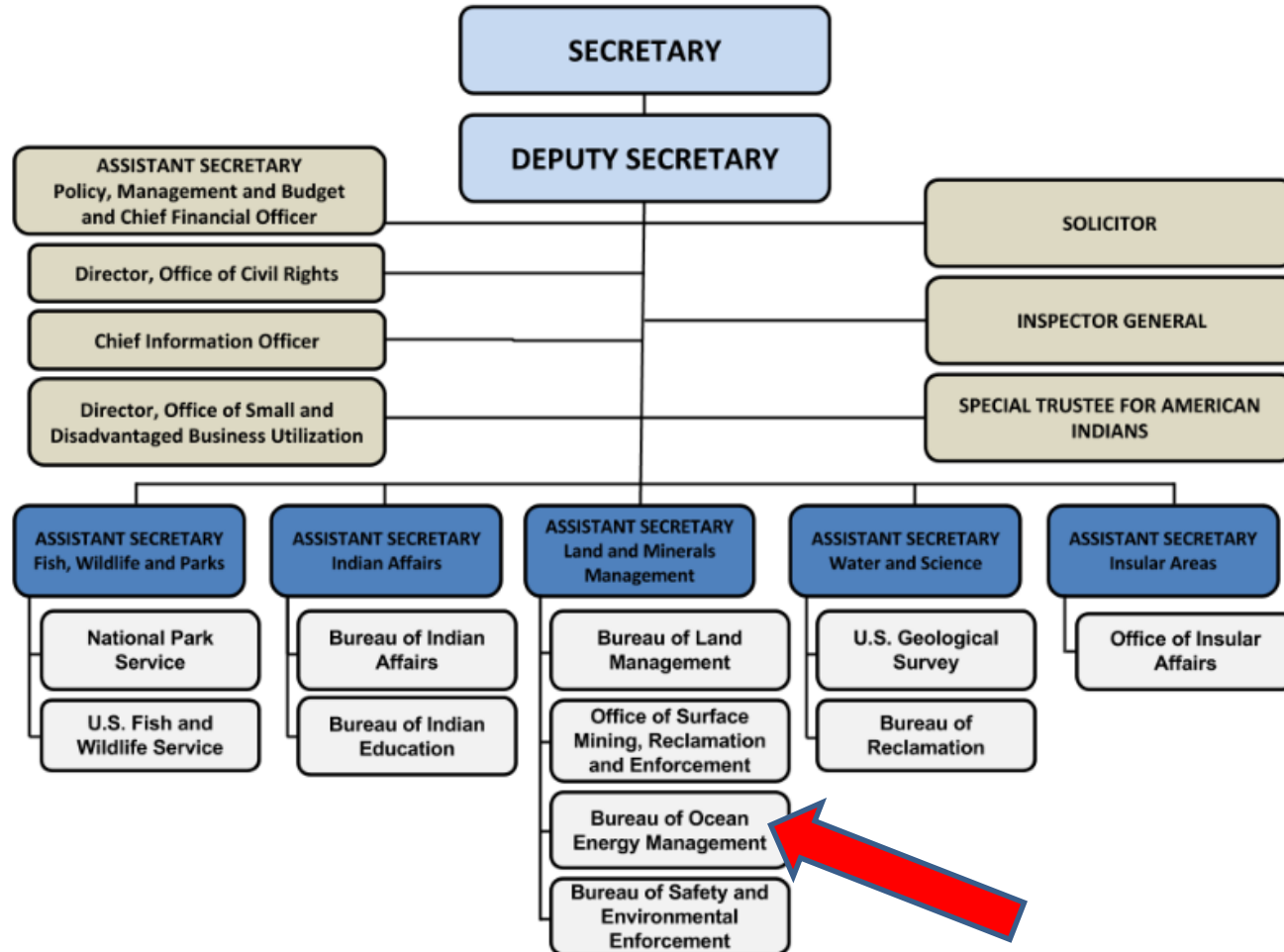
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## Preparedness, Resilience, and Response

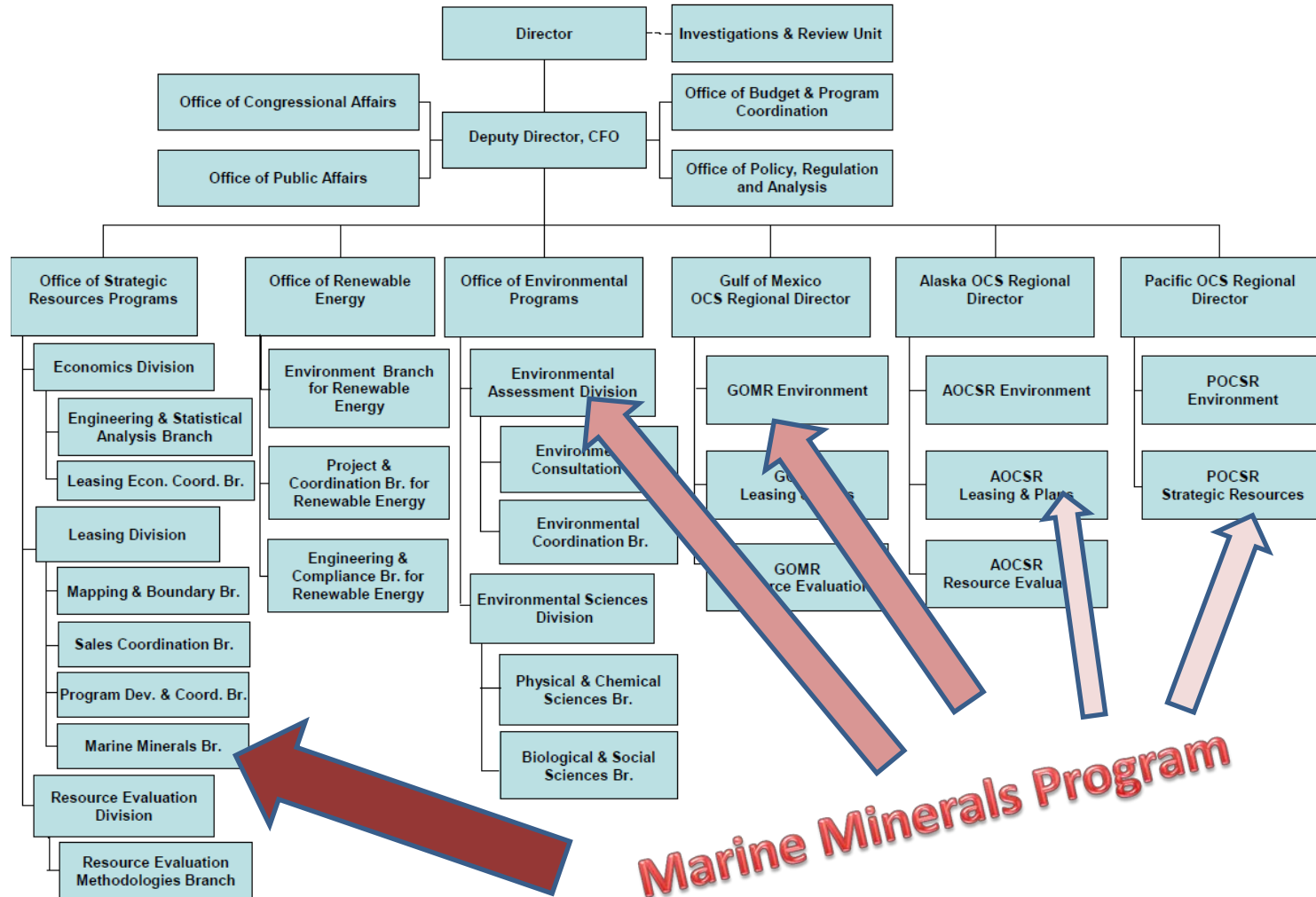
Paul O. Knorr, Ph.D.  
GSA Annual Meeting  
Seattle, WA  
October 22, 2017



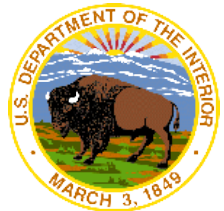
## Department of the Interior



## Bureau of Ocean Energy Management (BOEM)

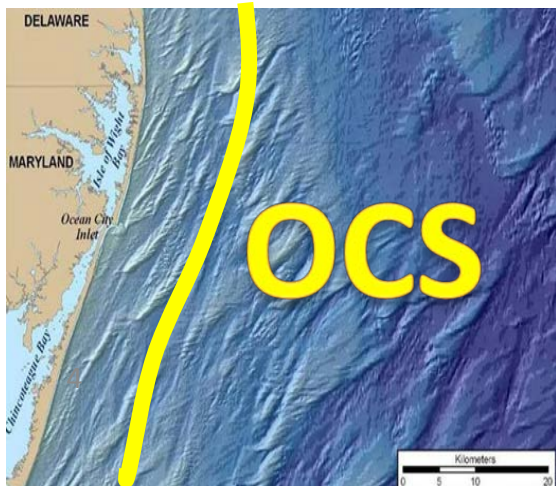


**Marine Minerals Program**



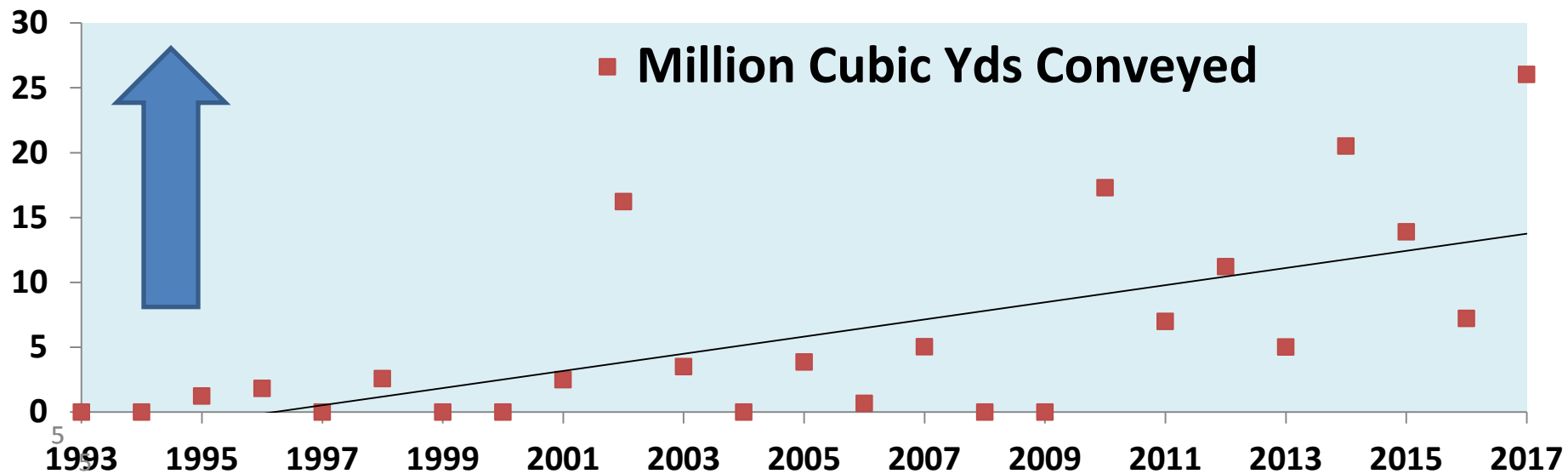
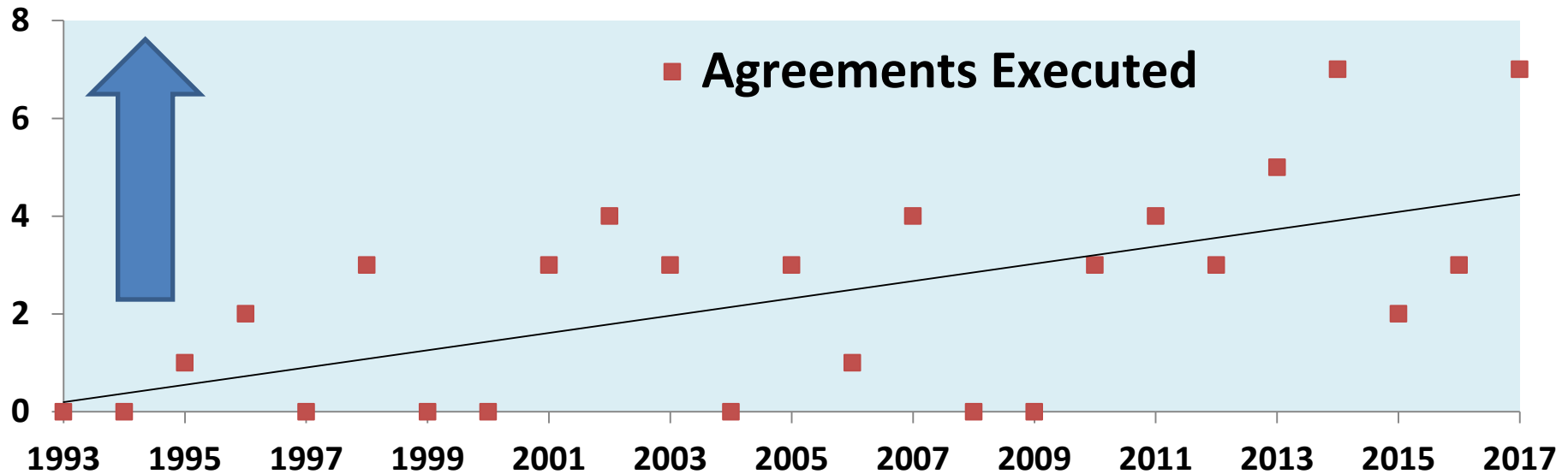
## 30 CFR 583 (October, 2017); Negotiated Noncompetitive Agreements for the Use of Sand, Gravel, and/or Shell Resources on the Outer Continental Shelf (“OCS”)

- Codifies existing procedures
- Ensure predictability and continuity of the marine minerals program
- Clarify expectations and requirements for an agreement to use sand, gravel and shell resources





# Increased requests



# Annual OCS sand leasing (recent)

15,000,000 yds<sup>3</sup>  
11,500,000 m<sup>3</sup>



11 Empire State  
Buildings



1,700,000  
Trucks

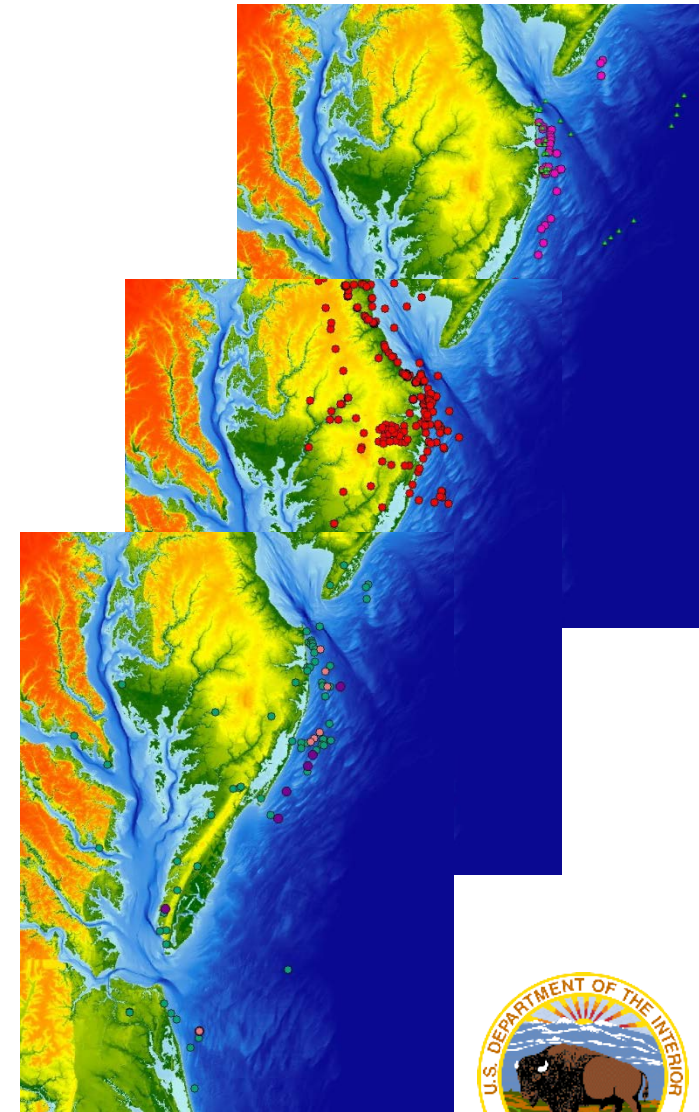
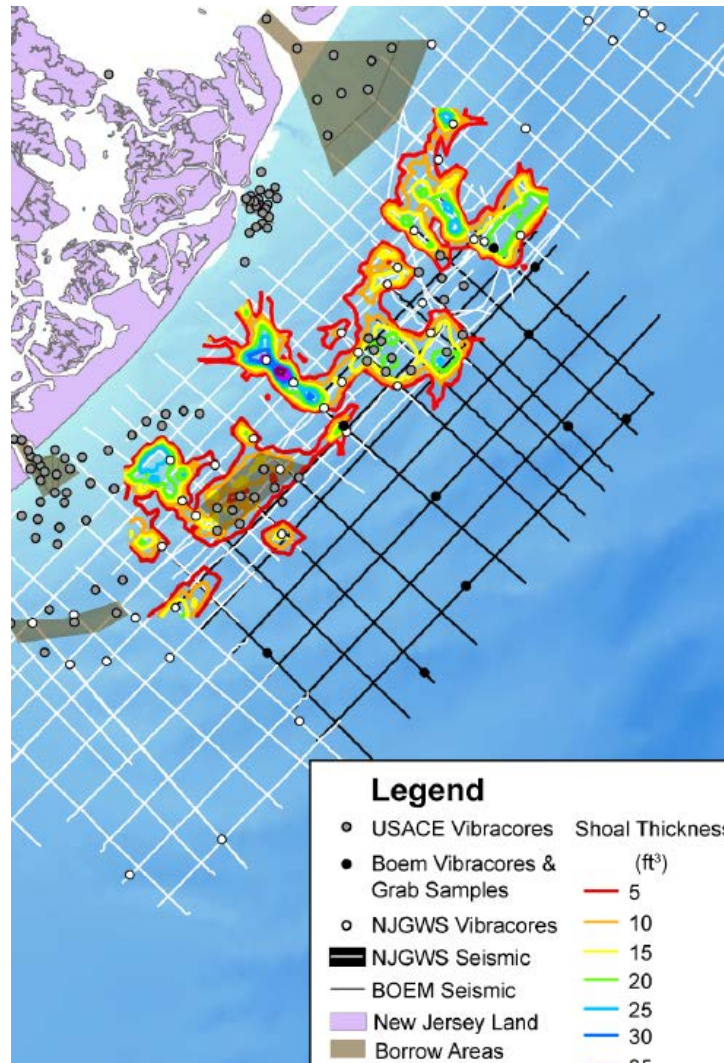










# Cooperative Agreements with States

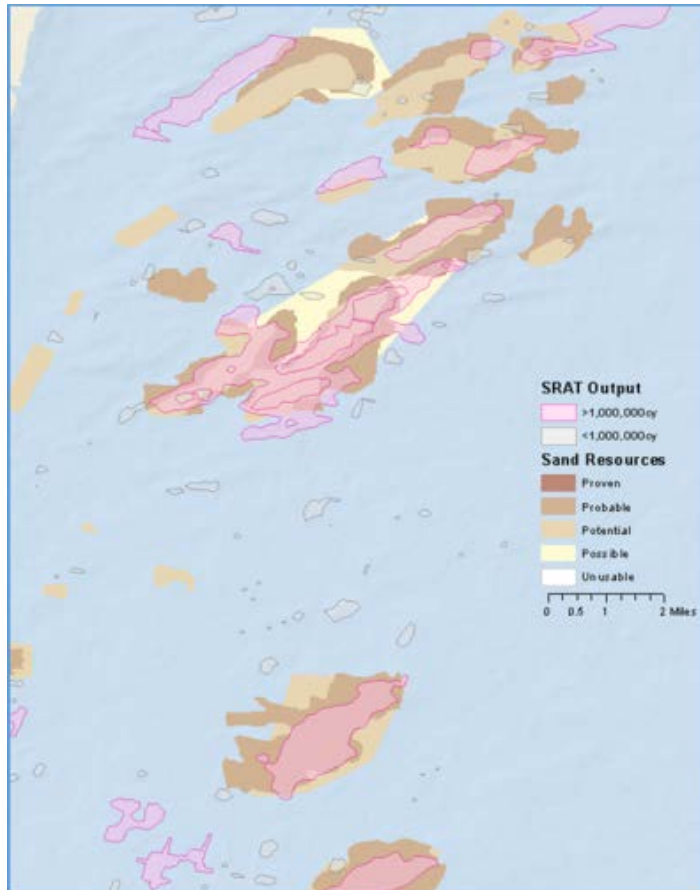
Delaware  
Florida  
Georgia  
Maine  
Maryland  
Massachusetts  
New Hampshire  
New Jersey  
New York  
North Carolina  
Rhode Island  
South Carolina  
Virginia

Louisiana  
California  
Texas  
...and more...

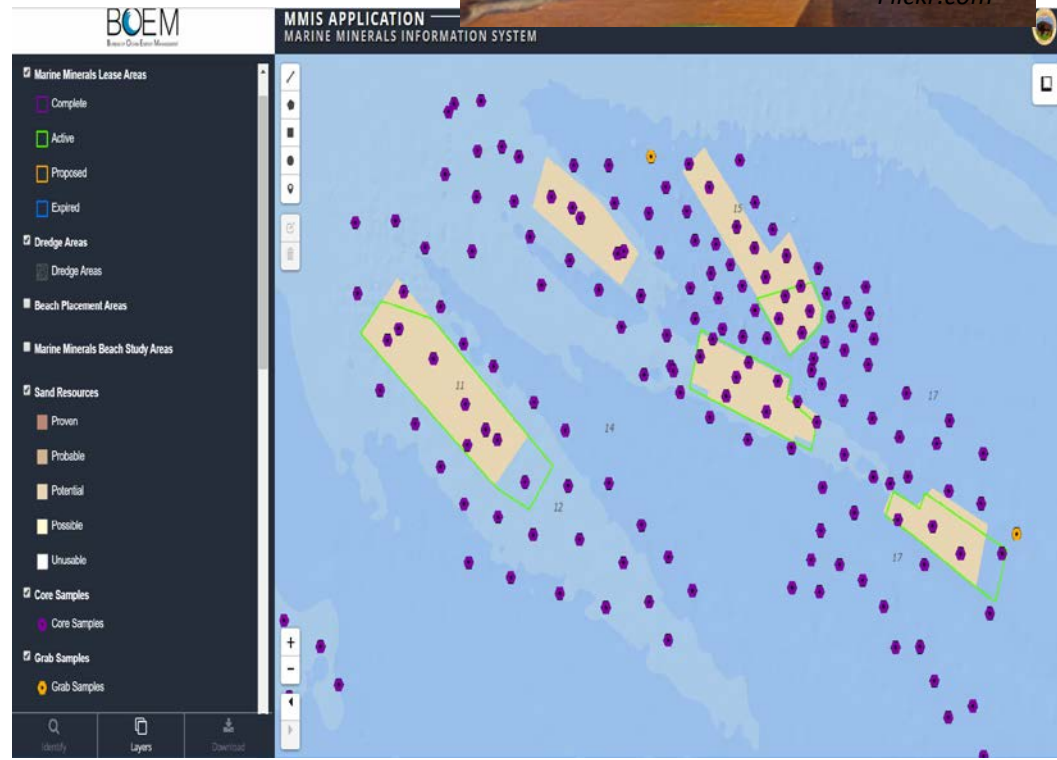


## ETA 2018

-   SediSearch.gdb
-   MMIS\_103.tbx
-  SediSearch
-  SediSearch\_Sand\_Resources\_Rank\_Category.lyr



Flickr.com





*Rugosity quantifies the pattern of elevation change*

(-1, 1)	(0, 1)	(1, 1)
(-1, 0)	(0, 0)	(1, 0)
(-1, -1)	(0, -1)	(1, -1)

Figure 4. Neighborhood grid (3 x 3 cells) used for rugosity analysis.

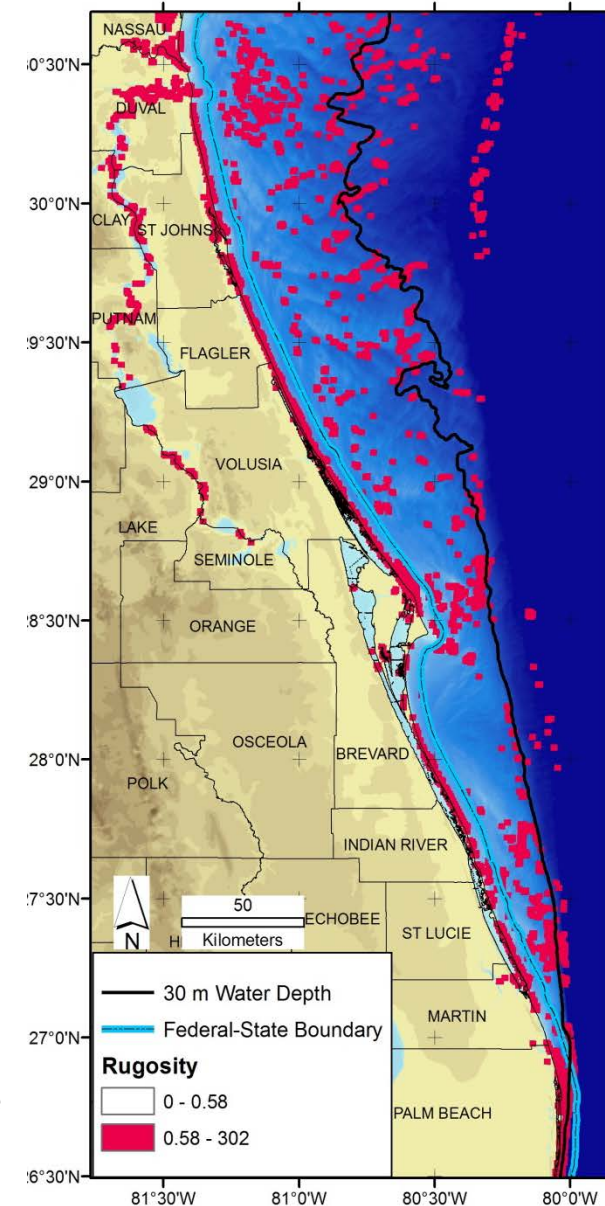
## Sand Reserve Estimate, East Florida Shelf

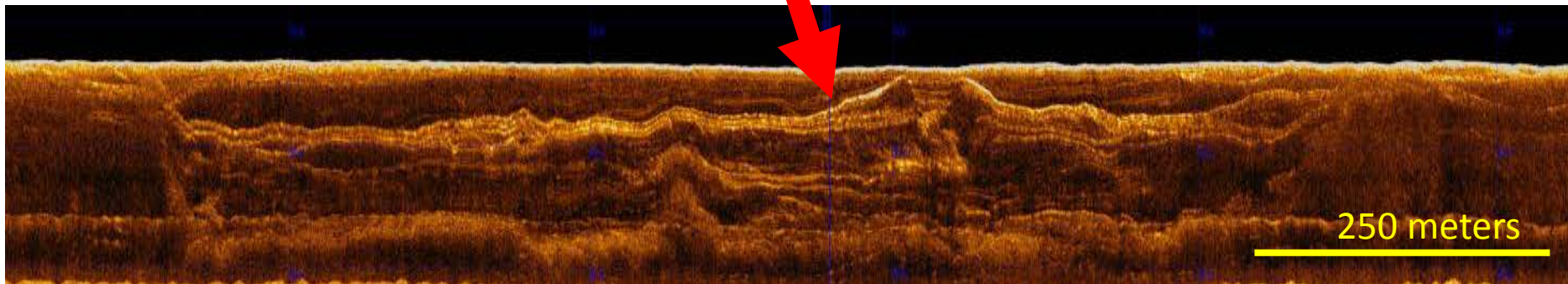
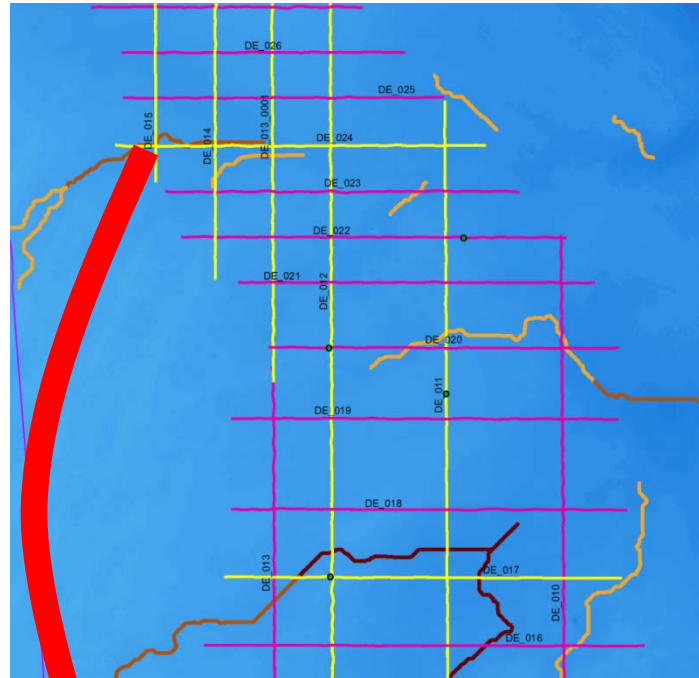
Sand, 2 m thickness, Gm <sup>3</sup>	3
Sand, 2 m thickness, bcy	4
Gm <sup>3</sup> billion cubic meters; bcy billion cubic yards	

Grid Size (m)	Rugosity (Mean±95% Confidence Interval)			
	Permitted	Proven	Potential	Shelf
100	0.24±0.006	0.124±0.004	0.111±0.002	0.049±0.003
10	0.04±0.002	0.02±0.001	0.003±0.0001	0.005±0.0005
Absolute rugosity	0.002	0.001	0.001	0.0005

*Searching for sand in Florida: Exploiting sea floor morphology as a reconnaissance tool, Knorr, P.O., Shore & Beach 85(3)*

[https://www.researchgate.net/publication/319490822\\_Searching\\_for\\_Sand\\_in\\_Florida\\_Exploiting\\_Seafloor\\_Morphology\\_as\\_a\\_Reconnaissance\\_Tool](https://www.researchgate.net/publication/319490822_Searching_for_Sand_in_Florida_Exploiting_Seafloor_Morphology_as_a_Reconnaissance_Tool)





250 meters

CH 3, 1



Loss of fine sediment during dredging operations (BOEM-ERDC)

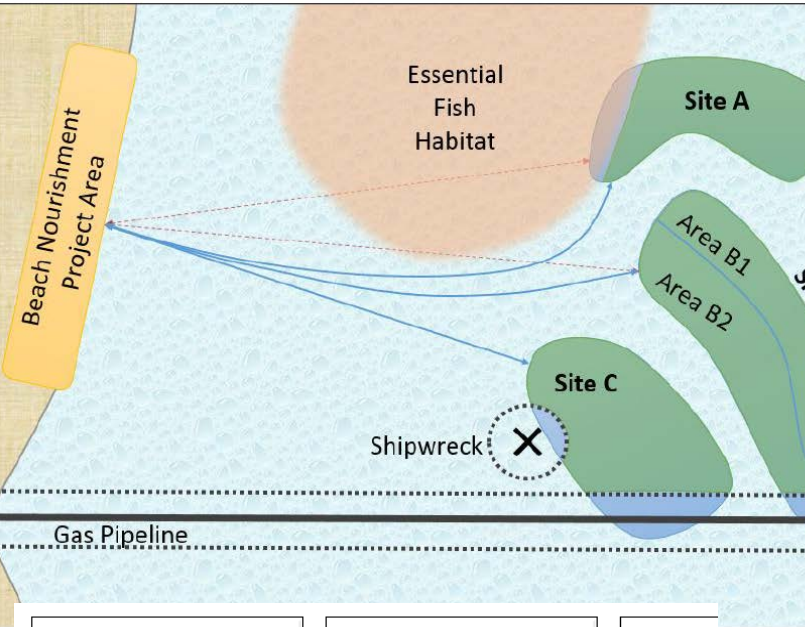


Sea Turtle Entrainment Risk; browser-based decision analysis tool

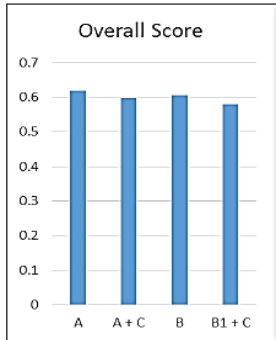




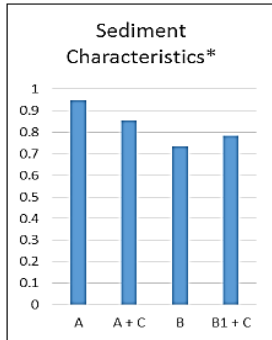
# Managing dredge impacts by optimizing the use of sand resources



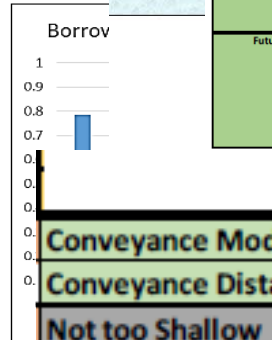
Main Criteria (Level 1)	RANK	SCORE	WEIGHT	Sub-Criteria (Level 2)	RANK	SCORE	WEIGHT	Sub-Sub-Criteria (Level 3)	RANK	SCORE	WEIGHT	Total Weight
Sediment Characteristics*	3	75	0.20548	Presence of Contaminants		10	0.20833					0.042808219
				Heavy Mineral Content		10	0.20833					0.042808219
				Color		10	0.20833	Munsell Value		1	0.33333	0.014269406
								Munsell Hue		1	0.33333	0.014269406
								Munsell Chroma		1	0.33333	0.014269406
				Texture		10	0.20833	Grain Size		1	0.11111	0.004756469
								% Fines (mud/silt/day)		1	0.11111	0.004756469
								% Sand		1	0.11111	0.004756469
								% Fine gravel		1	0.11111	0.004756469
								% Rock		1	0.11111	0.004756469
Borrow Site Controls	2	85	0.23288	Mineralogy / Composition		5	0.10417	Grain Shape		1	0.11111	0.004756469
				Overfill Ratio		3	0.0625	Sorting		1	0.11111	0.004756469
				Conveyance		2	0.125	Skewness		1	0.11111	0.004756469
				Water Depth / Bathymetry		1	0.0625					
				Site Obstructions		3	0.1875					
				Total Dredging Time (including expected project delays due to safety, windows, etc.)		5	0.3125					
				Expected Permit/ Coordination time (e.g. due to tribal & jurisdictional issues)		5	0.3125					
Stakeholder Acceptability & Community Opinion	5	50	0.13699									
Environmental & Physical Concerns	1	100	0.27397	Spatial Extent of Environmental Impact		1	100	0.25641				0.13698301
				Intensity of Environmental Impact		2	90	0.23077				0.070249385
				Time for Environmental Recovery		4	25	0.0641				0.063224447
				Spatial Extent of Physical Impact		2	90	0.23077				0.017562346
				Intensity of Physical Impact		3	85	0.21795				0.063224447
												0.059711978
Future Site Usability	4	55	0.15068	Ukelihood of Reduced Future use due to Surface Armoring		1	5	0.38462				0.057995743
				Ukelihood of Reduced Future use due to the Creation of Challenging Geometry		2	4	0.30769				0.046364594
				Changed Sediment Preservation Ability		3	3	0.23077				0.034773446
				Support Future Accretion of Useful Material		4	1	0.07692				0.011591149



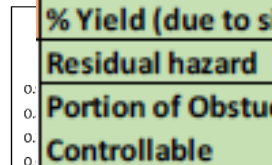
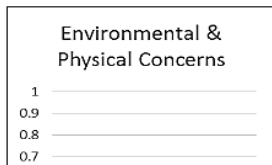
a. Overall Scores



b. Criterion 1 Scores



c. Criterion 2 Scores



Conveyance Mode	2	1	0.09091	0.002646326
Conveyance Distance	1	10	0.90909	0.026463263
Not too Shallow		1	0.5	0.007277397
Not too Deep		1	0.5	0.007277397
% Yield (due to site obstructions)		4	0.57143	0.024951076
Residual hazard		1	0.14286	0.006237769
Portion of Obstructions Clearable or Controllable		2	0.28571	0.012475538

- Hurricane Sandy cooperative agreements
- BOEM-Corps of Engineers MOU
- Competing uses for sand
- Competing needs for sand
- Post-storm cooperative agreements
- National sand inventory
- Competitive mineral leasing
- New marine minerals research



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