



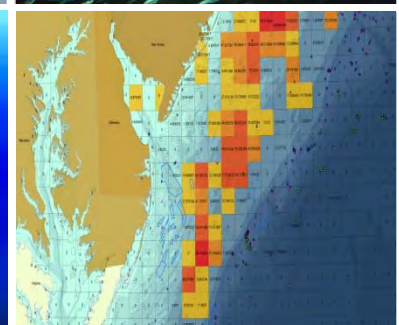
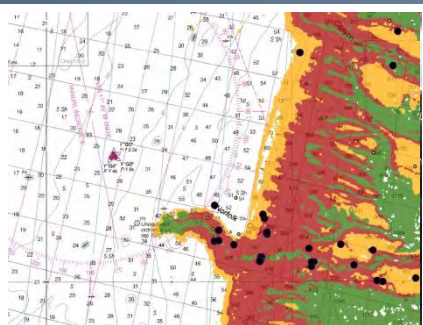
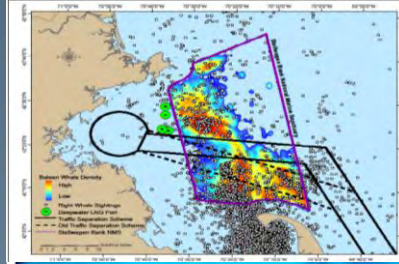
# TNC's Ecoregional Marine Assessments & Conservation Action Plans

Albemarle-Pamlico National Estuary Program

July 26, 2011

Greenville, NC

Jay Odell





# Overview



- Northwest Atlantic Marine Ecoregional Assessment, Phase II Overview
- **Methods Overview: “Score and Lock” Approach**
- Coastal, benthic and migratory themes
- Integration and Results
- **So what...how are the results actually being used (first steps)**
- Next steps
- Your questions and advice



# NAM ERA Portfolio Context

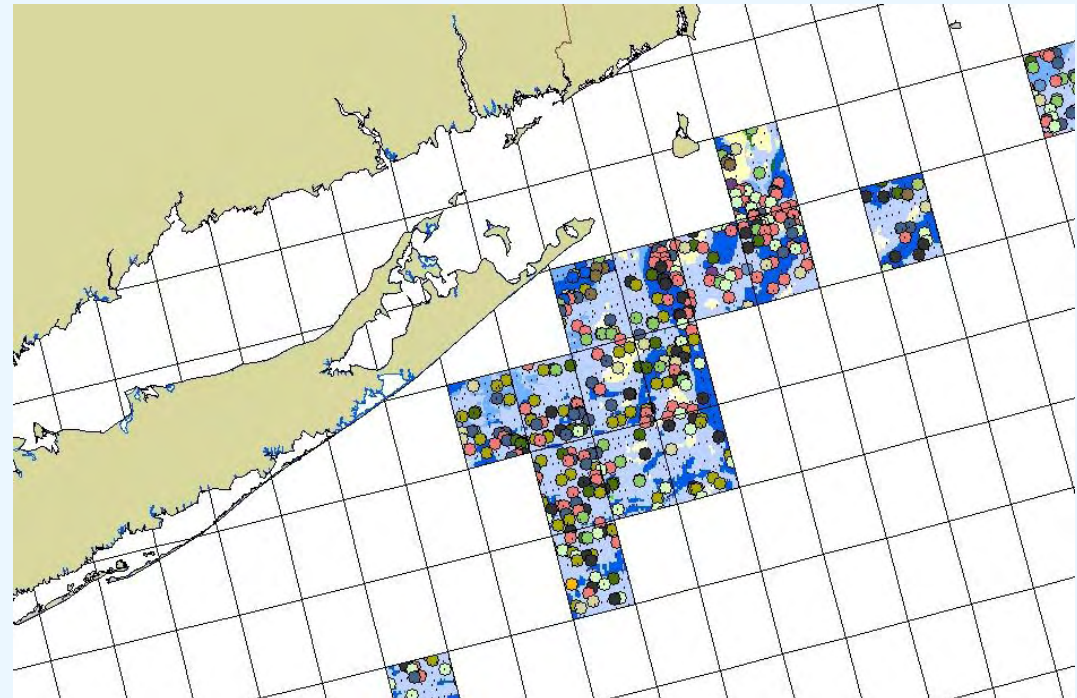
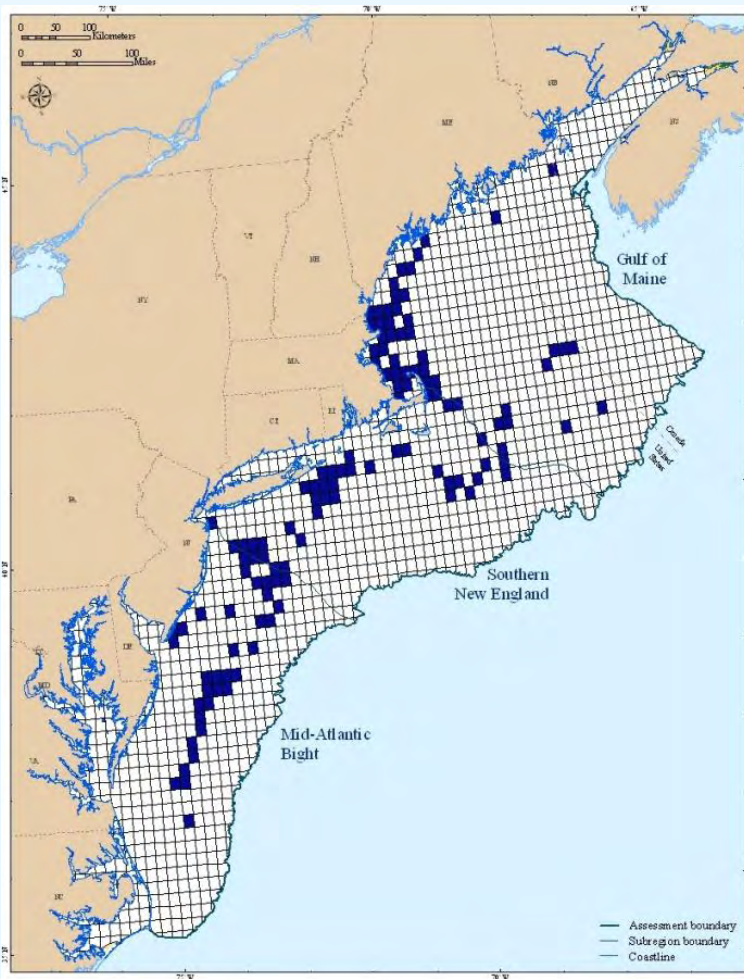
- How did we identify the most important places?
  - Data driven: let the species tell us
  - Scoring and locking
  - Two standard deviations above the mean
  - Weighted Persistence
  - Co-occurrence





# Locking and Scoring

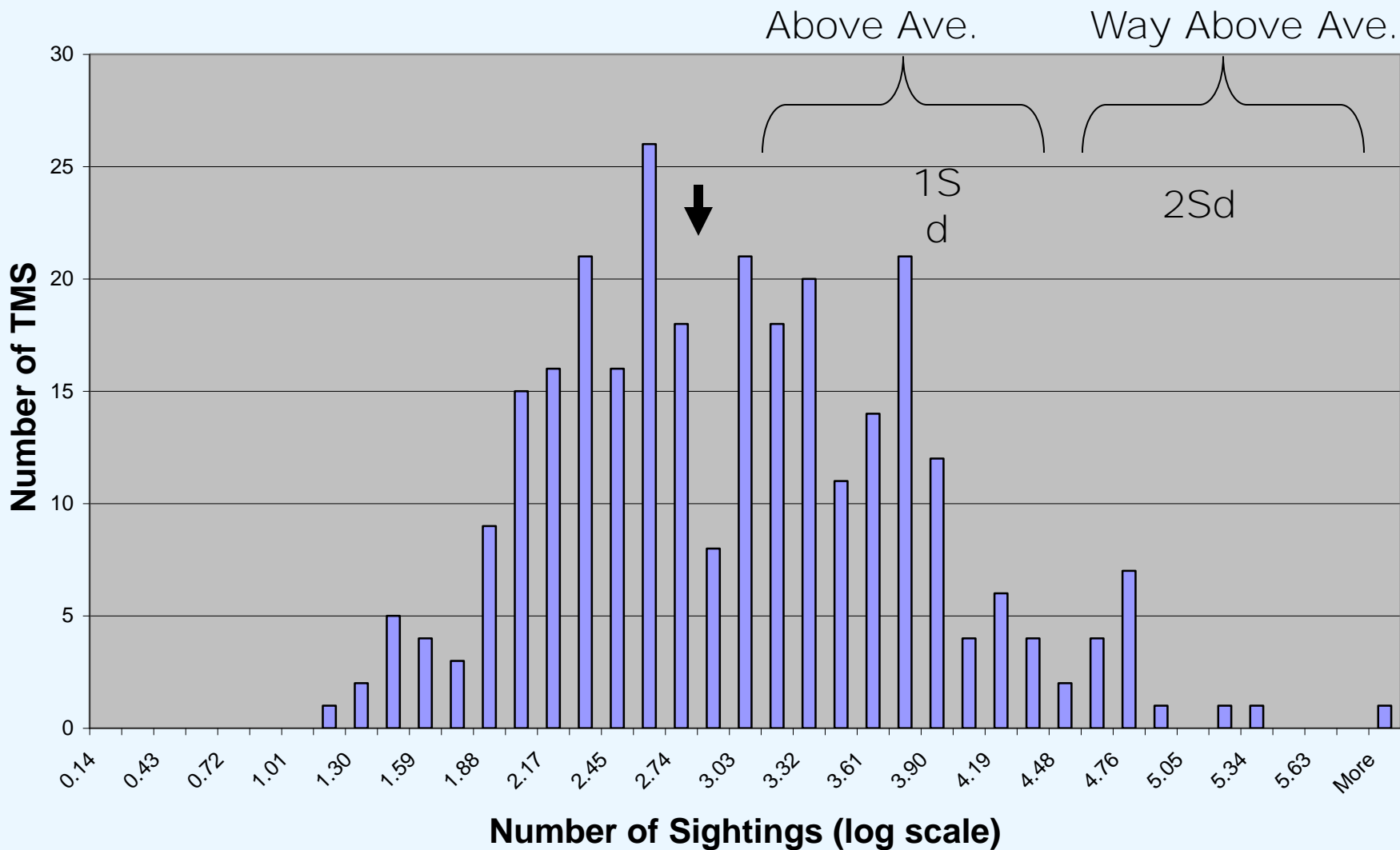
Ten Minute Squares (70 – 100 square miles)





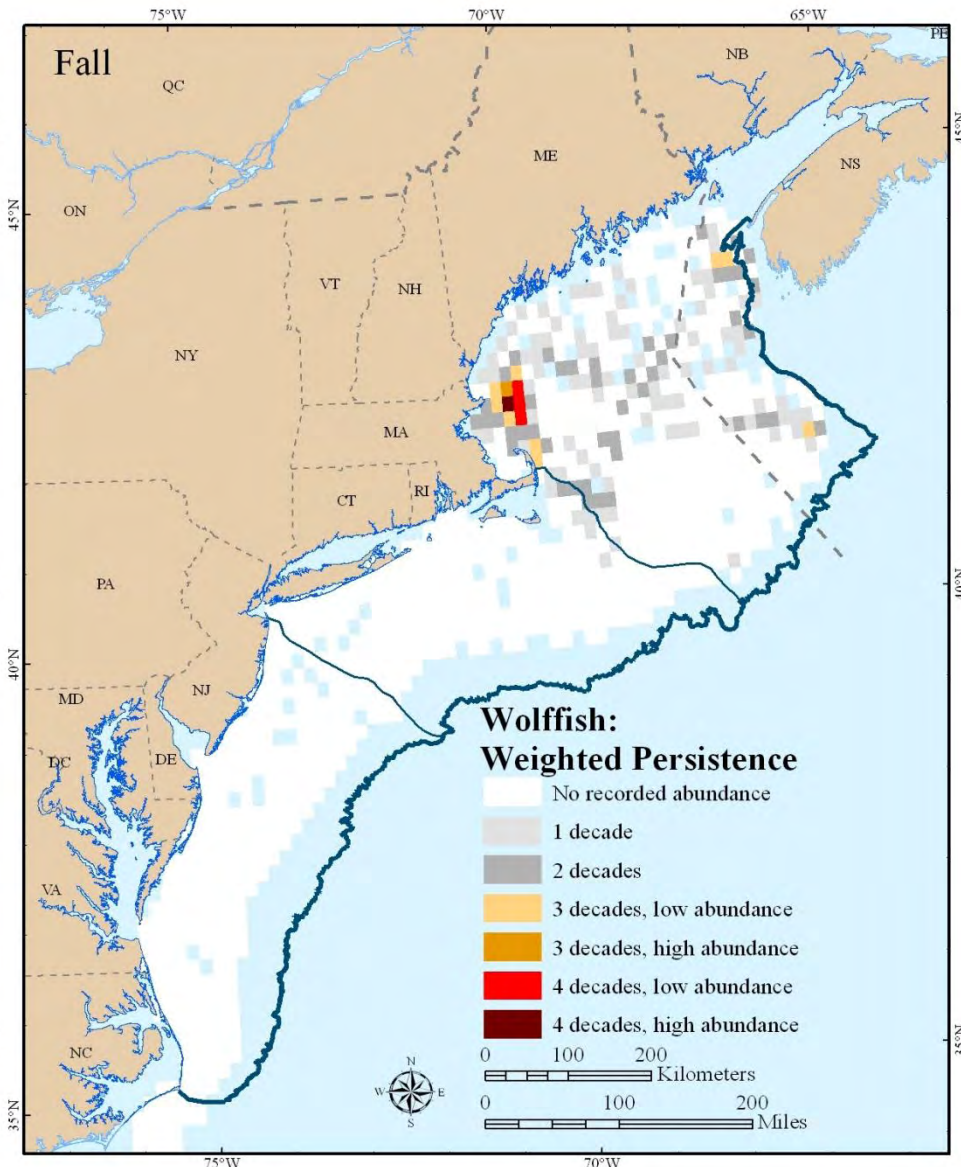
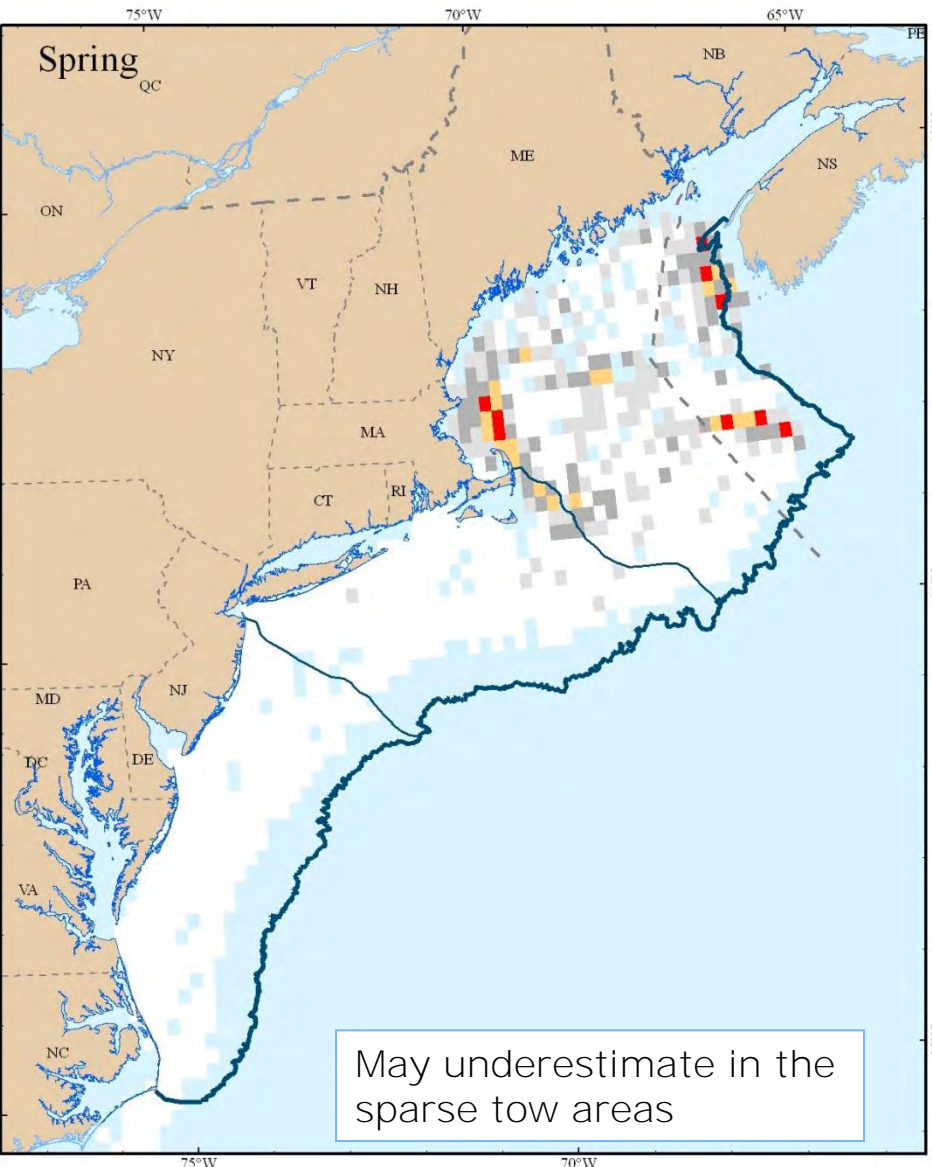
# “Way Above Average”

## Fin Whale Sightings





# Weighted Persistence

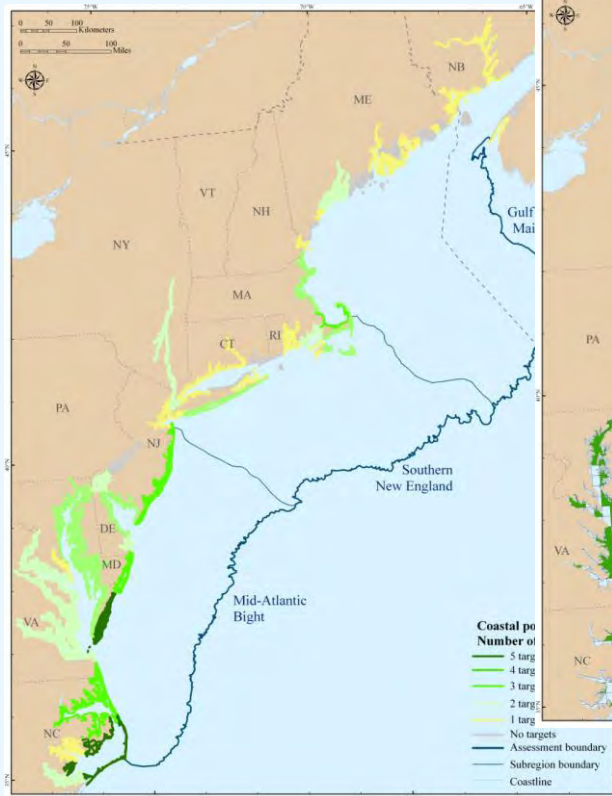




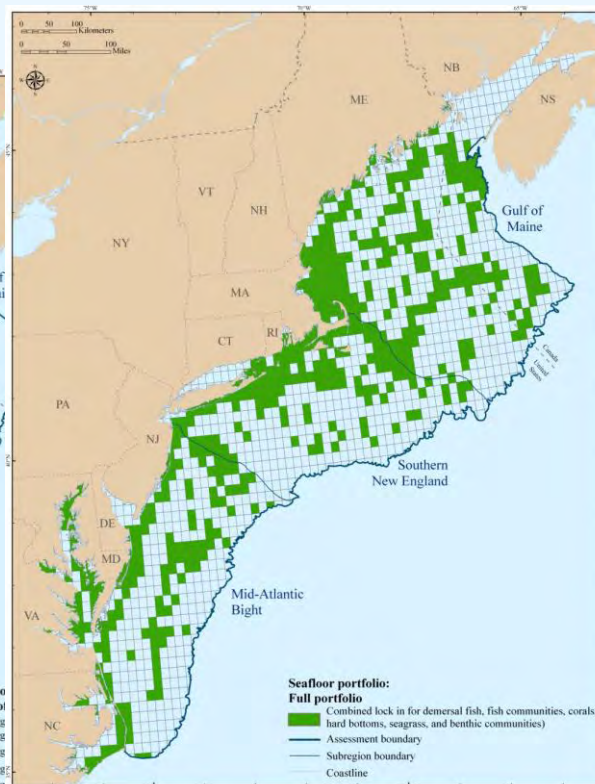


# THREE THEMES + INTEGRAION

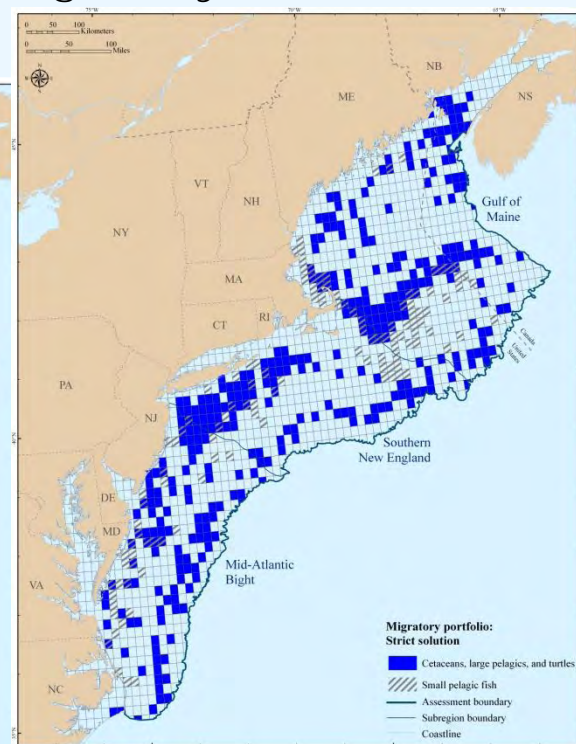
Coastal



Seafloor



Migratory (water column)





# COASTAL THEME



Evaluate the coast from a “Marine Perspective”





# 62 Coastal Shoreline Units (CSUs)



Connecticut River  
 Long Island Sound  
 Hudson/Raritan River  
 DE Bay: Upper Estuary  
 DE Bay: Lower Estuary  
 Chesapeake Bay Inner  
 Patuxent River  
 DE  
 MD  
 VA  
 NC

Narragansett  
 Block Island Sound  
 Gardiners Basin  
 Long Island Sound - Central Basin  
 Long Island South Shore  
 New Jersey Shore  
 Delaware Bay  
 Rehoboth & Indian River Bays  
 Assawoman & Chincoteage Bays  
 Chesapeake Bay Eastern  
 Potomac River  
 Ketotank Bay to Smith Island Inlet  
 Rappahannock River  
 York River  
 James River  
 Currituck & Albemarle Sounds  
 Tar - Pamlico  
 Pamlico Sound  
 Neuse River

Southern New England  
 Mid-Atlantic Bight





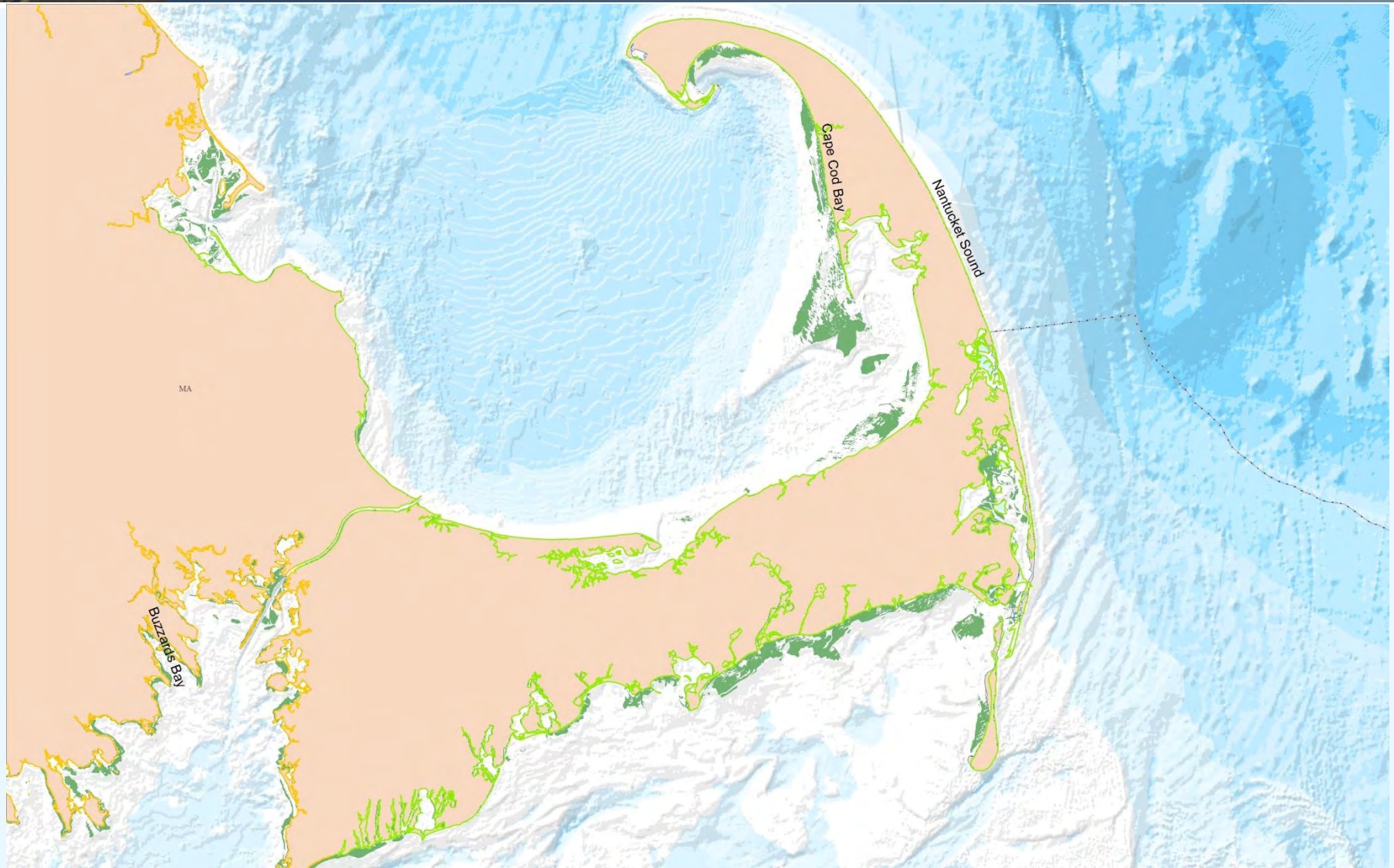




# Marine Perspective – Eight Features

1. Total Seagrass (percent of total for subregion & type)
2. Total Saltmarsh (percent of total for subregion & type)
3. Estuarine Fish Support Score (contribute to persistence)
4. Presence of spawning salmon and sturgeon
5. Scores for locally, regionally, globally significant areas for seabirds and waterbirds
6. Sea turtle nesting areas
7. Condition (Watershed condition minus percent of hardened shoreline)
8. Shellfish (unable to use)

# CAPE COD BAY - CSU





# CAPE COD BAY - CSU

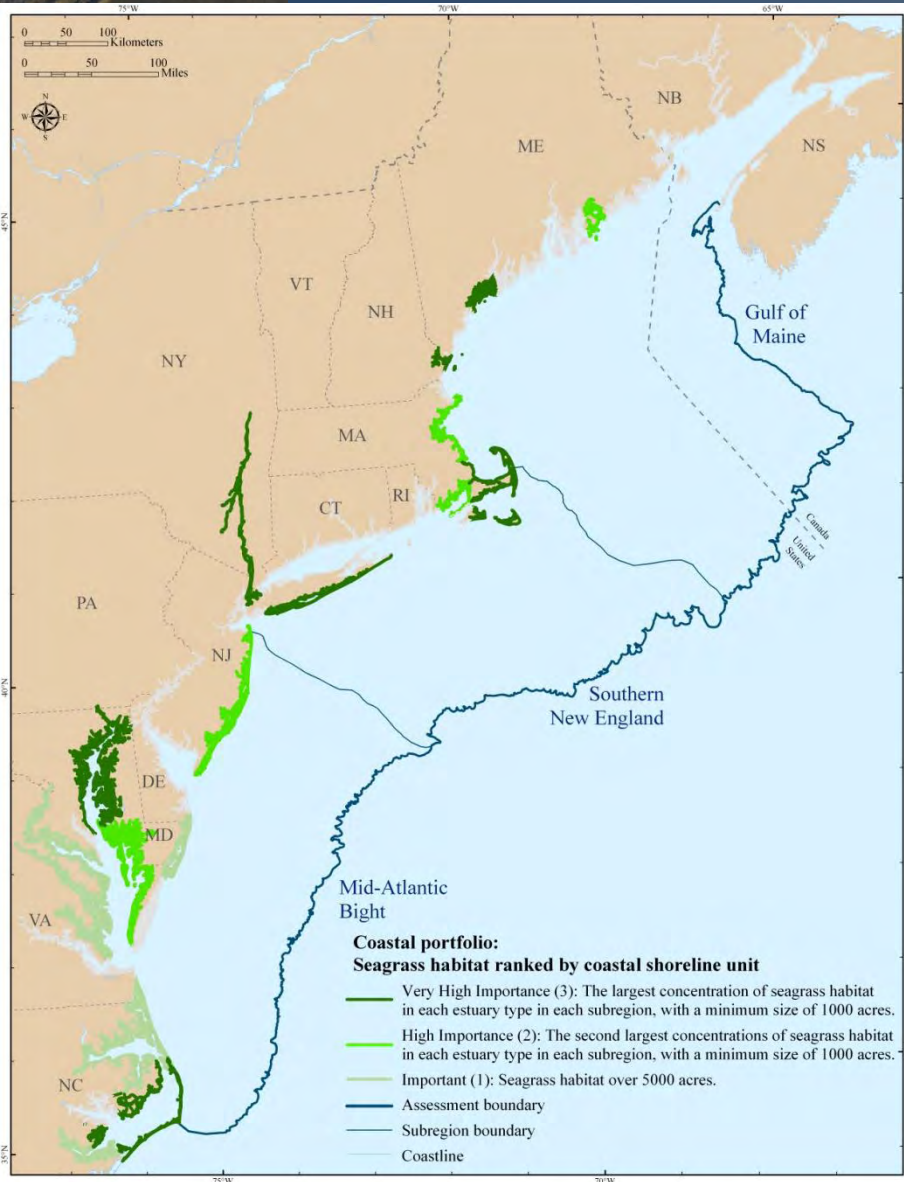
Cape Cod Bay		CSU	Embayment	
Subregion		<b>GOM</b>	Shoreline Length (mi)	284
<b>Seagrass</b>		<b>3</b>	<b>Diadromous Fish</b>	
Historic Acres 2010		9,710	Shortnose%	0
Recent Acres 2010		4,957	Atlantic %	0
2010%Sub-SG		18%	Salmon %	0
2010%Reg-SG		2%	Diadromous Total Species	7
<b>Tidal Marsh</b>		<b>3</b>	<b>Sea Birds</b>	<b>2</b>
Acres Emergent Marsh		9,877	Signif.	Regional
%Sub-TM		11%	basis	>21,000 shorebirds/day
%Reg-TM		1%	<b>Sea Turtles</b>	
TM		3	Nesting SeaTurtles	
TM+HSG		19,587	Sea Turtles	
<b>Estuary Fish</b>		<b>3</b>	<b>Condition</b>	
number of species		11	%Man-made shoreline	9
Sum of propotional contribution		68%	Condition (100)	72
Normalized scores (contribution/area)		45%	Score	63



# Coastal Shoreline Unit Analysis

Subreg	Estuarine type	COASTAL SHORELINE UNIT	Seagrass			Tidal Marsh			Total Veg		Estuary Fish		Condition			Summary Scores							Additional Features											
			%Sub-SG	%Reg-SG	SG	%Sub-TM	%Reg-TM	TM	%Reg-Total	%Reg-Total	Fish Score	Fish	made shoreline	Condition	Score	C	SG	TM	Fish	Birds	SpD	C	Rank	Diatoms	Turks	Cais	Total Shellfish							
GOM	Embayment	Cape Cod Bay	0.13	0.02	3	0.11	0.01	3	0.24	0.03	0.45	3	9	72	63		3	3	3	2			4	2	11	7				4				
GOM	Embayment	Massachusetts Bay	0.07	0.01	2	0.10	0.01	2	0.17	0.02	0.22		19	22	4		2	2					2	2	4	7				4				
GOM	Fiard	Kennebec/Sheepscoot	0.01	0.00		0.07	0.01	3	0.09	0.01	0.02		7	93	87	2			3				3	2	4	1	1	3	2	11	4			
GOM	Fiard	Casco Bay	0.18	0.02	3 <sup>S</sup>	0.02	0.00	2	0.20	0.03	0.06		15	71	56		3	2					1	1	1	4	1	7	9	2	4			
GOM	Fiard	Cobscook Bay								0.00			5	96	91	3							2	2	3	3	2	7	9	2	4			
GOM	Fiard	Englishman Bay	0.05	0.01		0.01	0.00		0.05	0.01	0.03		3	98	95	3							1	2	3	3	1	6	9	1	1			
GOM	Fiard	Narragagus Bay/Pleasant B	0.07	0.01		0.02	0.00		0.10	0.01	0.11		5	97	92	3							2	2	3	2	2	5	9	2	2			
GOM	Fiard	Indian River/GWI Arch	0.05	0.01		0.00	0.00		0.05	0.01	0.13		8	93	85	2							2	2	2	2	2	4	9	1	1			
GOM	Fiard	Machias Bay	0.04	0.01		0.01	0.00		0.05	0.01	0.02		7	94	87	2							2	2	2	2	2	4	9	1	1			
GOM	Fiard	Frenchman Bay	0.08	0.01	2	0.00	0.00		0.09	0.01	0.07		12	82	70		2						1	2	2	2	1	3	8	3	2			
GOM	Fiard	Muscongus Bay	0.06	0.01		0.01	0.00		0.06	0.01	0.05		7	89	82								1	2	2	2	1	3	8	3	2			
GOM	Fiard	Penobscot	0.03	0.00		0.01	0.00		0.03	0.00	0.01		17	76	59								1	2	2	2	1	3	8	2	3			
GOM	Fiard	Schoodic/Gouldsboro/Dyer B	0.06	0.01		0.00	0.00		0.06	0.01	0.17	1	12	88	76								1	2	2	2	1	3	9	2	2			
GOM	Fiard	East Pennobscot Bay/Jericho	0.05	0.01		0.00	0.00		0.05	0.01	0.17	1	8	86	78								1	1	1	2	2	1	2	8	3	3		
GOM	Fiard	Bold Coast	0.00	0.00		0.00	0.00		0.00	0.00	0.00		3	100	97	3										3	1	3	3	8	2	2		
GOM	Fiard	Bluehill Bay	0.01	0.00		0.00	0.00		0.01	0.00	0.09		7	89	82											2	1	2	2	9	1	1		
GOM	Fiard	Quoddy								0.00			10	80	70												1	1	1	8	1	1		
GOM	Fiard	Bagaduce								0.00			5	87	82													0	0	8	3	3		
GOM	Fiard	Damariscotta River	0.01	0.00		0.00	0.00		0.02	0.00	0.02		12	79	68													0	0	7	1	1		
GOM	Fiard	Muscle Ridge Channel	0.03	0.00		0.01	0.00		0.04	0.01	0.09		6	80	74													0	0	8	2	2		
GOM	Fundy	Minas Basin				0.10	0.01	2	0.10	0.01			8	0	-8								2		3	-	-	2	2	5	0	0		
GOM	Fundy	Chignecto Bay				0.14	0.01	3	0.14	0.01			5	0	-5								3			-	-	1	3	3	0	0		
GOM	Fundy	St. Mary's Bay				0.01	0.00		0.01	0.00			12	0	-12										3	-	-	1	3	3	0	0		
GOM	Fundy	Fundy				0.02	0.00		0.02	0.00			9	0	-9										1	-	-	1	1	1	0	0		
GOM	Fundy	Digby Harbour				0.01	0.00		0.01	0.00			25	0	-25											-	-	0	0	0	0	0		
GOM	Fundy	St. John				0.01	0.00		0.01	0.00			15	0	-15											-	-	0	0	0	0	0		
GOM	Fundy	Unknown near New Brunswick				0.00	0.00		0.00	0.00			10	0	-10											-	-	0	0	0	0	0		
GOM	River:GOM	Plum Island/Hampton	0.00	0.00		0.23	0.02	3 <sup>S</sup>	0.23	0.02	0.14		1	88	87	2							1	2	3	1	2	3	1	6	10	4		
GOM	River:GOM	Great Bay	0.06	0.01	3	0.03	0.00		0.09	0.01	0.11		12	61	50		3										3	1	4	8	2	2		
GOM	River:GOM	Saco/Scarborough River	0.01	0.00	2	0.04	0.00	2	0.05	0.00	0.05		7	84	76		2	2									2	2	4	8	1	1		
GOM	River:GOM	Bigelow Bight	0.01	0.00		0.04	0.00		0.04	0.00	0.07		16	67	51												1	1	1	5	2	2		
MAB	Lagoon	Ketotank Bay to Smith Island	0.01	0.01	1	0.09	0.07	2	0.10	0.08	0.25	2	0	98	98	3	1	2	2	3						3	5	1	11	1	2	BC	4	
MAB	Lagoon	Pamlico Sound	0.50	0.32	3 <sup>SR</sup>	0.08	0.07	1	0.58	0.39	0.41	3	1	94	93	3	3	1	3	1							3	5	1	11	5	1	2	4
MAB	Lagoon	New Jersey Shore	0.07	0.04	2	0.14	0.12	3	0.21	0.16	0.30	2	22	69	48		2	3	2	1							4	1	8	4	2	HC	3	
MAB	Lagoon	Assawoman & Chincoteague E	0.06	0.04	1	0.03	0.02	1	0.08	0.06	0.34	2	9	72	63		1	1	2	1							4	1	5	1	2	3	3	
MAB	Lagoon	Currituck & Albemarle Sound	0.03	0.02	1	0.06	0.05	1	0.09	0.07	0.26	2	4	80	77		1	1	2								3	1	4	5	2	3	3	
MAB	Lagoon	Rehoboth & Indian River Bay	0.00	0.00		0.01	0.01	1	0.01	0.01	0.36	2	18	60	41								1	2			2	1	3	5	1	3	3	
MAB	River:MAB	Chesapeake Bay Inner	0.10	0.06	1	0.04	0.03	1	0.14	0.10	0.00		22	54	33		1	1	1				2	1			4	1	5	5	1	3	3	
MAB	River:MAB	Rappahannock River	0.02	0.01	1	0.02	0.01	1	0.03	0.02	0.00		11	77	66		1	1	1				2	1			4	1	5	5	1	3	3	
MAB	River:MAB	Chesapeake Bay Eastern	0.10	0.06	2	0.22	0.18	3 <sup>SR</sup>	0.31	0.25	0.03	2	2	85	83		2	3	2				2	1			3	2	7	5	1	3	3	
MAB	River:MAB	Delaware Bay	0.00	0.00		0.16	0.14	2	0.16	0.14	0.06	3	90	87	2		2	3								2	3	2	7	6	2	HC	3	
MAB	River:MAB	DE Bay: Lower Estuary	0.00	0.00		0.02	0.02	1	0.02	0.02	0.00		14	59	44		1	2	3	1							3	1	5	7	1	2	3	
MAB	River:MAB	Potomac River	0.17	0.04	3	0.14	0.01	1	0.30	0.05	0.00		12	66	54		3	1									3	1	3	5	1	3	3	
MAB	River:MAB	James River	0.01	0.00		0.02	0.02	1	0.03	0.02	0.03		13	61	48								1	1	2	1	3	1	4	5	1	3	3	
MAB	River:MAB	Neuse	0.07	0.05	1	0.04	0.03	1	0.11	0.08	0.01	2	82	80		1	1										3	1	3	6	1	2	2	
MAB	River:MAB	Patuxent River	0.00	0.00		0.01	0.01	1	0.01	0.01	0.00		9	64	55												2	1	3	3	1	2	3	
MAB	River:MAB	York River	0.04	0.02	1	0.04	0.03	1	0.08	0.06	0.01	8	77	69		1											2	1	2	5	1	3	3	
MAB	River:MAB	DE Bay: Upper Estuary				0.00	0.00		0.00	0.00	0.00		21	41	20												1	1	1	7	1	1	3	1
MAB	River:MAB	Tar - Pamlico	0.00	0.00		0.04	0.03		0.04	0.03	0.00		3	82	79												1	1	1	6	1	2	2	2
SNE	Embayment	Nantucket Sound	0.24	0.06	3	0.08	0.01	2	0.31	0.07	0.36	2	6	58	51		3	2	2	2							4	2	9	6	1	4	4	
SNE	Embayment	Long Island Sound	0.00	0.00		0.13	0.01	3	0.13	0.01	0.05		20	23	3								3				1	2	1	4	10	2	4	4
SNE	Embayment	Buzzards Bay	0.06	0.02	2	0.06	0.01	1	0.13	0.02	0.15		16	47	31		2	1									2	1	3	7	1	4	4	
SNE	Embayment	Vineyard Sound	0.02	0.00		0.00	0.00		0.02	0.00	0.24		5	91	87	2											1	2	1	3	7	1	4	4
SNE	Embayment	Gardens Basin	0.05	0.01		0.05	0.00		0.10	0.02	0.31	2	17	45	28								2				1	2	2	8	1	4	4	
SNE	Embayment	Block Island Sound	0.00	0.00		0.01	0.00		0.02	0.00	0.18		10	59	49													0	0	0	9	1	4	4
SNE	Embayment	Long Island Sound - Central E	0.00	0.00		0.01	0.00		0.01	0.00	0.09		6	34	28													0	0	0	9	1	4	4
SNE	Embayment	Wood-Pawcatuck	0.02	0.00		0.02	0.00		0.04	0.01	0.11		29	43	15													0	0	0	9	1	4	4
SNE	Lagoon	Long Island South Shore	0.35	0.09	3 <sup>S</sup>	0.21	0.02	3 <sup>S</sup> </																										

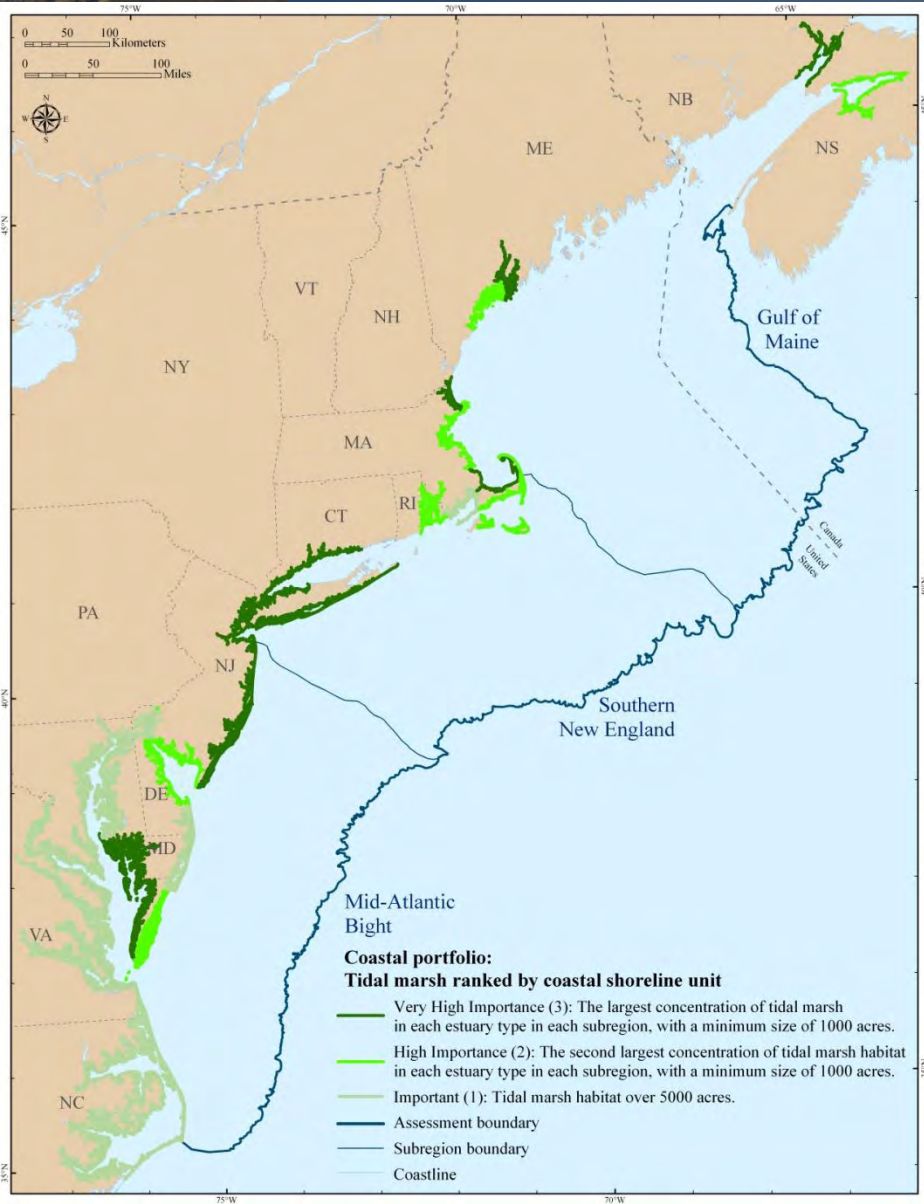
# Coastal Portfolio: Seagrass



- **Very High Importance (3):** The largest concentration of seagrass habitat in each estuary type in each subregion, with a minimum size of 1,000 acres.
- **High Importance (2):** The second largest concentrations of seagrass habitat in each estuary type in each subregion, with a minimum size of 1,000 acres.
- **Important (1):** Any historic seagrass habitat over 5,000 acres.



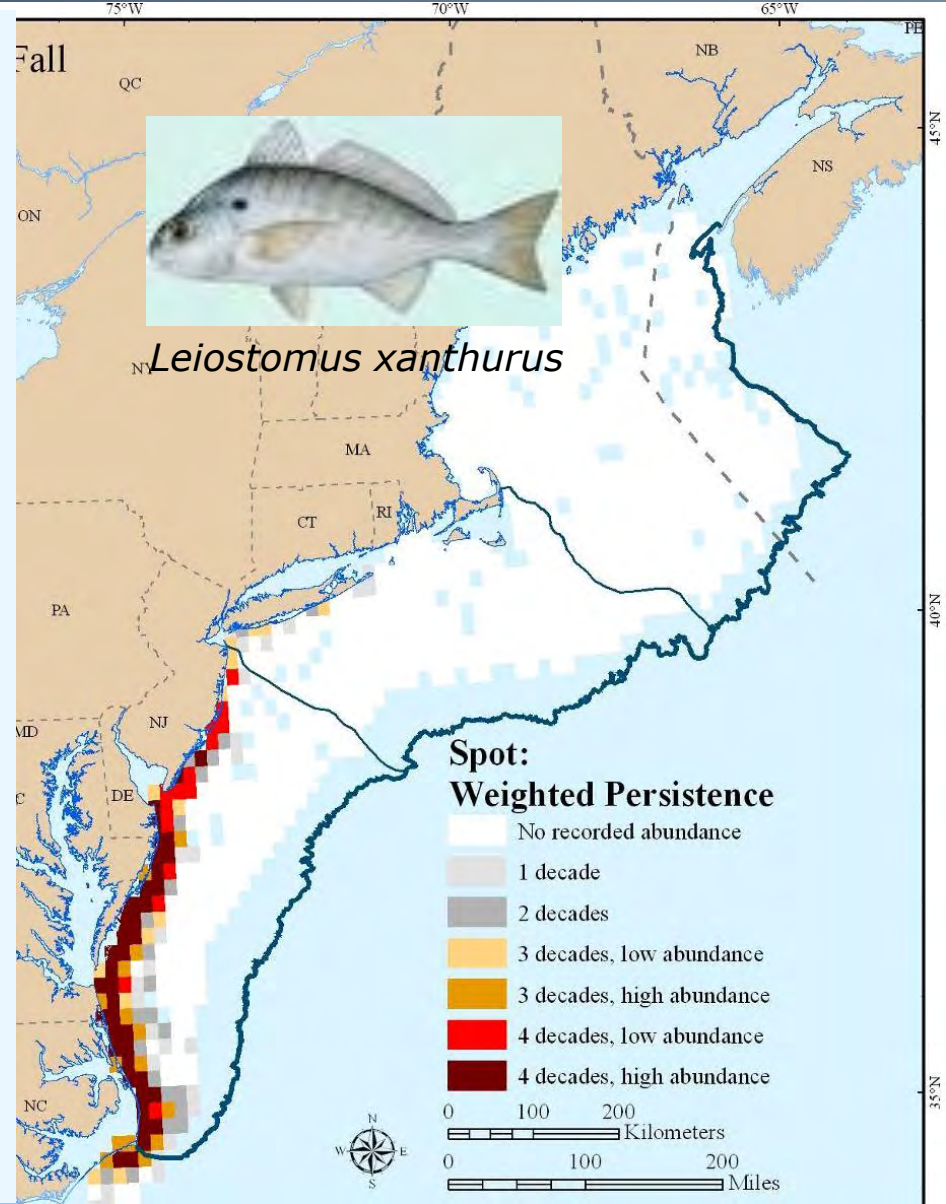
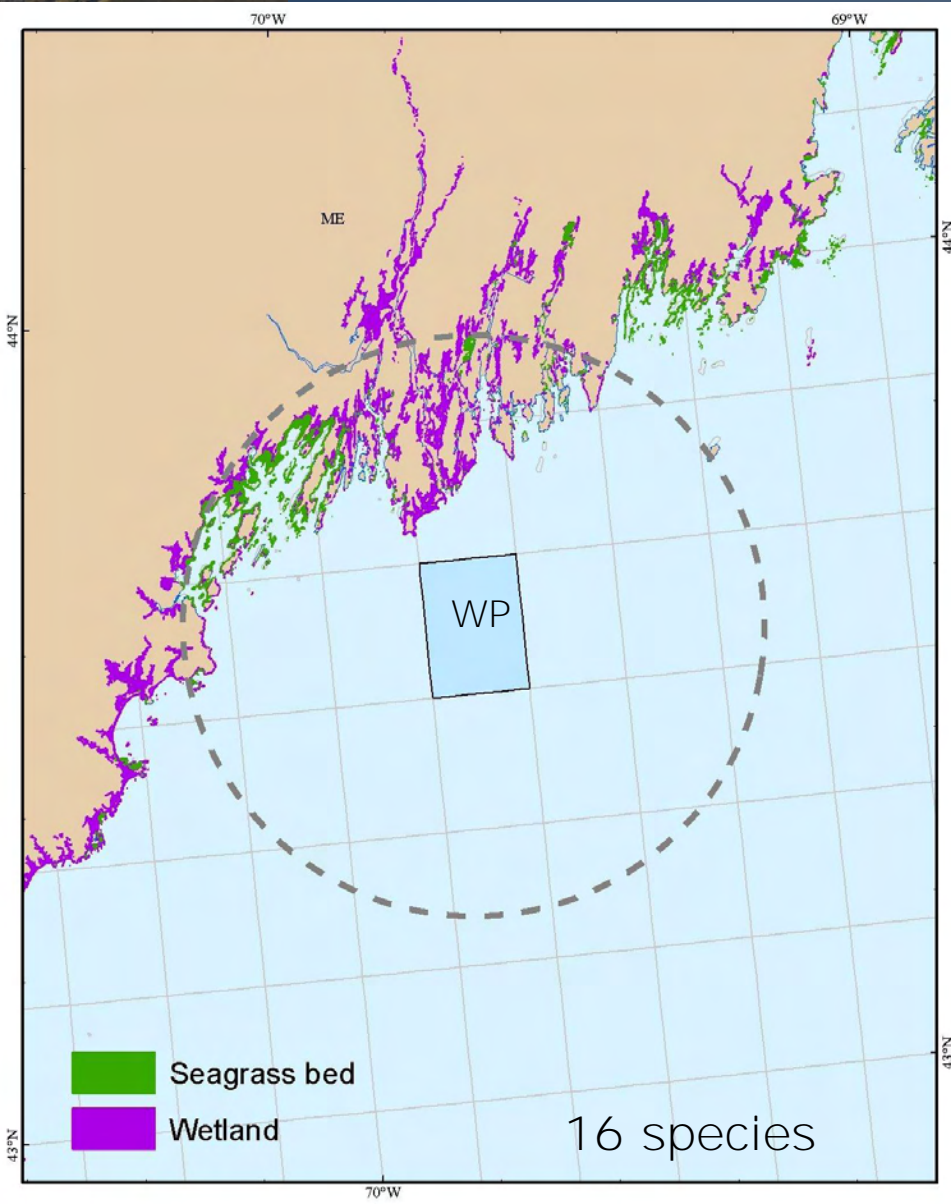
# Coastal Portfolio: Tidal Marsh



- **Very High Importance (3):** The largest concentration of tidal marsh in each estuary type in each subregion, with a minimum size of 1,000 acres.
- **High Importance (2):** The second largest concentrations of tidal marsh in each estuary type in each subregion, with a minimum size of 1,000 acres.
- **Important (1):** Any patch of tidal marsh over 5000 acres.

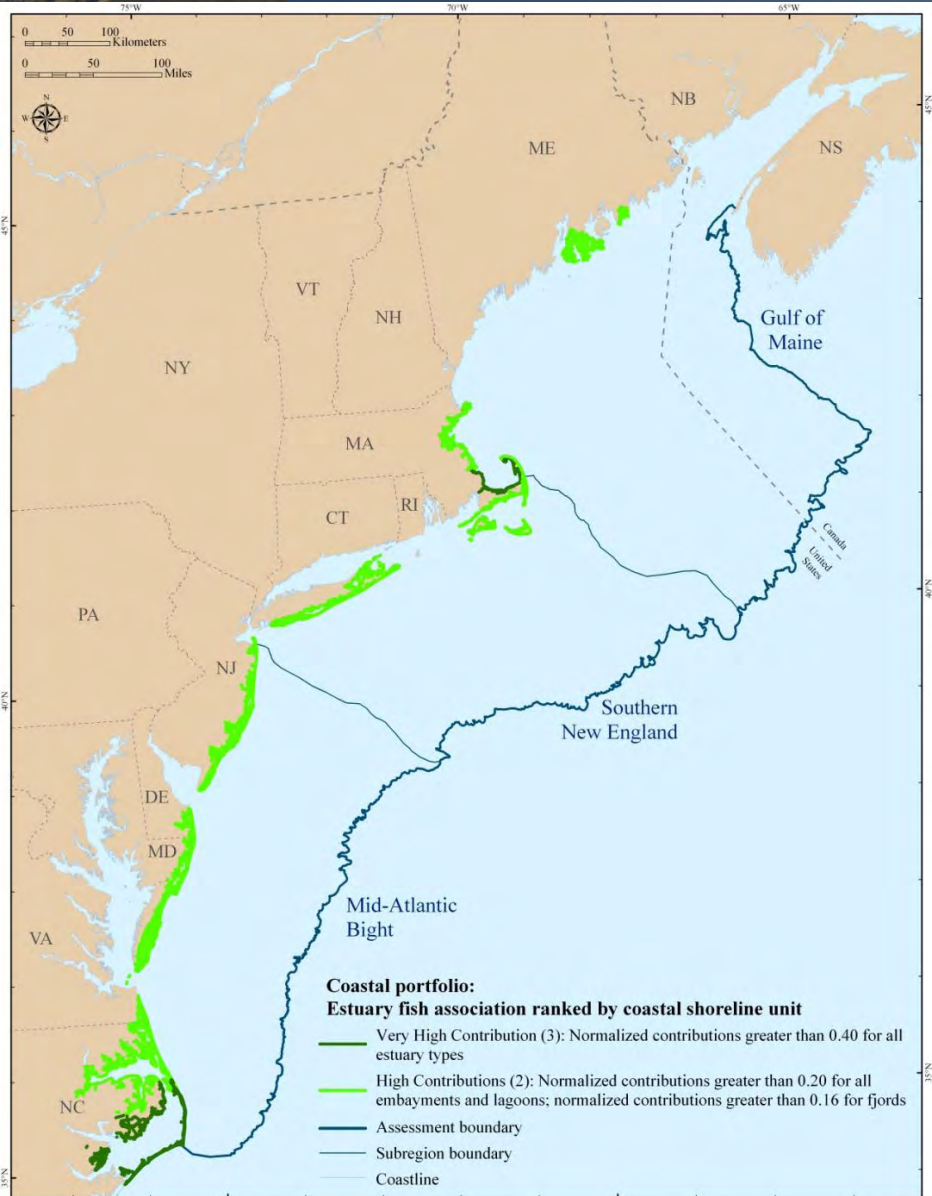


# Coastal Portfolio: Estuarine species

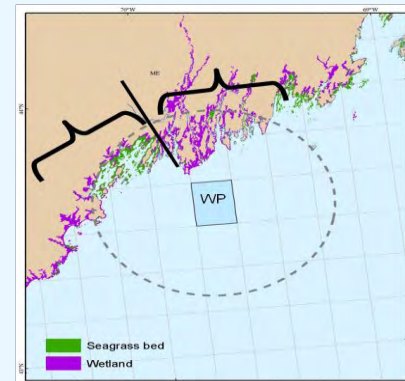




# Coastal Portfolio: Estuary Fish



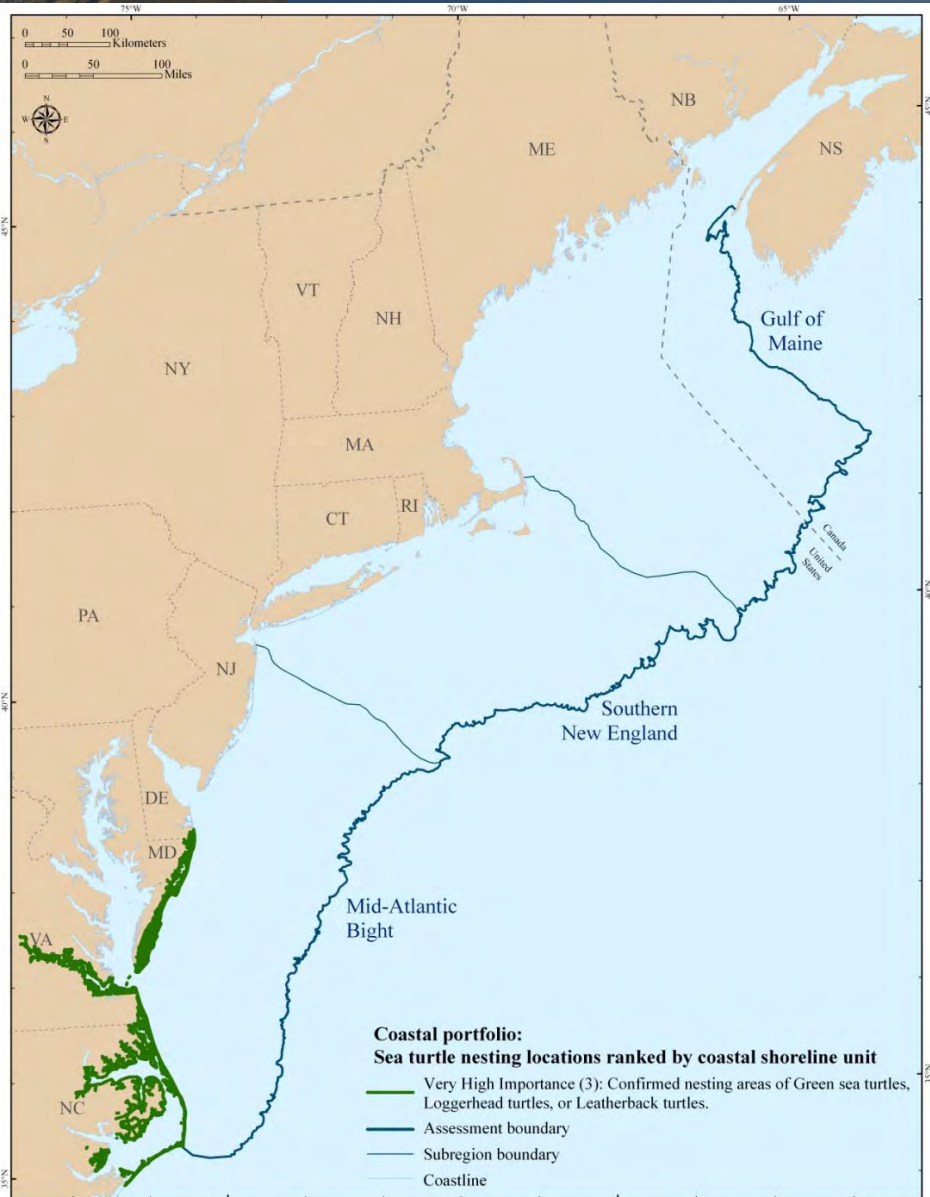
- **Very High Contribution (3):** Standardized value  $>0.40$  per acre of vegetation
- **High Contribution (2):** Standardized value  $> 0.20$  per acres in embayments and lagoons **OR**  $> 0.16$  per acre in fjords







# Coastal Portfolio: Sea Turtles



- **Very High Importance (3):** Confirmed nesting areas of green sea turtle, loggerhead turtle or leatherback turtle.



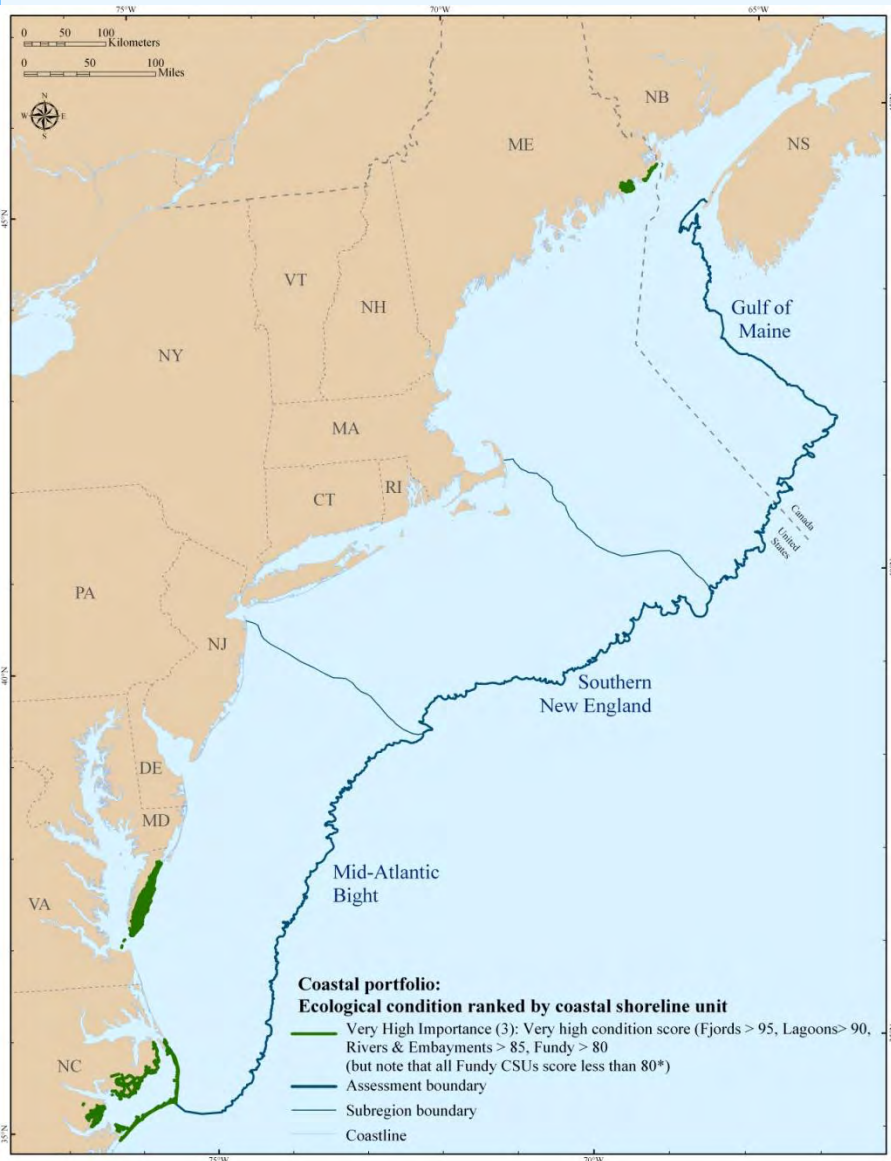


# Coastal Portfolio: Condition

## • **Very High Importance (3)**

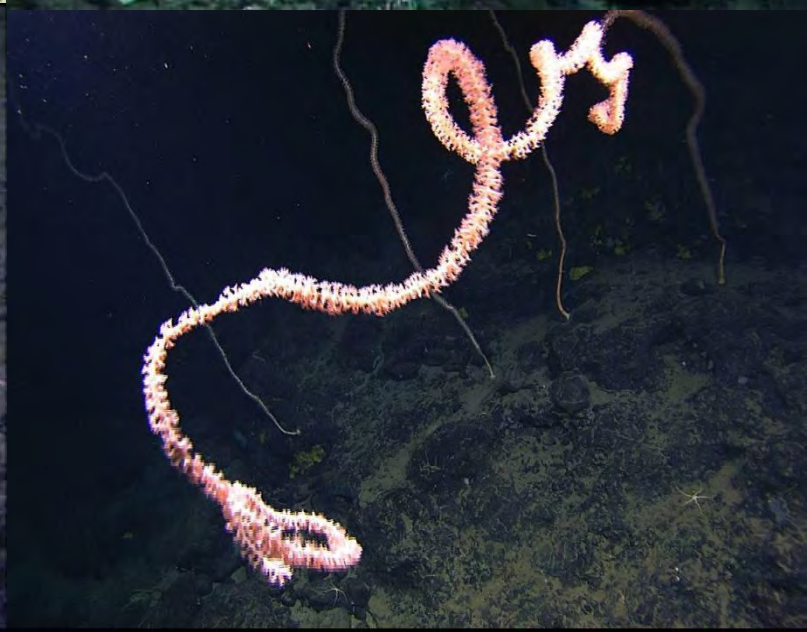
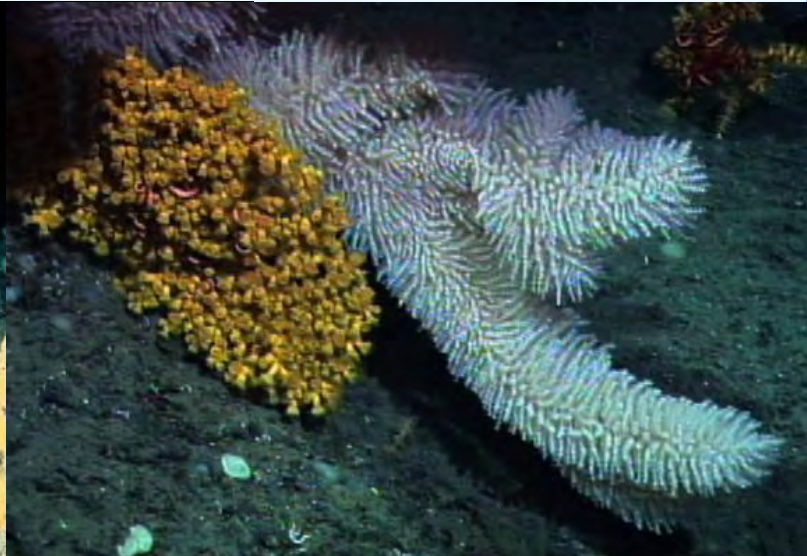
Condition score incorporates on % natural shoreline, landcover, watershed intactness.

Fjords > 95, Lagoons > 90, Rivers & Embayments > 85, Fundy > 80





# Seafloor Theme





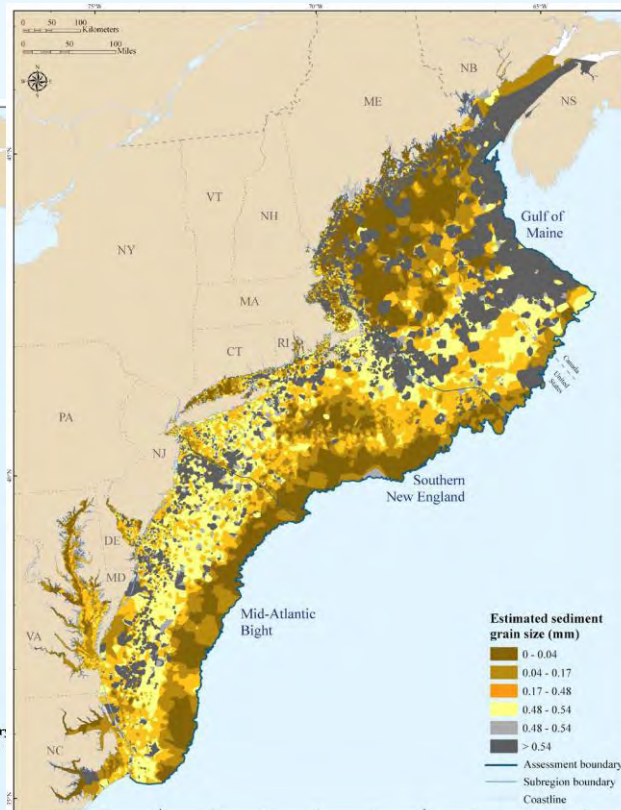


# Seafloor: Framework Datasets

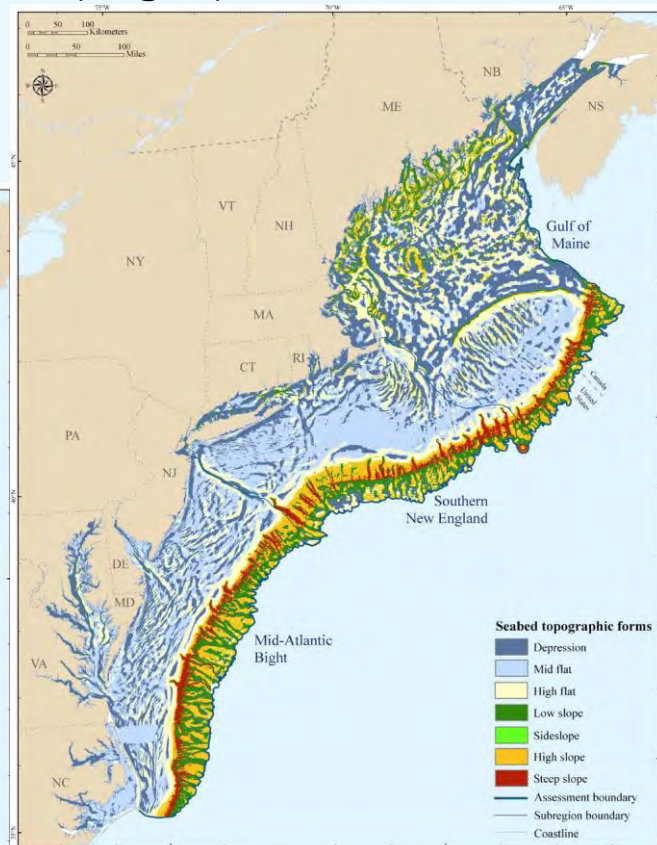
## Bathymetry



## Sediment

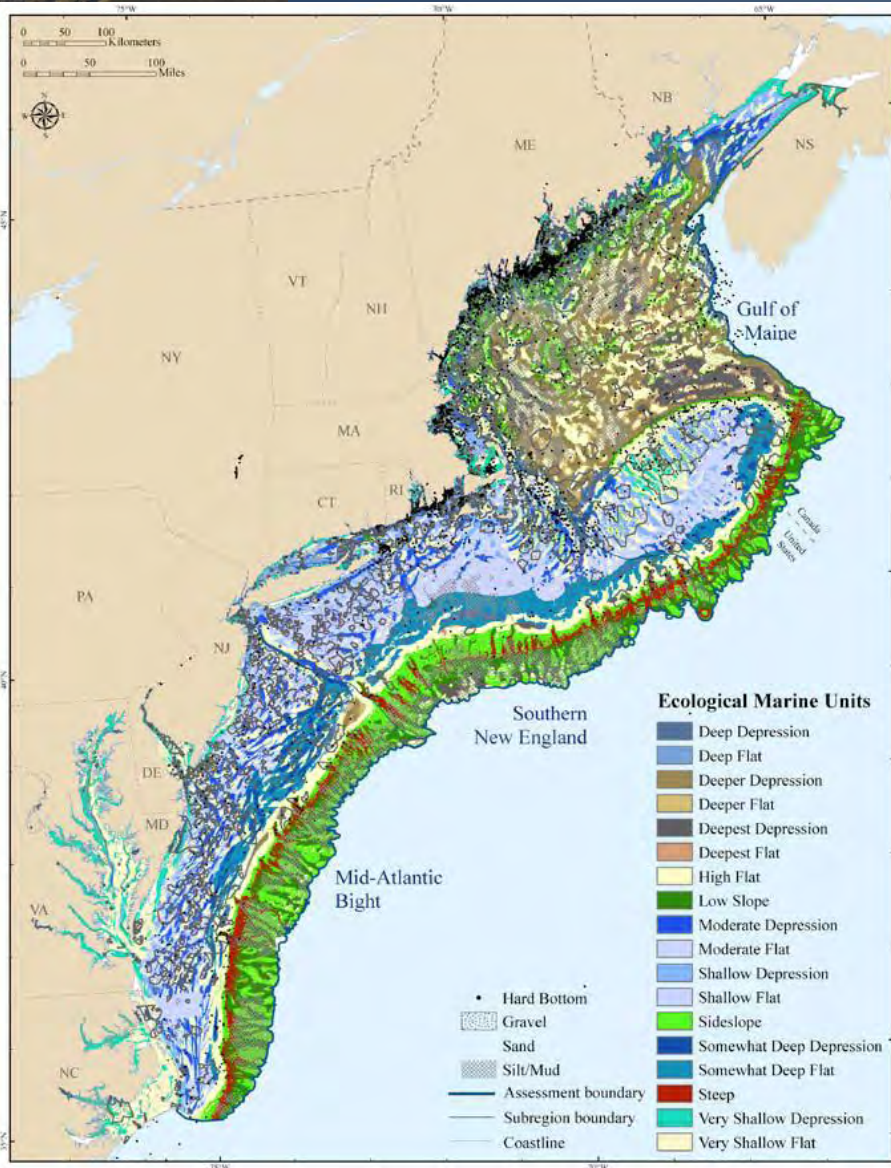


## Topographic forms





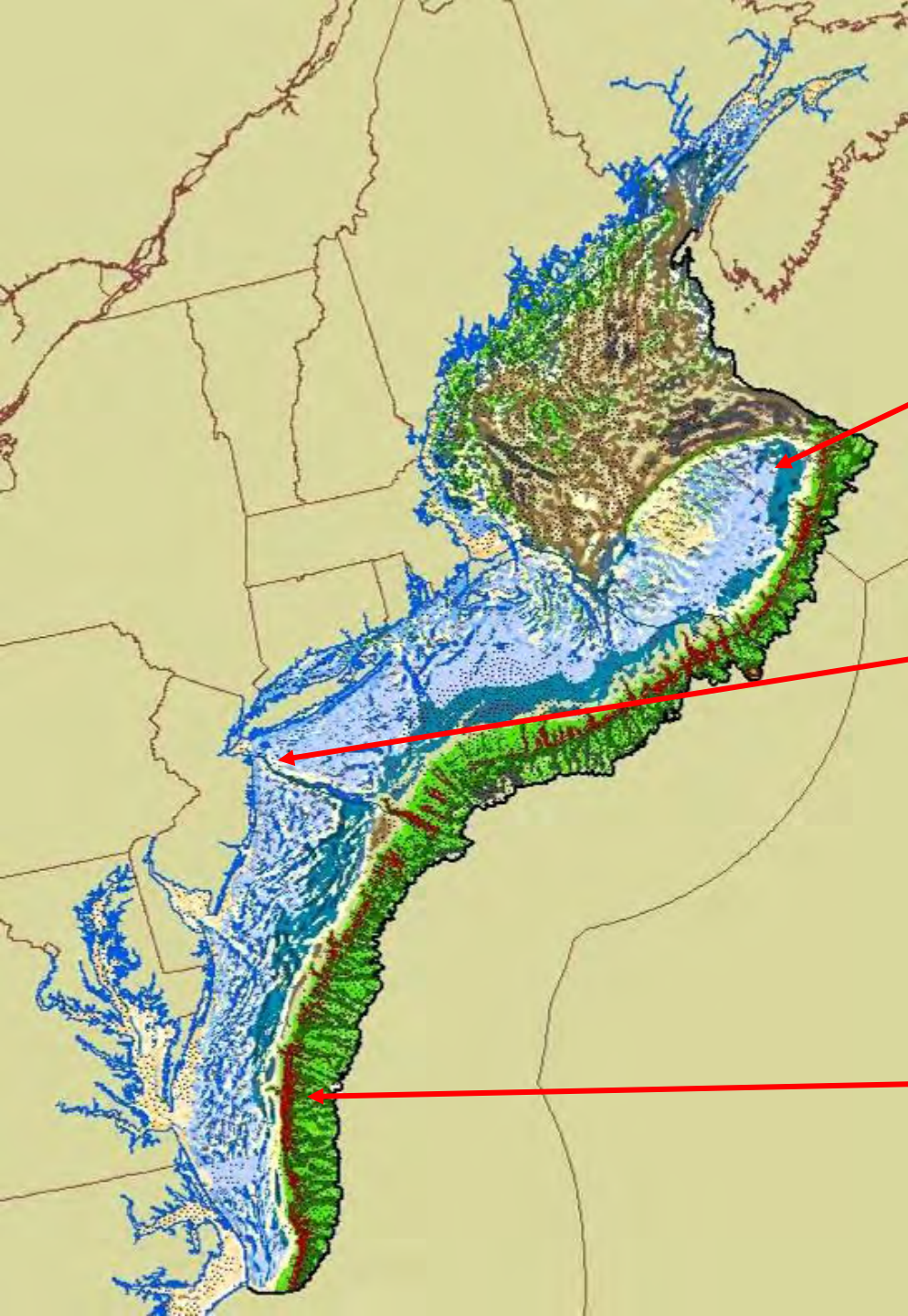
# Seafloor (Benthic) Portfolio: EMUs



## Ecological Marine Units

- Depth
- Sediment grain size
- Seabed topographic forms
- Reveal the structure of the seafloor

# Benthic habitat model examples



## Habitat 91

Level flat on medium to coarse substrate at moderate depths



## Habitat 25

Flats in very shallow water on coarse sand



## Habitat 55

Deep water canyon and slopes with silts and bare rock