Preparing for Offshore Energy Development in Virginia

Laura McKay

Virginia Coastal Zone
MANAGEMENT PROGRAM

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

SUBAQUEOUS LANDS
Marine Resources Commission

DUNES
MRC & Local Wetlands Boards

WETLANDS
MRC, DEQ & Local Wetlands Boards

SHORELINE SANITATION
Dept. Health

Virginia Coastal Zone MANAGEMENT PROGRAM

DEQ Virginia Department of Environmental Quality

LEAD AGENCY

FISHERIES
Dept. Game & Inland Fisheries & MRC

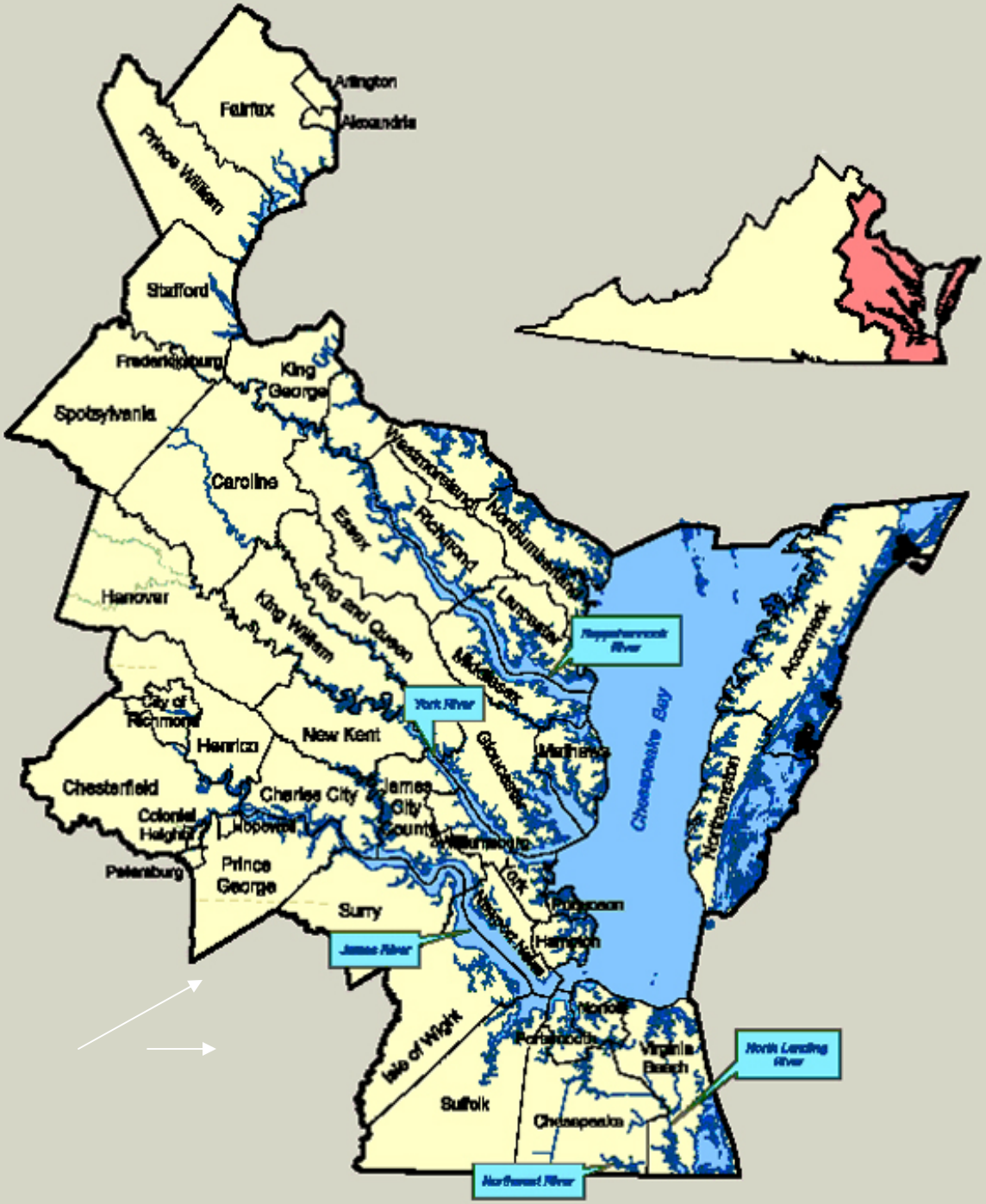
AIR POLLUTION
Dept. Environmental Quality

NONPOINT SOURCE WATER POLLUTION
DCR & Local Governments

POINT SOURCE WATER POLLUTION
DEQ

COASTAL LANDS MANAGEMENT
Dept. Conservation & Recreation

Virginia's Coastal Zone



Executive Order

Signed by each new Governor to direct state agencies to attain

10 Goals of the VA CZM Program

Goal #7:

Promote renewable energy production and provide for appropriate extraction of energy and mineral resources.

Northampton Special Area Management Plan 1992-2000

$2 Million CZM Investment

Seaside Heritage Program

2002-2008

$2.7 Million CZM Investment

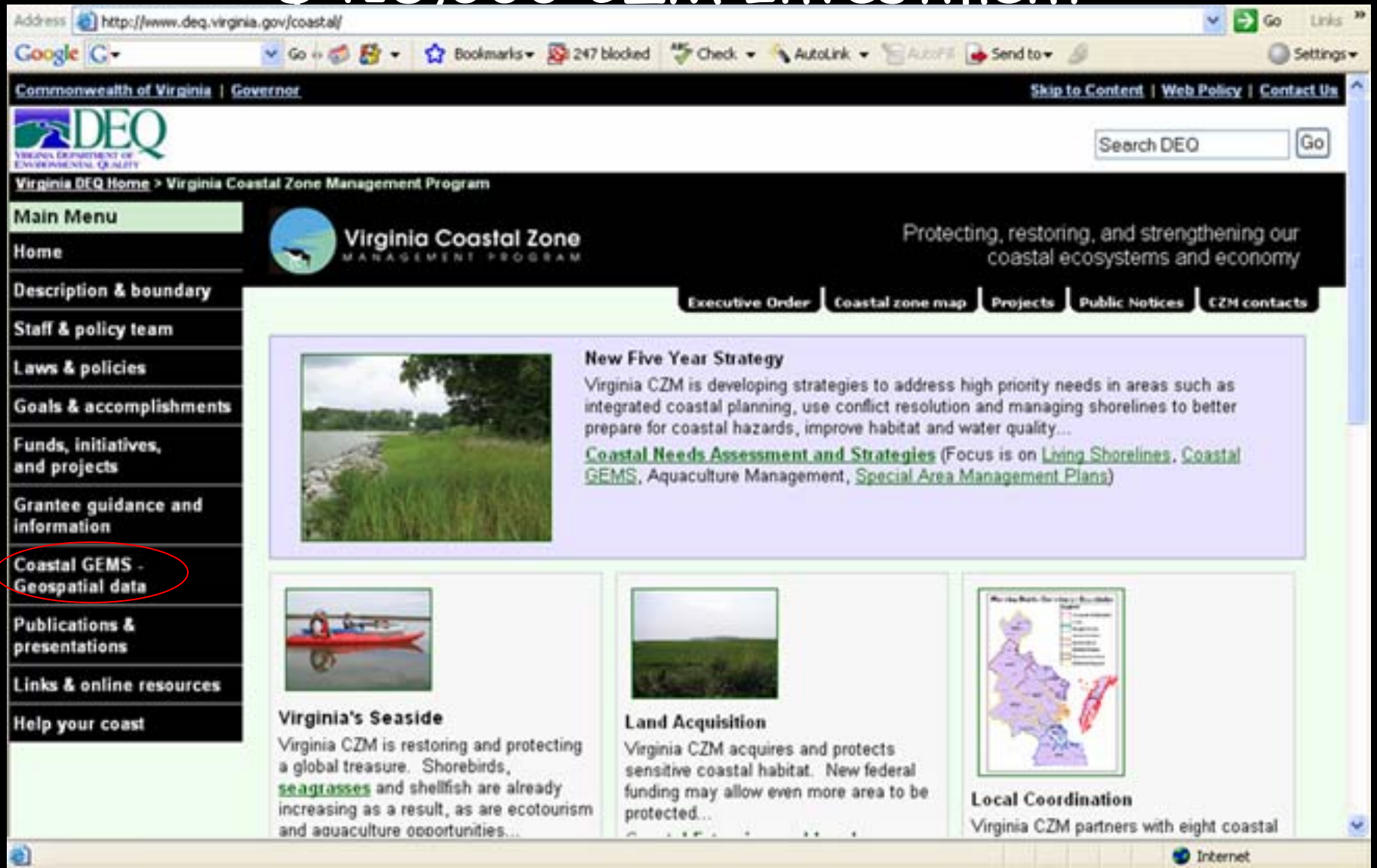
Seaside Special Area Management Plan 2007-2010

$324,000 CZM Investment

Coastal GEMS: Geospatial & Educational Mapping System

2006-2010

$418,000 CZM Investment



GEMS - Microsoft Internet Explorer

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Address http://128.172.160.131/gems2/# Go

Commonwealth of Virginia | Governor Contact Us

Virginia Coastal Zone
MANAGEMENT PROGRAM

Address Search | Coastal News & Events | Zoom To Locality

Go!

Map Layers | Results

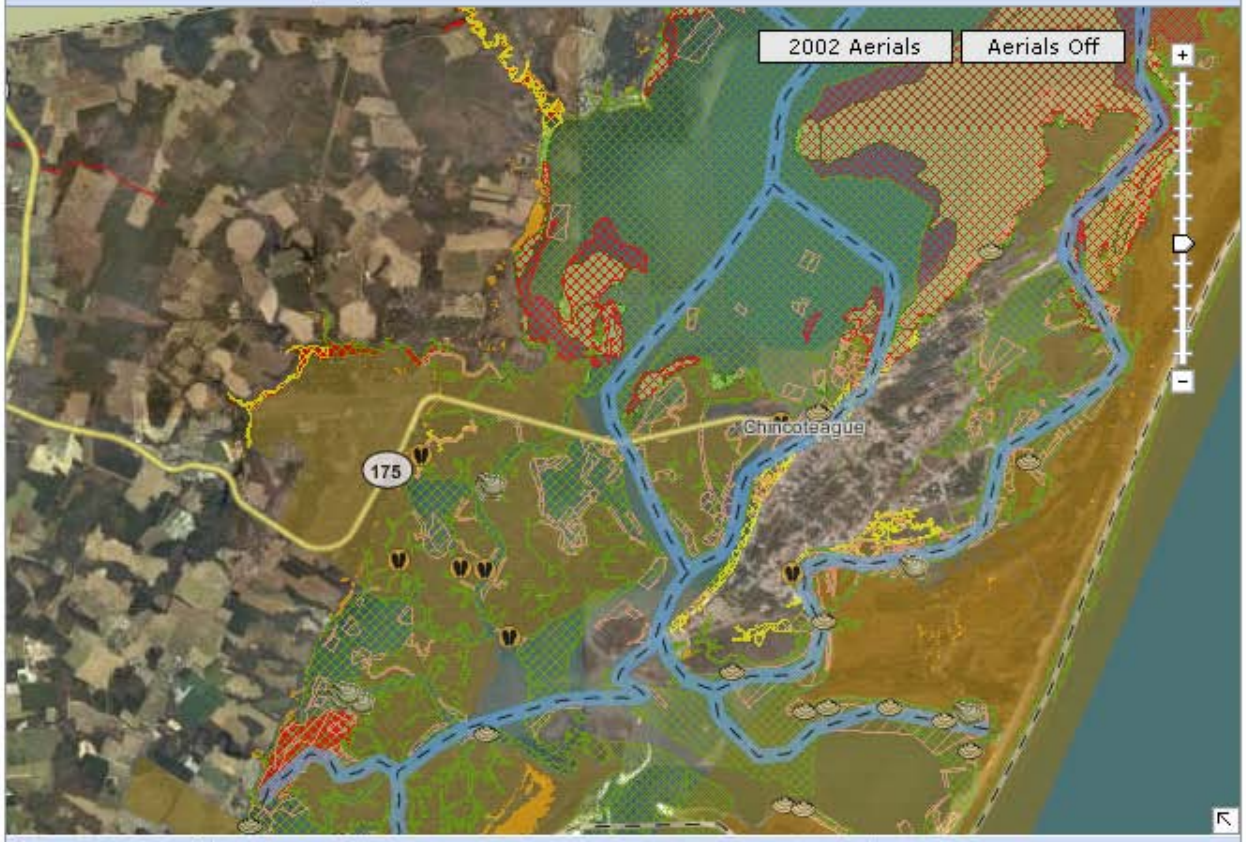
Show All Map Layers

- Water Features
  - Fisheries Management Areas
  - Baylor Grounds (Public Oyster Grounds)
  - Private Oyster Leases
  - State Constructed Oyster Reefs
  - Commercial Shellfish Aquaculture Sites
    - Hard clam
    - Soft clam
    - Oyster
    - Crab shed
  - Oyster Gardening Sites
  - Submerged Aquatic Vegetation (SAV)
  - Seaside SAV Planting Sites
  - Anadromous Fish Use Areas
  - Threatened & Endangered Species Waters

Developed By:
Virginia Commonwealth University
Center for Environmental Studies

In partnership with: WorldView SOLUTIONS

Advanced Tools Export/Print



2 mi Scale 1:122738 37° 55' 04.41"N 75° 17' 51.02"W

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GEMS - Microsoft Internet Explorer

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Go!

Map Layers | Results

Show

Shoreline Features
- Beaches Above H
- Chesapeake Bay
- Restored Riparian

Land Features
- Forest Cover
- Conservation Lar
- Barrier Island Ov

Wildlife
- Essential Wildlife
- Important Bird Ar
- Migratory Songbi

Recreational Features
- VDGIF Boat Ramps
- Scenic Rivers

Aerials Off

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Virginia Commonwealth University
Center for Environmental Studies

In partnership with:
WorldView SOLUTIONS

2 mi Scale 1:122738 37° 56' 12.51"N 75° 37' 42.38"W

Fact Sheet

Conservation Lands

This dataset contains the boundaries and attributes for public and certain private lands in Virginia that have potential significance for serving a variety of conservation and recreation roles. This dataset includes lands conserved and managed by The Nature Conservancy and the Virginia Outdoors Foundation. The full dataset shown in Coastal GEMS may not be available for download. Contact the VA Department of Conservation and Recreation for more information regarding this dataset.

Status of the data
This project began in 1999. The data is current as of July 2007 and is updated regularly as needed.

Data Source
Conservation Lands Database (2007). Virginia Department of Conservation and Recreation, Division of Natural Heritage.

To access this data layer/tool directly, please visit:

http://www.dcr.state.va.us/dnh/conslandindex.htm

Why should we care?

Kiptopeke State Park. Photo by Virginia Witmer, courtesy of Virginia CZM Program.

For original datasets, please contact:

David Boyd - Conservation Lands GIS Planner
217 Governor Street
Richmond, VA 23219
Phone: (804) 371-4801
Fax: (804) 371-2674
Email: david.boyd@dcr.virginia.gov

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3 Major Offshore Energy Activities

1. Establishment of Virginia Coastal Energy Research Consortium

2. Mapping of offshore habitats and resources: VA CZM grant to The Nature Conservancy

3. Legal analysis of strength of current laws & policies to protect coastal resources from potential impacts of offshore energy development: VA CZM grant to Environmental Law Institute

1. Virginia Coastal Energy Research Consortium

VCERC Created by 2006 General Assembly

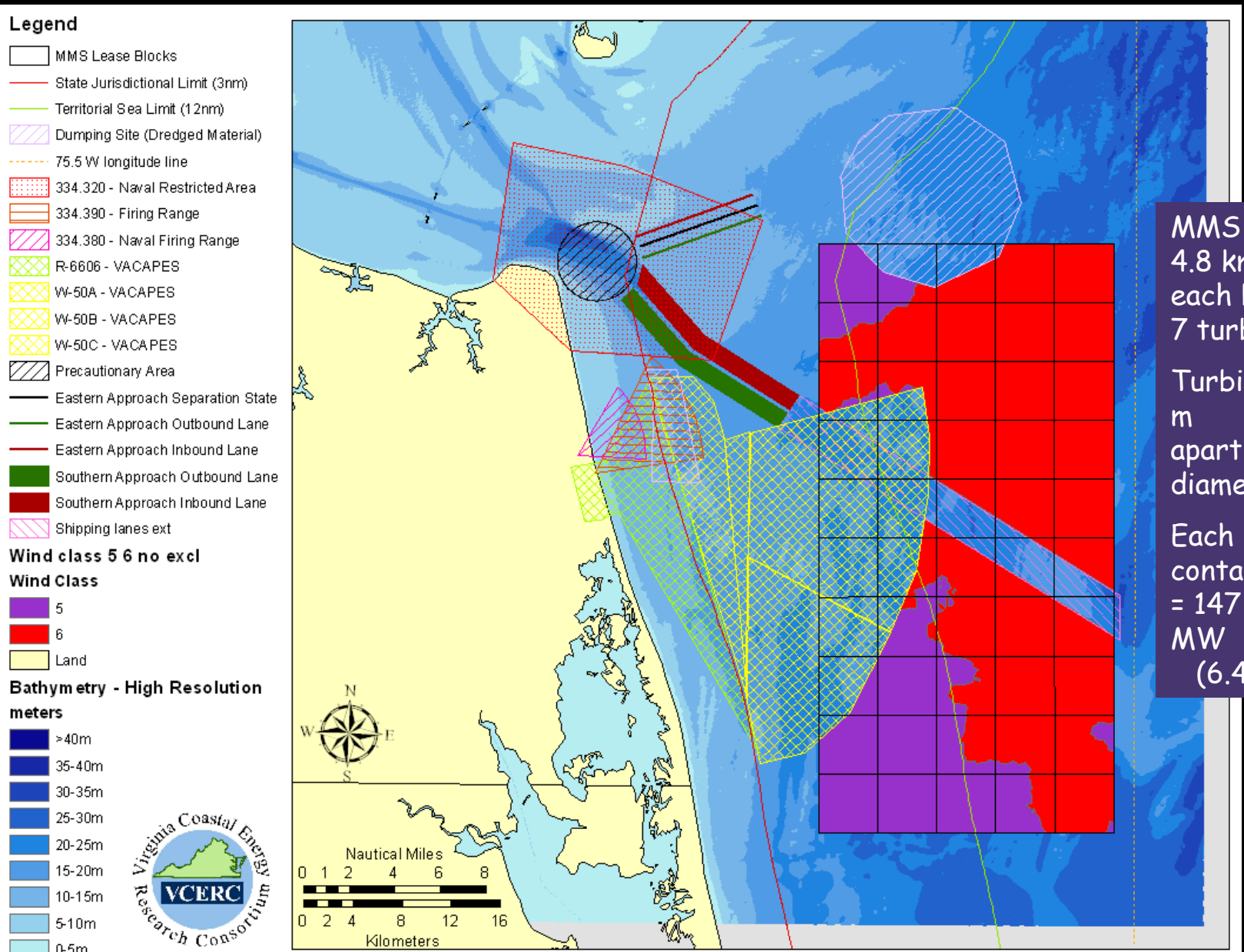
Initial VCERC Focus: Marine Renewable Energy Technologies with Large National Potential

- Offshore wind power
  could meet 50% of present US electricity demand using 10% of the Outer Continental Shelf (OCS) area between 5 and 20 nautical miles offshore and 20% of the OCS area between 20 and 50 nautical miles offshore

- Marine biofuels
  could meet 50% of present US transportation demand using less than 3% of available cropland

GIS Analysis and Mapping of Wind Resources

Focus on 50 MMS lease blocks and avoid excluded areas



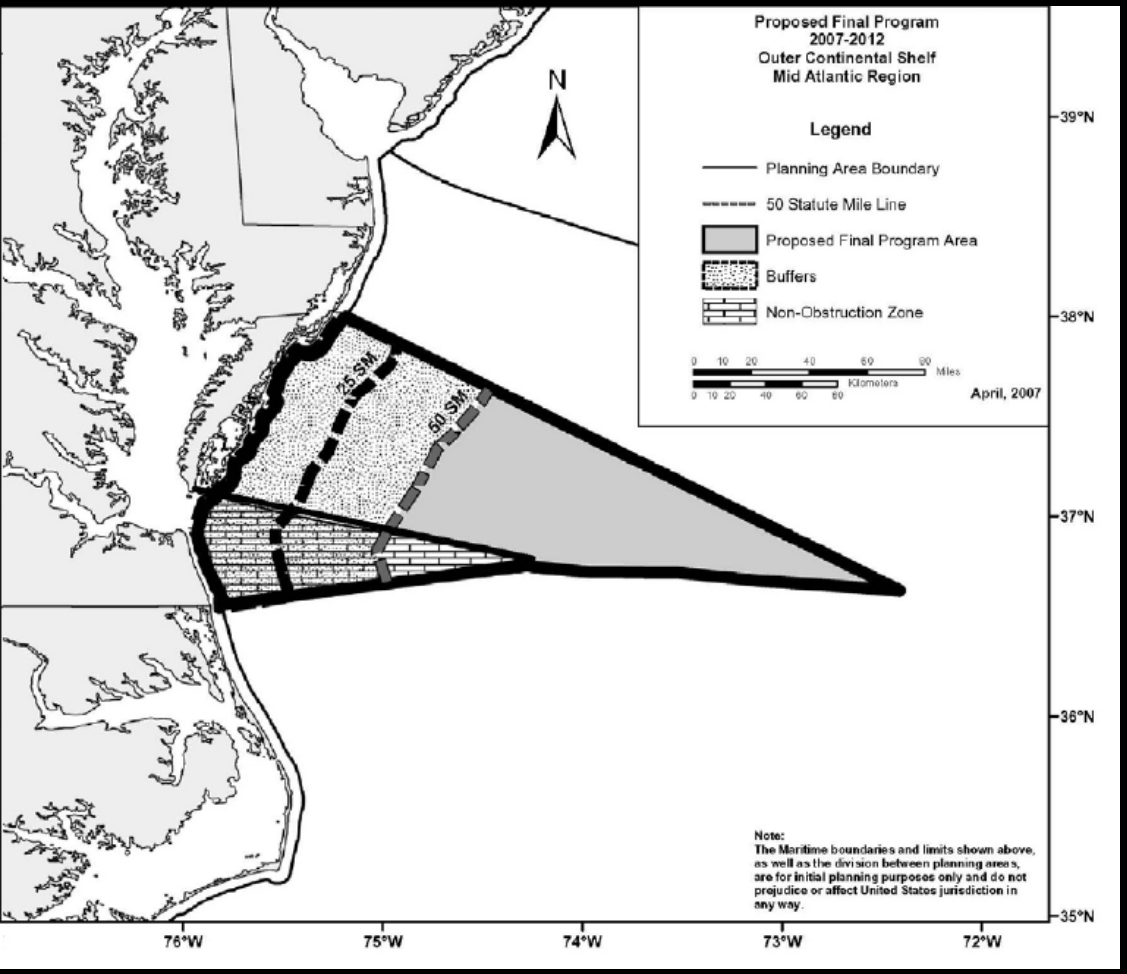
MMS lease blocks are 4.8 km x 4.8 km, with each block having 7 x 7 turbines.

Turbines spaced 685 m
apart (7.6 rotor diameters)

Each lease block could contain 49 turbines = 147 MW if V-90 3 MW
(6.4 MW per km^2)

GIS layers and calculations by Remy Luerssen, James Madison University

Comparing Electrical Energy Potential from Offshore Gas with Offshore Wind



MMS Proposed Oil & Gas Leasing Program for 2007-2012 has lease sale scheduled for Virginia OCS in 2011, contingent upon lifting of Presidential withdrawal and Congressional moratorium

Estimated total recoverable gas reserves on Virginia's OCS:

= 327 billion cu.ft. (BCF)

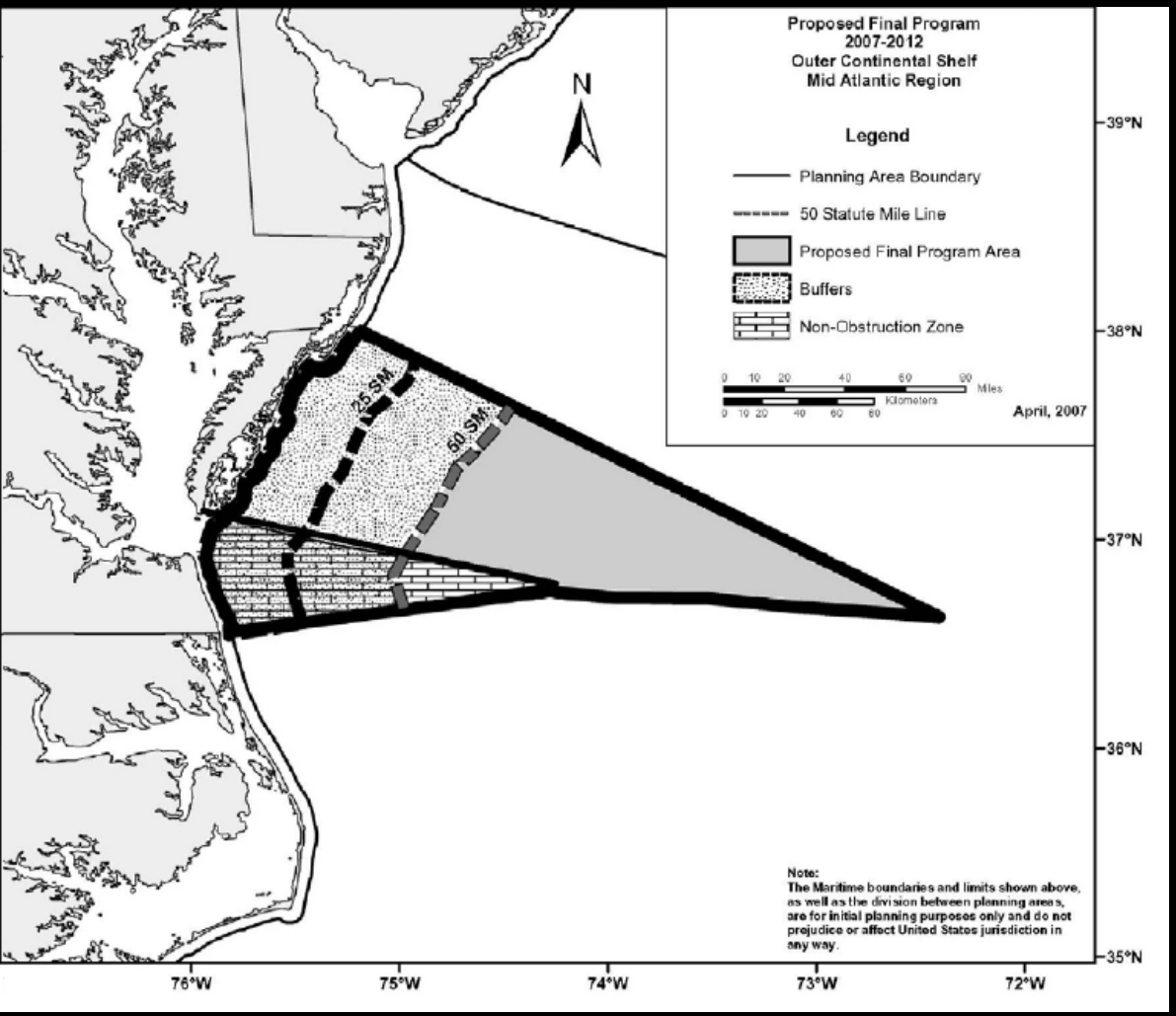
Divide by heat rate of 8.1E-06 BCF/MWh

= 40,322,624 MWh

Again assume a 40-year lease with 15 years to explore and develop, and 25 years to produce

A 526 MW offshore wind project operating at 35% average capacity factor would generate this same amount of electrical energy over a service life of 25 years

Comparing Offshore Oil Potential with Algae-to-Biodiesel Potential in Virginia



MMS Proposed Oil & Gas Leasing Program for 2007-2012 has lease sale scheduled for Virginia OCS in 2011, contingent upon lifting of Presidential withdrawal and Congressional moratorium

Estimated total recoverable oil reserves on Virginia's OCS:

= 56 million barrels over 40-year lease life

Assume 15 years to explore and develop, with first oil production in 2026, followed by 25-year production life

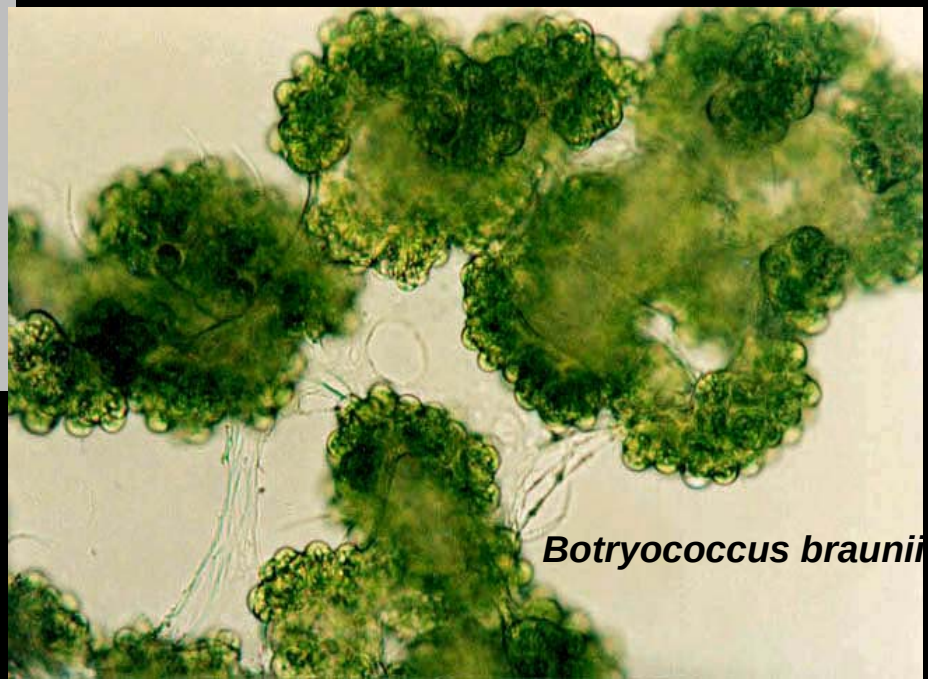
Producing this amount of algal biodiesel fuel in ten years would require 78,330 acres of total pond area

Marine Biofuels -"Fat Algae" Could Supply 50% of US Transport Fuel Needs on <3% of US Cropland

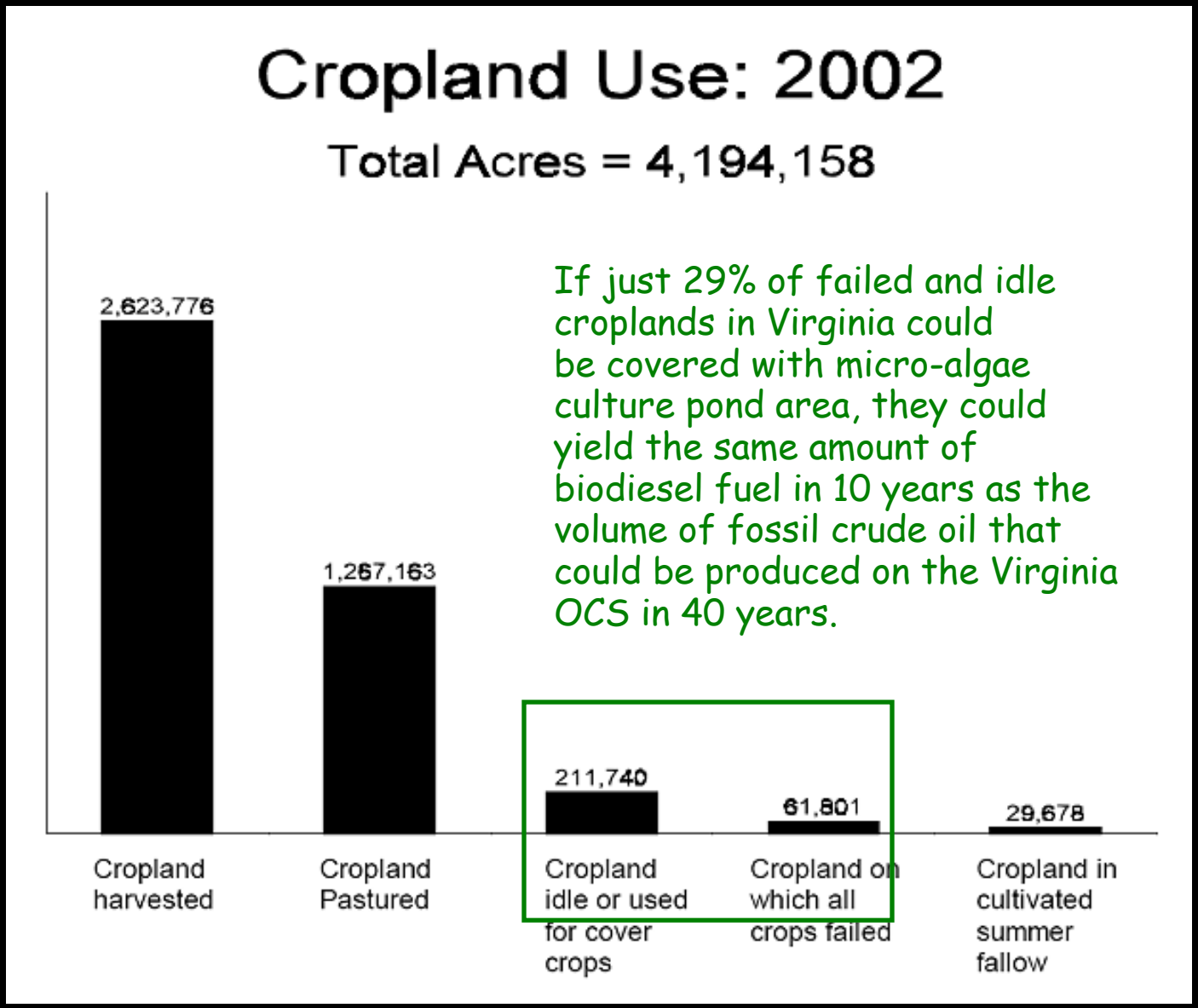
Comparison of some sources of biodiesel

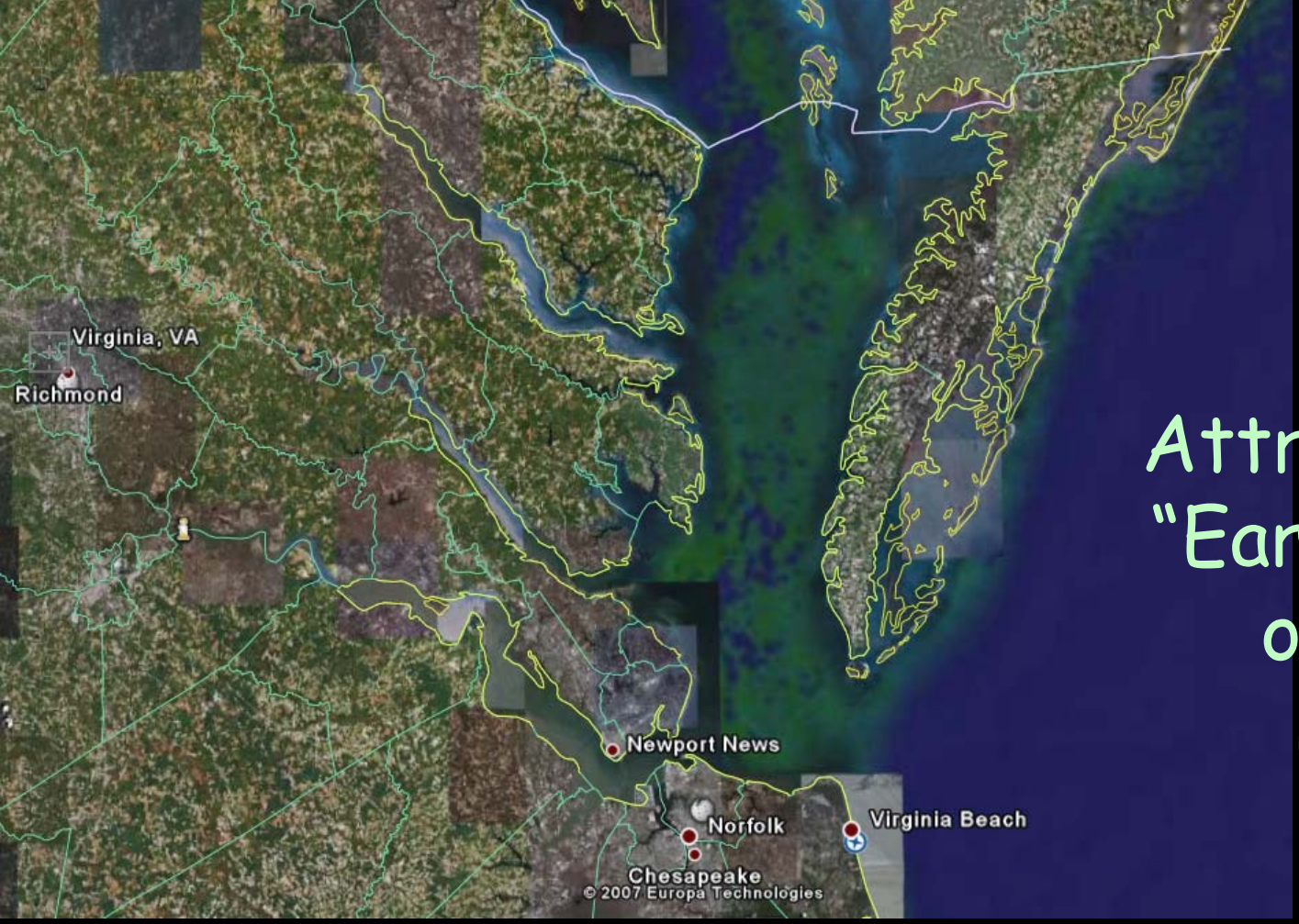
Crop	Oil Yield (L/ha)	Land Area Needed (M ha)[a]	Percent of Existing US Cropping Area [a]
Corn	172	1540	846
Soybean	446	594	326
Canola	1190	223	122
Jatropha	1892	140	77
Coconut	2689	99	54
Oil Palm	5950	45	24
Microalgae[b]	136,900	2	1.1
Microalgae[c]	58,700	4.5	2.5

[a] For meeting 50% of all transport fuel needs of the United States.
[b] 70% oil (by weight) in biomass.
[c] 30% oil (by weight) in biomass.
From : Chisti, Y. 2007. Biodiesel from microalgae. *Biotechnology Advances* **25** 294–306



Potential Biodiesel from Micro-algae Cultivation on Virginia's Agricultural Lands





Virginia Attractive as an "Early Adopter" of Marine Biofuels

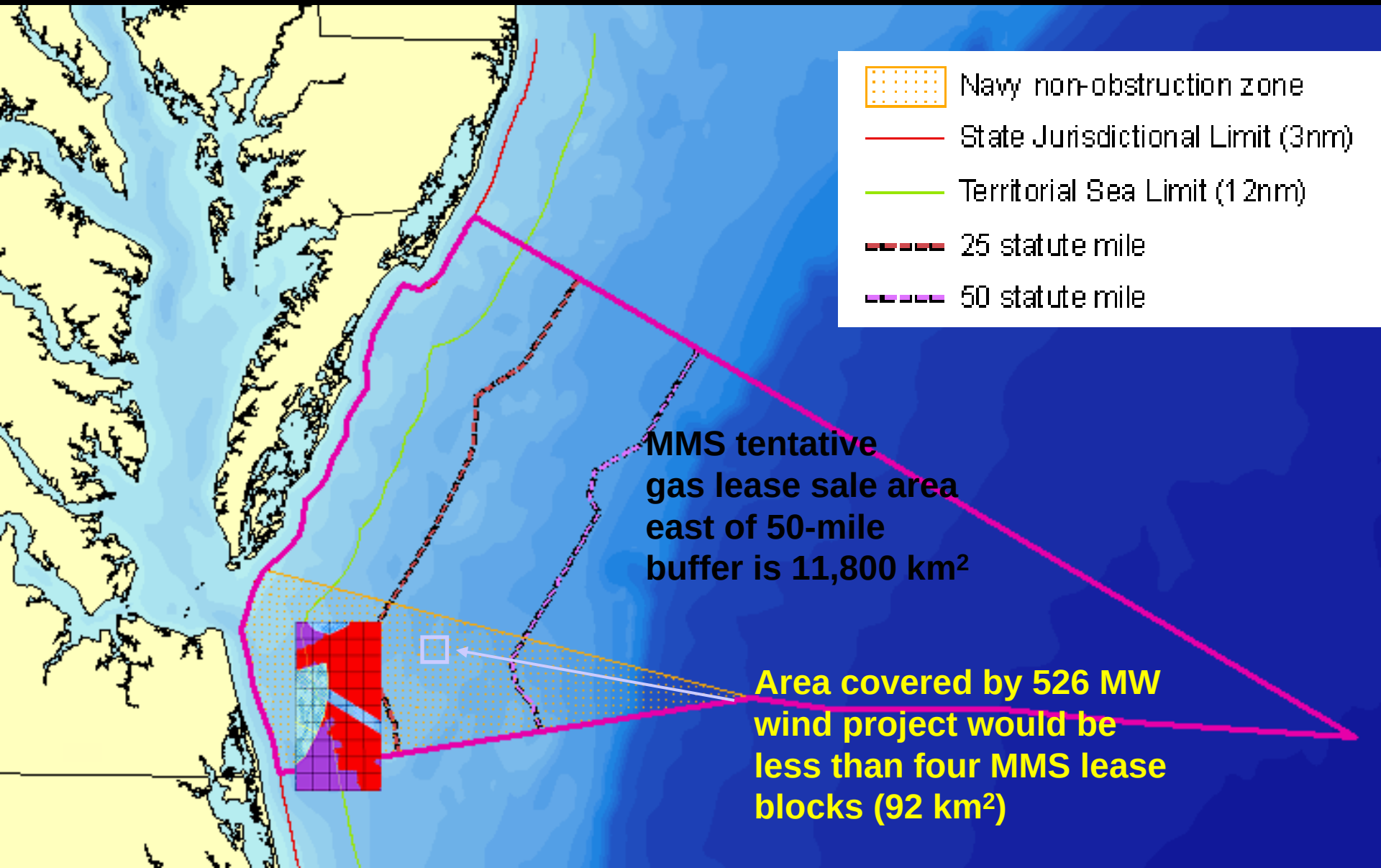
1. Plenty of sunshine on our coastal plain
2. Flat coastal areas for algal ponds close to fossil-fueled power plants (CO_2 source) and wastewater treatment facilities (nutrient source)
3. Waterways with excess algae which could be harvested and used

Test Site: Hampton Roads Sanitation District

Pilot Facility: Algal Farms, Inc., Surry County, Virginia

1-acre of parallel raceways will produce 3,000 gallons of biodiesel per year.
Next phase will be 200 acres, producing 600,000 gallons per year by 2011

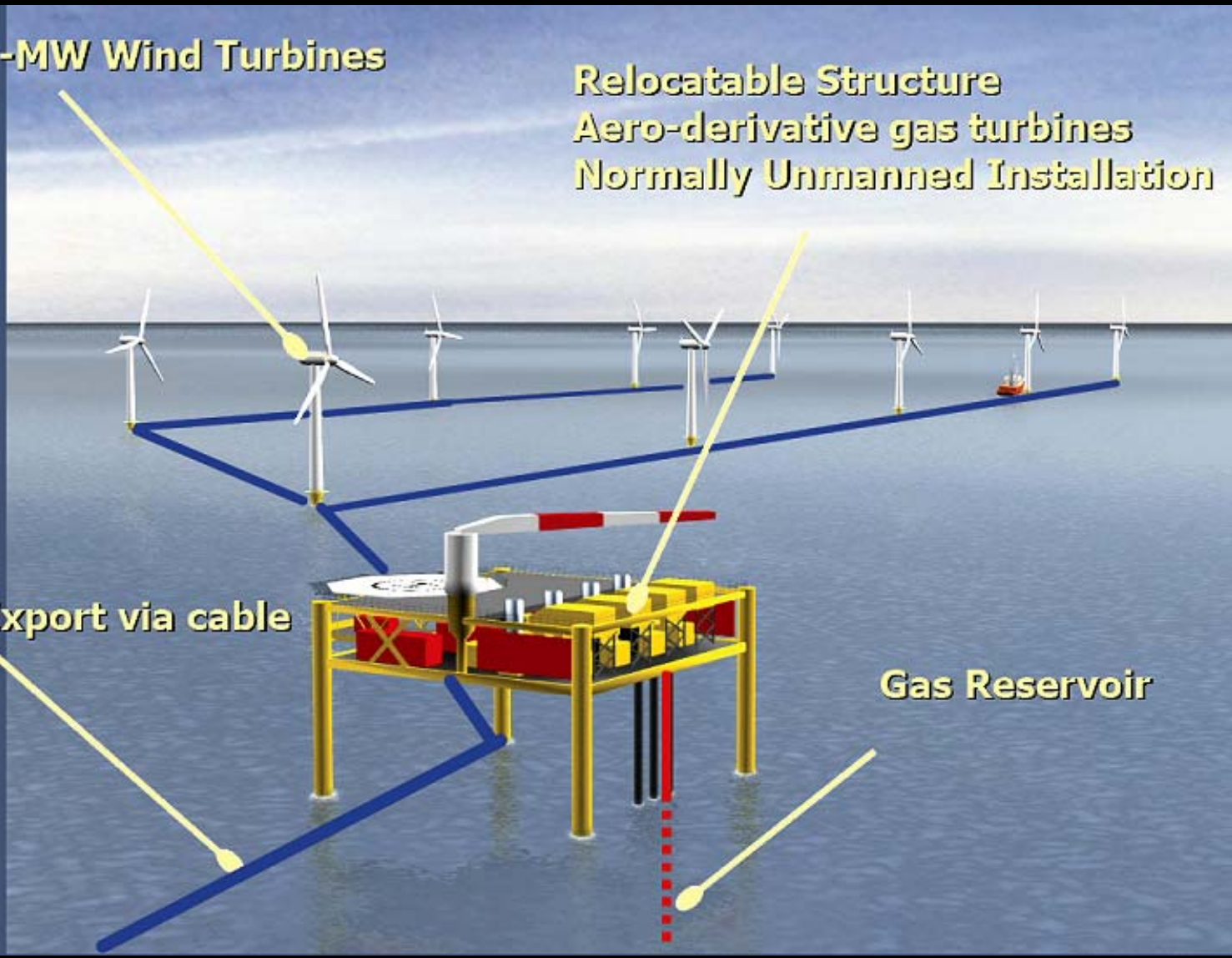
While it is Tempting to Consider a Choice: Offshore Wind OR Offshore Natural Gas …



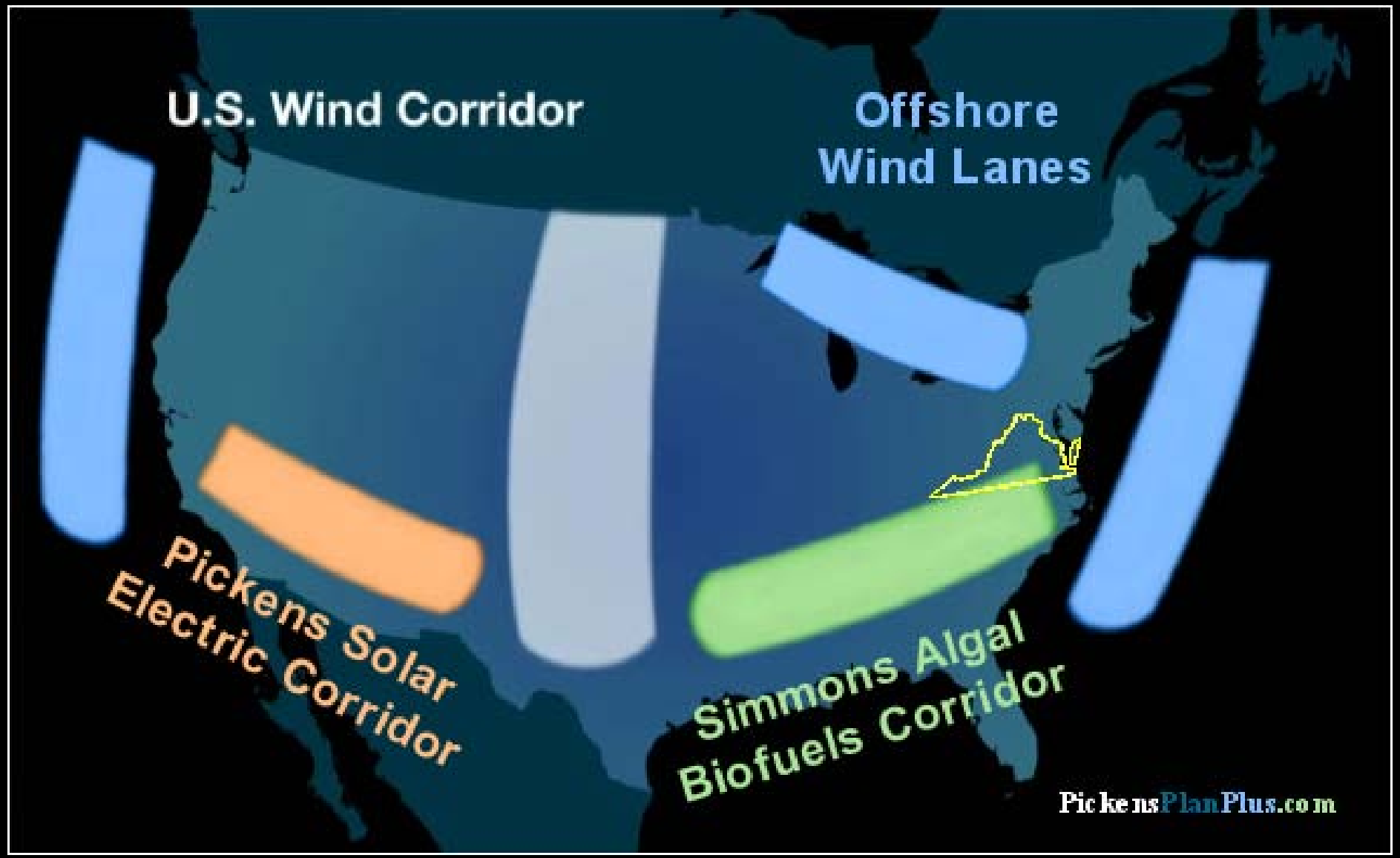
... Consider Offshore Wind AND Gas in a Hybrid Project for Firm, Dispatchable Power

ADVANTAGES:

- Provides high-value baseload power
- Avoids utility need for land-based "spinning reserve" to accommodate wind variability
- Submarine power cable to shore more secure, with less environmental impact than gas pipeline
- Avoids onshore siting challenge of finding cooling water for land-based gas power plants
- Prolongs offshore gas reservoir life for more secure future

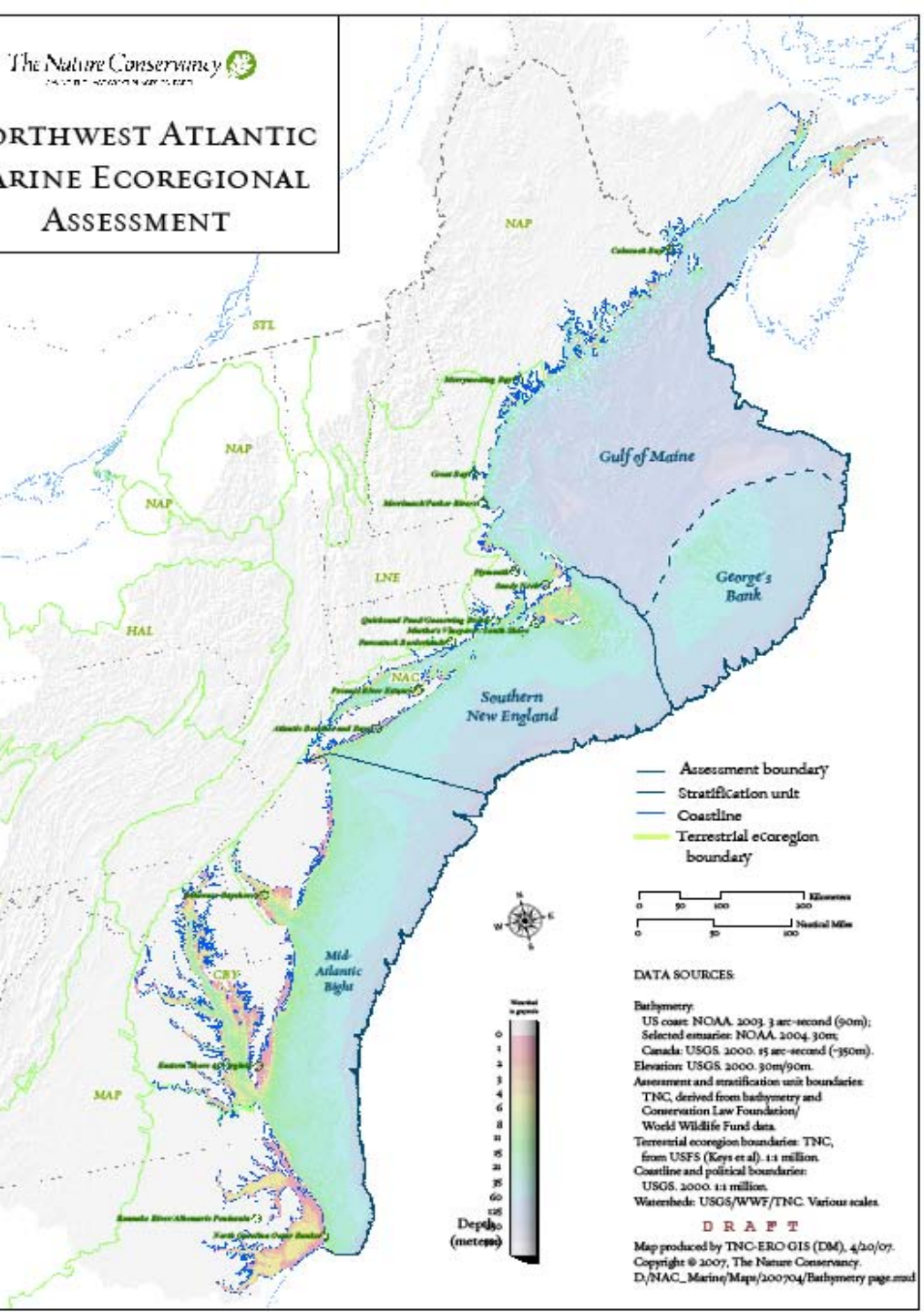


Virginia Could Participate Strongly in Both Offshore Wind and Marine Biofuels



2. Mapping of Offshore Habitats and Resources:

(VA CZM Grant to The Nature Conservancy)


The Nature Conservancy
ORTHWEST ATLANTIC
ARINE ECOREGIONAL
ASSESSMENT
NAP
STL
NAP
NAP
LNE
HAL
NACP
MAP
Gulf of Maine
George's Bank
Southern New England
Mid-Atlantic Bight
Assessment boundary
Stratification unit
Coastline
Terrestrial ecoregion boundary
DATA SOURCES:
Bathymetry:
US coast: NOAA. 2003. 3 arc-second (90m);
Selected estuaries: NOAA. 2004. 30m;
Canada: USGS. 2000. 15 arc-second (~350m).
Elevation: USGS. 2000. 30m/90m.
Assessment and stratification unit boundaries:
TNC, derived from bathymetry and
Conservation Law Foundation/
World Wildlife Fund data.
Terrestrial ecoregion boundaries: TNC,
from USFS (Keys et al). 1:1 million.
Coastline and political boundaries:
USGS. 2000. 1:1 million.
Watersheds: USGS/WWF/TNC. Various scales.
D R A F T
Map produced by TNC-ERO GIS (DM). 4/20/07.
Copyright © 2007, The Nature Conservancy.
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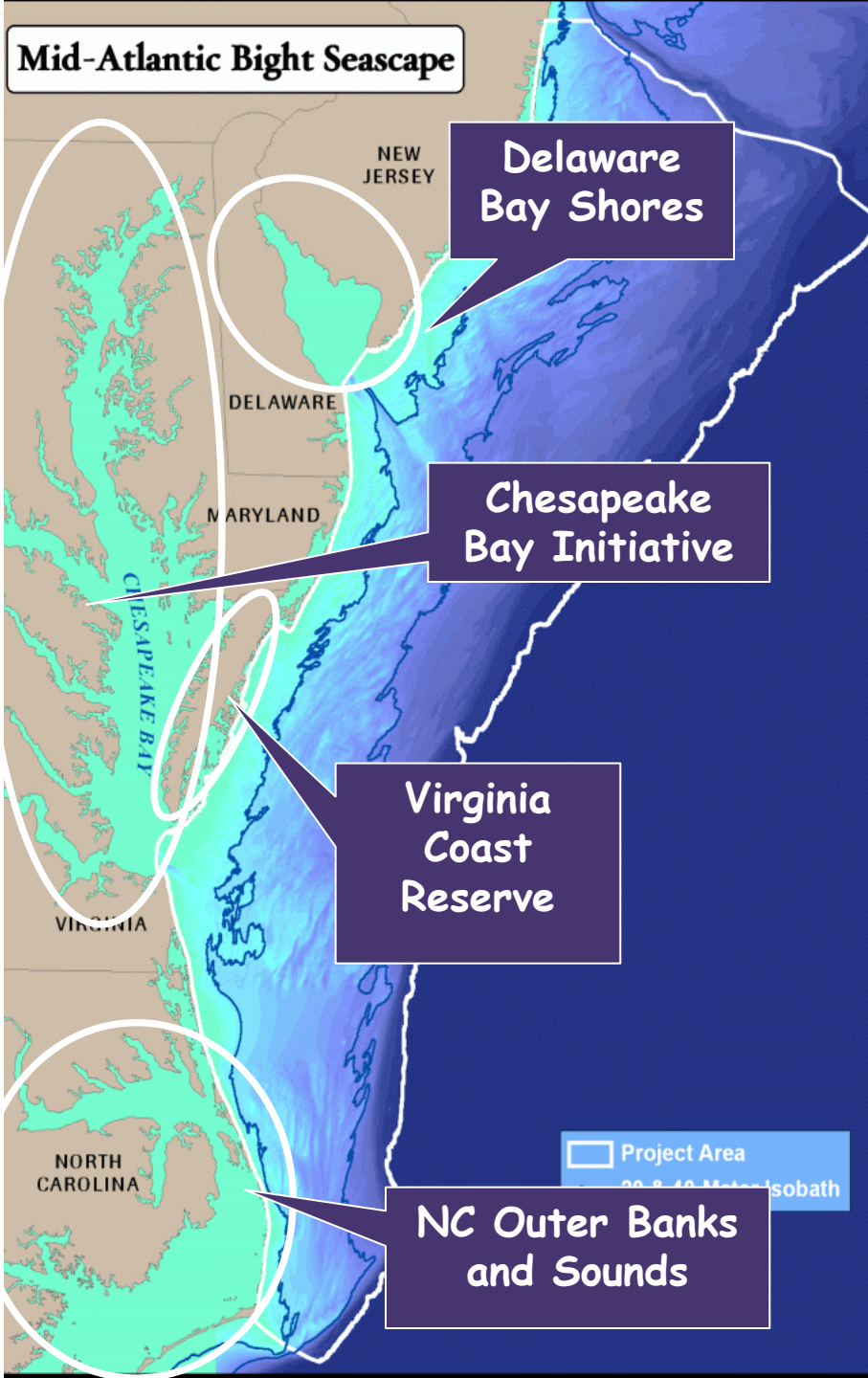
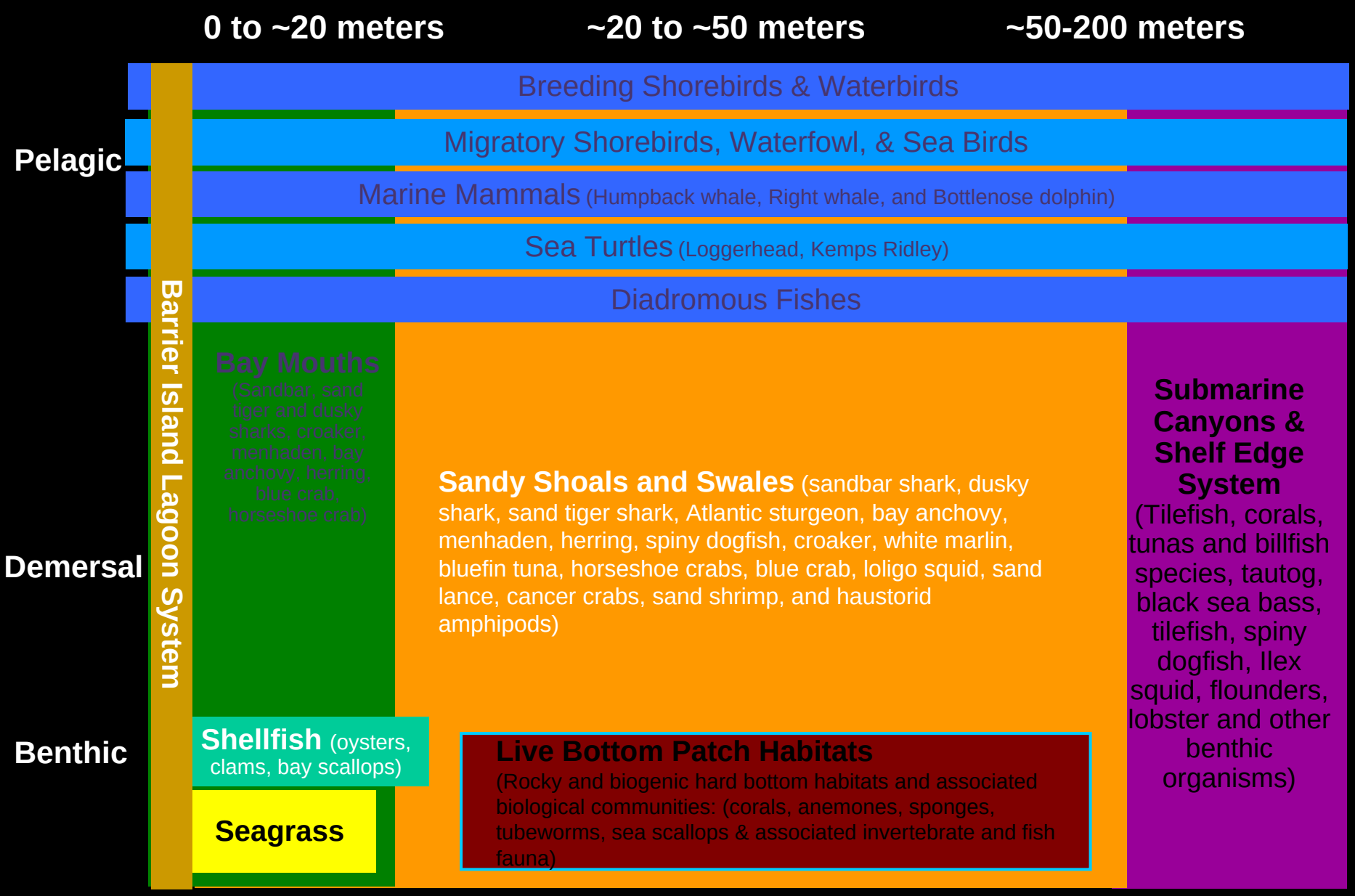
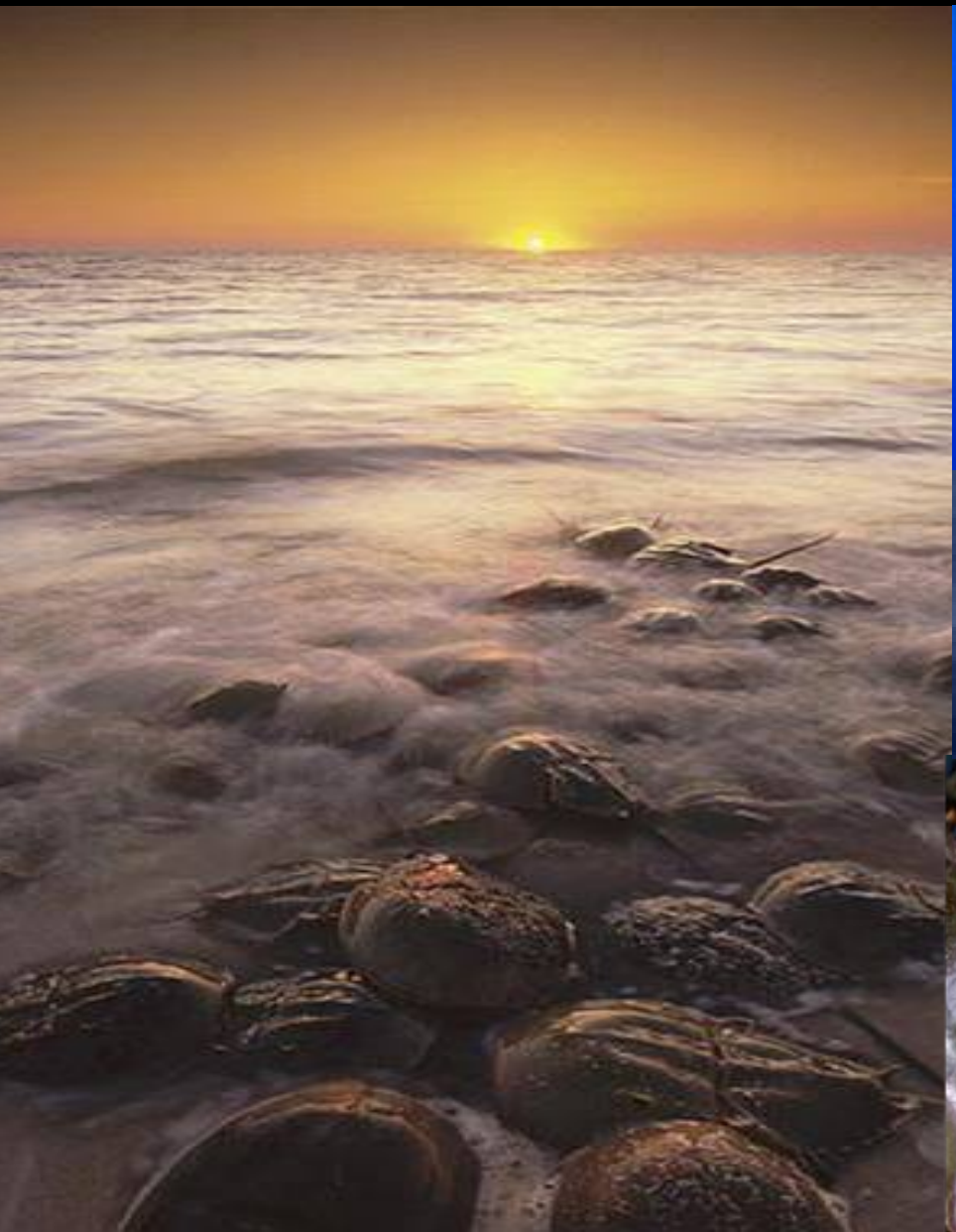

Mid-Atlantic Bight Seascape
NEW JERSEY
Delaware Bay Shores
DELAWARE
MARYLAND
Chesapeake Bay Initiative
CHESAPEAKE BAY
Virginia Coast Reserve
VIRGINIA
NORTH CAROLINA
NC Outer Banks and Sounds
Project Area

Mid-Atlantic Seascape Conservation Targets



Bay Mouths & Coastal Inlets



Sea Turtles (Loggerhead & Kemp's Ridley)

Marine Mammals

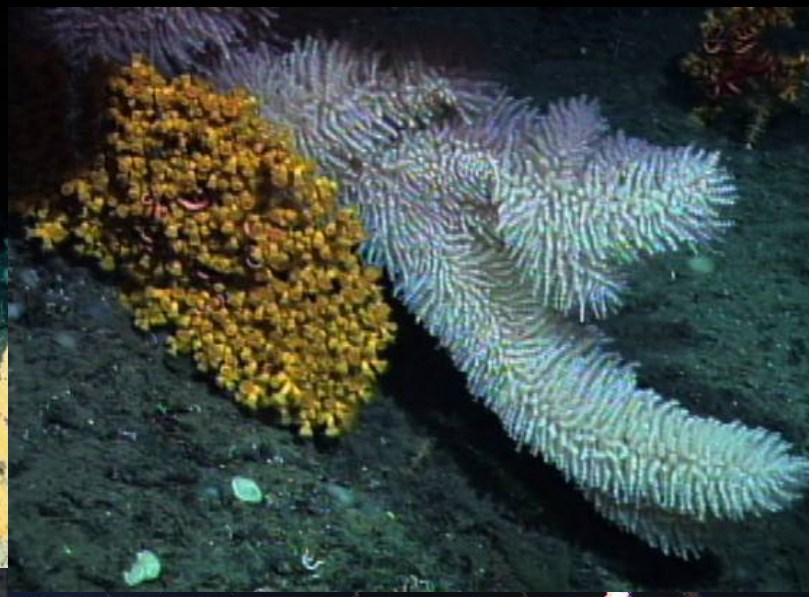
Right whale

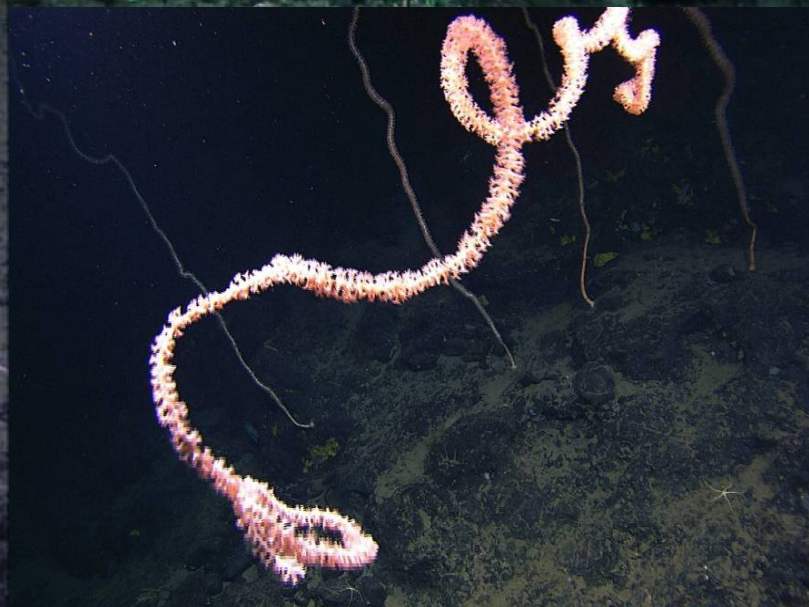
Bottlenose dolphin

Humpback whale

Sea Birds & Sea Ducks

Cold Water Corals

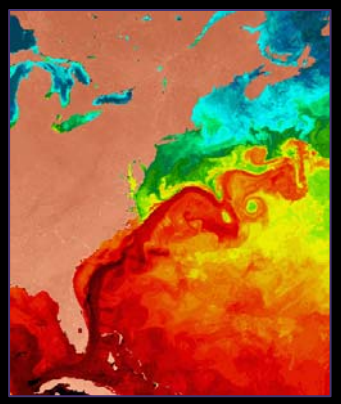




Mid-Atlantic Threats Summary

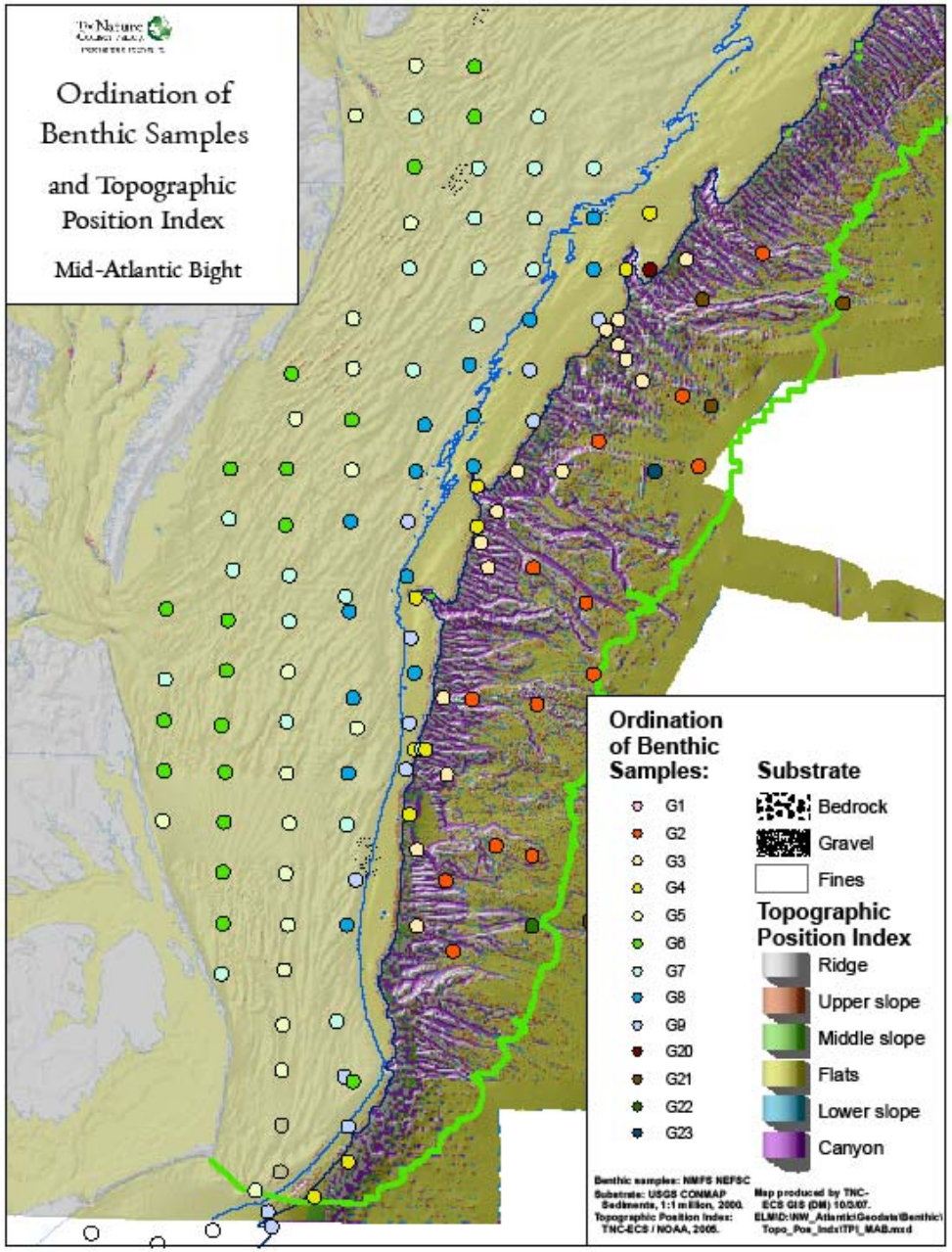
- Ocean acidification
- Ocean warming
- Shoreline hardening
- Bottom contact fishing
- Coastal sand mining
- Shoreline development
- Shipping lanes
- Energy development
- Gill nets
- Nutrient loading
- Invasive/aggressive spp.







Ecological Marine Units (EMUs)



Physical factors:

Bathymetry

Temperature

Topographic Position

Percent gravel

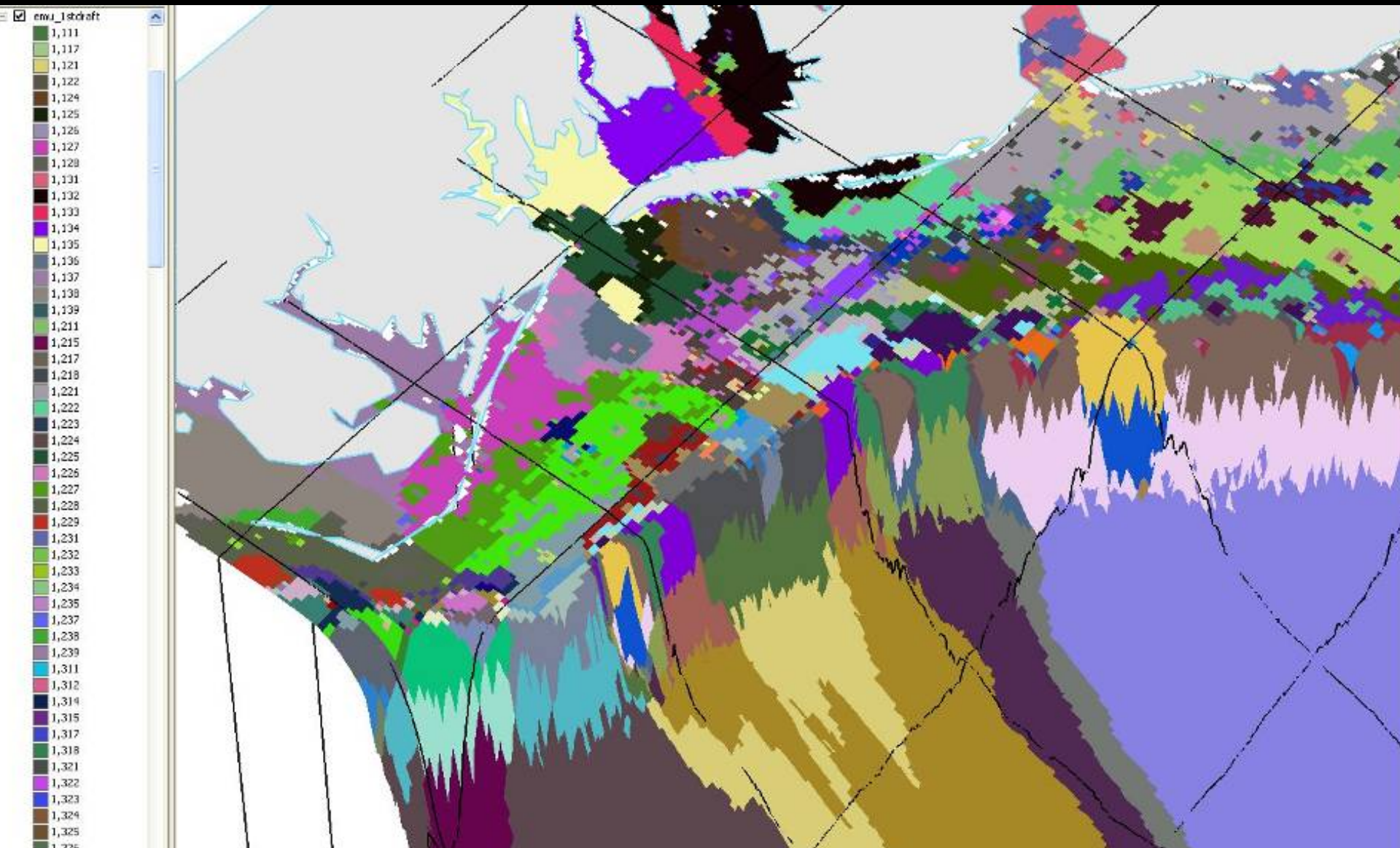
Percent sand

Percent silt

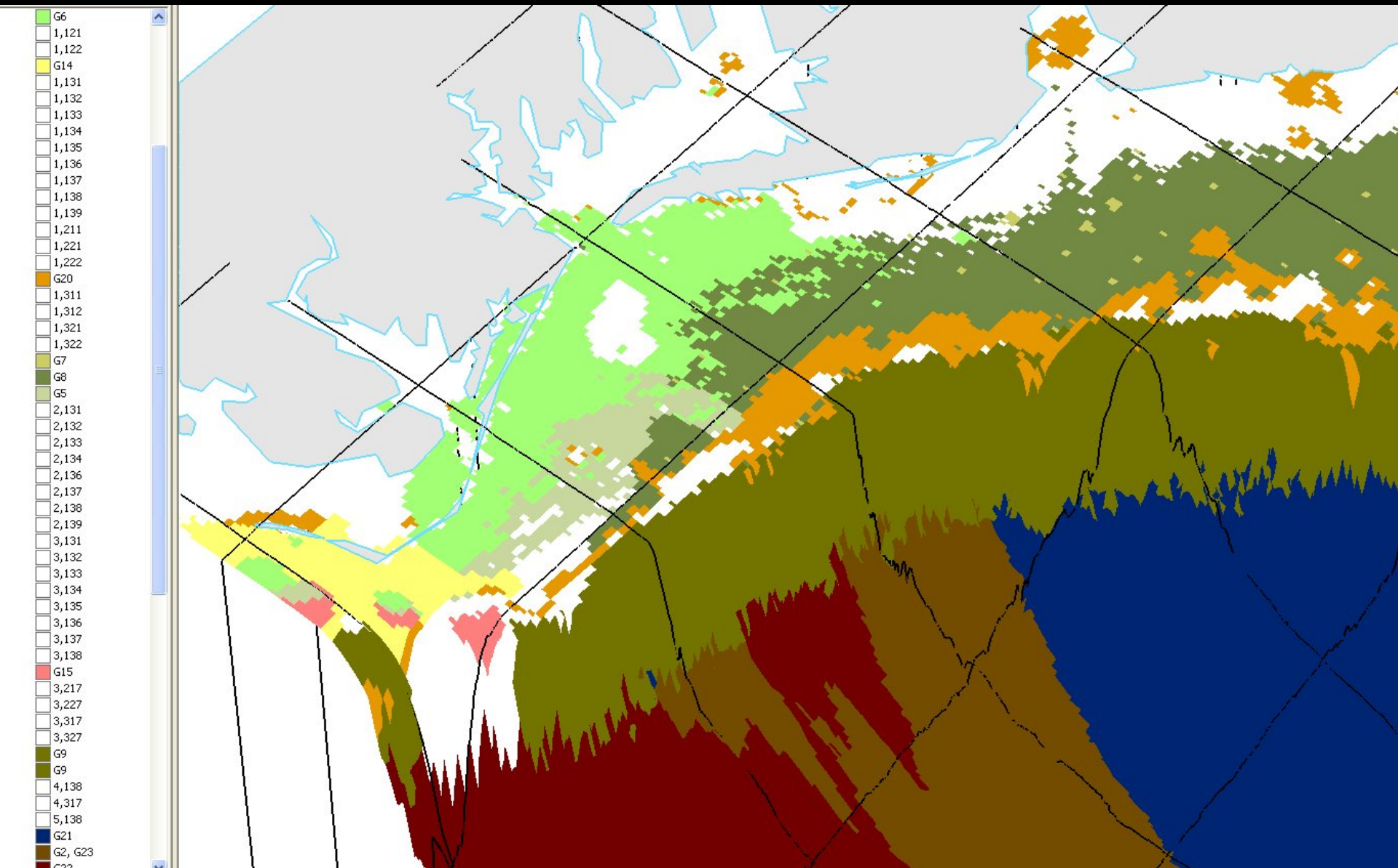
Percent clay

All possible combinations:

bathymetry X temperature X substrate type X topo position



Benthic Habitats: smoothed based on species composition differences



Northwest Atlantic
Marine Ecoregional Assessment

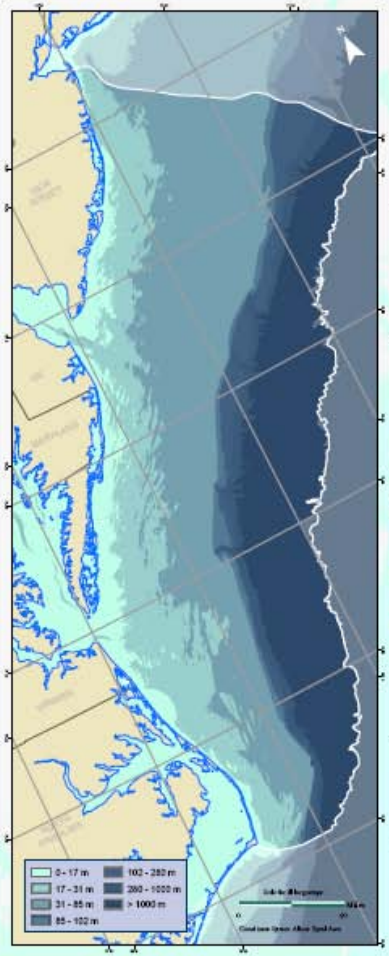
Ecological Marine Units

First Iteration for the Mid-Atlantic Bight

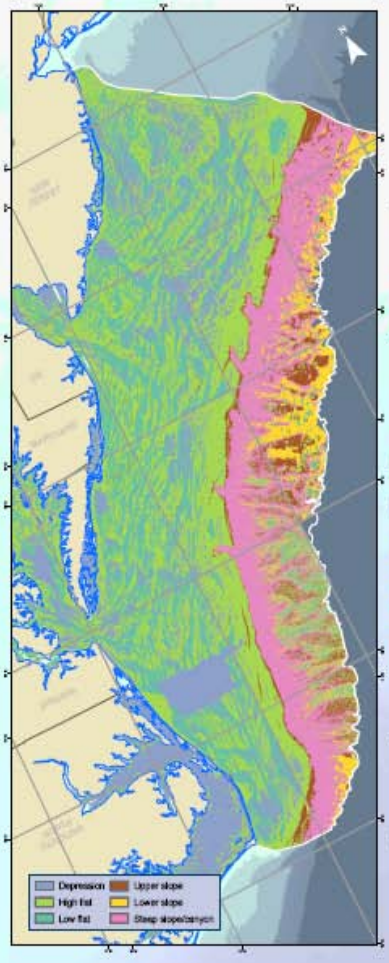
The Nature Conservancy — Protecting nature. Preserving life.

Virginia Coastal Zone Management Program

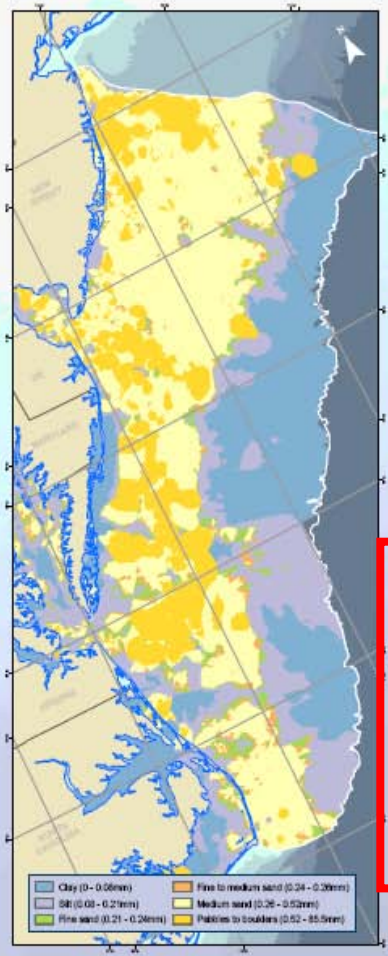
Depth



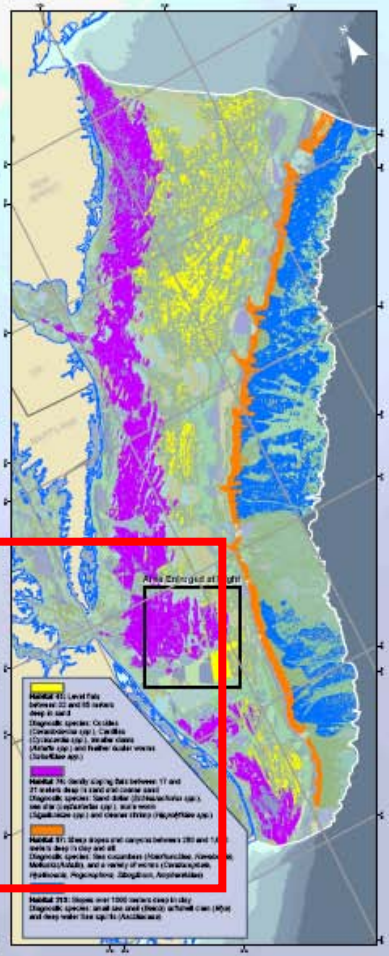
Seabed Form



Grain Size

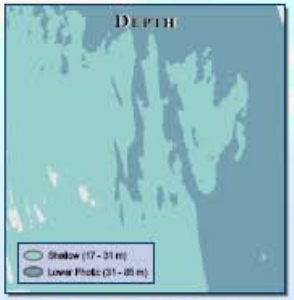


Ecological Marine Units (Draft Example)

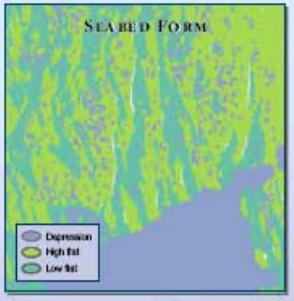


Area of Detail

Depth



Seabed Form

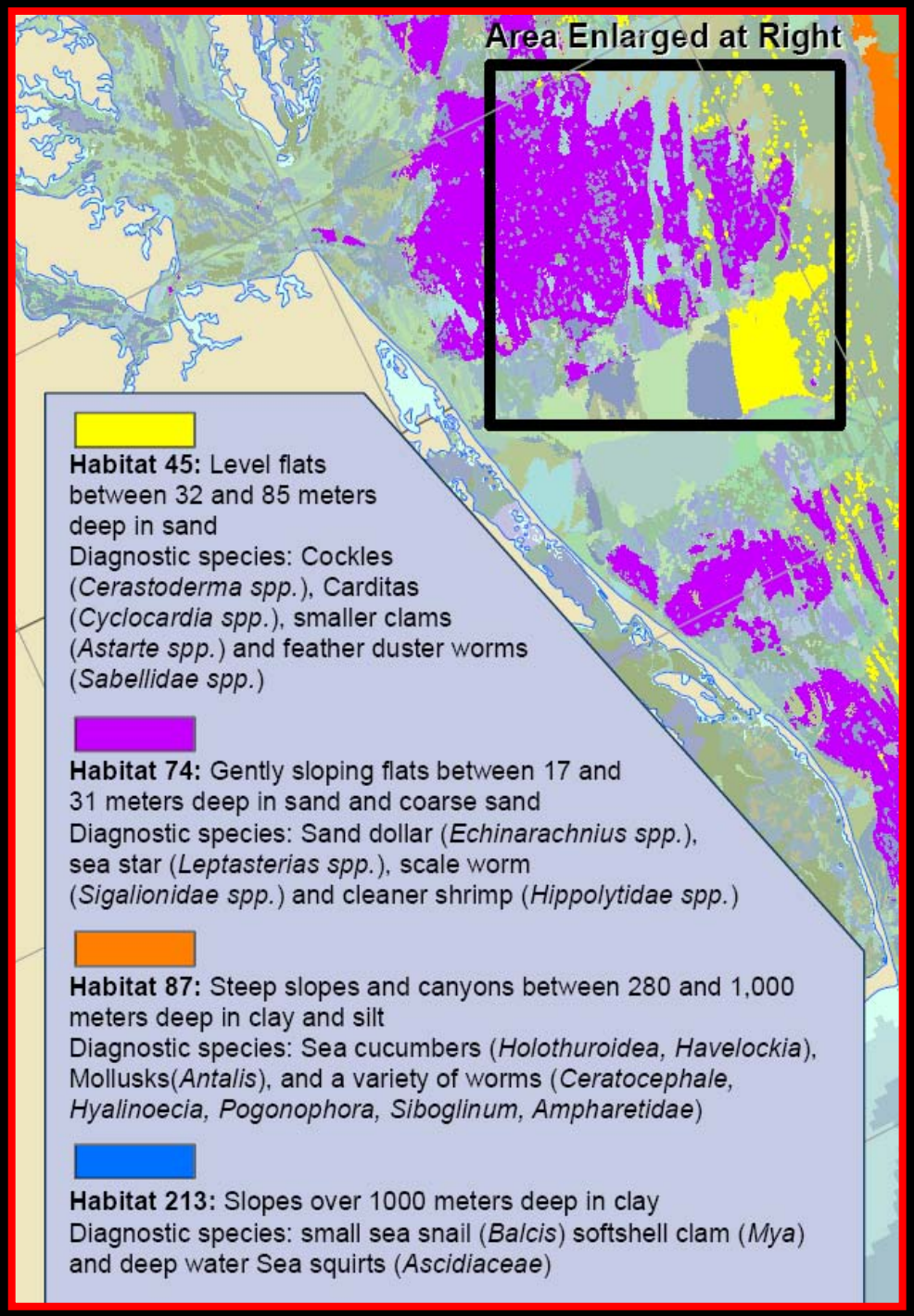


Grain Size

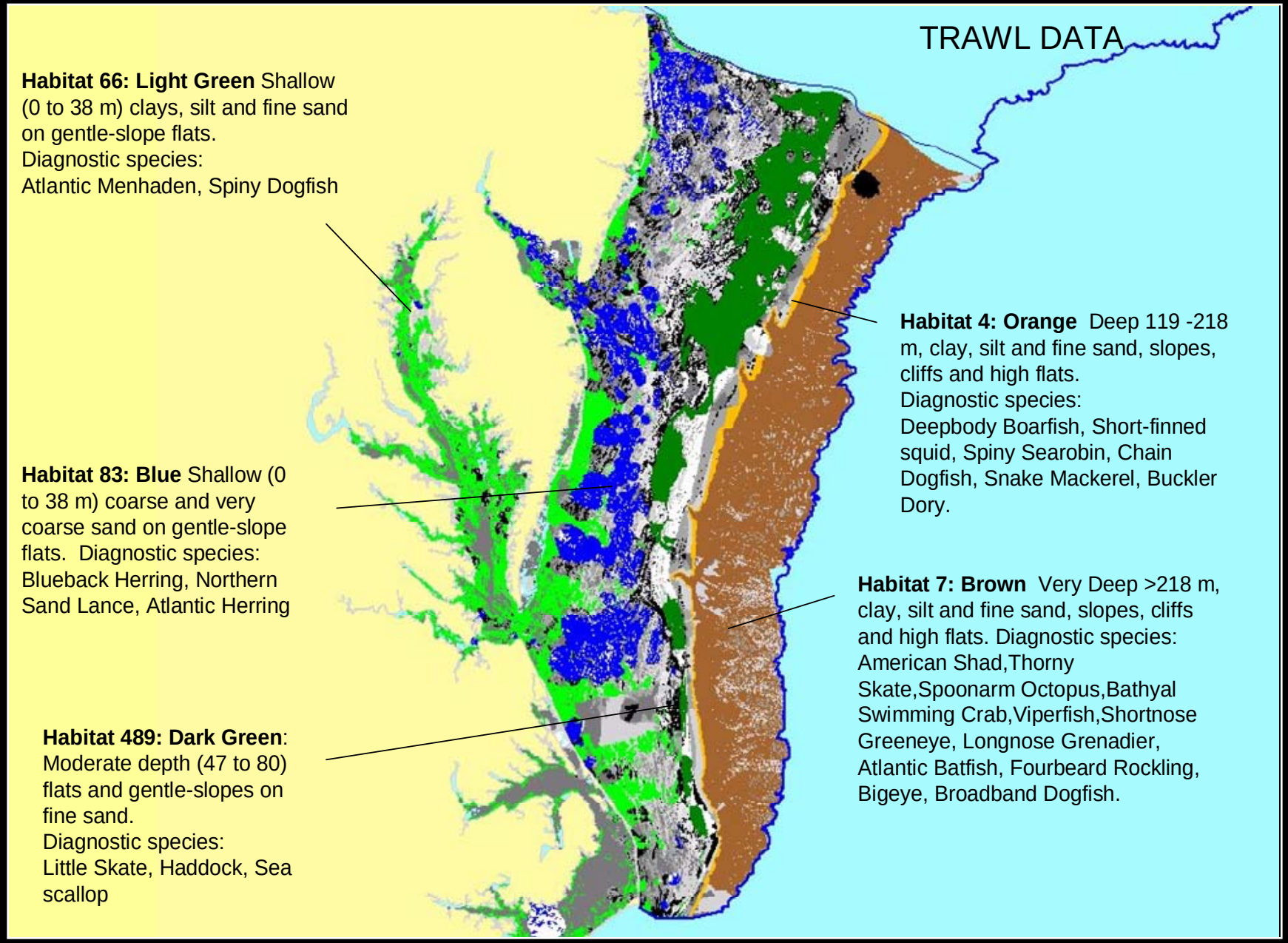
Ecological Marine Units

Habitat 74
Depth: Shallow
Seabed Form: Low Flat & High Flat
Grain Size: Medium Sand & Pebbles to Boulders

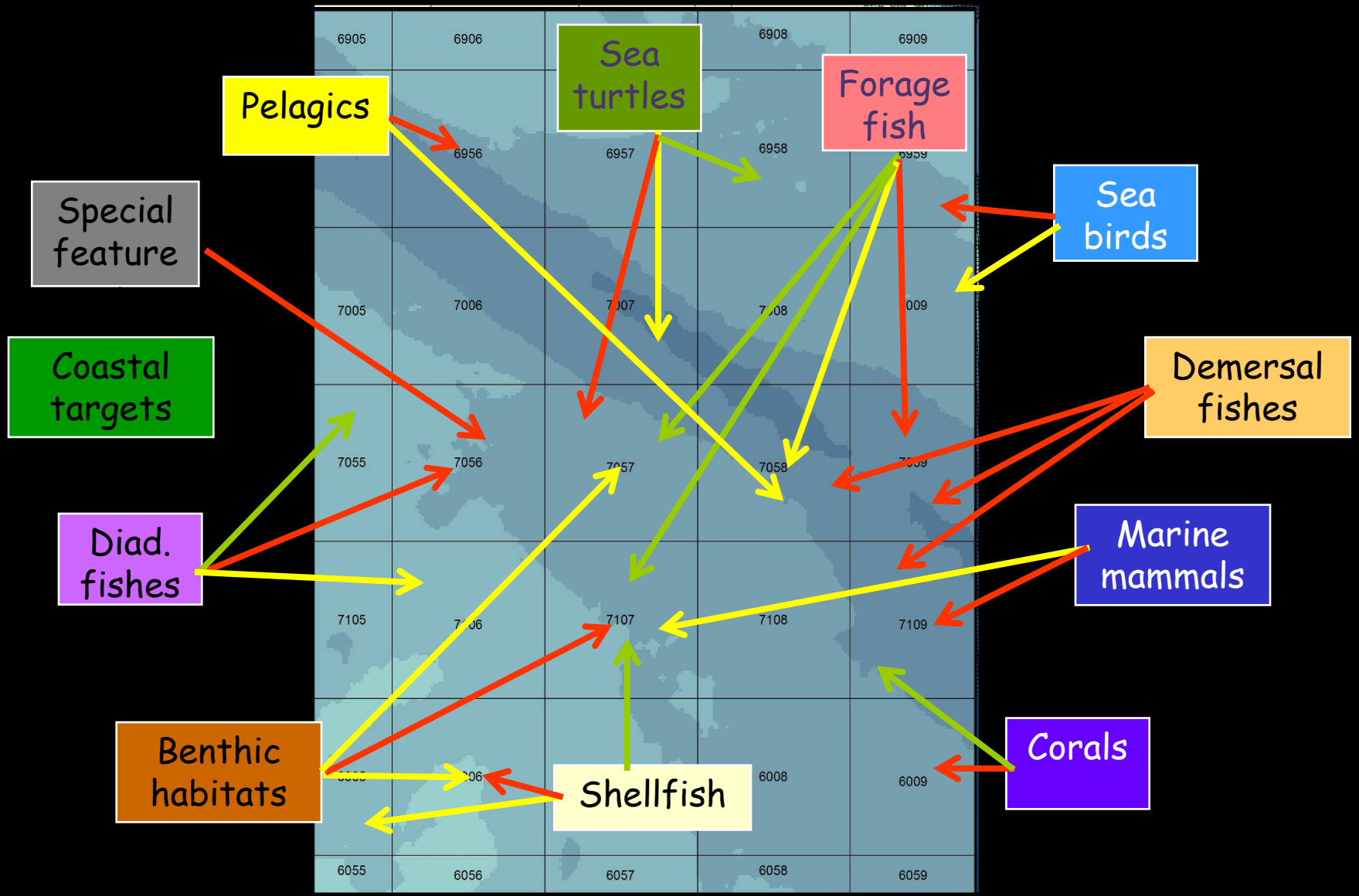
Habitat 45
Depth: Lower Photic
Seabed Form: Depression
Grain Size: Medium Sand

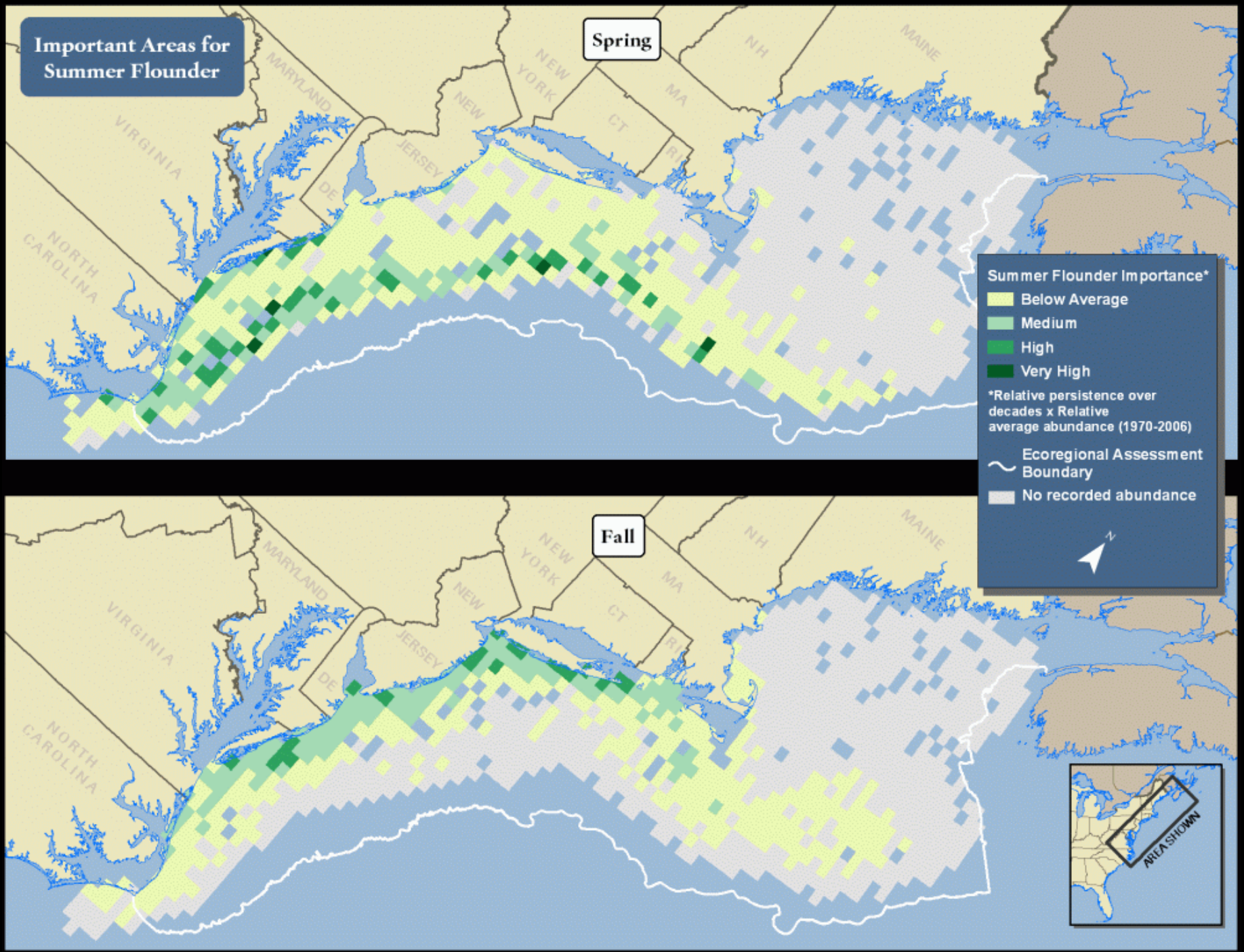

Area Enlarged at Right
Habitat 45: Level flats between 32 and 85 meters deep in sand
Diagnostic species: Cockles (Cerastoderma spp.), Carditas (Cyclocardia spp.), smaller clams (Astarte spp.) and feather duster worms (Sabellidae spp.)
Habitat 74: Gently sloping flats between 17 and 31 meters deep in sand and coarse sand
Diagnostic species: Sand dollar (Echinarachnius spp.), sea star (Leptasterias spp.), scale worm (Sigalionidae spp.) and cleaner shrimp (Hippolytidae spp.)
Habitat 87: Steep slopes and canyons between 280 and 1,000 meters deep in clay and silt
Diagnostic species: Sea cucumbers (Holothuroidea, Havelockia), Mollusks(Antalis), and a variety of worms (Ceratocephale, Hyalinoecia, Pogonophora, Siboglinum, Ampharetidae)
Habitat 213: Slopes over 1000 meters deep in clay
Diagnostic species: small sea snail (Balcis) softshell clam (Mya) and deep water Sea squirts (Ascidiaceae)

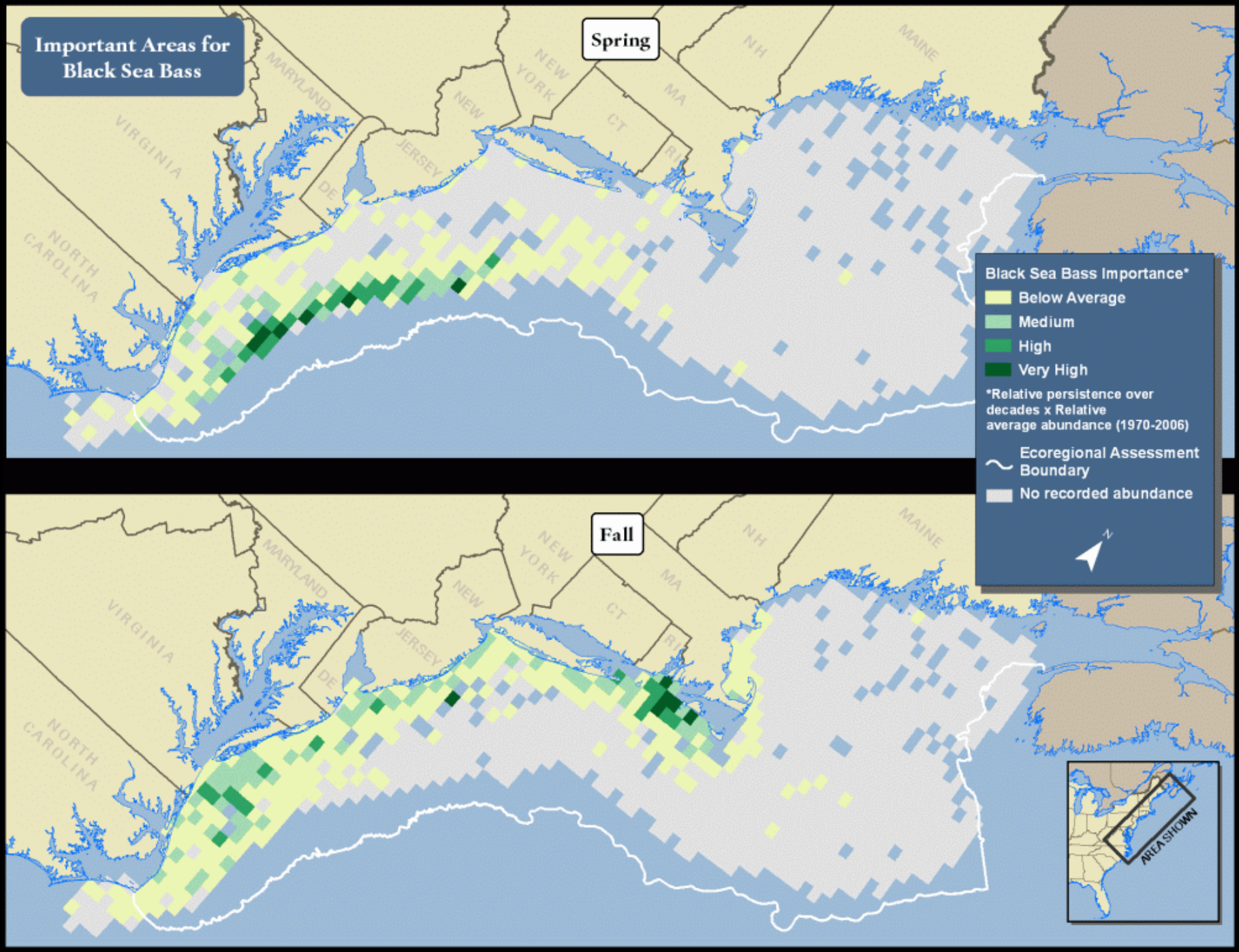
Next steps: Integrate demersal fish data



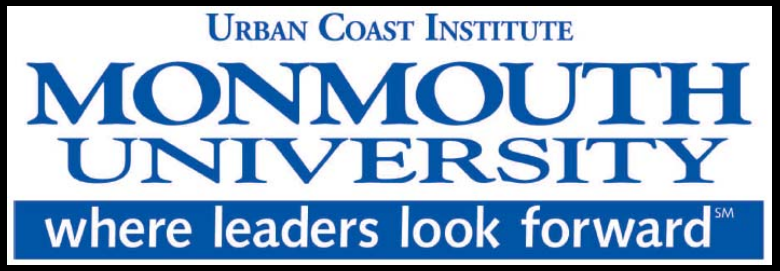
Integrating Importance Values for All Targets:
Each cell "knows" what's in it, and relative importance for each target type




Important Areas for Summer Flounder
Spring
Fall
MARYLAND
VIRGINIA
NORTH CAROLINA
DE
NEW JERSEY
NEW YORK
CT
RI
MA
NH
MAINE
Summer Flounder Importance*
Below Average
Medium
High
Very High
*Relative persistence over decades x Relative average abundance (1970-2006)
Ecoregional Assessment Boundary
No recorded abundance
N
AREA SHOWN


Important Areas for Black Sea Bass
Spring
Fall
MARYLAND
VIRGINIA
NORTH CAROLINA
DE
NEW JERSEY
NEW YORK
CT
RI
MA
NH
MAINE
Black Sea Bass Importance*
Below Average
Medium
High
Very High
*Relative persistence over decades x Relative average abundance (1970-2006)
Ecoregional Assessment Boundary
No recorded abundance
N
AREA SHOWN

December in Baltimore: Mid-Atlantic Ocean Forum



February in Manhattan: Mid-Atlantic Ocean Summit

3. Legal Analysis:

(VA CZM Grant to Environmental Law Institute)

Summary Findings of ELI

1. Virginia's laws and policies are generally sufficient to address anticipated environmental impacts from proposed offshore energy development, and are comparable to those of other coastal states that anticipate such development on a case-by-case basis.

2. However, Virginia has not adopted laws and policies that affirmatively assist in facilitating offshore energy development review.

3. Virginia also could benefit from information gathering and from policies that could allow advance identification of suitable areas for offshore energy transmission and support facilities.

4. In addition, Virginia has a number of articulated energy policies that are not reflected in enforceable legislation or regulations in ways that would ensure the desired outcomes in federal or state permitting.

15 Recommendations of ELI

1. Enact legislation or by executive order or other means establish a single administrative process that coordinates the development and review of energy facilities in state and federal coastal waters.

2. Map ocean and coastal resources and identify potential use conflicts.

3. Enact legislation to prevent location of OCS oil & gas support facilities on the Eastern Shore without approval of the General Assembly and Governor.

4. Authorize the designation of preferred corridors for electric transmission and gas pipelines through Virginia's coastal waters.

5. Adopt an enforceable provision that "energy generation and delivery systems…should be located so as to minimize impacts to pristine natural areas and other significant onshore natural resources, and as near to compatible development as possible."

6. Require directional drilling for bringing transmission pipelines and (possibly) electric lines ashore and protecting dunes, wetlands, barrier islands.

7. Adopt provisions for state review of visual impacts for facilities in state waters.

8. Improve coordination with local land use planning and zoning.

9. Enhance the opportunity for environmental review in advance of lease sales on the OCS.

10. Apply fish/fisheries protection to facility *operation* as well as *construction*.

11. Adopt enforceable provisions to protect birds, bats, fish, and wildlife.

12. Virginia should review its applicable water quality standards for marine waters for Clean Water Act 401 certification.

13. Assure that the State Corporation Commission is able to apply environmental standards and conditions that may arise from offshore activities and transmission and support facilities subject to licensing.

14. Consider adopting provisions addressing decommissioning, fees, bonds, and similar provisions related specifically to offshore energy and related pipeline and transmission facilities.

15. Make administrative changes to the Virginia CZM Program's review processes to anticipate offshore energy proposals and impacts by:

    (A) Updating the Program's energy facilities review process

    (B) Revising Virginia's coastal consistency lists to include certain additional activities such as ROW for electricity transmission lines.

Questions?

Laura McKay
Virginia CZM Program
(804) 698-4323
Laura.McKay@deq.virgnia.gov