

BOEM

Bureau of Ocean Energy
Management

Collaboration and Decision Making with Ocean Mapping and Reporting Tools

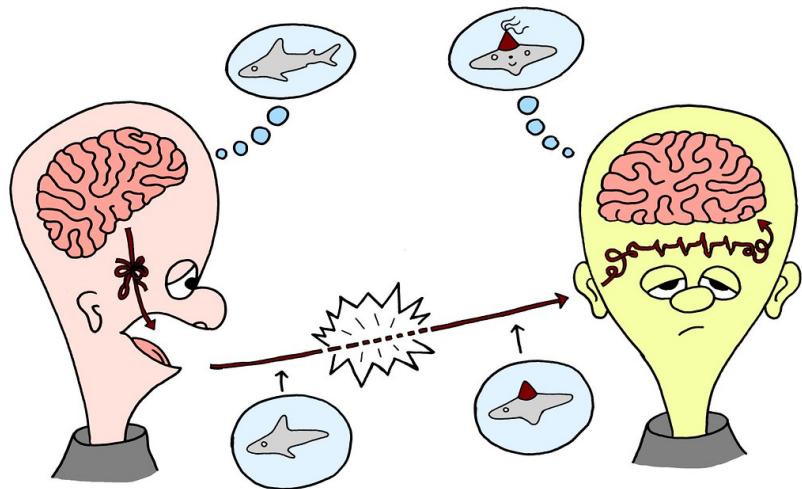
Christine Taylor (BOEM)

Maritime Industry Knowledge Exchange– 8/19/2021

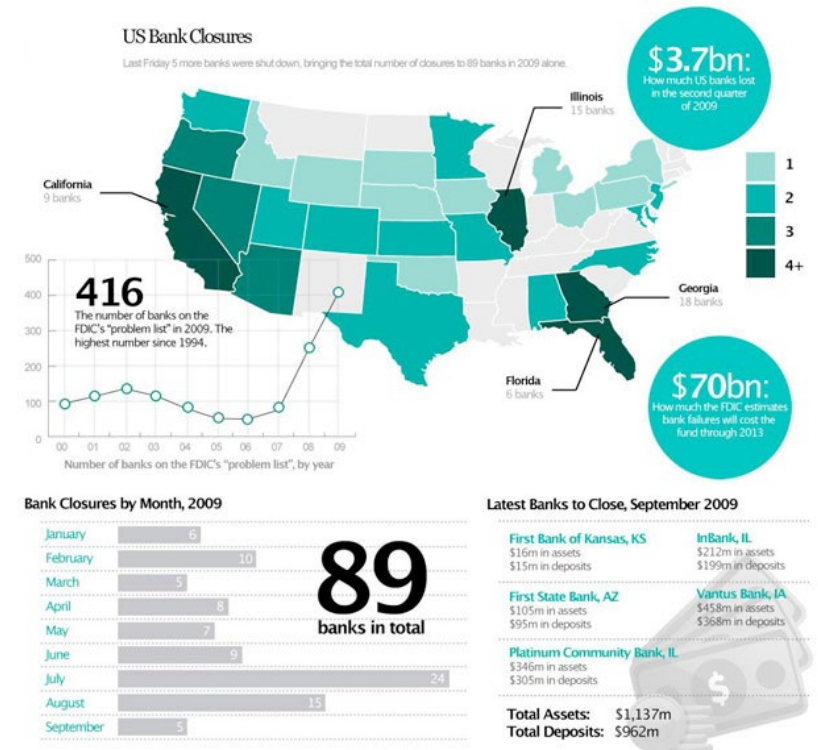


Maps...

- Are important visuals for communications
 - Get everyone on the same page quickly
- Provide a quick way to discern multiple on the ground/in the water issues at hand
 - Best locations for a project – physical conditions, distance to a resource
 - Potential conflicts for use – physical conditions, other uses, species interactions
- Often provide data that is actionable
- Easily **shared** in a digital format and can be updated with other existing data to help tell the whole story



OR



Maps & Decision Tools

- **MarineCadastre.gov**
 - Authoritative, mostly federal data
 - Map viewer/ID tools/Data download
 - Historical AIS data
- **Regional Ocean Data Portals**
 - Authoritative, federal, state, local data
 - Map viewer/ID tools/Data download
 - Maps by topic area
- **Ocean Reports**
 - Map viewer/Custom Area Report/Data download/Data from MarineCadastre.gov
 - A MarineCadastre.gov Tool

MarineCadastre.gov

Data Maps Uses Tools News About

An Ocean of Information

A joint BOEM and NOAA initiative providing authoritative data to meet the needs of the offshore energy and marine planning communities.

DATA EXPLORER

Define and view any combination of data on one map

LAUNCH DATA EXPLORER

OceanReports

TRANSPORTATION AND INFRASTRUCTURE

Custom Area 26.56 nautical miles from Winter Harbor, ME

The United States Marine Transportation System is essential to the American economy. It supports millions of American jobs, facilitates trade, and safely moves people and goods. This report provides a snapshot of the infrastructure and activities of the marine transportation sector along the coast of the United States.

Vessel Count

These data show the approximate number of vessels over 60 feet transiting the ocean within the U.S. Exclusive Economic Zone over a one year period. This count is based on the vessel automatic identification system (AIS) vessel traffic reports received by MarineCadastre.gov in collaboration with the U.S. Coast Guard. Understanding where vessels transiting can help identify conflicts between various ocean uses. Vessel count can be highly variable across an area, so the average displayed may not be representative of the entire area. Turn on the data layer to understand the spatial distribution. Not shown here are any vessels classified as the following: military, not available, not identified, and, or other.

Type	Min	Mean	Max
All	1	226	115
Cargo	1	128	5
Fishing	1	142	108
Passenger	1	208	38
Pleasure	1	139	7
Tanker	1	182	26
Tugboat	1	107	5

SHOW FINE-SCALE TYPES

Showing the minimum, maximum, and mean of vessel counts by type within the report area.


Vessel Routing

Vessel routing measures designate traffic lanes, precautionary, and other geographic features with a primary purpose for navigation over all other uses. The presence of a traffic lane or precautionary area will help limit the

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 Features



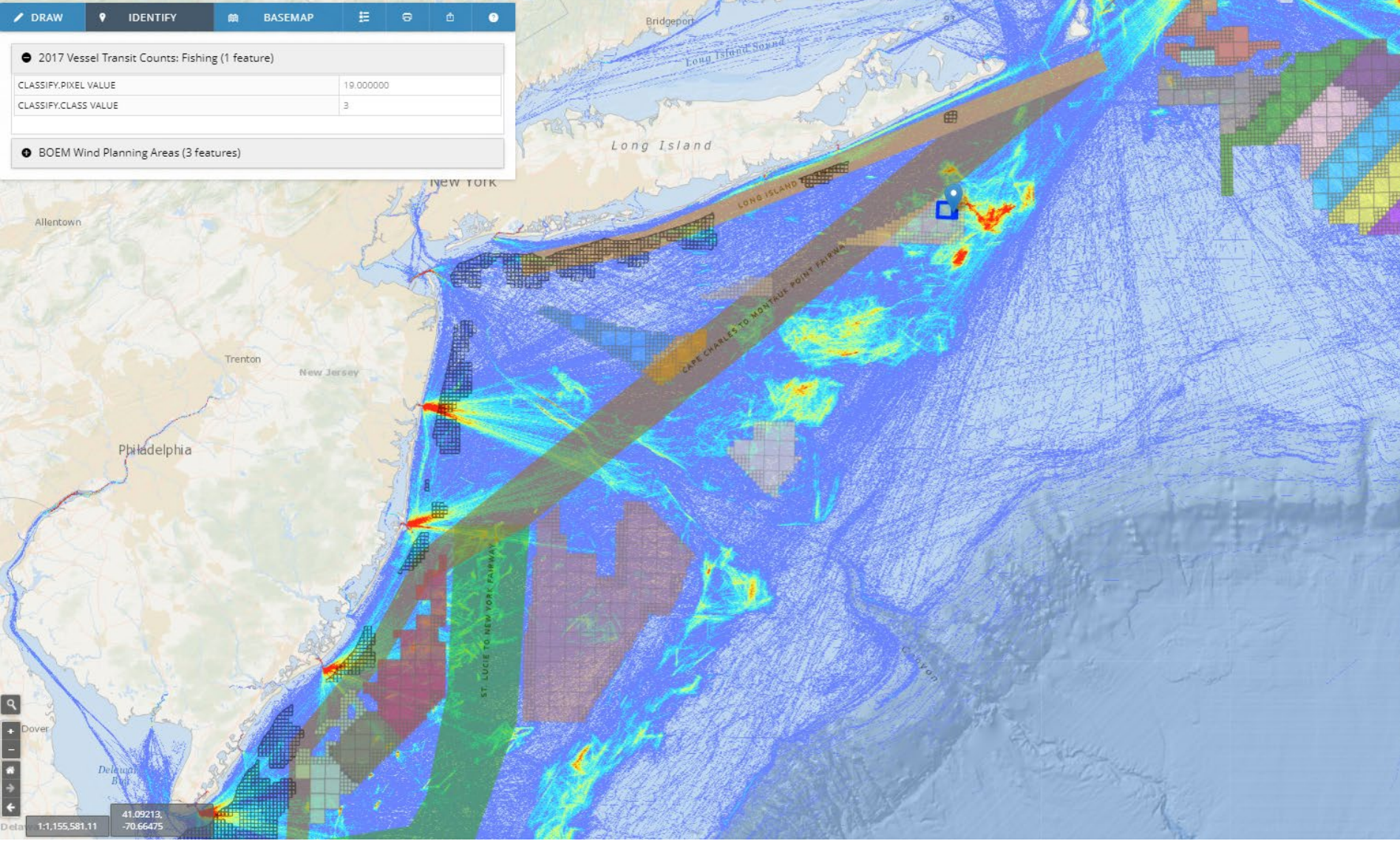
MarineCadastre.gov – Map Viewer

Marine Cadastre National Viewer

Map navigation and tool icons: DRAW, IDENTIFY, BASEMAP, and others.

● 2017 Vessel Transit Counts: Fishing (1 feature)	
CLASSIFY.PIXEL VALUE	19.000000
CLASSIFY.CLASS VALUE	3

● BOEM Wind Planning Areas (3 features)	
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Map interface controls including layer management and search filters.

HIDE LAYERS

ALL LAYERS | **ACTIVE LAYERS** (7)

Search: Filter by tags Nearby Layers Sort by Active

MATCHING LAYERS 26

- 2015 Vessel Transit Counts: All Vessels
- 2016 Vessel Transit Counts: All Vessels
- 2016 Vessel Transit Counts: Cargo
- 2016 Vessel Transit Counts: Fishing
- 2016 Vessel Transit Counts: Passenger
- 2016 Vessel Transit Counts: Pleasure Craft and Sailing
- 2016 Vessel Transit Counts: Tanker
- 2016 Vessel Transit Counts: Tug and Tow
- 2017 Vessel Transit Counts: All Vessels
- 2017 Vessel Transit Counts: Cargo



MarineCadastre.gov – Map Viewer

Marine Cadastre National Viewer

DRAW IDENTIFY BASEMAP

Copy the link below to share.
<https://bit.ly/2RbbQMm>

BOEM Wind Planning Areas (1 feature)

VIEW IN ARCGIS.COM

Marine Mammal Species Richness
MARINE-LIFE DATA AND ANALYSIS TEAM

DATA SERVICES MORE INFO

LEGEND PATCH

21
20
19
18
17
16
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13
12
11
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1

ADDITIONAL KEYWORDS

ANIMALS ATLANTIC CETACEAN DUKE
HABITAT MAMMALS MARINE MDAT



MarineCadastre.gov – Map Viewer

ArcGIS My Map Open in new Map Viewer

Details Add Basemap Save Print Measure Bookmarks Find address or place

About Content Legend

Contents

- PhysicalOceanographicAndMarineHabitat - Atlantic Seafloor Sediment CONMAP
- BOEM Wind Planning and Lease Areas - BOEM Wind Planning Areas
- BOEM Wind Planning and Lease Areas - BOEM Wind Leases
- PlanningandAdministration - Atlantic OCS Aliquots with Sand Resources
- CoastalEnergyFacilities
- CetaceanBiologicallyImportantAreas Migration
- AtlanticCoastPortAccessRouteStudyAreas
- 2017VesselTransitCounts Fishing
- AtlanticCoastPortAccessRouteStudyPotentialFairways
- Topographic

The map displays a coastal region from New York to Delaware, overlaid with various colored planning areas and facilities. A dialog box is open in the foreground, titled 'Add Layer from File', which lists supported file formats: Shapefile (ZIP archive), CSV or TXT files, GPX, and GeoJSON. A 'Choose File' button is highlighted with a mouse cursor.

Add Layer from File

Locate the file you want to import.

- Shapefile (ZIP archive containing all shapefile files)
- CSV or TXT files with optional address, place or coordinate locations (comma, semi-colon or tab delimited)
- GPX (GPS Exchange Format)
- GeoJSON (open standard format for simple geographical features)

File: No file chosen



cean Reports

Unlocking Ocean Intelligence, Empowering Ocean Decisions

<https://marinecadastre.gov/oceanreports>

Ocean Reports Components

- Draw your own area – results in about 2 seconds
 - Move it around if you don't get the results you need
 - Or use known coordinates



OceanReports
A BOEM/NOAA PARTNERSHIP

Know what's happening in your ocean area

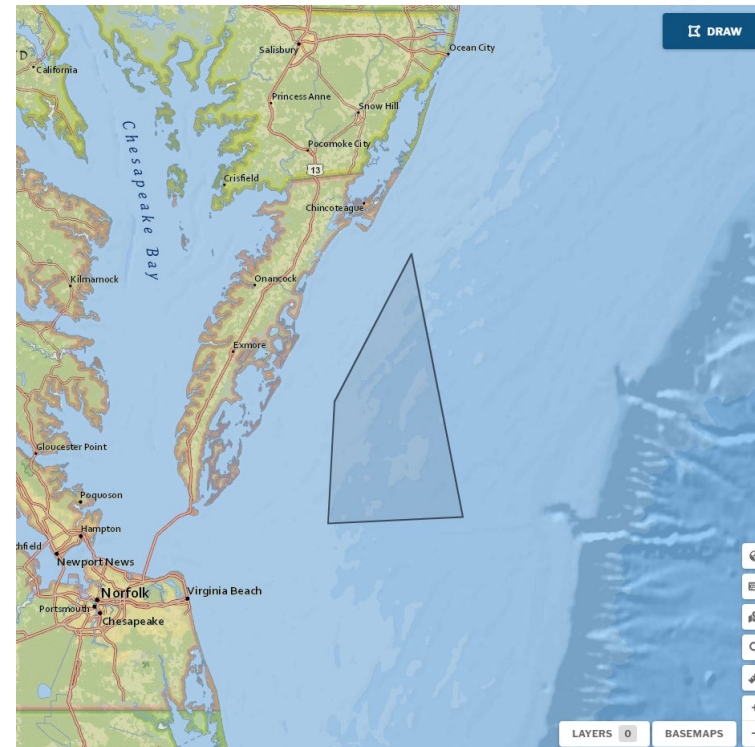
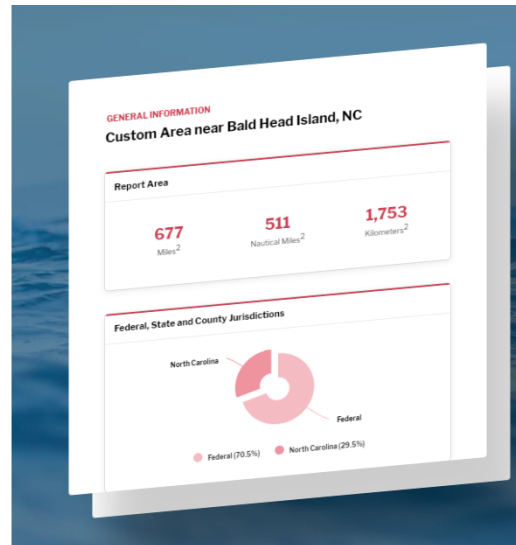
Draw a custom area anywhere in U.S. waters or pick from a predefined list of locations to get instant custom reports. Reports include descriptive infographics and supporting data that can be used for offshore planning, permitting, environmental review, public relations, and more. New features allow printing by industry, sharing, and adding custom coordinates.

Report Topics Include

General Information	Oceanographic and Biophysical
Energy and Minerals	Transportation and Infrastructure
Natural Resources and Conservation	Economics and Commerce

DRAW CUSTOM AREA

VIEW QUICK REPORTS









CREATE A POLYGON WITH COORDINATES

Enter a minimum of four geographic coordinate pairs, each on their own line. The first and last pair must be the same. For example:

```
-70.2301, 41.8634  
-70.4360, 41.8204  
-70.8178, 41.4344  
-70.4690, 41.2881  
-70.2301, 41.8634
```



6 Chapters, 80+ layers, 67 infographics

Chapter Theme	Symbol	Infographic Reports Available			
General Information		Report Area Depth/Elevation Populated Places Federal/State/County Jurisdictions	Congressional and Legislative Districts Federal Statutes Tribal Lands		
Energy & Minerals		Offshore Wind Potential Offshore Wind Planning Areas Offshore Wind Energy Leases OCS Revenue Sharing Areas Oil and Gas Potential	Oil and Gas Planning Areas Oil and Gas Leases Energy Facilities OCS Blocks with Sand Resources	Beach Nourishment Projects Surficial Sediment Texture Ocean Disposal Sites Federal Sand and Gravel Leases	
Transportation & Infrastructure		AIS Vessel Count Vessel Routing N. Atlantic Right Whale Management Areas Anchorage Areas Pilot Boarding Areas	Ports Coastal Maintained Channels Danger Zones/Restricted Areas Unexploded Ordnances Formerly Used Defense Sites	Wrecks/Obstructions Cables and Pipelines Wastewater Outfalls Aquaculture Oil Lightering Zones	Deepwater Ports Oil/Gas Platforms Oil/Gas Wells
Natural Resources		Endangered Species ESA-Critical Habitat Designations Habitat Areas of Particular Concern Managed Highly Migratory Species Audubon Important Bird Areas	Protected Areas Artificial Reefs Shallow Corals Deep-sea Sponge/Coral Obs. Deep-sea Coral Habitat Suitability	Historical Lighthouses Cetacean Biologically Important Areas	
Oceanographic & Biophysical		Wave Height, Period and Direction Wind Speed and Direction Current Speed and Direction at Depths Sea Surface Height Water Temp/Salinity	Nitrates Phosphates Silicates Aragonite Light Attenuation KD PAR	Light Attenuation KD 490 Chlorophyll a Concentration	
Economics & Commerce		Ocean Job Contributions GDP of Ocean Economy Contributions by Sector	Census Statistics Fishing Economic Value (North and Mid Atlantic)		



Custom Area 11.37 nautical miles from ...

GENERAL INFORMATION



Congressional and Legislative Districts



2

Congressional Districts

5

State Districts

US Congressional Districts



State Senate



State House



Showing all districts within 24 nautical miles of the report area, or the closest one if none are within 24 nautical miles.

Federal Statutes



Federal statutes cover a broad variety of legal restrictions and permitted activities within state and U.S. federal waters. It is important to know these statutes and where they are applicable before planning for any activities in these waters. Those listed below apply within the area of interest outlined in this report. Please note that other federal statutes with complex or uncertain geographic boundaries may exist in the area and can be found by using the Ocean Law Search tool.

- | | |
|---|--|
| Act to Prevent Pollution from Ships and MARPOL 73/78 | Marine Debris Research, Prevention and Reduction Act |
| Clean Water Act | Marine Mammal Protection Act |
| Coastal Zone Management Act | National Environmental Policy Act |
| Comprehensive Environmental Response, Compensation, and Liability Act | National Historic Preservation Act |
| Endangered Species Act | National Marine Sanctuaries Act |
| Energy Policy Act | Outer Continental Shelf Lands Act |
| Magnuson-Stevens Fishery Conservation and Management Act | |

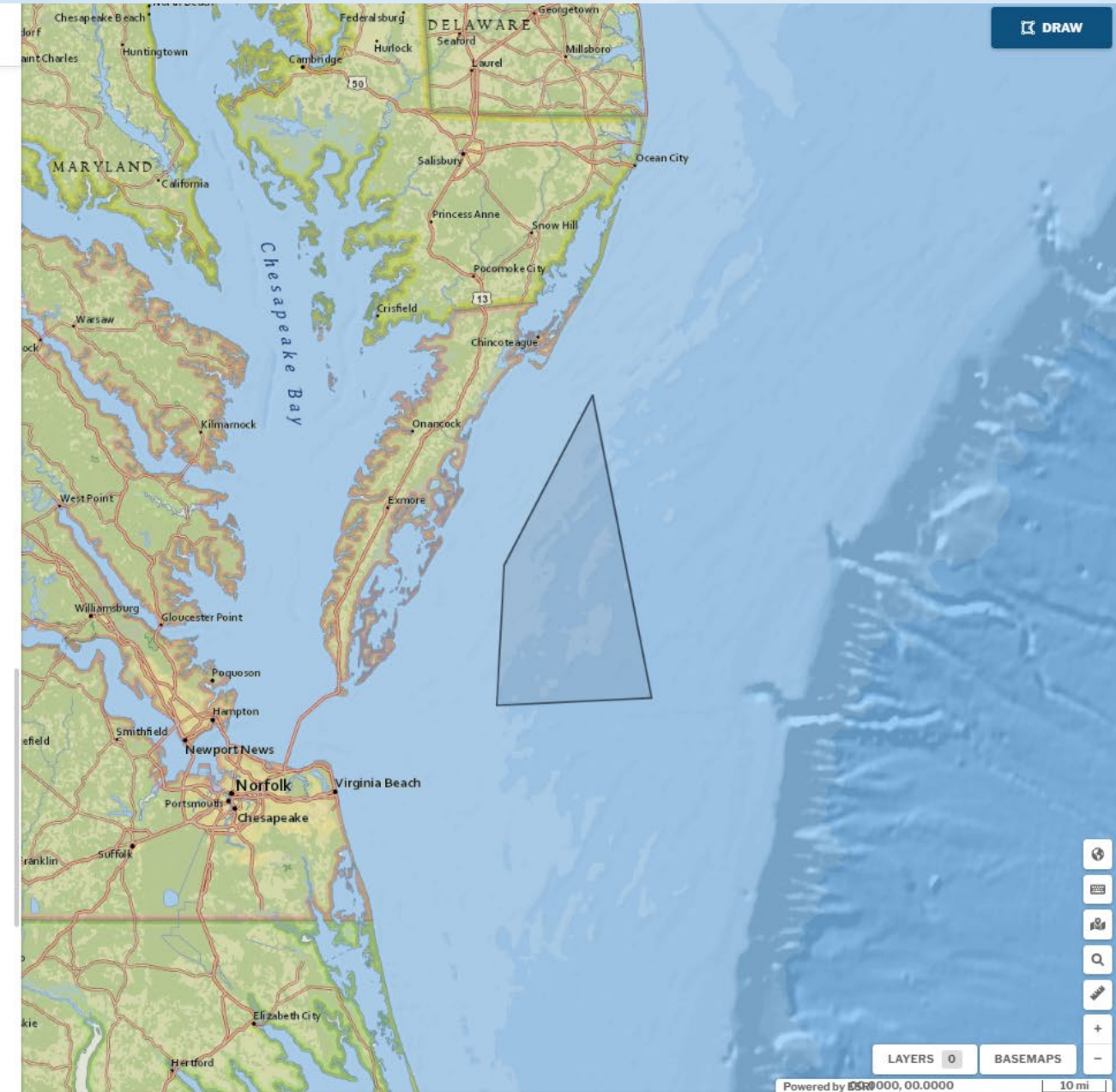
Showing federal statutes that apply inside the report area.

Indian Land Areas



The relationship between federally recognized tribes and the United States is one between sovereigns, that is, between a government and a government. This principle, which is grounded in the United States Constitution, has helped to shape the long history of relations between the federal government and these tribal nations. So too has the federal government's historic policies of forced relocation and assimilation.

The following are the current known boundaries of Indian land areas located nearest to this area. However, because of relocation policies, many tribes





Custom Area 11.37 nautical miles from ...
ENERGY AND MINERALS



water, and biofuels) is increasing and can help reduce greenhouse gas production. Wind energy projects are currently planned for the Atlantic coast. Hawaii and California are also considering wind projects. At the same time, the continued development of conventional oil and gas resources is critical to meeting current U.S. energy needs. America's coastal and marine waters also provide sand and gravel, which is used to restore hundreds of miles of coastline and protect billions of dollars in infrastructure and ecological habitats from coastal erosion and destructive storms.

Offshore Wind Resource Potential

Areas with annual average wind speeds of 7 meters per second (m/s) and greater, at 100-meters (328-feet) height sufficient wind resources suitable for offshore development. Our nation's offshore wind resource potential, with development, is predicted to be more than 2,000 gigawatts of capacity per year. This is nearly double the nation's current capacity. If 10 percent of the potential available areas were built by 2050, they could support 160,000 jobs, reduce power sector greenhouse gas emissions by 1.8 percent. Floating wind platforms could potentially provide access to the greatest wind capacity, expanding this potential.



8.50

Weighted Average (m/s)

- Outstanding (9.0+)
- Superb (8.5)
- Excellent (8.0)
- Good (7.5)
- Fair (7.0)
- Unsuitable (< 7.0)



1,980,5

Potential Houses Supported

2,028.4

Area with suitable wind resources

Additional Information

In 2016, the average annual electricity consumption for a U.S. residential utility customer was 10,766 kilowatt hours (kWh), an average of 897 kWh per month. Louisiana had the highest annual electricity consumption at 14,881 kWh per residential customer, and Hawaii had the lowest at 6,061 kWh per residential customer.

(Turbine Name Plate Capacity (Based on National Renewable Energy Laboratory conversion 3MW/km²) * Hours per year (8,760) * Capacity Factor (.4)) / Average Household Electricity Use (in megawatt hours per year)

¹ [U.S. Department of Energy offshore wind potential](#)

² [U.S. Energy Information Administration FAQ](#)

One meter per second is equivalent to approximately 2.25 miles per hour.

Check the metadata page for more information, or use the download link to get the latest available geospatial layer.

Legend

- Outstanding (9.0+)
- Superb (8.5)
- Excellent (8.0)
- Good (7.5)
- Fair (7.0)
- Unsuitable (< 7.0)



Slide 13



Custom Area 11.37 nautical miles from ...

NATURAL RESOURCES AND CONSERVATION



Cetacean Biologically Important Areas



Biologically important areas are places essential for specific species or species groups of cetaceans for migration, or feeding or reproduction, or areas that are permanently populated with small resident populations. Many cetacean species (whales and dolphins) are threatened or endangered and serve as important apex predators in their respective ecosystems. Cetaceans can be especially susceptible to noise, entanglement in fishing gear, and disturbances from other human activities. Activities in areas corresponding to a biologically important area may require consultation with regional experts to determine sites that will minimize interactions with threatened and endangered cetacean species.

Name	Type	Area	Count
North Atlantic right whale	Migration	Eastern Atlantic	1

Showing biologically important areas by species and type inside the report area and within 10 nautical miles.



Audubon Important Bird Areas

DISPLAY LAYER

The state Audubon societies have designated [Audubon important bird areas](#), which involve identifying, monitoring, and protecting places for ecologically important bird species. These include coastal areas, but most state important bird areas do not consider areas over open ocean. Each area designates the birds that use these important areas for breeding, nesting, feeding, or migration. Because these are highly mobile animals, it is important to know what birds are in the area of interest when considering a project that may affect these areas or disturb the birds, many of which are protected by the Migratory Bird Act, and in some cases the Endangered Species Act. For more information, visit the [Information for Planning and Consultation \(IPaC\)](#) website.

Site Name (in order of distance from report area)

Barrier Island/Lagoon System	Explore Data	Learn More	View Report
Assateague Island IBA	Explore Data	Learn More	View Report
Maryland Coastal Bays IBA	Explore Data	Learn More	View Report
Pocomoke-Nassawango IBA	Explore Data	Learn More	View Report
Delmarva Bayside Marshes	Explore Data	Learn More	View Report
Lower Delmarva	Explore Data	Learn More	View Report
Somerset-Wicomico Marshes IBA	Explore Data	Learn More	View Report
Back Bay	Explore Data	Learn More	View Report
Chesapeake Bay Islands	Explore Data	Learn More	View Report
Outer Banks Inshore Ocean	Explore Data	Learn More	View Report

Name	Barrier Island/Lagoon System	
Status	Recognized	State Virginia
Priority	Global	Counties Accomack, Northampton
Proposed Criteria	A1, A2, A3, A4i, A4iii, A4iv, B1, B3, B4i, B4ii, B4iv	
Confirmed Criteria	D1, D3, D4i, D4ii, D4iii, D4iv, D4v, D4vi, D4vii, A1, A4i, A4ii, B1, B4i	

Central Coordinates	37.53000, -75.68278	Area (acres)	260,076	Elevation (meters)	Min: Max:15 Avg:8
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Bird Conservation Region

New England / Mid-Atlantic Coast

SITE DESCRIPTION

The Virginia Barrier Island Lagoon System includes the seaward margin of the lower Delmarva Peninsula from the mouth of the Chesapeake Bay to the MD-VA border. This location is the most important bird area in Virginia and one of the most important bird areas along the Atlantic Coast of North America. The area has been designated as a UNESCO Biosphere Reserve, a Western Hemisphere Shorebird Reserve Site with international status, is the site of a National Science Foundation Long-term Ecological Research site, and is the focus of a multi-organizational partnership dedicated to bird conservation. The area includes the most pristine chain of barrier islands along the Atlantic Coast, extensive salt marshes, inter-tidal mudflats, and open water. Although much of the system is currently owned by government agencies and conservation organizations, numerous conservation challenges remain. For a fact sheet on this IBA, including a map, click [here](http://www.audubon.org/bird/iba/virginia/Documents/Barrier%20Island_Lagoon%20System.pdf) | http://www.audubon.org/bird/iba/virginia/Documents/Barrier%20Island_Lagoon%20System.pdf

ORNITHOLOGICAL SIGNIFICANCE

This IBA supports the highest diversity and density of birds of conservation concern within Virginia. It supports significant populations of multiple sensitive bird species throughout the year as well as significant species assemblages for Barrier Island/Beach and Coastal Marsh bird communities. Several beach-nesting species such as the Piping Plover, Wilson's Plover, American Oystercatcher, Gull-billed Tern, Least Tern, and Black Skimmer that are of high regional or national concern nest exclusively or nearly so within this system. The area supports the most significant breeding populations in the state of waders such as the Little Blue Heron, Tricolored Heron, Snowy Egret, Glossy Ibis, and Black-crowned Night Heron. Marsh-nesting species such as the Forster's Tern, Seaside Sparrow, and Saltmarsh Sharp-tailed Sparrow also have their center of abundance here. During migration, the area is of international significance as a stopover area for Whimbrel, Short-billed Dowitcher, and Red Knot. In addition, the area supports significant wintering populations of Nelson's Sharp-tailed Sparrow, Atlantic Brant, and Dunlin. Other at-risk species supported on the site below threshold levels include the Peregrine Falcon, Barn Owl, Bald Eagle, and Northern Harrier.

SPECIES DATA AND CRITERIA

Common Name	Date	Seasonal/Daily	Season	Observed	Density (#/km ²)	Units	Proposed	Confirmed
American Black Duck	2003	S	breeding	10		Breeding pairs	-	-
Source	Bydrowski, T. and G. Costanzo. 2003. Progress report: Survey of breeding Black Ducks on the Virginia Barrier Islands, Spring 2003. Unpublished Report. VDGIF, Richmond, VA.							
	2005	S	breeding	20		Breeding pairs	-	-
Source	Arquilla, B. 2005. The impact of predator reduction on the productivity of American Black Ducks and other ground-nesting avifauna on the Virginia Coast Reserve. Unpublished data.							
American Oystercatcher	2003	S	breeding	525		Breeding pairs	-	A4i ,B1
Source	Wilke, A. L., B. D. Watts, B.R. Truitt, and R. Boettcher. 2005. Breeding season status of the American Oystercatcher in Virginia, USA. Waterbirds 28: 308-315.							
Bald Eagle	2005	S	breeding	3		Breeding pairs	-	-
Source	Watts, B.D. and M.A. Byrd. 2005. Virginia bald eagle nest and productivity survey: Year 2005 report. Center for Conservation and Science, Virginia Polytechnic Institute, Blacksburg, VA.							



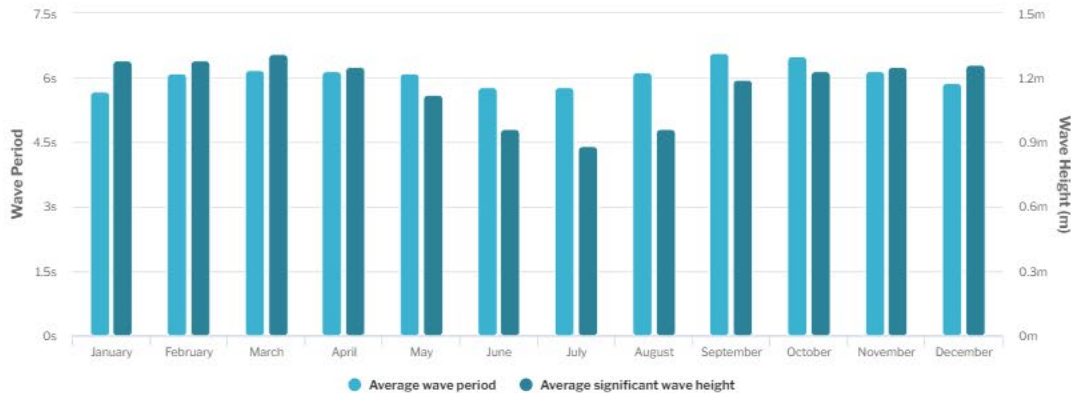
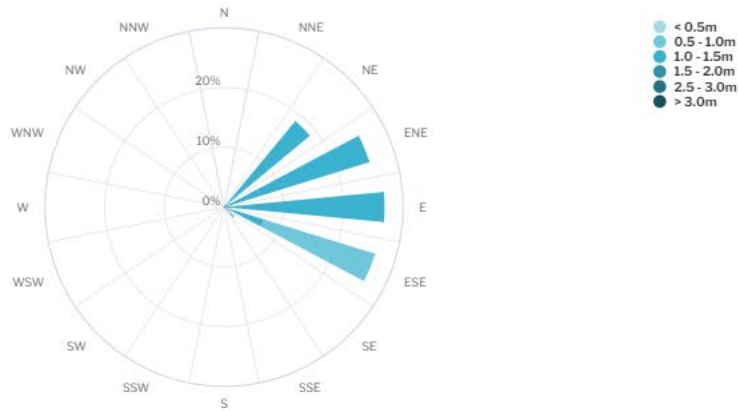
Custom Area 11.37 nautical miles from ...
 OCEANOGRAPHIC AND BIOPHYSICAL



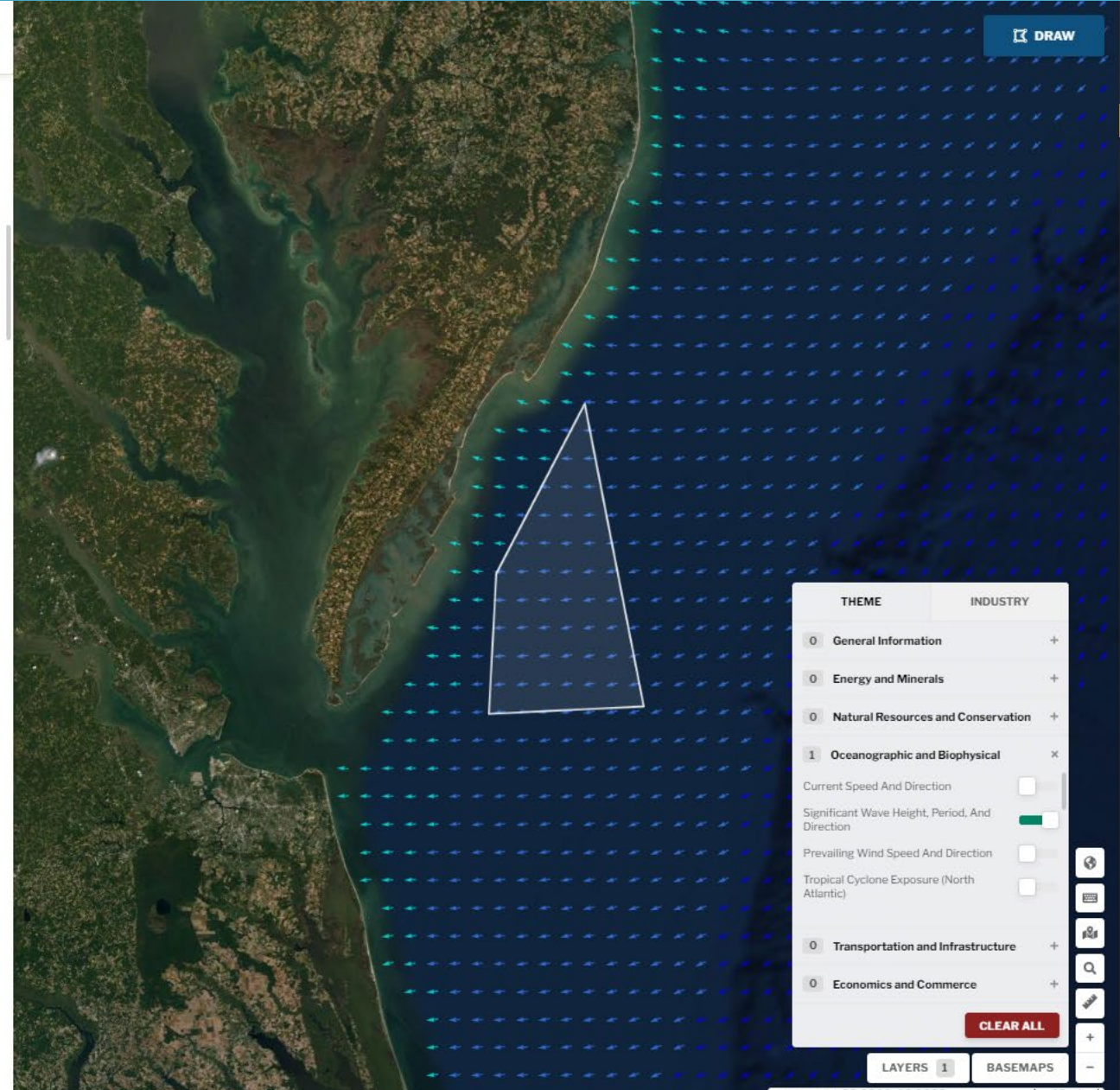
Significant Wave Height, Period and Direction



Significant wave height roughly corresponds to the mean wave height of the highest one-third of waves in a given location. It is an important parameter representative of the statistical distribution of ocean waves and is an indicator of the local wave climate. Wave period represents the average time between two successive wave crests. Wave direction indicates the average directionality of local waves. Knowledge of local conditions are important in determining compatible areas for the design of in-water infrastructure. The wave rose and mapped wave vectors indicate the direction that waves are coming from (arrowheads on the map indicate the direction that waves are moving towards).



Data used to derive infographic includes the monthly mean significant wave height, wave direction, and mean wave period inside the report area.



DRAW

THEME	INDUSTRY
0	General Information +
0	Energy and Minerals +
0	Natural Resources and Conservation +
1	Oceanographic and Biophysical x
	Current Speed And Direction <input type="checkbox"/>
	Significant Wave Height, Period, And Direction <input checked="" type="checkbox"/>
	Prevailing Wind Speed And Direction <input type="checkbox"/>
	Tropical Cyclone Exposure (North Atlantic) <input type="checkbox"/>
0	Transportation and Infrastructure +
0	Economics and Commerce +

CLEAR ALL

LAYERS 1 BASEMAPS



TRANSPORTATION AND INFRASTRUCTURE

Custom Area 11.37 nautical miles from Chincoteague, VA

The United States Marine Transportation System is essential to the American economy; it supports millions of American jobs, facilitates trade, and safely moves people and goods. This report provides a snapshot of the infrastructure and activities of the marine transportation sector along the coast of the United States.

Vessel Count

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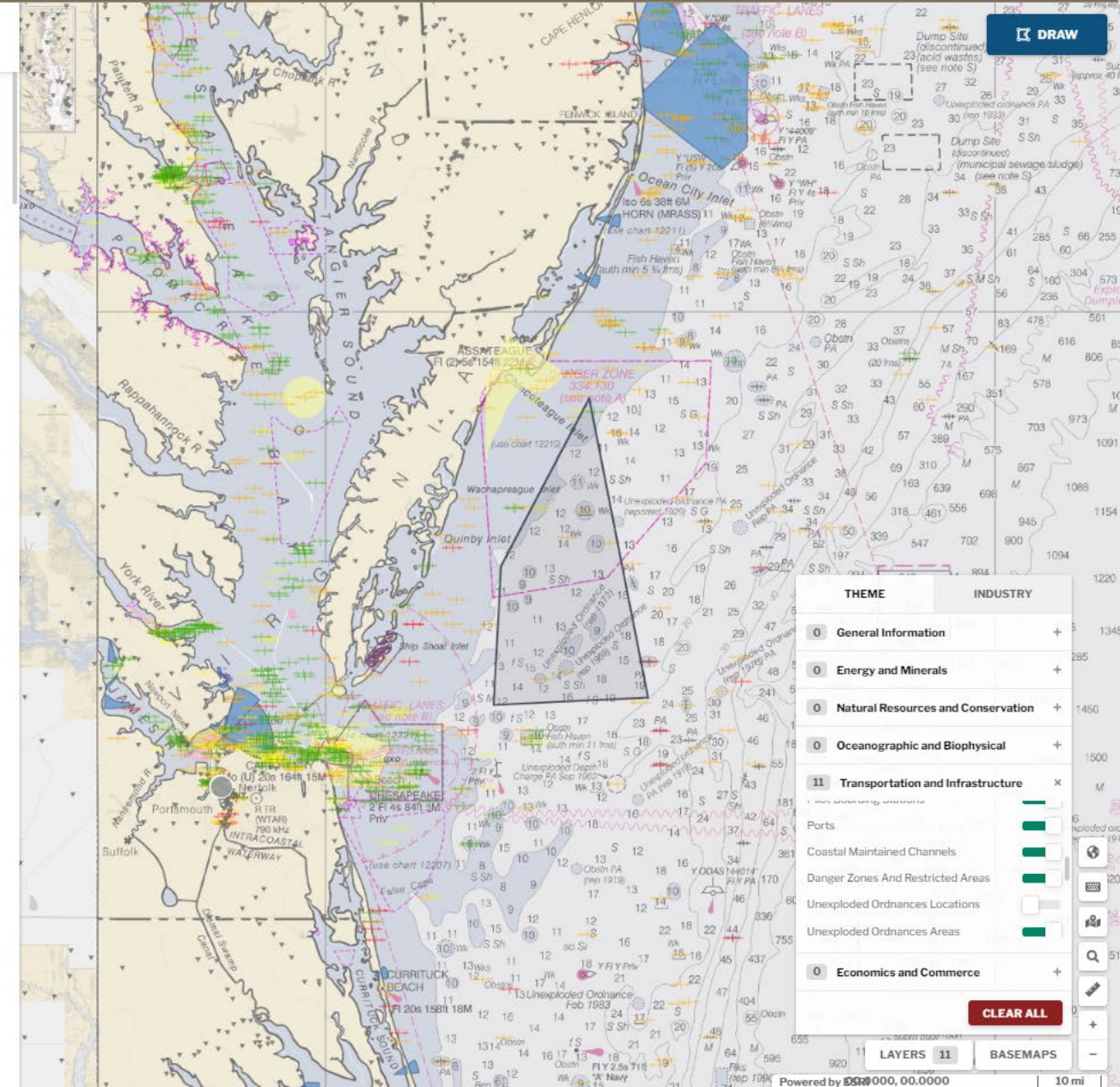
Type	Min	Mean	Max
All	1	6.36	111
Cargo	1	3.89	102
Fishing	1	2.61	16
Passenger	1	1.27	7
Pleasure	1	1.54	10
Tanker	1	1.08	7
Tugtow	1	1.79	20

Showing the minimum, maximum, and mean of vessel counts by type inside the report area.

Vessel Routing

Vessel routing measures designate traffic lanes, precautionary, and other geographic features with a primary purpose for navigation over all other uses. The presence of a traffic lane or precautionary area will likely limit the placement of a temporary or permanent structure in those areas.

The data are not applicable to this location.



THEME | **INDUSTRY**

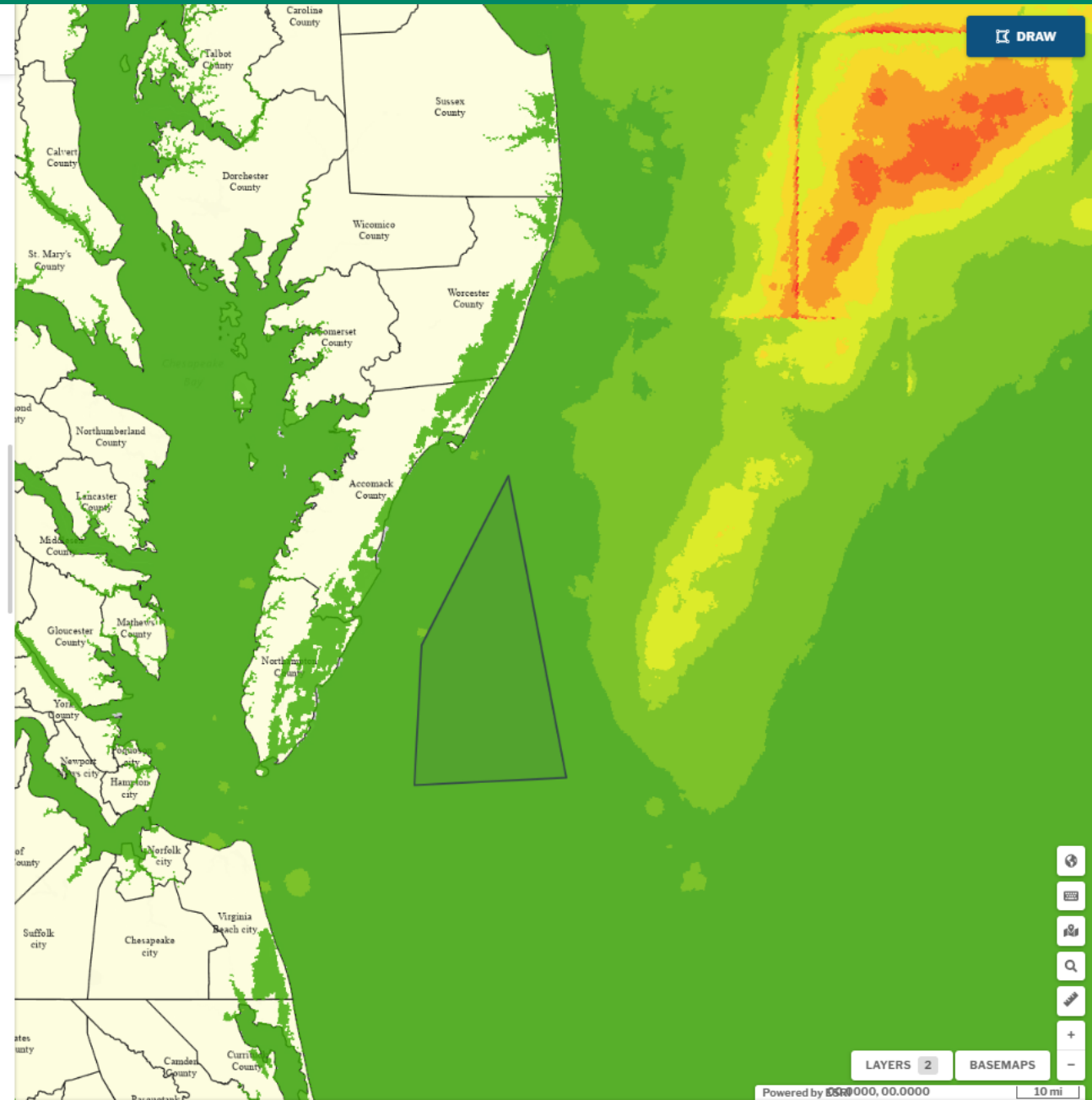
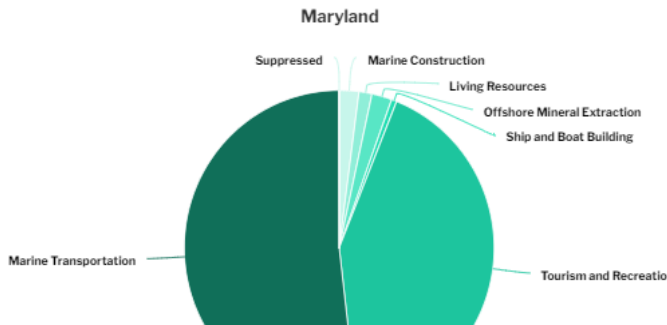
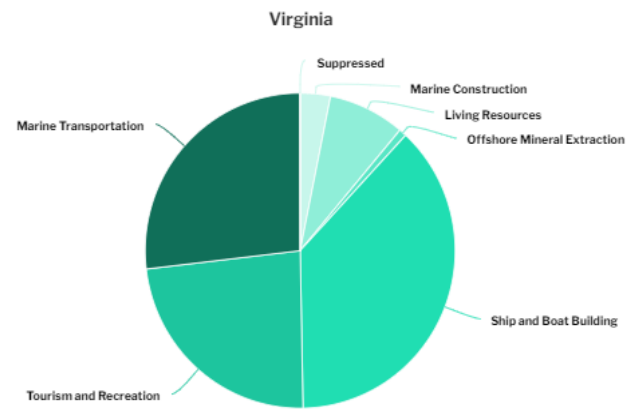
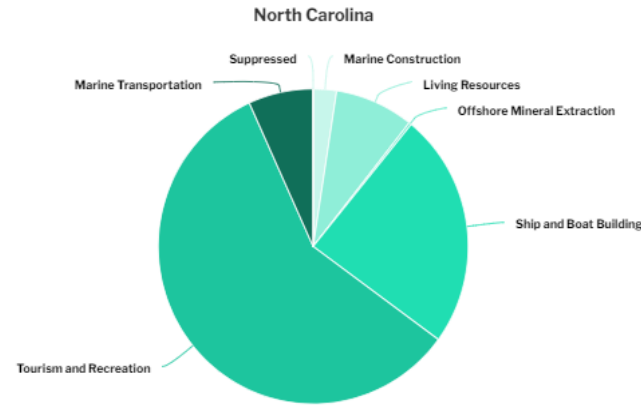
- General Information +
- Energy and Minerals +
- Natural Resources and Conservation +
- Oceanographic and Biophysical +
- Transportation and Infrastructure** x
- Economics and Commerce +

CLEAR ALL

LAYERS 11 | BASEMAPS



Custom Area 11.37 nautical miles from ...
ECONOMICS AND COMMERCE



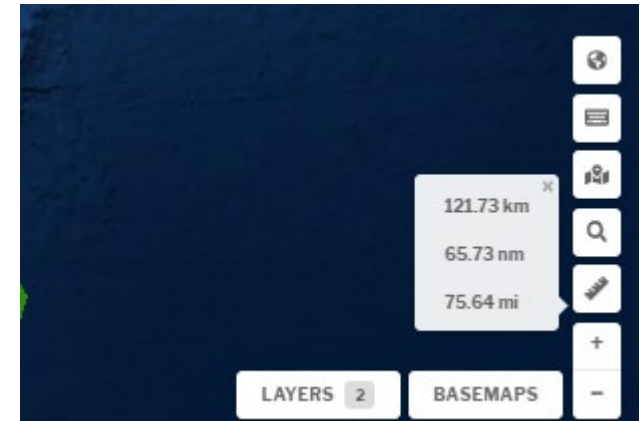
DRAW

LAYERS 2 BASEMAPS

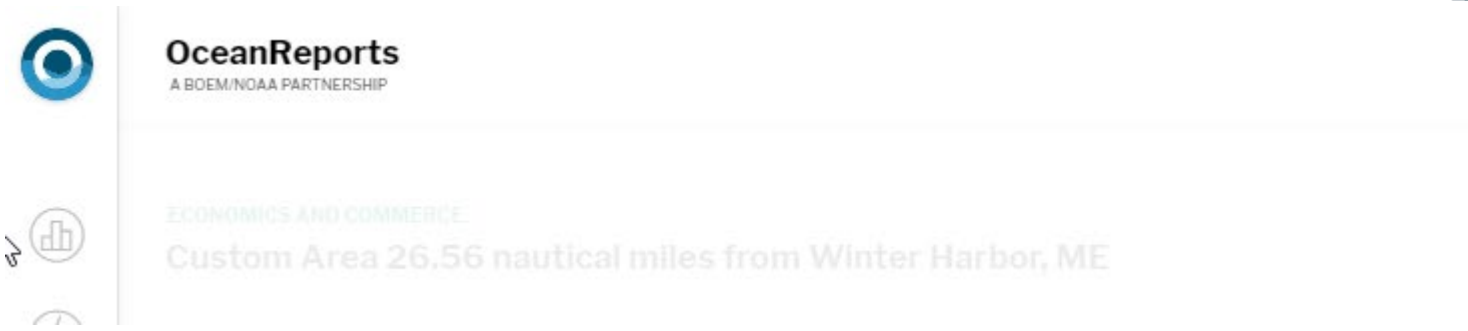
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Available tools

- **Special Tools**
 - Coordinate entry
 - Return to original location on map
 - Measure distances
 - Change base maps
 - Display map layers



Available tools



- Print a pdf version
- Share with others/keep for later
- Investigate further (metadata, downloads)

<https://bit.ly/3iPMqyW>

Metadata/Data Downloads

This page provides information on the data used in this application. The listing below is broken down by theme and associated data layers. For each of the layers listed, the layer name is hyperlinked to the metadata record, and an associated data download link and the name of the data provider are provided.

General Information

Dataset Name	Provider	Download
Bathymetry DEM	NOAA National Centers for Coastal Ocean Science	Download
Bathymetry Contours	MarineCadastre.gov	Download
Coastal Populated Places	MarineCadastre.gov	Download
Federal and State Waters	MarineCadastre.gov	Download
Coastal States	U.S. Census Bureau	Download
Coastal Counties	U.S. Census Bureau	Download
US Congressional Districts	NOAA Office for Coastal Management	Download
State Legislative Districts: House	U.S. Census Bureau	Download
State Legislative Districts: Senate	U.S. Census Bureau	Download
Federal Statutes	NOAA Office for Coastal Management	Download
Indian Lands	Bureau of Indian Affairs	Download

Energy & Minerals

Dataset Name	Provider	Download
Offshore Wind Resource Potential (Atlantic)	Bureau of Ocean Energy Management	Download

- **Print Report**

- Gives you all the infographics and links
- Allows you to choose to turn off infographics you don't need
- Or you can choose a preset grouping by industry

The screenshot displays the OceanReports web interface. At the top, the logo for OceanReports is shown, along with the text "A BOEM/NOAA PARTNERSHIP" and the URL "https://marinecadastre.gov/oceanreports". Below the header is a map of a coastal area with various colored overlays representing different data layers. The map is titled "Ocean Report for Custom Area 11.37 nautical miles from Chincoteague, VA" and is dated "August 16, 2021".

Below the map is a configuration panel with a dropdown menu on the left and a list of data layers on the right. The dropdown menu is currently set to "Renewable". The data layers list includes:

Data Layer	Status
Aquaculture	On
Aragonite	Off
Artificial Reefs	On
Atlantic Mean Fishing Economic Value (2007-2012)	On
Audubon Important Bird Areas	On
Beach Nourishment Projects	Off
BOEM Offshore Oil And Gas Resources	Off
Census Statistics	On

At the bottom of the interface, there are two buttons: "CANCEL" and "PRINT". The "PRINT" button is highlighted in blue. Below the map and configuration panel, the report type is "Renewable" and the number of infographics is "47".



AccessAIS

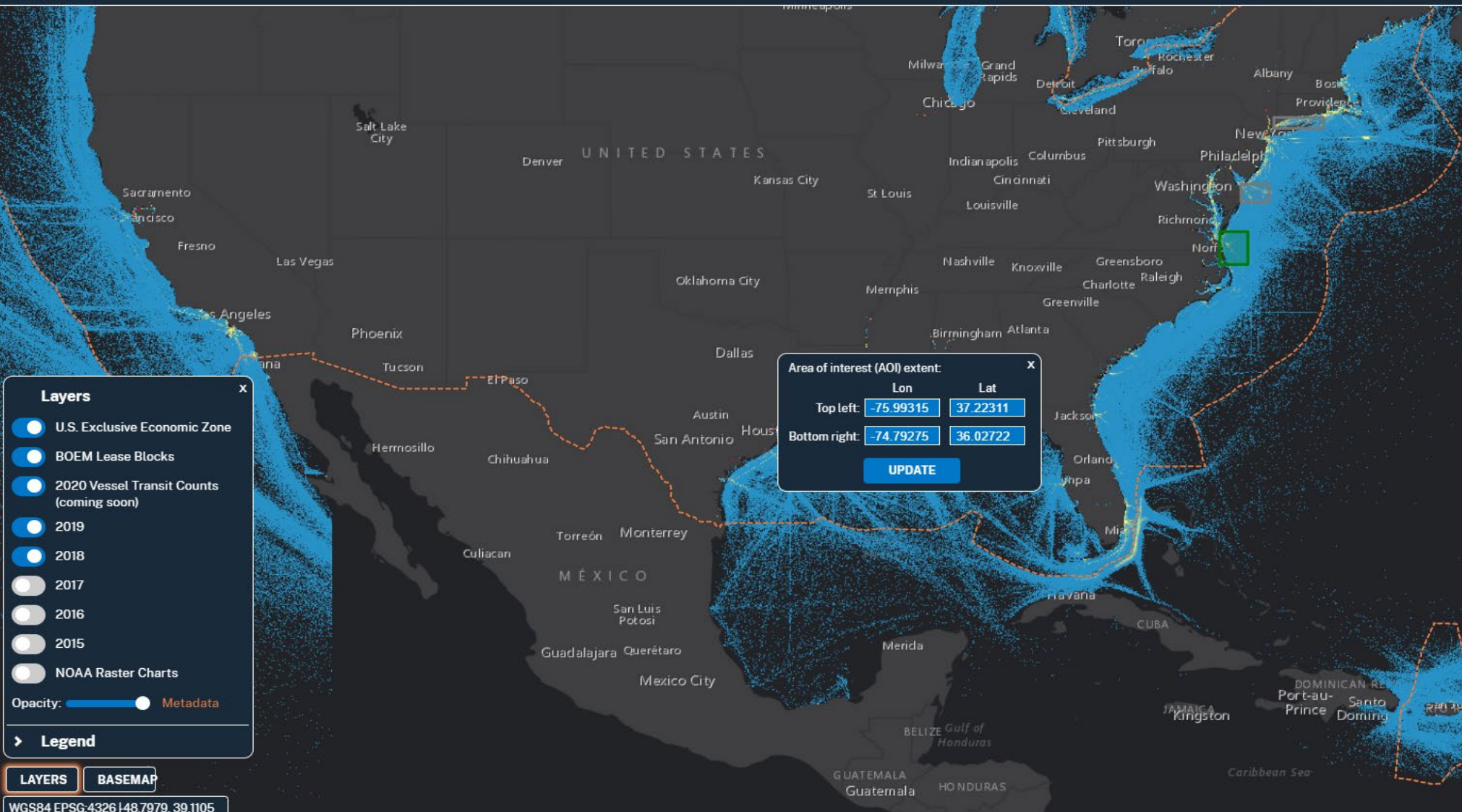
Shark Fin

U.S. Vessel Traffic
A BOEM, NOAA & USCG
PARTNERSHIP

3/31/2018

3/31/2020
3/31/2020







DRAW    



Area of interest (AOI) extent: x

	Lon	Lat
Top left:	<input type="text" value="-75.99315"/>	<input type="text" value="37.22311"/>
Bottom right:	<input type="text" value="-74.79275"/>	<input type="text" value="36.02722"/>

Please begin by drawing an AOI to be downloaded.
Download large orders [here](#).

Area (sq.mi)	Date Range	Size (GB)	XY	Actions
5,500	3/31/2018 - 3/31/2020	0.86	Show	 
2,898	3/31/2018 - 3/31/2020	0.66	Show	 
2,848	3/31/2018 - 3/31/2020	2.22	Show	 
Size Limit: 5GB		Total	3.74 GB	

This will be order 1 of a maximum 3 active orders for this email address

I understand NOAA's [Privacy Policy](#)

Send me the Marine Cadastre [Quarterly Newsletter](#)

Layers x

- U.S. Exclusive Economic Zone
- BOEM Lease Blocks
- 2020 Vessel Transit Counts (coming soon)
- 2019
- 2018
- 2017
- 2016
- 2015
- NOAA Raster Charts

Opacity: Metadata

Legend

WGS84 EPSG:4326 | 48.7979, 39.1105



BOEM

Bureau of Ocean Energy
Management

BOEM.gov



Christine Taylor | Christine.taylor@boem.gov | 703-787-1606

MarineCadastre.gov

MarineCadastre.gov/OceanReports.

Northeast and Mid-Atlantic Ocean Data Portals

Nick Napoli

Offshore Wind and Maritime Industry Knowledge
Exchange August 19, 2021



Northeast Ocean Data Portal

NORTHEAST OCEAN DATA
Maps and Data for Ocean Planning in the Northeastern United States

HOME WHAT'S NEW! CURRENT ISSUES THEME MAPS DATA EXPLORER DOWNLOAD ABOUT

DATA EXPLORER
Define and view any combination of data on one map.
LAUNCH DATA EXPLORER!

THEME MAPS
View curated maps and data on key topics:

- Marine Life & Habitat: Mammals & Turtles, Fish, Birds, Habitat
- Commercial Fishing
- Marine Transportation
- Energy & Infrastructure
- Aquaculture
- Recreation
- Restoration
- Cultural Resources
- National Security
- Water Quality

Bathymetry | Eelgrass | Habitat Classification

CASE STUDIES

- U.S. Navy Uses Data Portal to Select Test Site for Unmanned Underwater Vehicle (Marine Transportation - Recreation)
- Coast Guard Uses Data Portal in Waterways Management in the Northeast (Commercial Fishing - Marine Transportation)
- Inspiring K-12 Students to Investigate the Ocean Ecosystem and Ocean Uses (Aquaculture - Commercial Fishing - Energy and Infrastructure - Marine Life - Marine Transportation - Recreation)

More Case Studies

NEWS

- Jun 12, 2020: New 2018 and 2019 Vessel Traffic Data, Maps, and Tools Now Available on Northeast Ocean Data Portal
- Jun 11, 2020: Supplement to Vineyard Wind 1 Draft Environmental Impact Statement now available for public comment
- Jun 9, 2020: Attend a Portal webinar on June 23 hosted by OmerDAA Science Seminar Series
- News Archives
- List of Data Updates

MAP GALLERIES
Offshore Wind
Maps on current issues

FOLLOW US

Northeast Ocean Data @NEOceanData
Want to view maps of vessel traffic data by month instead of year, including our newly released 2018 and 2019 data? <https://t.co/TUjv955Wk>

Northeast Ocean Data @NEOceanData
Bureau of Ocean Energy Management (@BOEM_DOE) has released a Supplement to its Draft Environmental Impact Statement. <https://t.co/RCH9KJWZ>

Facebook, Twitter, YouTube, LinkedIn icons

Email: contact@northeastoceandata.org | [Receive Updates](#) | Northeast Ocean Data provides data and maps for the Northeast Ocean Plan.

www.NortheastOceanData.org

MARCO Mid-Atlantic Ocean Data Portal

MARCO MID-ATLANTIC OCEAN DATA PORTAL

MAP NEWS DATA HELP LOG IN

2020 AIS Vessel Transit Counts
View annual and monthly maps of marine traffic patterns in the Mid-Atlantic and Northeast

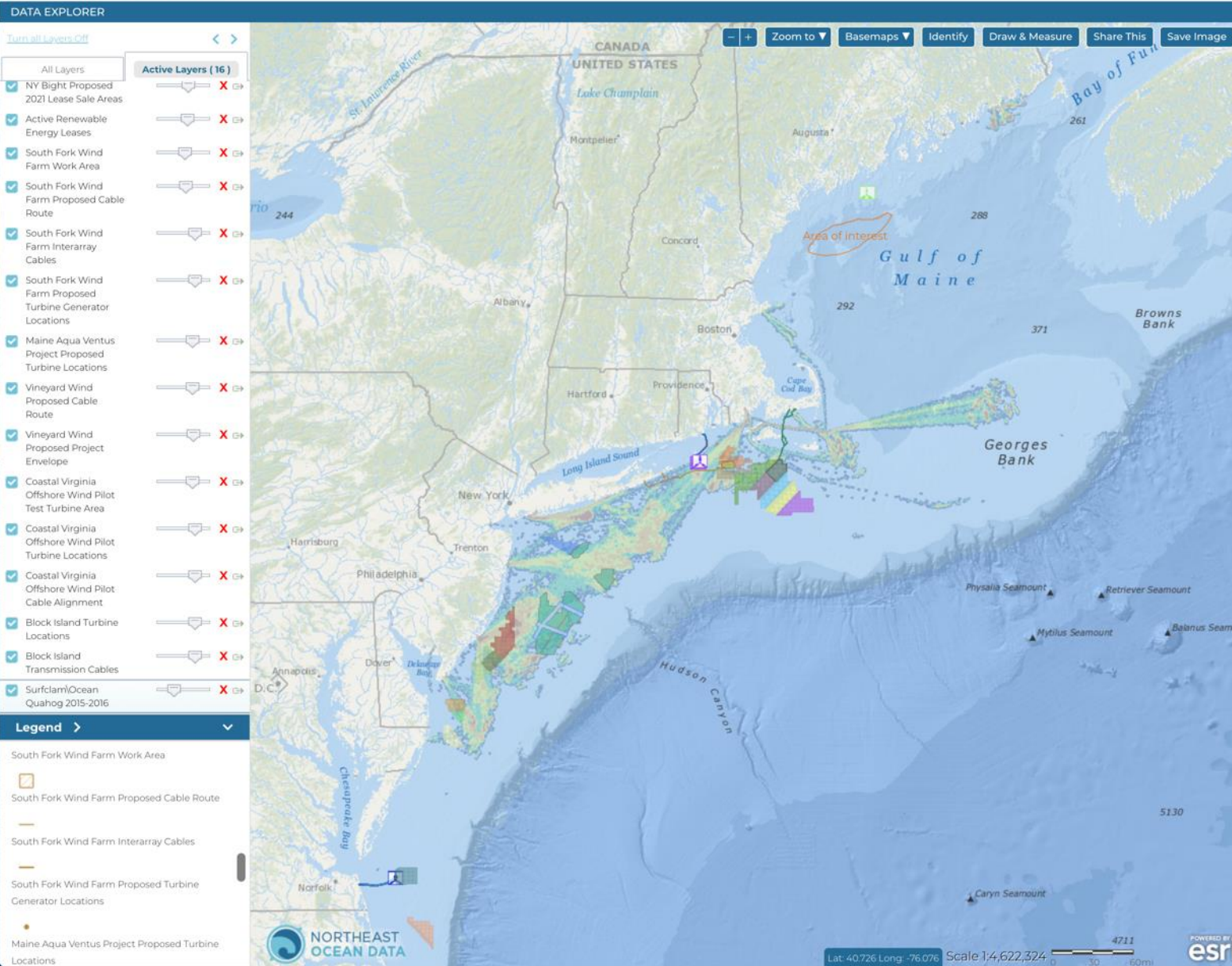
View Maps
Browse over 5,000 maps showing fishing grounds, marine life habitats and much more in Marine Planner

How to Use the Portal
Browse our library of tutorial materials, webinars and Portal use case studies

Collaborate
Work with friends in a Group, schedule a Portal training, or share your feedback and questions with us

Search data
Active: 1 MyPlanner Data Legend
Map View Bookmarks
Drawings water
Test
Test Towers
Lease Block Collections water
Wind Energy Storage water
Share
Group Sharing

www.portal.midatlanticocean.org/



- Map products showing the footprint and changes over time for economic activities and ecological resources
- Products derived from federal, state, tribal, research/academic, and stakeholder sources
- Informed and vetted by regional experts, agencies, and stakeholders

Data Catalog

The Data Catalog offers background information, download options, metadata and important links pertaining to map layers found on the Portal. You can explore the data available under each of the Portal's themes below.

To learn more about how data is selected for inclusion in the Portal, read our [Spatial data evaluation and criteria](#) (pdf) fact sheet.



20

Administrative

Numerous federal, regional, and state political and management boundaries of the Mid-Atlantic are compiled here to provide a regulatory context to help facilitate well-informed ocean planning decisions.



142

Fishing

Explore dozens of maps depicting the extent and locations of commercial and recreational fishing activities throughout the upper East Coast.



7

Fishing - Communities at Sea (by Port)

Search nearly 1,000 maps showing commercial fishing activity by several gear types for 200 individual ports along the East Coast.



538

Marine Life

The Mid-Atlantic region is well known for nutrient-rich and highly productive waters. Its estuaries, salt marshes, sea grasses, barrier islands, cold water corals, and submarine canyons provide spawning, nursery, and forage...



13

Marine Life Library (Species Specific)

The Marine Life Library is home to thousands of maps depicting populations of individual species of fish, birds and marine mammals along the East Coast. The maps were created by the



137

Maritime

The Mid-Atlantic ports are some of the busiest in the nation's seaport network, which unloads \$3.8 billion in goods each day.



184

Oceanography

From the depths of the Mid-Atlantic's submarine canyons to its sandy beaches, explore the physical and chemical properties of the ocean through our Oceanography theme, now under development.



21

Recreation

The Mid-Atlantic boasts countless opportunities for entertainment and leisure activities and has flourishing travel, tourism, and outdoor recreation industries, many of which are focused on the region...



37

Renewable Energy

Offshore wind in the Mid-Atlantic holds more than 60,000 Megawatts of potential energy – that's 10% of total U.S. offshore potential. This huge resource could help meet the growing electricity demand in the region,...

Ocean Activities and Economics Themes

- Administrative & management areas
- Commercial fishing
- Aquaculture
- Energy
- Marine transportation or maritime
- National security
- Recreation
- Culture
- Socioeconomic

Ocean Resources and Conditions Themes

- Marine mammals & sea turtles
- Fish
- Birds
- Habitat & other marine life
- Oceanography
- Bathymetry
- Geology, sand & sediment
- Water quality

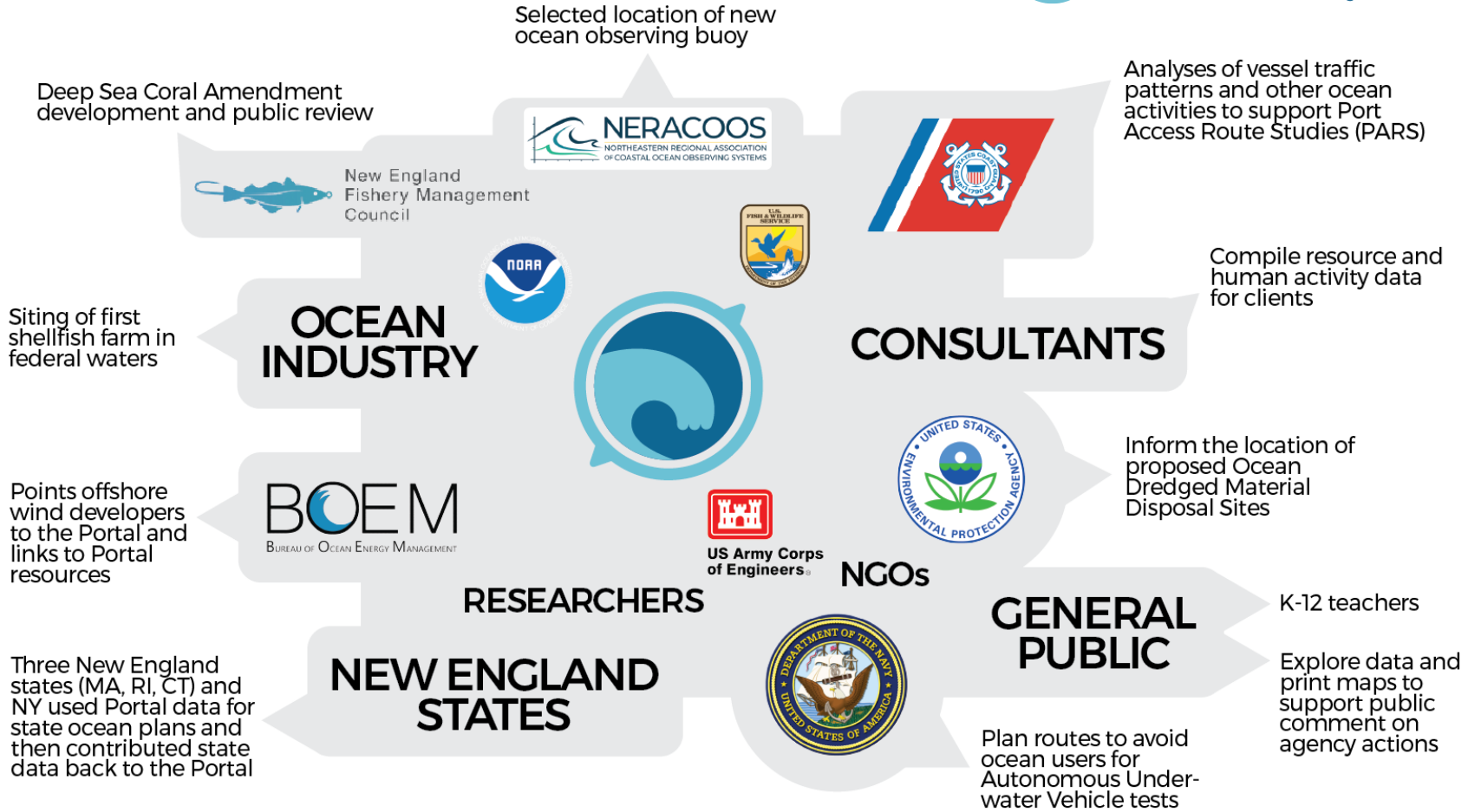
WHO USES THE PORTAL AND HOW?

SOME EXAMPLES

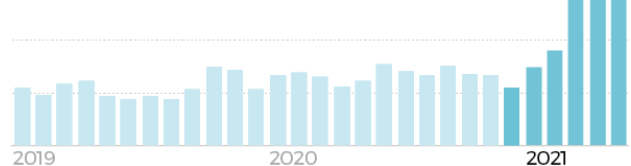


NORTHEAST OCEAN DATA

www.NortheastOceanData.org



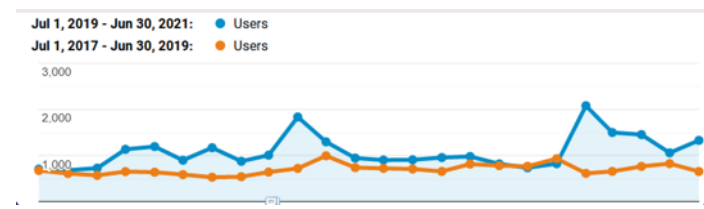
Recent increases in users per month



Increased layer hits during public meetings and events



MARCO MID-ATLANTIC OCEAN DATA PORTAL



Current Issues

- Quick access to maps and information for agency actions and proposed projects
 - Offshore Wind
 - USACE Public Notices (including proposed aquaculture and cable projects)
 - USCG Proposed Actions (including proposed anchorages and Port Access Route Studies)
 - Deep Sea Corals
 - Ocean Disposal Sites (archived)

The screenshot displays the Northeast Ocean Data website interface. At the top, the logo reads "NORTHEAST OCEAN DATA" with the tagline "Maps and Data for Ocean Planning in the Northeastern United States". A navigation menu includes "HOME", "WHAT'S NEW?", "CURRENT ISSUES" (highlighted with a red arrow), "THEME MAPS", "DATA EXPLORER", "DOWNLOADS", and "ABOUT".

The main content area is divided into several sections:

- DATA EXPLORER:** Features a map of the Northeastern United States coastline with various data points and a "LAUNCH DATA EXPLORER" button.
- THEME MAPS:** A grid of icons representing different topics: Marine Life & Habitat, Commercial Fishing, Aquaculture, Cultural Resources, Marine Transportation, Recreation, National Security, Energy & Infrastructure, Restoration, and Water Quality.
- NEWS:** A list of recent news items, including "April 2021 Newsletter", "BOEM announces Wind Energy Areas in New York Bight", and "Portal expands and re-organizes its collection of fisheries management maps".
- MAP GALLERIES:** A featured gallery titled "Offshore Wind" with a sub-section for "Maps on current issues".
- CASE STUDIES:** A section titled "CASE STUDIES" featuring articles such as "U.S. Navy Uses Data Portal to Select Test Site for Unmanned Underwater Vehicle" and "Coast Guard Uses Data Portal in Waterways".

Offshore Wind Areas on the Portals

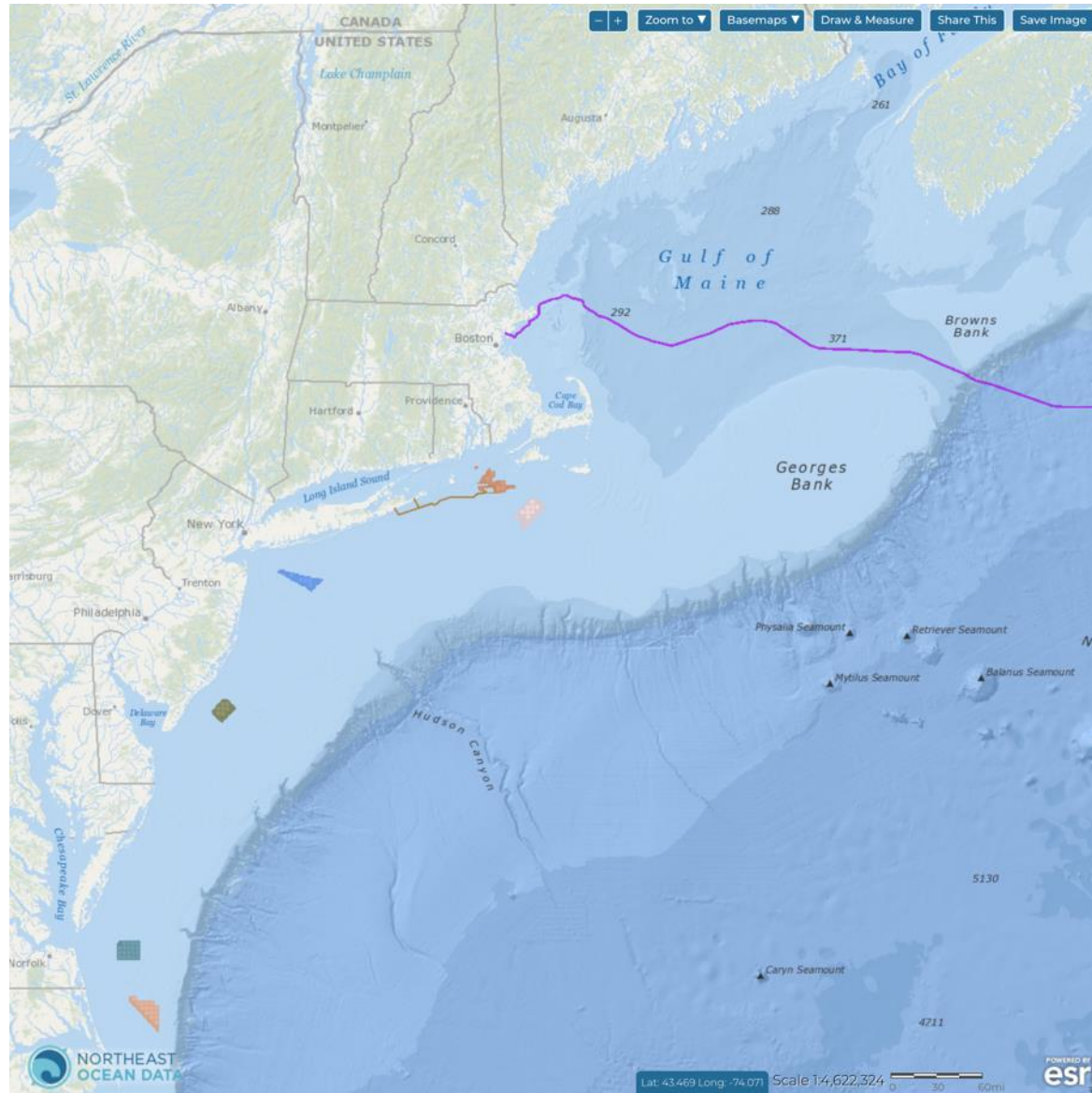
NORTHEAST OCEAN DATA
DATA EXPLORER

[Turn all Layers Off](#) < >

All Layers | **Active Layers (20)**

Keyword Search

- > Administrative Boundaries
- > Marine Transportation
- > National Security
- ✓ Energy & Infrastructure
 - > Infrastructure
 - ✓ Planning Areas
 - > Operational Installations
 - > Permitted Projects
 - > Projects in Review
 - > Lease Areas
 - > Planning Areas



MARCO MID-ATLANTIC OCEAN DATA PORTAL

Search data

Active | MyPlanner | **Data** | Legend

- ▶ Administrative
- ▶ Fishing
- ▶ Fishing - Communities at Sea (by Port)
- ▶ Marine Life
- ▶ Marine Life Library (Species Specific)
- ▶ Maritime
- ▶ Oceanography
- ▶ Recreation
- ▼ Renewable Energy
 - ▶ PLANNING AND LEASE AREAS
 - ▶ OFFSHORE ENERGY PROJECTS UNDER REVIEW
 - ▶ PERMITTED PROJECTS
 - ▶ OPERATIONAL OFFSHORE ENERGY PROJECTS

Offshore Wind Areas on the Portals

<https://www.northeastoceandata.org/offshore-wind-projects/>

OFFSHORE WIND PROJECTS

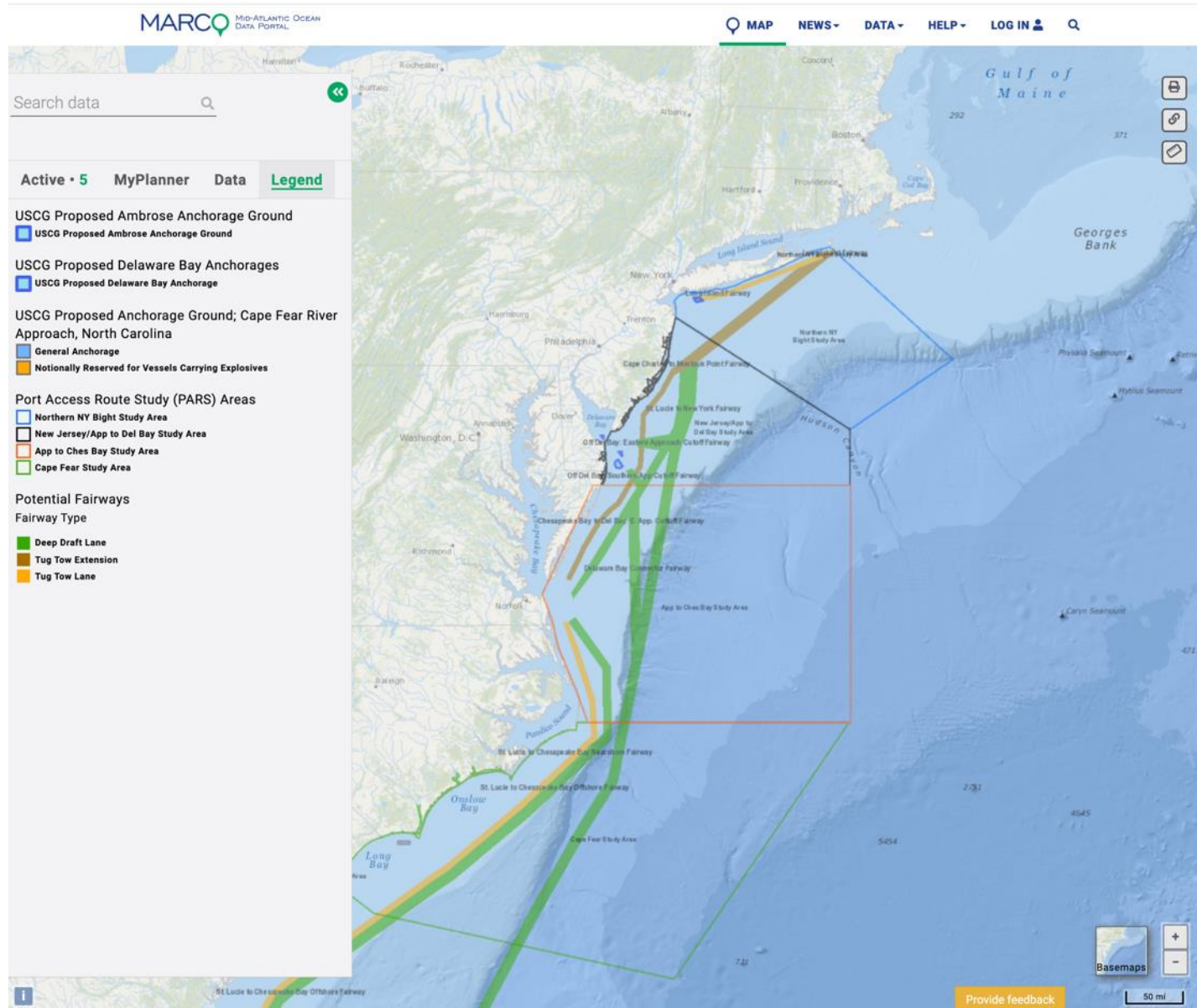
Click the links in the table below to access information associated with operational and proposed offshore wind energy projects from Maine to North Carolina. Links lead to the U.S. Bureau of Ocean Energy Management's (BOEM's) pages on each project, interactive Portal maps of each lease area where a project is located, and interactive Portal maps of any available project-specific data. For a series of maps related to offshore wind in the Northeast, visit the [Offshore Wind Map Gallery](#).

BOEM is the lead federal agency authorized to issue leases, easements, and rights of way to allow for renewable energy development on the Outer Continental Shelf (OCS). The four distinct phases of BOEM's renewable energy program are shown below the table. Other entities, including the [National Oceanic and Atmospheric Administration \(NOAA\)](#) and states, also have roles in the development and permitting process, which is beyond the scope of this web page.

Project Name <small>(Linked to BOEM page with details and public meeting info)</small>	Lease Number <small>(Linked to Portal map)</small>	Lessee / Parent Company	Status	Project Footprint, Cable Route(s), and/or Turbine Locations (as available)
Block Island Wind Farm	State lease	Deepwater Wind New England LLC / Orsted North America Inc.	Operation	Map
Coastal Virginia Offshore Wind - Pilot	OCS-A 0497	Commonwealth of Virginia Department of Mines Minerals and Energy	Operation	Map
Vineyard Wind 1	OCS-A 0501	Vineyard Wind 1 LLC / Avangrid Renewables LLC & Copenhagen Infrastructure Partners	BOEM ROD	Map
South Fork Wind Farm	OCS-A 0517	South Fork Wind LLC / Orsted North America Inc. & Eversource	BOEM FEIS	Map
Coastal Virginia Offshore Wind - Commercial	OCS-A 0483	Virginia Electric and Power Company – Dominion Energy	BOEM NOI	Map
Empire Wind	OCS-A 0512	Empire Offshore Wind LLC / Equinor Wind US & BP	BOEM NOI	Map
Ocean Wind 1	OCS-A 0498	Ocean Wind LLC / Orsted North America Inc. & PSEG	BOEM NOI	Map
Revolution Wind	OCS-A 0486	Revolution Wind LLC / Orsted North America Inc. & Eversource	BOEM NOI	Map
Kitty Hawk	OCS-A 0508	Avangrid Renewables LLC	BOEM NOI	Map
Vineyard Wind South (Phase 1: Park City Wind)	OCS-A 0534	Vineyard Wind LLC / Avangrid Renewables LLC & Copenhagen Infrastructure Partners	BOEM NOI	
Bay State Wind	OCS-A 0500	Bay State Wind LLC / Orsted North America Inc. & Eversource	COP Submitted	
Skipjack Wind 1	OCS-A 0519	Skipjack Offshore Energy LLC / Orsted North America Inc.	COP Submitted	
US Wind	OCS-A 0490	US Wind Inc	COP Submitted	
Sunrise Wind	OCS-A 0487	Sunrise Wind LLC / Orsted North America Inc. & Eversource		
Mayflower Wind	OCS-A 0521	Mayflower Wind Energy LLC / EDP Renewables & Shell		
Beacon Wind	OCS-A 0520	Beacon Wind LLC / Equinor Wind US & BP		

USCG Proposed Areas and Studies

- ▼ Maritime
- ▶ AIS VESSEL TRANSIT COUNTS (2020)
- ▶ AIS 2020 MONTHLY DATA SLIDERS
- ▶ AIS VESSEL TRANSIT COUNTS (2019)
- ▶ AIS 2019 MONTHLY DATA SLIDERS
- ▶ AIS VESSEL TRANSIT COUNTS (2018)
- ▶ AIS 2018 MONTHLY DATA SLIDERS
- ▶ AIS VESSEL TRANSIT COUNTS (2017)
- ▶ AIS 2017 MONTHLY DATA SLIDERS
- ▶ AIS VESSEL TRANSIT COUNTS (2016)
- ▶ AIS 2016 MONTHLY DATA SLIDERS
- ▶ AIS VESSEL TRANSIT COUNTS (2015)
- ▶ AIS VESSEL TRANSIT COUNTS (2013)
- ▶ AIS VESSEL DENSITY (2013)
- ▶ AIS VESSEL DENSITY (2012)
- ▶ AIS VESSEL DENSITY (2011)
- AIDS TO NAVIGATION
- ANCHORAGE AREAS
- ANCHORAGE AREAS - LOWER CHESAPEAKE BAY ANCHORAGES (6/29/2020)
- MAINTAINED CHANNELS
- N. ATLANTIC RIGHT WHALE SMAS
- OCEAN DISPOSAL SITES
- PILOT BOARDING AREAS
- PILOT BOARDING STATIONS
- ▶ PORT FACILITIES (AREAS)
- ▶ PORT FACILITIES (POINTS)
- ROUTING MEASURES
- ▶ SAND
- ▶ SUBMARINE CABLES AND PIPELINES
- ▼ USCG PROPOSED AREAS AND STUDIES
- USCG PROPOSED AMBROSE ANCHORAGE GROUND
- USCG PROPOSED DELAWARE BAY ANCHORAGES
- USCG PROPOSED ANCHORAGE GROUND; CAPE FEAR RIVER APPROACH, NORTH CAROLINA
- PORT ACCESS ROUTE STUDY (PARS) AREAS
- POTENTIAL FAIRWAYS



NORTHEAST OCEAN DATA

DATA EXPLORER

[Turn all Layers Off](#)

All Layers

Active Layers (9)

Keyword Search

▶ Administrative Boundaries

▼ Marine Transportation

▶ Navigation

▶ Commercial Traffic

▼ Proposed Areas and Studies

Proposed Ambrose Anchorage Ground

USCG PARS Study Areas

USCG ACPARS Fairways

USCG MA RI PARS Study Areas

Maritime Industry Data on the Portals

- **Commercial fishing**

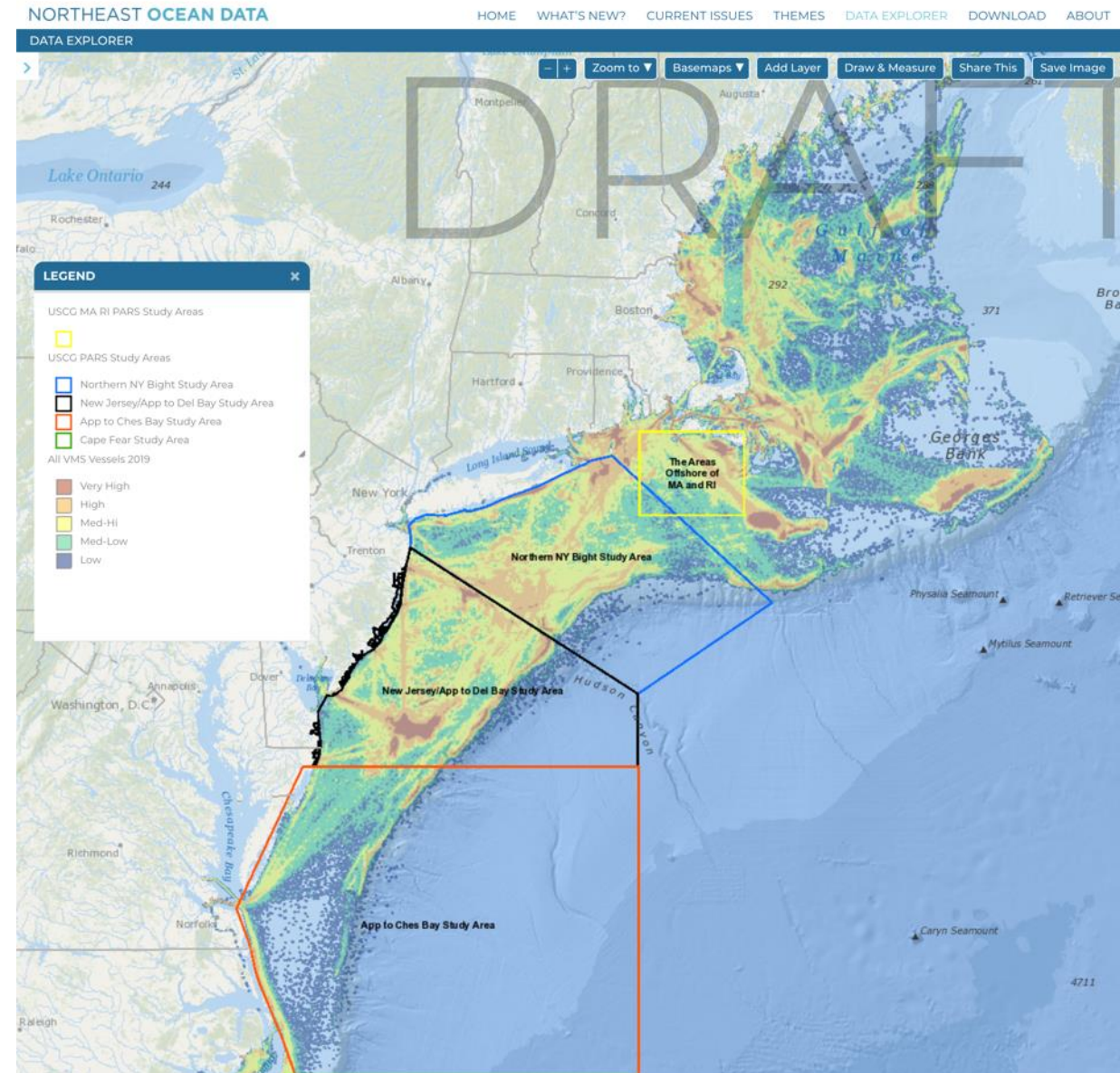
- Recently reviewed by the industry with the assistance of RODA
- Vessel Monitoring System
- Communities at Sea
- Management Areas

- **Maritime or marine transportation**

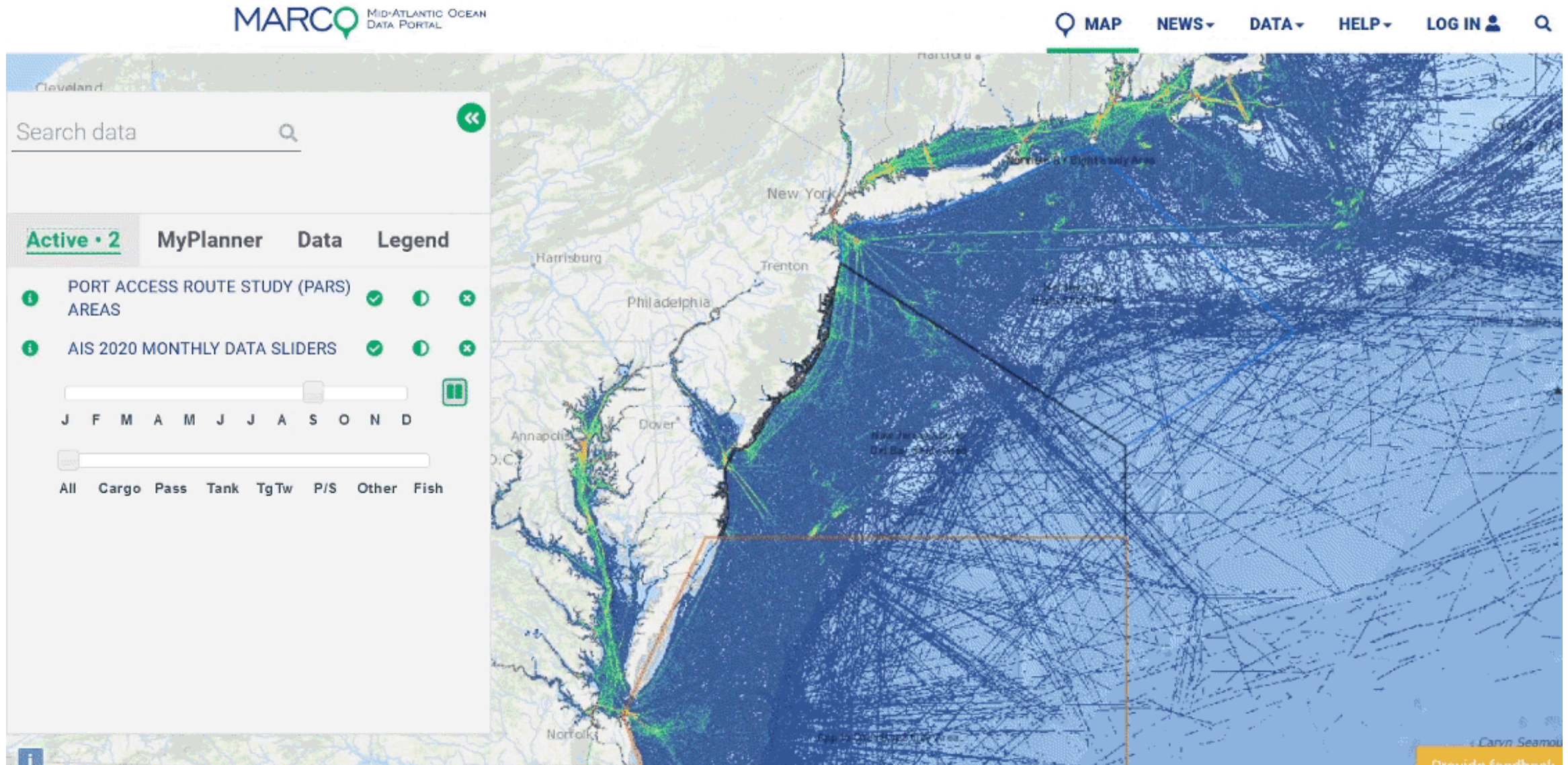
- Routing measures and other important operational areas
- Vessel traffic from AIS
- Reviewed by USCG, NOAA, BOEM, port operators groups, and safety and security forums

- **Recreation**

- Boating
- Whale watching
- SCUBA
- Other coastal recreation



Maritime Industry Data on the Portals



Contacts

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Director, Regional Wildlife Science Entity

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Karl Vilacoba

Manager, Mid-Atlantic Ocean Data Portal

kvilacob@monmouth.edu

BOEM

Knowledge Exchange

MARINE SPATIAL PLANNING

Cheryl Stahl, DNV



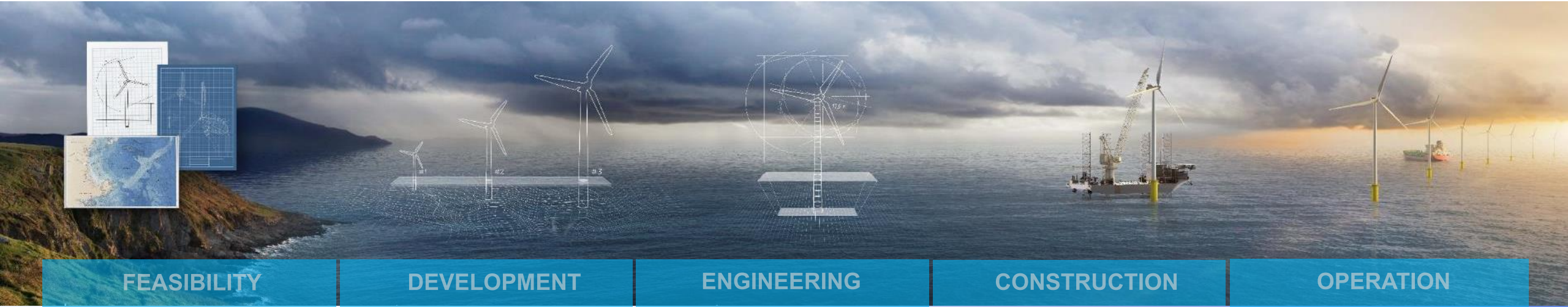
Amilynn Adams, USCG

U.S. Department of
Homeland Security
**United States
Coast Guard**





WHEN TRUST MATTERS



FEASIBILITY

DEVELOPMENT

ENGINEERING

CONSTRUCTION

OPERATION

Driven by our purpose, to safeguard life, property and the environment, DNV empowers our customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. DNV is the world's leading classification society and a recognized advisor for the maritime and energy industries. We deliver world-renowned testing, certification and technical advisory services helping businesses assure the performance of their organizations, facilities, people and supply chains.



150 yrs Shipping



45 yrs Oil & Gas



30 yrs Renewables

U.S. Coast Guard Navigation Center



Waterways Risk Analysis and Support Division



Homeland
Security

*U.S. Department of
Homeland Security*
**United States
Coast Guard**





Navigation Safety Analyses and Spatial Data

Data sources used in assessing navigation safety

Which data?

How it is used?

Outputs from spatial data analysis of navigation safety

Marine traffic analysis

Incident/accident modelling

Looking forward

Where we are headed?

How we intend to get there



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Homeland Security
**United States
Coast Guard**





Navigation Safety Analyses and Spatial Data

Spatial Data

(sources/types and inherent challenges)



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Coast Guard**





Spatial Data Sources - Vessels

USCG - AIS

Nationwide AIS (NAIS)

S-AIS

USCG business systems

Marine Cadastre - AIS

NOAA/BOEM

Quality Routines

Publically available

Time-series archive

NOAA Fisheries - VMS

Vessel Monitoring System

Monitored fisheries (not all fisheries are monitored)

Magnuson-Stevens Fisheries Management and Conservation Act data confidentiality requirements.



ESRI's US Vessel Traffic, <https://livingatlas.arcgis.com/vessel-traffic/>



**Homeland
Security**

U.S. Department of
Homeland Security
**United States
Coast Guard**





Data Quality

“The best way to improve data quality is to remove the humans.”

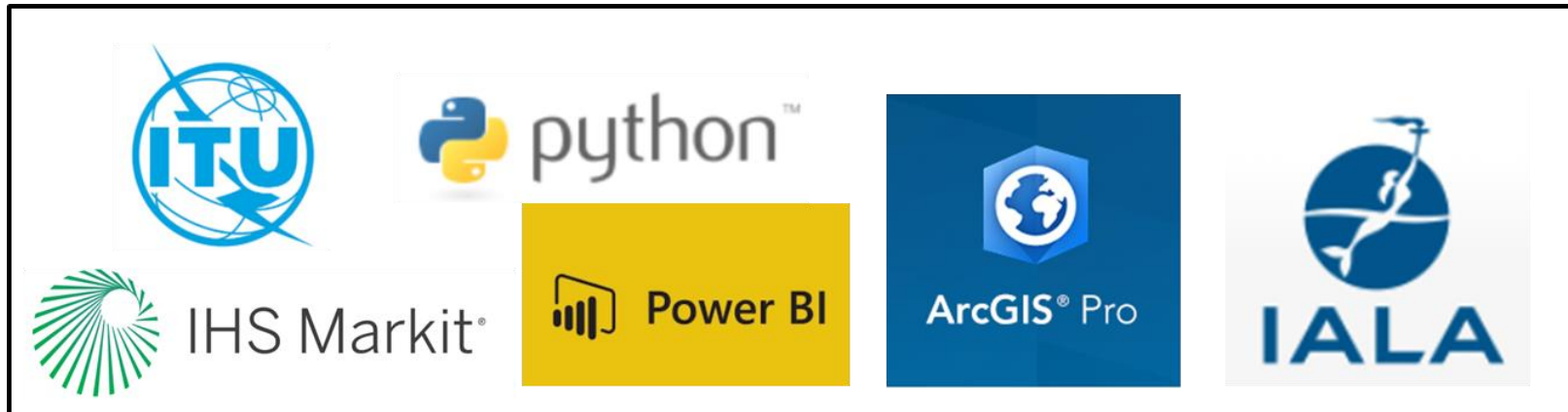
Challenges

- Counting Boats
- Counting Tracks
- Vessel Categories
- Vessel Characteristics



Opportunities

- Web Scraping
- Authoritative Registries
- ArcGIS tools
- Partnerships



Homeland Security

U.S. Department of
Homeland Security
**United States
Coast Guard**





Data Quality Challenge



How many boats
are in the harbor?



**Homeland
Security**

U.S. Department of
Homeland Security
**United States
Coast Guard**



Data Sources used in Navigation Safety Risk Assessment

- Navigation Safety Risk Assessment is required by USCG/BOEM for all offshore wind developments
- Requires a considerable amount of spatially distributed data (or in lieu, statistics)
 - Wind
 - Wave
 - Tide/current
 - Bathymetry
 - Visibility
 - Other marine uses, i.e., fishing and recreation
 - Vessel transits not included in AIS data
 - Non-marine uses, i.e., DoD
 - Cargoes
 - Areas with special rules for transit, i.e., Pilots on board
 - Sizes of structures in the lease area
 - Locations of structures and export cable
 - Historical data on accidents/incidents

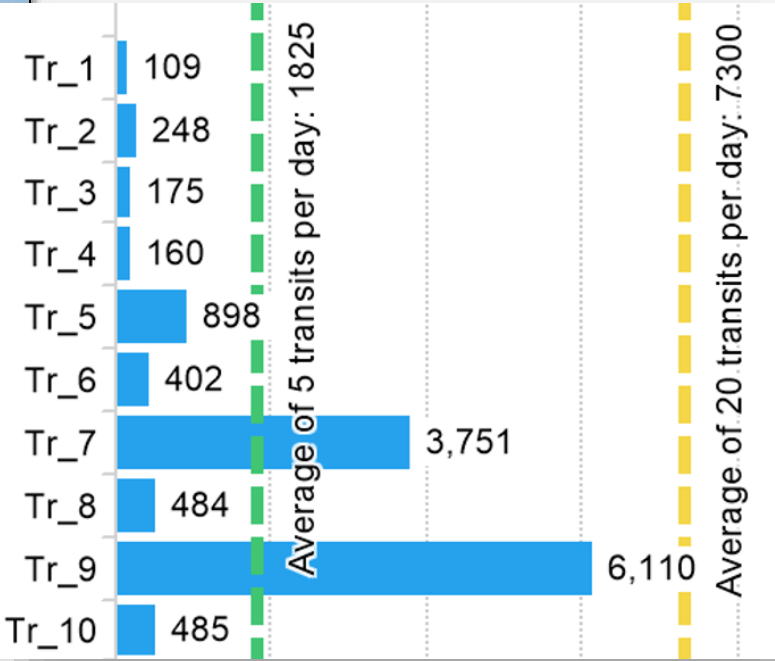
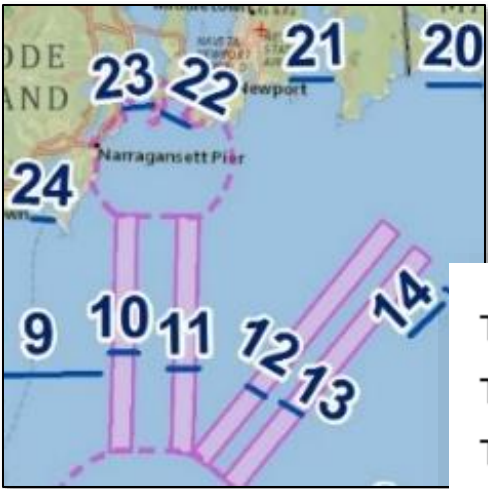
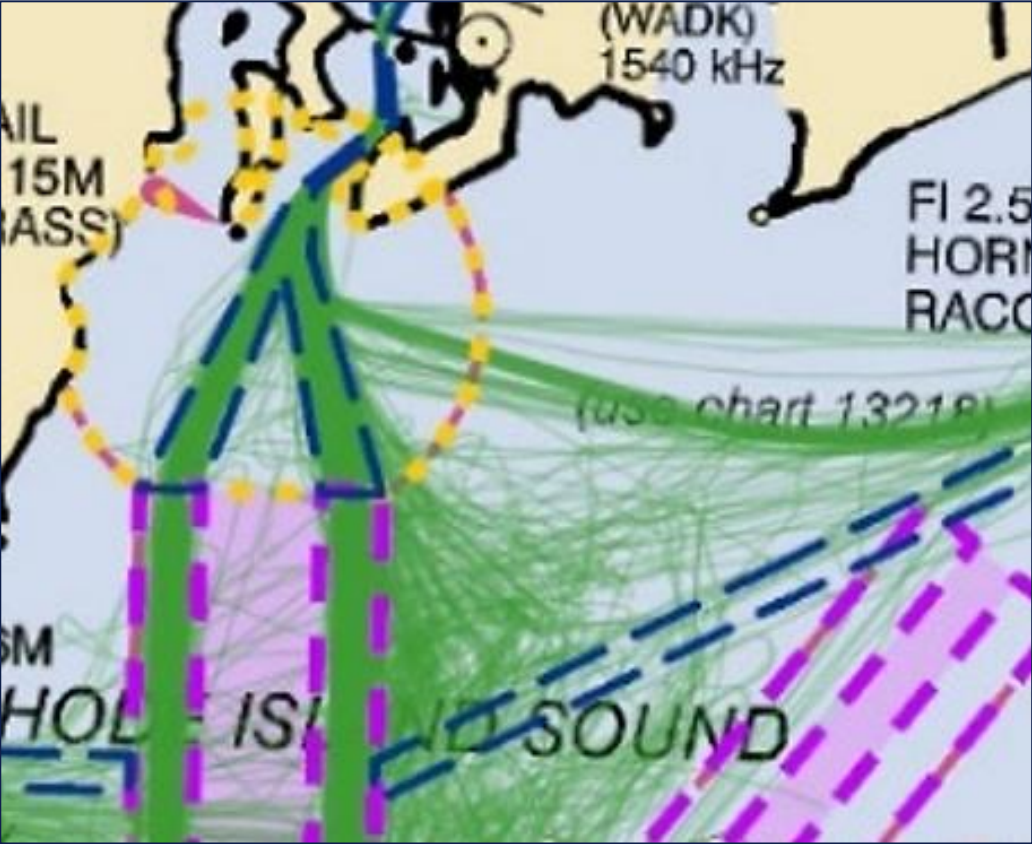
Almost all of the data is obtained for each wind farm assessment –
quality has improved over time

Data Sources - Summary

- AIS is a primary data input
 - Quality routines are important
 - Has limitations due to carriage requirements
- VMS data has confidentiality/limitations
- Data quality and resulting products are improving over time

Example Output of Spatial Data Analysis for Navigation Safety

Output of Spatial Data Analysis - Traffic Surveys

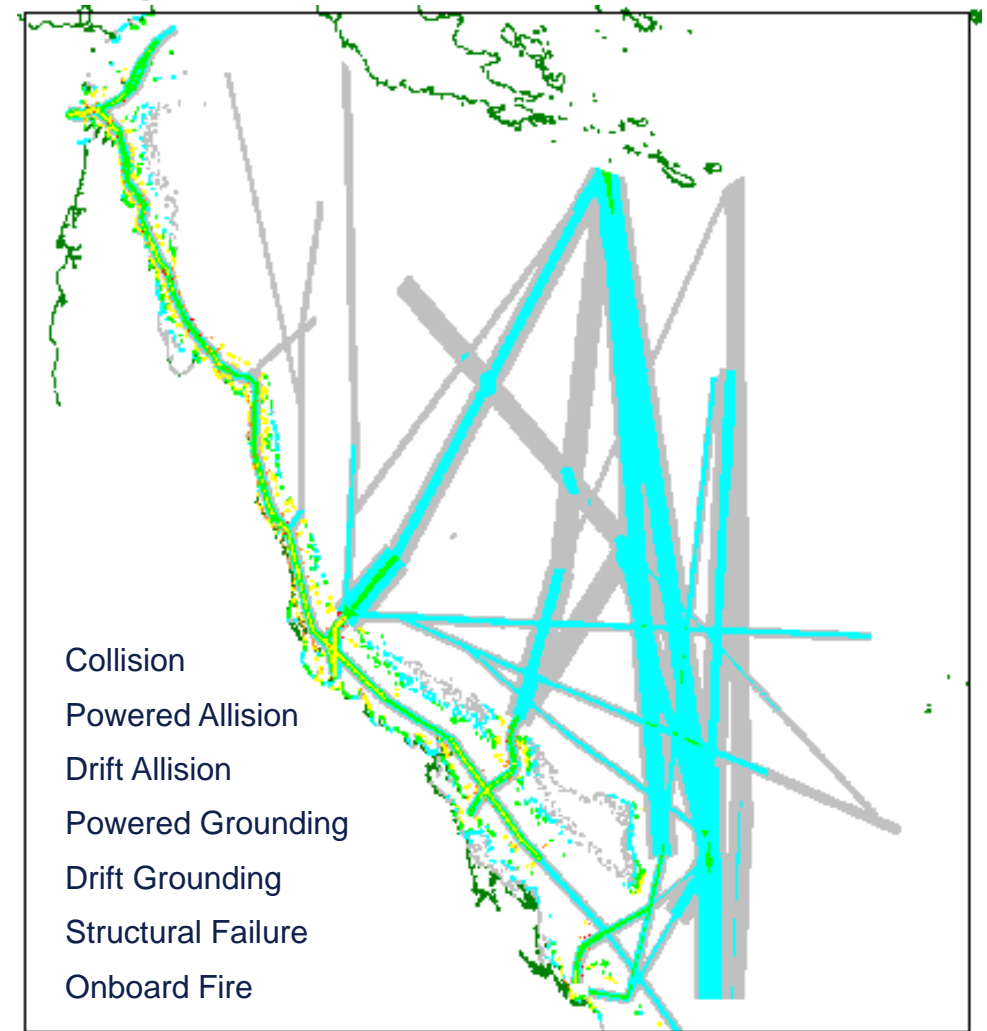


Outputs of Vessel Incident Modeling in MARCS

MARCS was built to evaluate change in risk from (1) new vessel traffic; new cargoes (spills/fires); (2) maritime mitigation measures

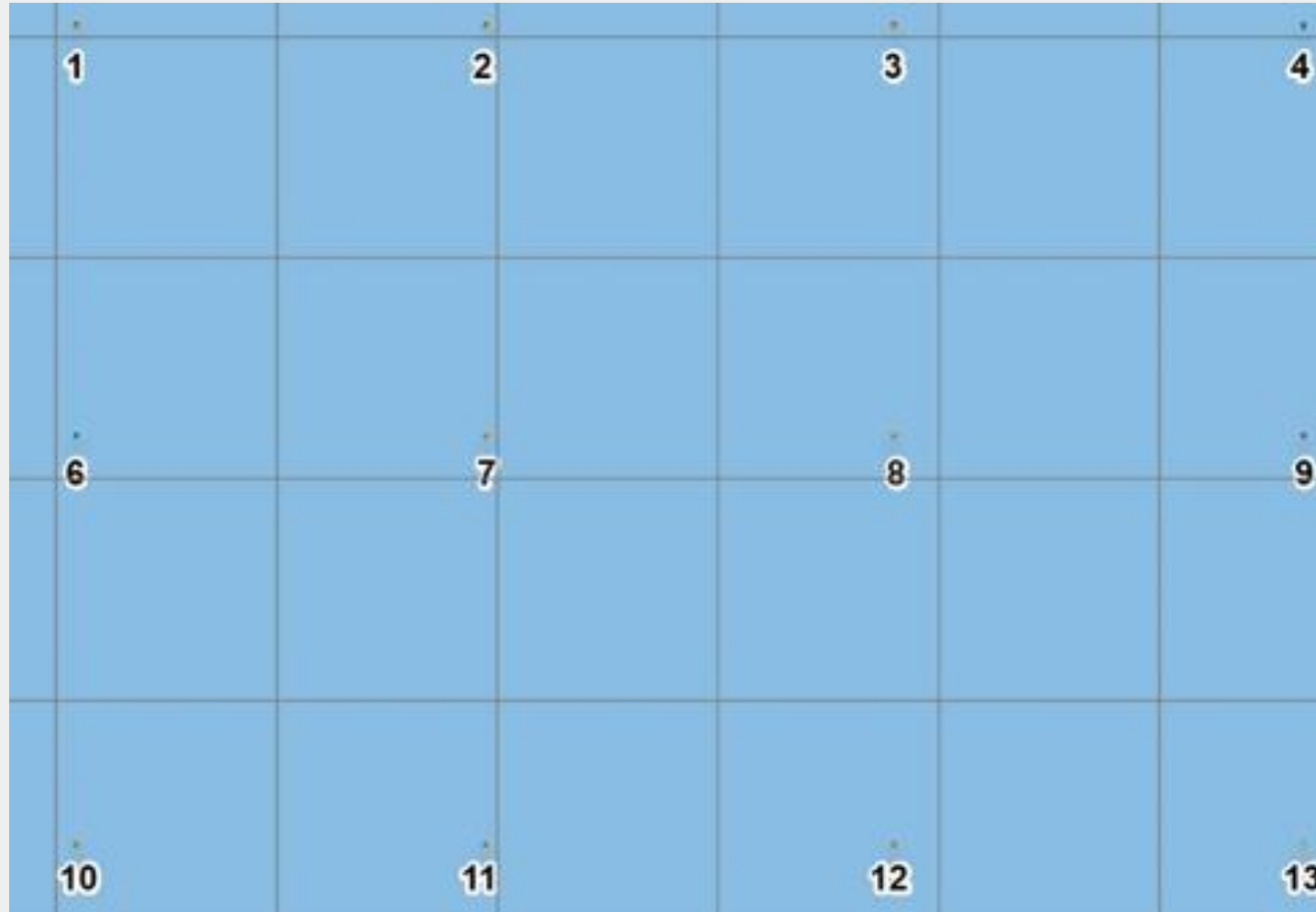
Example output types:

- Accident frequency – used for wind farms
- Consequence and frequency
- As function of location (grid cell), accident type, vessel type, and lane (route)
- Spill risk (volume/year)
- Sum (integrate) over different variables to provide many different types of results



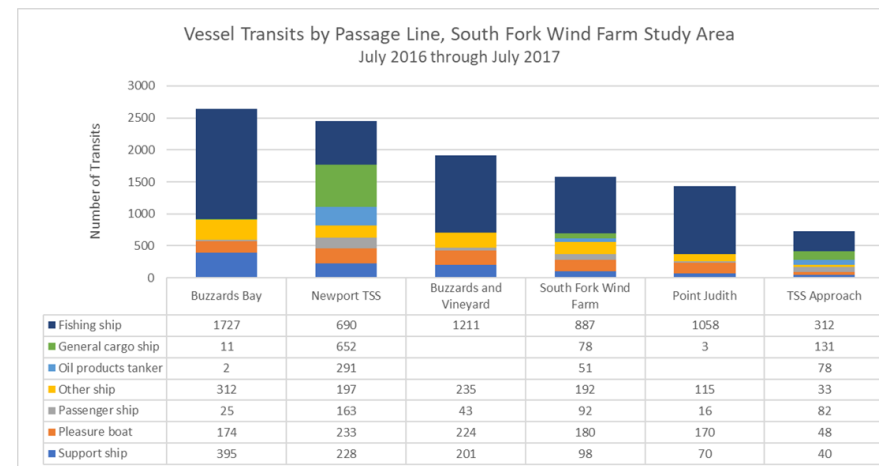
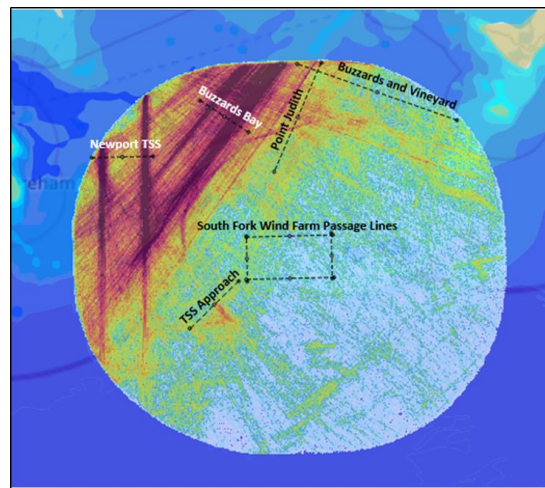
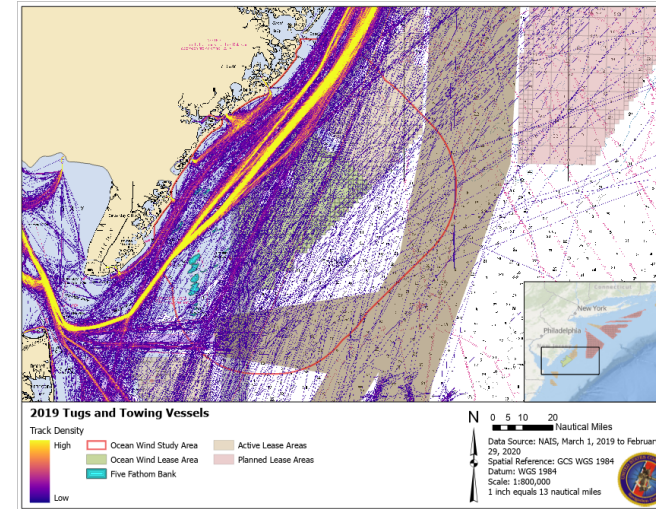
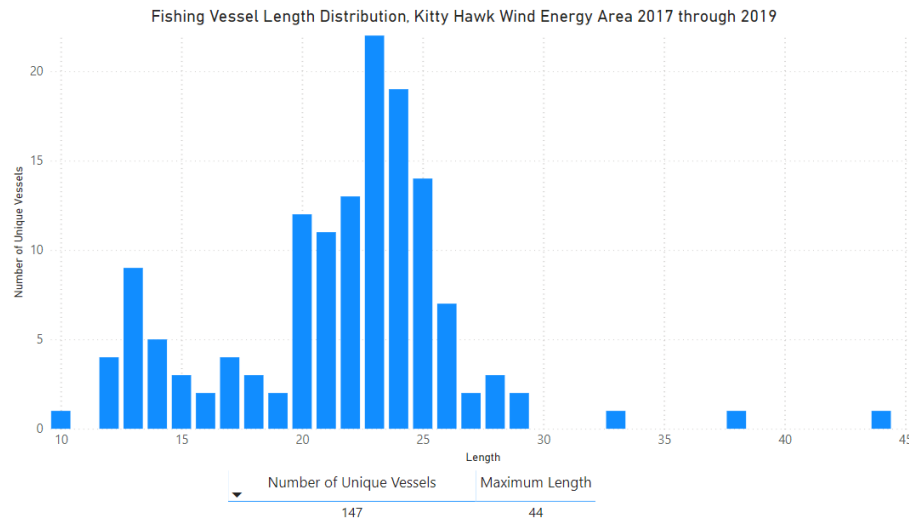
Limitations of Spatial Output

Example: Allision Risk in a Wind Farm – to scale





Data Analysis Outputs – Traffic Surveys



U.S. Department of
Homeland Security

U.S. Department of
Homeland Security
United States Coast Guard

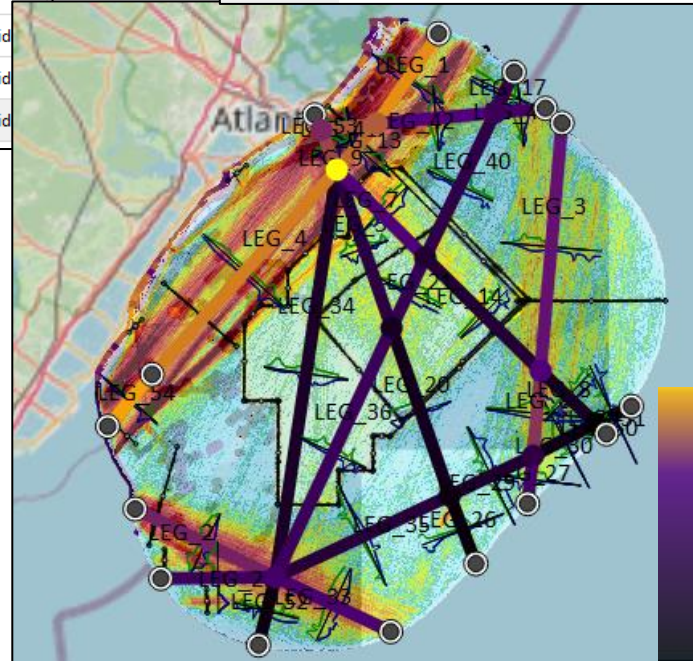




Data Analysis Outputs – Incident Frequency Modeling

	OW19_Alpha	Unit
Powered Grounding	1.306	Years between incidents
Drifting Grounding	19.11	Years between incidents
Total Groundings	1.223	Years between incidents
Powered Allision	---	Years between incidents
Drifting Allision		Years between incidents
Total Allisions	---	Years between incidents
Overtaking	6,975	Years between incidents
HeadOn	1,831	Years between incidents
Crossing	2,015	Years between incidents
Merging	3.498e+04	Years between incidents
Bend	3.488e+04	Years between incidents
Area	---	Years between incidents
Total Collisions	804.6	Years between incidents

Item	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Struck sum
Crude oil tanker															
Oil products tanker	3.39535e-10					6.65906e-10			2.72359e-12		4.1735e-09	1.14349e-09	2.79965e-09	3.37431e-09	1.24991e-08
Chemical tanker															
Gas tanker															
Container ship															
General cargo ship						6.65906e-10					1.07063e-08	2.59824e-09	6.14648e-09	7.78144e-09	2.78983e-08
Bulk carrier															
Ro-Ro cargo ship															
Passenger ship									2.72359e-12						
Fast ferry															
Support ship											4.05813e-11	9.54312e-12	2.28451e-11	2.92466e-11	1.0494e-10
Fishing ship											4.05813e-11	9.54312e-12	2.28451e-11	2.92466e-11	1.0494e-10
Pleasure boat											4.1735e-09	1.14349e-09	2.79965e-09	3.37431e-09	1.24991e-08
Other ship											4.1735e-09	1.14349e-09	2.79965e-09	3.37431e-09	1.24991e-08
Striking sum											4.1735e-09	1.14349e-09	2.79965e-09	3.37431e-09	1.24991e-08



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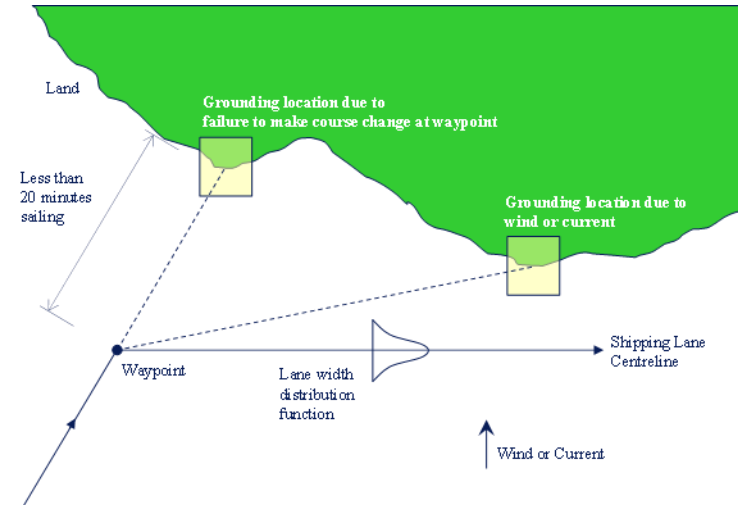
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Spatial Data Outputs - Summary

- Two different models
- Similar methodologies
- Both built on 50-year old frameworks of fault/event trees that are still valid
- Underlying failure data are overly pessimistic - could be updated to reflect more recent maritime risk controls.
- Model correlation to historical data increases with lots of quality data.



$$\text{Frequency} = (\text{Frequency of vessels on lane aligned on location}) \times (\text{Probability of failure to make course change})$$

$$\text{Frequency} = (\text{Frequency of vessels in lane}) \times (\text{Probability of inattention}) \times (\text{Probability of wind/wave to shore})$$



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The Future of Spatial Data in Navigation Safety Analyses

- Improved data has enabled
 - Higher quality (more realistic) analyses and outputs
 - Support better decision making
 - Identification of meaningful mitigation measures
- Increased collaboration w/ stakeholders and agencies
 - Brings focus on the aspects of concern
 - Increases understanding of interpretation/use of the outputs and conclusions



Future of Waterways Risk Analysis & Modeling

Expand quantitative analysis and visualization

Colocation Analysis (encounters)

Space-Time Cubes (congestion)

Simulation (measure precautionary area effectiveness)

Project models into the future

Machine learning

Forest-based classification and regression

Incorporate climate change driven impacts

Technical collaboration

Partner with industry, academia, other government agencies

Leverage ESRI GIS expertise via DHS enterprise agreement

Participate in fora, symposia, conferences, knowledge exchanges



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Thank You!

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