Spatial Modeling to Inform Wind Energy Areas for the Gulf of Maine Call Area

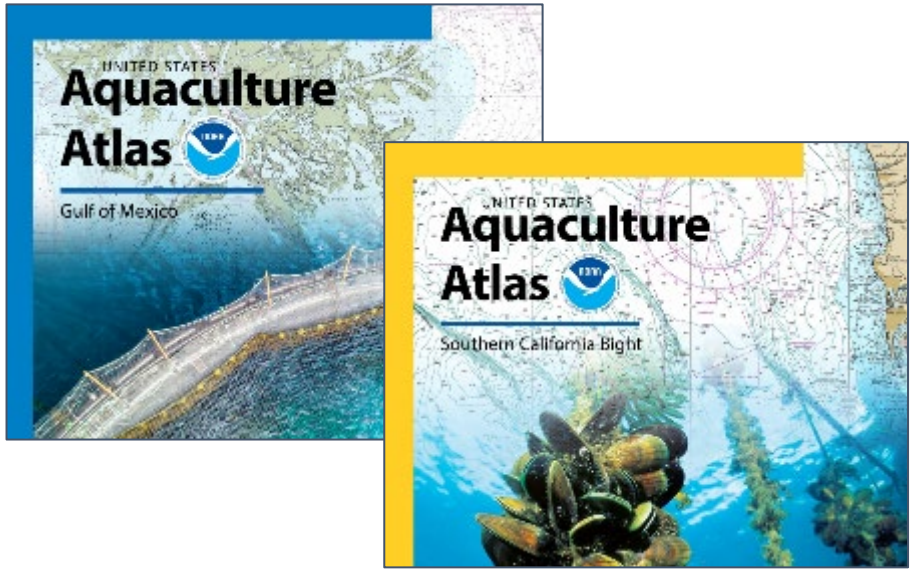
NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

BOEM BUREAU OF OCEAN ENERGY MANAGEMENT

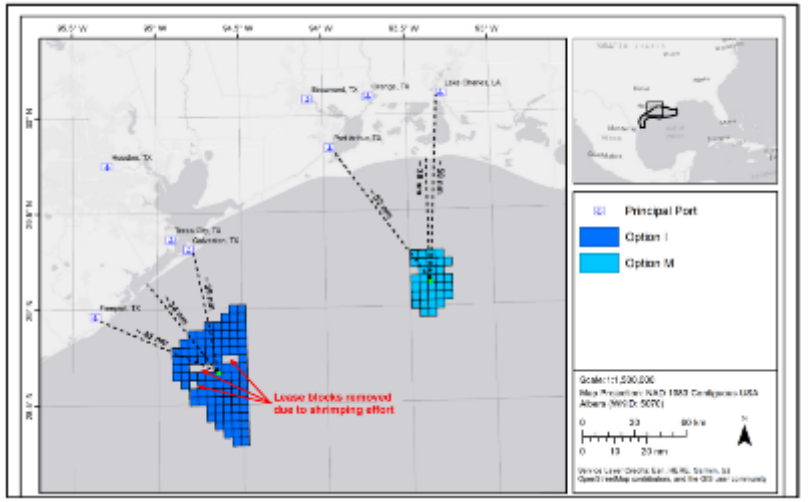
NOAA Office for Coastal Management
NOAA National Centers for Coastal and Ocean Science
Bureau of Ocean Energy Management

NOAA Spatial Planning

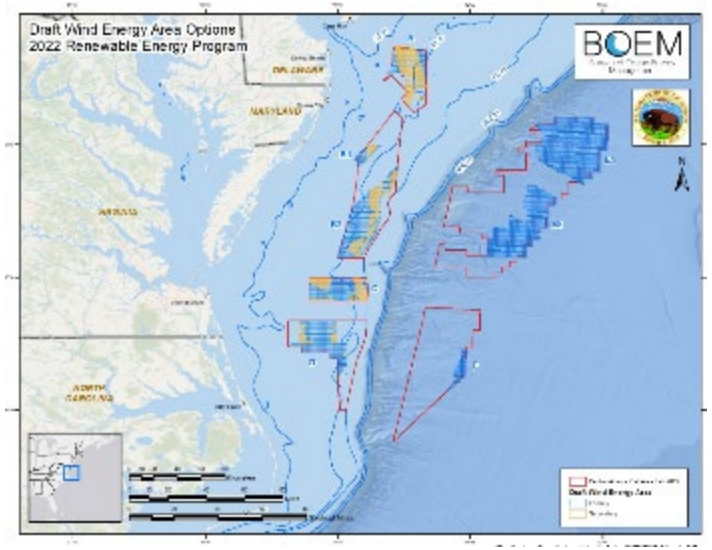
- Completed 50+ analyses in last 5 years
- Aquaculture Opportunity Areas
- Wind Energy Areas
- State-designated aquaculture use areas
- Spatial planning for Ports/Harbors and farm specific sites
- Tool/app development
- Stakeholder engagement
- Geospatial science and services



Gulf of Mexico WEAs



Central Atlantic WEAs



New Federal Partnerships

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Home / News & Features

NOAA and BOEM announce interagency collaboration to advance offshore wind energy

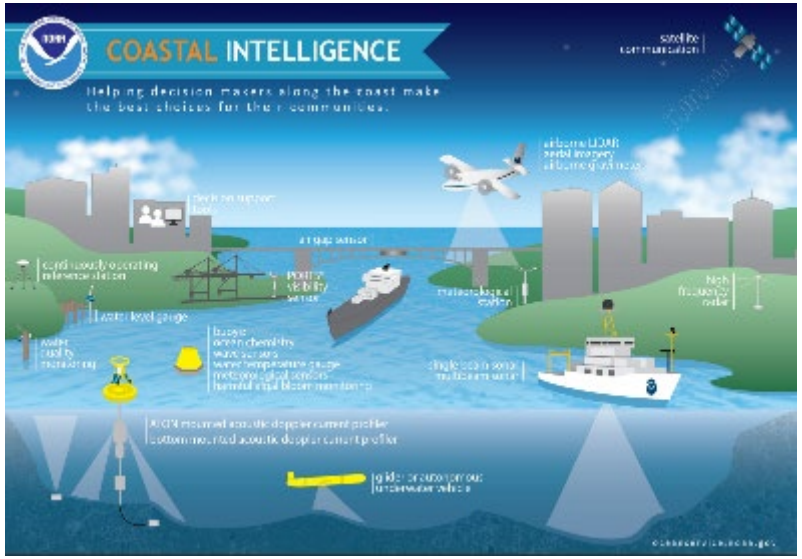
HOME | NEWSROOM

BOEM Enhances its Processes to Identify Future Offshore Wind Energy Areas

New Changes in Response to Public Input

09/16/2022

BOEM
Bureau of Ocean Energy Management



Wind Spatial Models Underway

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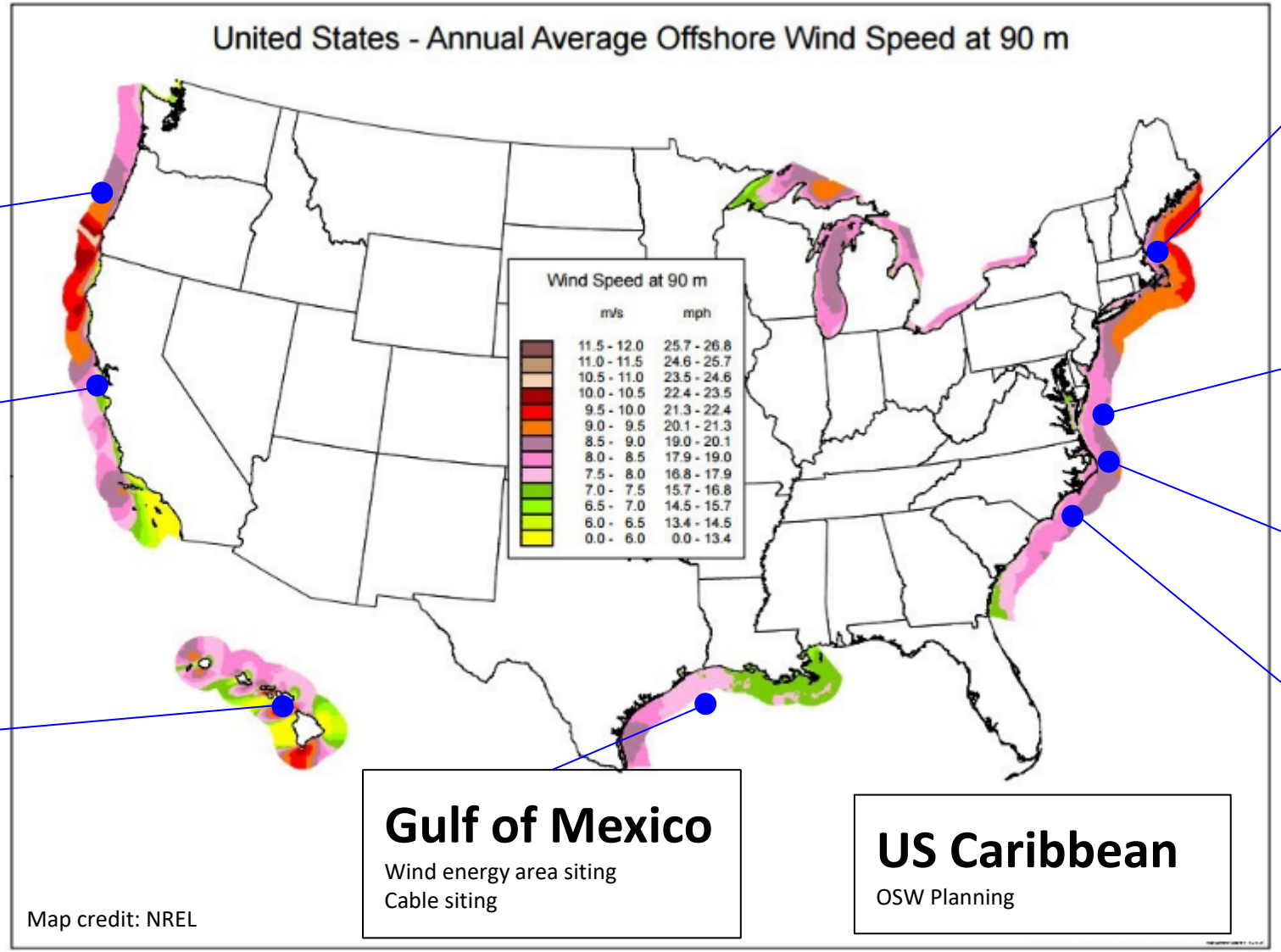
Oregon
Wind energy area siting
Cable siting

California
Call area siting
Wind energy area siting
Cable siting

Hawaii
Call area siting
Wind energy area siting
Cable siting



Map credit: NREL

Gulf of Mexico
Wind energy area siting
Cable siting

US Caribbean
OSW Planning

Gulf of Maine
Call area siting
Wind energy area siting
Cable siting

Central Atlantic
Wind energy area siting
Cable siting

Kitty Hawk
Cable siting

Carolina Long Bay
Cable siting

NOAA

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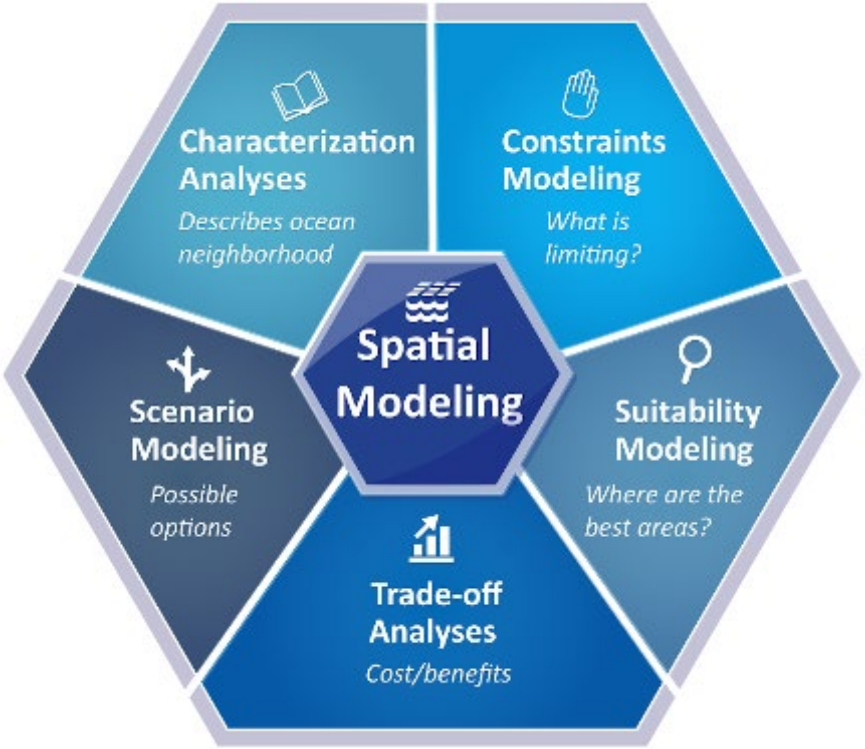
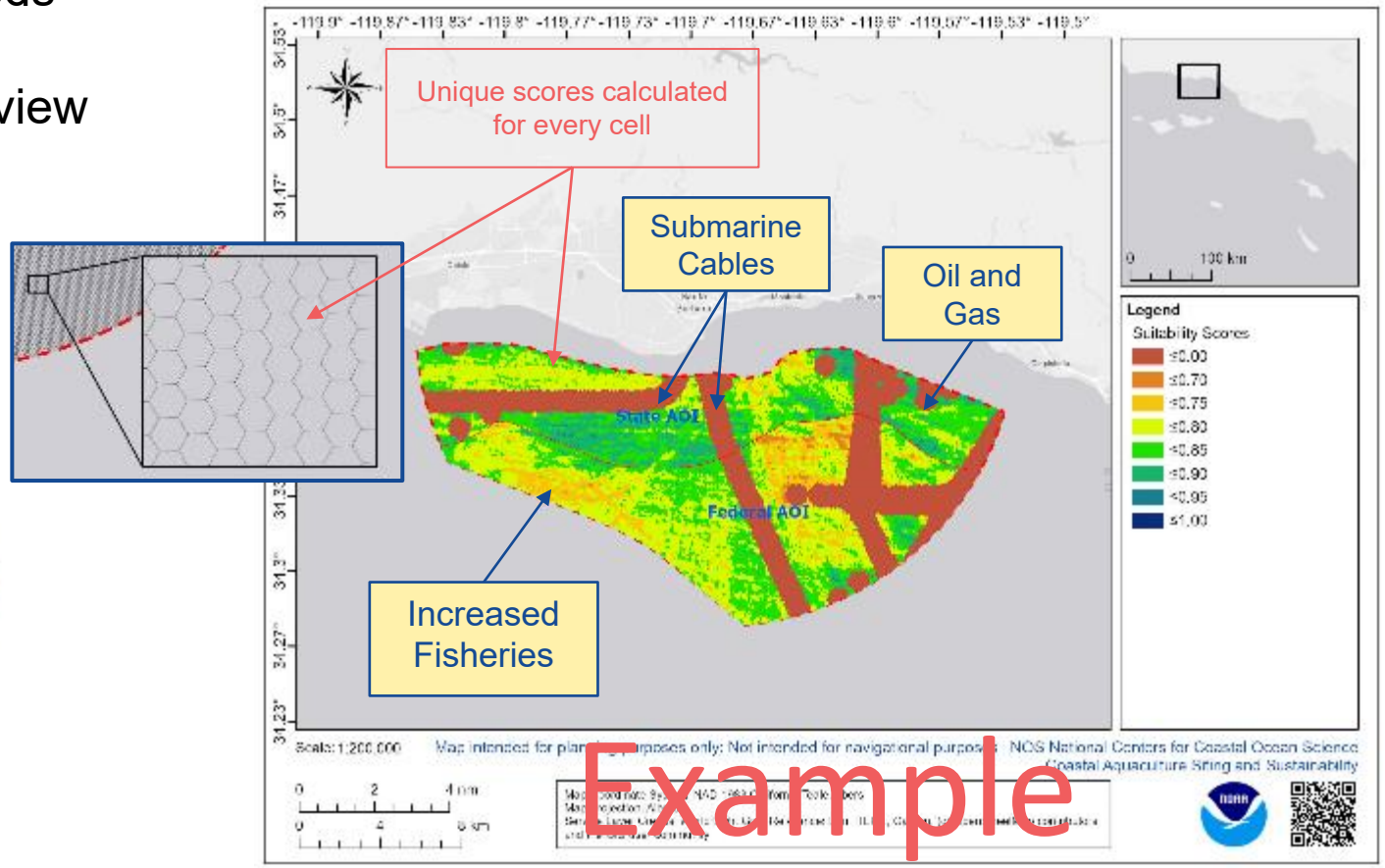
Why Spatial Suitability Modeling?

Analyzes the “whole ecosystem”
Identifies hotspots of conflict and opportunity
Requires set rules (weights) and methods
Provides defensible and transparent methods
Allows for scenario planning
Supports comprehensive environmental review



A **spatial suitability model** weights locations relative to each other based on a given criteria.



Model Structure

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

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

MarineCadastre.gov
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.

NOAA FISHERIES

State Agencies

BOEM
Bureau of Ocean Energy Management

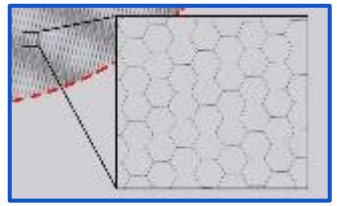
Many Stakeholders/Experts

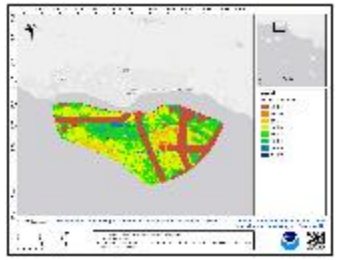
Submodels

- Industries
- Fisheries
- Natural Resources
- Wind

Geometric Mean Calculated

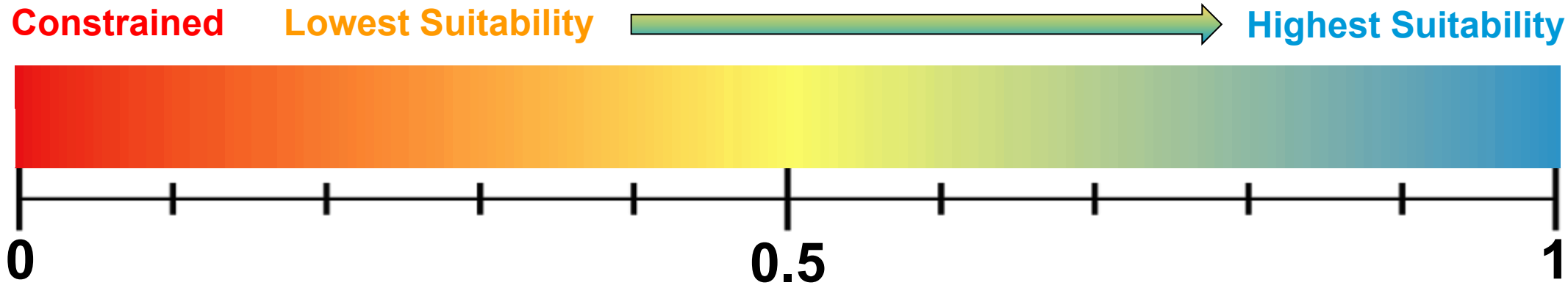
Cumulative Suitability

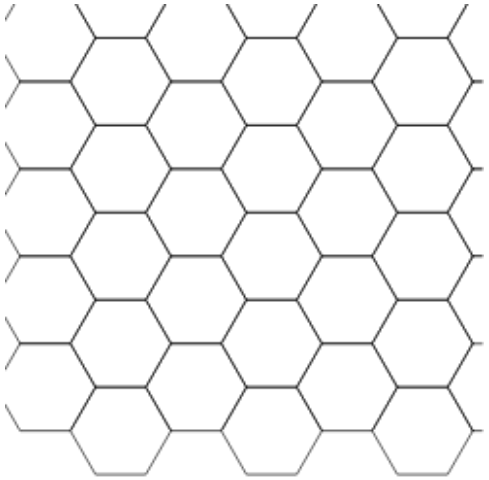




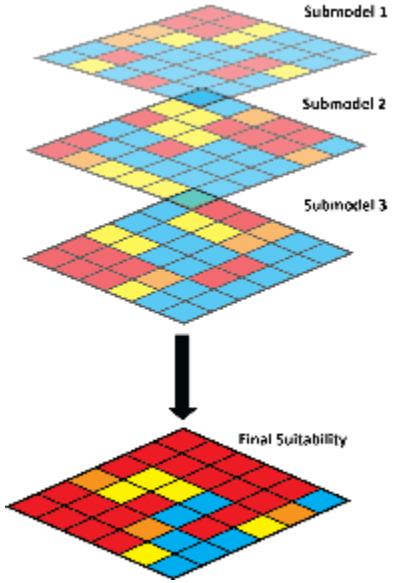
Building the Spatial Model

Scoring Data Layers





Scores are assigned to each grid cell for each separate data layer

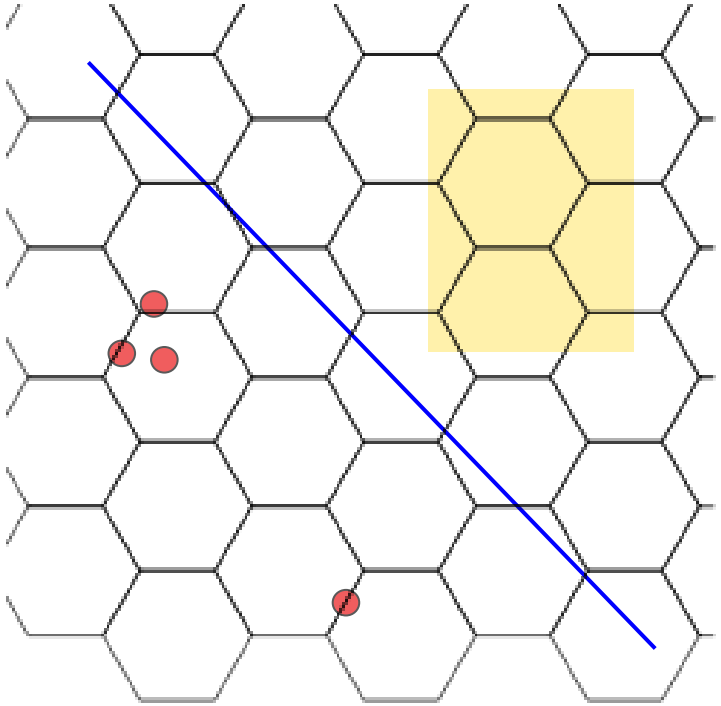


Cumulative scores for each submodel are calculated

The geometric mean of all submodels is calculated to determine final suitability

Scoring Data Layers

Categorical data

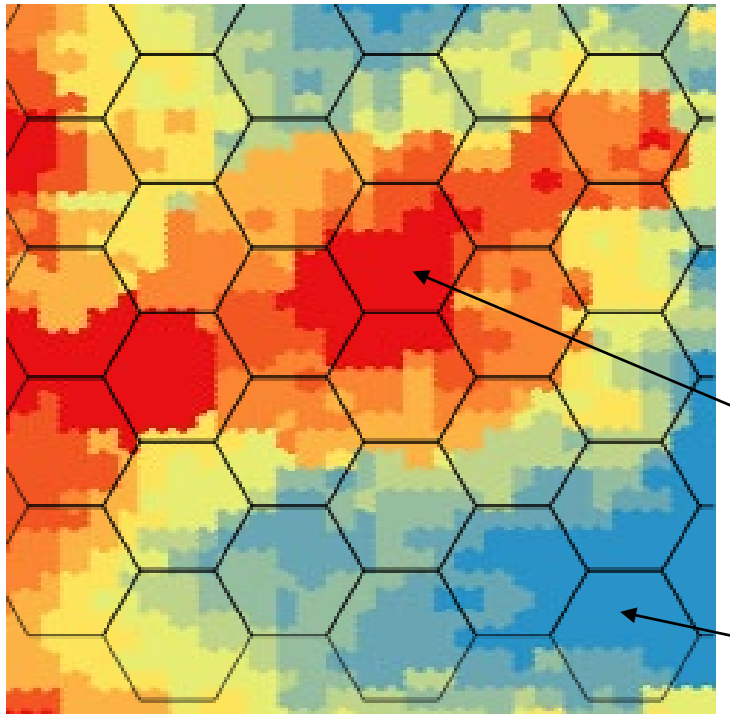


Examples:

- Deep-sea corals
- Cables
- Pipelines
- Wrecks
- Military restriction areas
- Hardbottom area
- Environmental buoys

Presence/Absence Data
0 - 1 score is assigned to grid cell if that data layer is present inside of cell or overlaps the cell

Continuous data



Examples:

- Fishing effort
- Vessel traffic
- Protected resources

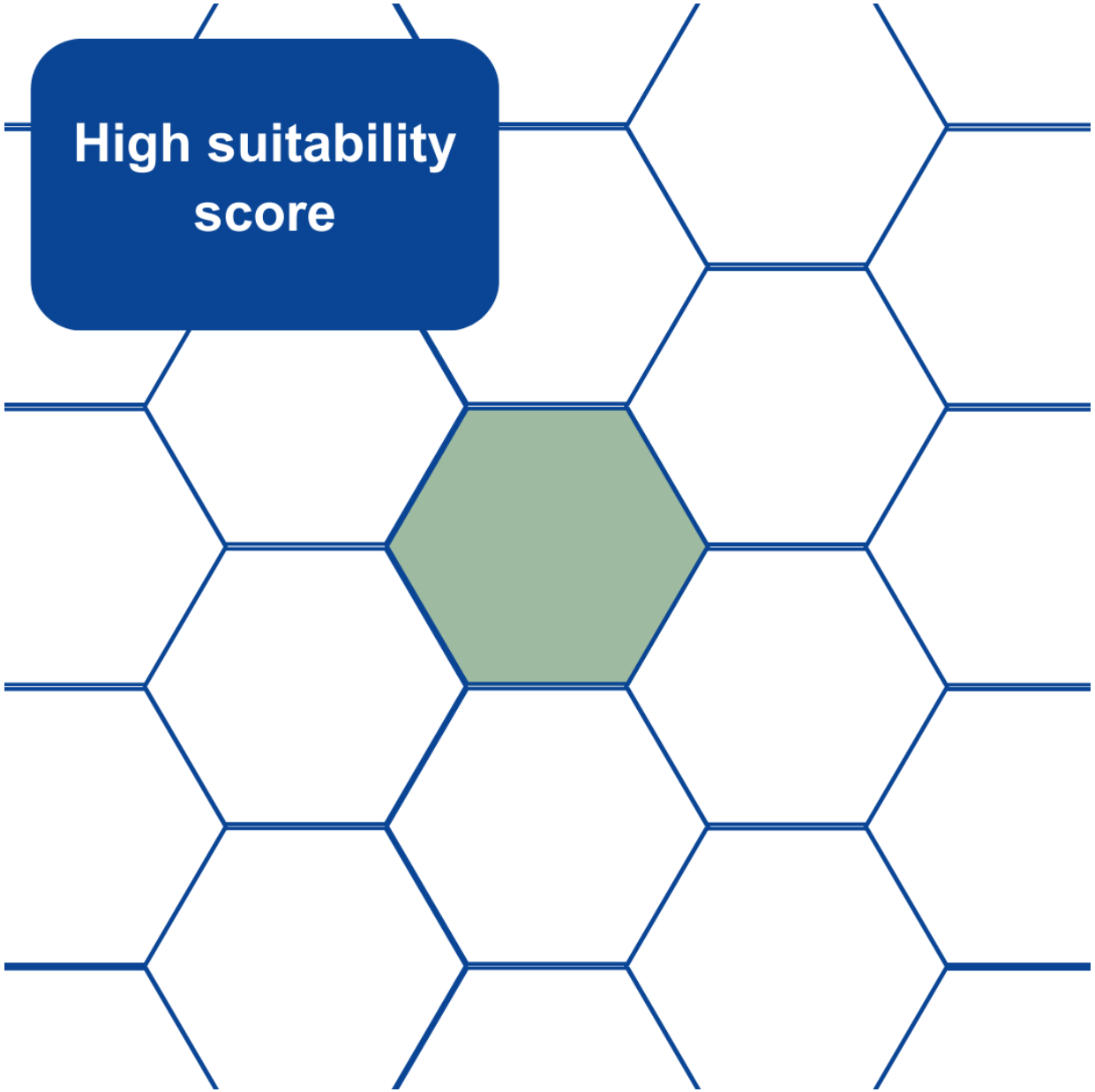
High fishing effort - score closer to 0

Lower fishing effort - score closer to 1

Raster Data - Changes over space and time
Data is rescaled 0 - 1 using a z-membership function

Cluster & Outlier Analysis

- Identifies concentrations of highly suitable areas
- Examines areas in neighborhoods
- Takes into account the suitability of all neighbors in the neighborhood



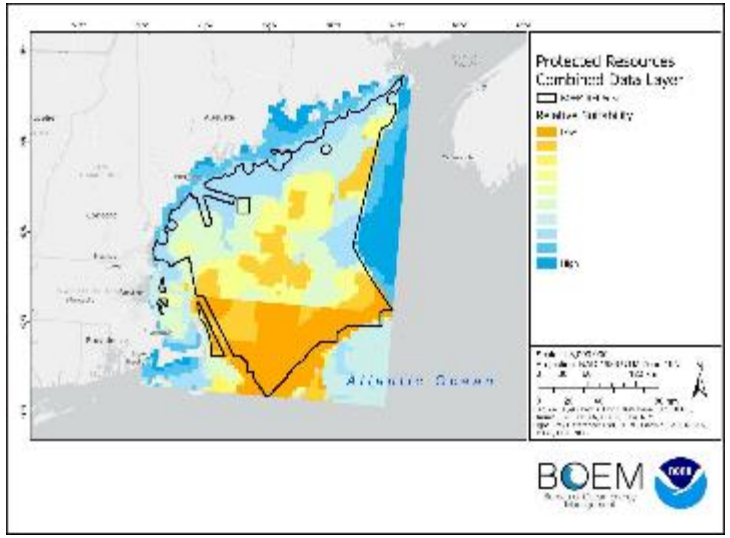
Data Inventory by Submodel

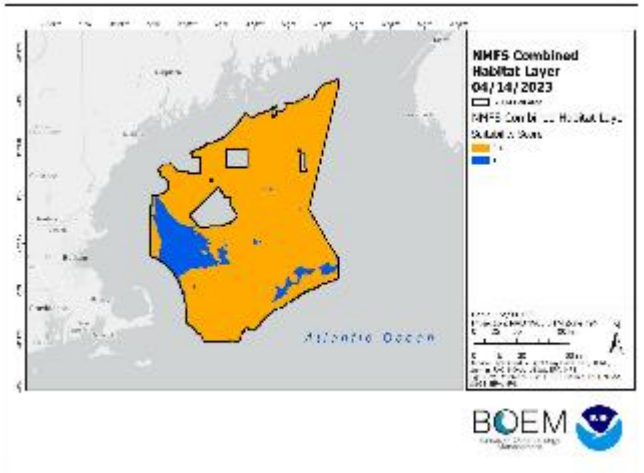
Natural Resources Submodel

Data Layer
NMFS Protected Species Combined Layer (22 species) - **See summary slide**
NMFS Habitat Combined Layer (9 habitats) - **See summary slide**
NMFS North Atlantic Right whale Considerations (4 layers) - **See summary slide**
NARW Area Removals: Massachusetts Restricted Area; Great South Channel Restricted Area, LMA 1 Restricted Area, CLF Cashes Ledge Extensions; NARW Corridor & Extension
FWS Combined Avian Layer: BRI - Integrated Seabird Risk and Vulnerability Assessment - High BRI - Tracking Data for Diving Birds - 50% Core Use Contour 24 nm setback from shore, including islands (birds and bats)
NEFSC Trawl Survey Interpolated Biomass 2010 - 2019

Combined data layers

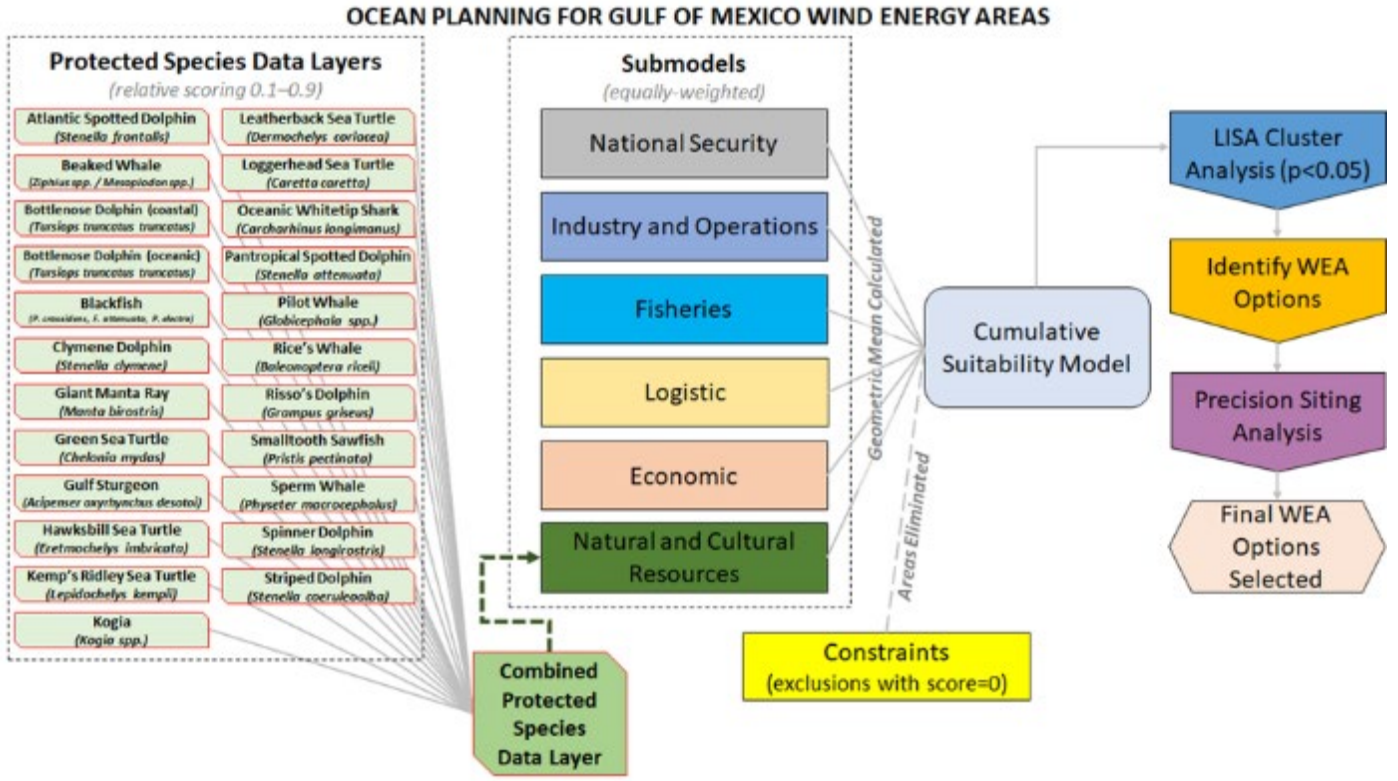
Single layer for a topic (e.g., whales/sea turtles, birds, habitat, etc.)
Provides higher weighting of most critical species/habitats
Provides a holistic view across entire study area/region





Status	Trend	Score	Converted scores for model
Endangered	Declining, small population* or both	9	0.10
Endangered	Stable or unknown	8	0.20
Endangered	Increasing	7	0.30
Threatened	Declining or unknown	6	0.40
Threatened	Stable or increasing	5	0.50
MMPA Strategic	Declining or unknown	4	0.60
MMPA listed	Small population* or unknown/declining	3	0.70
MMPA listed	Large population or stable/increasing	2	0.80

**Small population equates to populations of 500 individuals or less (Franklin 1980).*



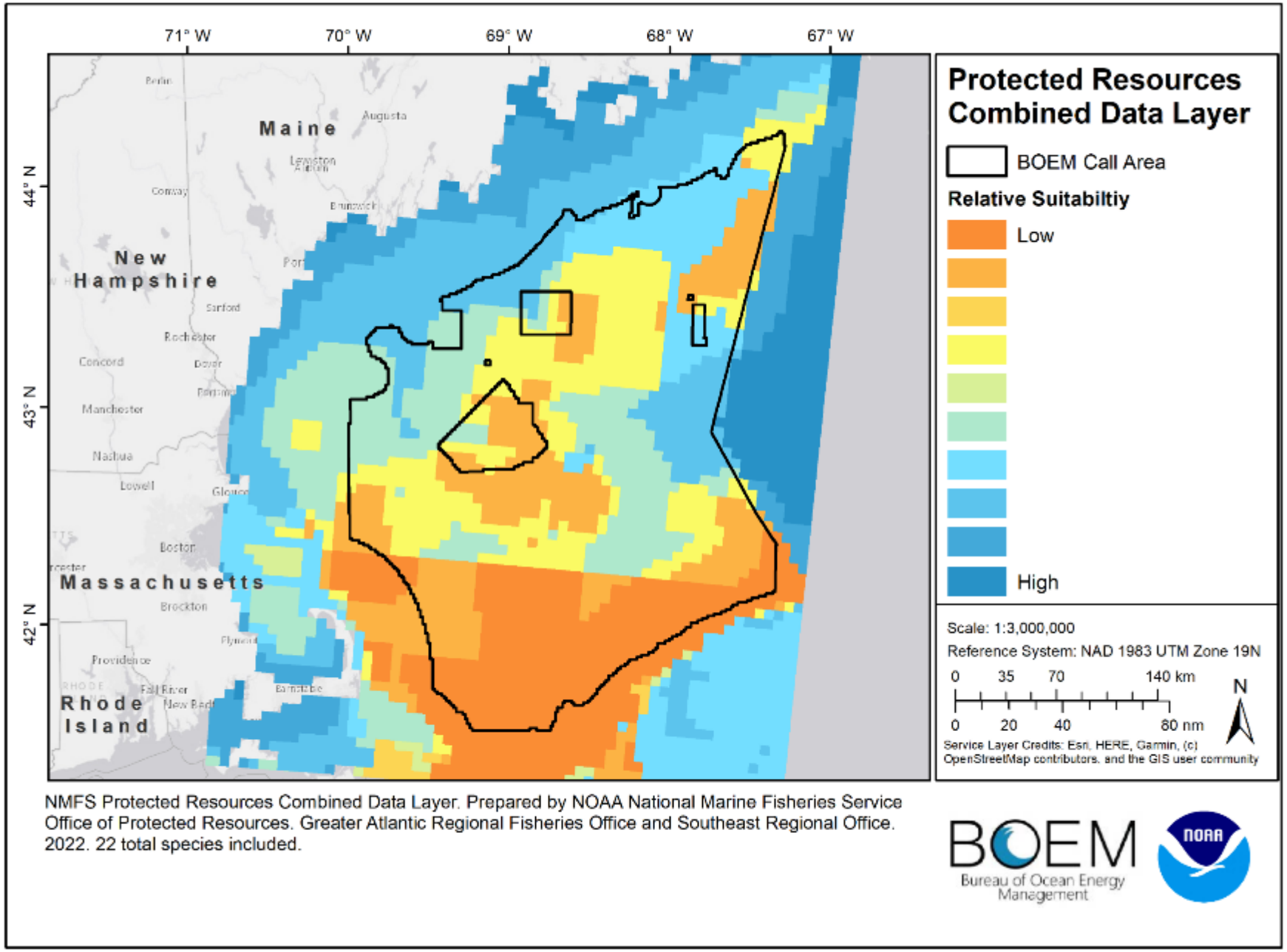
Common name	Scientific name	Score
Delphinids		
Atlantic spotted dolphin (coastal)	*Stenella frontalis*	1.0
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	0.9
Bottlenose dolphin	*Tursiops truncatus*	0.6
Clymene dolphin	*Stenella clymene*	1.0
Cuvier’s beaked whale	*Ziphius cavirostris*	1.0
Dwarf and Pygmy sperm whale	*Kogia spp.*	1.0
Harbor porpoise	*Phocoena phocoena*	0.7
Mesoplodon beaked whales	*Mesoplodon spp.*	1.0
Pantropical spotted dolphin	*Stenella attenuata*	1.0
Pilot whale	*Globicephala spp.*	0.7
Risso's dolphin	*Grampus griseus*	0.7
Rough-toothed dolphin	*Steno bredanensis*	1.0
Short-beaked common dolphin	*Delphinus delphis*	0.7
Striped dolphin	*Stenella coeruleoalba*	1.0
Large Whales		
Blue whale	*Balaenoptera musculus*	0.2
Fin whale	*Balaenoptera physalus*	0.2
Humpback whale	*Megaptera novaeangliae*	0.8
Minke whale	*Balaenoptera acutorostrata*	0.7
North Atlantic right whale	*Eubalaena glacialis*	0.1
Sei whale	*Balaenoptera borealis*	0.2
Sperm whale	*Physeter macrocephalus*	0.2

Common name	Scientific name	Score
Phocids		
Seals	*Phocidae spp.*	0.8
Fish		
Atlantic salmon (Gulf of Maine DPS)	*Salmo salar*	0.5
Atlantic sturgeon (All DPSs)	*Acipenser oxyrinchus oxyrinchus*	0.2
Giant manta ray	*Manta birostris*	0.4
Oceanic whitetip shark	*Carcharhinus longimanus*	1.0
Shortnose sturgeon	*Acipenser brevirostrum*	0.5
Sea Turtles		
Green sea turtle (North Atlantic, South Atlantic DPSs)	*Chelonia mydas*	0.5
Hawksbill sea turtle	*Eretmochelys imbricata*	1.0
Kemp's ridley sea turtle	*Lepidochelys kempii*	0.5
Leatherback sea turtle	*Dermochelys coriacea*	0.1
Loggerhead sea turtle (Northwest Atlantic, Northwest Atlantic Ocean DPSs)	*Caretta caretta*	0.5

22 Total ESA and MMPA listed species included in the protected resources combined data layer. Excludes species assigned a score of 1.

NMFS Protected Resources Combined Layer

- 22 total ESA and MMPA listed species included
- Product method used to calculate relative suitability



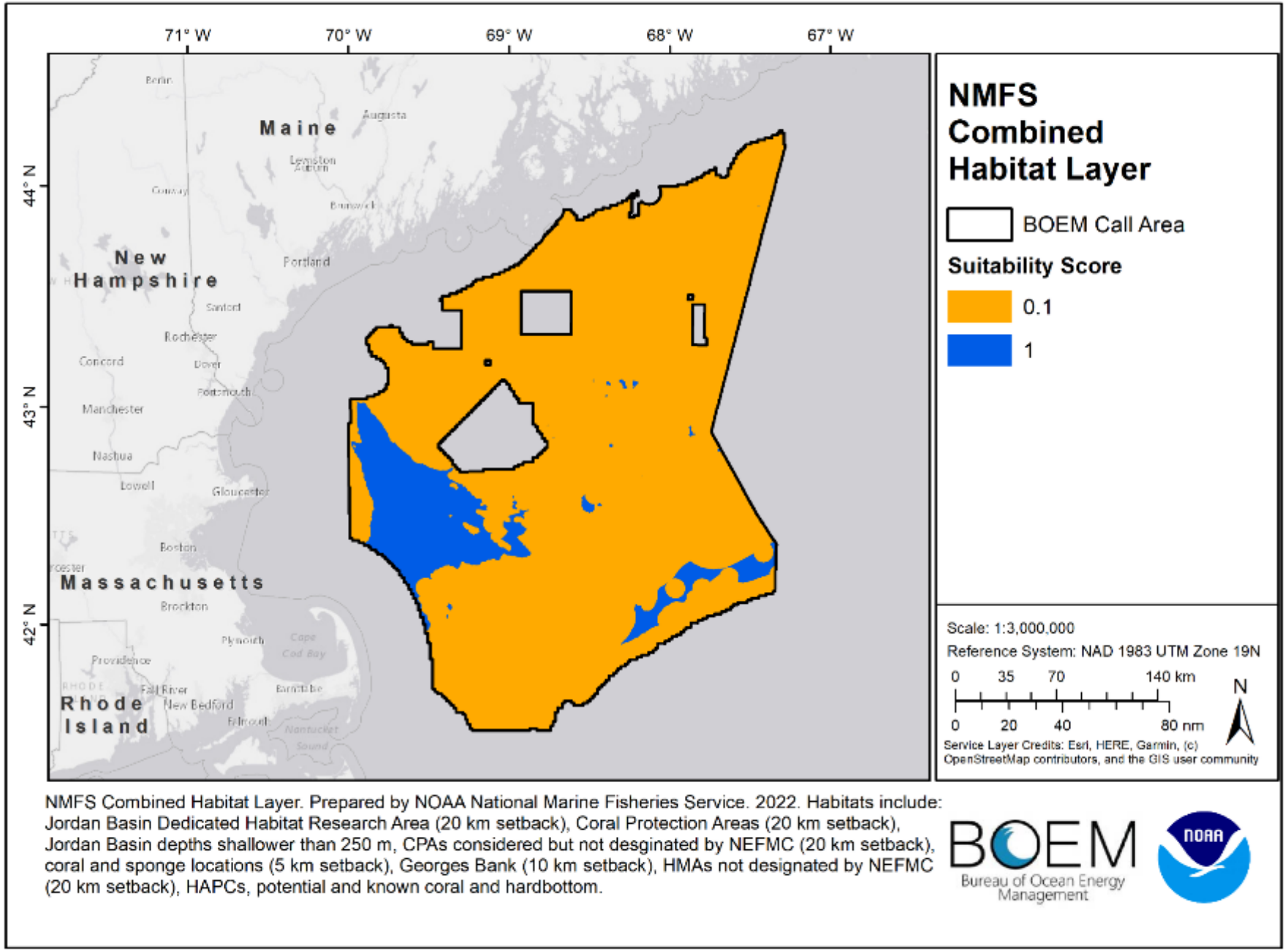
NMFS Combined Habitat Layer

Data Layer	Setback	Score for Model
Jordan Basin Dedicated Habitat Research Area	20-km	0.1
Coral Protection Areas (CPAs) (Mt. Desert Rock CPA, Outer Schoodic Ridge CPA)	20-km	0.1
Jordan Basin (depths shallower than 250 m)	-	0.1
CPAs considered but not designated by NEFMC (Western Jordan Basin 114 Fathom Bump, Western Jordan Basin 96 Fathom Bump, Western Jordan Basin 118 Fathom Bump, Central Jordan Basin, Lindenkohl Knoll)	20-km	0.1
Coral-Sponge Locations	5-km[1]	0.1
Georges Bank (delineated by 140 m contour)	10-km	0.1
HMAs considered but not designated by NEFMC (Bigelow Bight, Machais, Platts Bank 1, Platts Bank 2, Toothaker Ridge)	20-km	0.1
Habitat Areas of Particular Concern[2] (HAPCs)	-	0.1
Potential and Known Coral and Hardbottom (all locations within RFI area shallower than 220m)	-	0.1
None of the above		1.0

[1] **NMFS recommended a 5-10 km buffer around coral and sponge point locations. A 5-km setback was applied.**
[2] **No HAPCs intersect with the Call Area.**

NMFS Combined Habitat Layer

- 9 habitat layers included

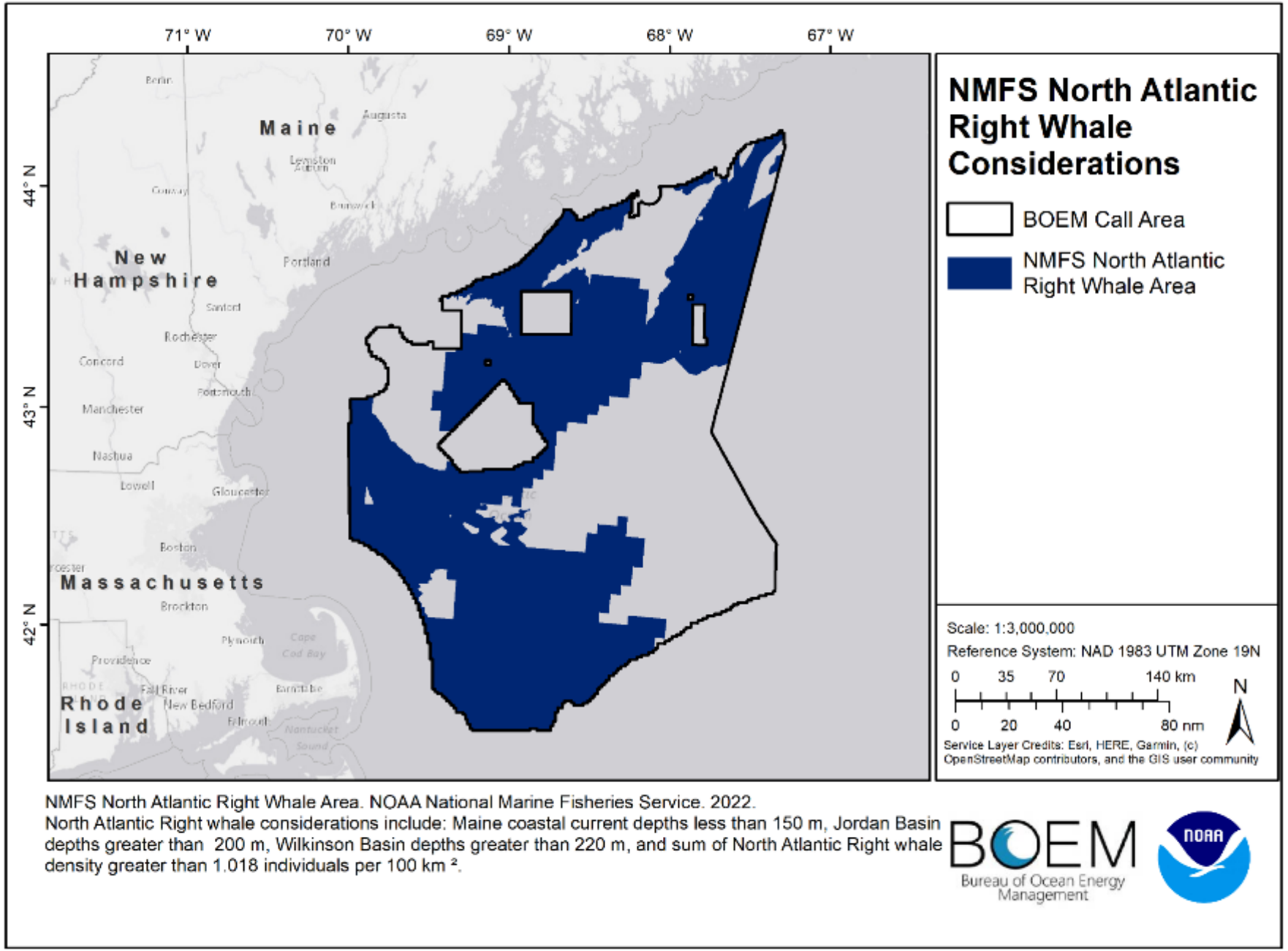


NMFS North Atlantic right whale (Scenario 2, Option 1)

Data Layer	Score for Model
Maine Coastal Current, Depths < 150 m	0.1
Jordan Basin, Depths > 200 m	0.1
Wilkinson Basin, Depth > 220 m	0.1
Sum of North Atlantic right whale density, >1.018 individuals/100 km2	0.1

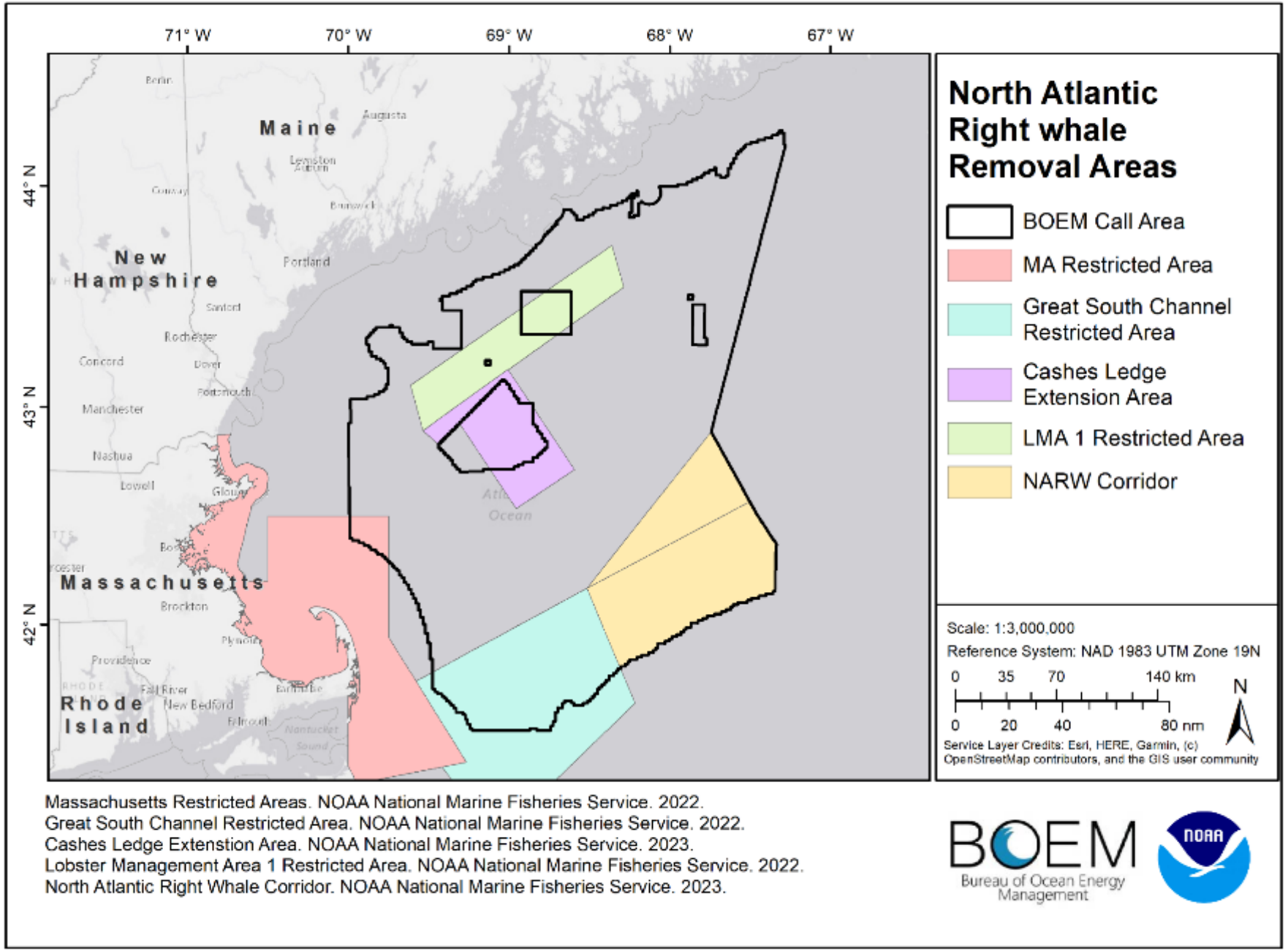
NMFS North Atlantic Right Whale Considerations

- Maine Coastal Current, Depths < 150 m
- Jordan Basin, Depths > 200 m
- Wilkinson Basin, Depths > 220 m
- Sum of North Atlantic right whale density, > 1.018 individuals per 100 km²



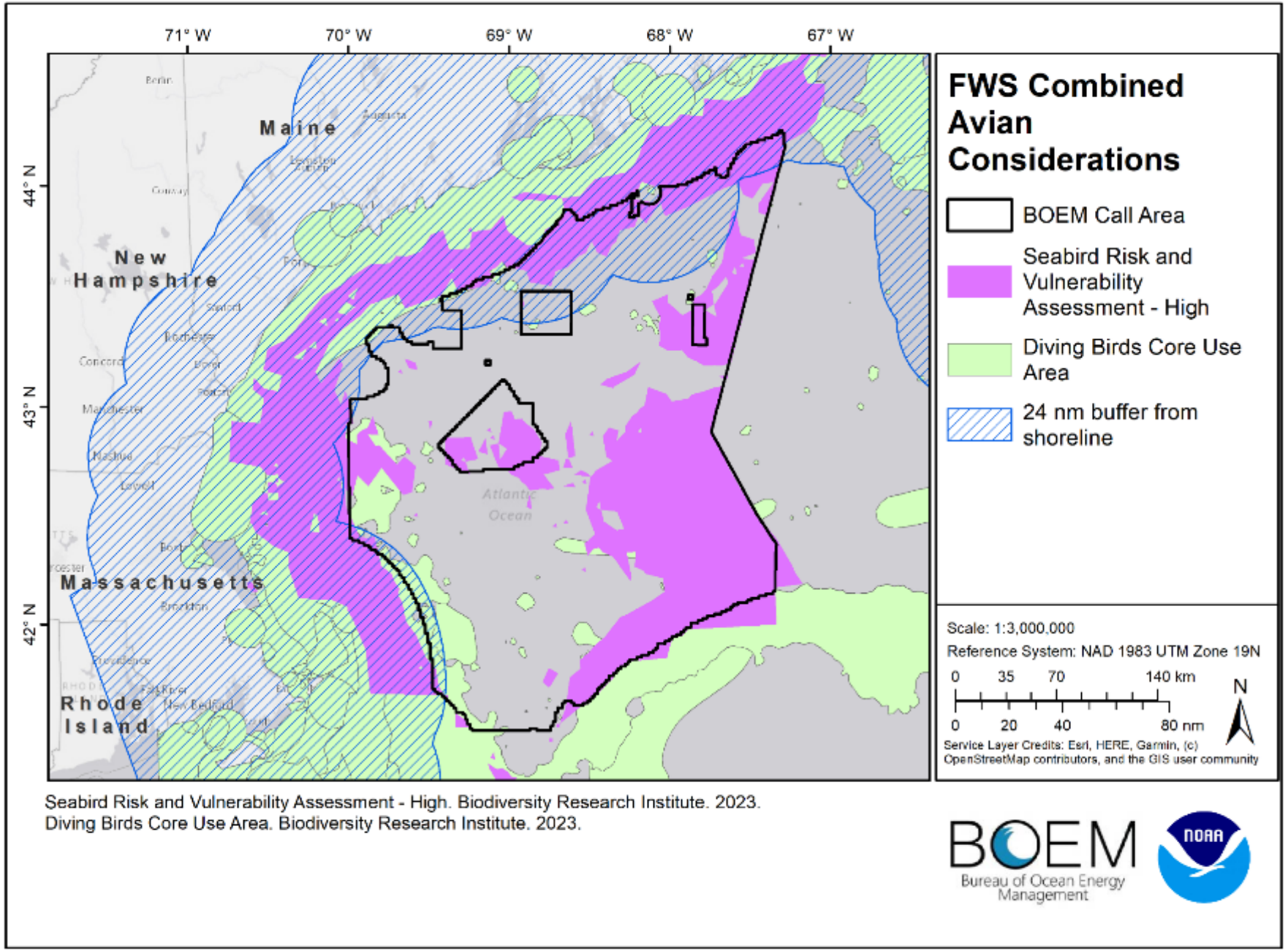
NARW Area Removals

- Massachusetts Restricted Areas
- Great South Channel Restricted Area
- Cashes Ledge Extension Area
- LMA 1 Restricted Area
- NARW Corridor & Extension



FWS Combined Avian Layer

- Seabird Risk and Vulnerability Assessment - High
- Tracking Data for Diving Birds - 50% Core Use Contour
- 24 nm buffer from shoreline, including islands (birds and bats)

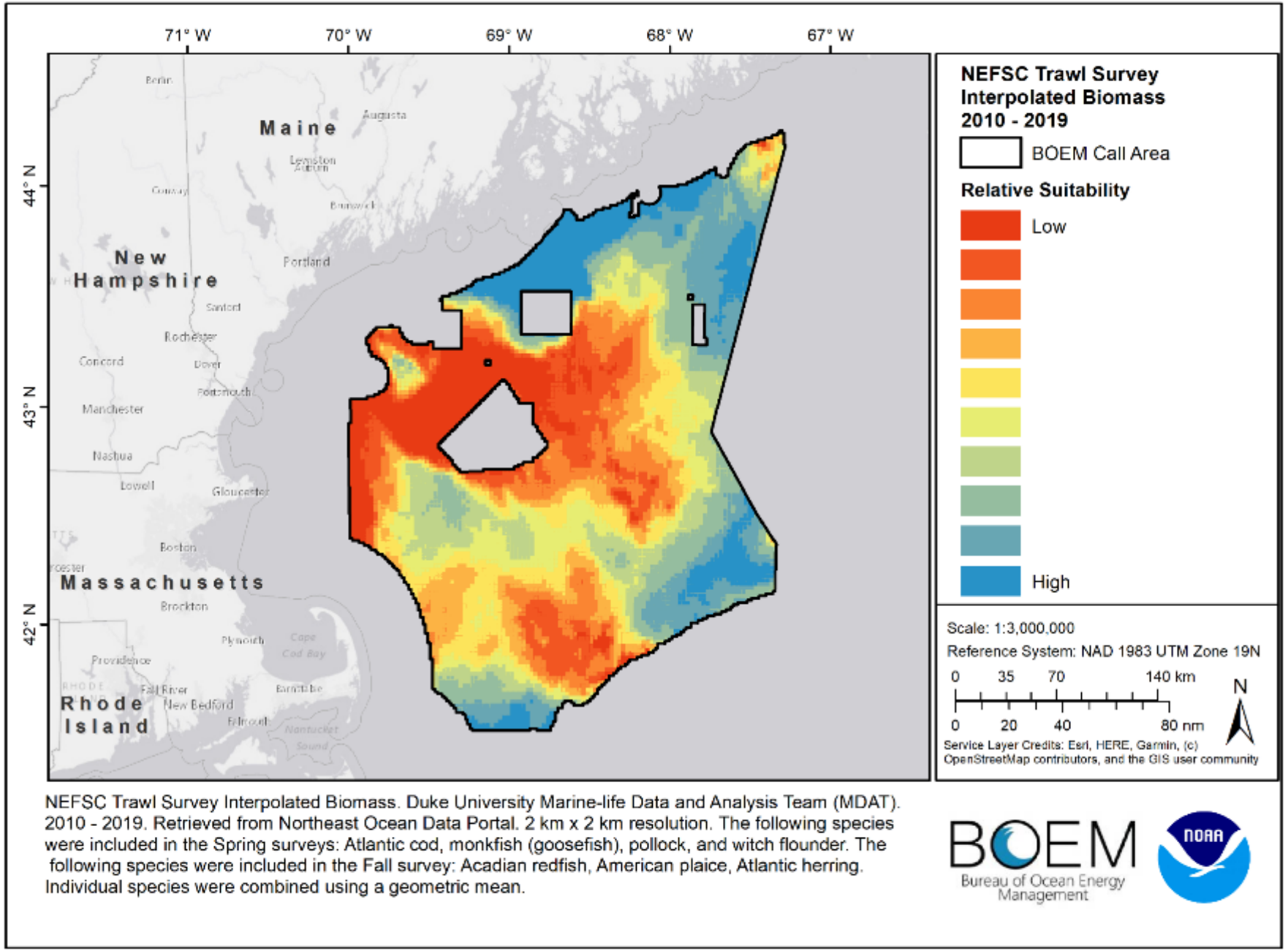


NEFSC Trawl Survey Interpolated Biomass 2010 - 2019

The following species were included:

- Spring – Atlantic cod, monkfish (goosefish), pollock, and witch flounder
- Fall – Acadian redfish, American plaice, Atlantic herring

Identifies areas where important species biomass concentrations occur that differ from concentrations of fishing effort in the VMS data



NEFSC Trawl Survey Interpolated Biomass. Duke University Marine-life Data and Analysis Team (MDAT). 2010 - 2019. Retrieved from Northeast Ocean Data Portal. 2 km x 2 km resolution. The following species were included in the Spring surveys: Atlantic cod, monkfish (goosefish), pollock, and witch flounder. The following species were included in the Fall survey: Acadian redfish, American plaice, Atlantic herring. Individual species were combined using a geometric mean.

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NOAA

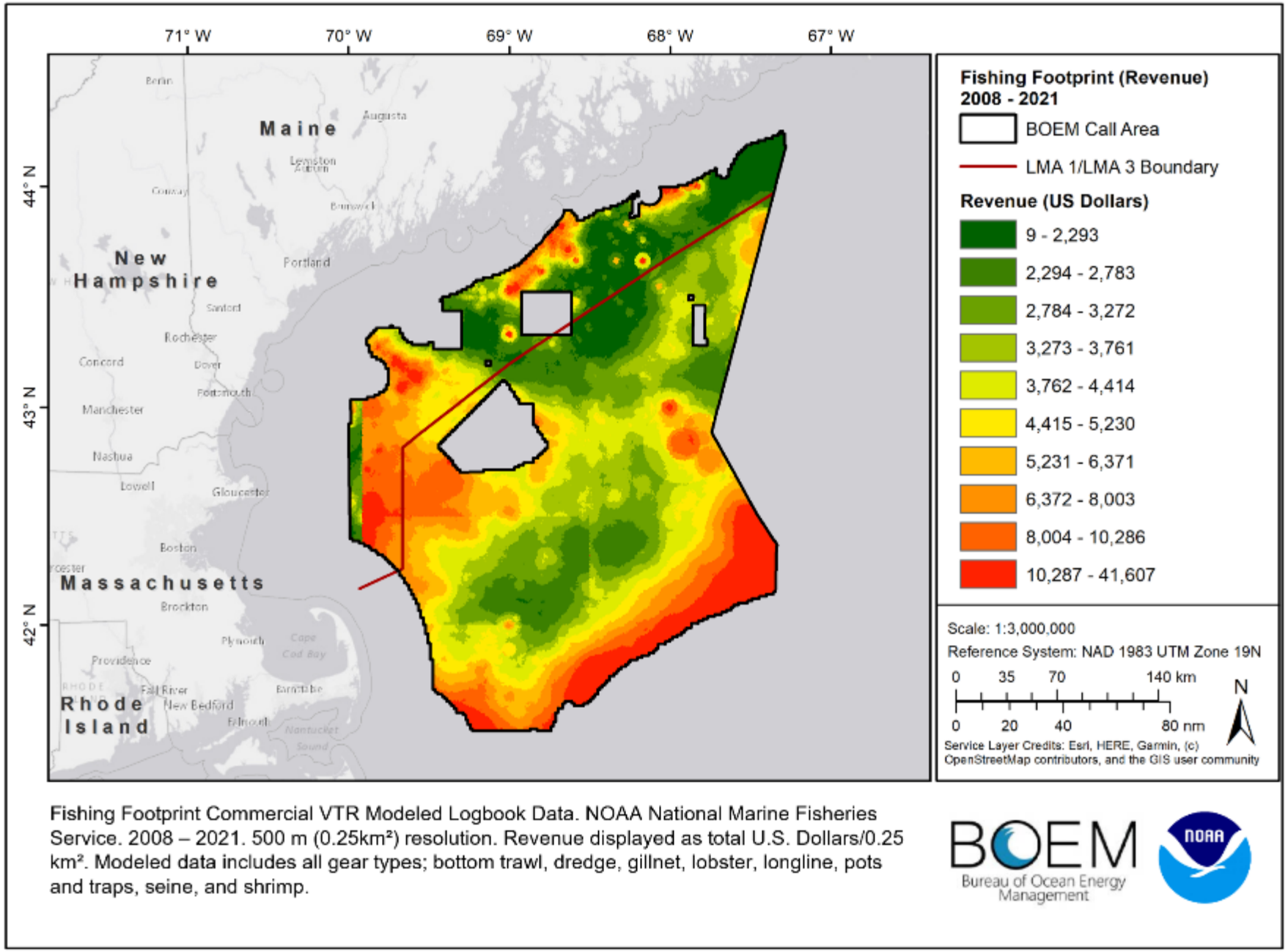
Fisheries Submodel

Data Layer
Fishing Footprint Raster Data (revenue) 2008 - 2021
Fishing Footprint Raster Data (landings) 2008 - 2021
VMS Data 2009-2021
Charter/Party VTR 2008 - 2020
<u>HMS Combined Layer:</u> Large Pelagic Survey Trip Points (HMS/Recreational) 2011 - 2021 with 10-mi setback Maine DMR HMS Data 2010 - 2021
Fisheries Considerations - LMA 1, Platts Bank, Georges Bank, Western GoME Closure, Jeffreys Bank HMA, HMAs considered, but not adopted by NEFMC (e.g., Toothaker Ridge, Large Eastern Maine proposed HMA, Wildcat Knoll), Closed Area II, Davis Swell, Parker Ridge and Three Dory Ridge, Jordan Basin Dedicated Research Area, Cashes Ledge

Fishing Footprint Raster (revenue) 2008 - 2021

Gear types include:

- Bottom Trawl
- Dredge
- Gillnet
- Lobster
- Longline
- Pots & Traps
- Seine
- Shrimp



Fishing Footprint Raster (landings) 2008 - 2021

Gear types include:

- Bottom Trawl
- Dredge
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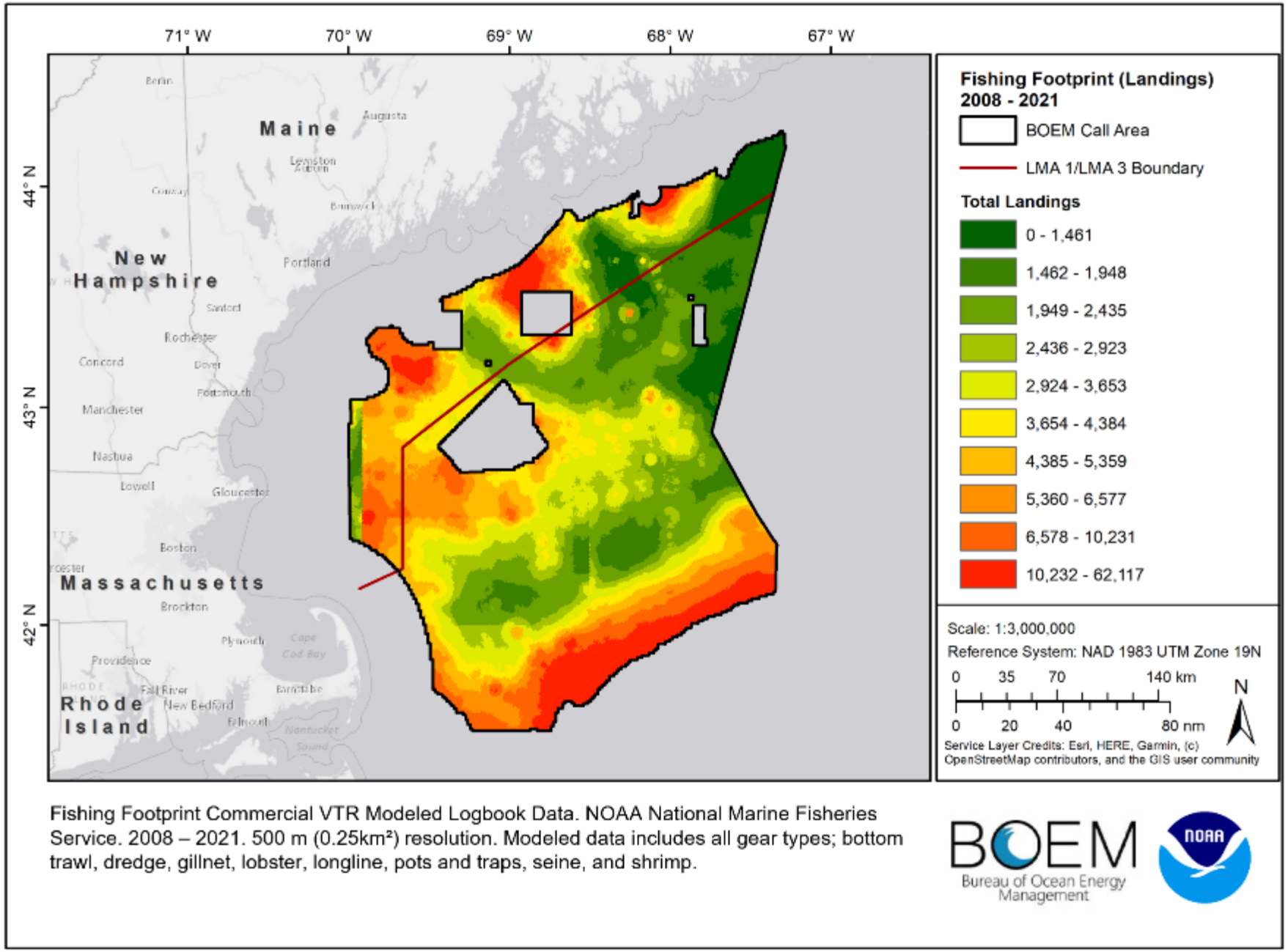
- Longline
- Pots & Traps
- Seine
- Shrimp

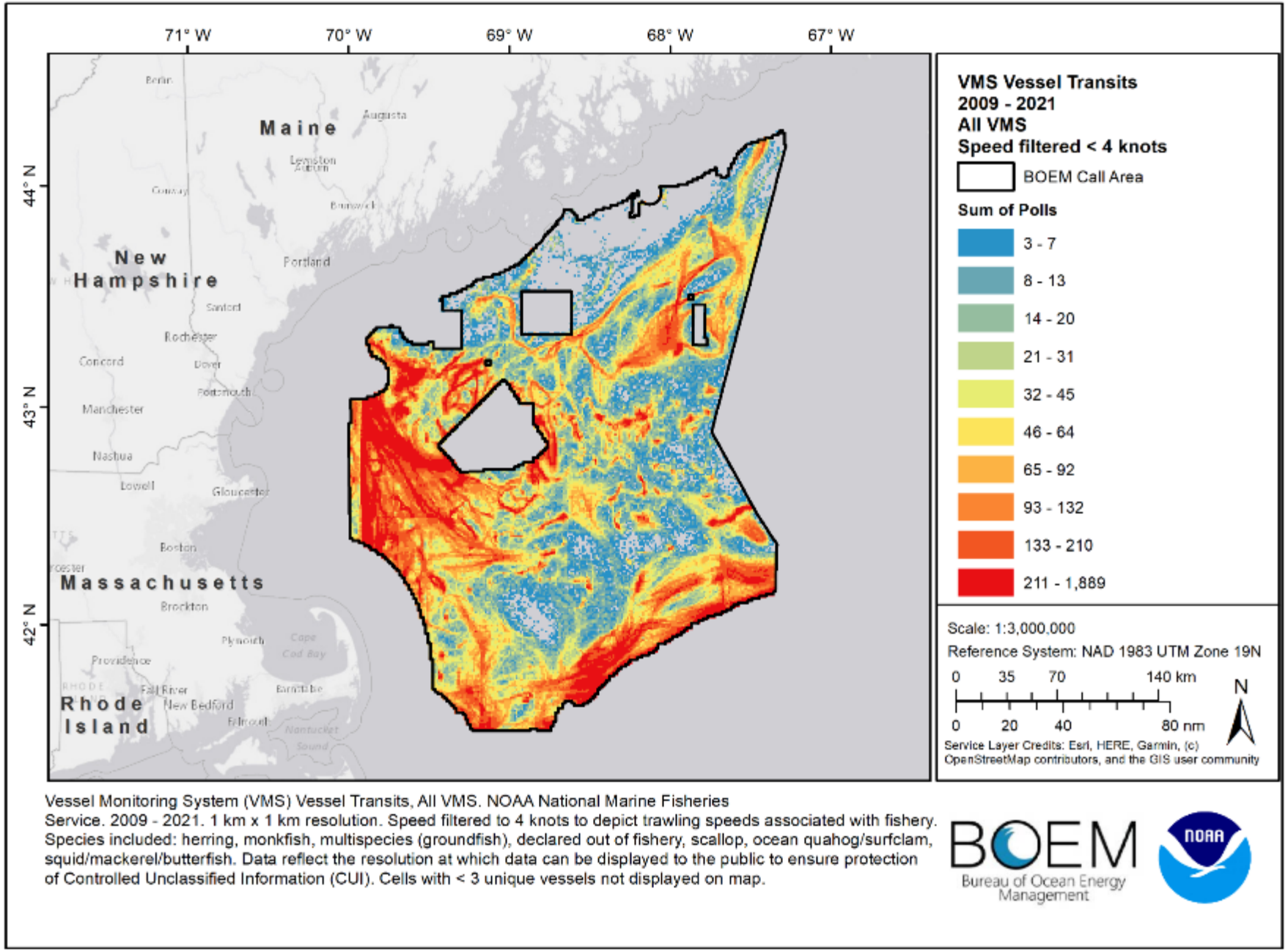


VMS Data 2009 - 2021

Includes all vessels that use VMS:

- Multispecies (groundfish)
- Monkfish
- Herring
- Scallop
- Surfclam
- Ocean Quahog
- Squid/Mackerel/ Butterfish

Speed filtered to < 4 knots



Vessel Monitoring System (VMS) Vessel Transits, All VMS. NOAA National Marine Fisheries Service. 2009 - 2021. 1 km x 1 km resolution. Speed filtered to 4 knots to depict trawling speeds associated with fishery. Species included: herring, monkfish, multispecies (groundfish), declared out of fishery, scallop, ocean quahog/surfclam, squid/mackerel/butterfish. Data reflect the resolution at which data can be displayed to the public to ensure protection of Controlled Unclassified Information (CUI). Cells with < 3 unique vessels not displayed on map.

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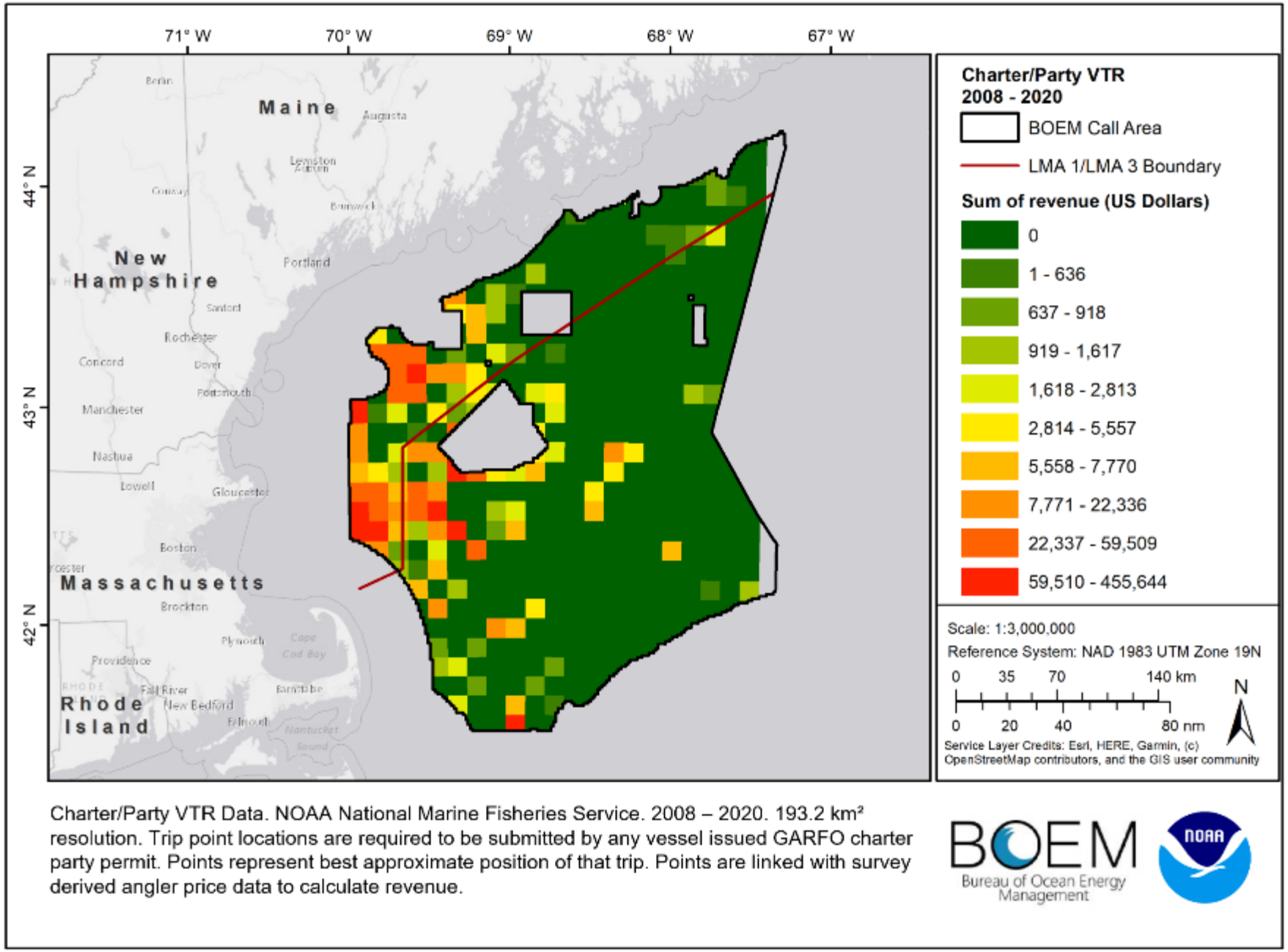
NOAA

Charter/Party VTR 2008 - 2020

Trip point locations are required to be submitted by any vessel issued GARFO charter party permit. Points represent best approximate position of trip. Points are linked with survey derived price data to calculate revenue.



Charter/Party VTR Data. NOAA National Marine Fisheries Service. 2008 – 2020. 193.2 km² resolution. Trip point locations are required to be submitted by any vessel issued GARFO charter party permit. Points represent best approximate position of that trip. Points are linked with survey derived angler price data to calculate revenue.

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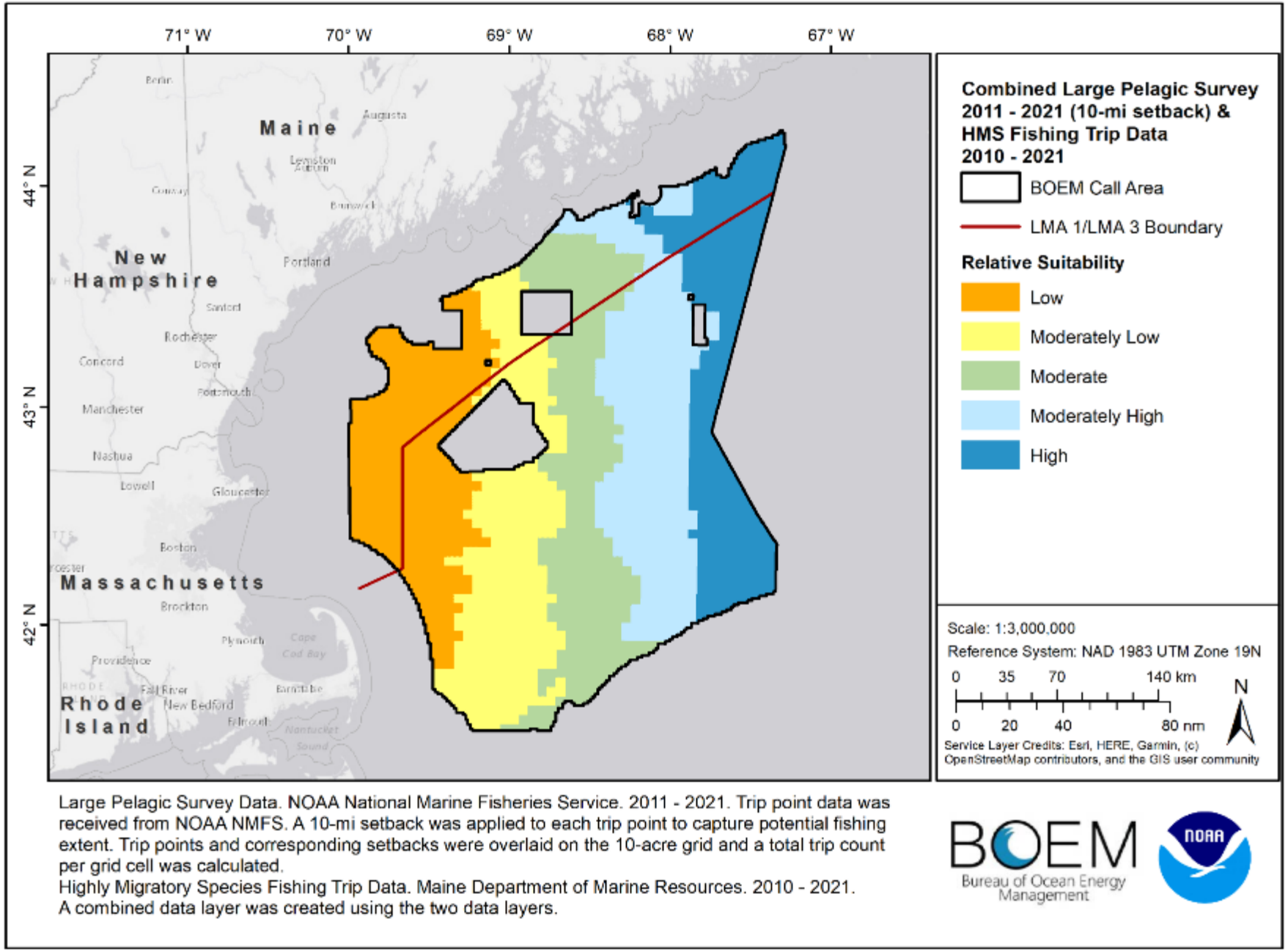
Combined Large Pelagic Survey 2011 - 2021 10-mi setback and HMS Fishing Trip Data 2010 - 2021



Large Pelagic Survey Data. NOAA National Marine Fisheries Service. 2011 - 2021. Trip point data was received from NOAA NMFS. A 10-mi setback was applied to each trip point to capture potential fishing extent. Trip points and corresponding setbacks were overlaid on the 10-acre grid and a total trip count per grid cell was calculated.
Highly Migratory Species Fishing Trip Data. Maine Department of Marine Resources. 2010 - 2021.
A combined data layer was created using the two data layers.

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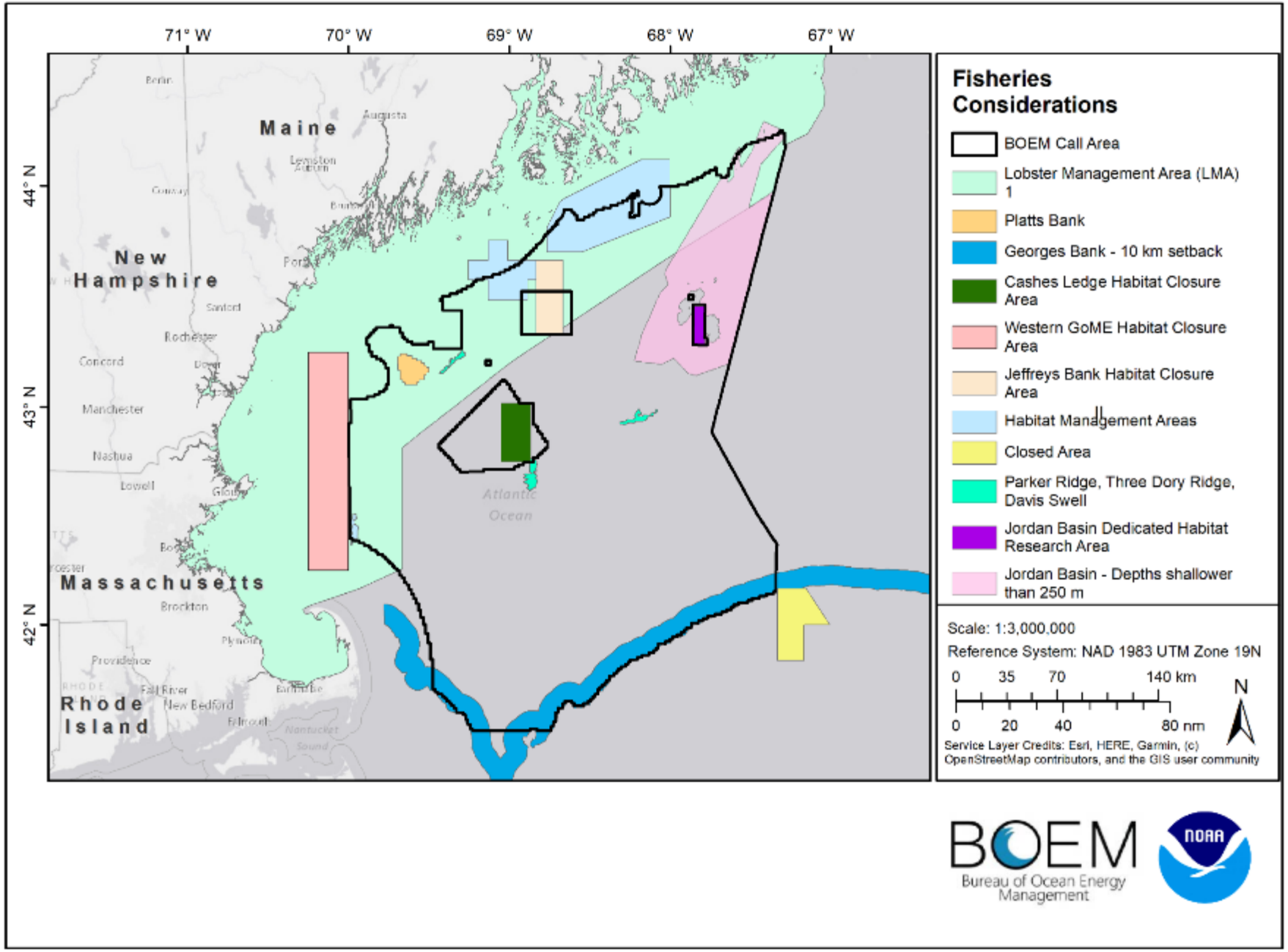
Fisheries Considerations

Includes:

- LMA 1
- Platts Bank
- Georges Bank
- Cashes Ledge
- Western Gulf of Maine Closure and HMA
- Jeffreys Bank HMA
- HMA considered, but not adopted (Toothaker Ridge, Large Eastern Maine proposed HMA, Wildcat Knoll)
- Closed Area II
- Parker Ridge, Three Dory Ridge
- Jordan Basin Dedicated Habitat Research Area
- Jordan Basin - areas shallower than 250 m



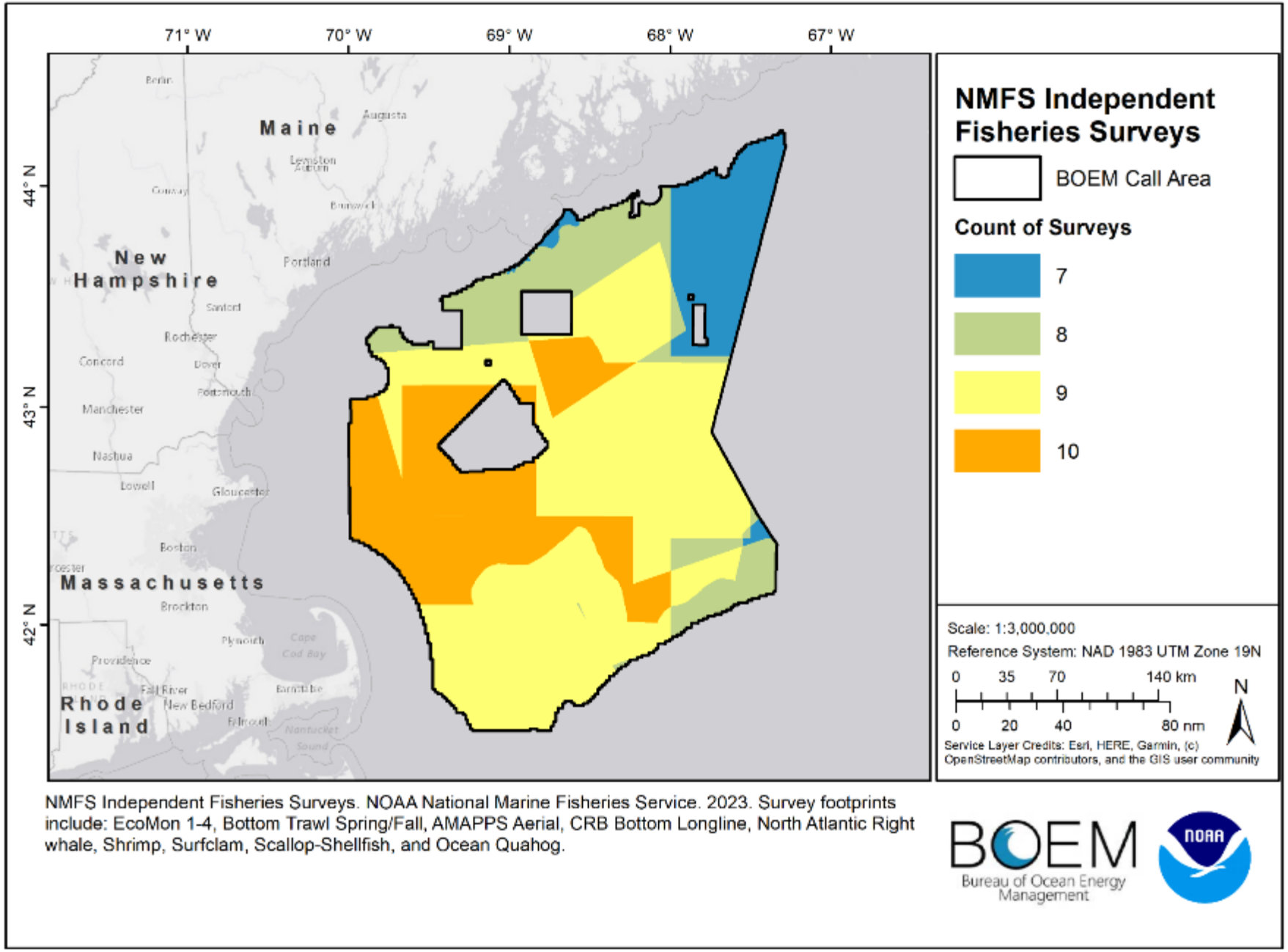
Industry and Operations Submodel

Data Layer
NMFS Independent Fisheries Surveys (13 total surveys) • AMAPPS Aerial, Bottom Trawl Fall/Spring, CRB Bottom Longline, EcoMon (4 separate survey seasons), NARW, Ocean Quahog, Shrimp, Surf Clam, Scallop-Shellfish
Wrecks and Obstructions with 500-ft setback
NEXRAD Stations Moderate Impact (35 - 70 km)
Aids to Navigation (beacons and buoys) with 500-m setback
AIS Vessel Traffic All Vessels 2015 - 2022 • Cargo, Military, Other, Passenger, Pleasure & Sailing, Tanker, and Tug & Tow
USCG Draft MNM PARS Fairways
EPA Mandatory Class 1 Federal Areas with 50 km and 100 km setback
Special Use Airspace Warning Area 103 (W103)

NMFS Independent Surveys

Surveys included:

- EcoMon 1-4
- Bottom Trawl Spring/Fall
- AMAPPS Aerial
- CRB Bottom Longline
- NARW
- Shrimp
- Surfclam
- Scallop-Shellfish
- Ocean Quahog



NMFS Independent Fisheries Surveys. NOAA National Marine Fisheries Service. 2023. Survey footprints include: EcoMon 1-4, Bottom Trawl Spring/Fall, AMAPPS Aerial, CRB Bottom Longline, North Atlantic Right whale, Shrimp, Surfclam, Scallop-Shellfish, and Ocean Quahog.

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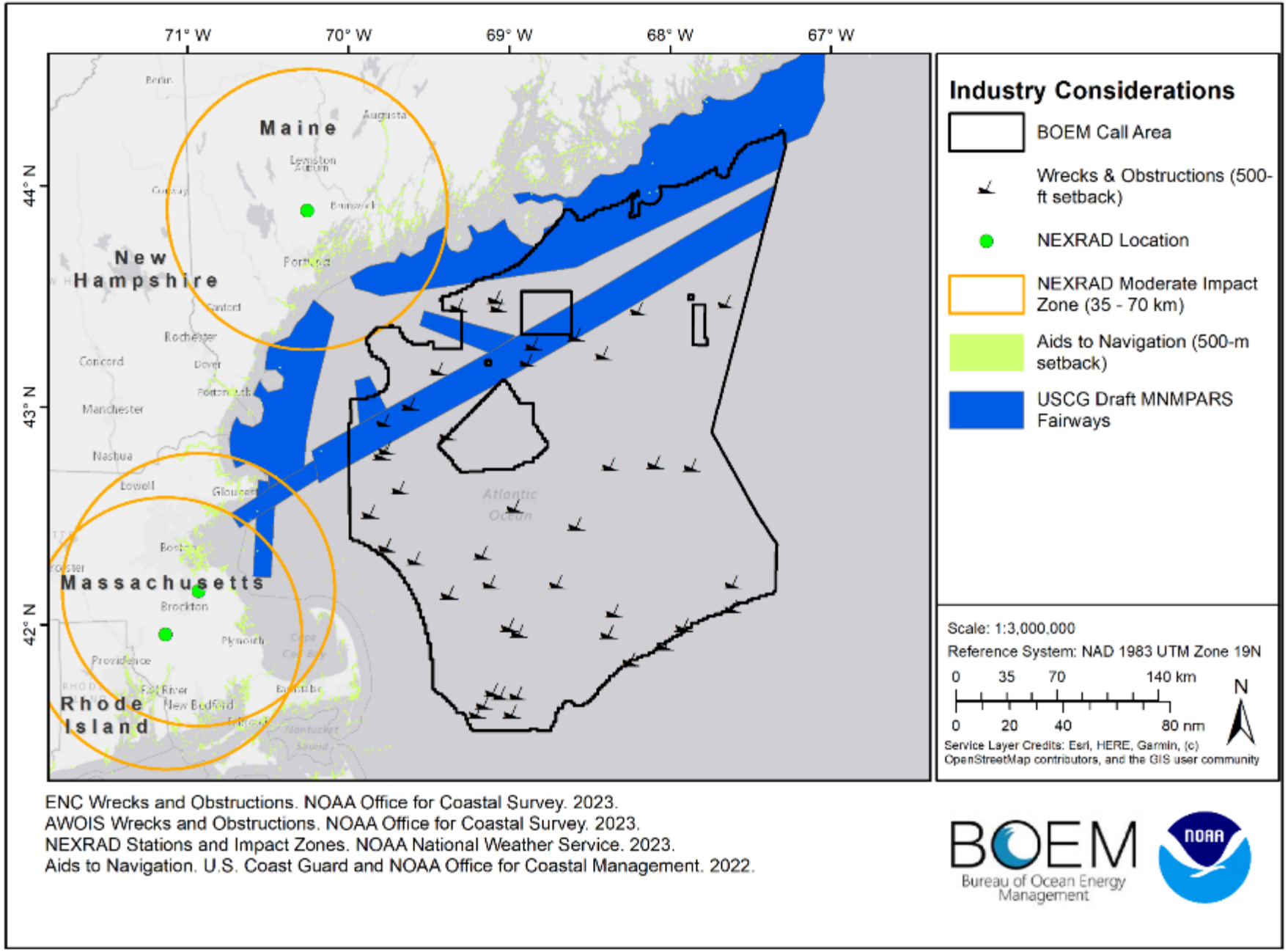
Industry Considerations

Includes:

- Wrecks and Obstructions
- NEXRAD stations - moderate impact
- Aids to Navigation
- USCG Draft MNM PARS

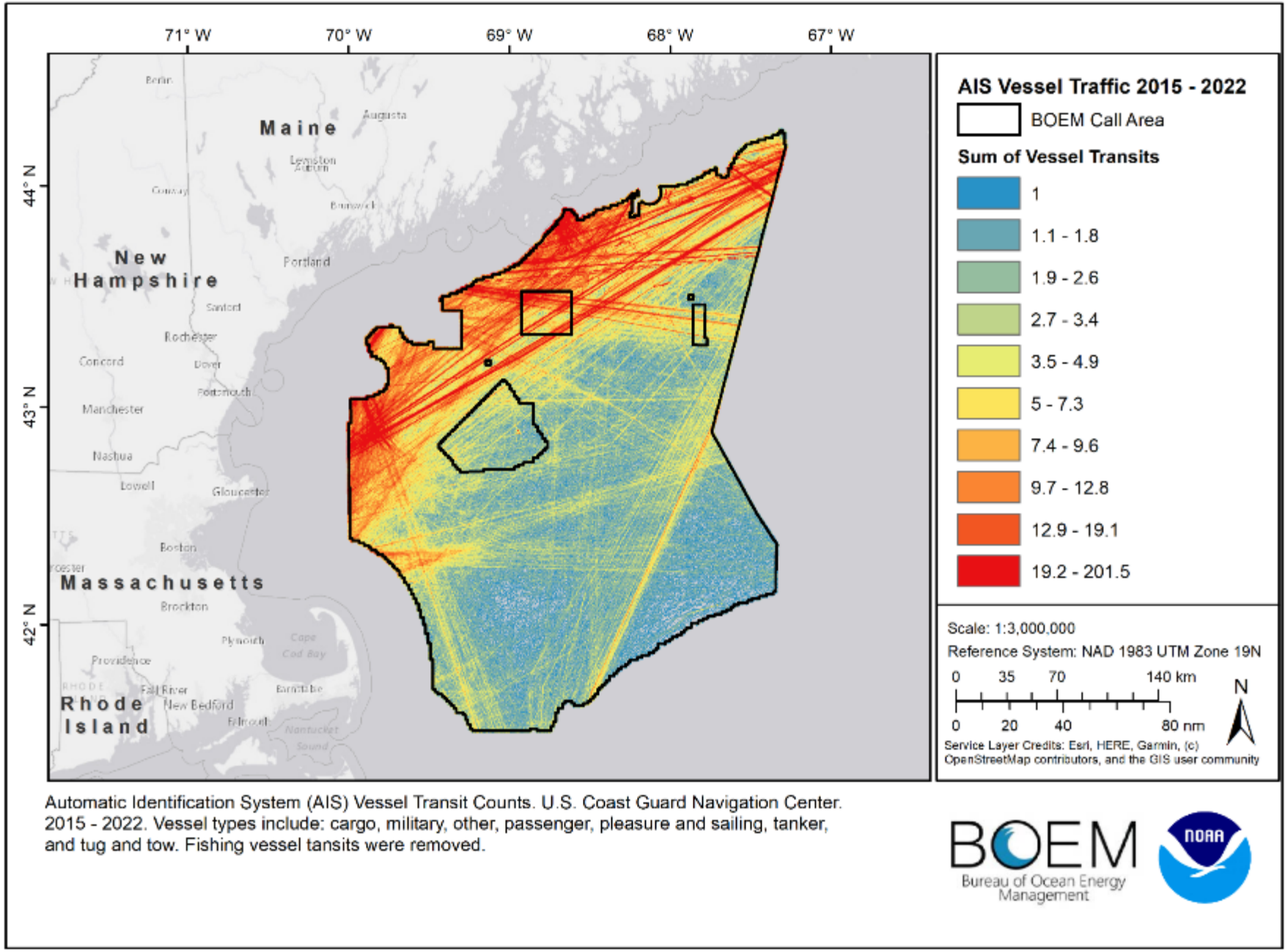


AIS Vessel Traffic All Vessel Types 2015 - 2022

Vessel types include:

- Cargo
- Military
- Other
- Passenger
- Pleasure & Sailing
- Tanker
- Tug & Tow

Fishing vessel transits were removed



Automatic Identification System (AIS) Vessel Transit Counts. U.S. Coast Guard Navigation Center. 2015 - 2022. Vessel types include: cargo, military, other, passenger, pleasure and sailing, tanker, and tug and tow. Fishing vessel tansits were removed.

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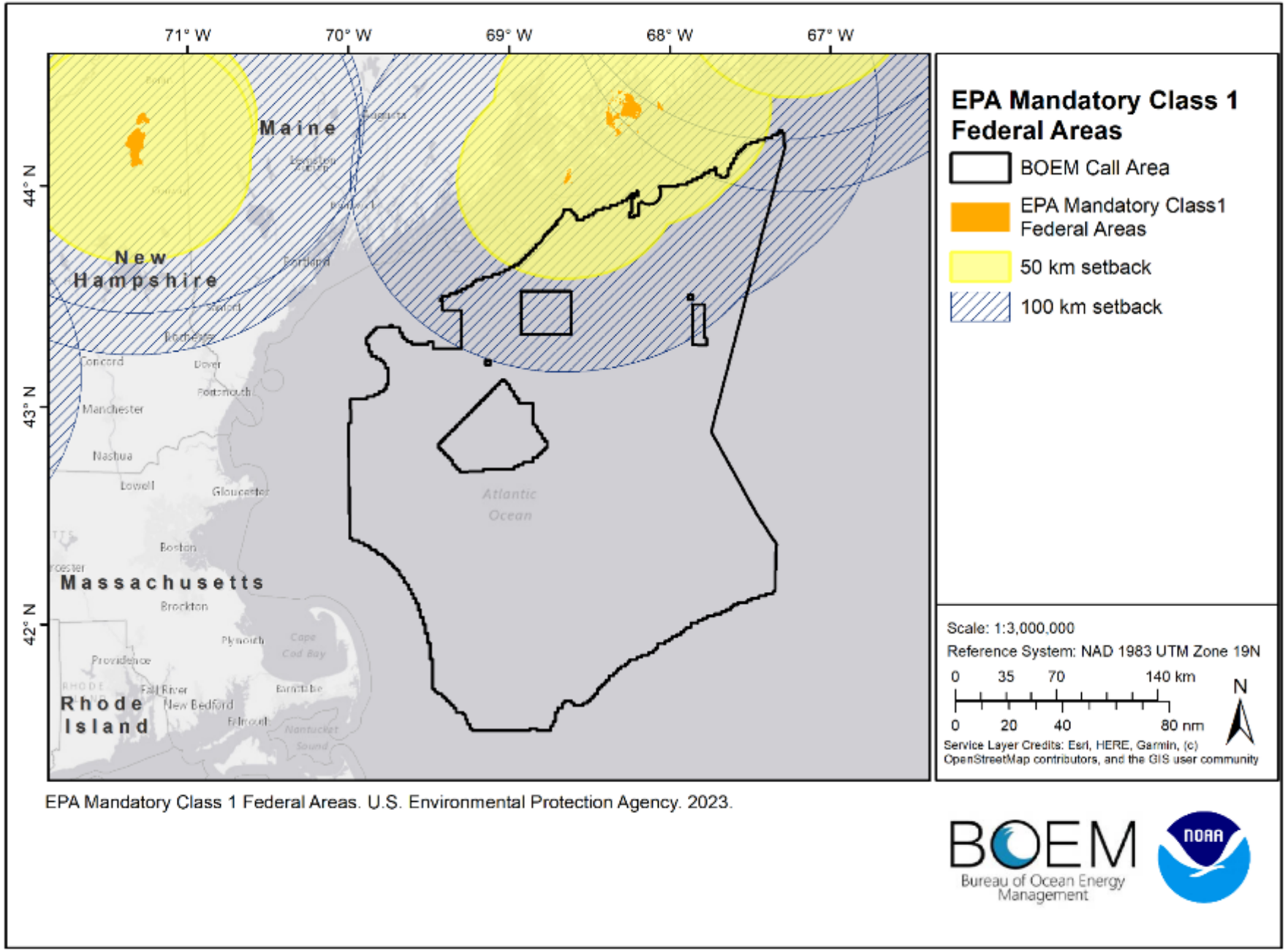
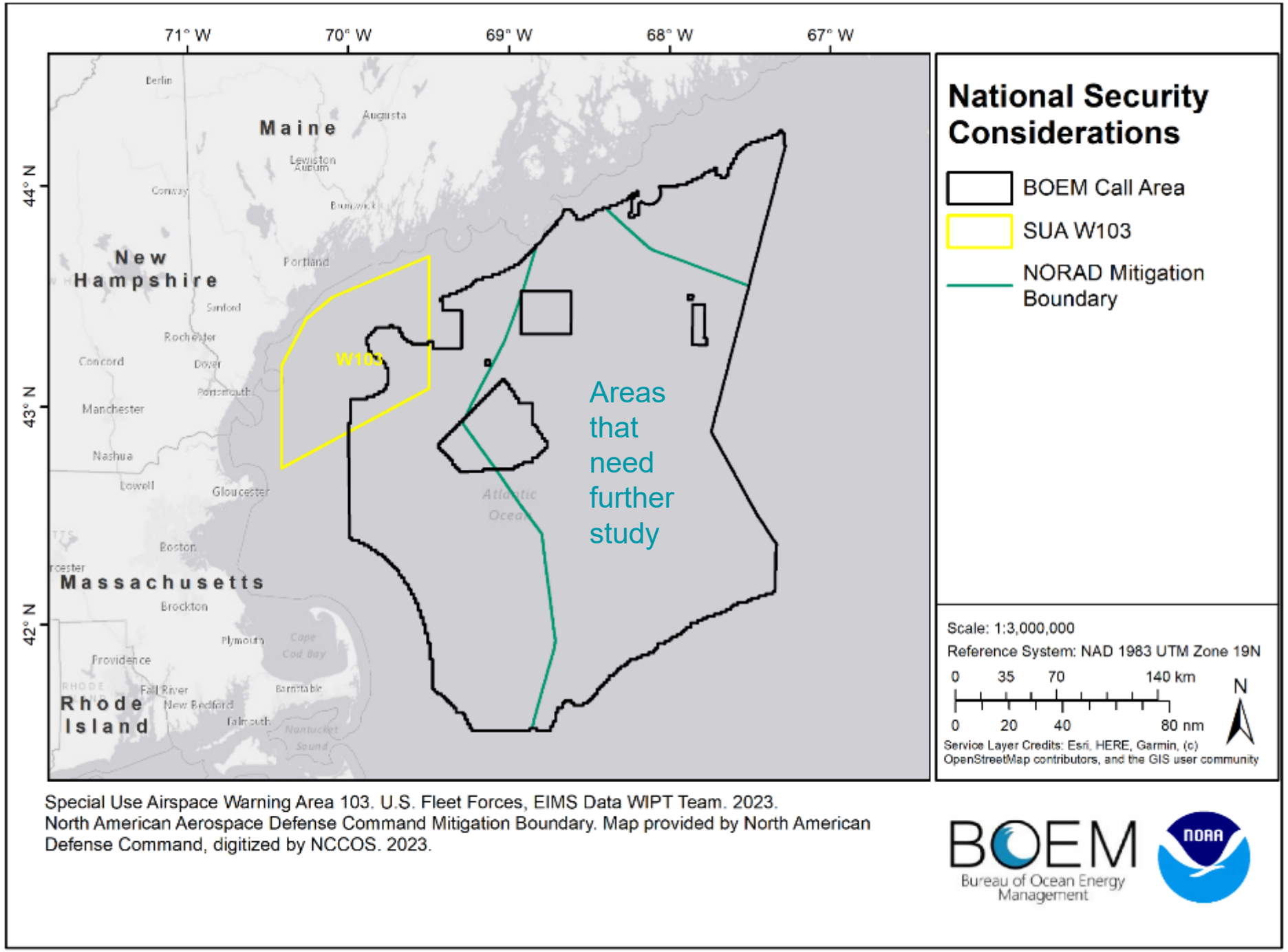
EPA Mandatory Class 1 Federal Areas

- Acadia National Park



National Security Considerations



Special Use Airspace Warning Area 103. U.S. Fleet Forces, EIMS Data WIPT Team. 2023.
North American Aerospace Defense Command Mitigation Boundary. Map provided by North American Defense Command, digitized by NCCOS. 2023.

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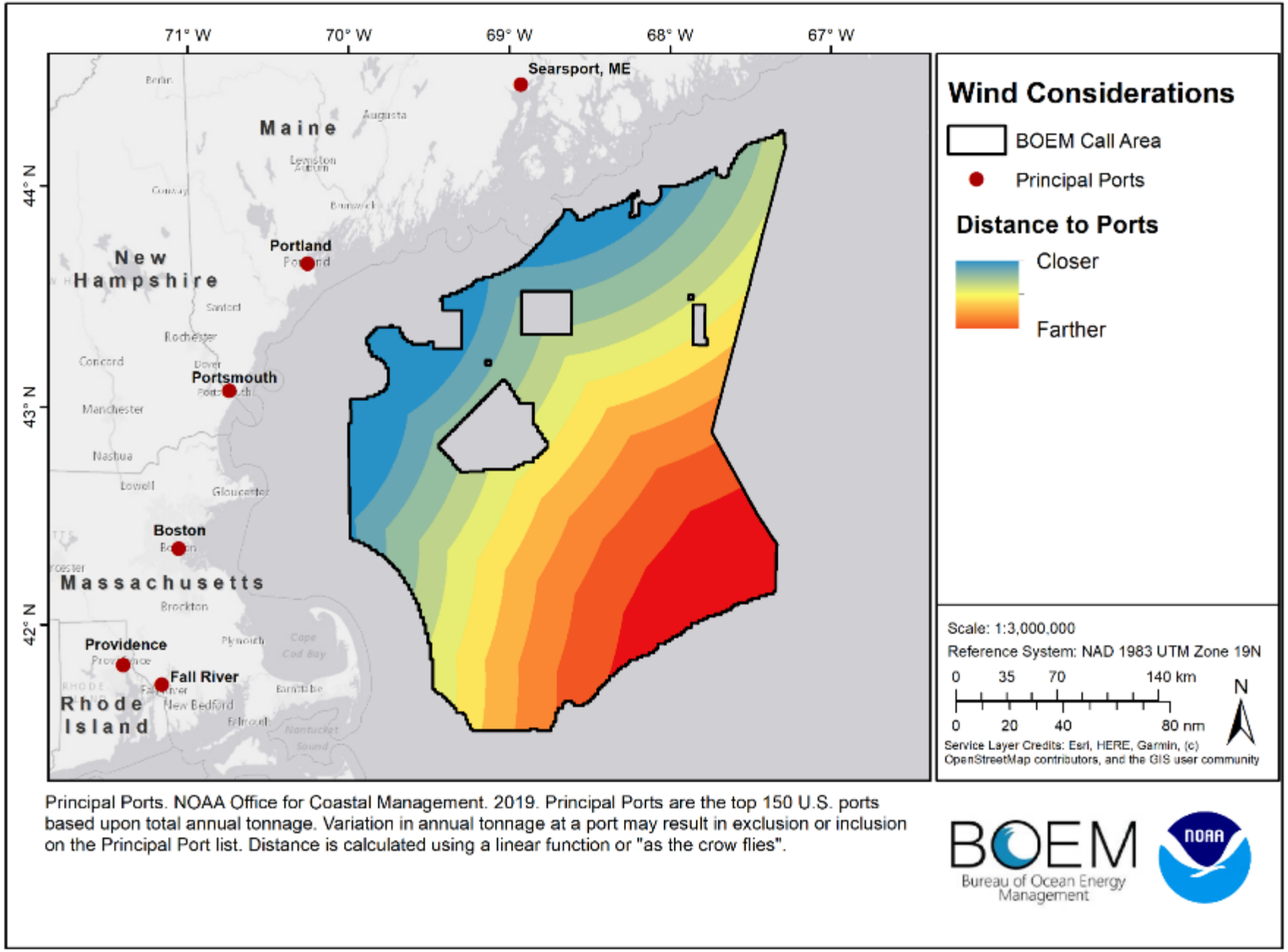
Wind Submodel

Data Layer
Distance to Ports
Call Developer Nominations
Distance to Points of Interconnection
NREL 20-Year Mean Wind Speed

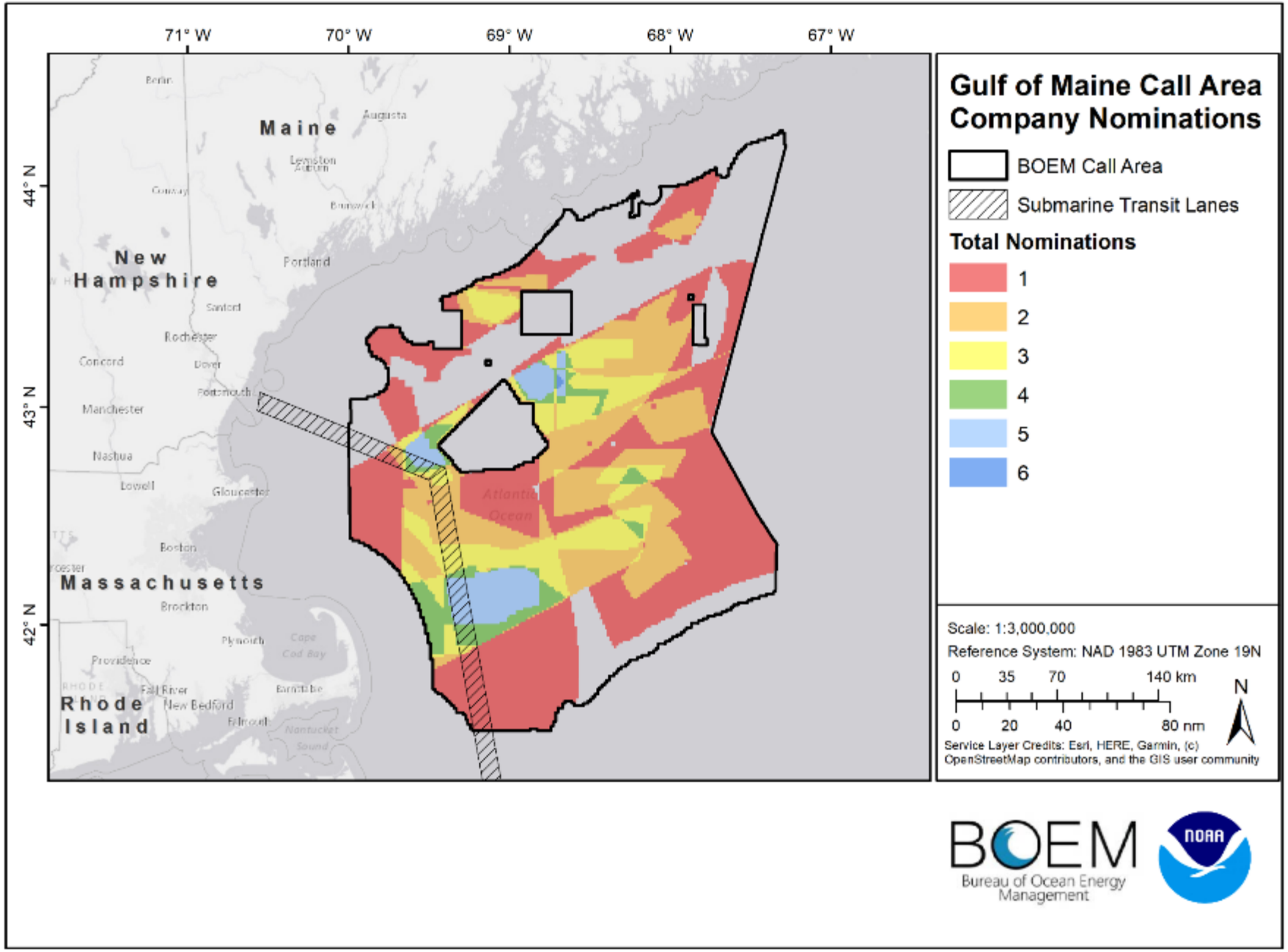
Distance to Ports

Ports include:

- Providence, RI
- Fall River, MA
- Boston, MA
- Portsmouth, NH
- Portland, ME
- Searsport, ME



Call Developer Nominations Overlay

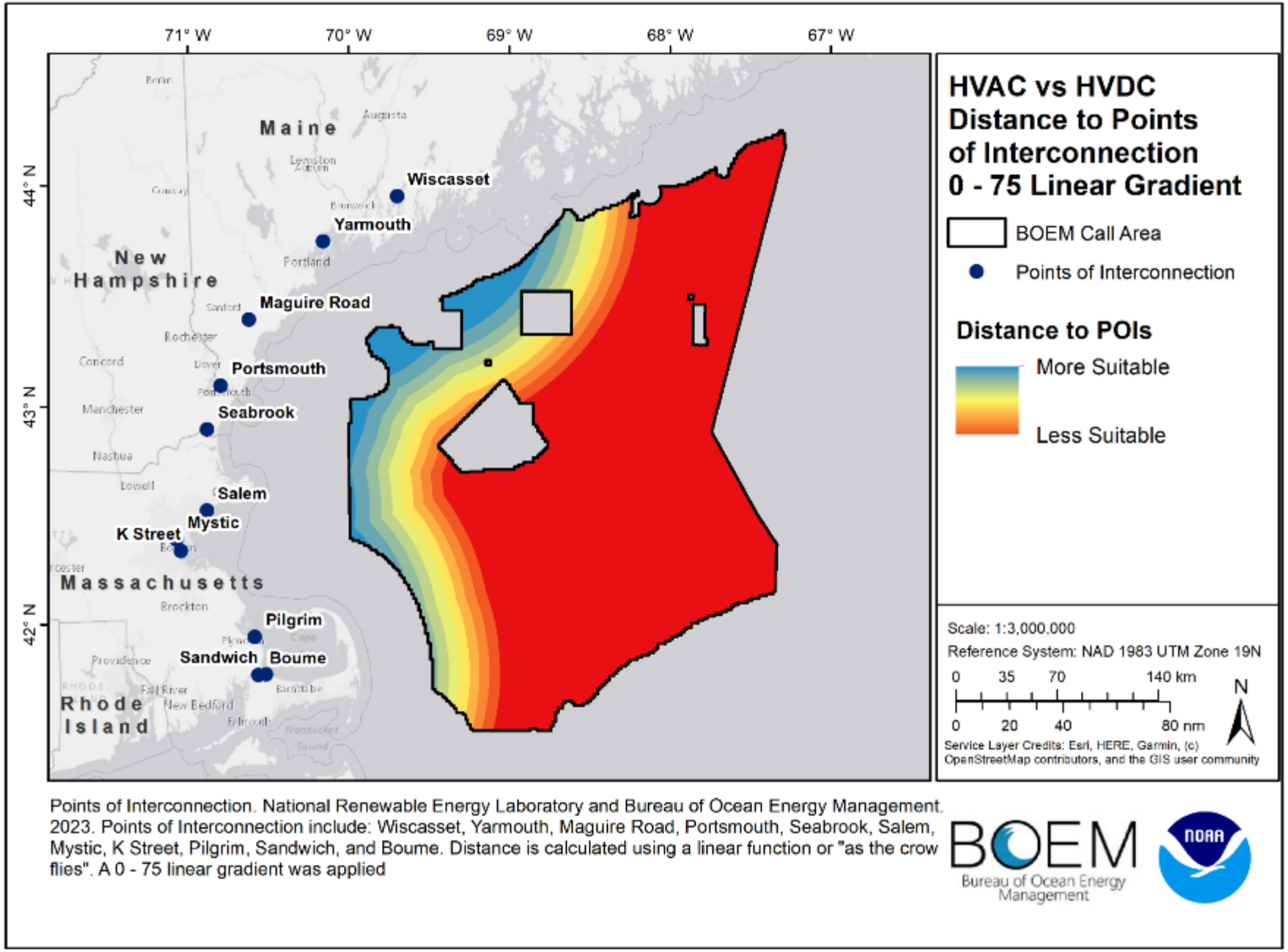


HVAC vs HVDC - Distance to Points of Interconnection

0 - 75 mi linear gradient from POIs

POIs include:

- Wiscasset
- Yarmouth
- Maguire Road
- Portsmouth
- Seabrook
- Salem
- Mystic
- K Street
- Pilgrim
- Sandwich
- Boume



Points of Interconnection. National Renewable Energy Laboratory and Bureau of Ocean Energy Management. 2023. Points of Interconnection include: Wiscasset, Yarmouth, Maguire Road, Portsmouth, Seabrook, Salem, Mystic, K Street, Pilgrim, Sandwich, and Boume. Distance is calculated using a linear function or "as the crow flies". A 0 - 75 linear gradient was applied

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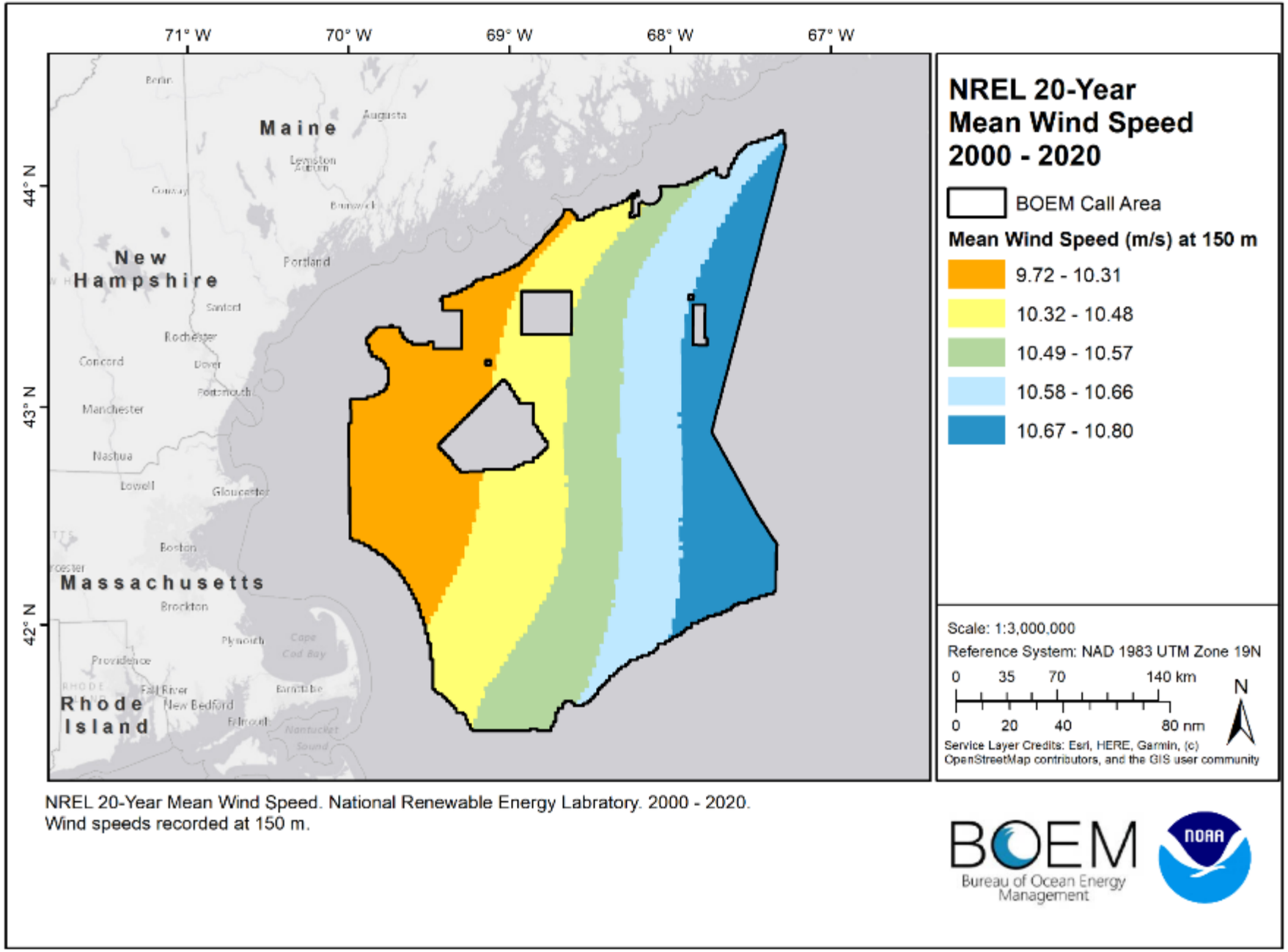
NREL Mean Wind Speed



NREL 20-Year Mean Wind Speed. National Renewable Energy Labratory. 2000 - 2020.
Wind speeds recorded at 150 m.

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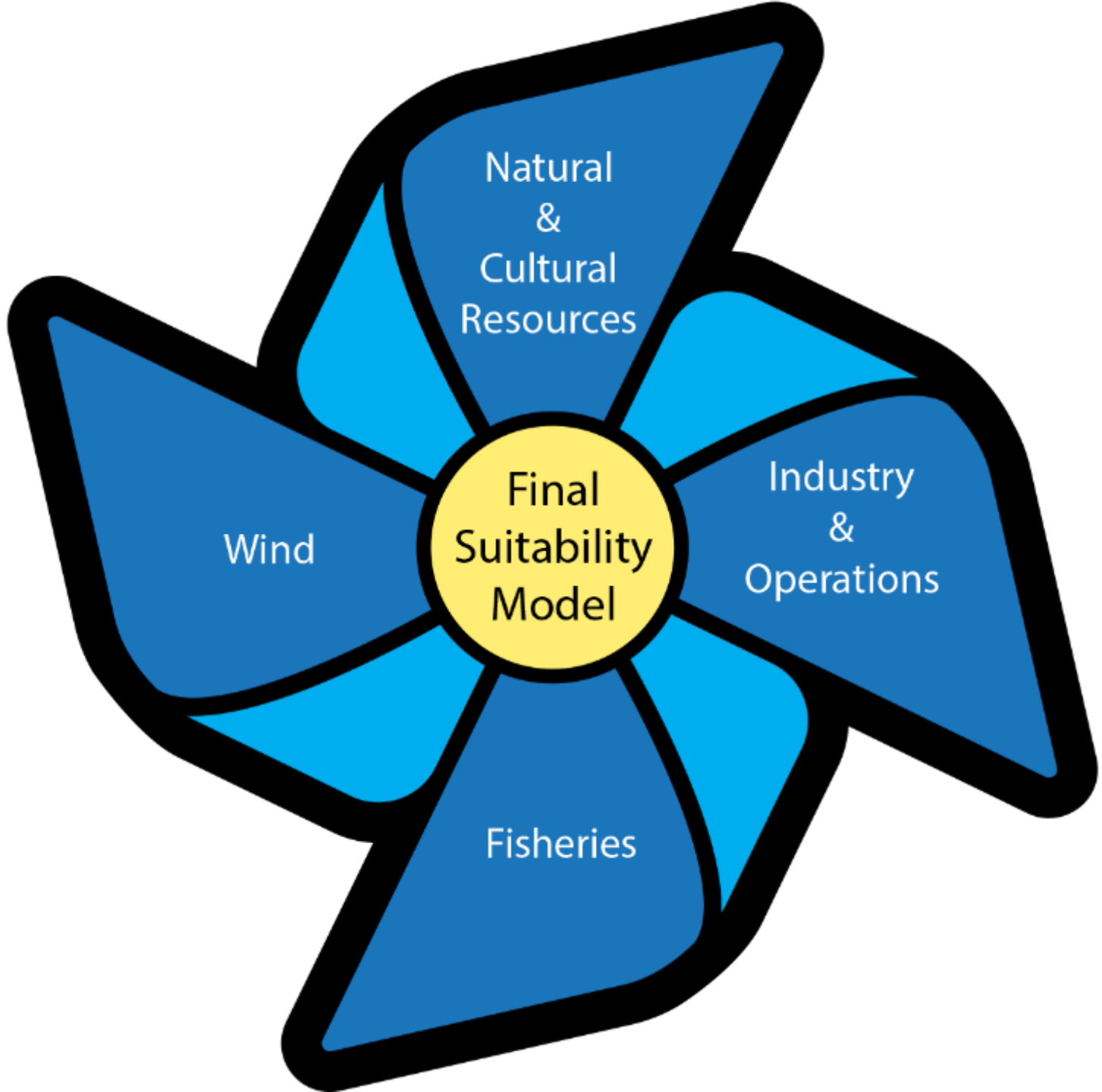
Gulf of Maine Draft Wind Energy Area


Natural
&
Cultural
Resources
Industry
&
Operations
Fisheries
Wind
Final
Suitability
Model

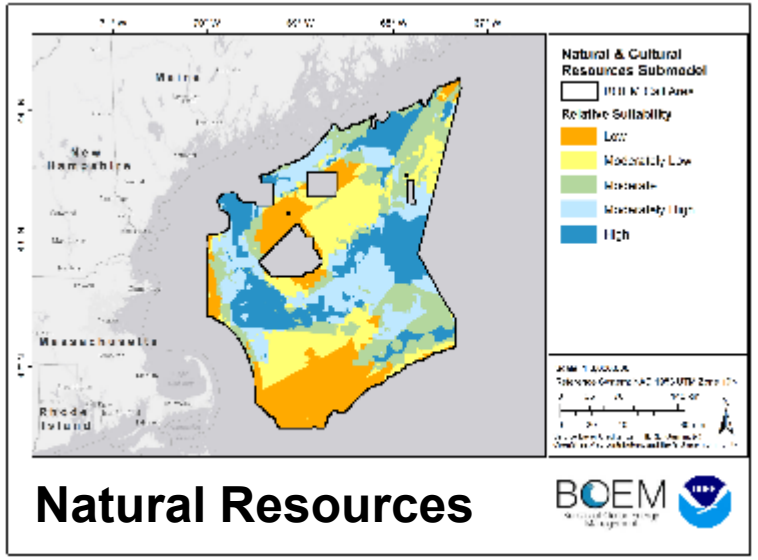
Scoring and Submodel Structure

Natural and Cultural Resources Submodel (25%)	Score
NMFS Protected Species Combined Layer (22 species)	NMFS Scores
NMFS Habitat Combined Layer (9 habitats)	0.1
NMFS North Atlantic Right Whale (NARW) Areas	0.1
<u>North Atlantic Right Whale Area Removals:</u> Massachusetts Restricted Area, Great South Channel Restricted Area, LMA1 Restricted Area NARW Corridor & Extension and Cashes Ledge Extension	 0.3 0.5
<u>USFWS Avian Combined Layer:</u> BRI - Integrated Seabird Risk and Vulnerability Assessment - High (33%) BRI - Tracking Data for Diving Birds - Core Use Area (33%) 24 nm buffer from shore, including islands (birds and bats) (33%)	 0.2 0.3 0.1
NEFSC Trawl Survey Interpolated Biomass 2010 - 2019	Z-membership

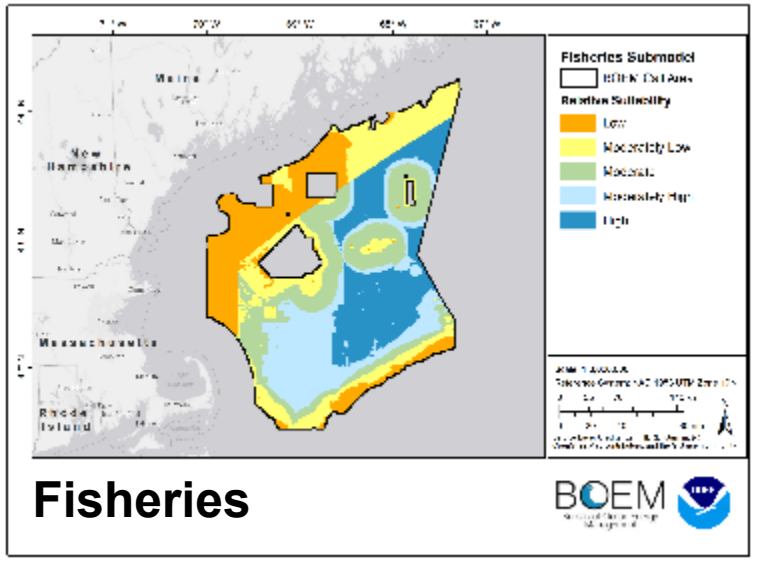
Fisheries Submodel (25%)	Score
Fishing Footprint Raster Data (revenue) 2008 - 2021	Z-membership
Fishing Footprint Raster Data (landings) 2008 - 2021	Z-membership
VMS Data 2009-2021	Z-membership
Charter/Party VTR 2008 - 2020	Z-membership
HMS Combined Layer: Large Pelagic Survey Trip Points (HMS/Recreational) 2011 - 2021 with 10-mi setback Maine DMR HMS Fishing Trip Data	 Z-membership Z-membership
Fisheries Considerations: Lobster Management Area I Platts Bank Georges Bank Western Gulf of Maine Closure Jeffreys Bank Habitat Management Area (HMA) HMAs considered but not adopted by NEFMC (e.g. Toothaker Ridge, Large Eastern Maine proposed HMA, Wildcat Knoll) Closed Area II Davis Swell, Parker Ridge, Three Dory Ridge Jordan Basin Dedicated Habitat Research Area Cashes Ledge	0.1 0.1; 0.1 to 0.5 from edge of Platts Bank to 20 km setback 0.1 for 10 km from 140 isobath; 0.1 to 0.5 from 10 km – 20 km from 140 m isobath 0.1 to 0.5 from edge to W GoME Closure to 20 km setback 0.1 to 0.5 from edge of Jeffreys Bank HMA to 20 km setback 0.5 for proposed HMAs 0.1 to 0.5 from edge of Closed Area II to 20 km setback 0.1 for area; 0.1 to 0.5 from edge to 20 km setback 0.1 to 0.5 from edge of JBDHRA to 20 km setback 0.1 to 0.5 from edge of Cashes Ledge to 20 km setback

Industry & Operations Submodel (25%)	**Score**
NMFS Independent Fisheries Surveys	Z-membership
Wrecks and Obstructions with 500-ft setback	0.5
NEXRAD Stations Moderate Impact (35 - 70 km)	0.5
Aids to Navigation (beacons and buoys) with 500-m setback	0.5
AIS Vessel Traffic All Vessels 2015 - 2022	Z-membership
USCG Draft MNM PARS Fairways	0.5
EPA Mandatory Class 1 Federal Areas with 50 km and 100 km setback	0.1 for 50 km setback 0.2 – 0.9 linear gradient for 50 – 100 km setback
Special Use Airspace W103	0.1
Wind Submodel (25%)	**Score**
Distance to Ports (10%)	Linear Function (Closer to port is better)
Call Developer Nominations (50%)	Linear Function (More nominations is better)
HVAC vs HVDC – Points of Interconnection – 0-75 miles linear gradient (20%)	0.4 to 1.0 for 0-75 mi linear gradient from POIs; 0.4 for > 75 mi
NREL 20-Year Mean Wind Speed (20%)	Linear Function (Greater wind speed is better)

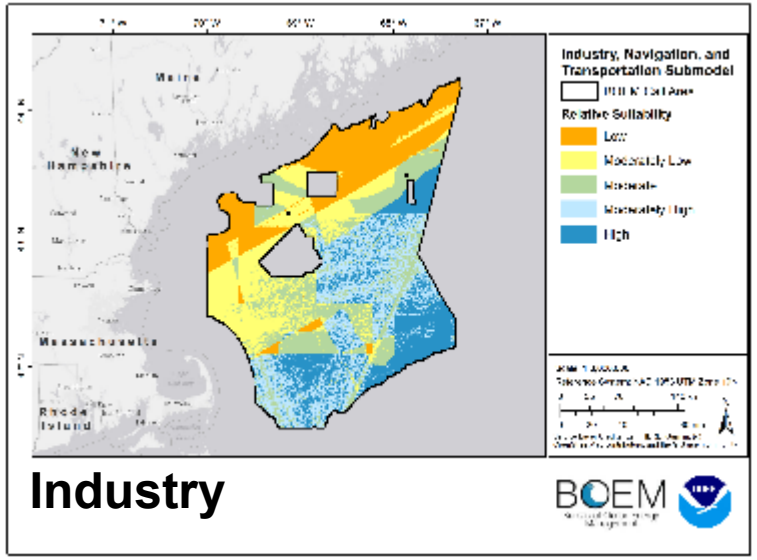
Suitability by Submodel



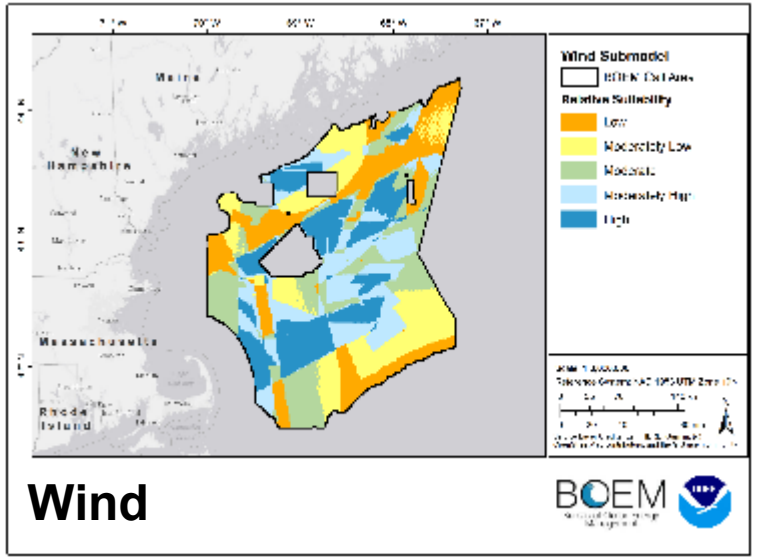
Natural Resources



Fisheries



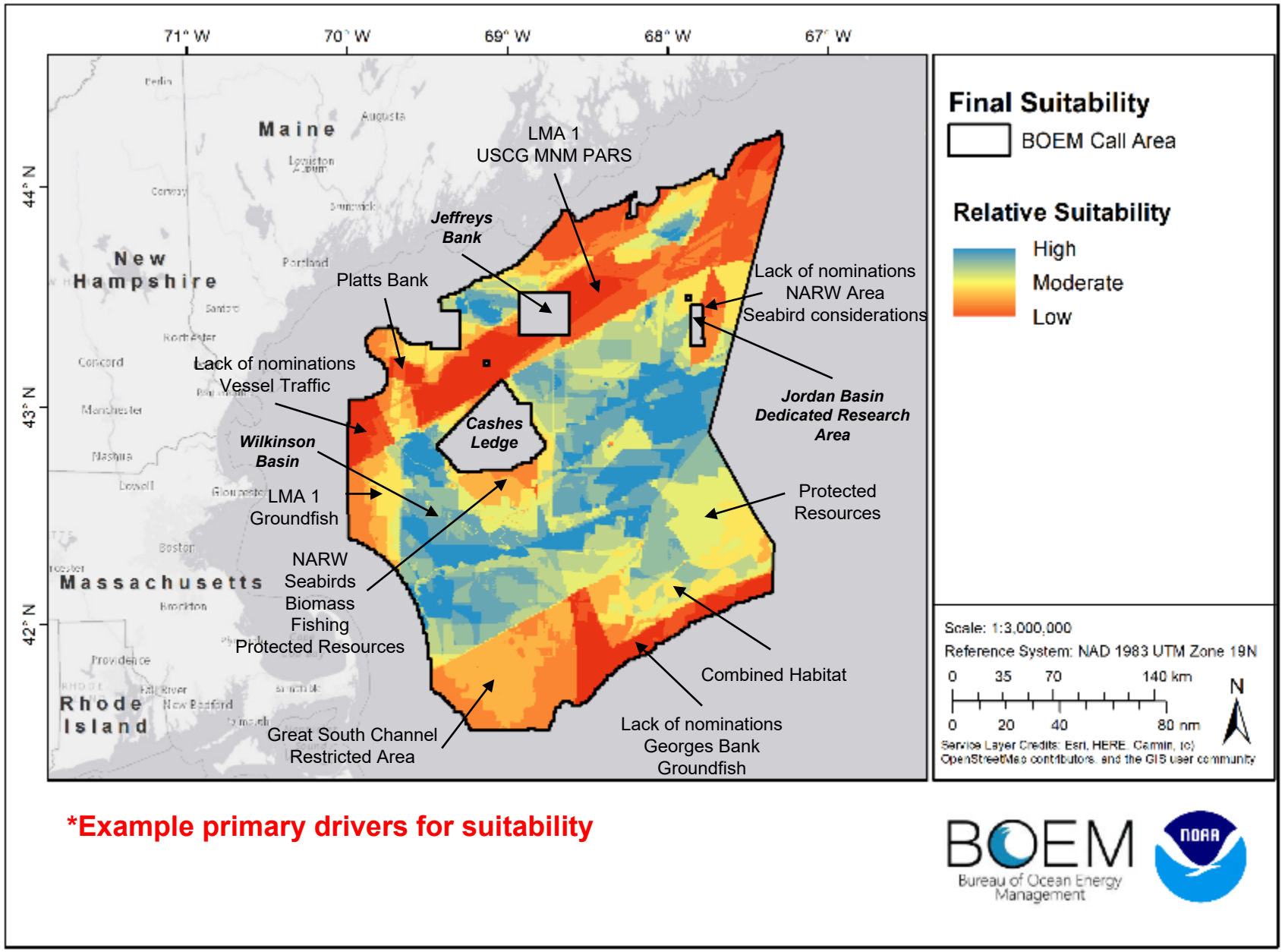
Industry



Wind

Pre-decisional, deliberative draft

Cumulative Suitability



***Example primary drivers for suitability**

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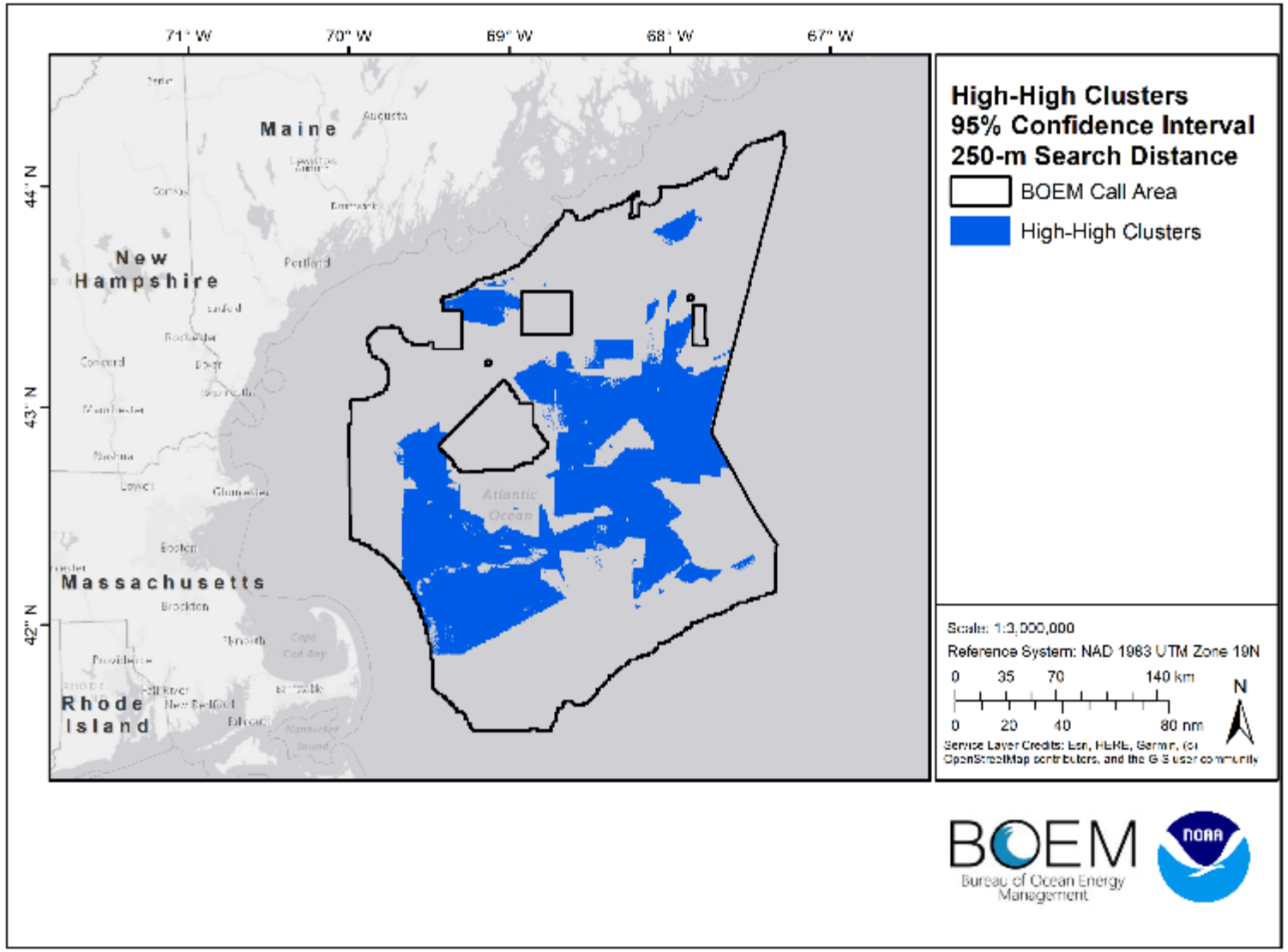
Pre-decisional, deliberative draft

High-High Cluster Analysis

3,341,873 acres



Pre-decisional, deliberative draft

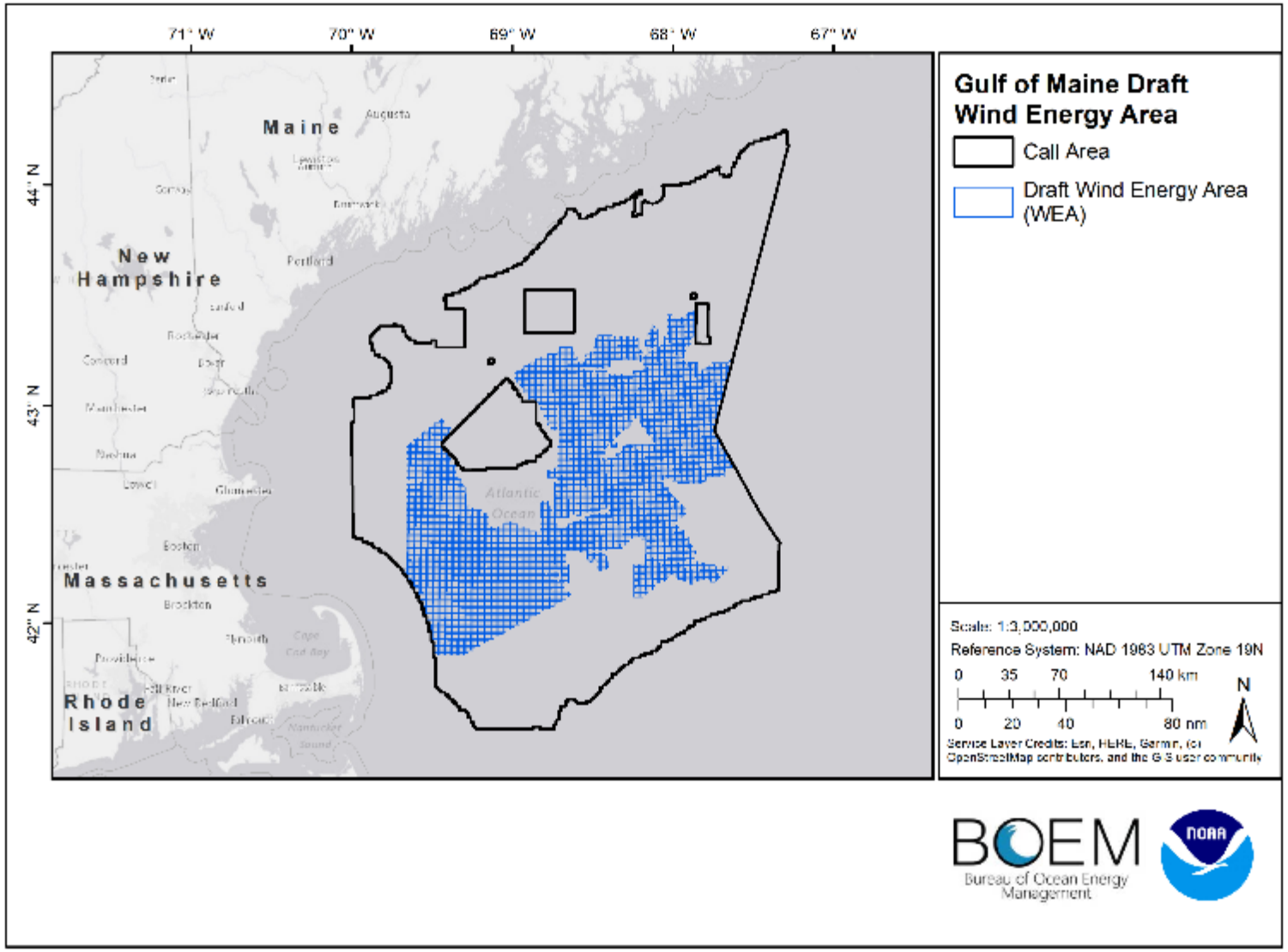
Identification of WEA Options

- All Aliquots that overlapped with High-High Clusters selected
- Any Aliquots that overlapped with Lobster Management Area 1 were removed from the selection (46,969 acres; 132 aliquots)
- Any Aliquots that overlapped with the Great South Channel Restricted Area were removed from the selection (12,454 acres; 35 aliquots)
- No percentage overlap rule applied

Gulf of Maine Draft Wind Energy Area

3,519,067 acres

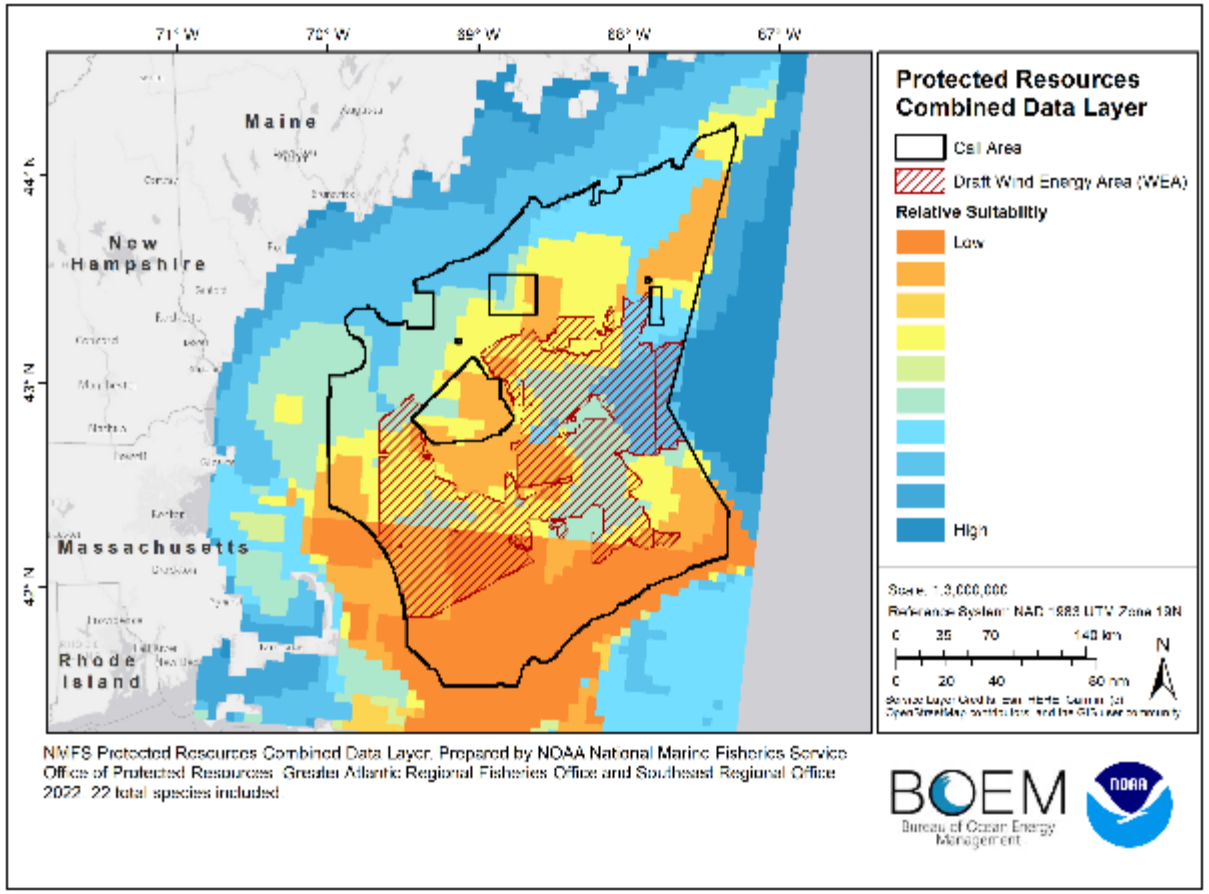
9,907 aliquots



Pre-decisional, deliberative draft

Model Performance & Interactions

NMFS Protected Resources Combined Layer (22 species)



NMFS Protected Resources Combined Data Layer. Prepared by NOAA National Marine Fisheries Service Office of Protected Resources, Greater Atlantic Regional Fisheries Office and Southeast Regional Office 2022. 22 total species included

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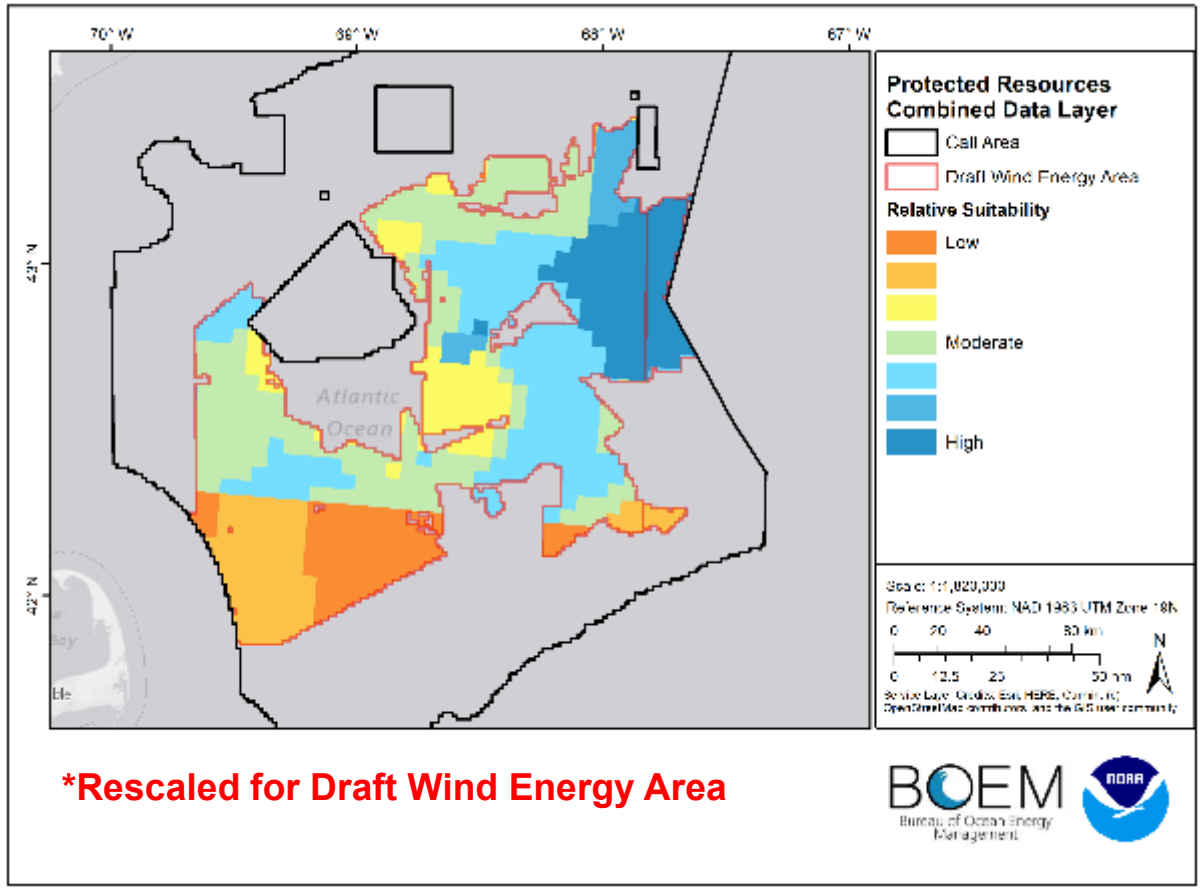

*Rescaled for Draft Wind Energy Area

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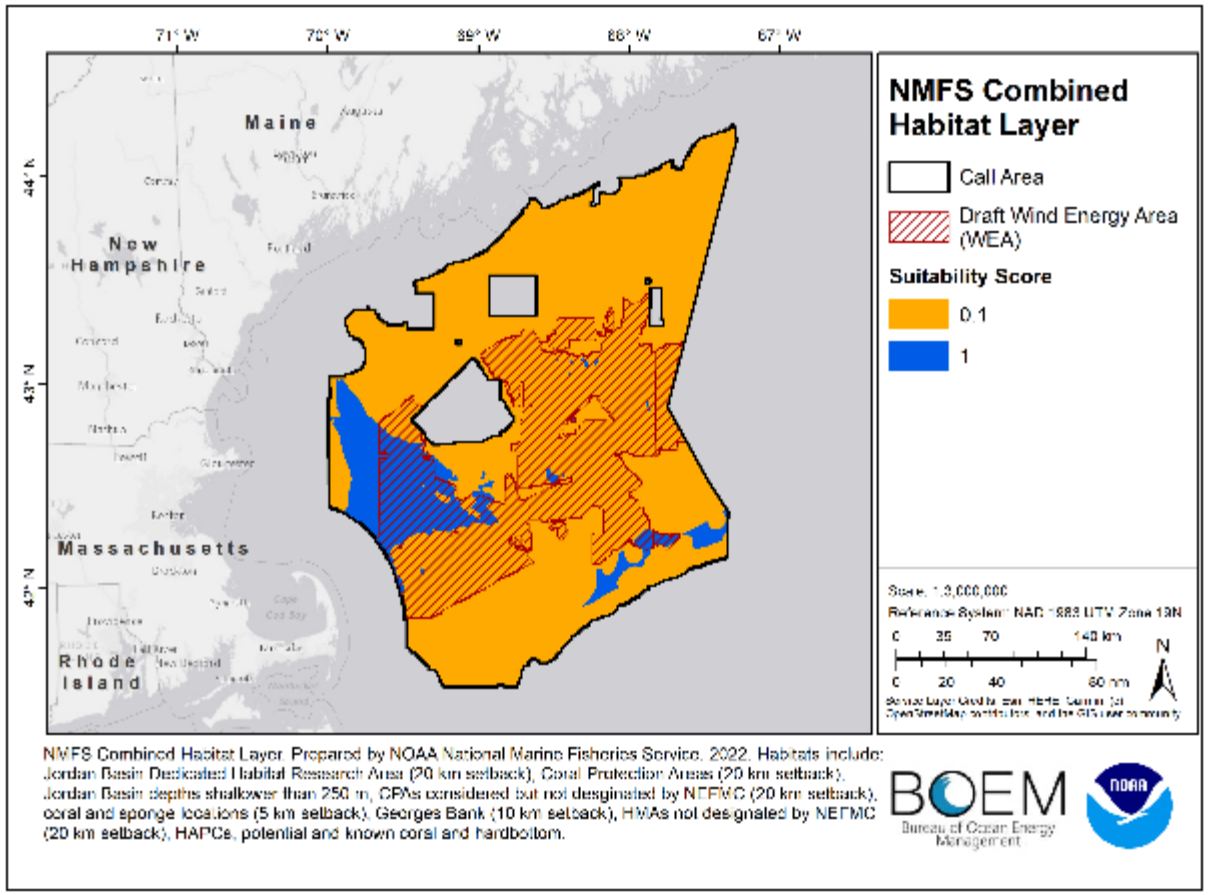
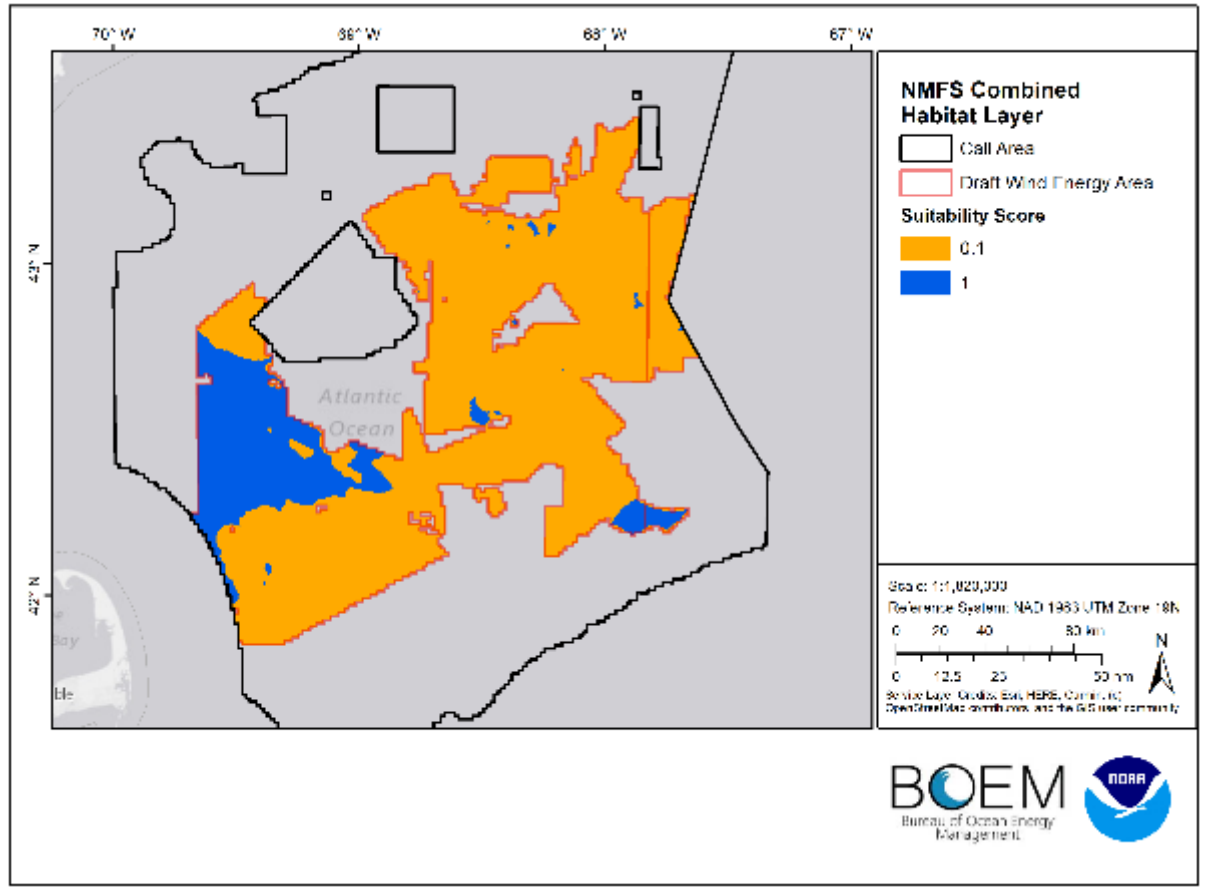
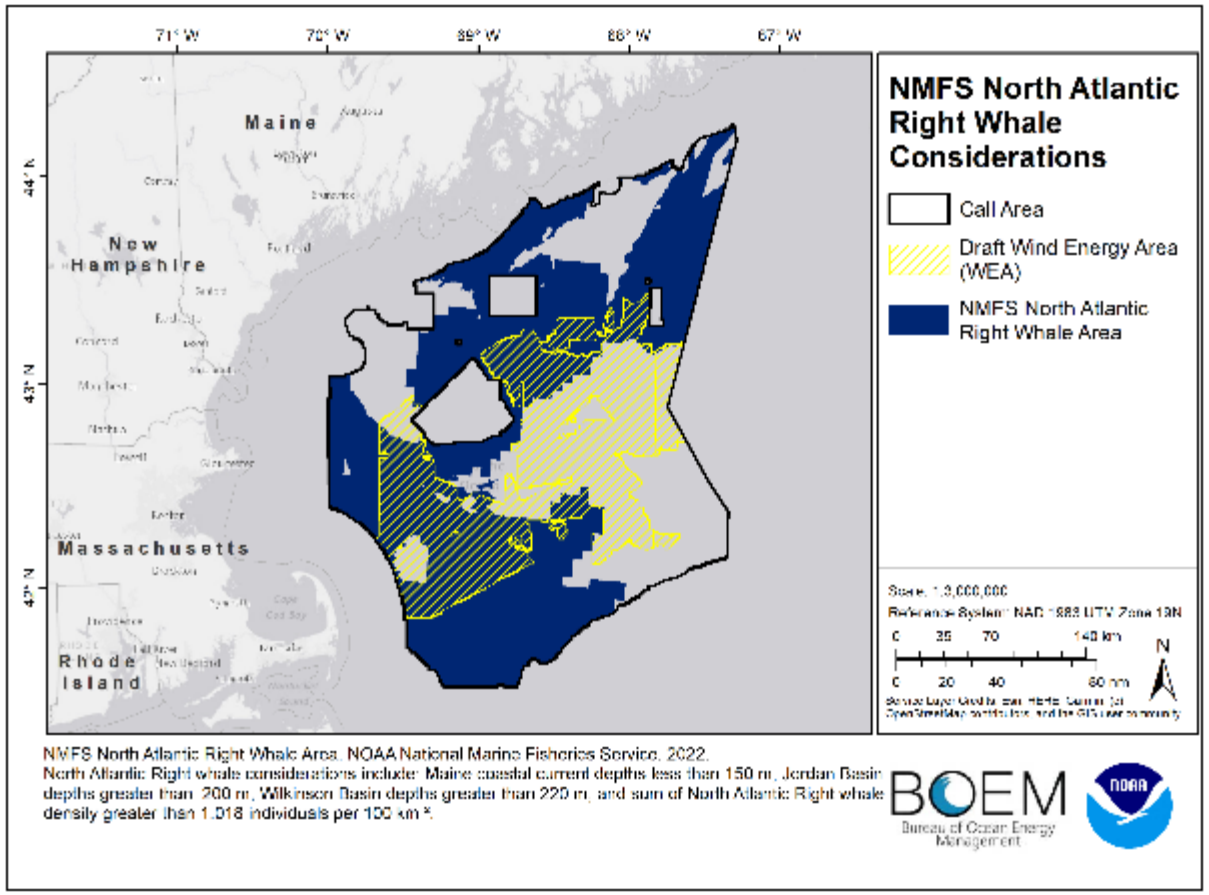
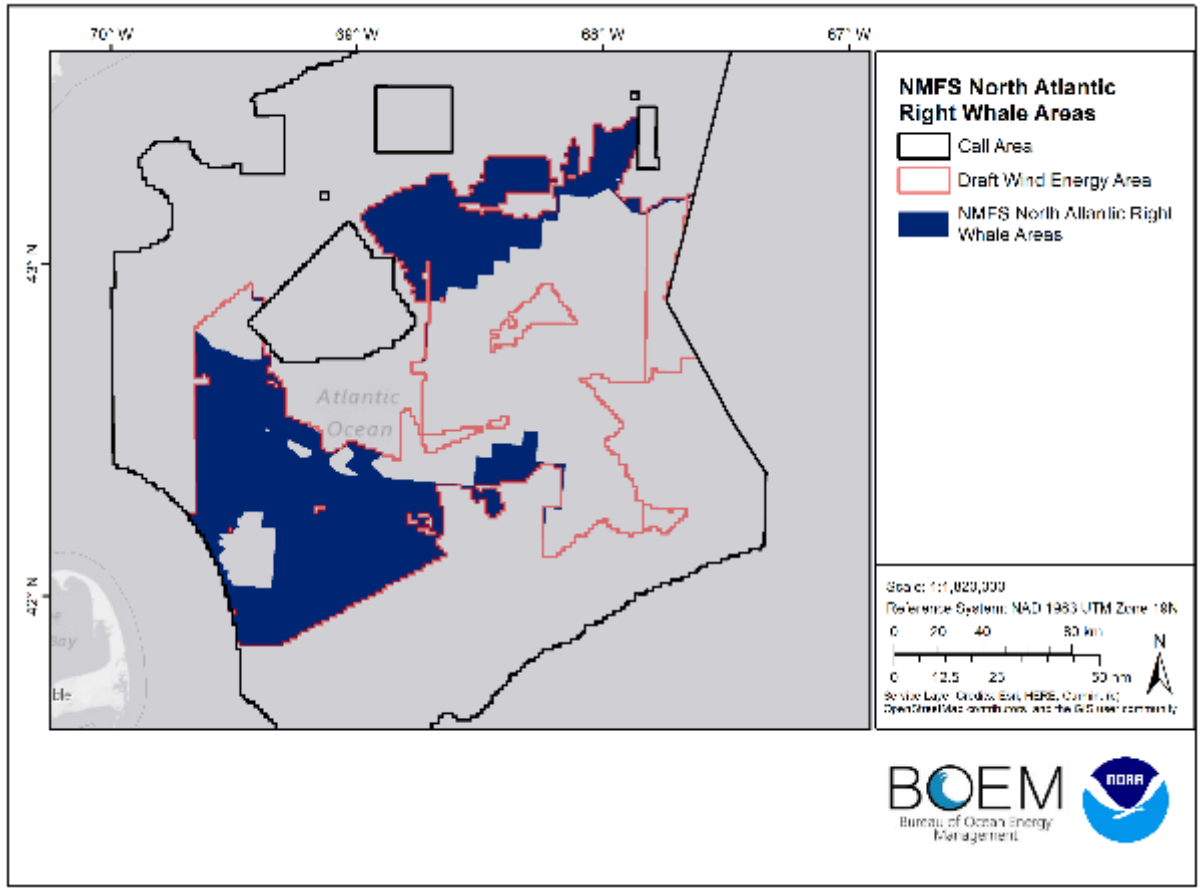
NMFS Combined Habitat Layer



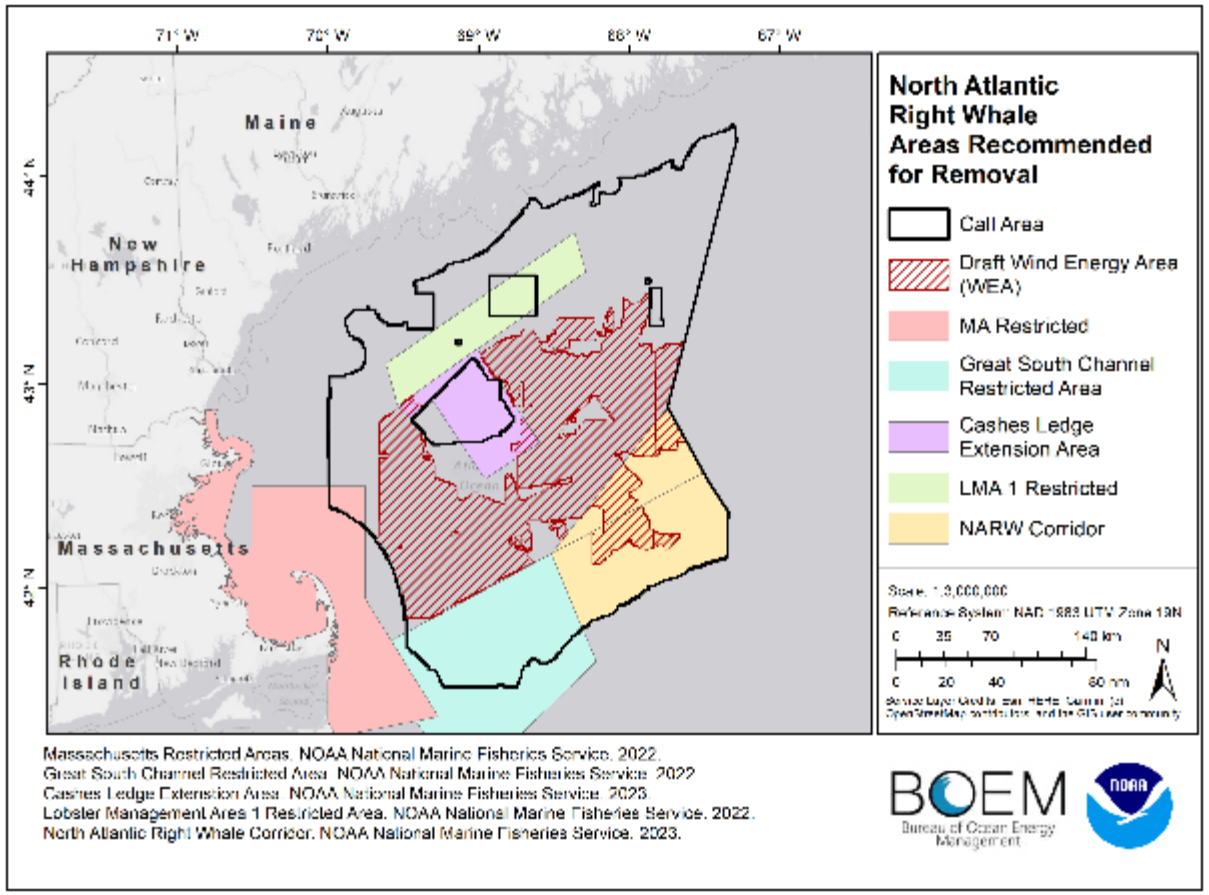


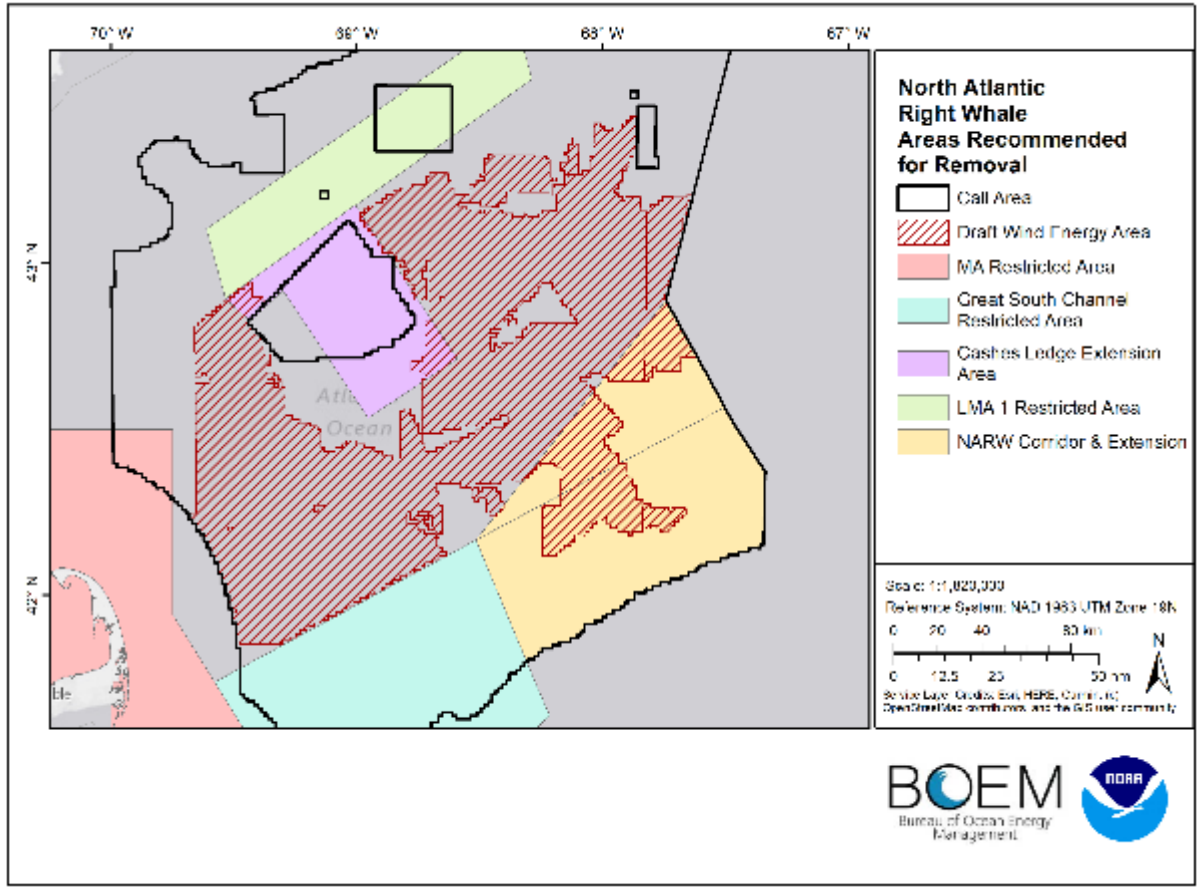
NMFS North Atlantic Right Whale Areas



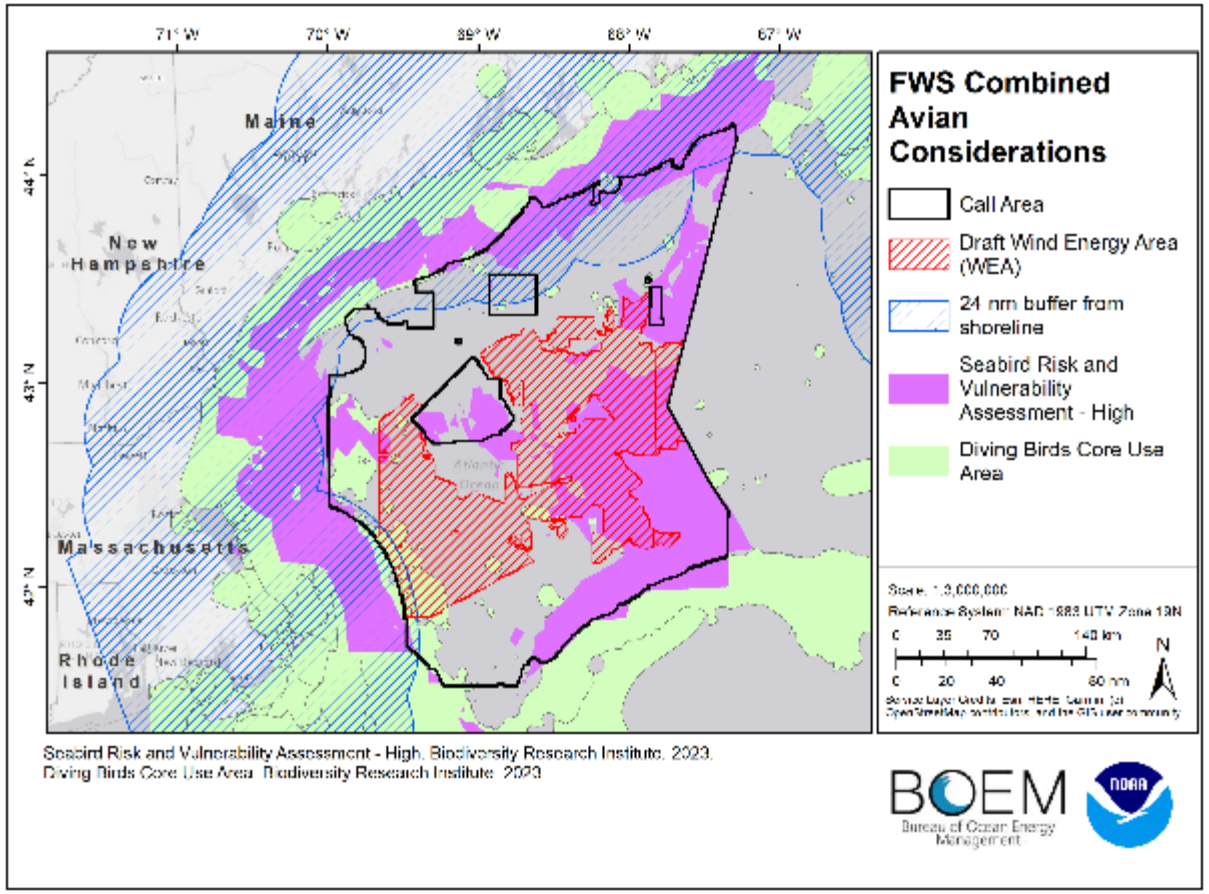


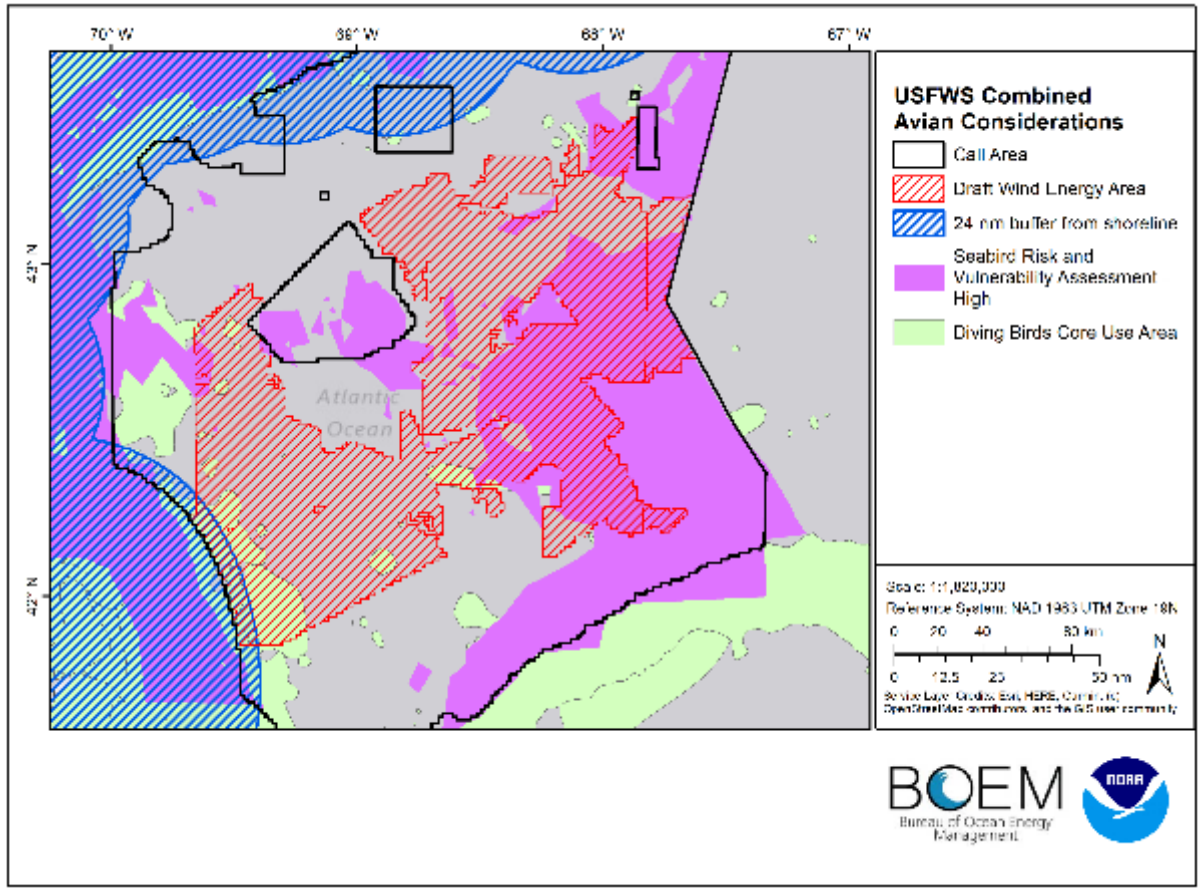
NMFS North Atlantic Right Whale Areas Recommended for Removal



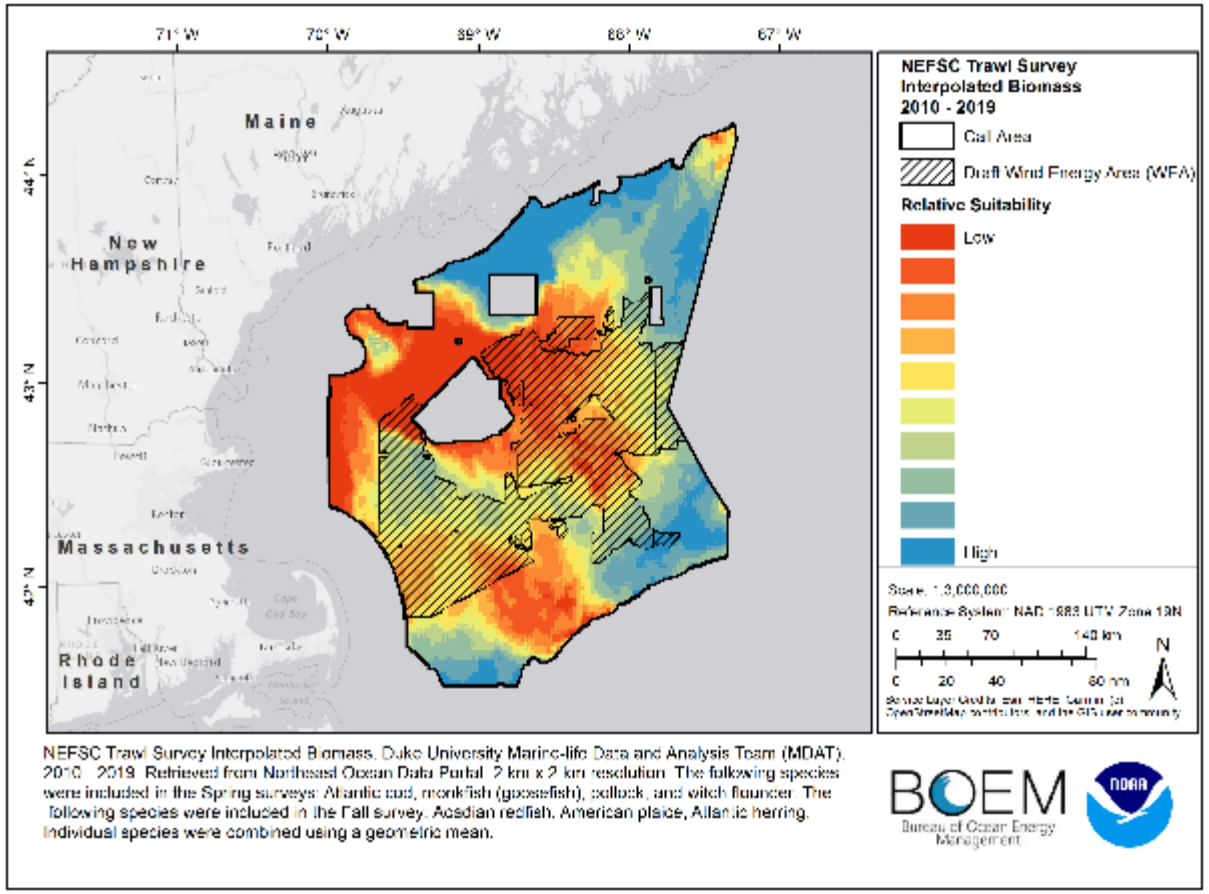


USFWS Combined Avian Considerations





NEFSC Trawl Survey Interpolated Biomass 2010 - 2019



NEFSC Trawl Survey Interpolated Biomass. Duke University Marine-life Data and Analysis Team (MDAT). 2010 - 2019. Retrieved from Northeast Ocean Data Portal. 2 km x 2 km resolution. The following species were included in the Spring surveys: Atlantic cod, monkfish (goosefish), pollock, and witch flounder. The following species were included in the Fall survey: Acadian redfish, American plaice, Atlantic herring. Individual species were combined using a geometric mean.

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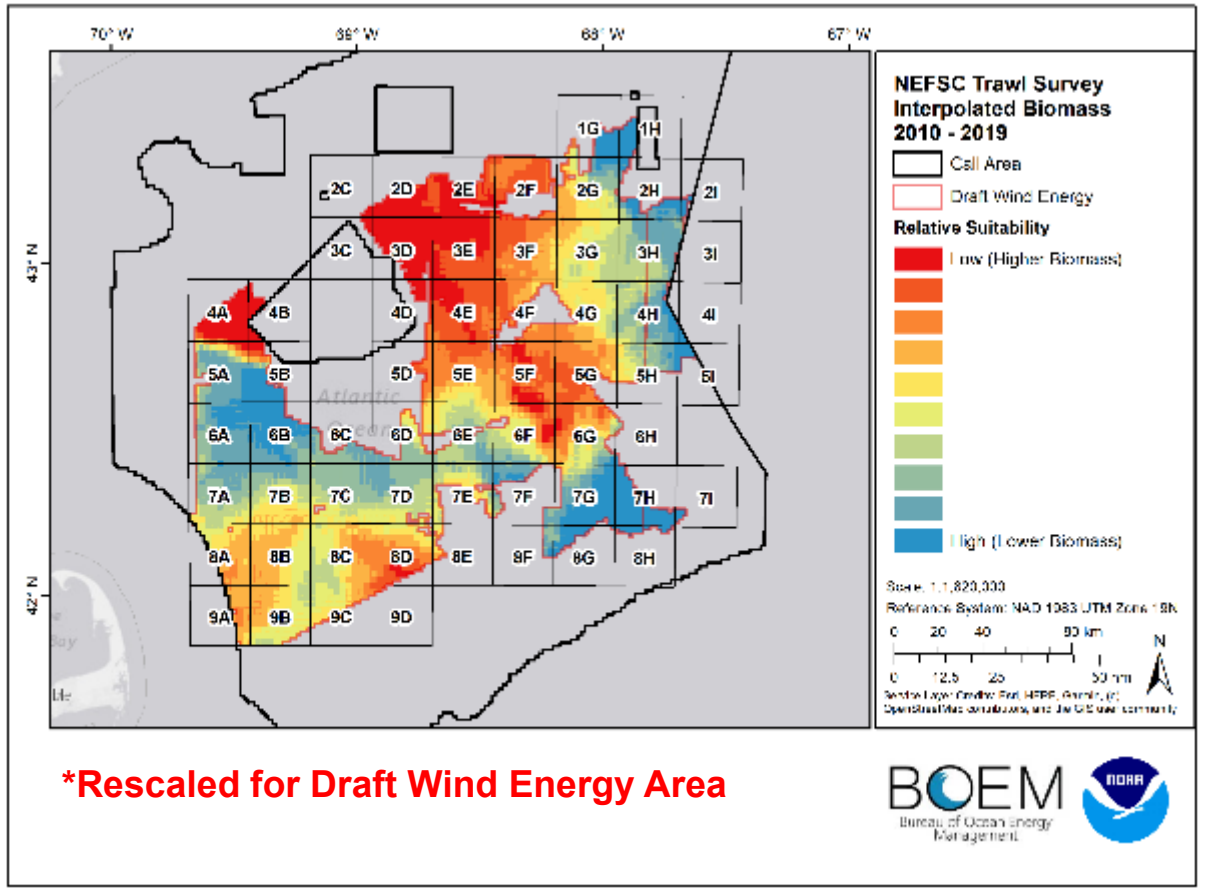

*Rescaled for Draft Wind Energy Area

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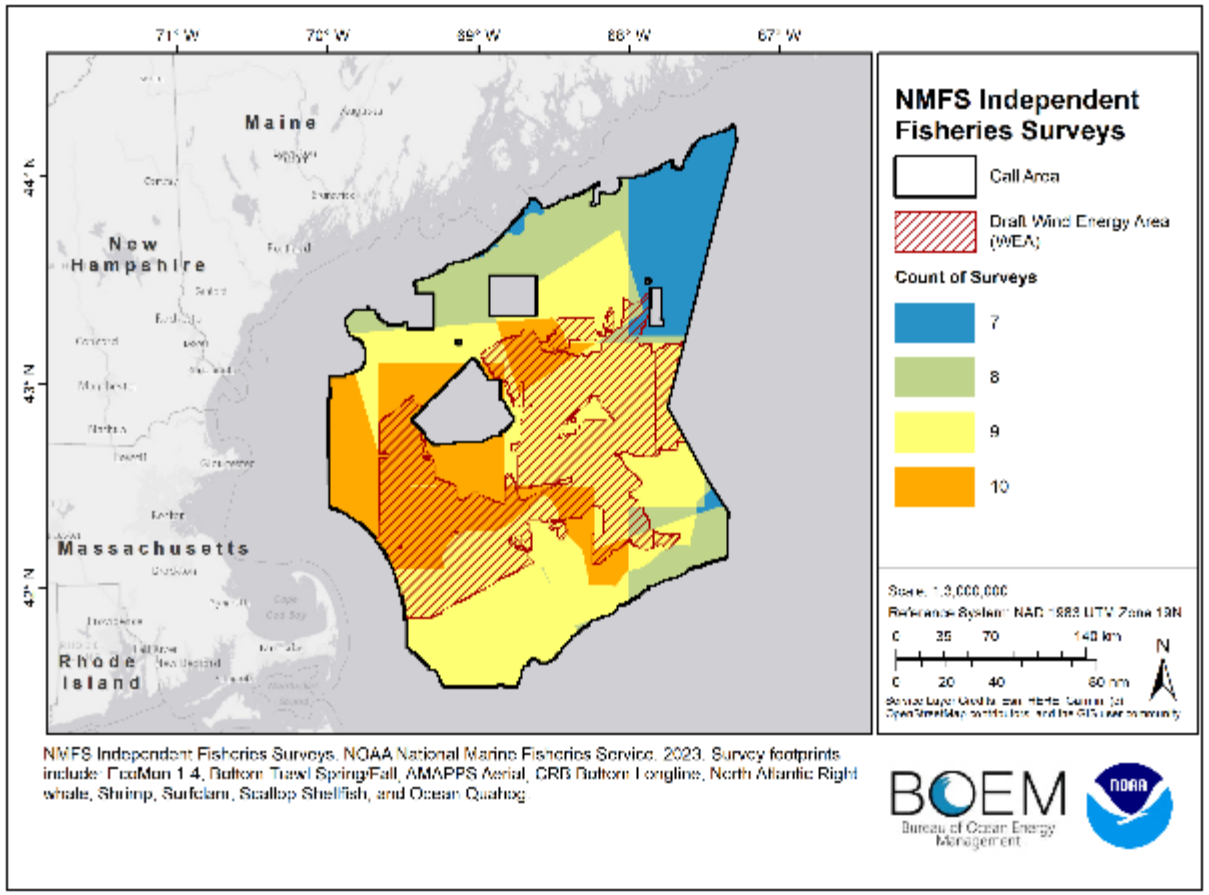
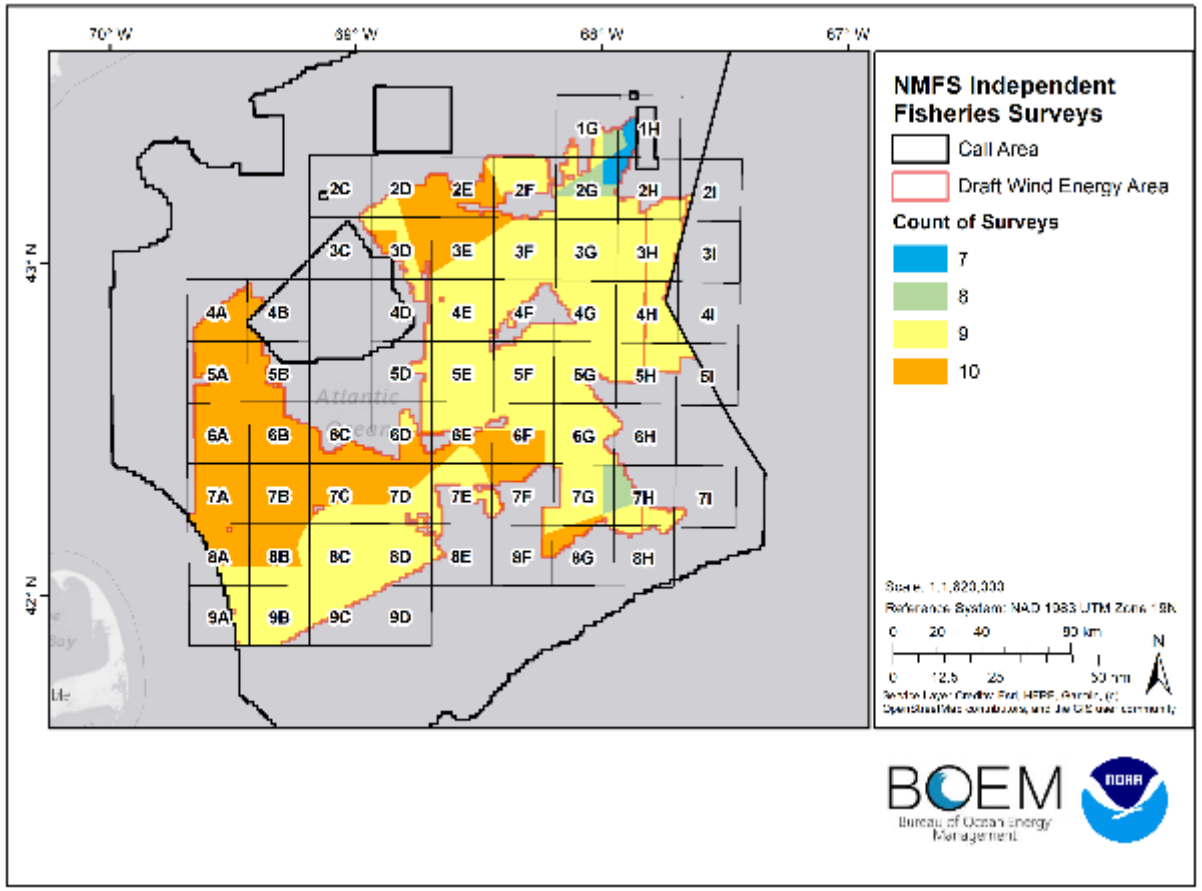
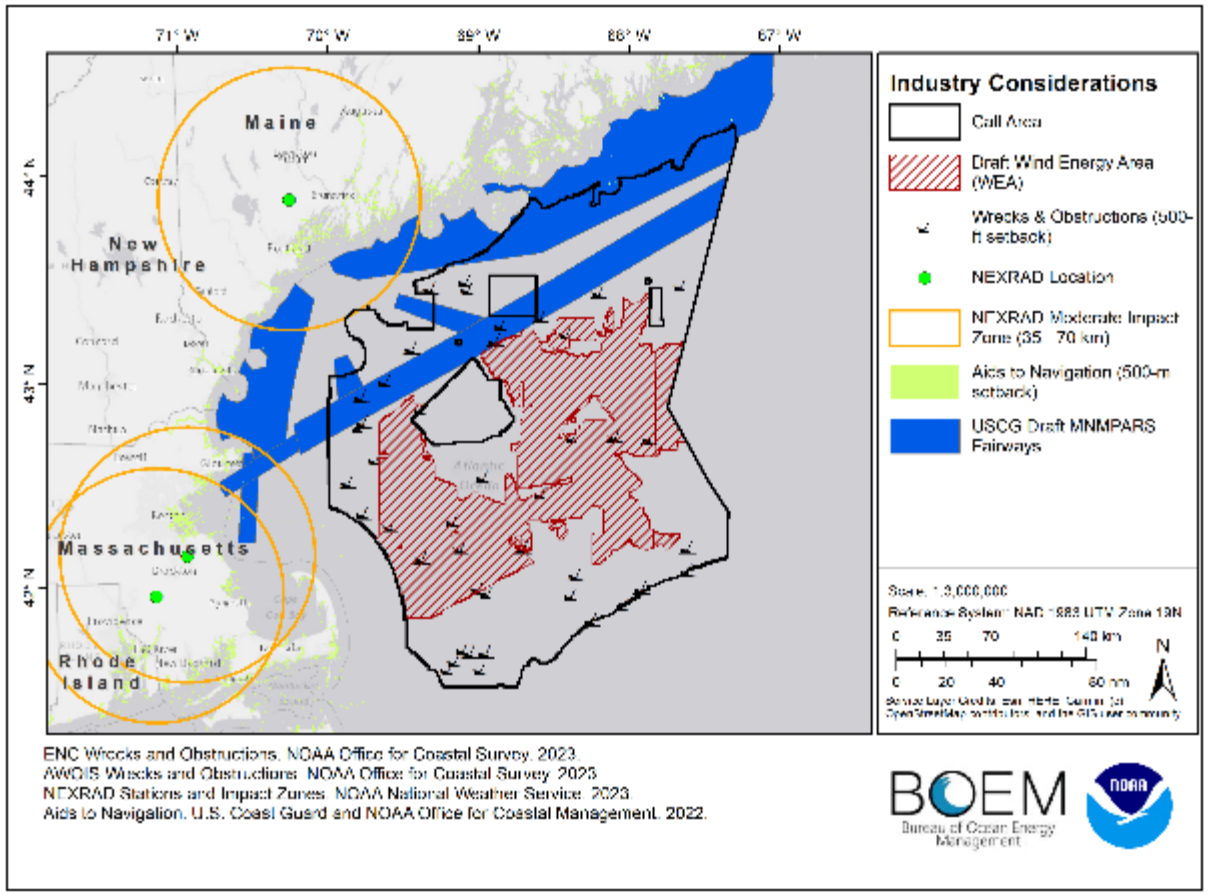
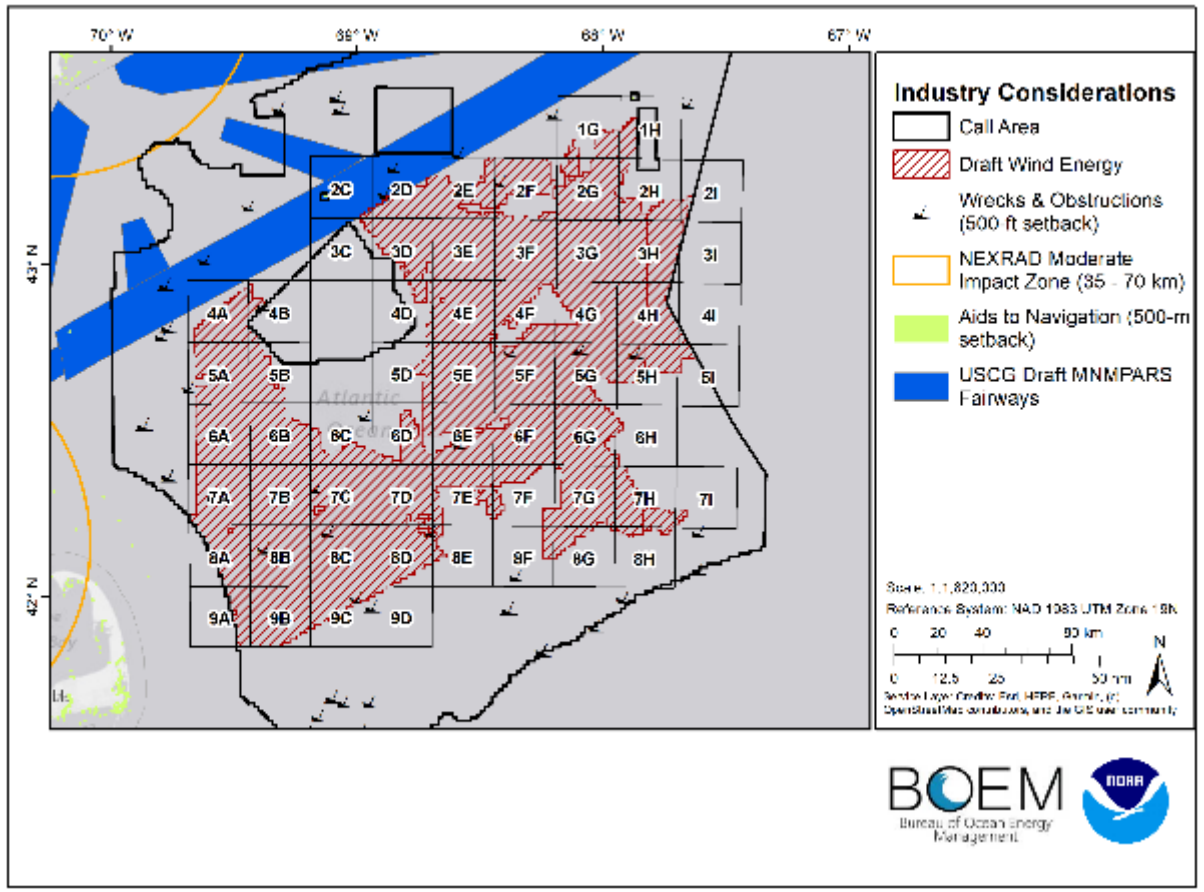
NMFS Independent Fisheries Surveys



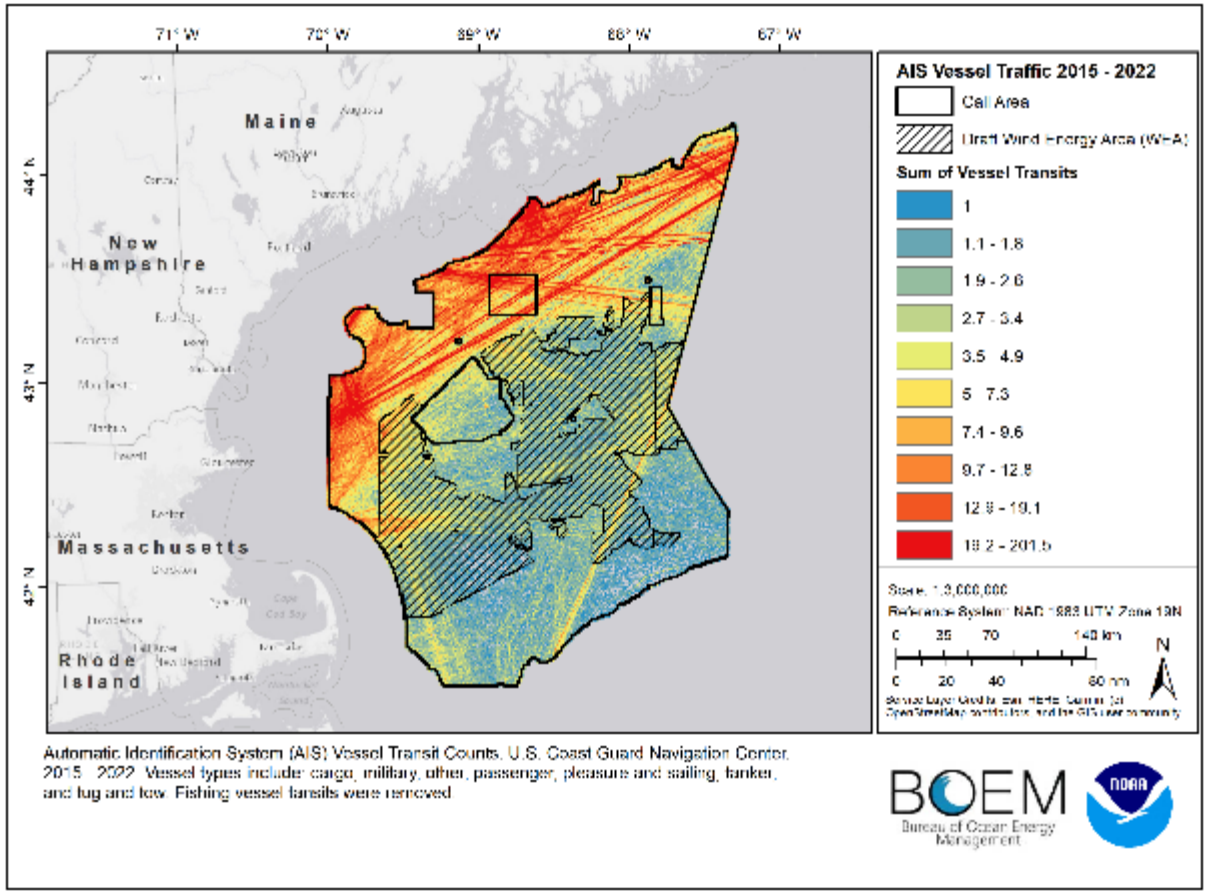


Industry Considerations





AIS Vessel Traffic 2015 - 2022



Automatic Identification System (AIS) Vessel Transit Counts, U.S. Coast Guard Navigation Center, 2015 - 2022. Vessel types include: cargo, military, other, passenger, pleasure and sailing, tanker, and tug and tow. Fishing vessel transits were removed.

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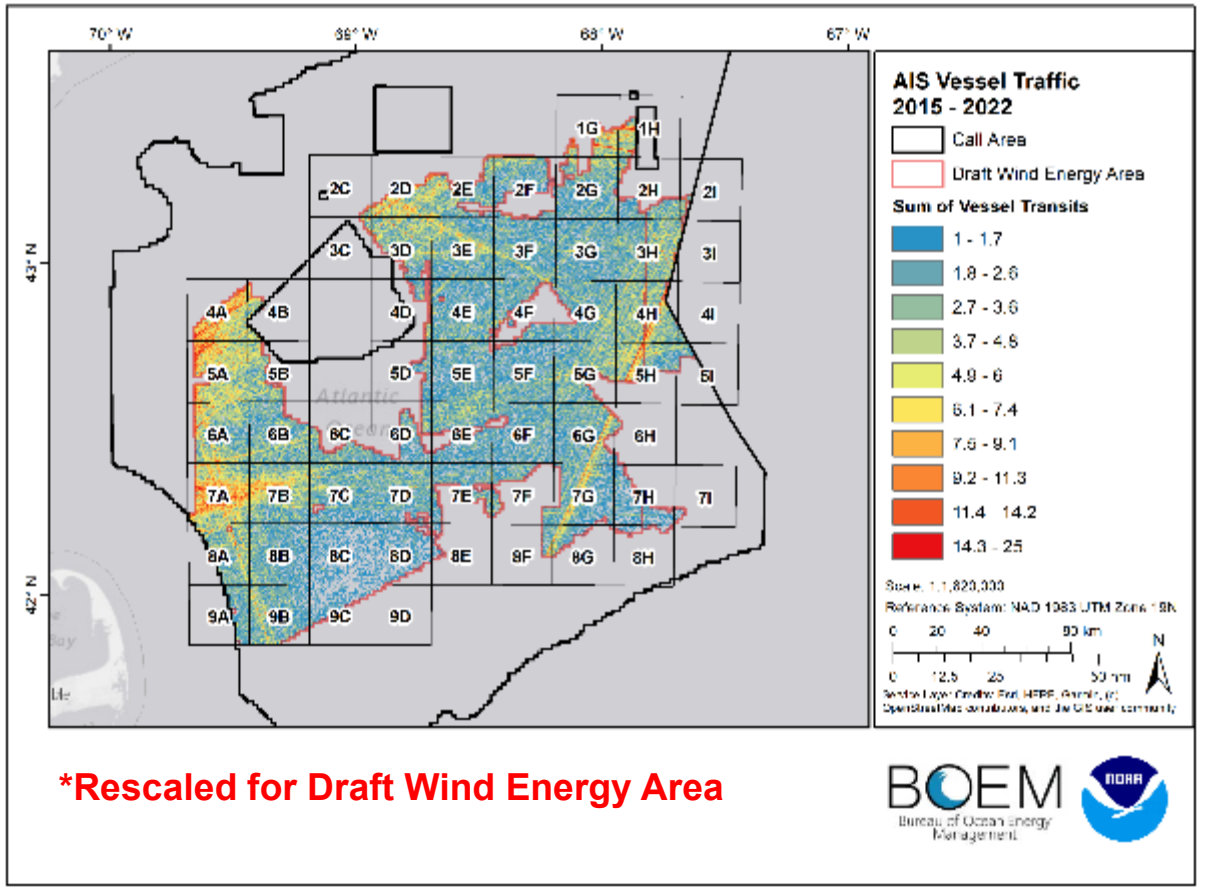

*Rescaled for Draft Wind Energy Area

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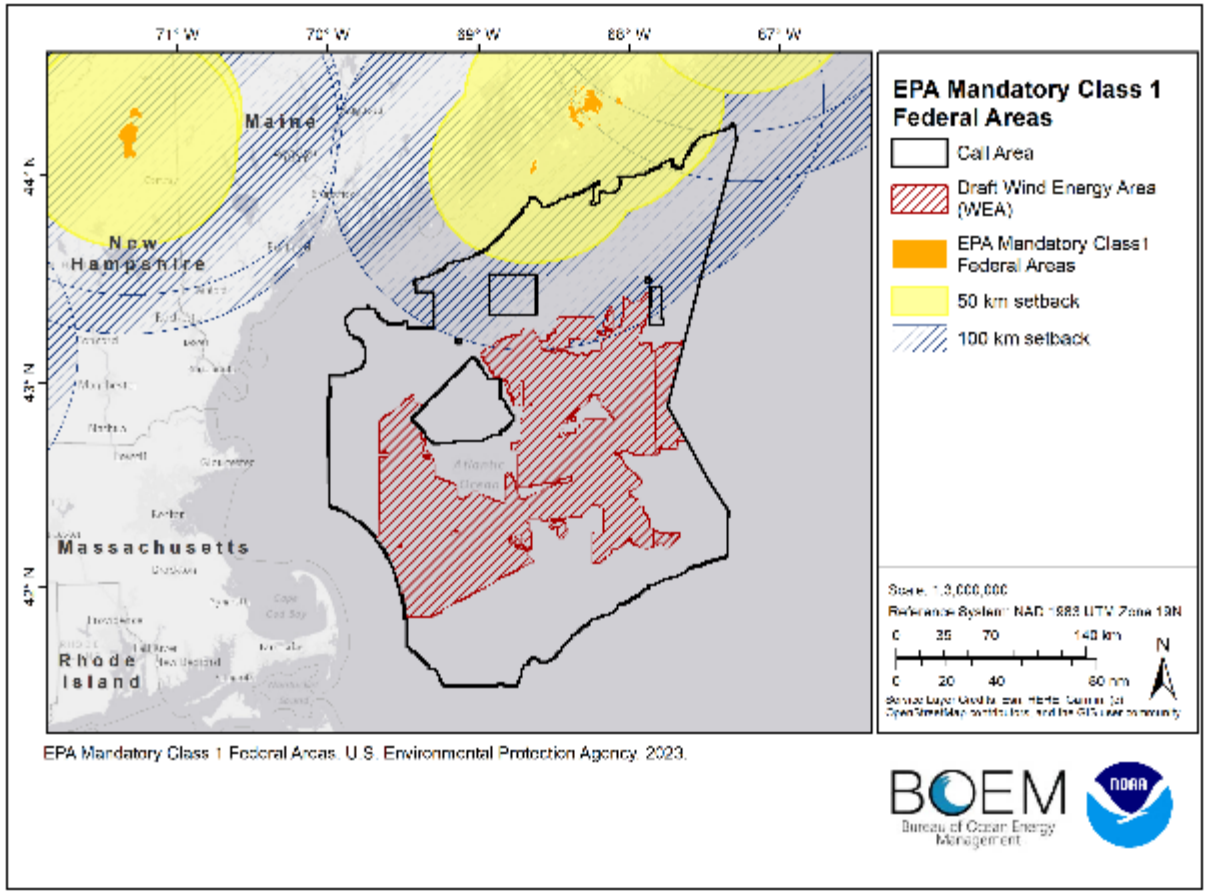
EPA Mandatory Class 1 Federal Areas



EPA Mandatory Class 1 Federal Areas. U.S. Environmental Protection Agency. 2023.

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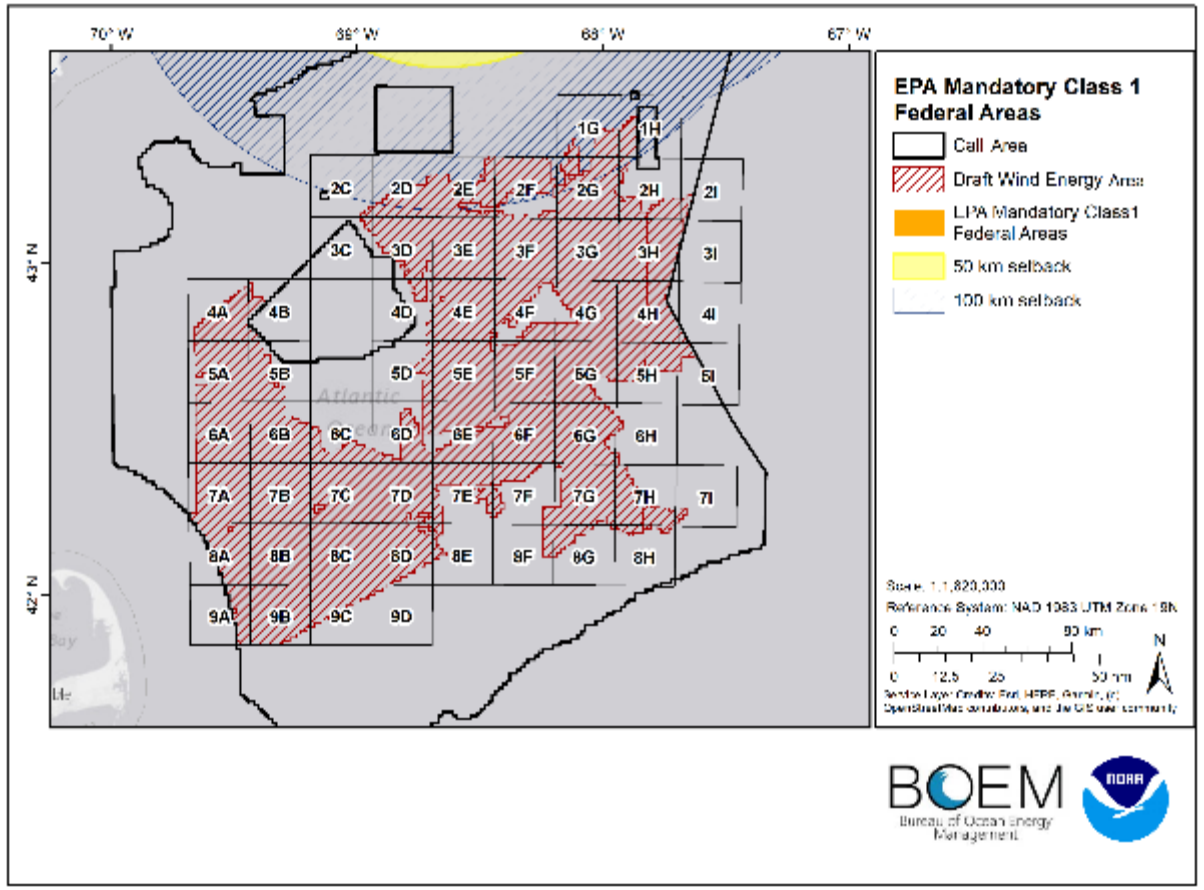
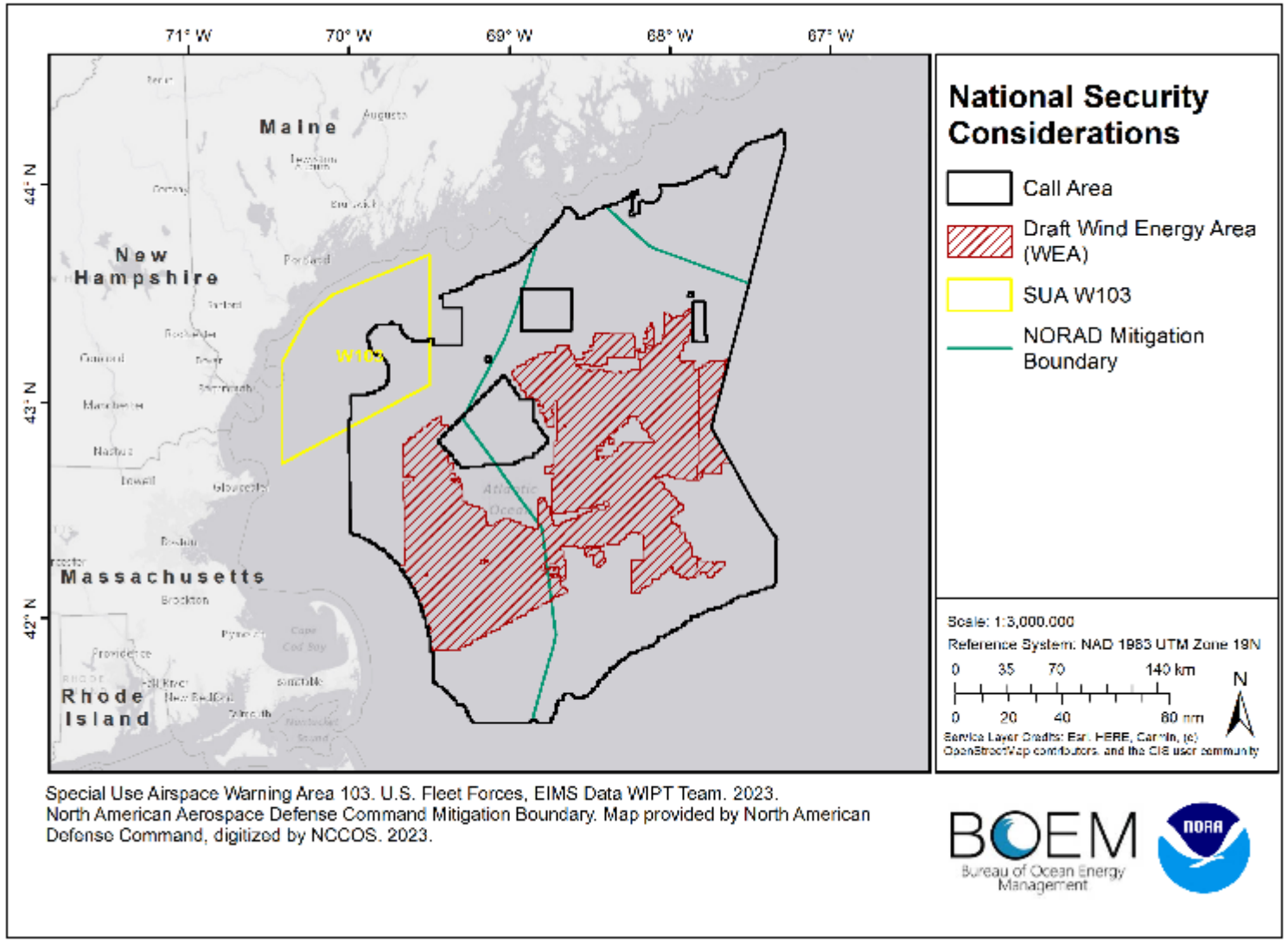


BOEM Bureau of Ocean Energy Management

National Security Considerations



Special Use Airspace Warning Area 103. U.S. Fleet Forces, EIMS Data WIPT Team. 2023.
North American Aerospace Defense Command Mitigation Boundary. Map provided by North American Defense Command, digitized by NCCOS. 2023.

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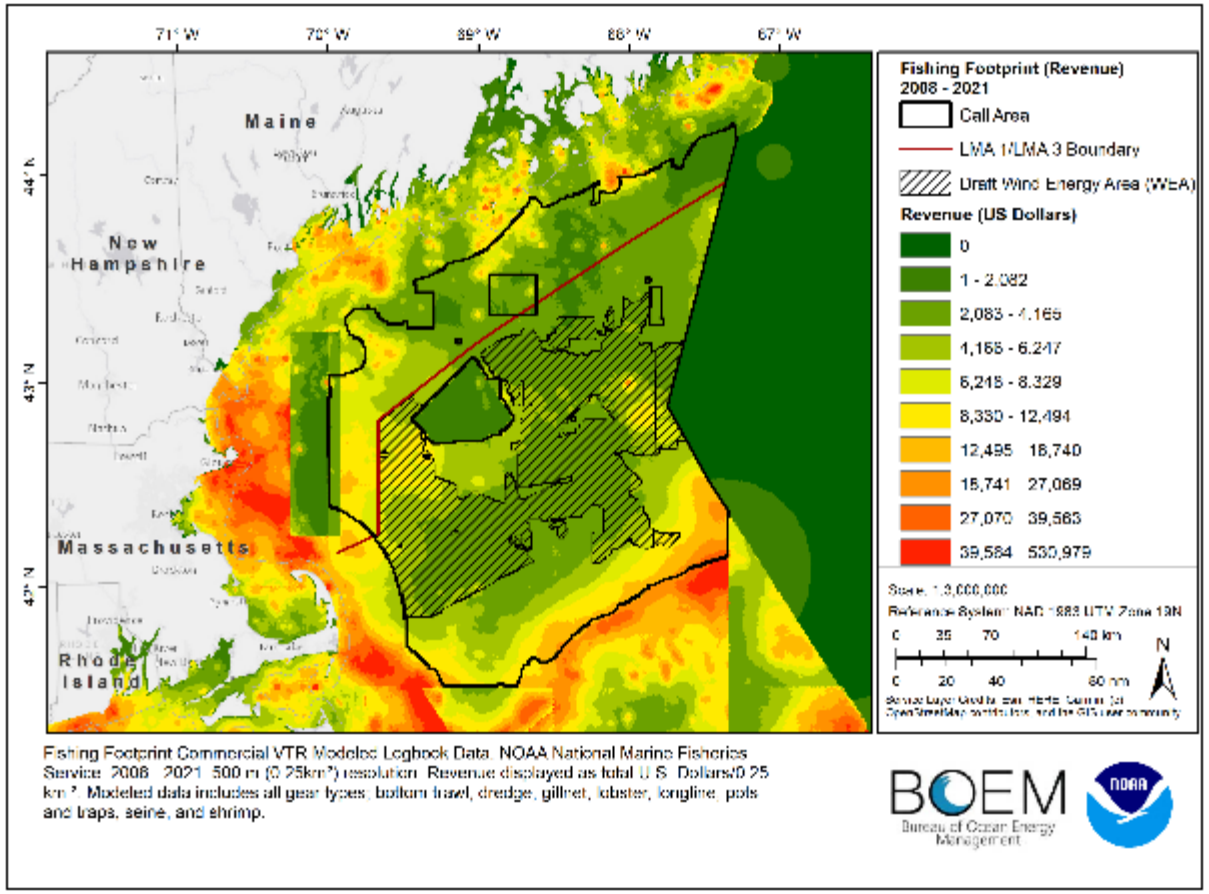
NOAA

Fishing Footprint (Revenue) 2008 - 2021



Fishing Footprint Commercial VTR Modelled Logbook Data. NOAA National Marine Fisheries Service. 2008 - 2021. 500 m (0.25km²) resolution. Revenue displayed as total U.S. Dollars/0.25 km². Modelled data includes all gear types: bottom trawl, dredge, gillnet, lobster, longline, pots and traps, seine, and shrimp.

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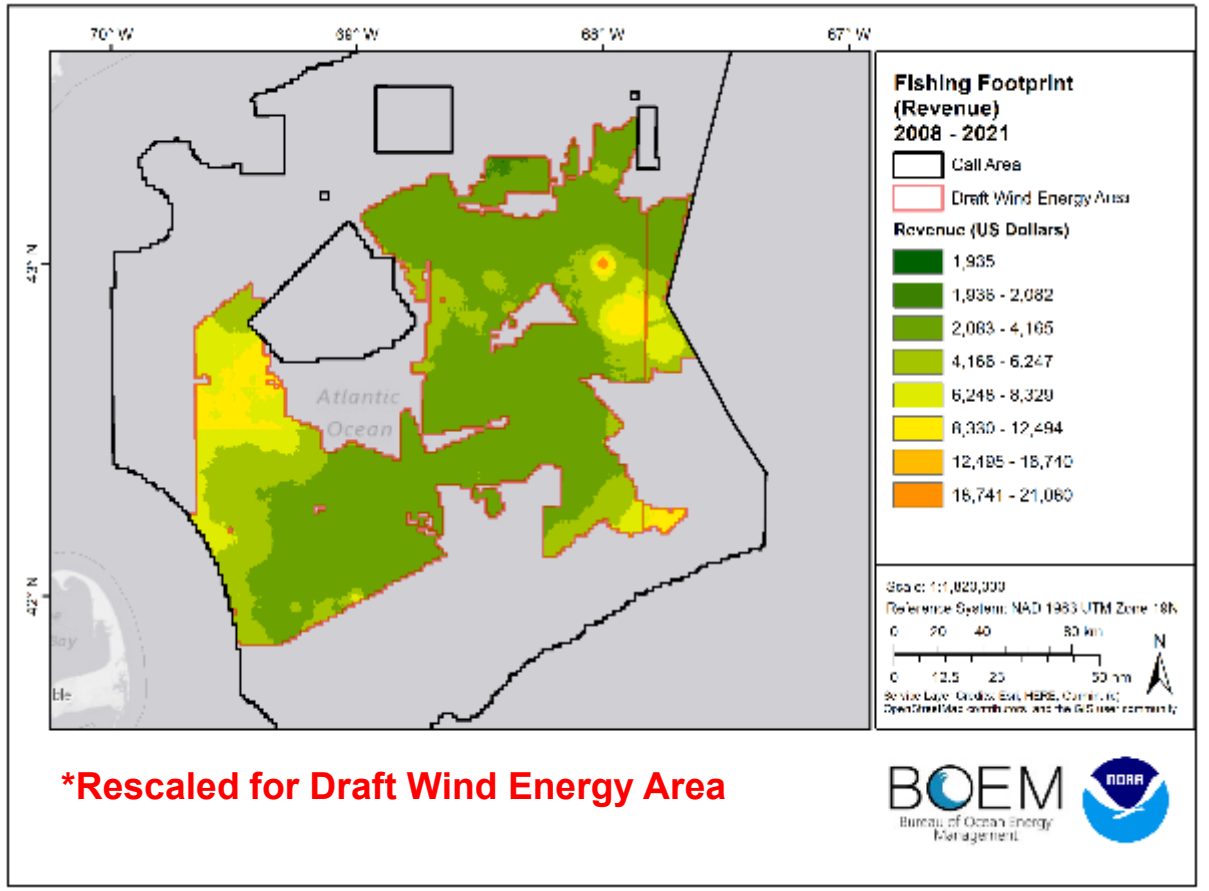

***Rescaled for Draft Wind Energy Area**

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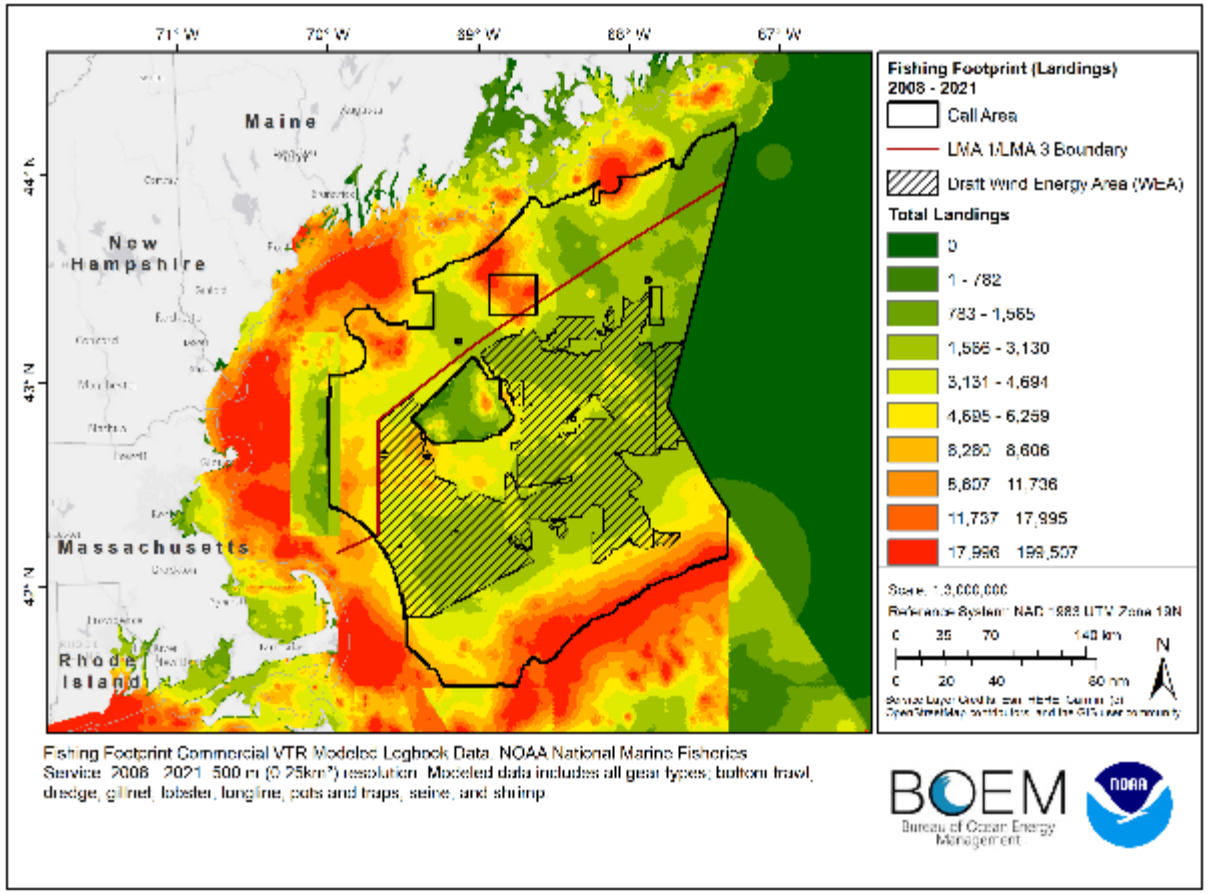
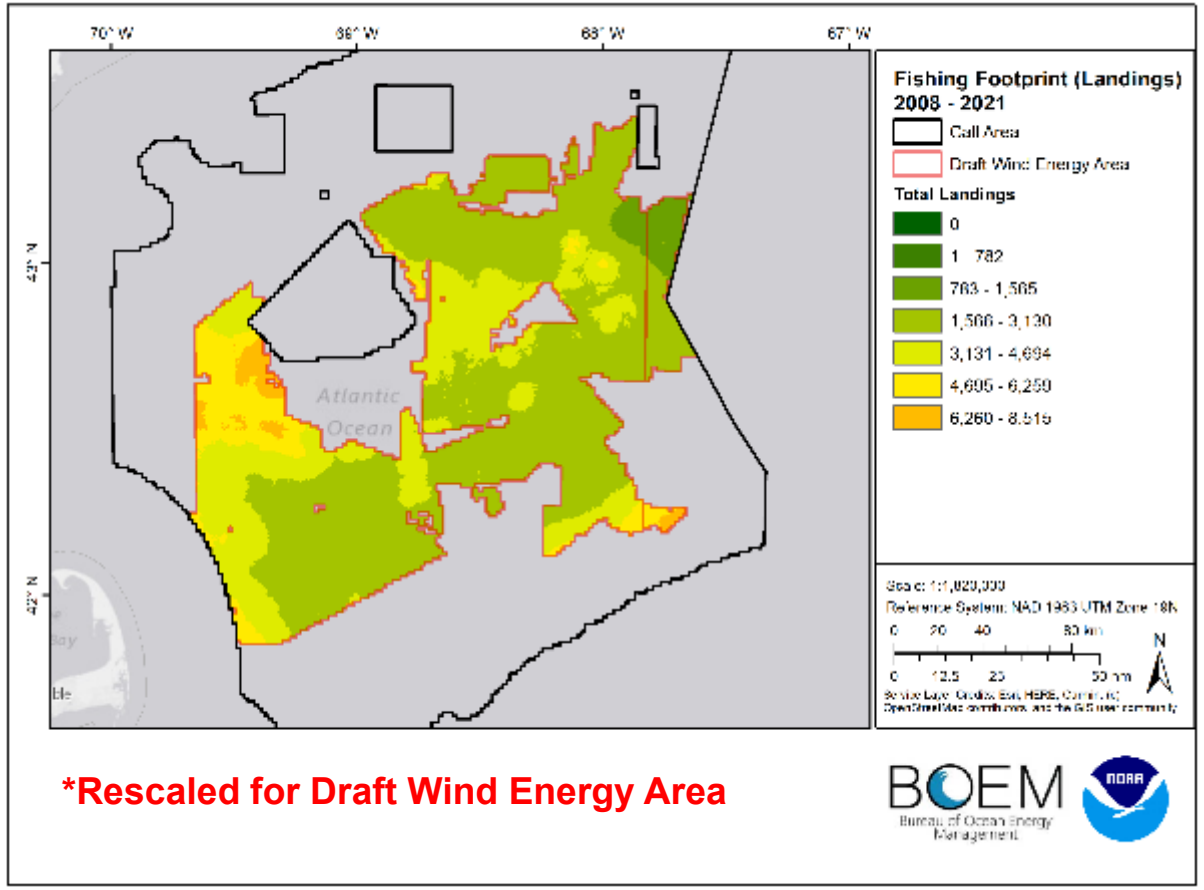
Fishing Footprint (Landings) 2008 - 2021

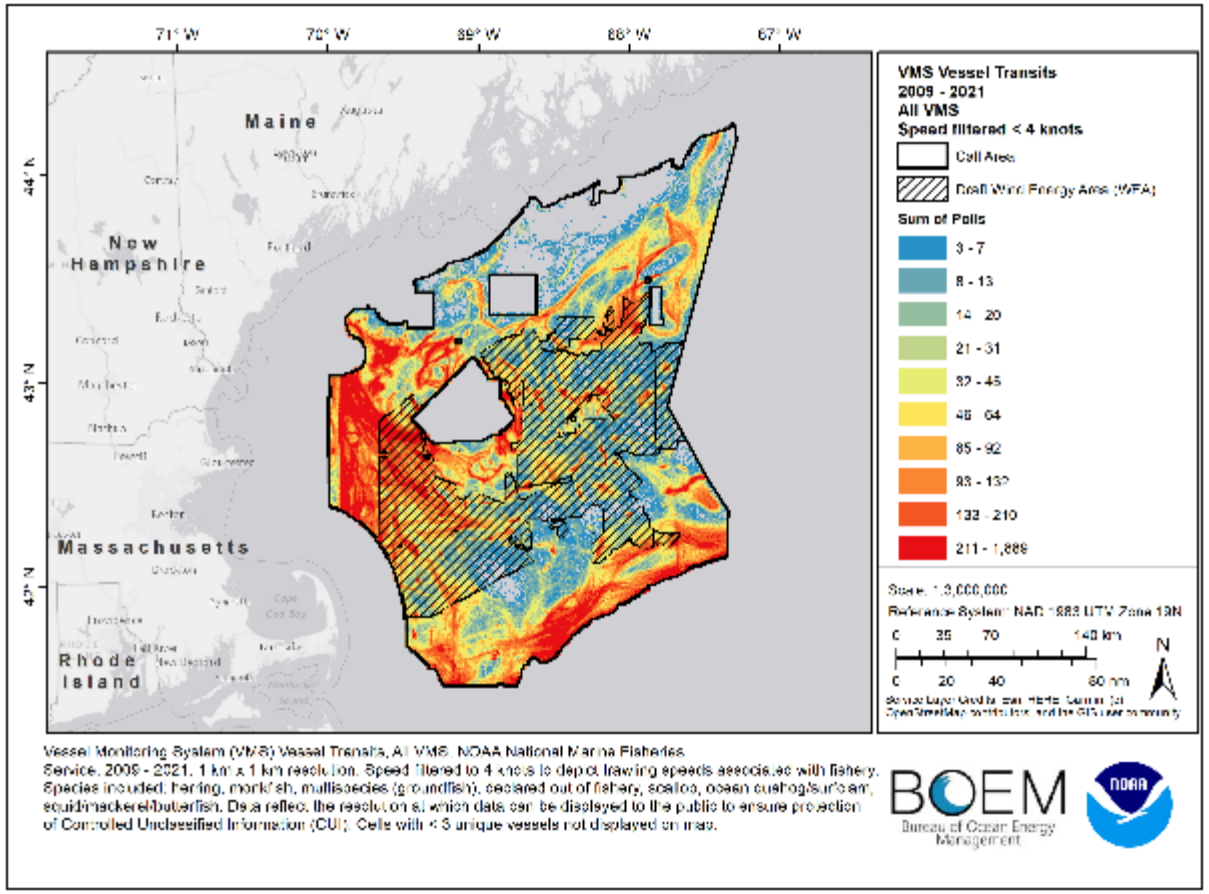


Fishing Footprint Commercial VTR Modelled Logbook Data. NOAA National Marine Fisheries Service. 2008 - 2021. 500 m (0.25km²) resolution. Modeled data includes all gear types; bottom trawl, dredge, gillnet, lobster, longline, pots and traps, seine, and shrimp

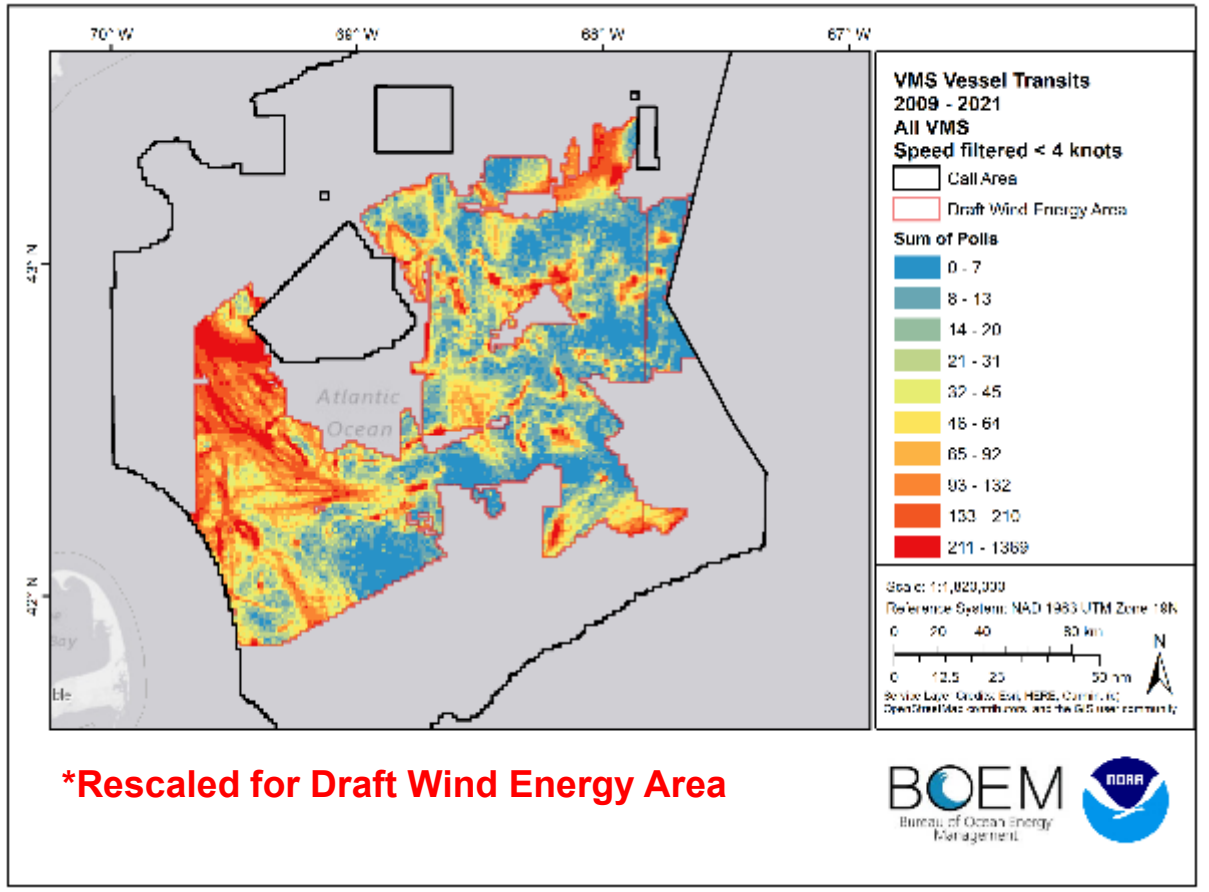


*Rescaled for Draft Wind Energy Area

VMS Vessel Transits 2009 – 2021 (All VMS, Speed Filtered < 4 knots)

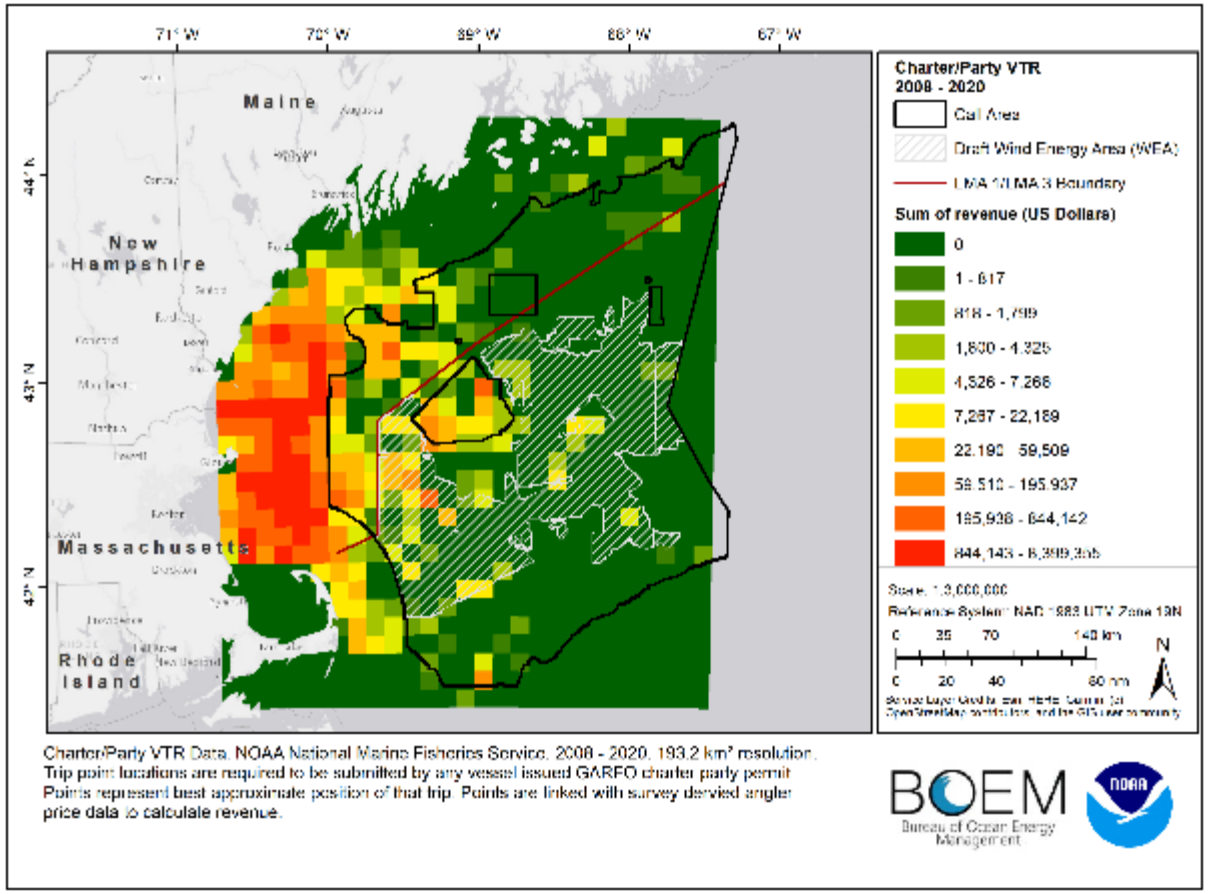


Vessel Monitoring System (VMS) Vessel Transits, All VMS. NOAA National Marine Fisheries Service. 2009 - 2021. 1 km x 1 km resolution. Speed filtered to 4 knots to depict trawling speeds associated with fishery. Species included: herring, monkfish, multispecies (groundfish), declared out of fishery, scallop, ocean quahog/surfclam, squid/mackerel/butterfish. Data reflect the resolution at which data can be displayed to the public to ensure protection of Controlled Unclassified Information (CUI). Cells with < 3 unique vessels not displayed on map.



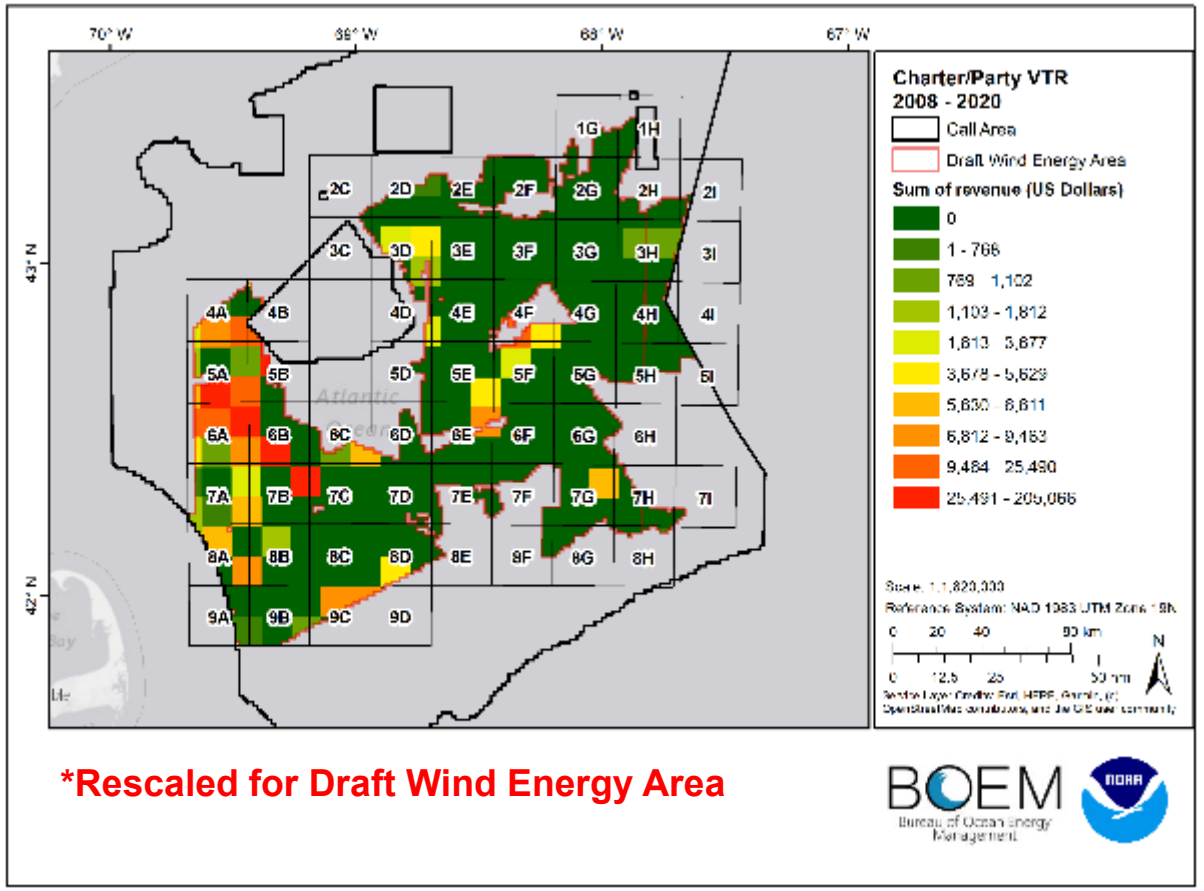
*Rescaled for Draft Wind Energy Area

Chater/Party VTR 2008 - 2020



Charter/Party VTR Data. NOAA National Marine Fisheries Service. 2008 - 2020. 193.2 km² resolution.
Trip point locations are required to be submitted by any vessel issued GARFO charter party permit. Points represent best approximate position of that trip. Points are linked with survey derived angler price data to calculate revenue.

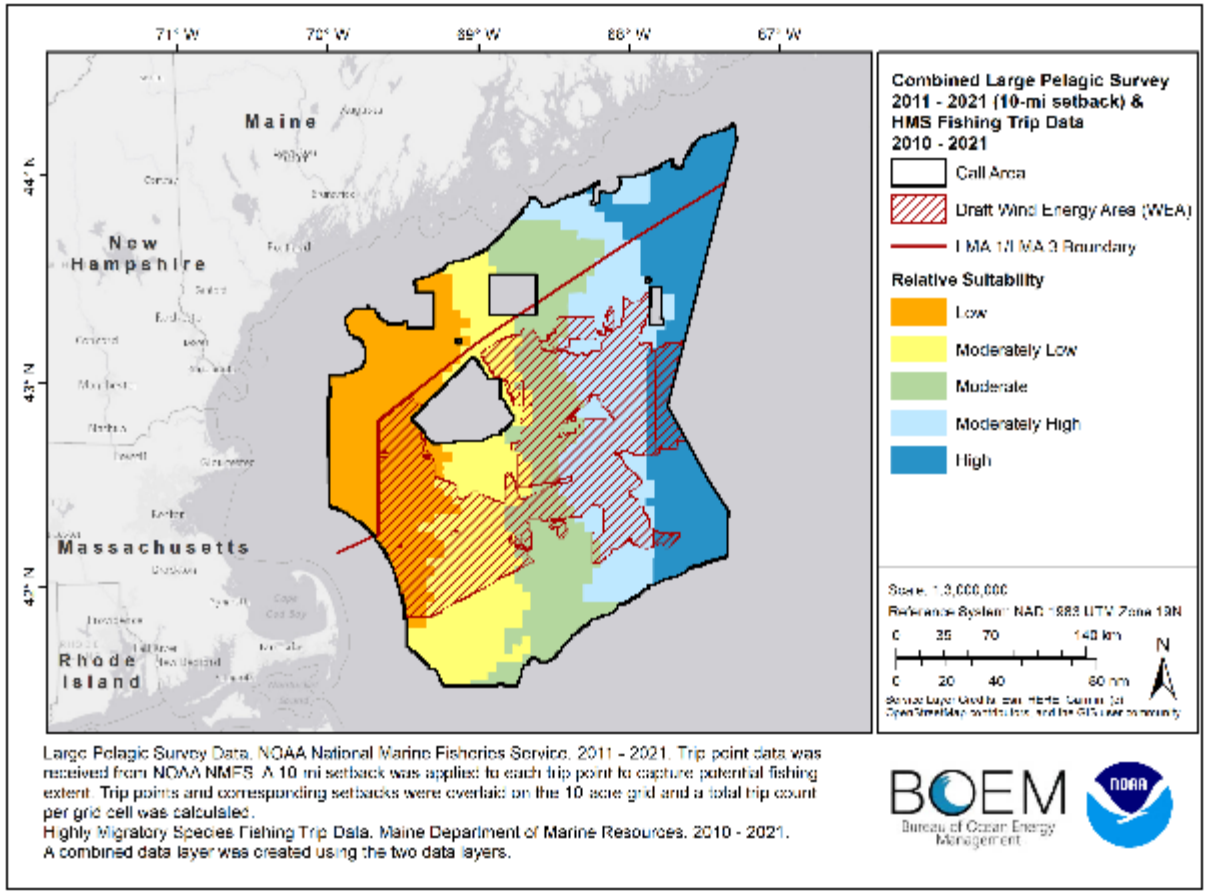
BOEM Bureau of Ocean Energy Management

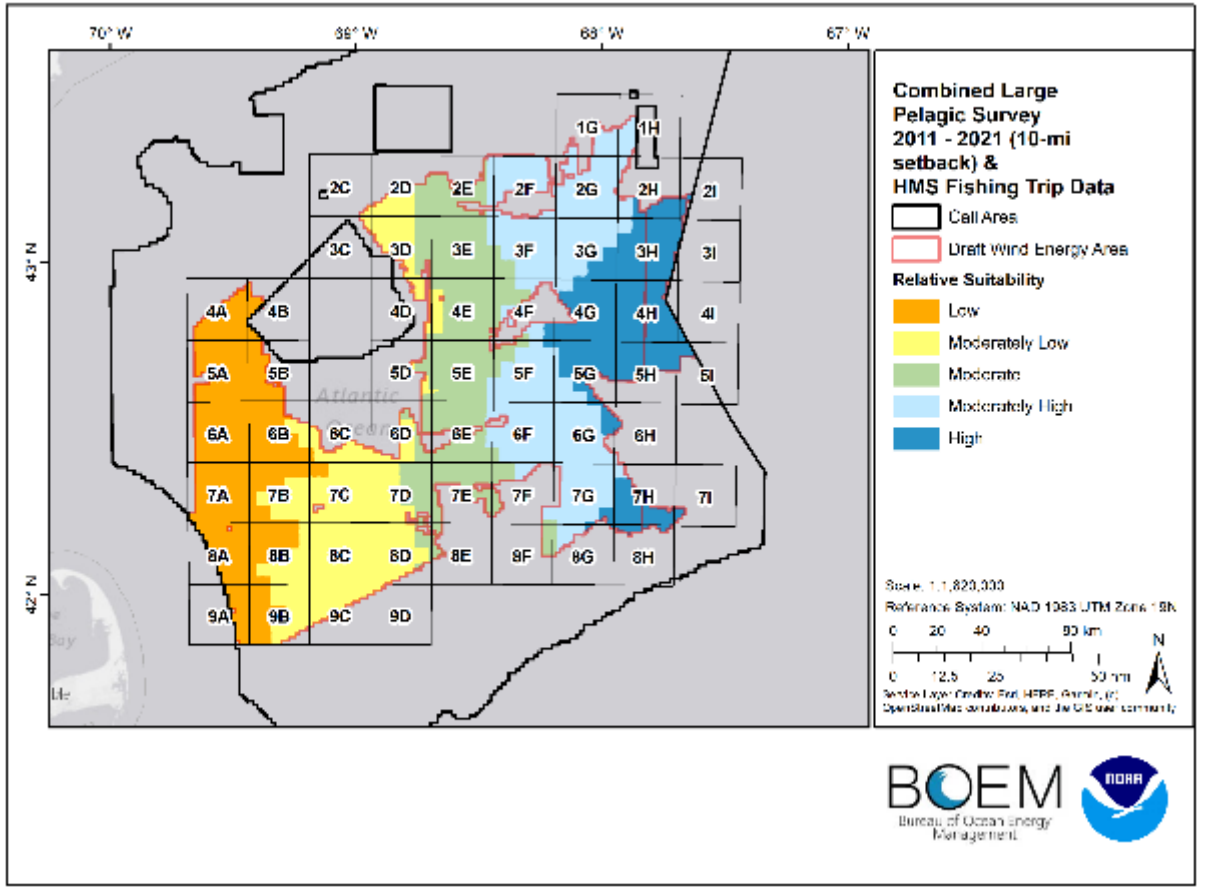


*Rescaled for Draft Wind Energy Area

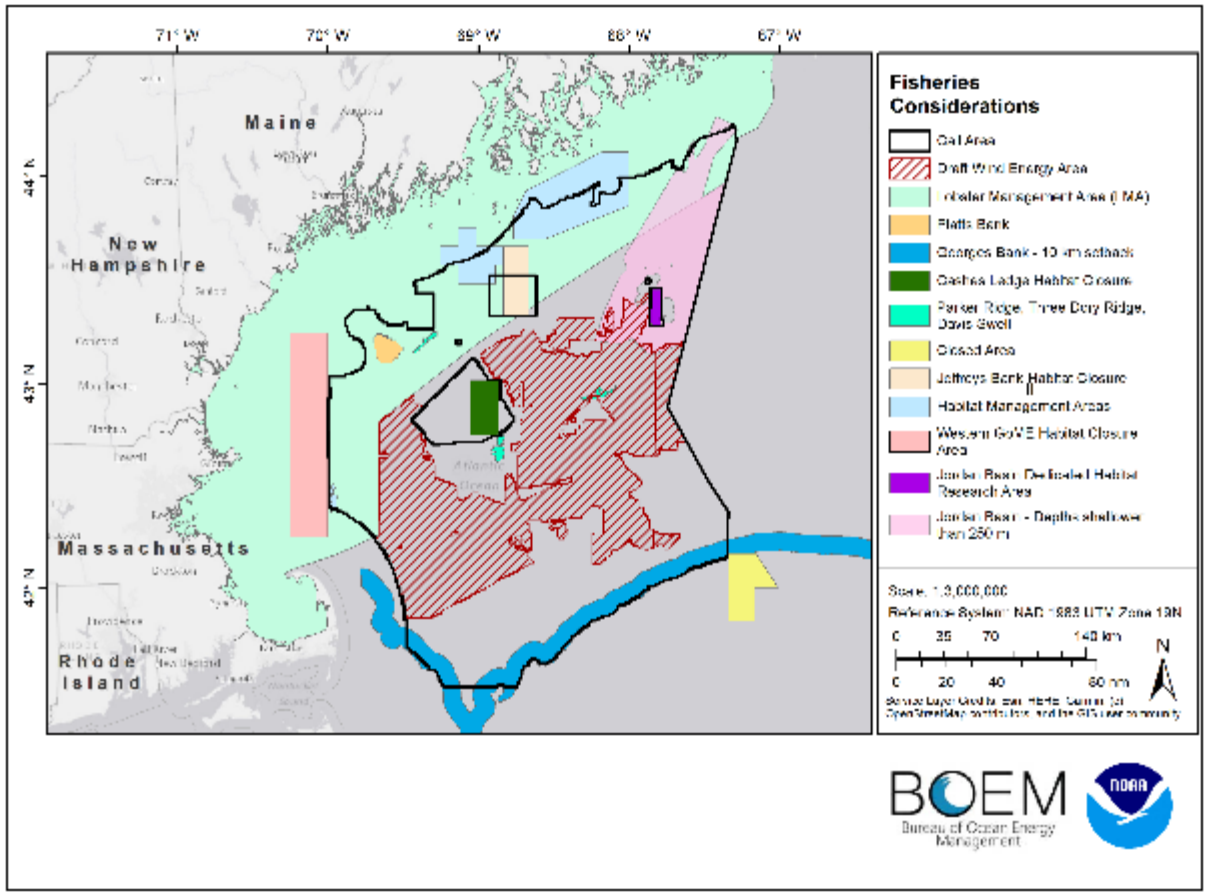
BOEM Bureau of Ocean Energy Management

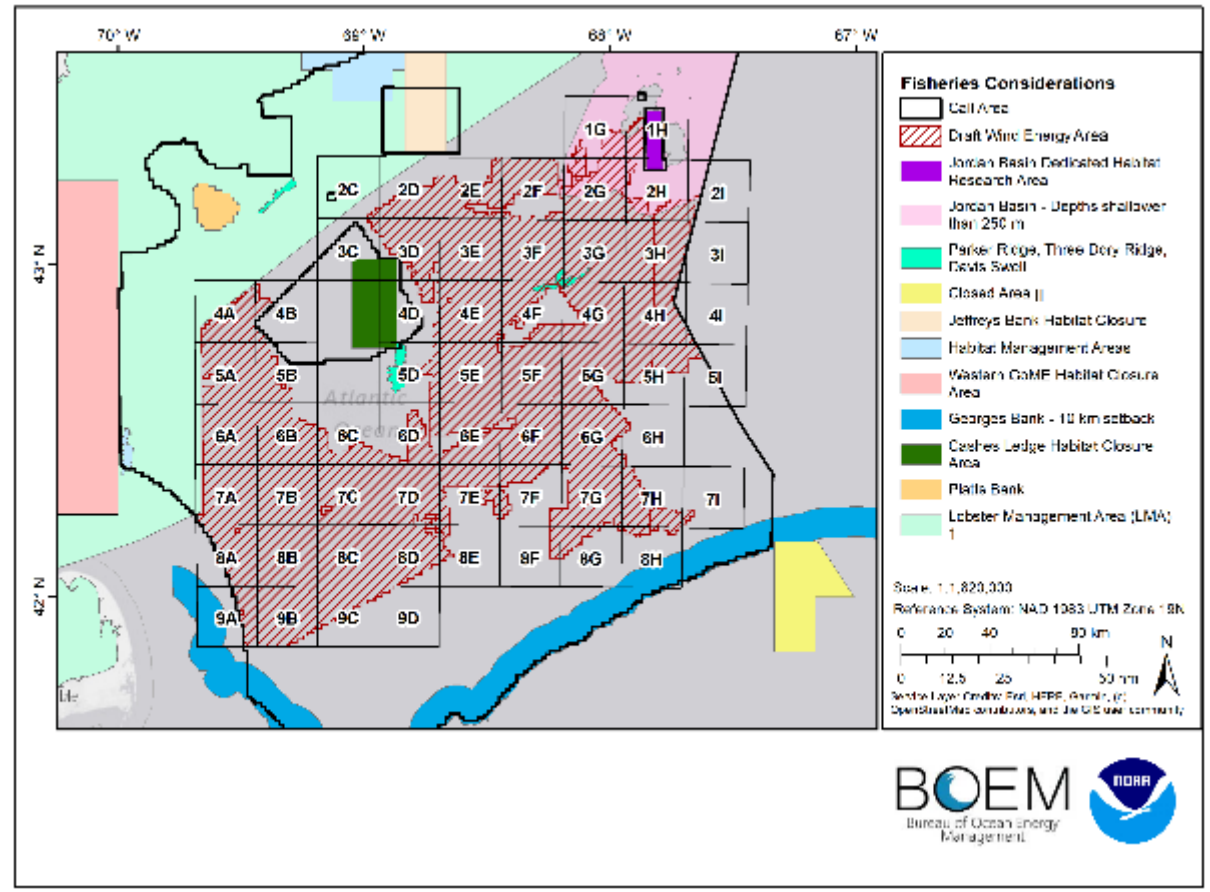
Combined Large Pelagic Survey 2011 – 2021 (10-mi setback) & Highly Migratory Species Fishing Trip 2010 - 2021



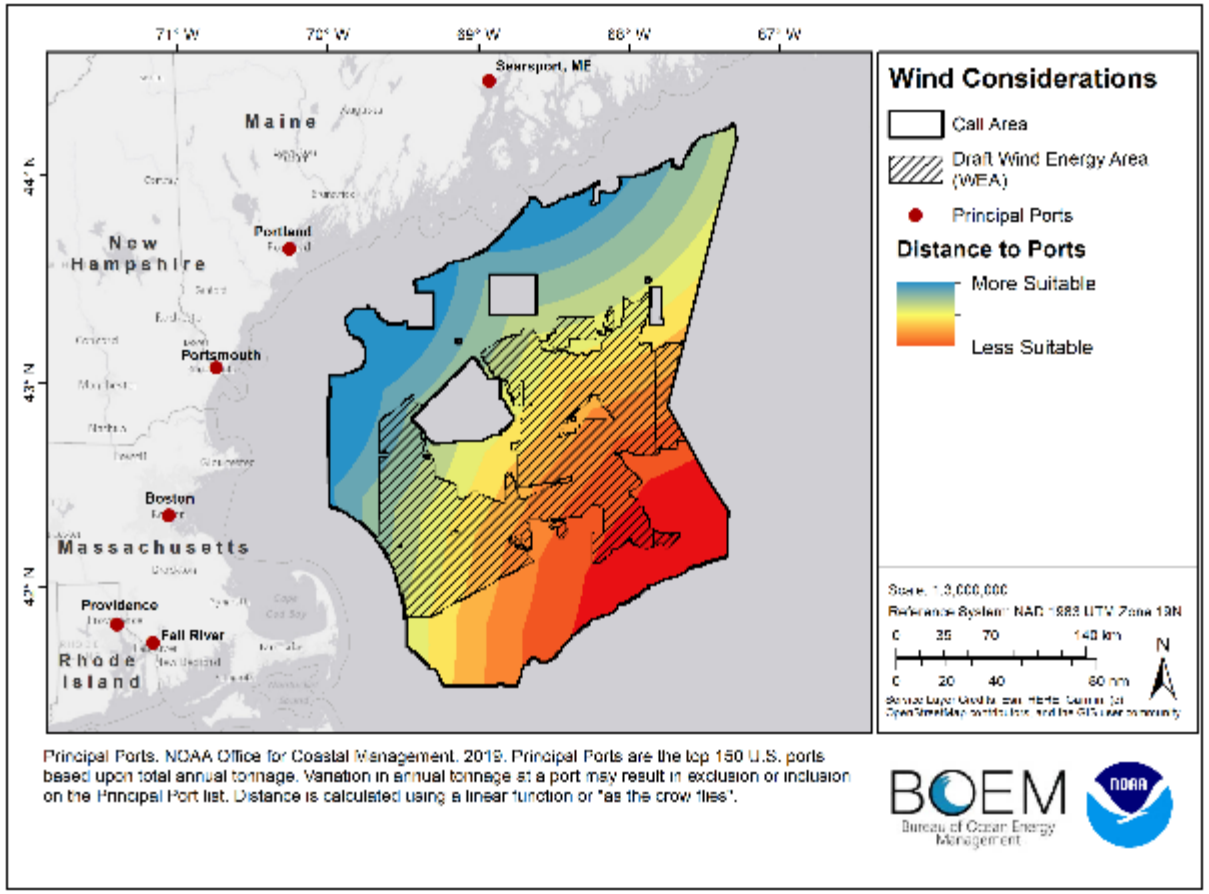


Fisheries Considerations

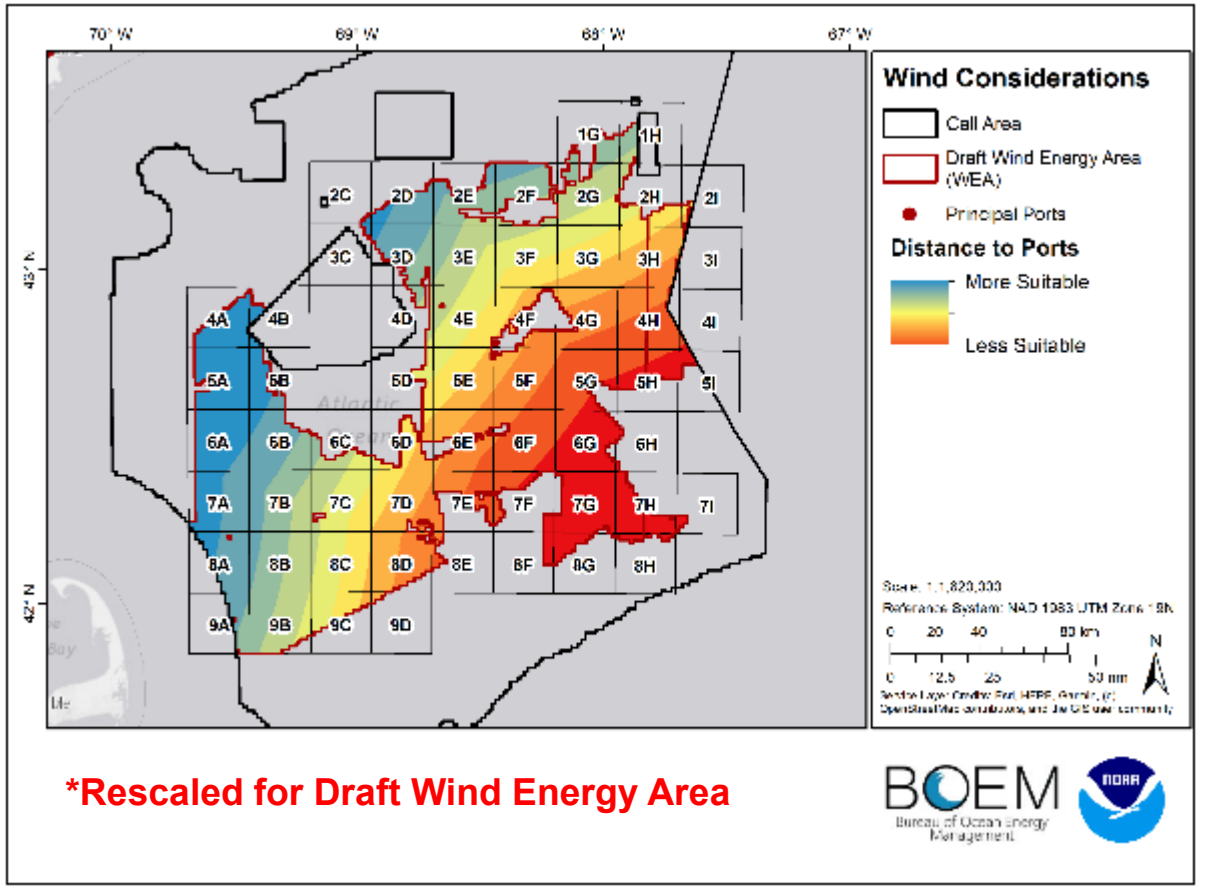




Distance to Ports

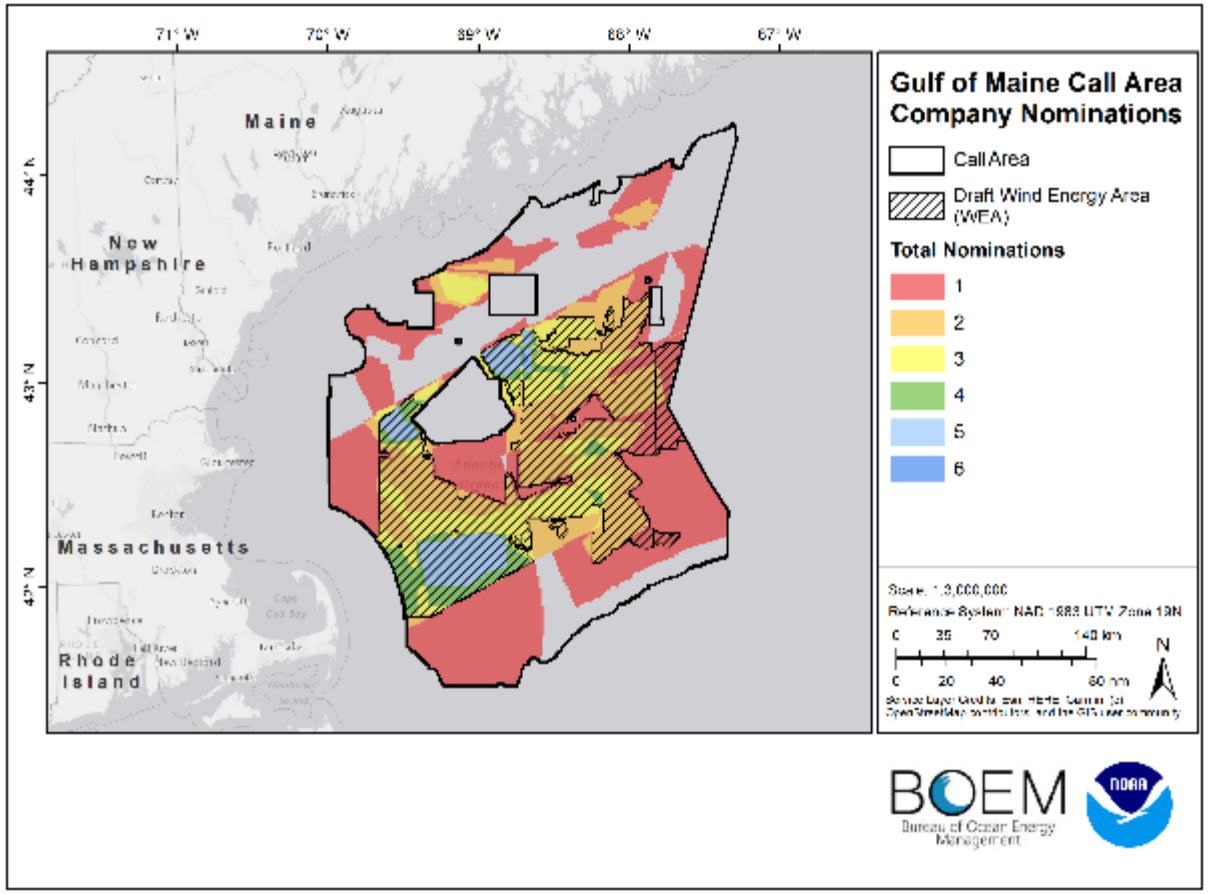


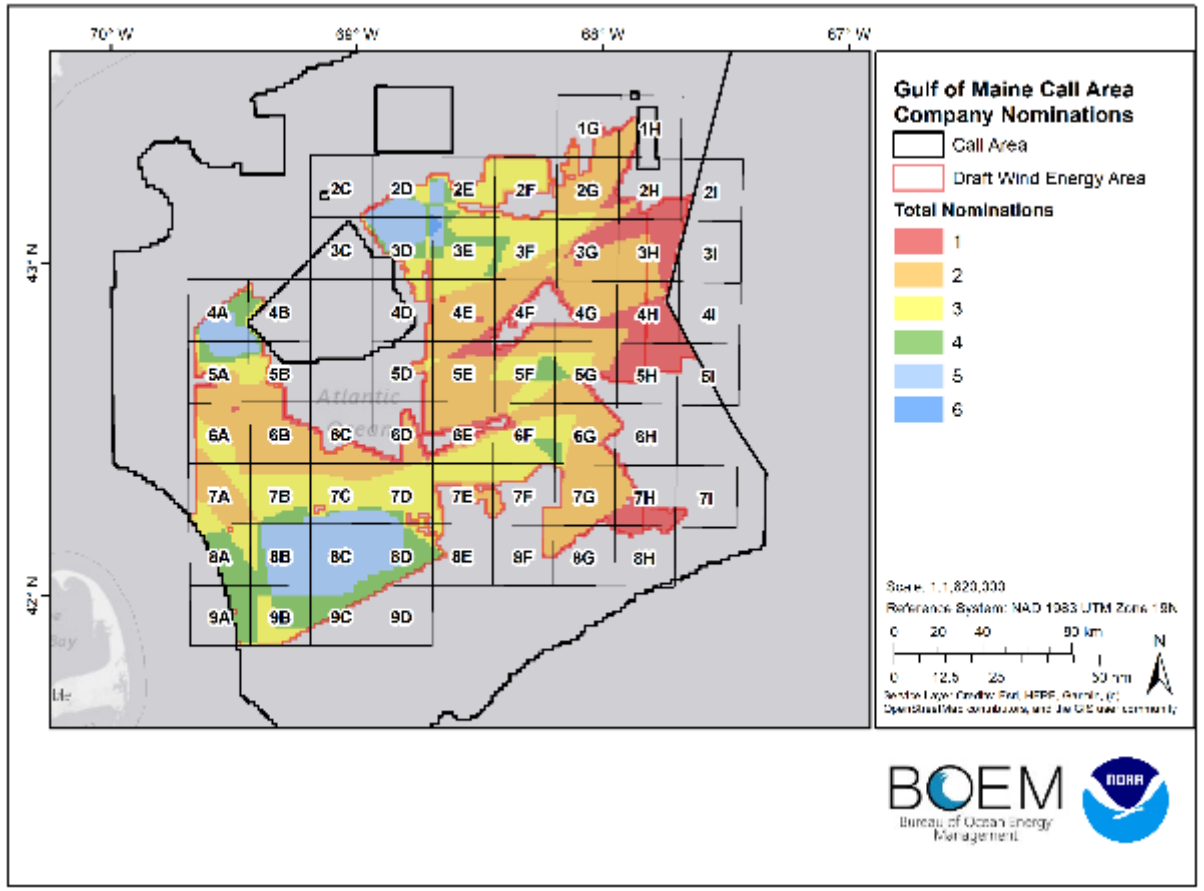
Principal Ports. NOAA Office for Coastal Management. 2019. Principal Ports are the top 150 U.S. ports based upon total annual tonnage. Variation in annual tonnage at a port may result in exclusion or inclusion on the Principal Port list. Distance is calculated using a linear function or "as the crow flies".



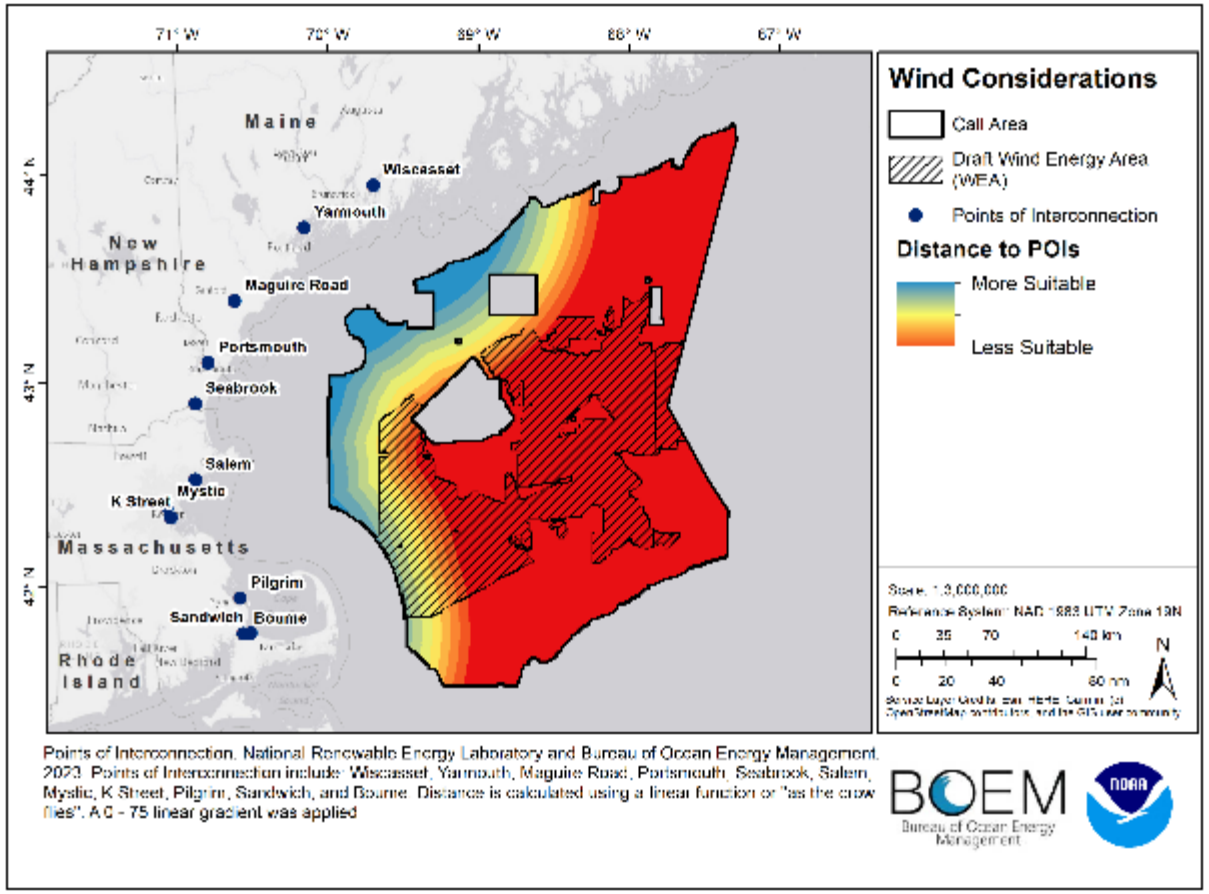
*Rescaled for Draft Wind Energy Area

Call Area Company Nominations

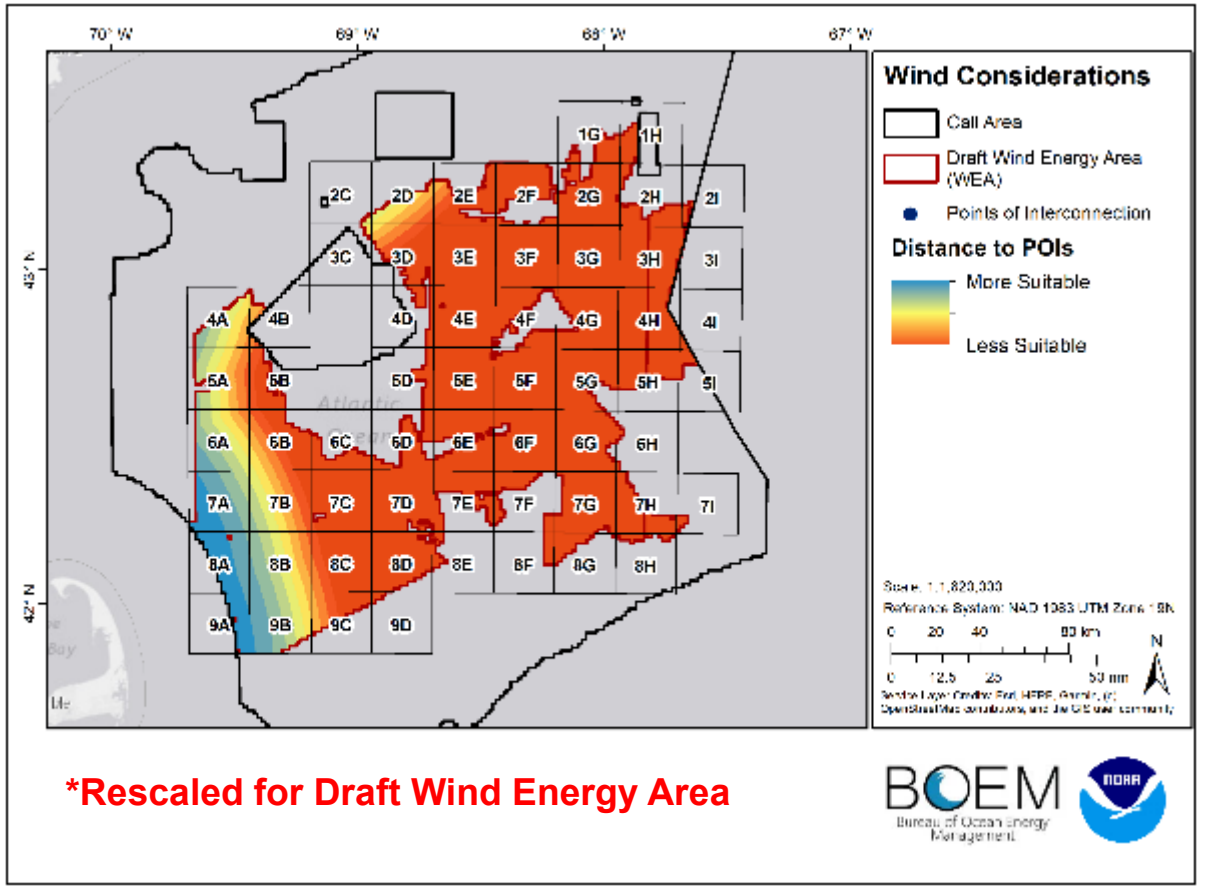




Distance to Points of Interconnection

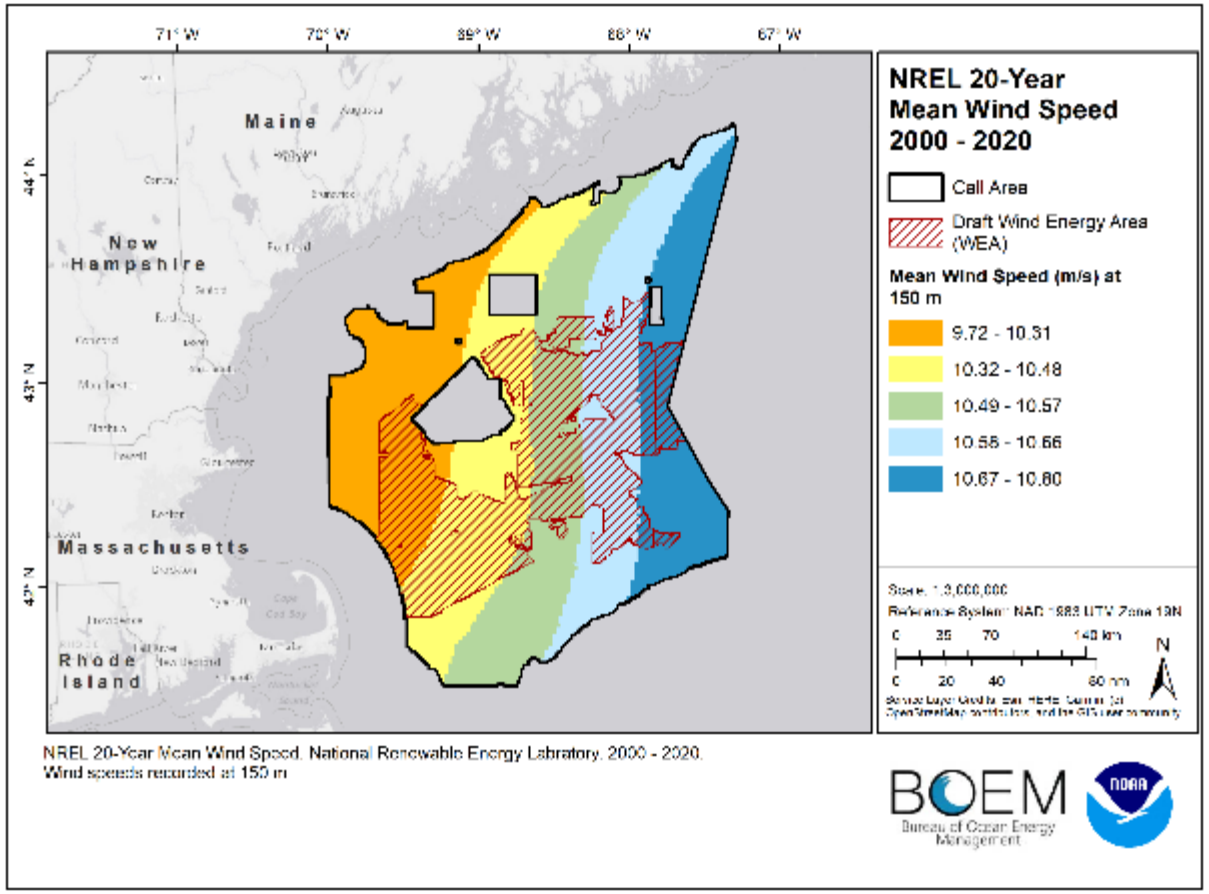


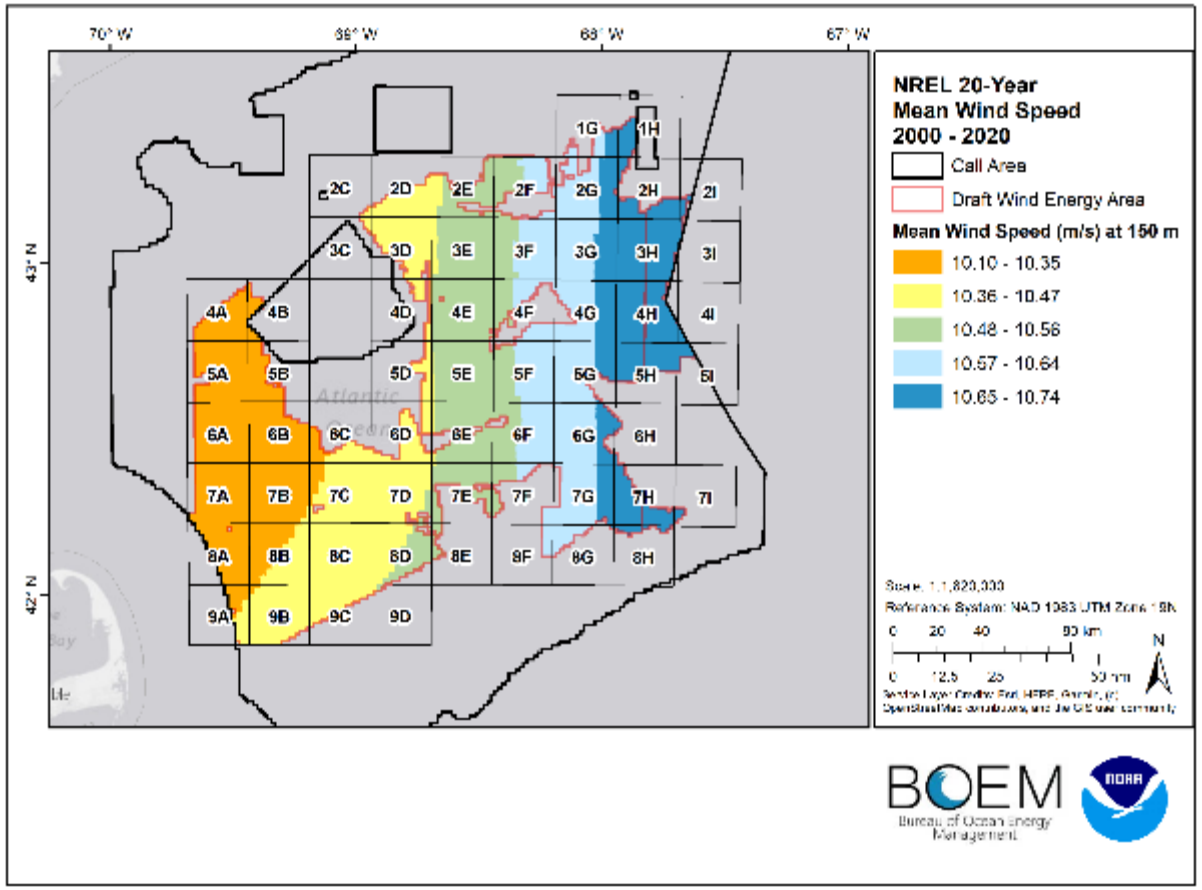
Points of Interconnection: National Renewable Energy Laboratory and Bureau of Ocean Energy Management, 2023. Points of Interconnection include: Wiscasset, Yarmouth, Maguire Road, Portsmouth, Seabrook, Salem, Mystic, K Street, Pilgrim, Sandwich, and Bourne. Distance is calculated using a linear function or "as the crow flies". A C - 75 linear gradient was applied



*Rescaled for Draft Wind Energy Area

NREL 20-Year Mean Wind Speed 2000 - 2020





Thank you!
Questions/discussion

Secondary Areas

Secondary Areas

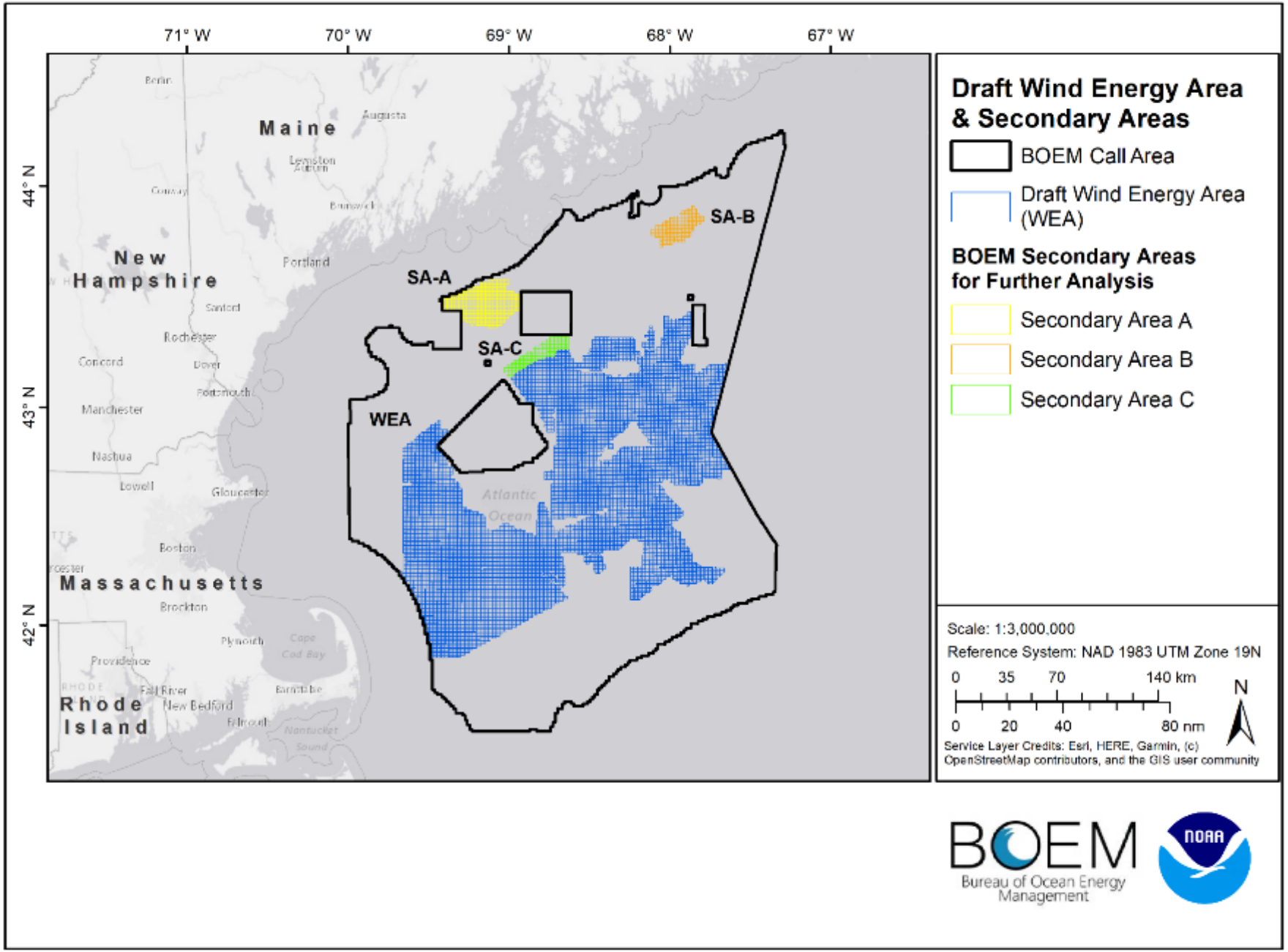
3 Secondary Areas:

268,295 total acres

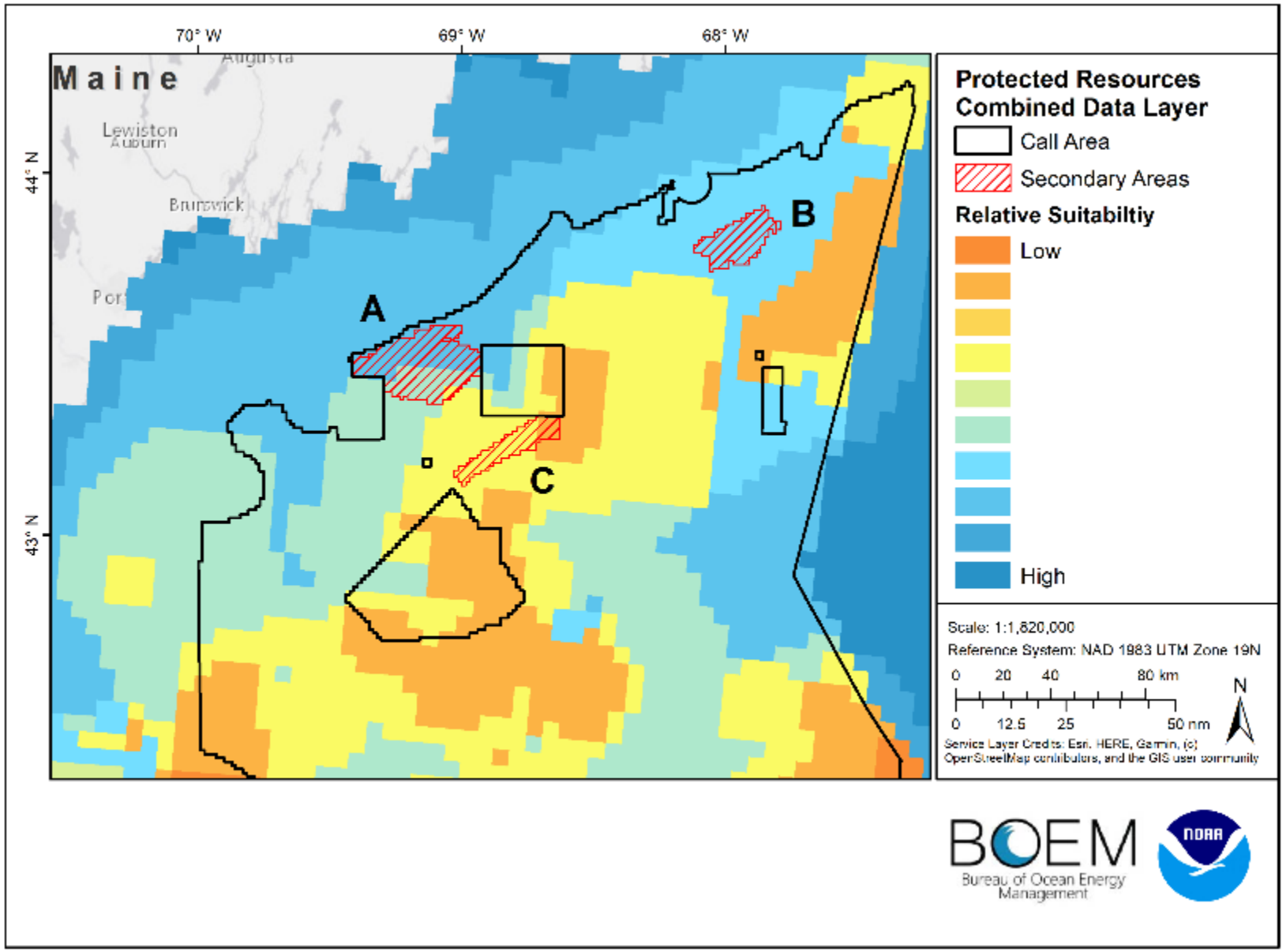
754 total aliquots

WEA Option	Acres
A	3,519,067

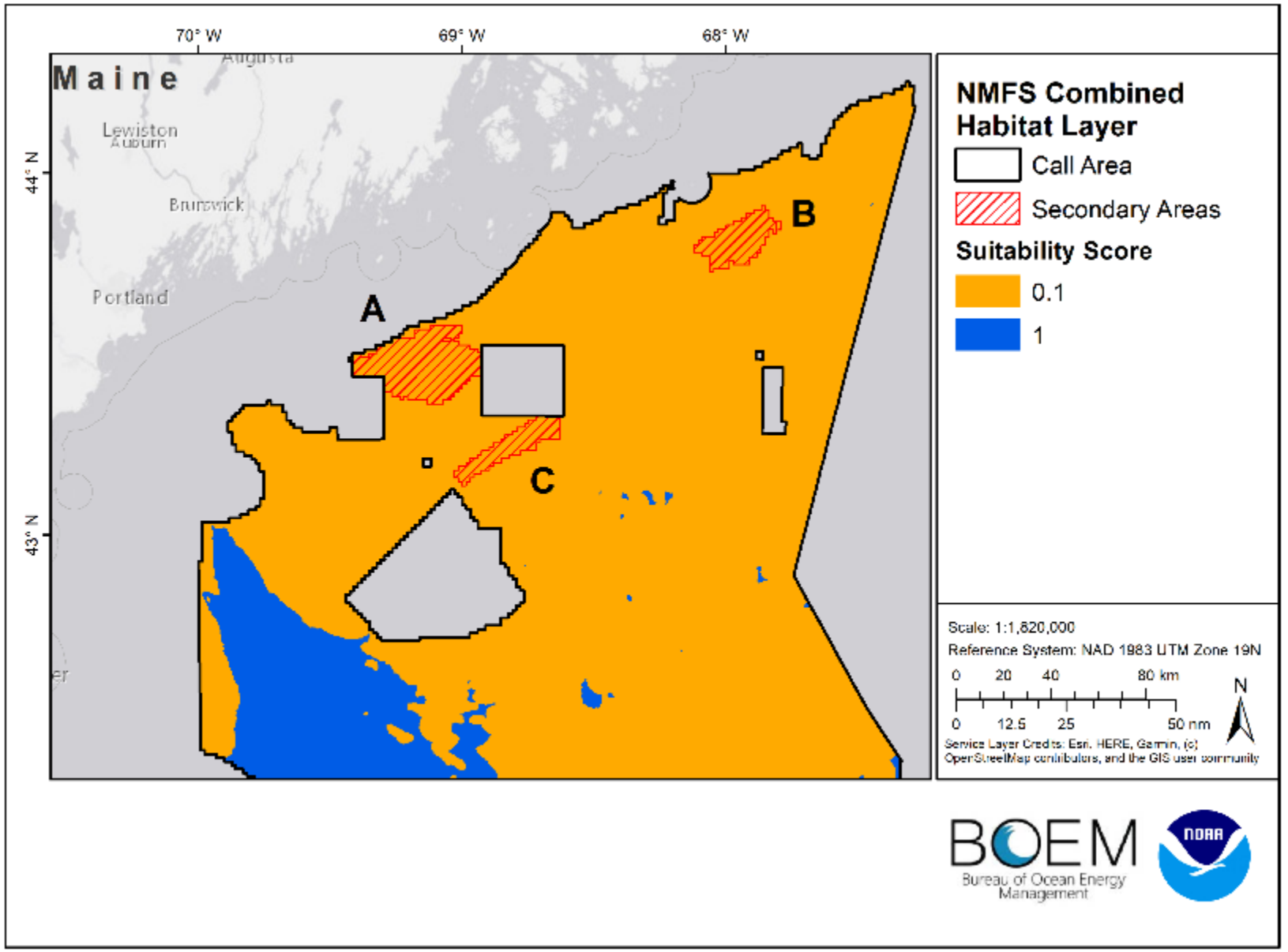
Secondary Area	Acres
A	151,228
B	63,693
C	53,374



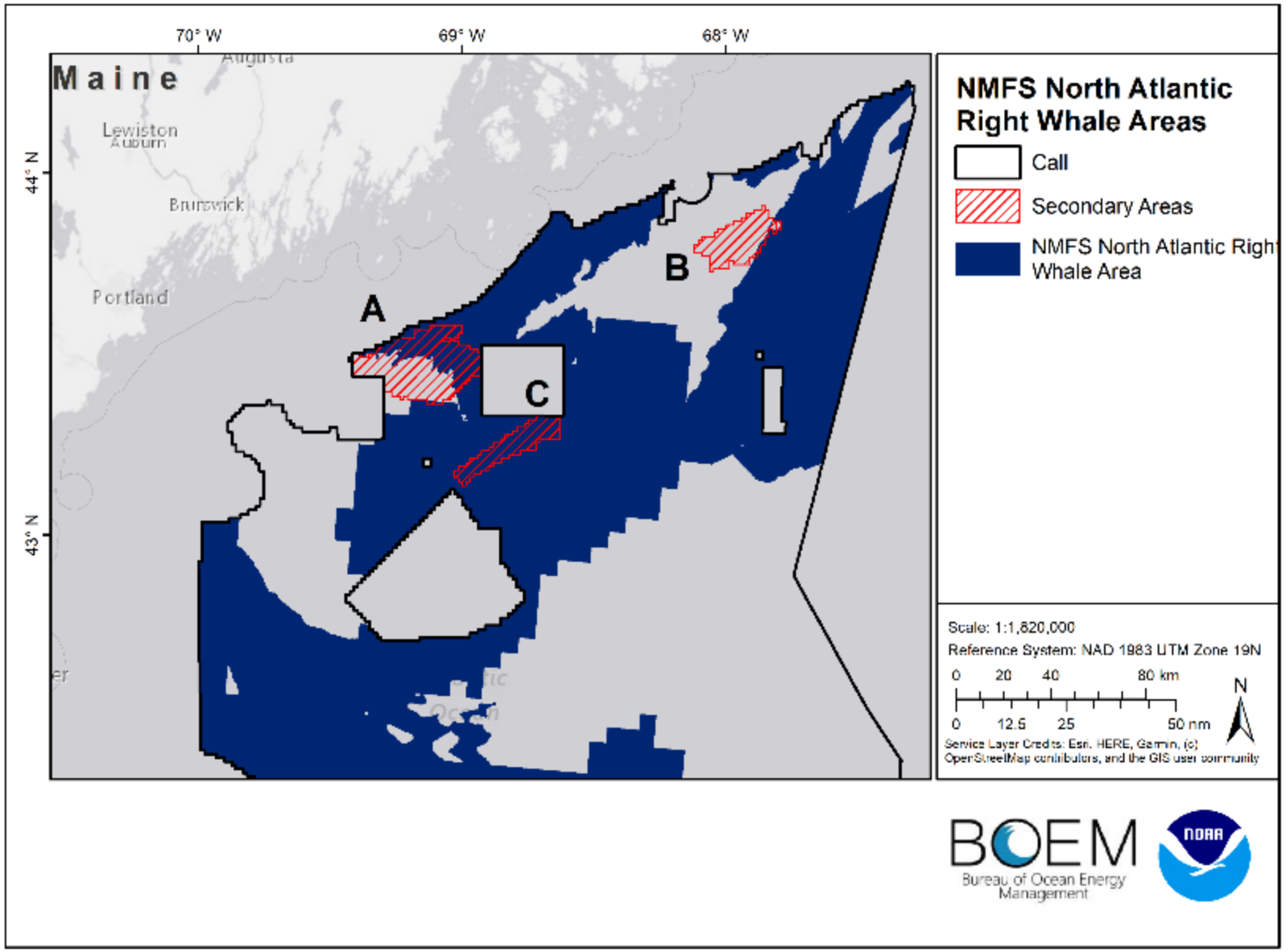
NMFS Protected Resources Combined Layer (22 species)



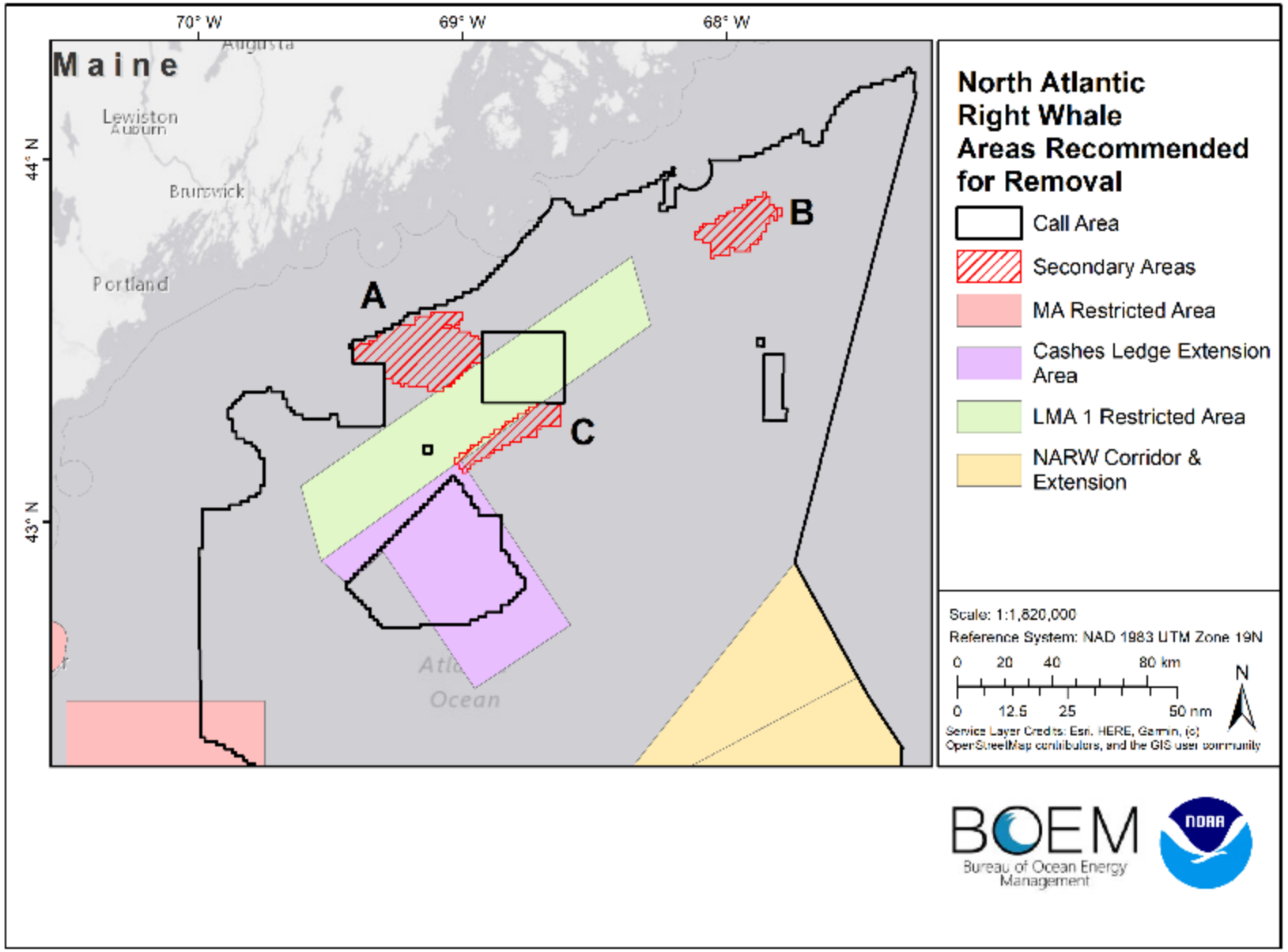
NMFS Combined Habitat Layer



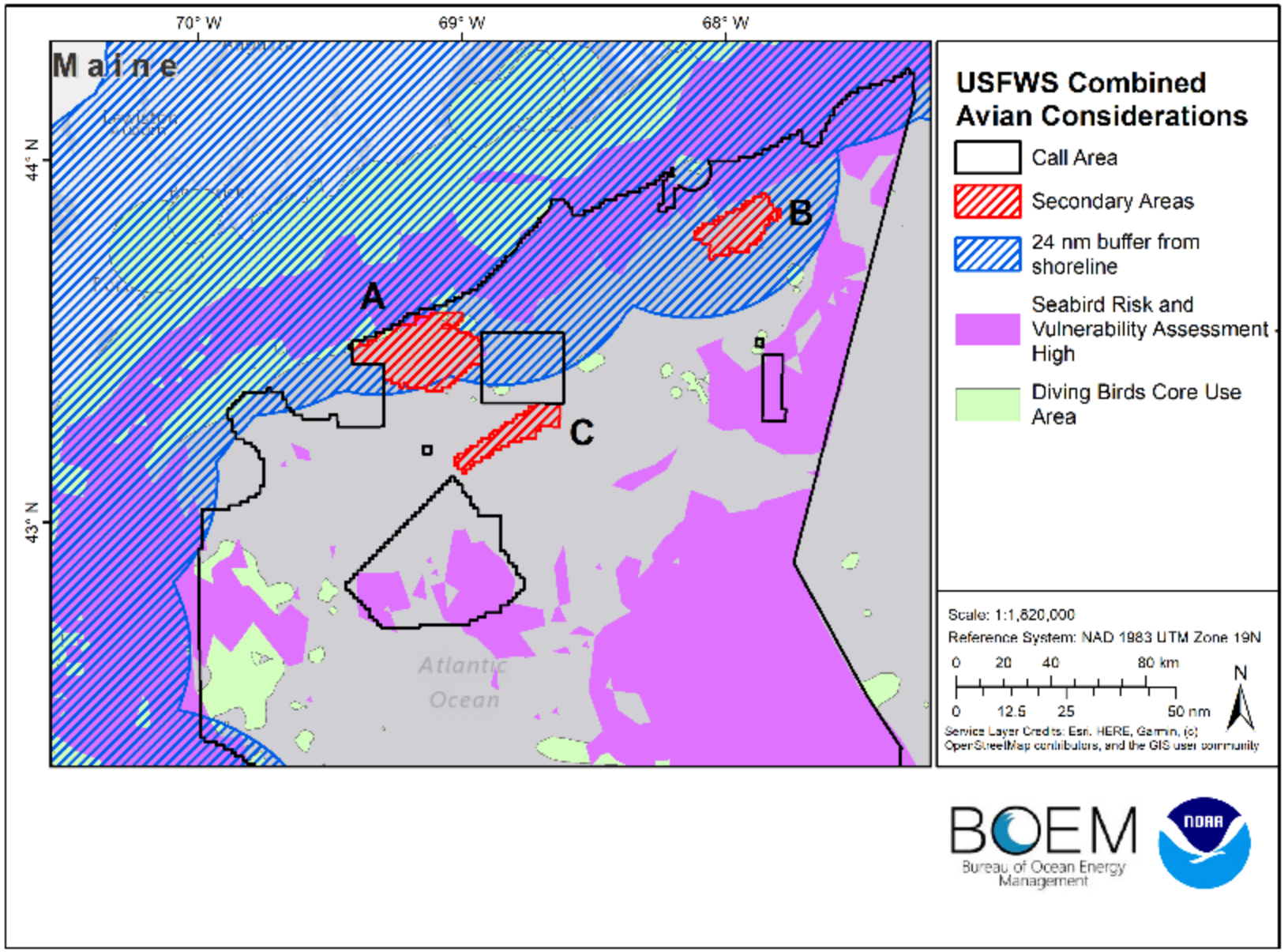
NMFS North Atlantic Right Whale Areas



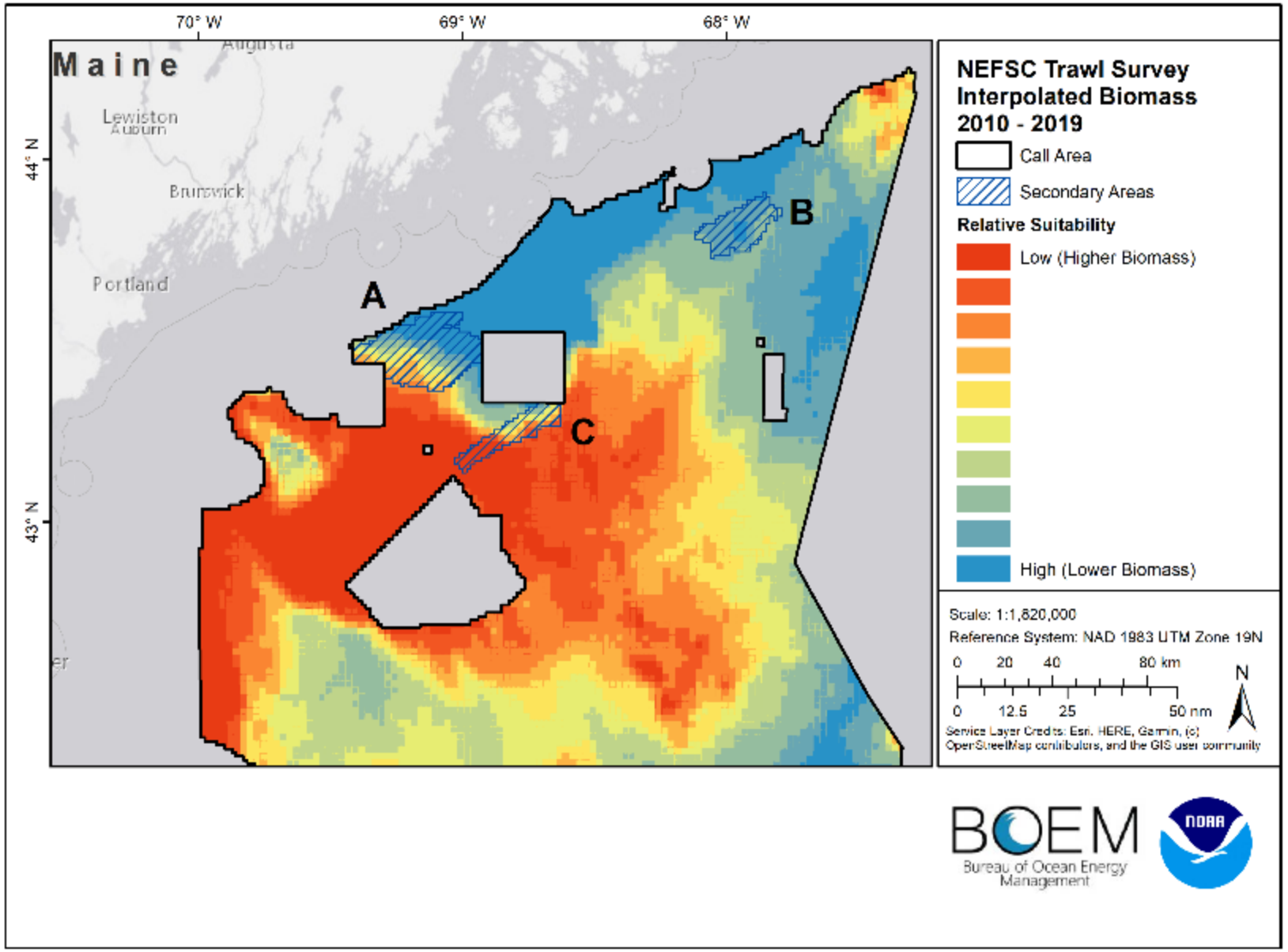
NMFS North Atlantic Right Whale Areas Recommended for Removal



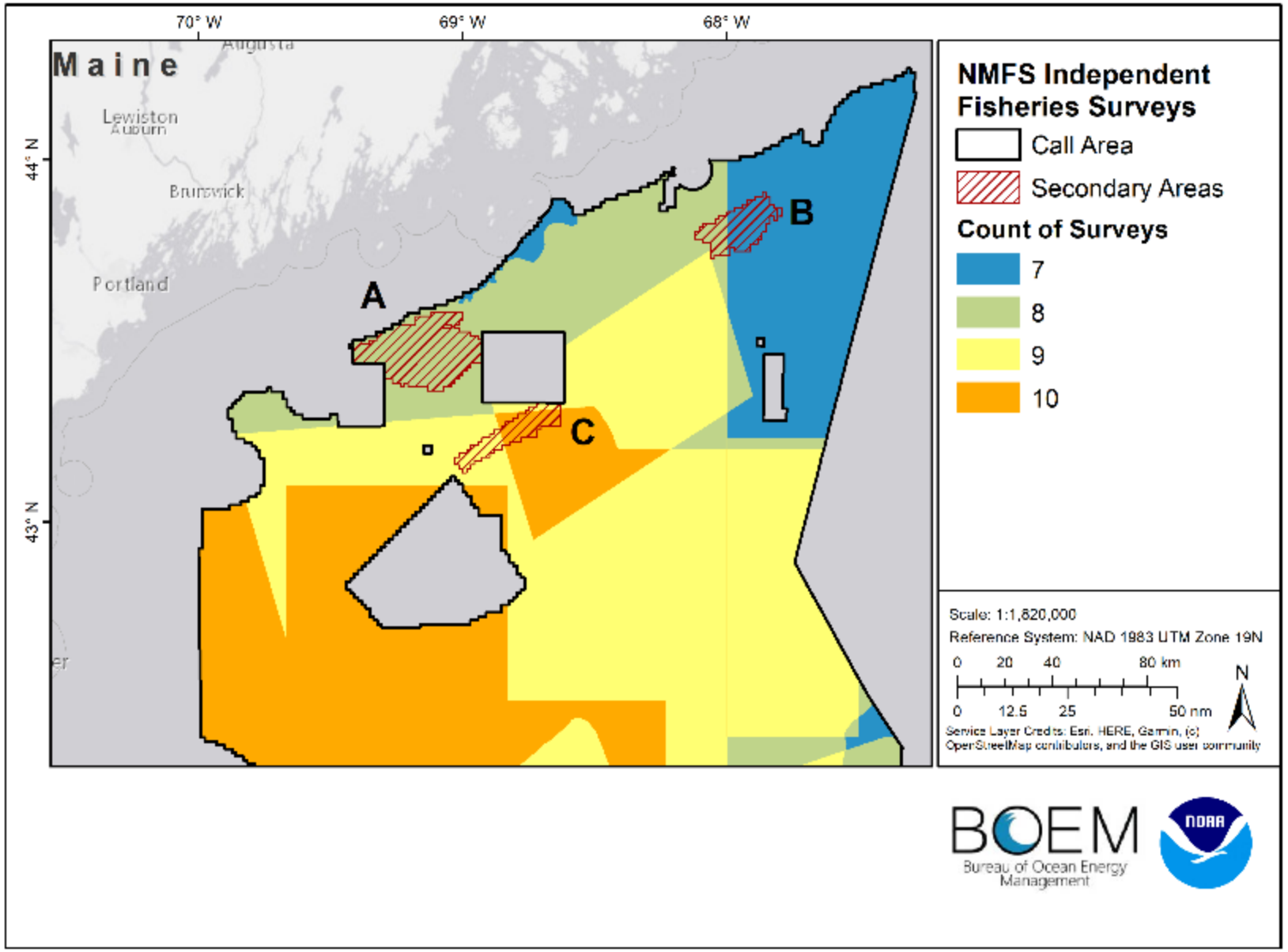
USFWS Combined Avian Considerations



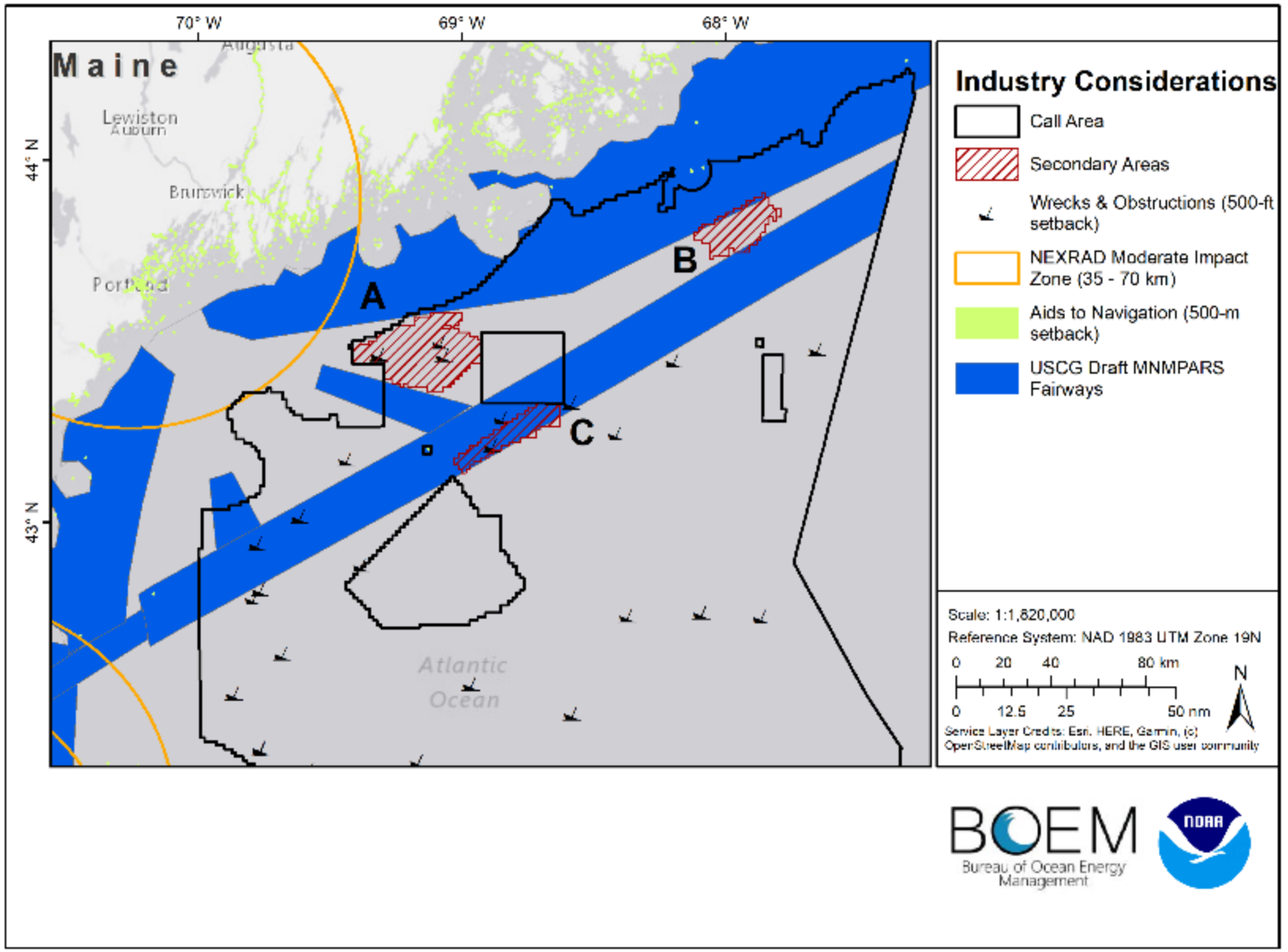
NEFSC Trawl Survey Interpolated Biomass 2010 - 2019



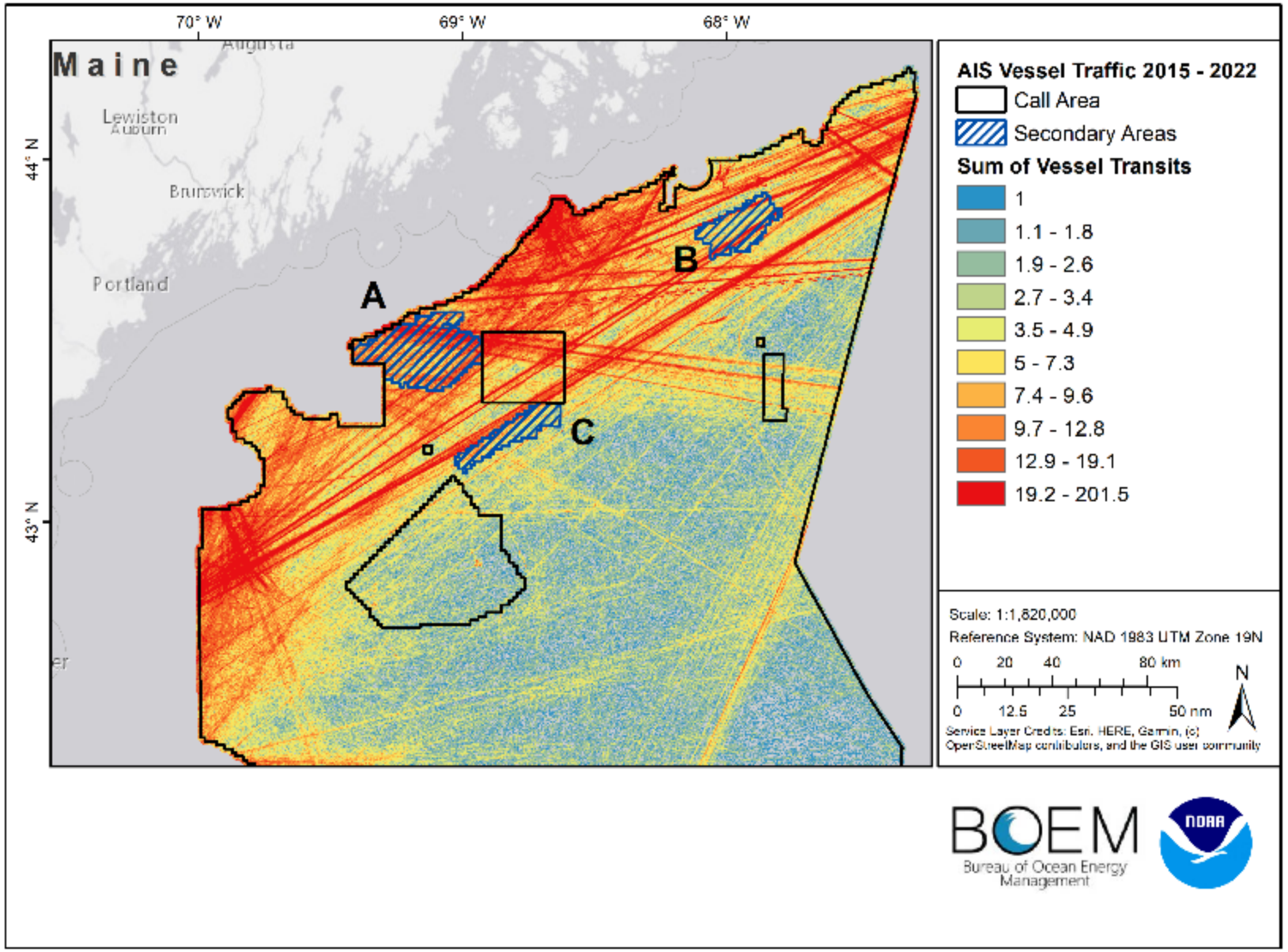
NMFS Independent Fisheries Surveys



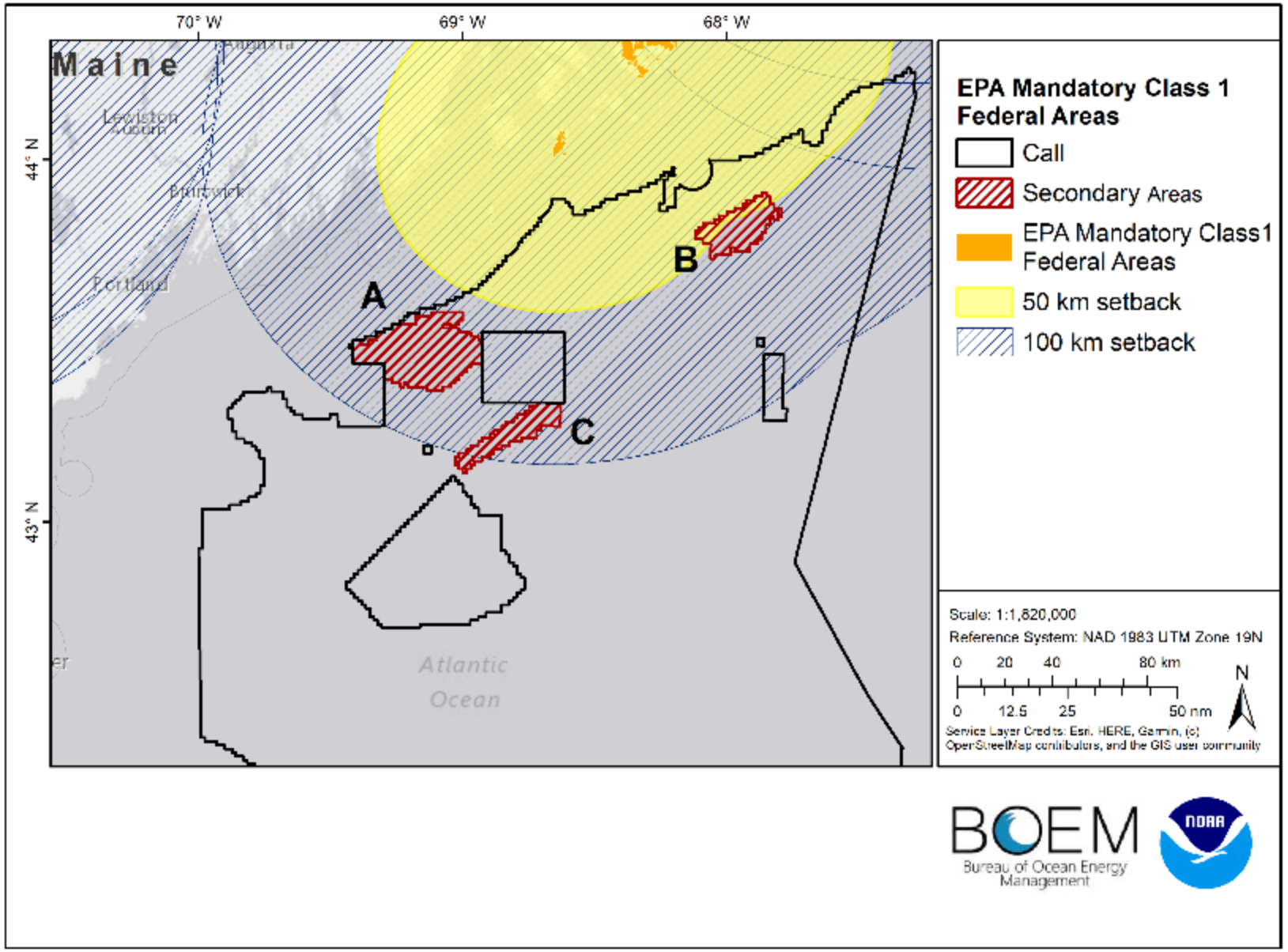
Industry Considerations



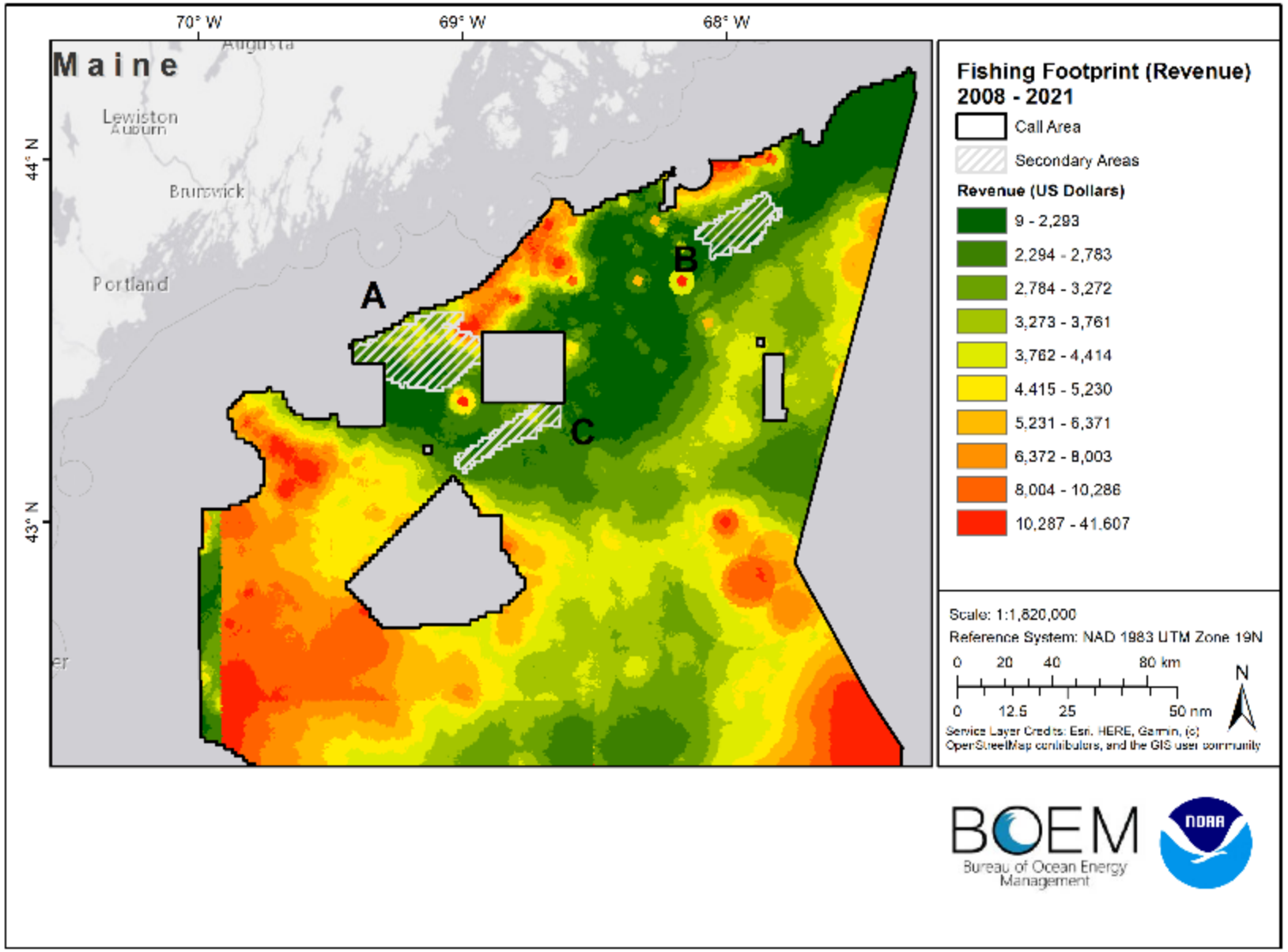
AIS Vessel Traffic 2015 - 2022



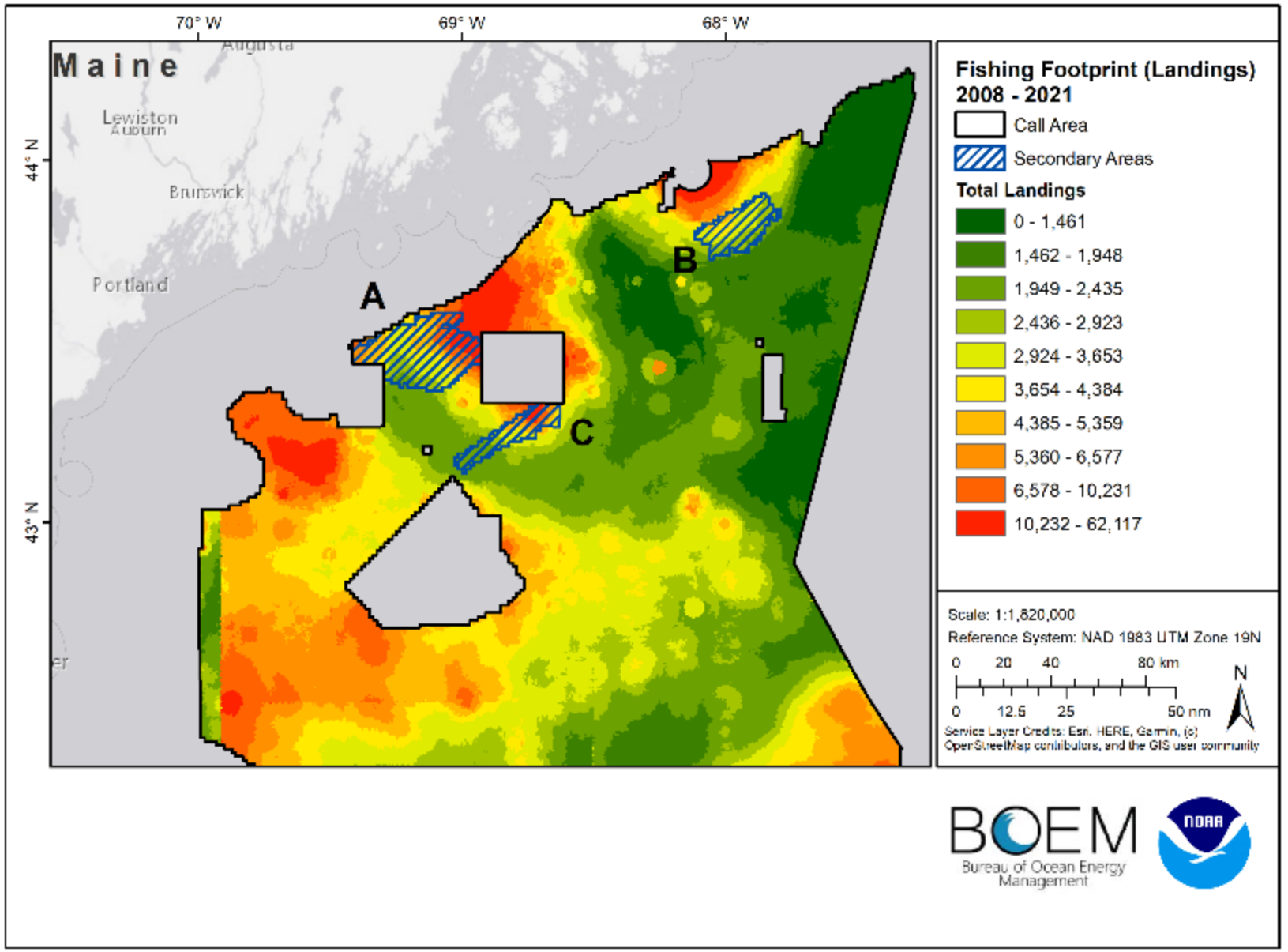
EPA Mandatory Class 1 Federal Areas



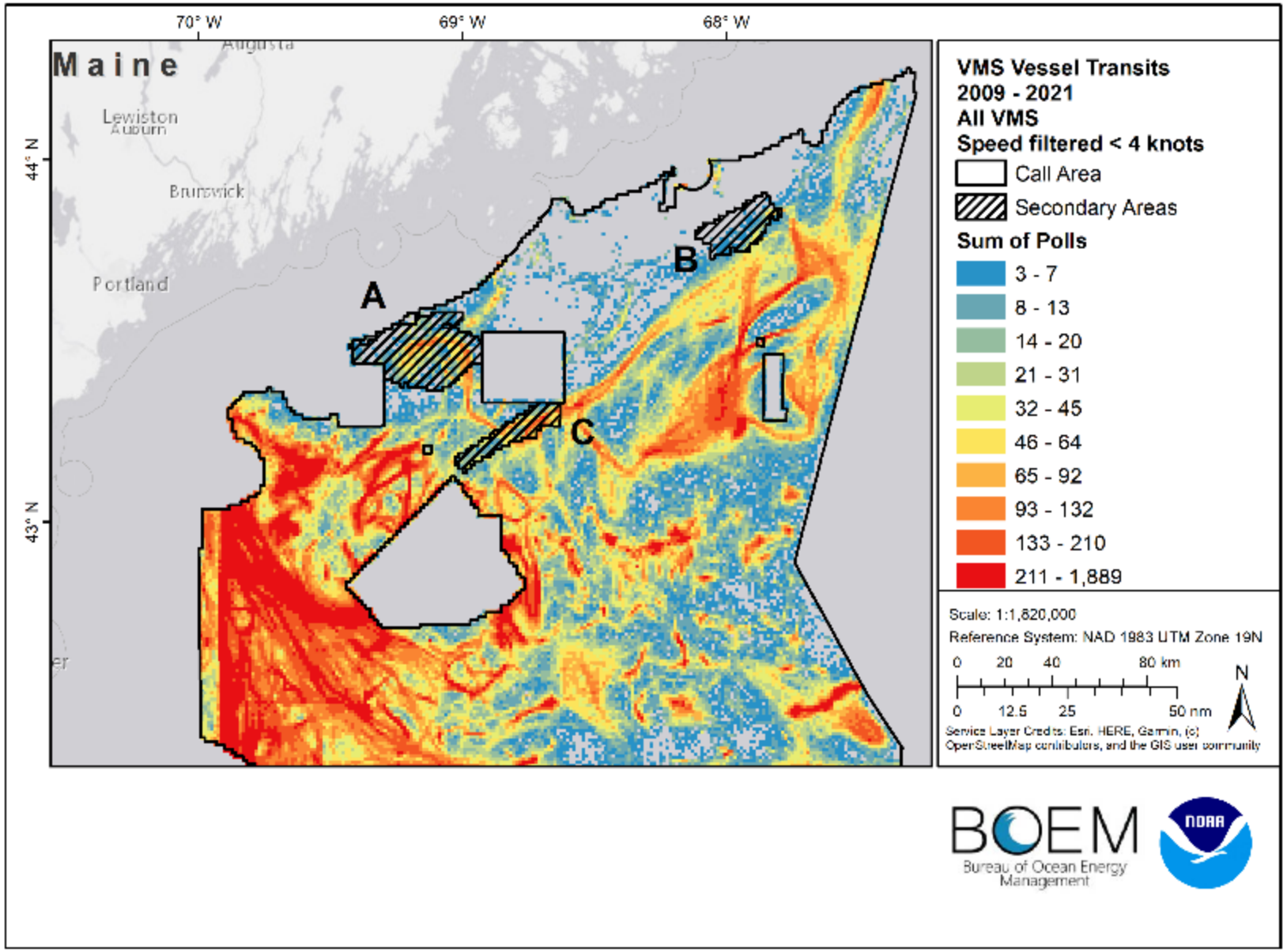
Fishing Footprint (Revenue) 2008 - 2021



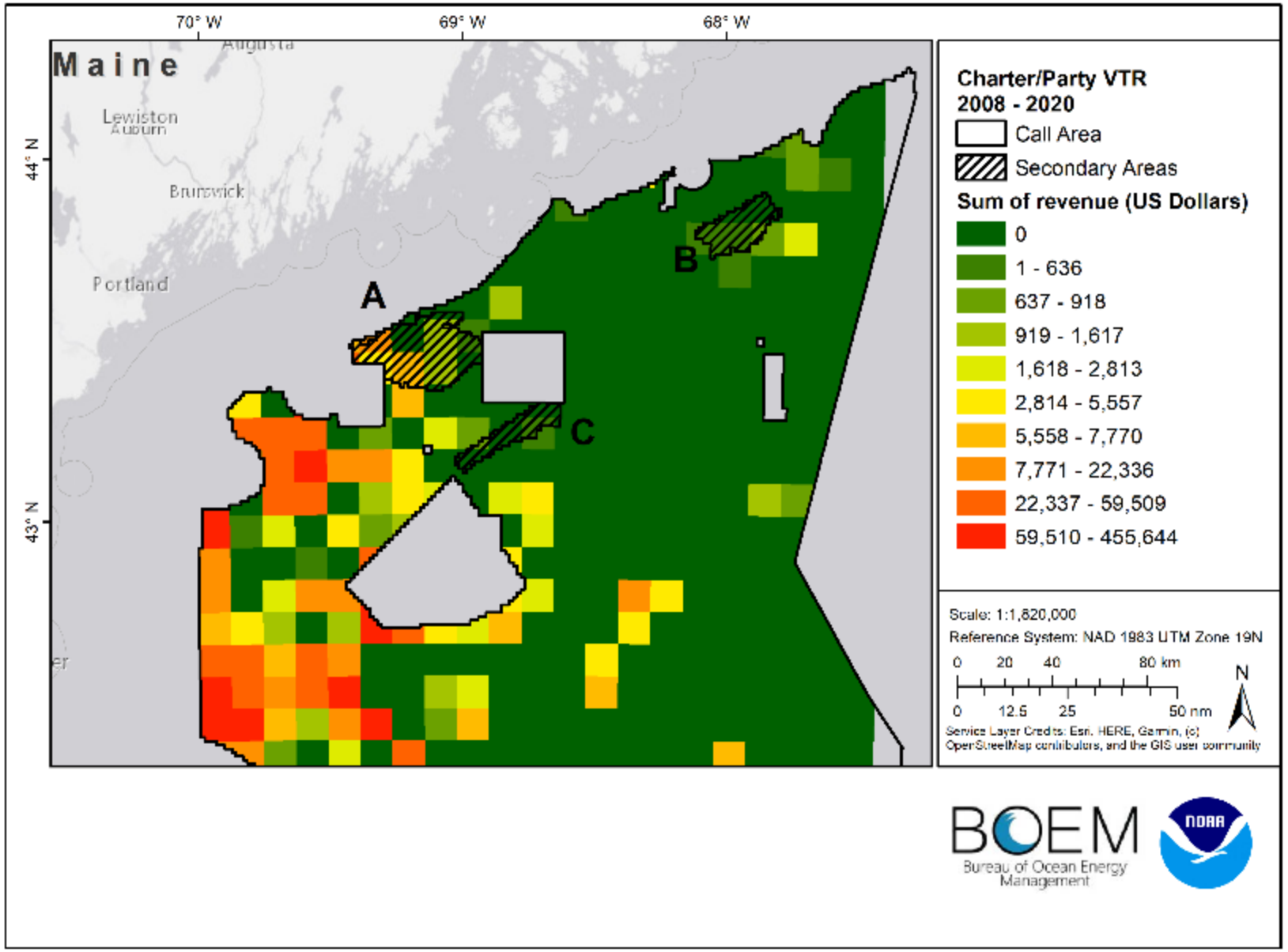
Fishing Footprint (Landings) 2008 - 2021



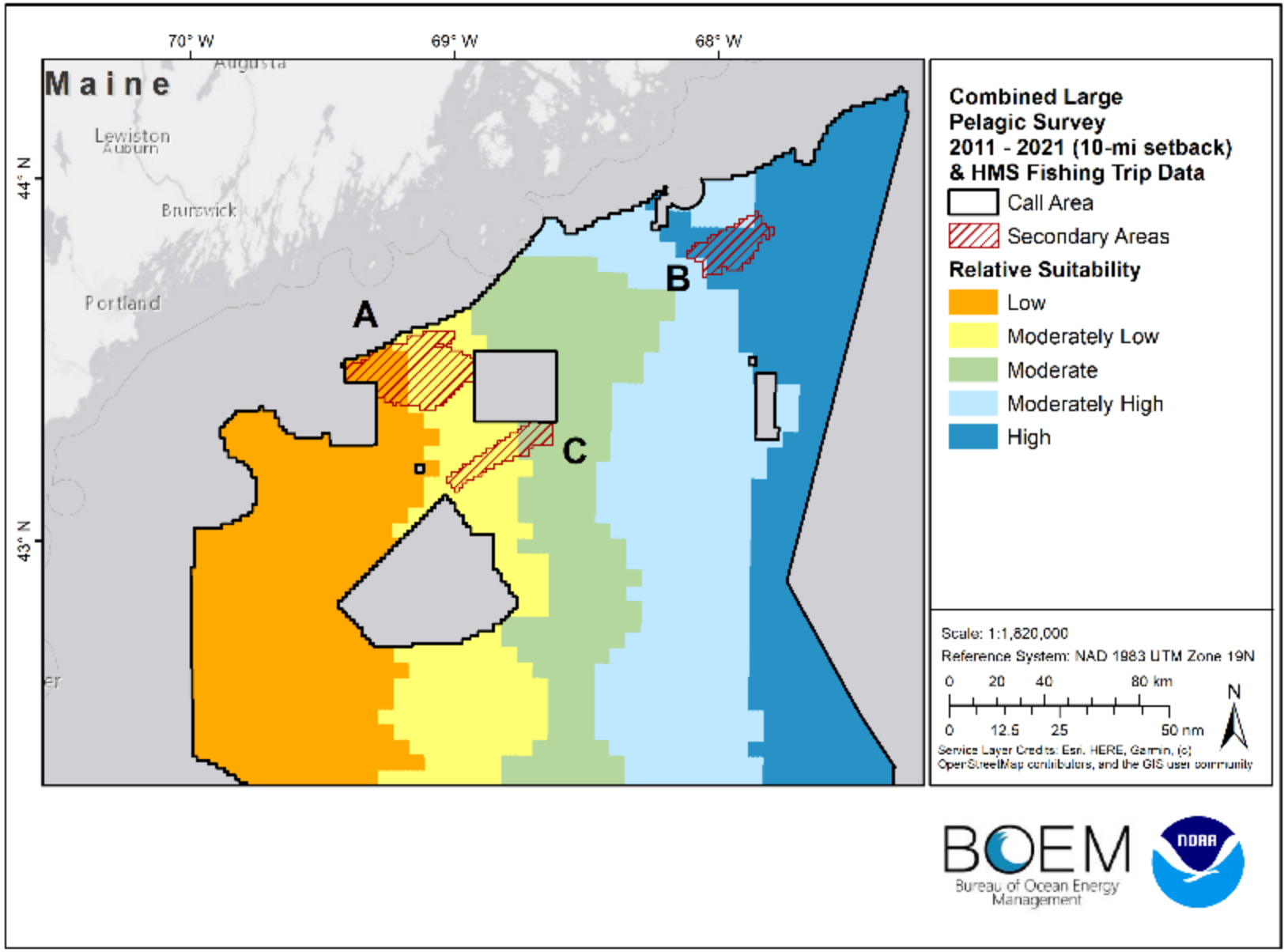
VMS Vessel Transits 2009 – 2021 (All VMS, Speed Filtered < 4 knots)



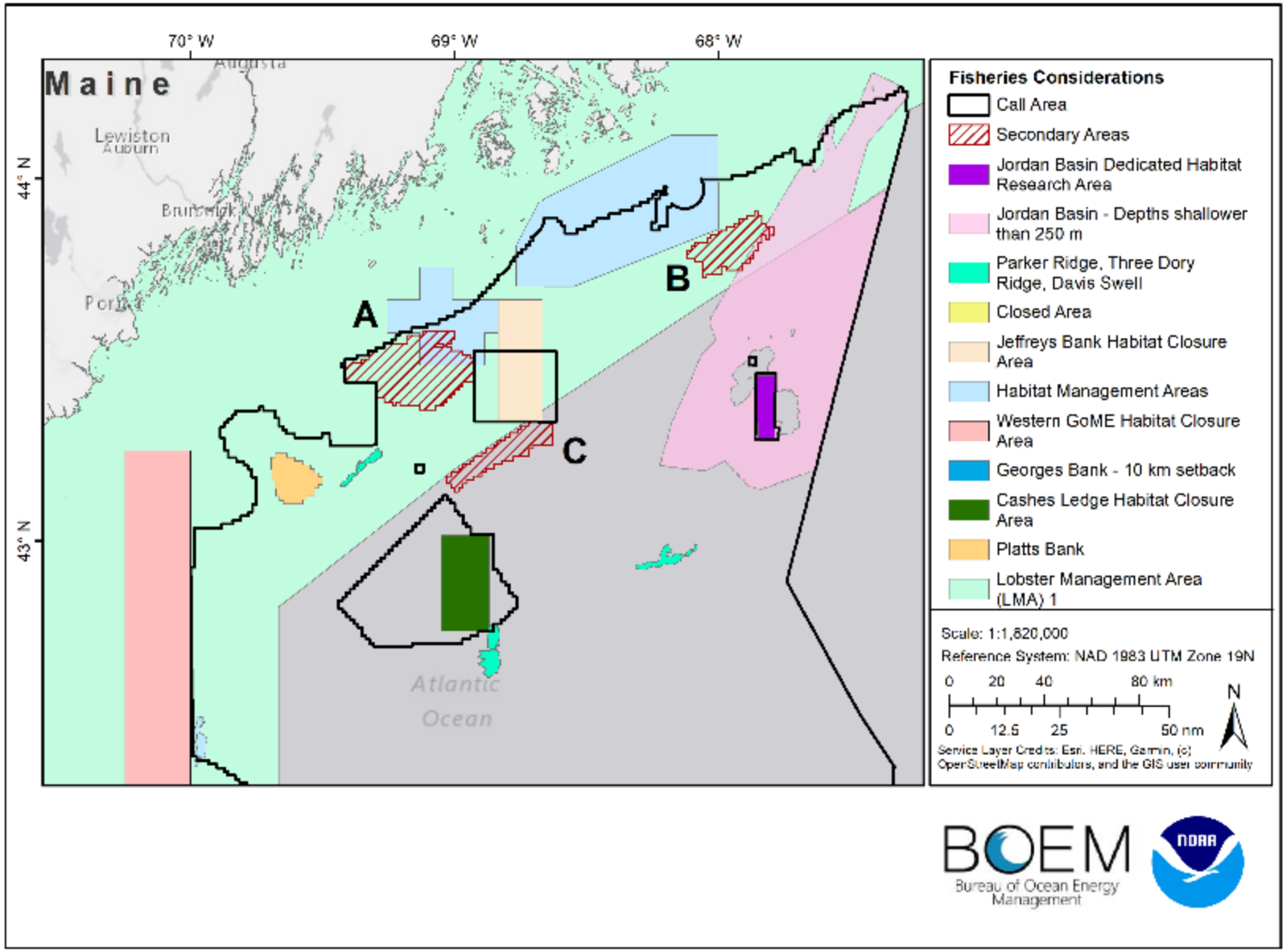
Chater/Party VTR 2008 - 2020



Combined Large Pelagic Survey 2011 – 2021 (10-mi setback) & Highly Migratory Species Fishing Trip 2010 - 2021



Fisheries Considerations



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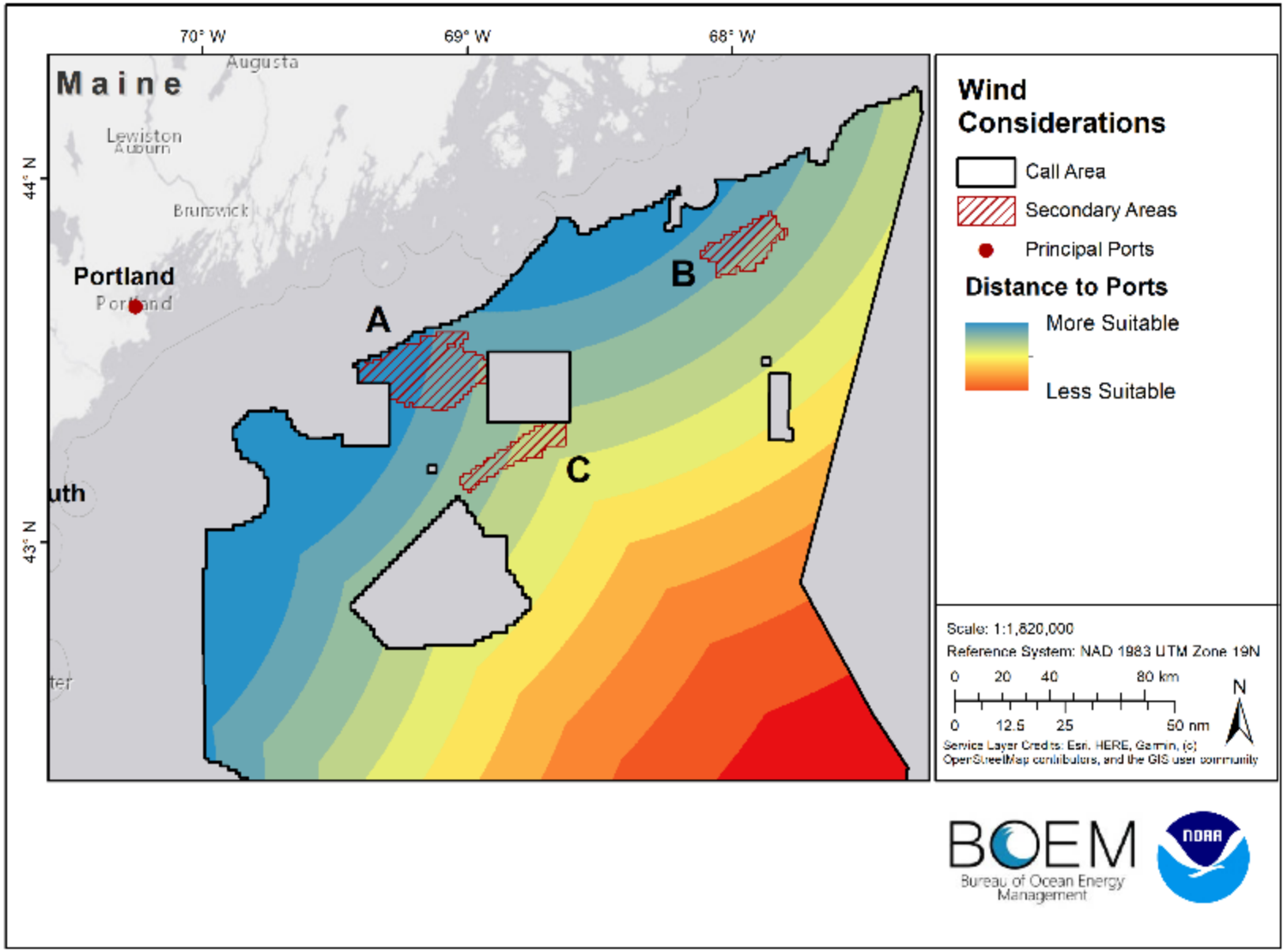

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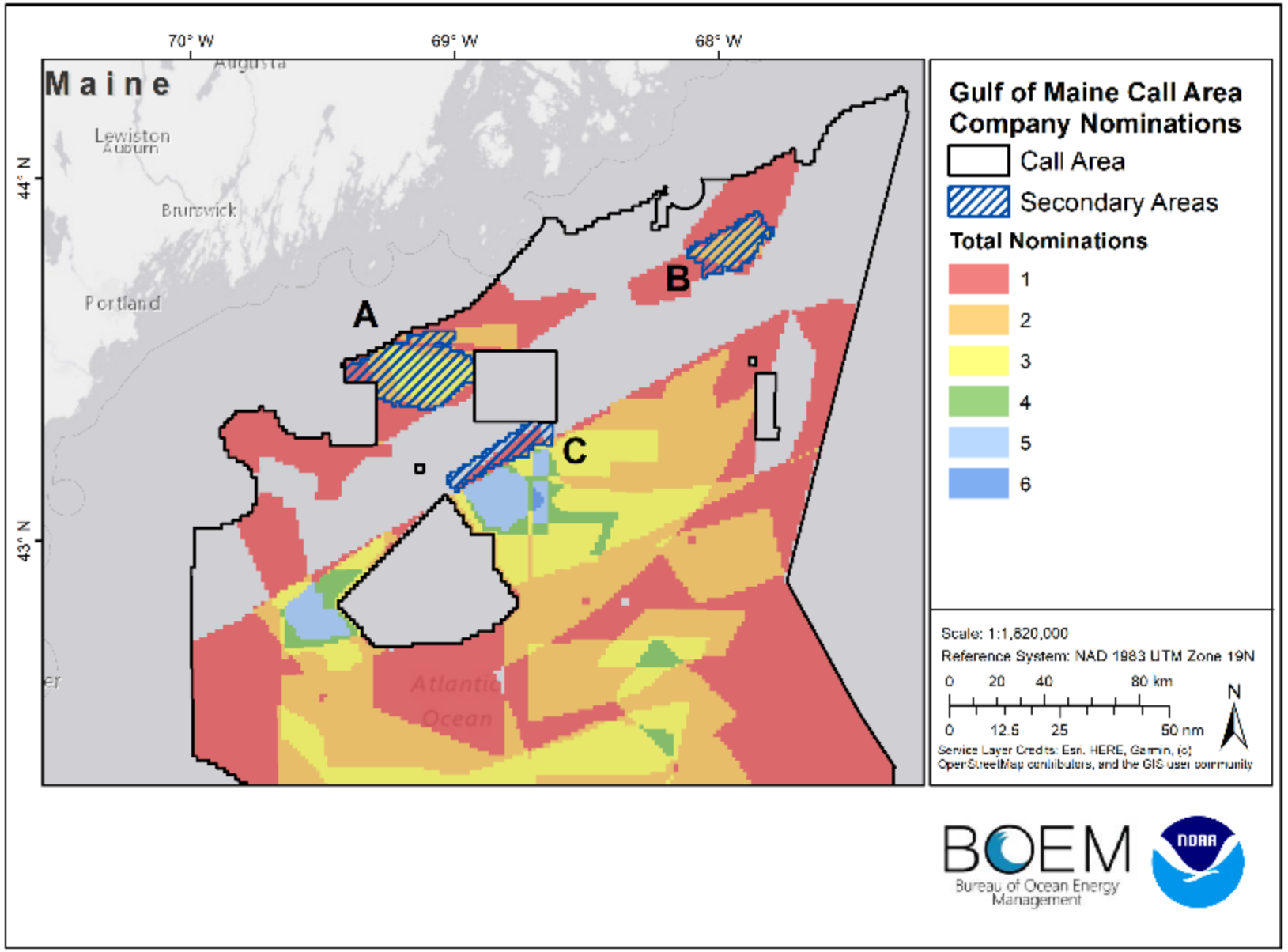
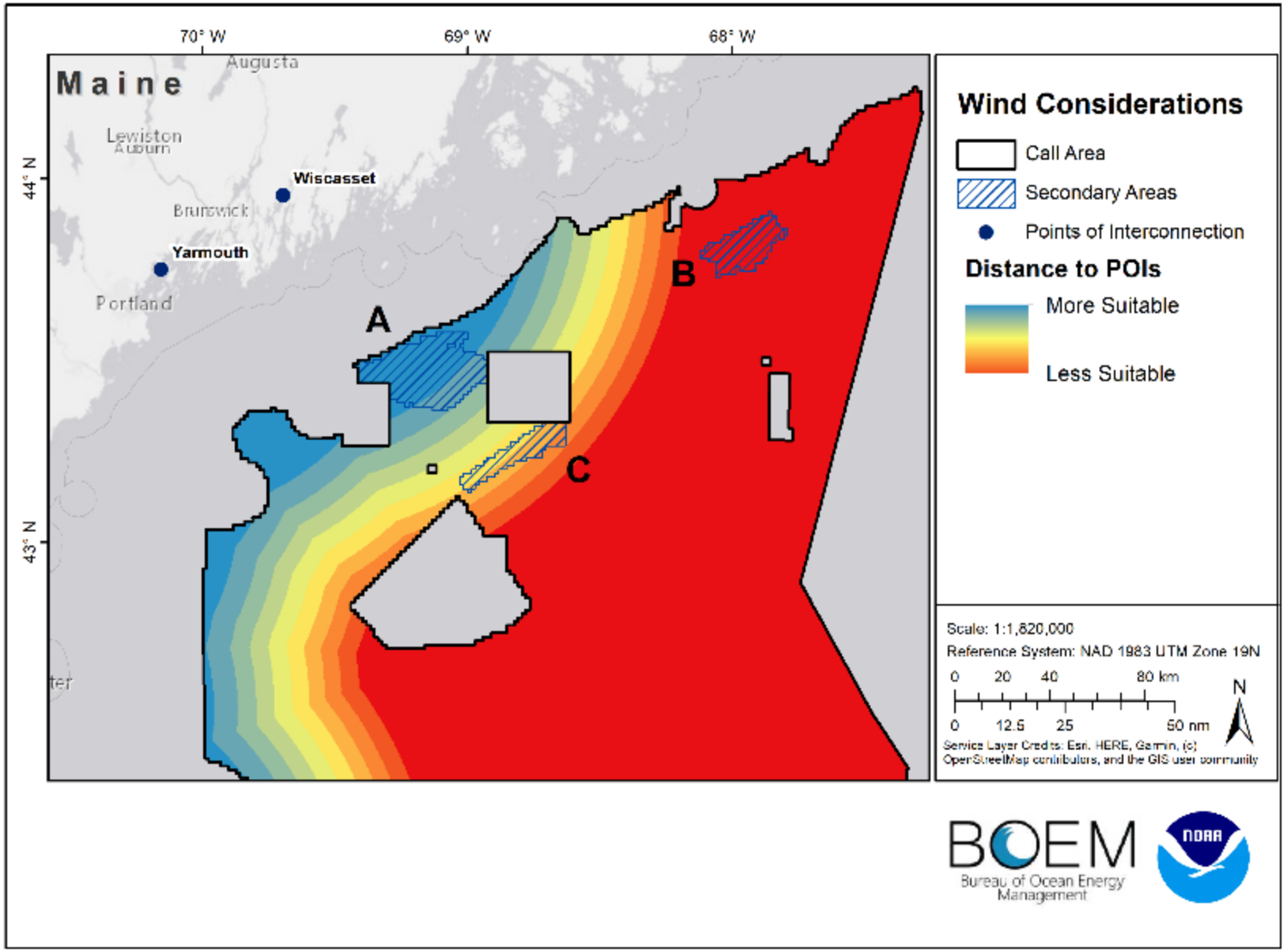


Distance to Points of Interconnection



NREL 20-Year Mean Wind Speed 2000 - 2020