

ALWTRP Vertical Line Model: Development and Distribution of Baseline Vertical Line Estimates

Prepared for Atlantic Large Whale Take Reduction Team
December 2010

Funded by:
NMFS / Northeast Regional Office

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Overview of Presentation

- Review model's objectives and development schedule
- Review methods employed to estimate the number of active vessels and vertical lines in the Northeast
 - Present 2008 baseline results
- Discuss status of state data gathering and the use of state data within the model
- Provide update on latest NEFSC Whale Sightings per Unit Effort (SPUE) data
- Discuss the development of the whale-vertical line co-occurrence indicator

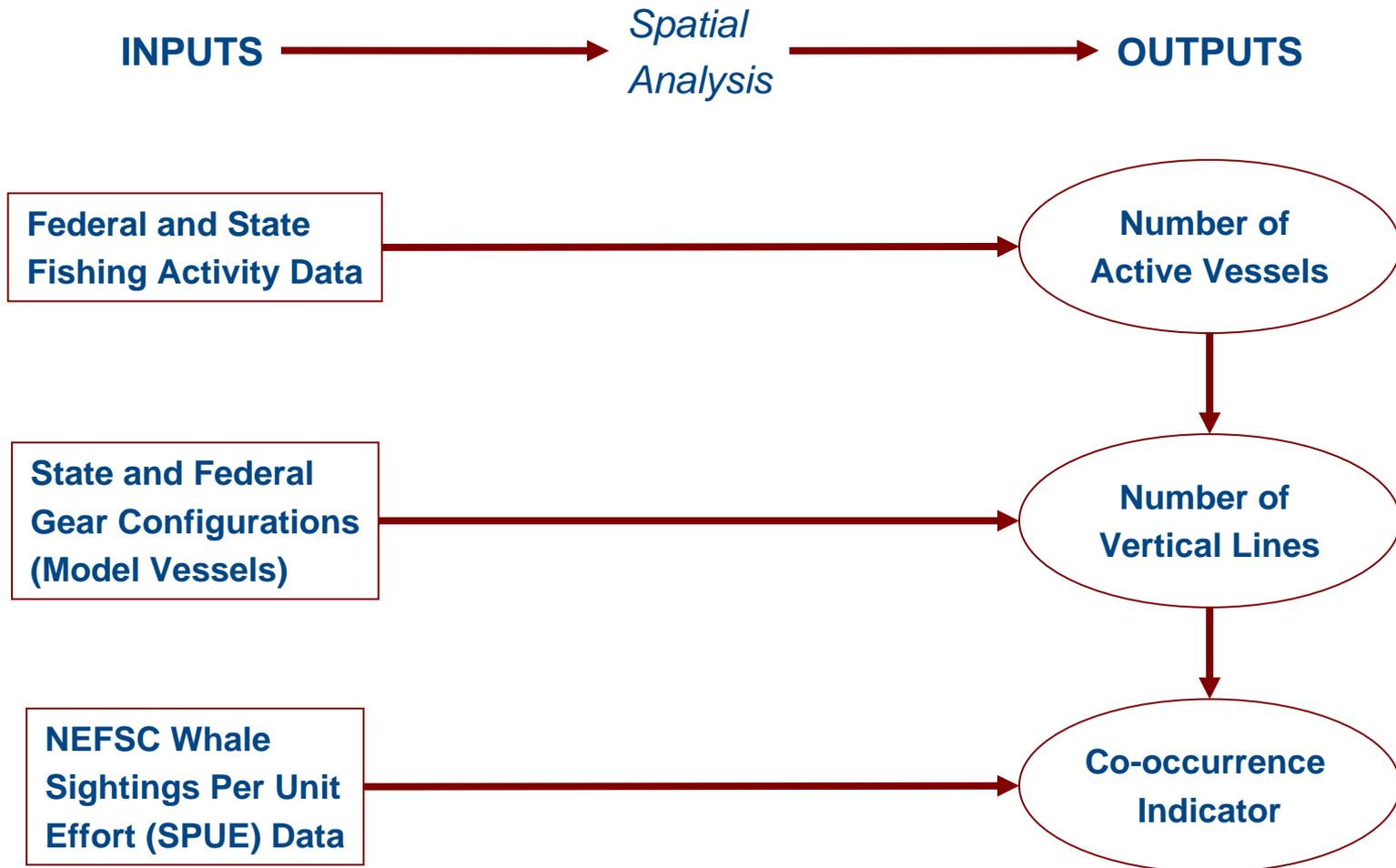
Review of Model's Scope and Objectives

- Support development of NMFS' Vertical Line Strategy
- Address fundamental management questions:
 - Where do particular fisheries operate?
 - Where are concentrations of vertical line greatest?
 - Do whales frequent areas with high concentrations of vertical line?
- Fisheries: American lobster, gillnet, and other trap/pot fisheries
- Geographic scope: all waters covered by the ALWTRP ~ focus on waters north of 40° N Latitude
- Temporal scope: 2000 – 2008 monthly outputs ~ focus on 2008 as baseline

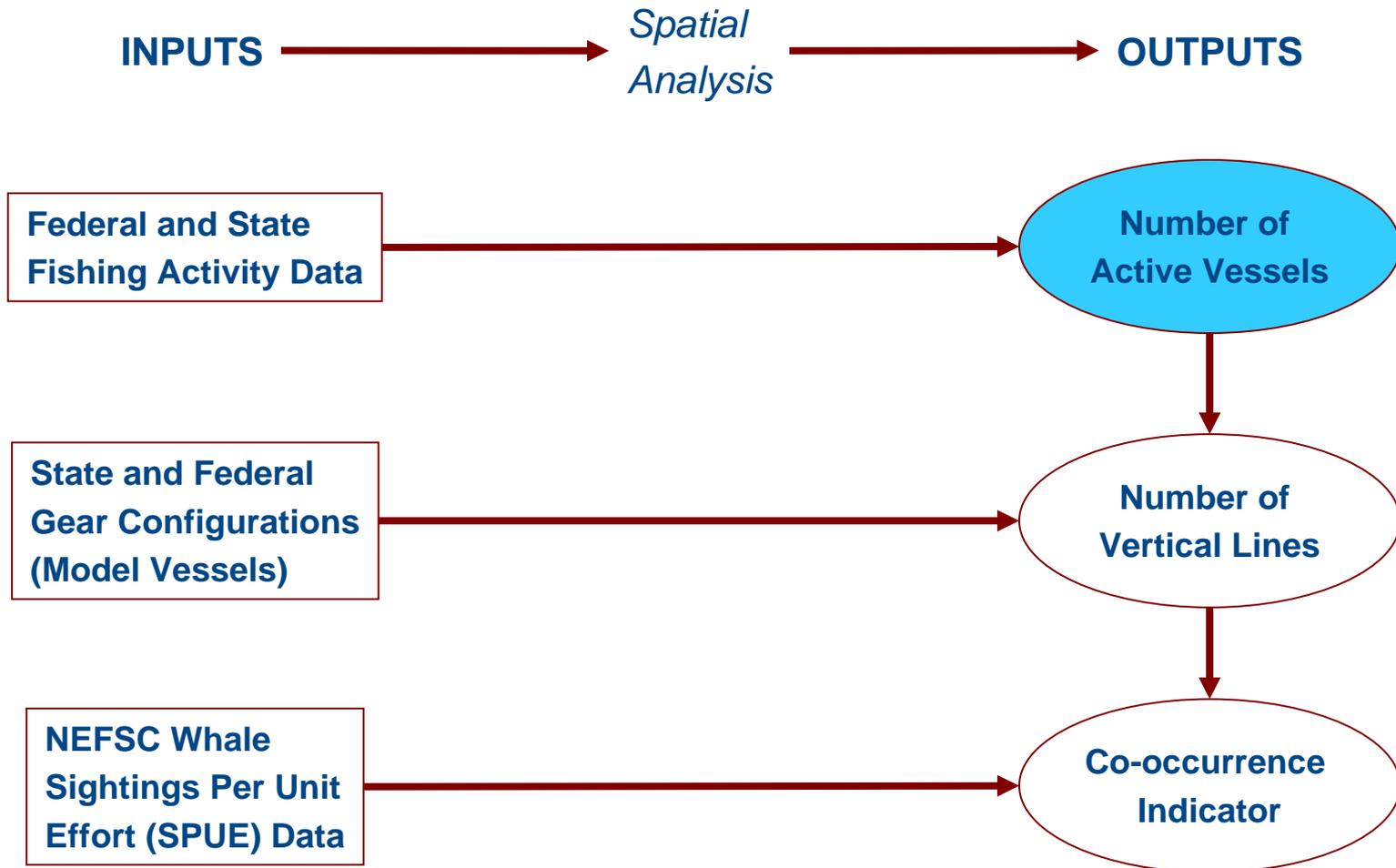
Model Development Process

- Phase 1 (2005): Methods development
- Phase 2 (2006): Working model
 - Focused on activity of vessels with Federal permits from 2000 through 2004
 - Presented methods and preliminary findings to ALWTRT in December 2006
- Phase 3 (2008): Model expansion
 - Improve characterization of commercial fishing activity and gear use
 - Add data on Federally permitted activity in 2005 and 2006
 - Incorporate data on State-permitted activity
 - Refine assumptions on configurations of gear
 - Incorporate data on whale sightings
- Phases 4 & 5 (2009 - Present): Scenario evaluation
 - Continue refinement of data inputs
 - Incorporate data for 2007 and 2008
 - Develop capability to evaluate potential management scenarios

Overview of Indicators



Overview of Indicators



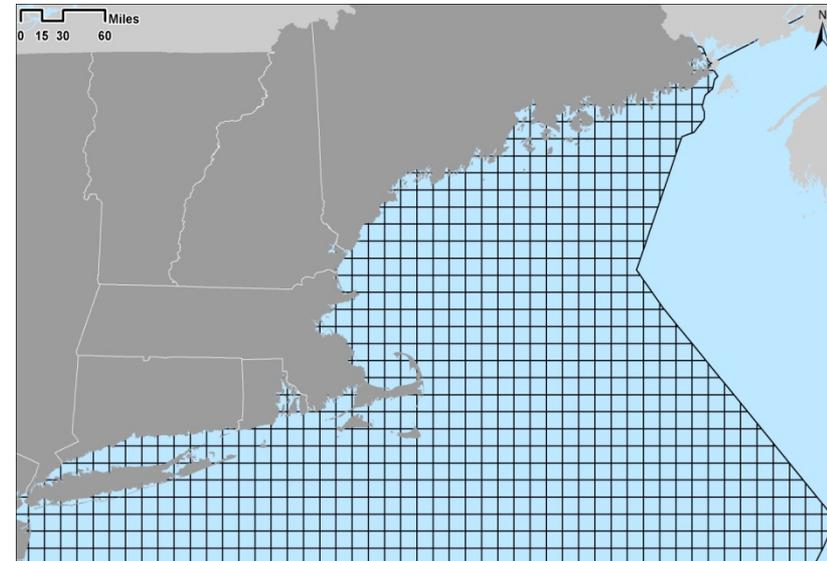
Active Vessels: Data Sources

- Federal waters
 - Northeast Vessel Trip Reporting System (VTR)
 - Covers waters North of Cape Hatteras, NC
 - Includes activity from lobster trap/pot, other trap/pot, and gillnet fisheries
 - Vessels report average fishing location per trip (longitude/latitude)
 - NMFS permit data
- State waters
 - Data varies by state

Active Vessels: VTR Analysis

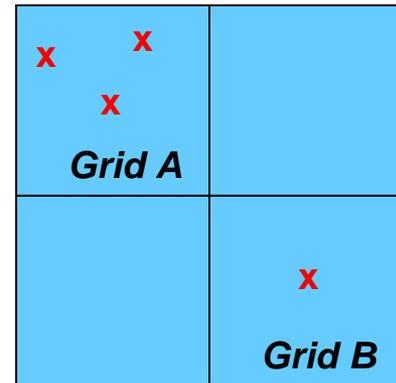
- Limitations of VTR
 - Several groups not required to submit VTR reports, including:
 - Fishermen who hold only a federal lobster permit
 - Fishermen who hold only state fishing permits
 - Activity extends beyond the single point reported in VTR
 - We summarize activity by using a grid model
 - Each cell is 1-minute by 1-minute
 - Aggregated to 10-minute by 10-minute grid for mapping

Northeast 10 x 10 minute grid



Active Vessels: VTR Analysis

- Analysis steps:
 1. Identify fishing trips by gear type
 - Lobster trap/pots
 - Gillnets
 - Other trap/pots
 2. Create monthly data sets for the years 2000 through 2008
 3. Locate vessel trip locations on the spatial grid
 4. Apportion vessel activity by trip location
 5. For each grid cell, total apportioned activity from different vessels



x = Vessel Trip

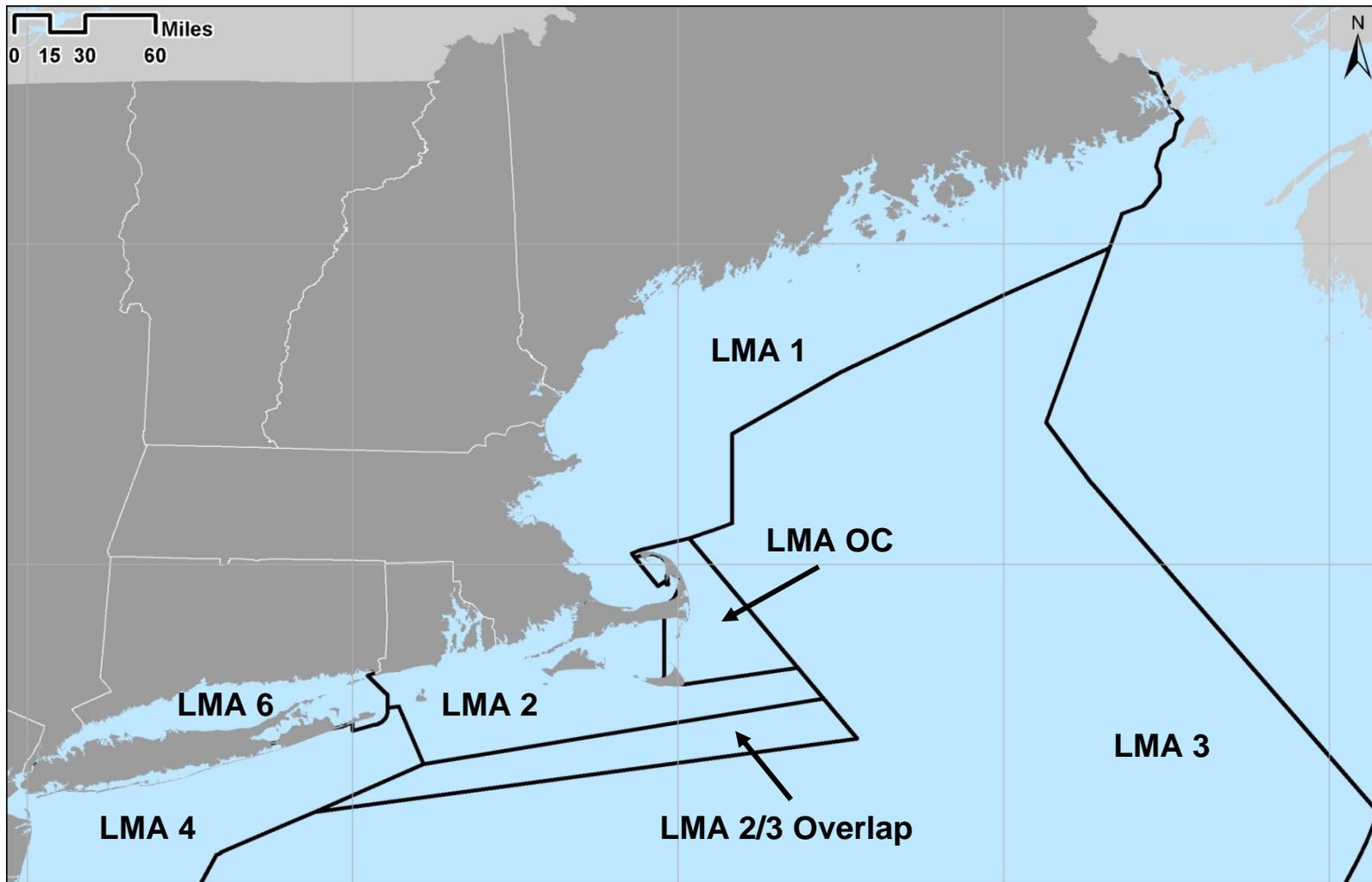
Hypothetical Example:

- A single fishing vessel makes 4 trips in 1 month:
 - 3 fishing trips in GRID A
 - 1 fishing trip in GRID B
- Apportioned activity for this vessel:
 - 0.75 vessel in GRID A
 - 0.25 vessel in GRID B

Active Vessels: Federal Permit Data

- Problem: Lobster fishermen who hold only federal lobster permits are not required to report to VTR
 - Only affects the Northeast/Mid-Atlantic results
 - Requires a procedure to account for missing data
- NMFS Permit Data provides source to estimate these missing vessels
 - Dataset of all federal permit holders and vessels
 - Includes information on Lobster Management Areas (LMAs)

Active Vessels: Federal Permit Data



Active Vessels: Federal Permit Data

- Procedure:
 1. For each LMA, compare VTR and permit data to identify vessels that are permitted only for lobster fishery and not included in VTR
 2. Only a subset of permitted vessels actually fish, therefore estimate percentage of permitted vessels that are active
 - For each month and LMA, calculate the percentage of vessels that are required to report to VTR and were active
 - Assumes similar behavior between vessels required to report to VTR and those that are not
 3. Apportion activity across each grid cell by LMA
 - Except LMA 3, where we assume permitted activity is concentrated north of 40°N latitude
 4. For each grid cell, sum the estimates of active vessels from permit and VTR data

Active Vessels: Impact of Federal Permit Data

Number of Active Vessels by Data Source (2008) Northeast Non-exempt Waters

Area	Number of Active Vessels (Average Per Month)	Percentage of Vessels (Average Per Month)
Northeast VTR	410	17%
NMFS Permit (Lobster Only)	890	38%
State Data	1,060	45%
Total	2,360	-

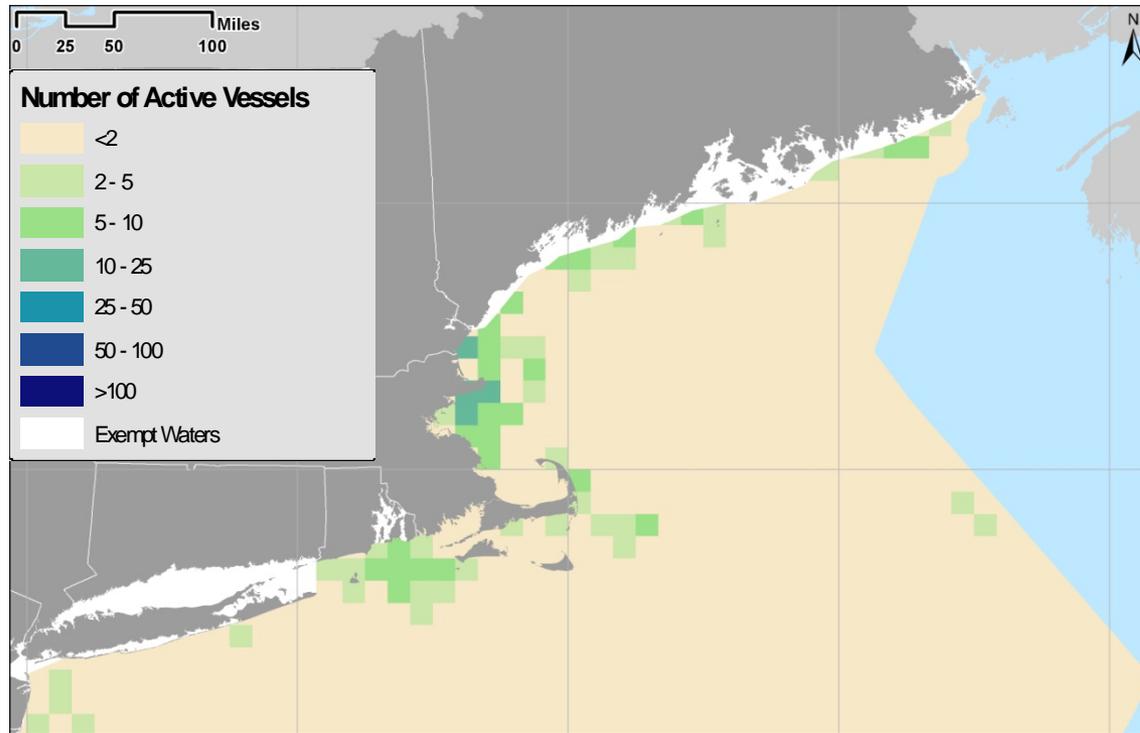
Active Vessels: Impact of Federal Permit Data

Estimated Number of Active Vessels
Distributed Across LMAs Based on NMFS Permit Data (2008)

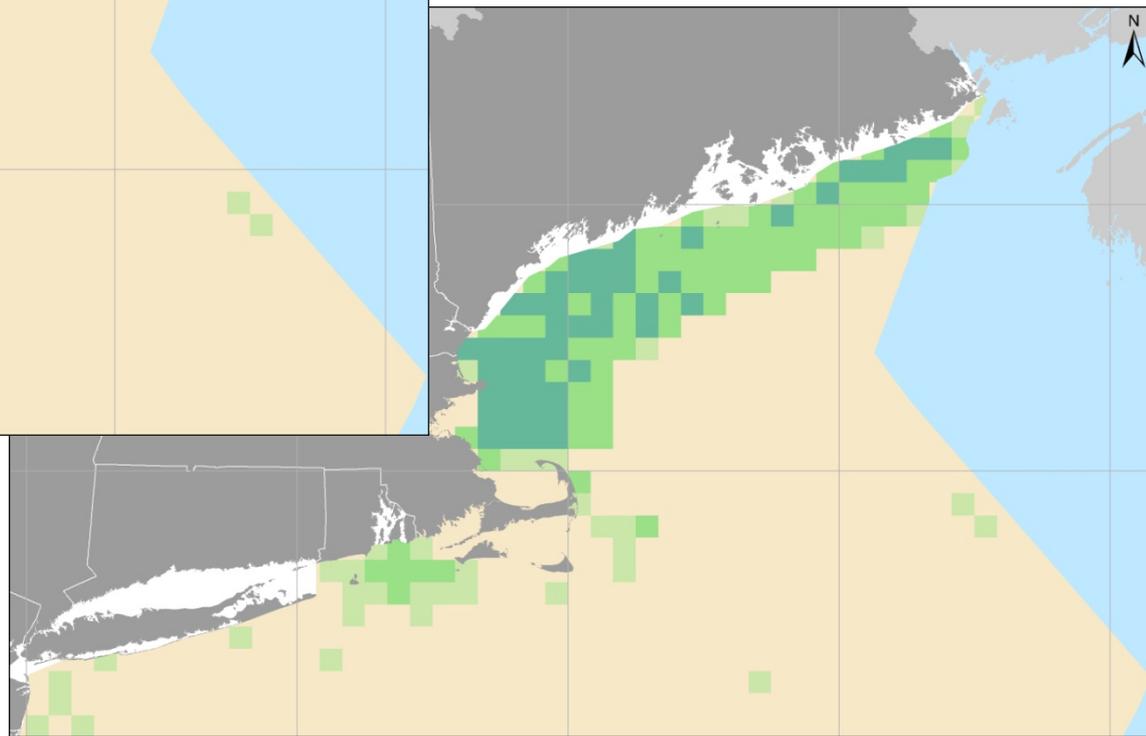
Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LMA 1	720	640	550	660	720	860	970	990	980	990	950	840
LMA 2	30	30	30	40	50	60	70	70	60	60	40	40
LMA 3 (N of 40°)	10	10	10	10	10	10	10	10	10	10	10	10
LMA 4	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
LMA Outer Cape	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Active Vessels: Impact of Federal Permit Data

VTR Data Only



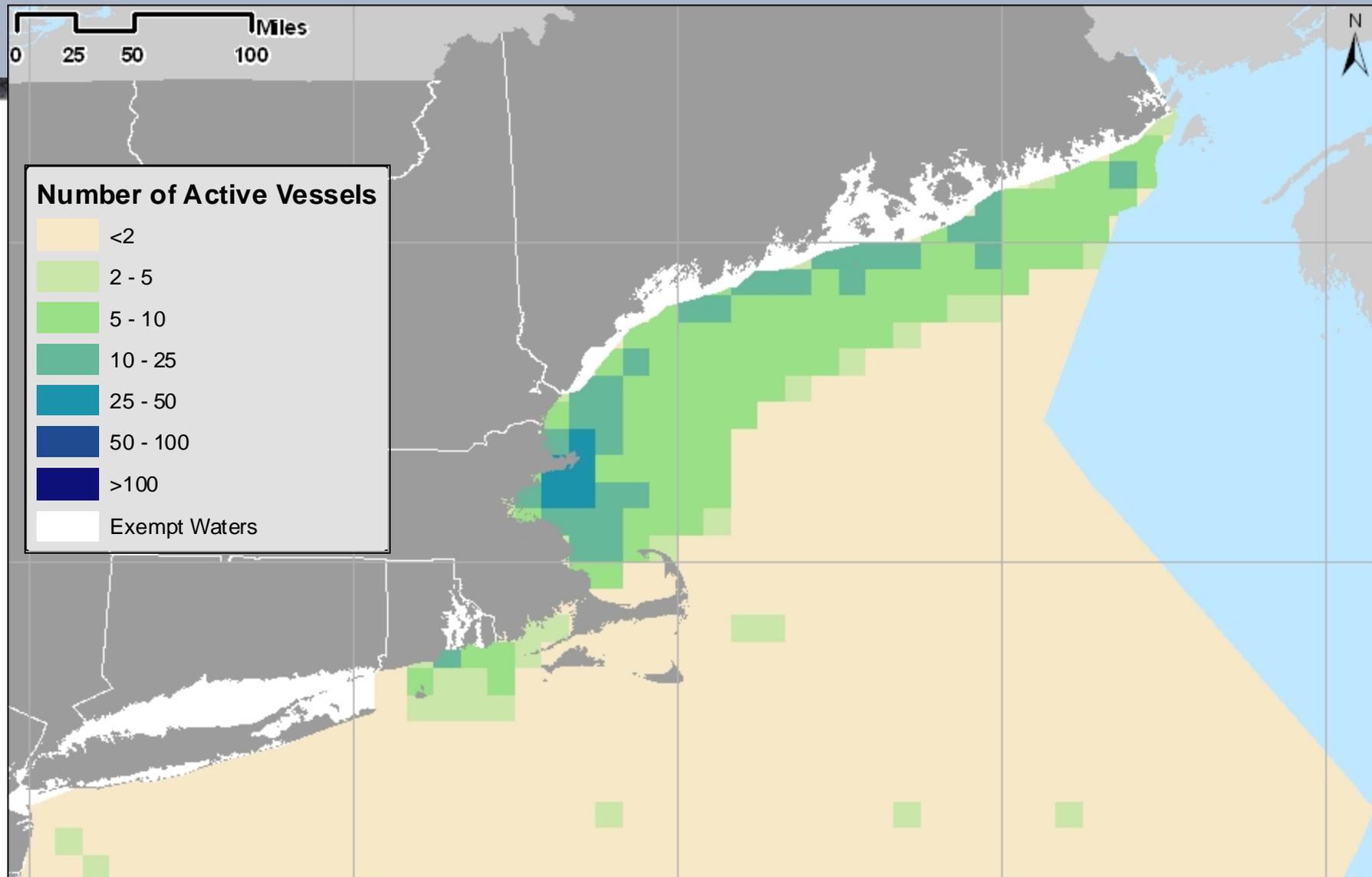
VTR & Federal Permit Data



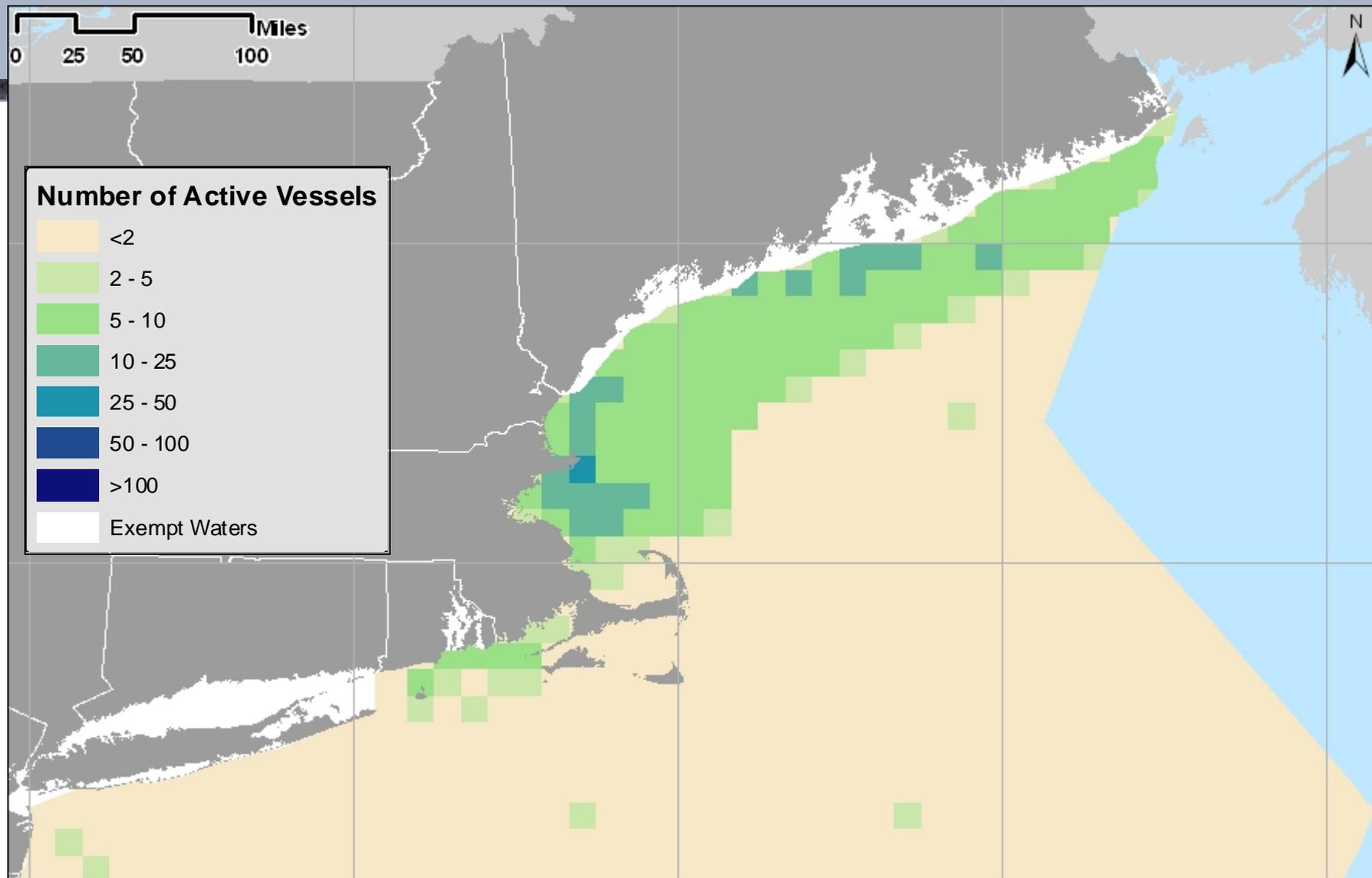
Active Vessels: State-Permitted Vessels

- State-specific methods for determining the number of active vessels in state waters
- Number of state vessels incorporated in manner similar to NMFS permit data
- To ensure that we only count those vessels that fish in areas subject to the ALWTRP, we exclude vessels fishing in exempt waters

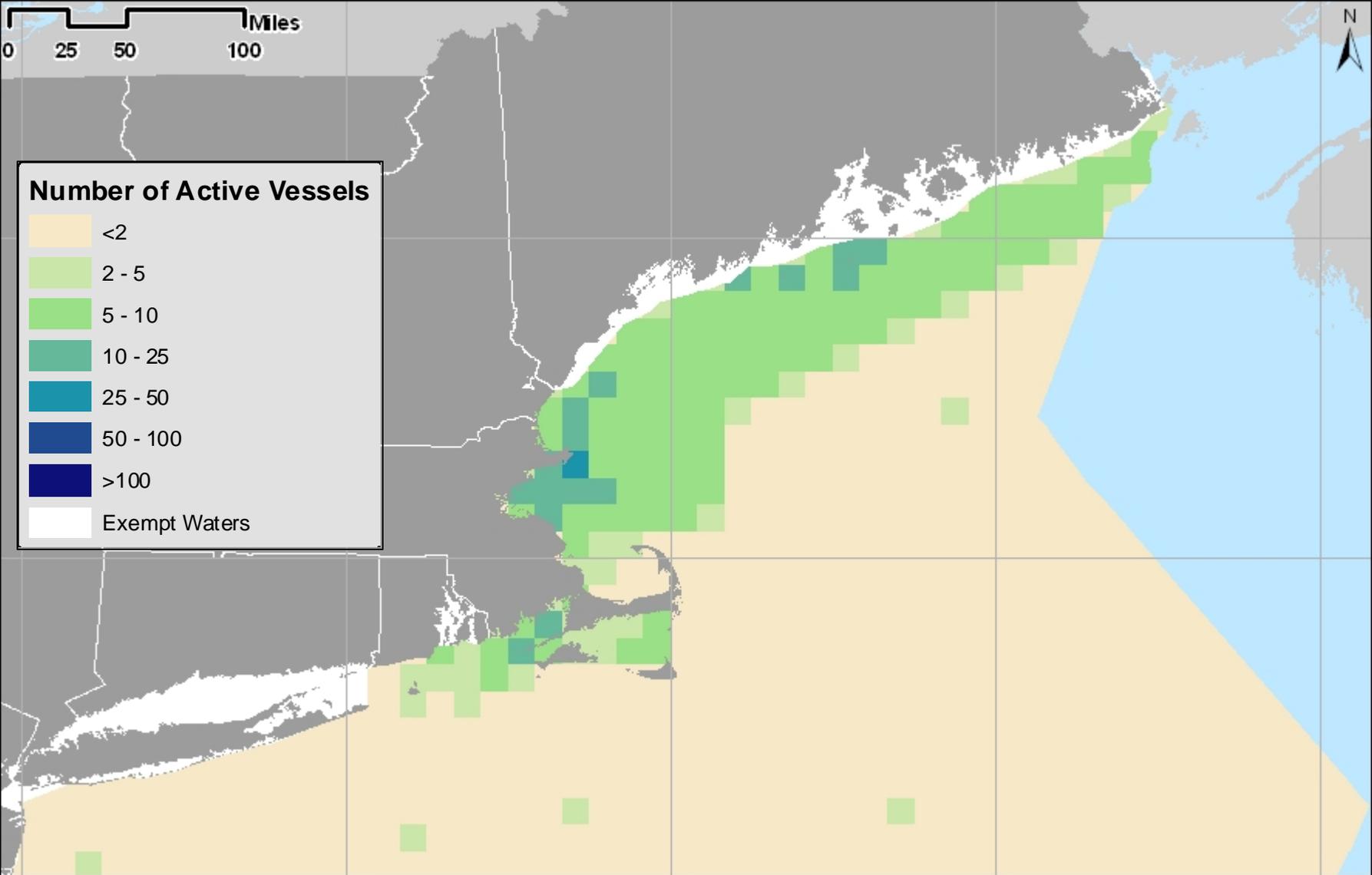
January 2008 Active Vessels



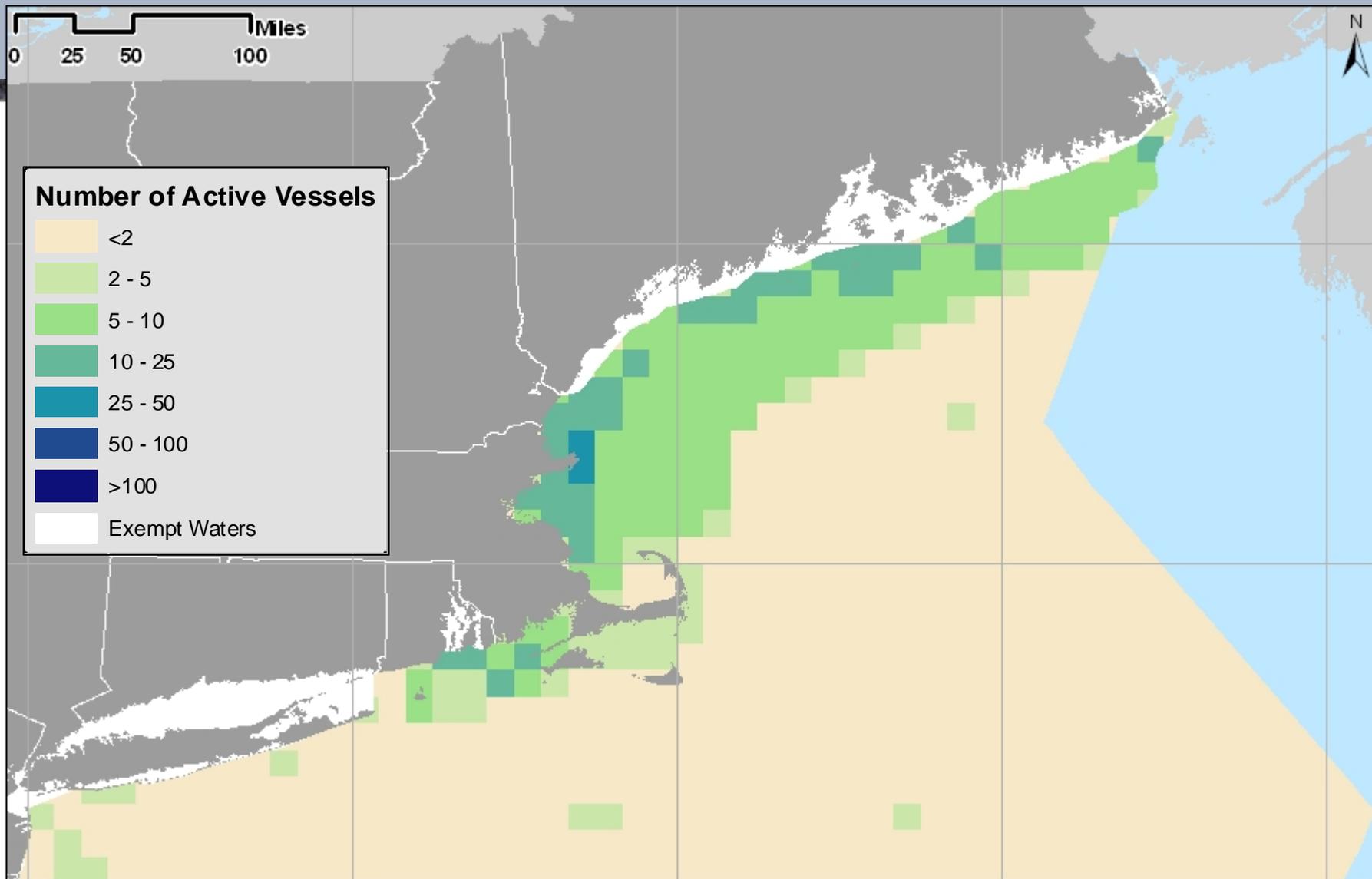
February 2008 Active Vessels



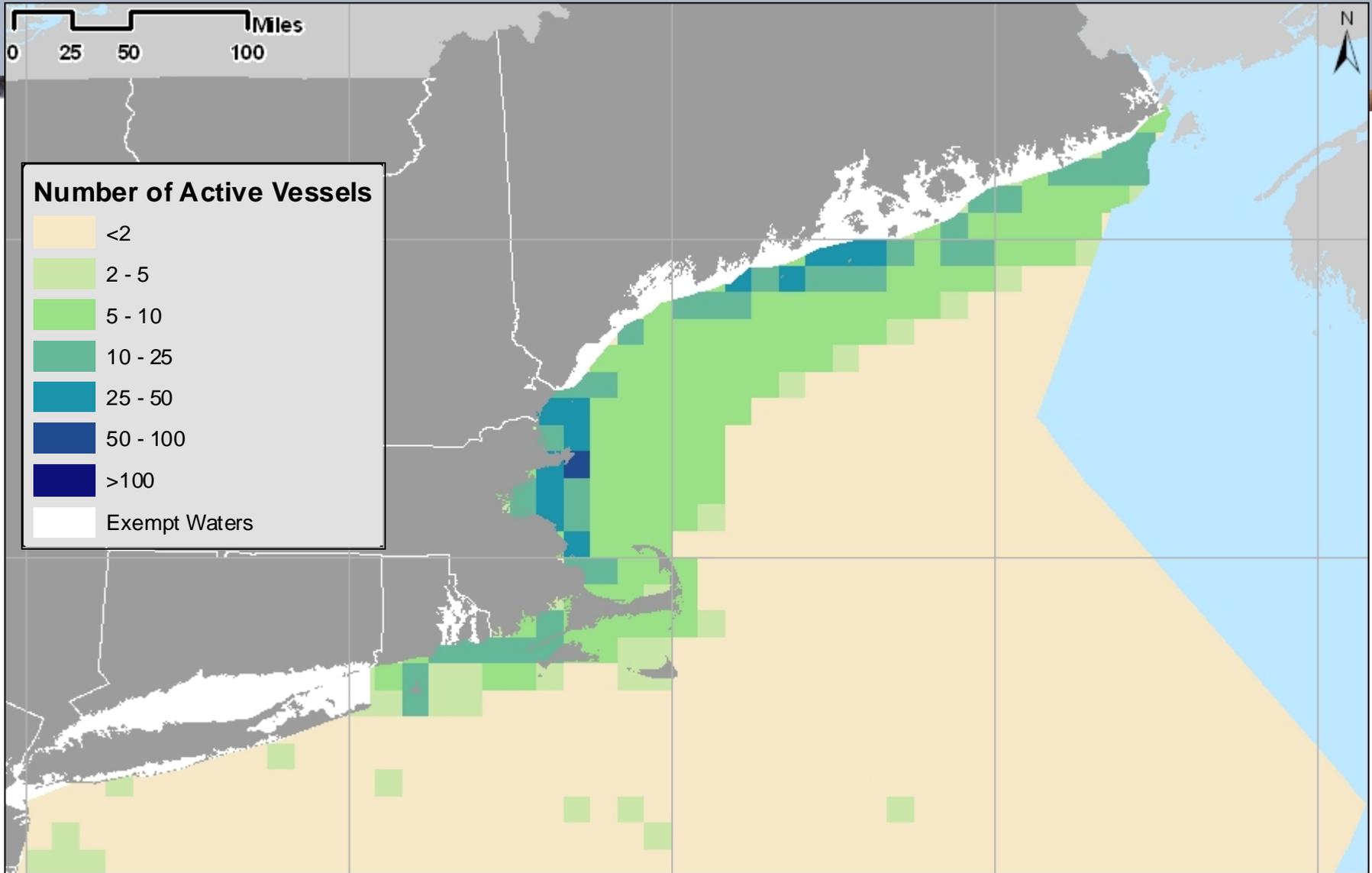
March 2008 Active Vessels



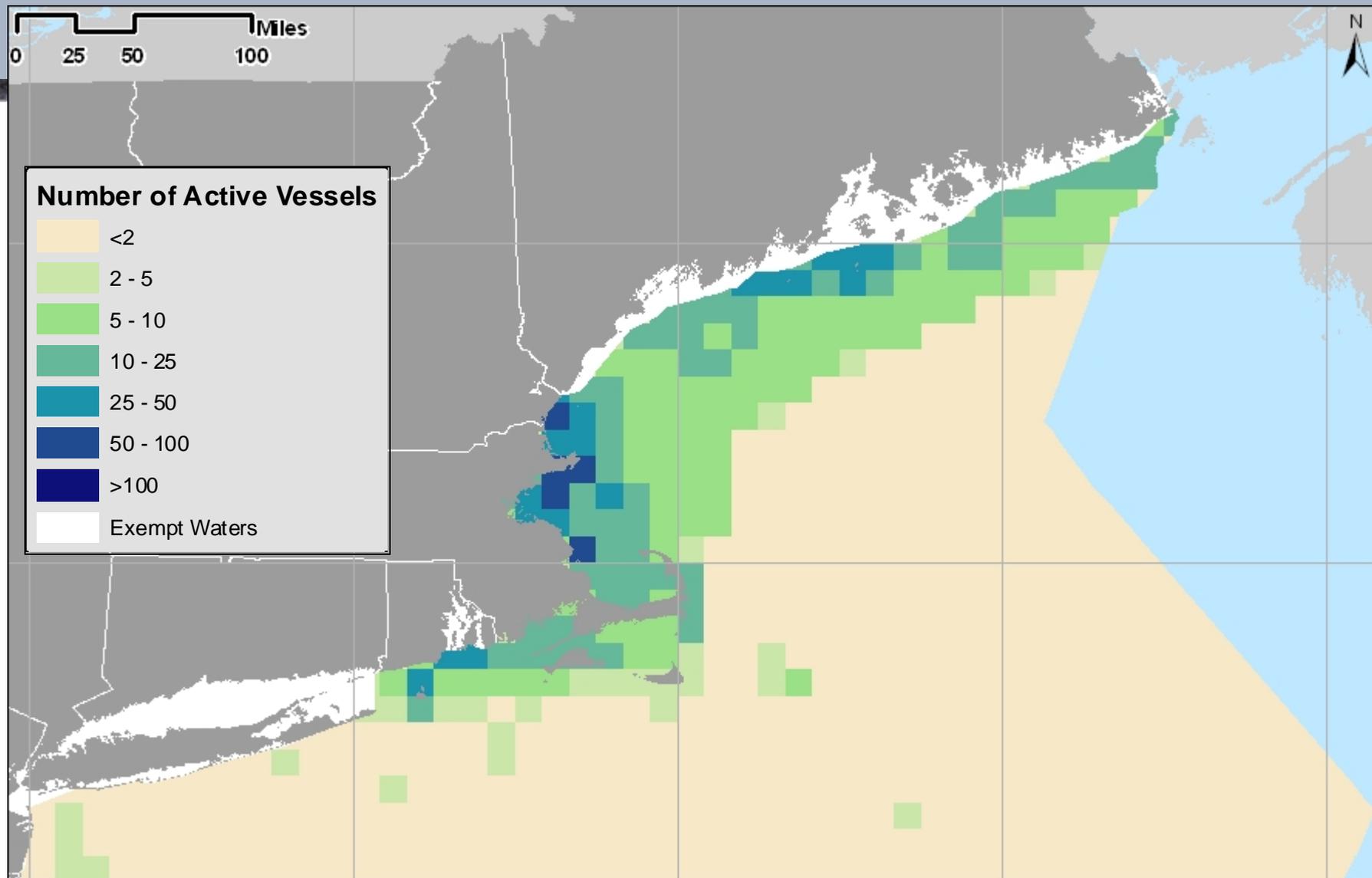
April 2008 Active Vessels



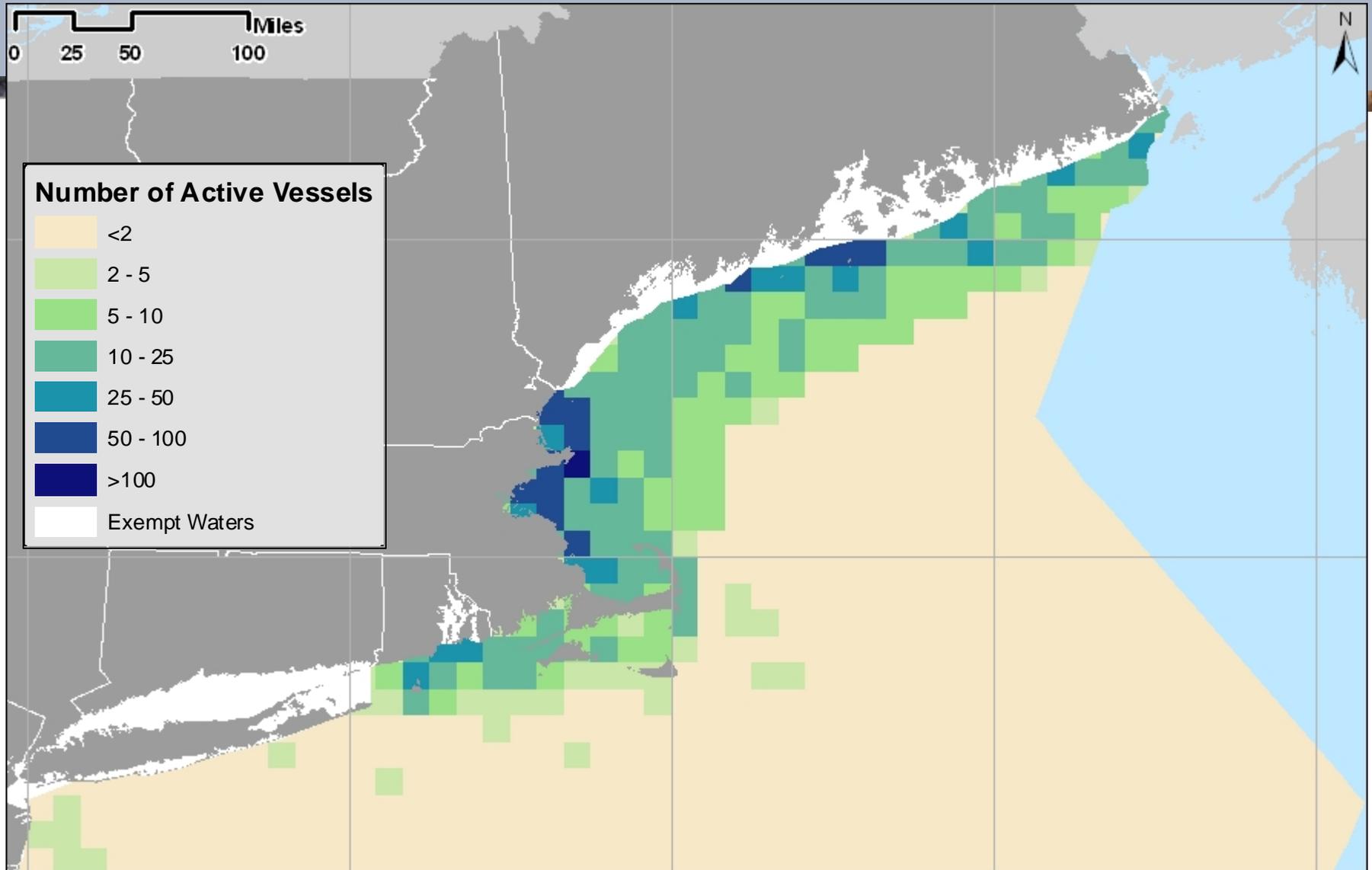
May 2008 Active Vessels



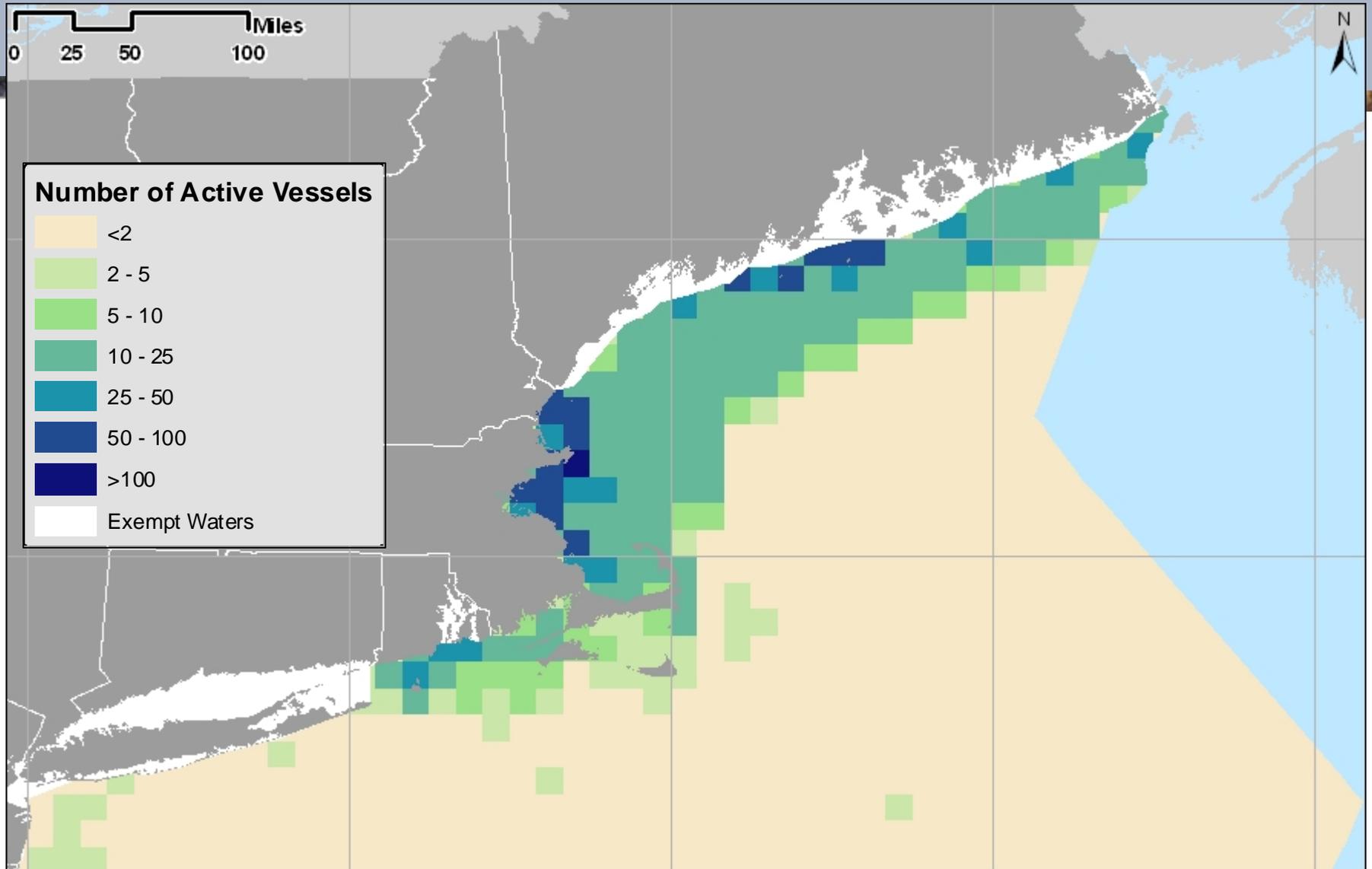
June 2008 Active Vessels



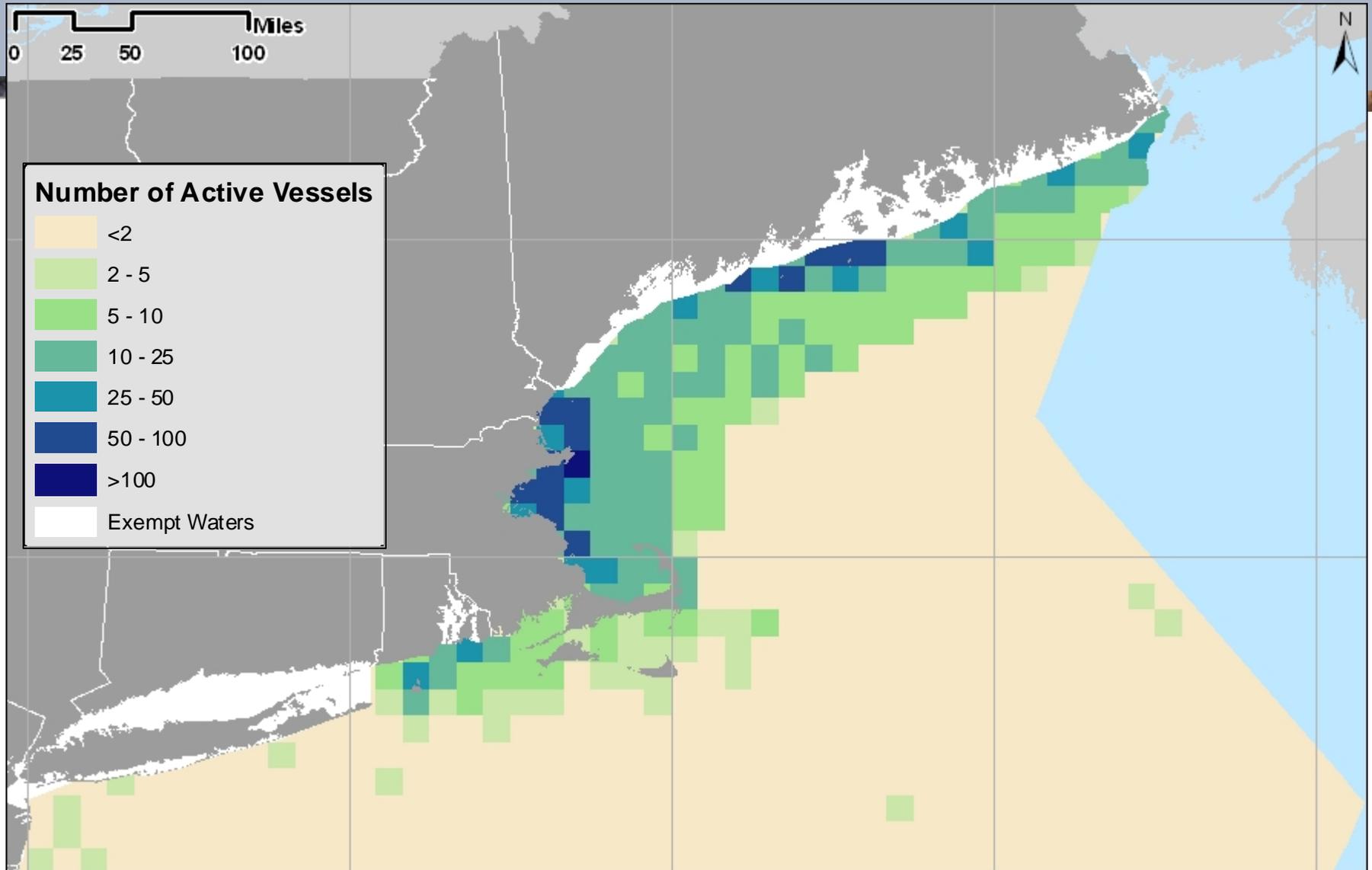
July 2008 Active Vessels



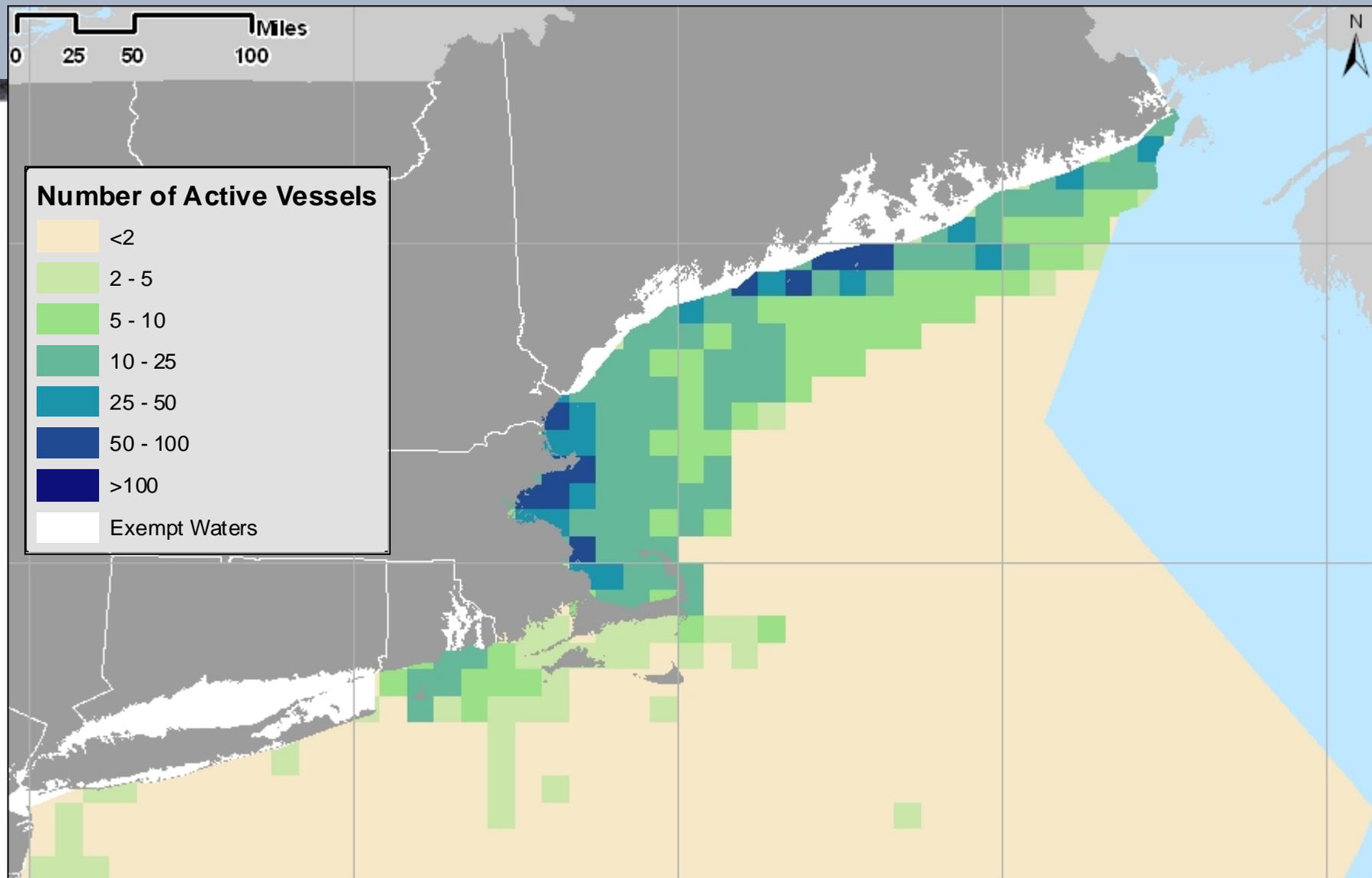
August 2008 Active Vessels



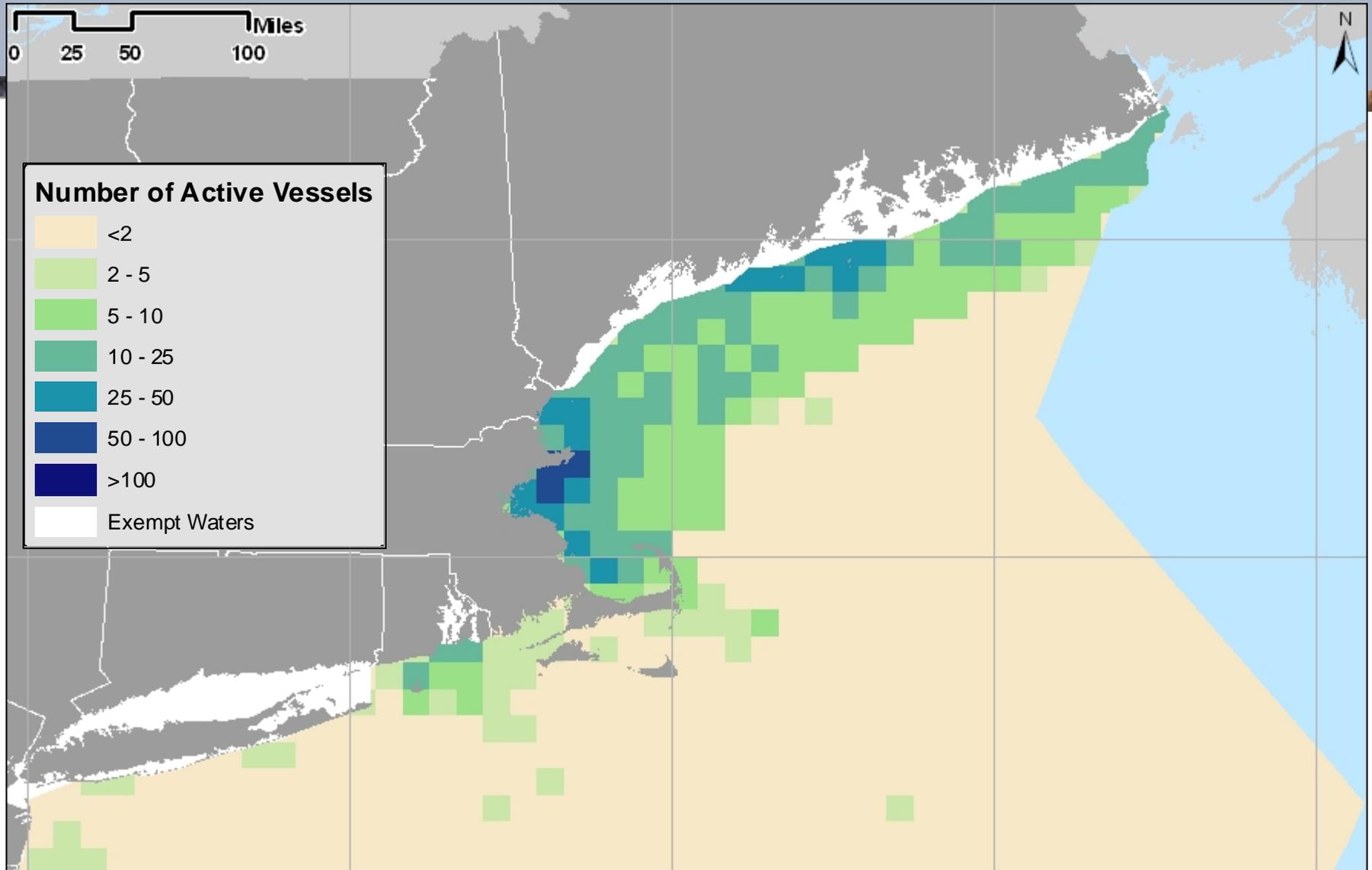
September 2008 Active Vessels



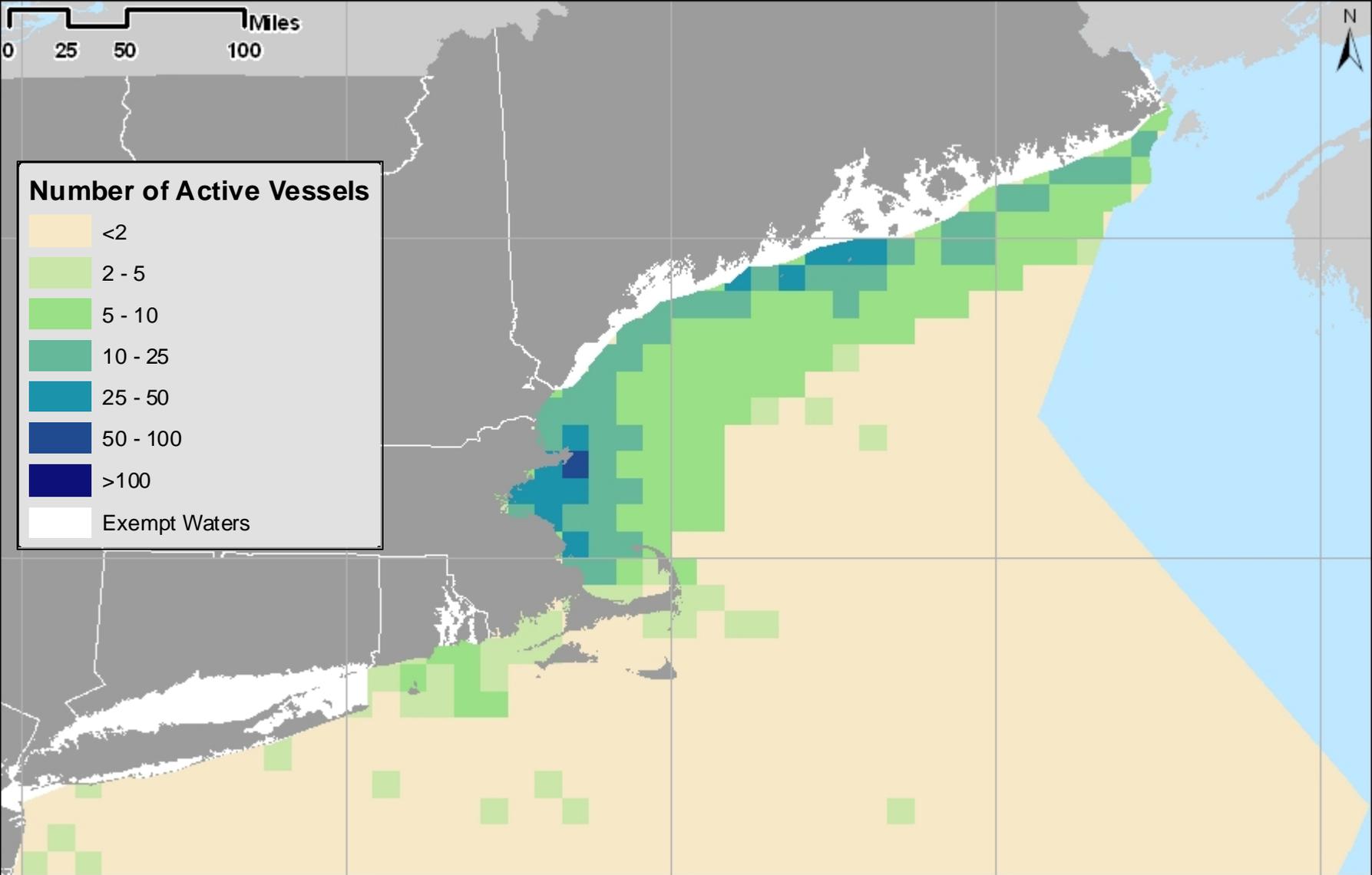
October 2008 Active Vessels



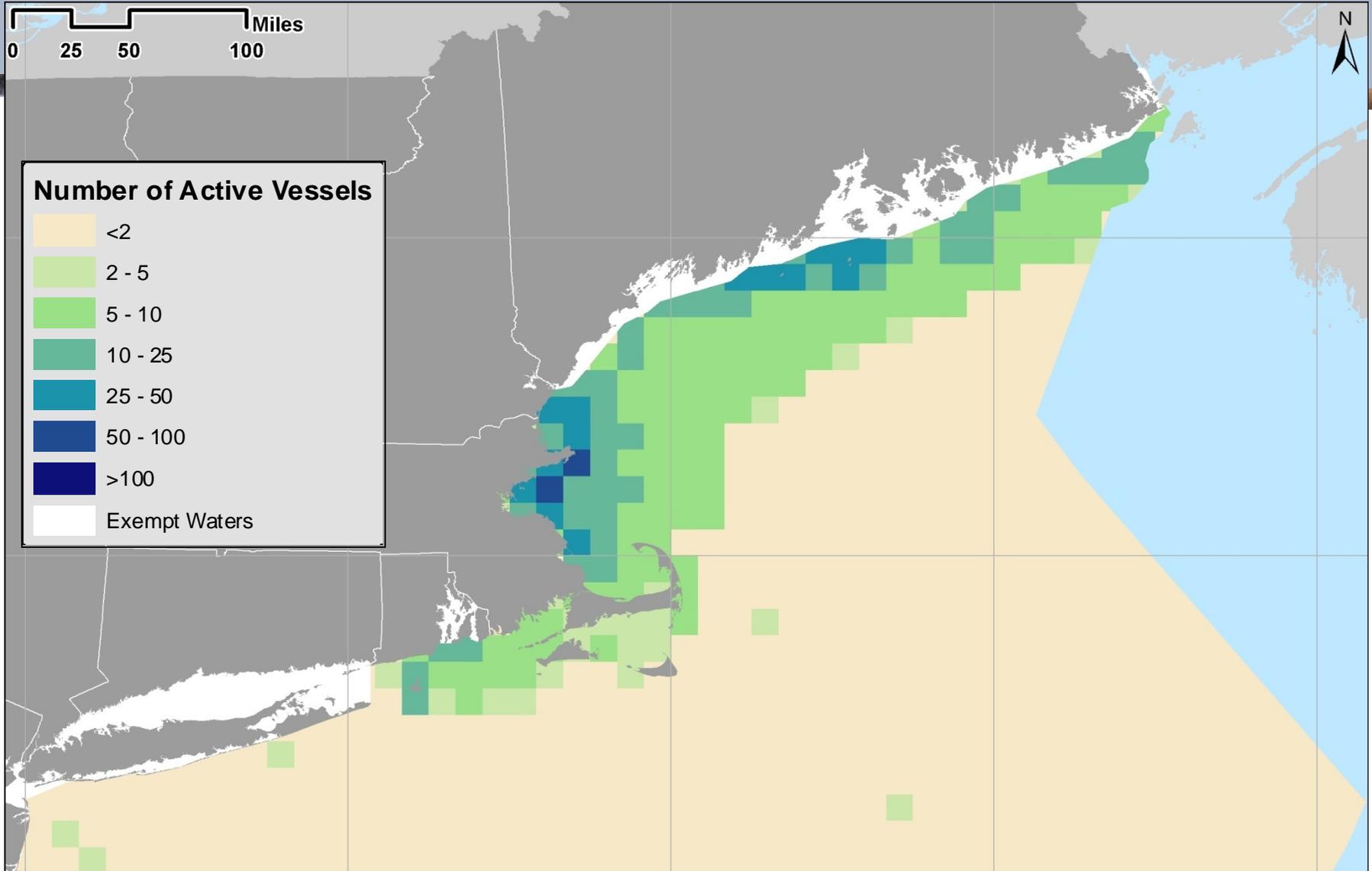
November 2008 Active Vessels



December 2008 Active Vessels



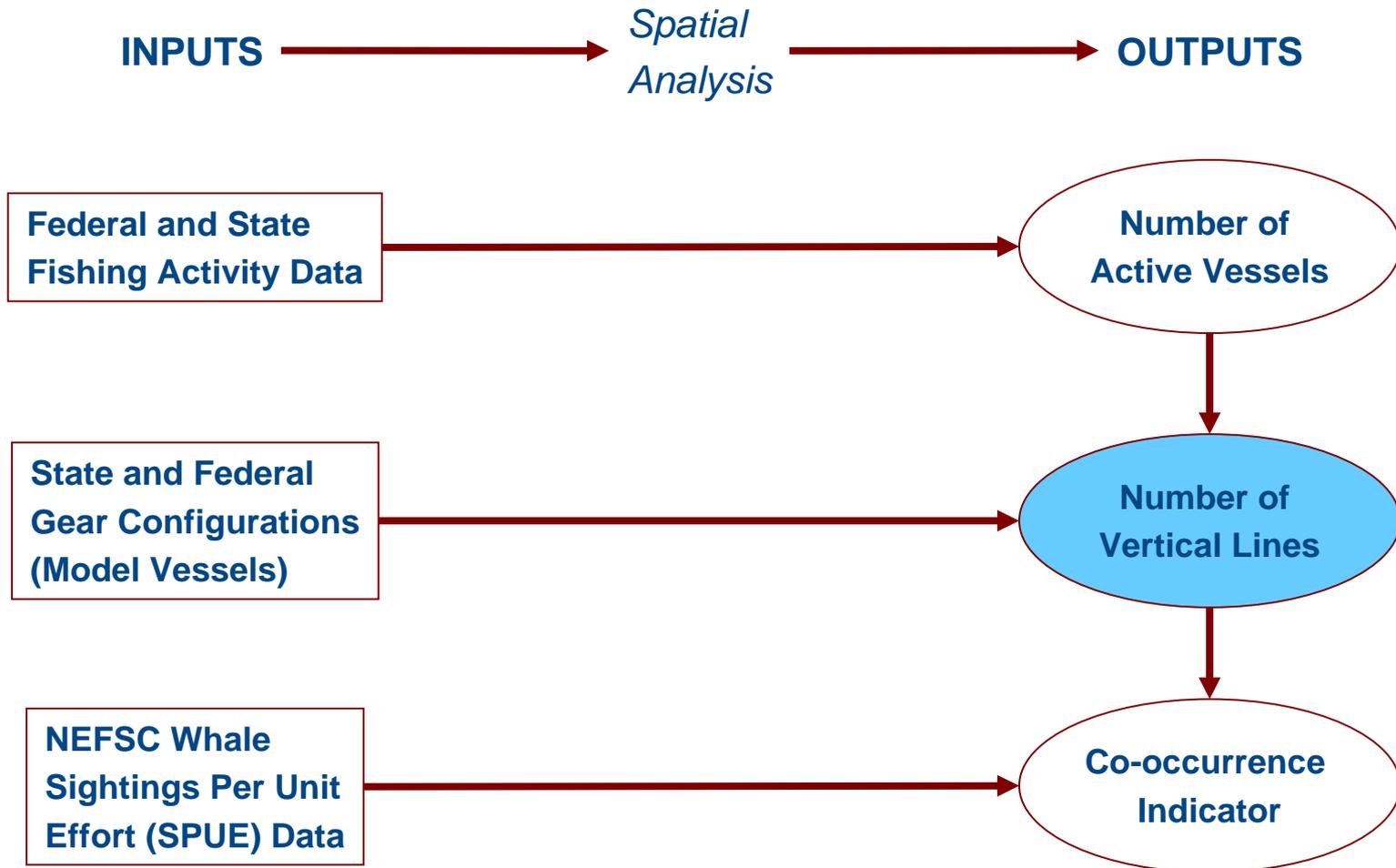
Average Annual Number of Active Vessels



General Observations

- Greatest concentration of vessels in state and nearshore waters off Maine, New Hampshire, and Massachusetts.
- Distribution of vessels within LMA 1 may be more varied than shown; many lobster vessels within LMA 1 are not subject to VTR requirements.
- Highest concentrations of vessels in summer and early fall.

Overview of Indicators



Vertical Line: Overview

- Estimate the location and number of vertical lines in the water
- Develop and use estimates of vertical lines fished by vessels within specific areas
- Account for variations in the amount of time that line soaks
- A model vessel describes the typical number of vertical lines fished by vessels it represents, defined by
 - Fishery (lobster trap/pot, gillnet, other trap/pot)
 - Location
 - Variations in regulatory requirements on activity or practices (i.e., trap limits)
 - Time of activity (divided by month)
- The model currently specifies over 100 model vessels.

Vertical Line: Overview

- To estimate number of vertical lines fished, we examine:
 - Lobster and Other Trap/Pot Fisheries
 - Number of traps fished
 - Number of traps per trawl
 - Number of endlines per trawl
 - Gillnet Fishery
 - Number of strings fished
 - Number of endlines per string
- Estimates based on information from:
 - NMFS gear experts
 - NMFS Observer data
 - State surveys
 - State gear experts

Vertical Line: Analysis Methods

1. Estimate the number of vertical lines per model vessel configuration

Example 1: A lobster model vessel:

- 600 traps fished by the model vessel
- 20 traps per trawl
- 2 endlines per trawl
- $600 \text{ traps} / 20 \text{ traps per trawl} = 30 \text{ trawls per vessel}$
- $2 \text{ endlines} \times 30 \text{ trawls} = \mathbf{60 \text{ endlines per vessel}}$

Example 2: A gillnet model vessel:

- 6 strings fished by the model vessel
- 2 endlines per string
- $6 \text{ strings per vessel} \times 2 \text{ endlines per string} = \mathbf{12 \text{ endlines per vessel}}$

Vertical Line: Analysis Methods

2. To account for seasonal variation in the number of traps or strings fished per vessel, each model vessel is also characterized by monthly scalars.
- For the month in which the model vessel is assumed to fish the highest number of traps or strings, the monthly scalar is set to one.
 - The monthly scalar for the other months of the year is indexed as a percentage of the peak month.
 - Example:
 - The highest number of traps fished by a hypothetical model vessel occurs in September, with 500 traps fished per vessel.
 - In March, when fishermen typically fish fewer traps, only 200 traps are fished per vessel. In this case, the monthly scalar for March would be 0.4 [= 200 / 500].

Vertical Line: Analysis Methods

3. Estimate the number of vessels represented by each model vessel (active vessels calculation)
4. Combine vertical line estimates with the number of active vessels represented by each model vessel

Example 1: Using the same lobster model vessel:

- 60 endlines per vessel
- 5 active vessels represented by the model vessel
- 60 endlines x 5 vessels = **300 endlines**

Example 2: Using the same gillnet model vessel:

- 12 endlines per vessel
- 5 active vessels represented by the model vessel
- 12 endlines x 5 vessels = **60 endlines**

Vertical Line: Analysis Methods

Also, need to consider the time that vertical line is in the water

- Potential for whale/gear interaction depends upon soak time
- Fisheries vary in terms of soaking and hauling practices

5. For each vessel and month, adjust for soak time

- Lobster and other trap/pot fisheries: if a vessel is active in any part of the month, we assume that all vertical line remains in the water throughout the month
- Gillnet fishery: seek to differentiate between vessels that leave gear in the water between trips and those that pull their gear
 - If gear set time is less than 24 hours per trip, we assume that fishermen leave gillnet in the water for the entire month

Vertical Line: Analysis Methods

Example 1: Lobster vessel where gear remains in water all month

- 60 endlines per vessel
- Soak time = 100%
- 60 endlines x 100% = **60 endlines per vessel**

Example 2a: Gillnet vessel where gear remains in water between trips

- 12 endlines
- Soak time = 100%
- 12 endlines x 100% = **12 endlines per vessel**

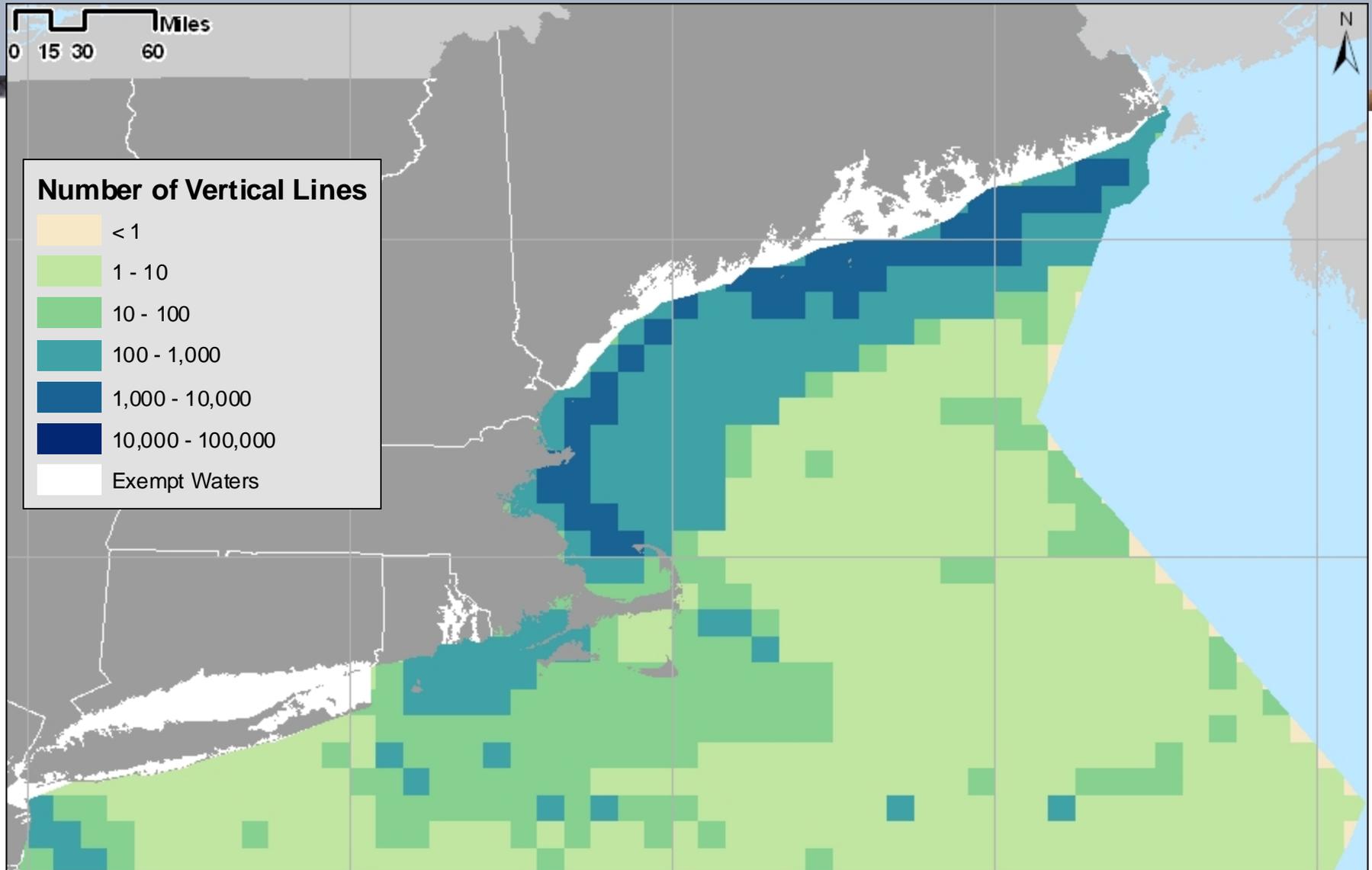
Example 2b: Gillnet vessel where gear is removed between trips

- Assume a cumulative soak time of 480 hours, which equals 20 days
- 480 Hours = 20 days = 0.67 months
- Soak time = 67%
- 12 endlines x 0.67 = **8 endlines per vessel**

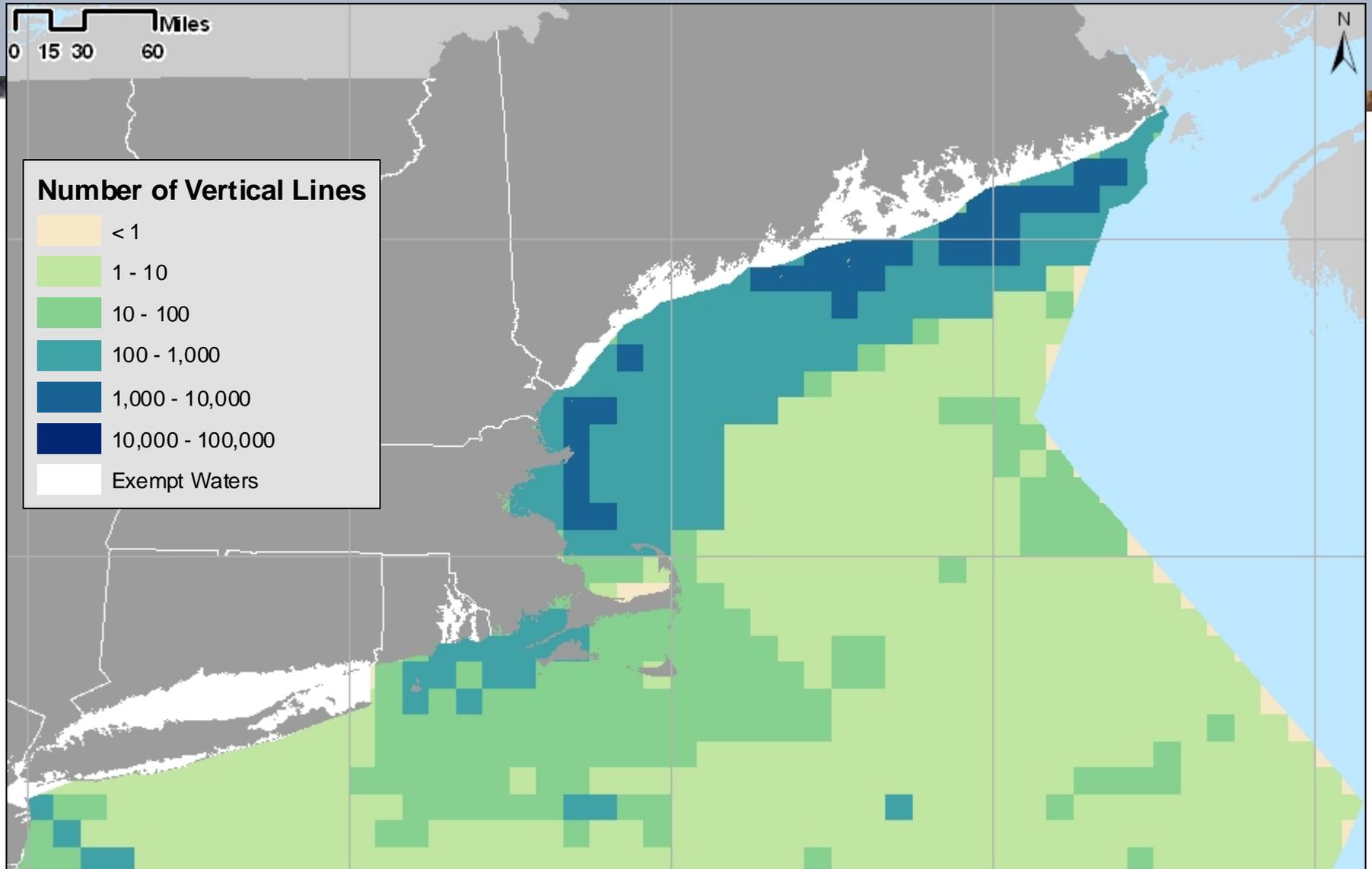
Model Vessel Configurations

- Federal waters
 - Lobster: based on discussions with NMFS gear experts
 - Nearshore (excluding Maine nearshore): 700 traps, 15 traps/trawl, 2 endlines/ trawl
 - Offshore: 1200 traps, 40 traps/trawl, 2 endlines/trawl
 - Gillnet: based on Northeast Observer data (2000-2008)
 - Northeast: 3 Strings, 2 endlines/string
 - Other trap/pot: based on discussions with NMFS gear experts
 - Nearshore: equal distribution of hagfish, black sea bass, shrimp, scup, conch/whelk
 - Offshore: equal distribution of hagfish, black sea bass, scup, conch/whelk, red crab
- State waters
 - State-specific studies
 - State gear experts

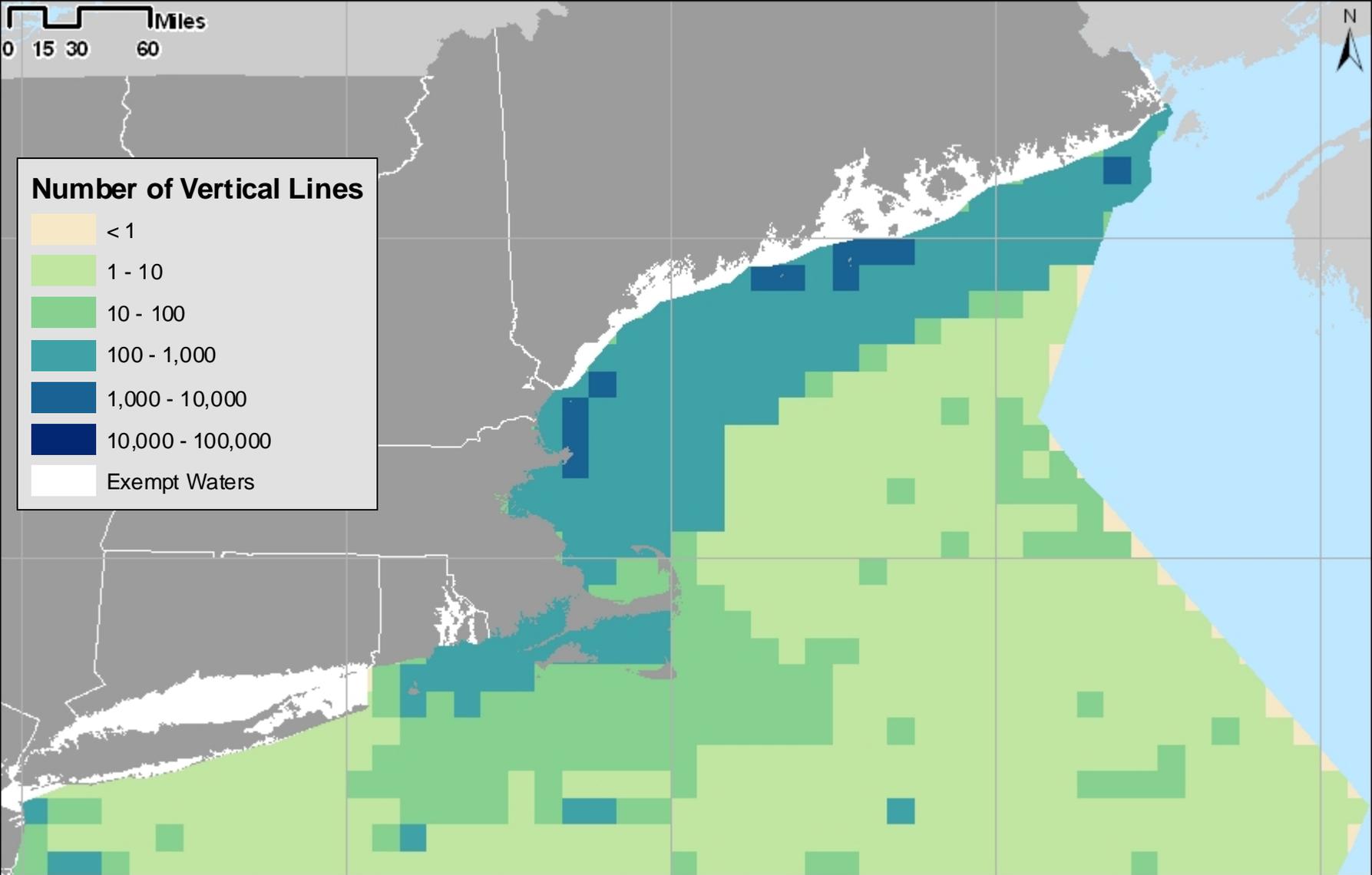
January 2008 Vertical Line



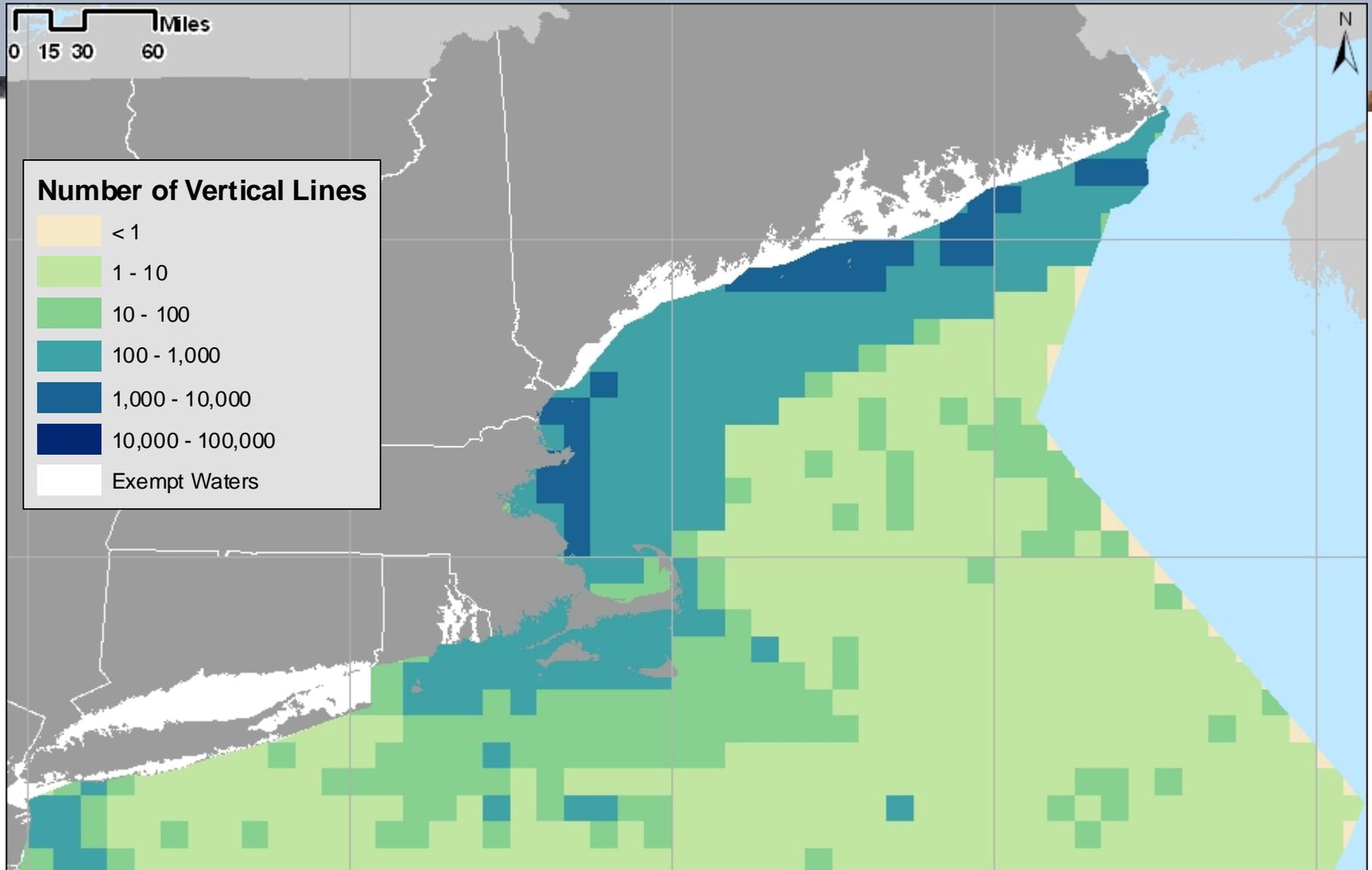
February 2008 Vertical Line



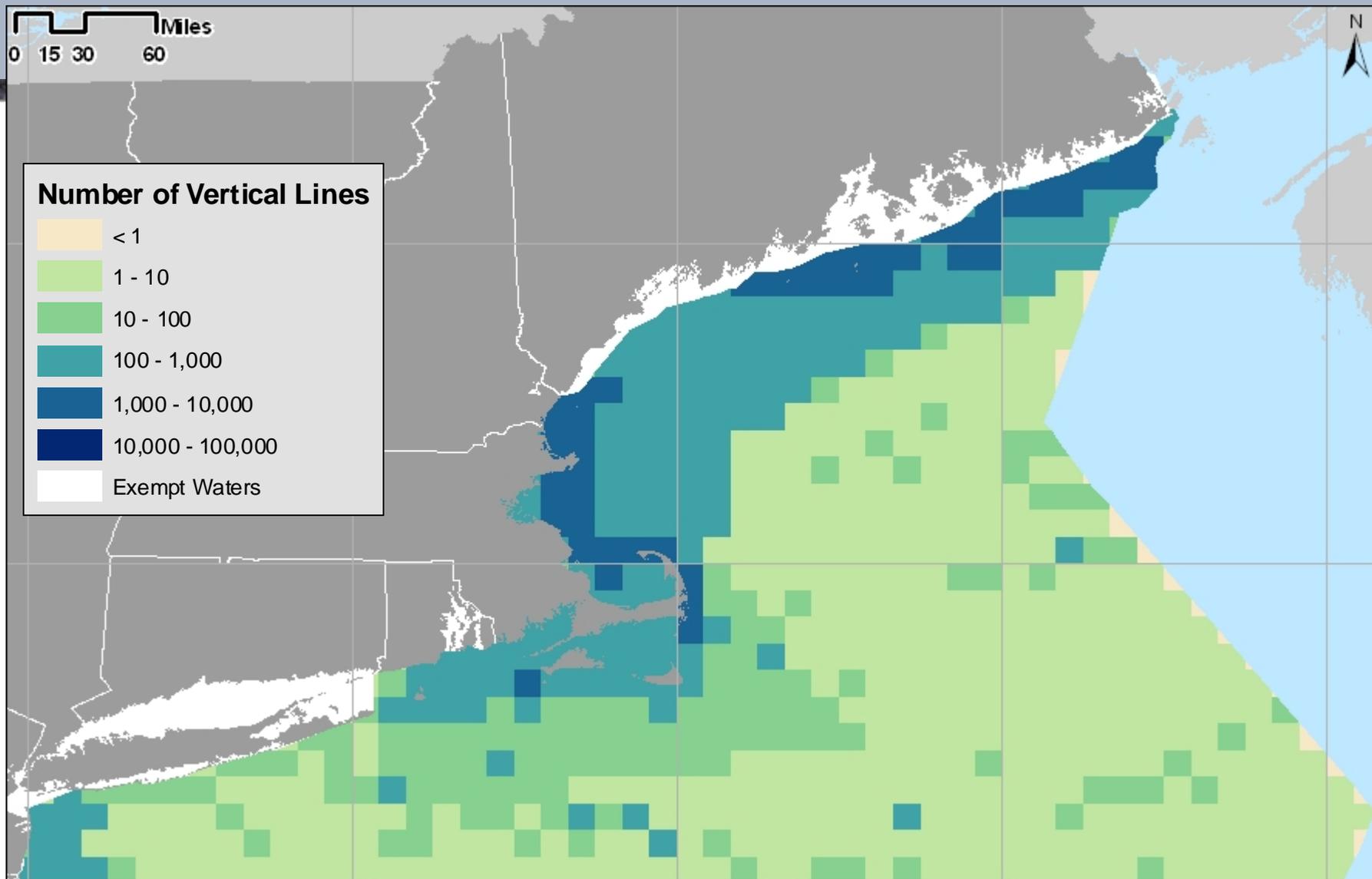
March 2008 Vertical Line



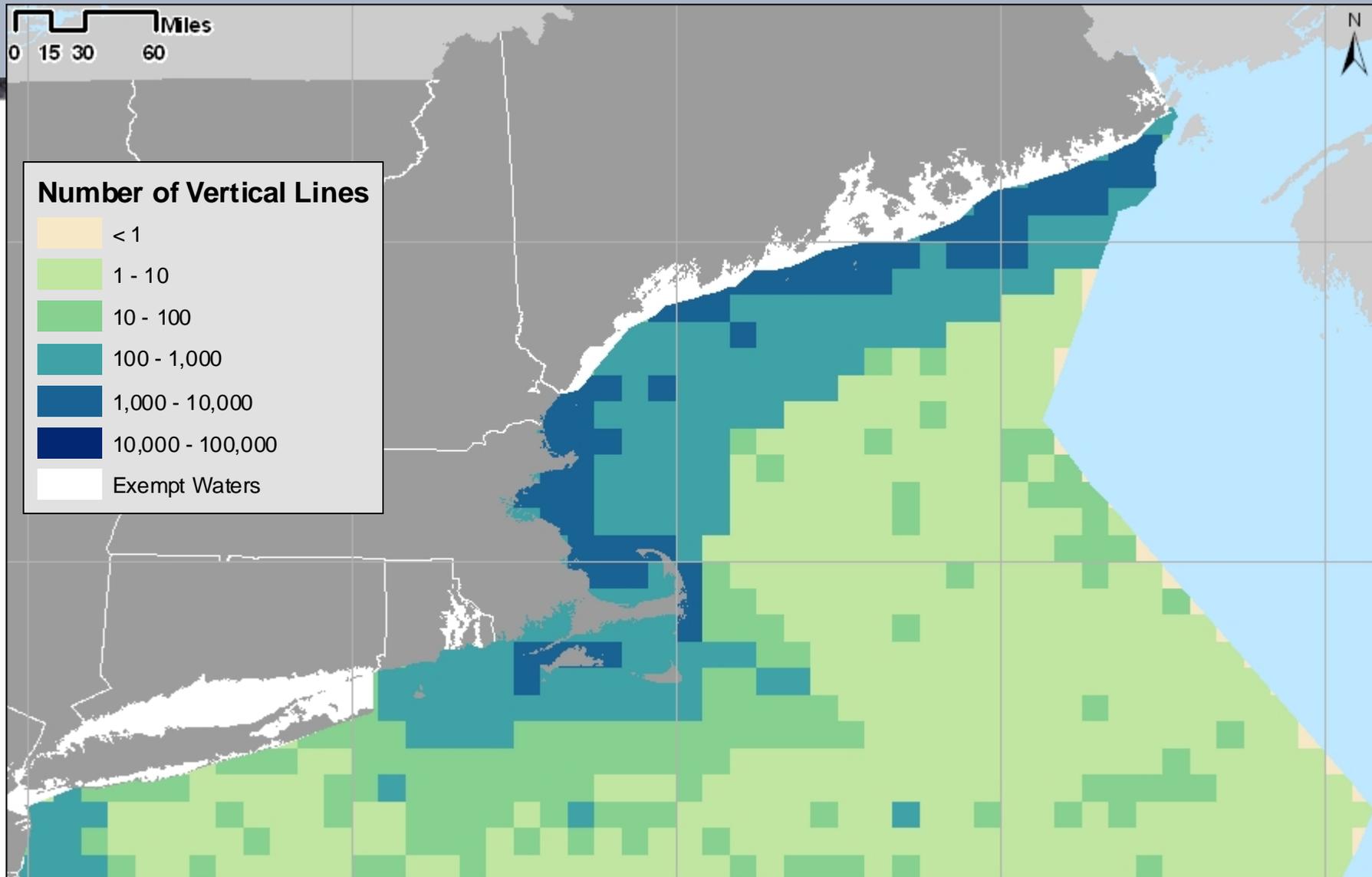
April 2008 Vertical Line



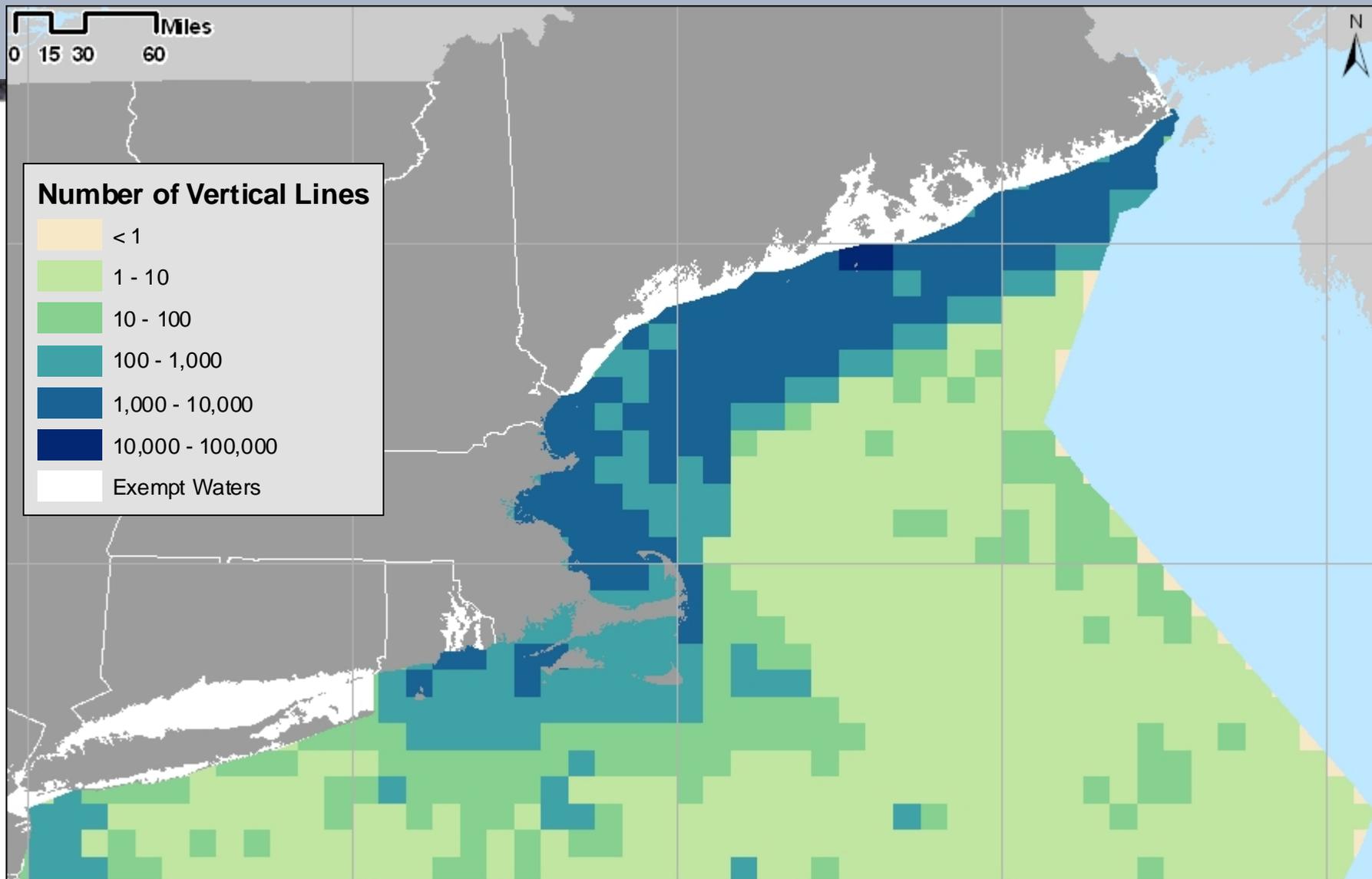
May 2008 Vertical Line



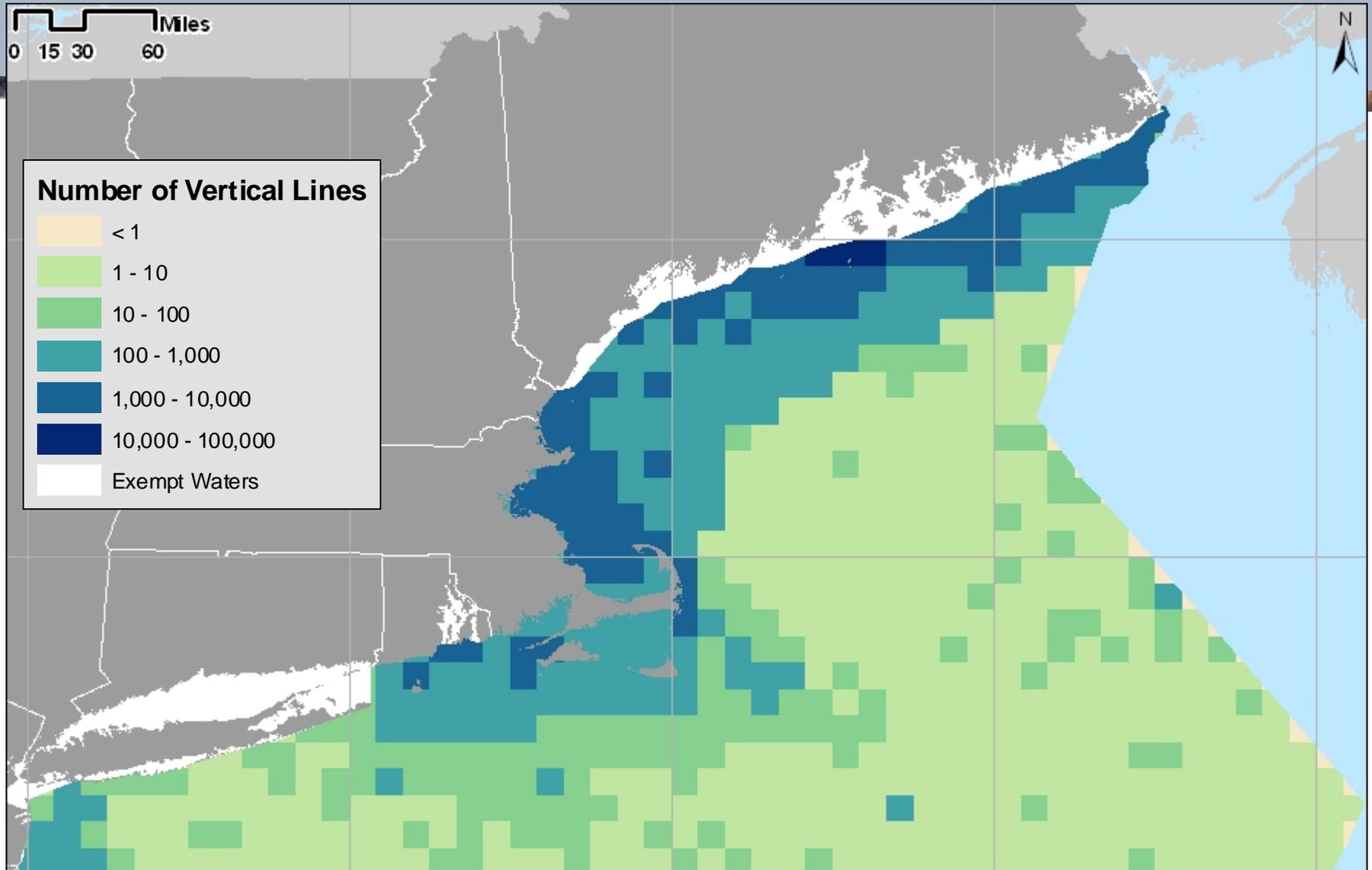
June 2008 Vertical Line



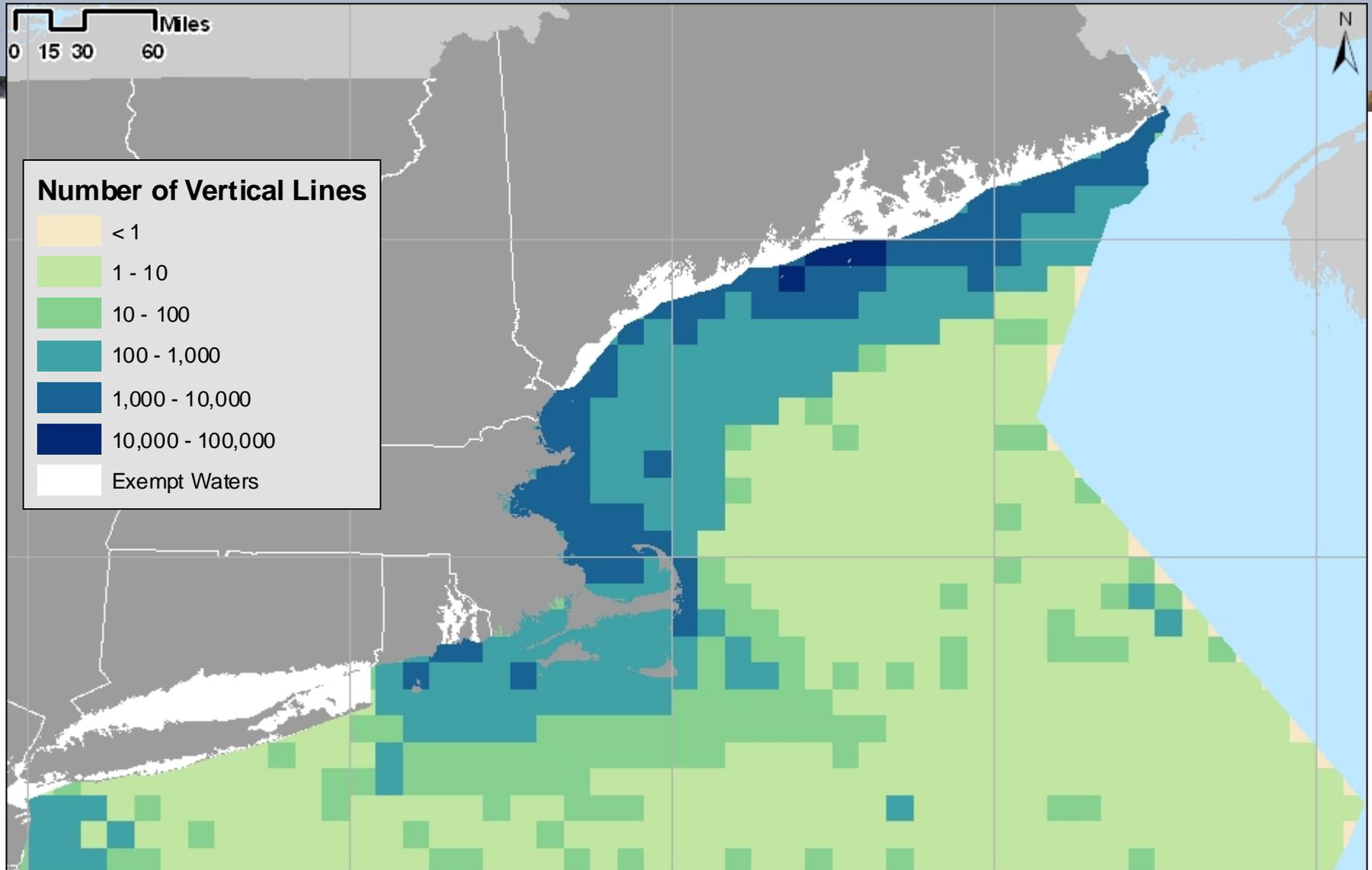
July 2008 Vertical Line



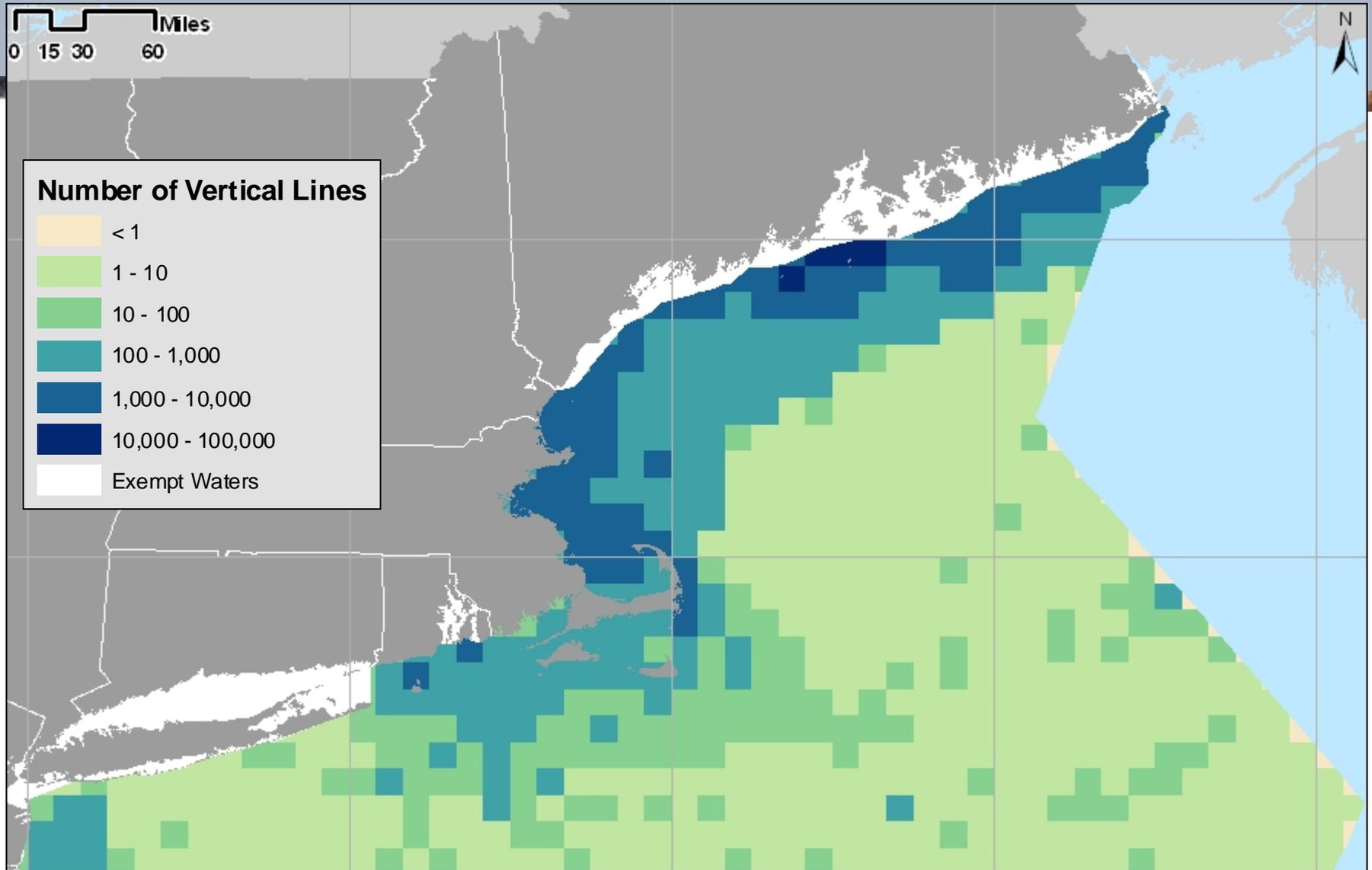
August 2008 Vertical Line



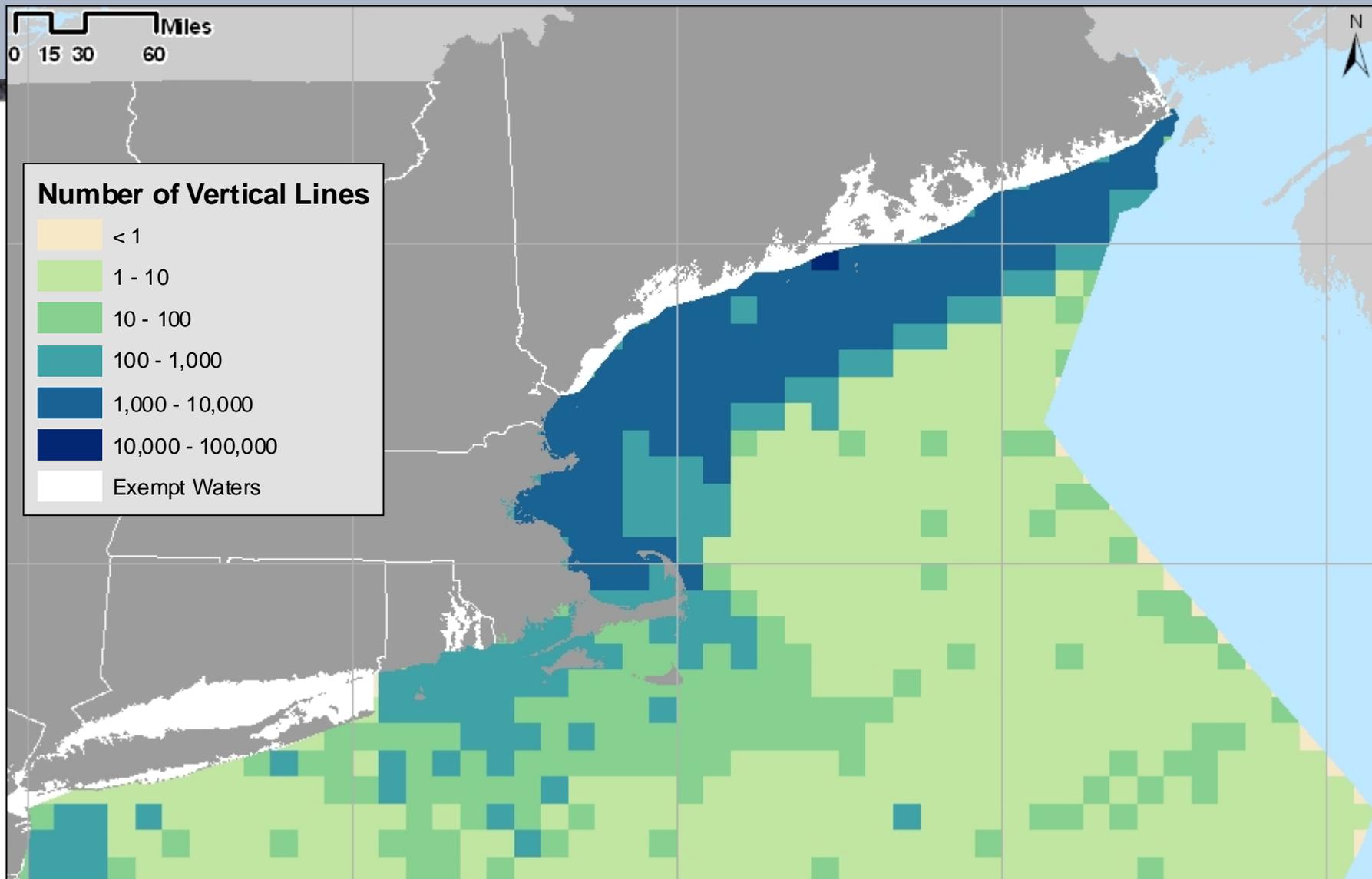
September 2008 Vertical Line



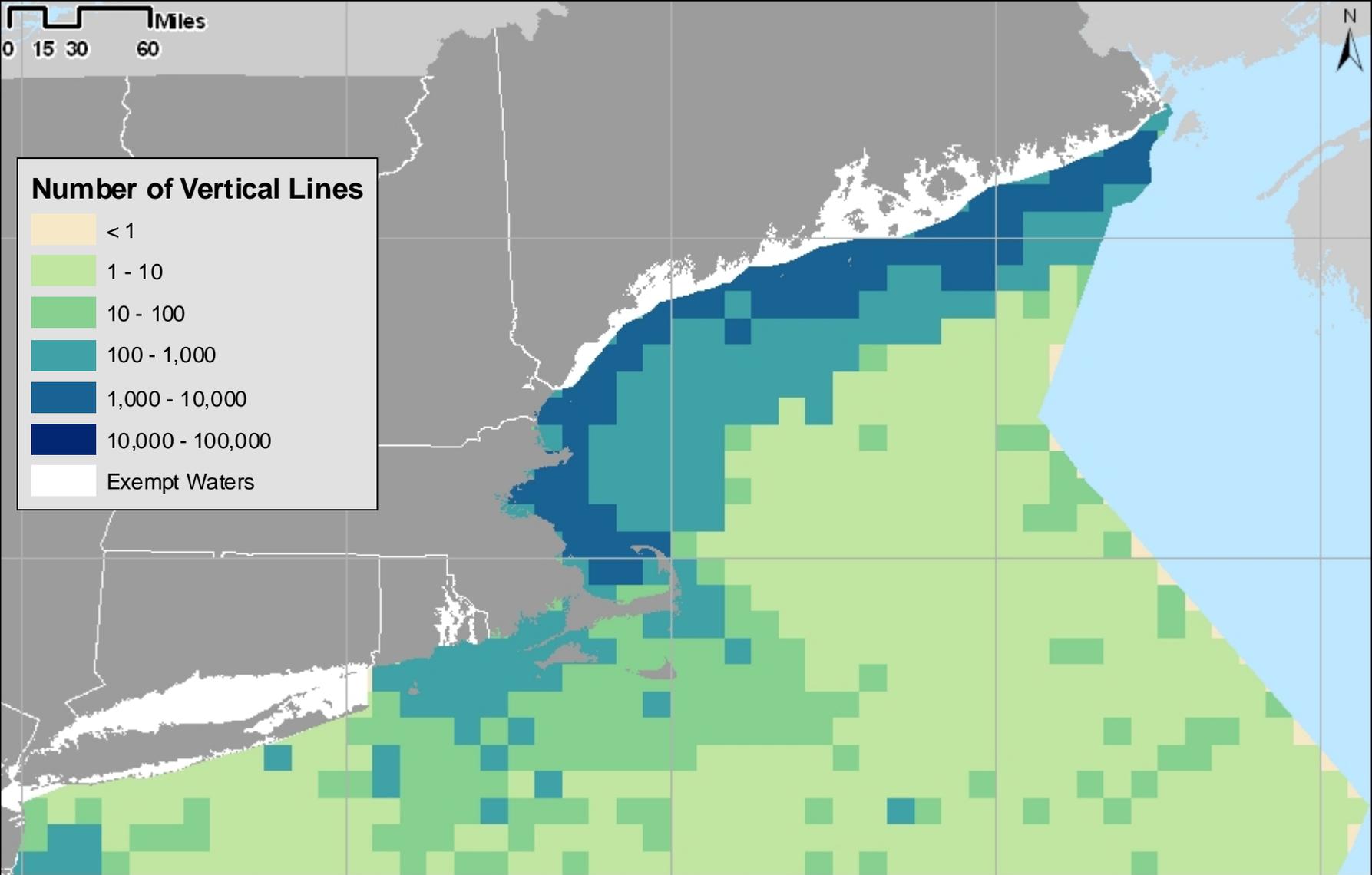
October 2008 Vertical Line



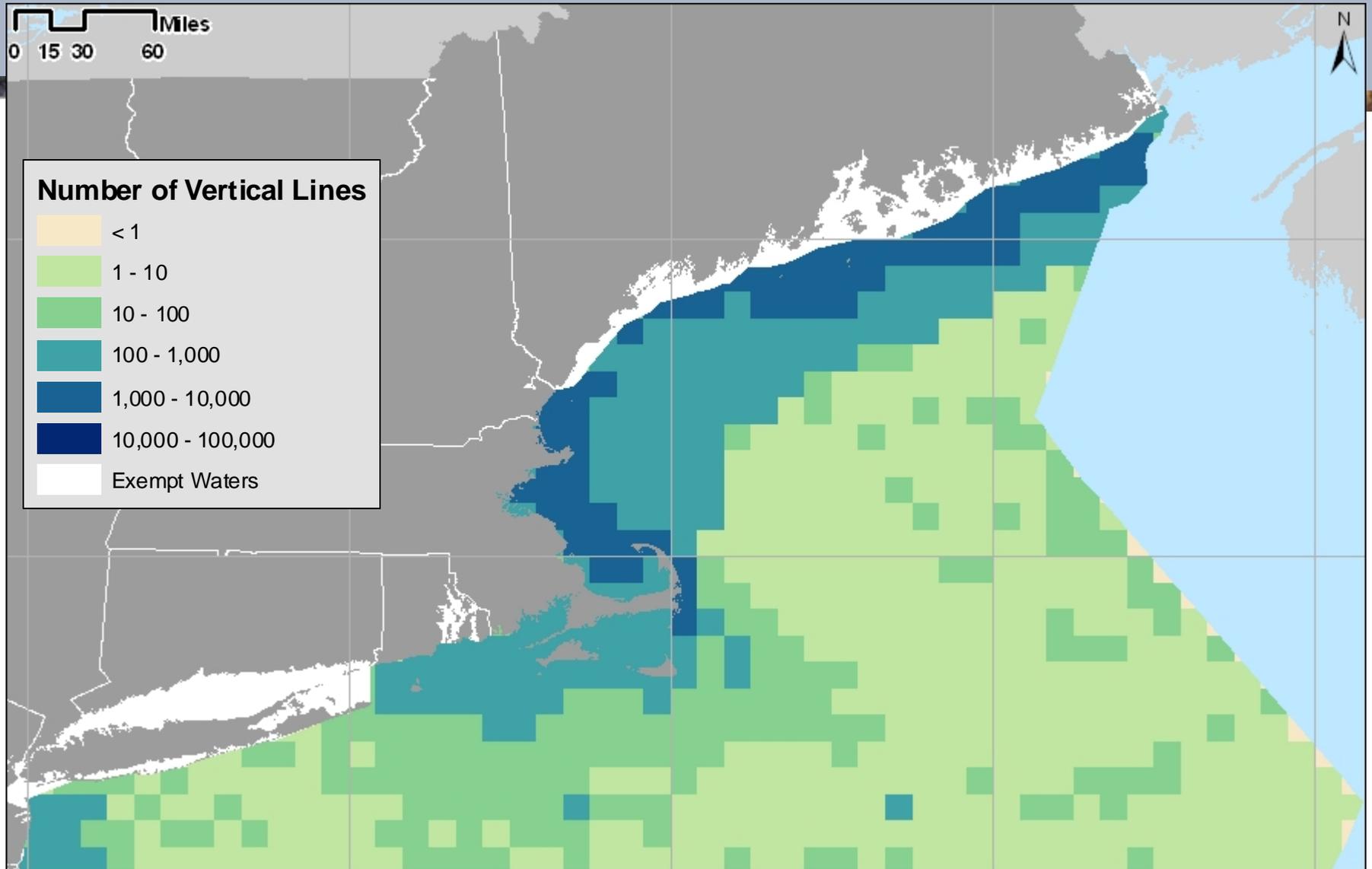
November 2008 Vertical Line



December 2008 Vertical Line

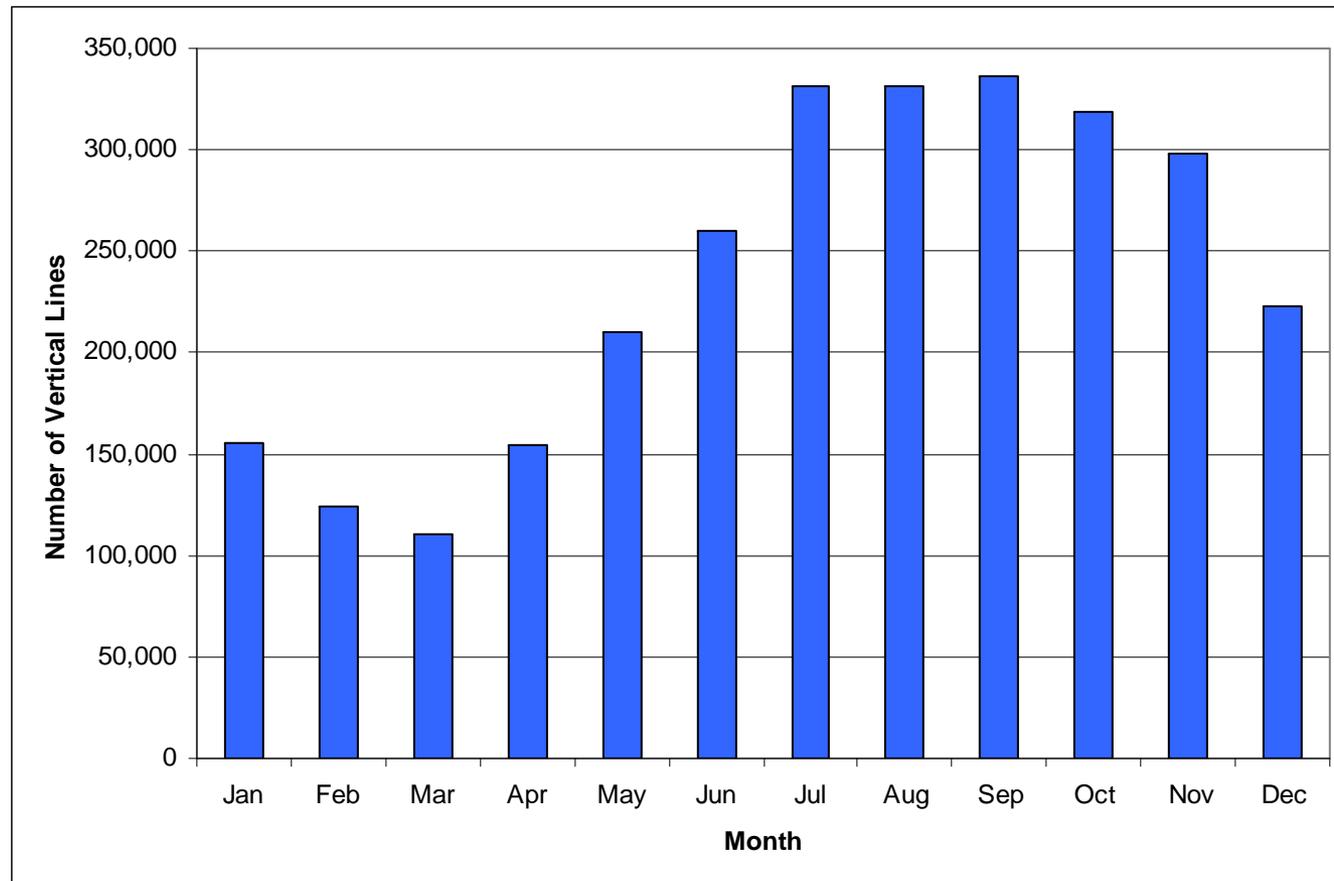


Average Annual Number of Vertical Lines



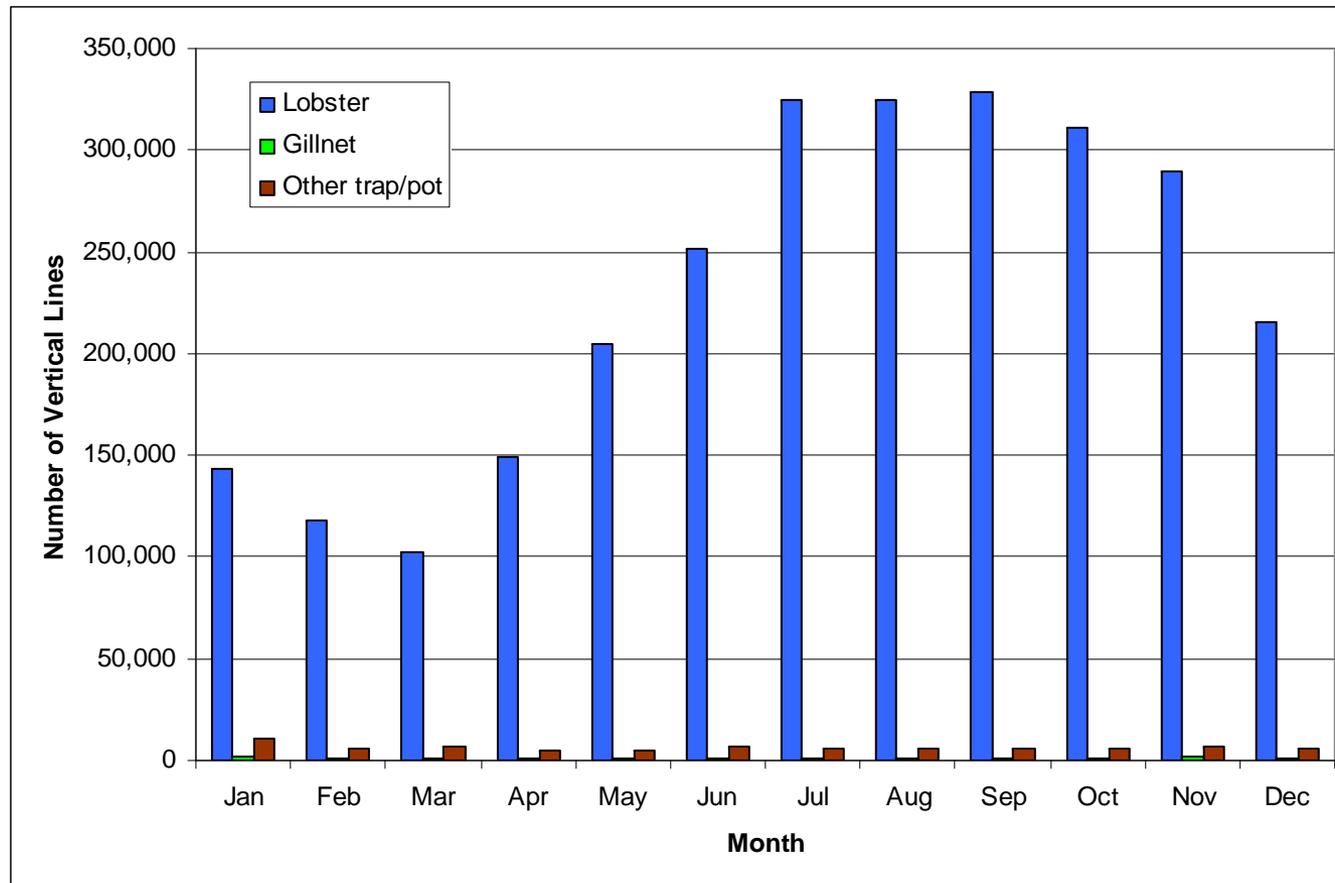
Baseline Results: Vertical Line

Number of Vertical Lines in Northeast
Non-Exempt Waters (2008)



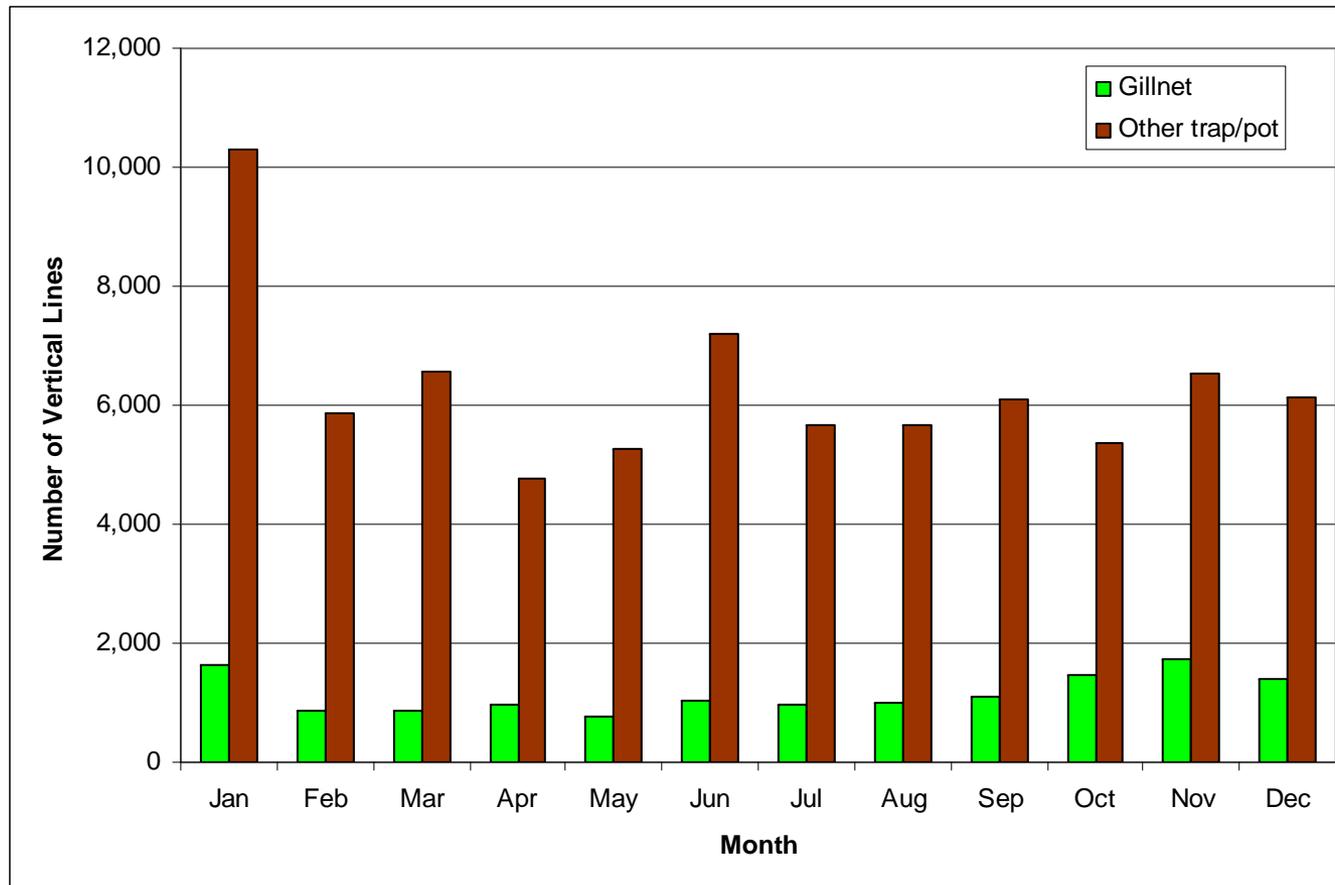
Baseline Results: Vertical Line

Number of Vertical Lines in Northeast Non-Exempt Waters (2008) by Fishery



Baseline Results: Vertical Line

Number of Vertical Lines in Northeast
Non-Exempt Waters (2008) by Fishery (Excluding Lobster)



General Observations

- Greatest concentration of vertical line in state and nearshore waters off Maine, New Hampshire, and Massachusetts.
- Distribution of gear within LMA 1 may be more varied than shown; many lobster vessels within LMA 1 are not subject to VTR requirements.
- Greatest concentration of vertical line found between July and October.
- Lobster fishery contributes the highest concentration of vertical line.