

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

Prepared for Atlantic Large Whale Take Reduction Team  
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Funded by:  
NMFS / Northeast Regional Office

Prepared by:

**IEC**

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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
  - Present 2008 baseline results
- Discuss status of state data gathering and the use of state data within the model
- Provide update on latest NARWC Whale Sightings per Unit Effort (SPUE) data
- Discuss the development of the whale-vertical line co-occurrence indicator

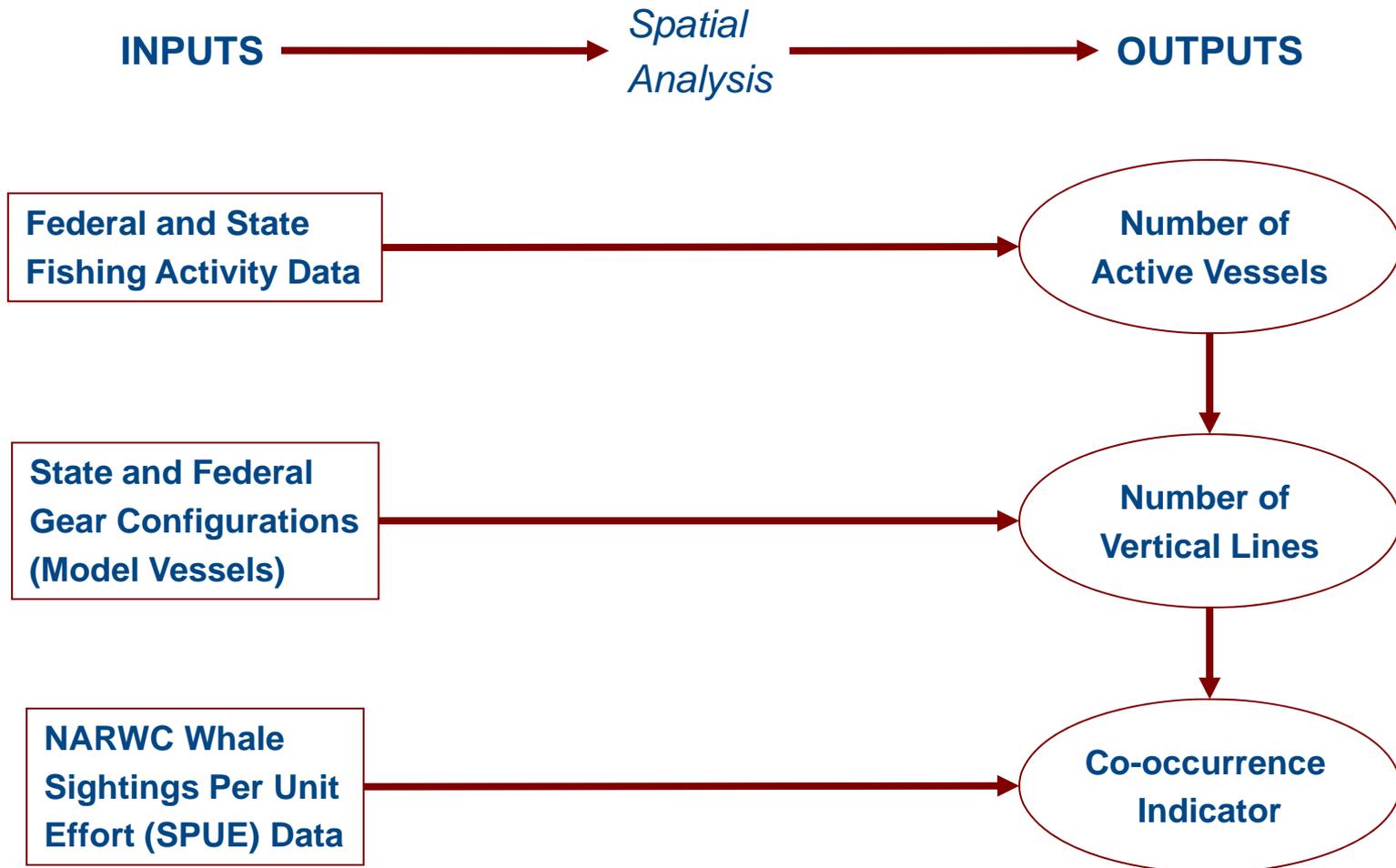
# Review of Model's Scope and Objectives

- 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 south of 40° N Latitude
- Temporal scope: 2000 – 2008 monthly outputs ~ focus on 2008 as baseline

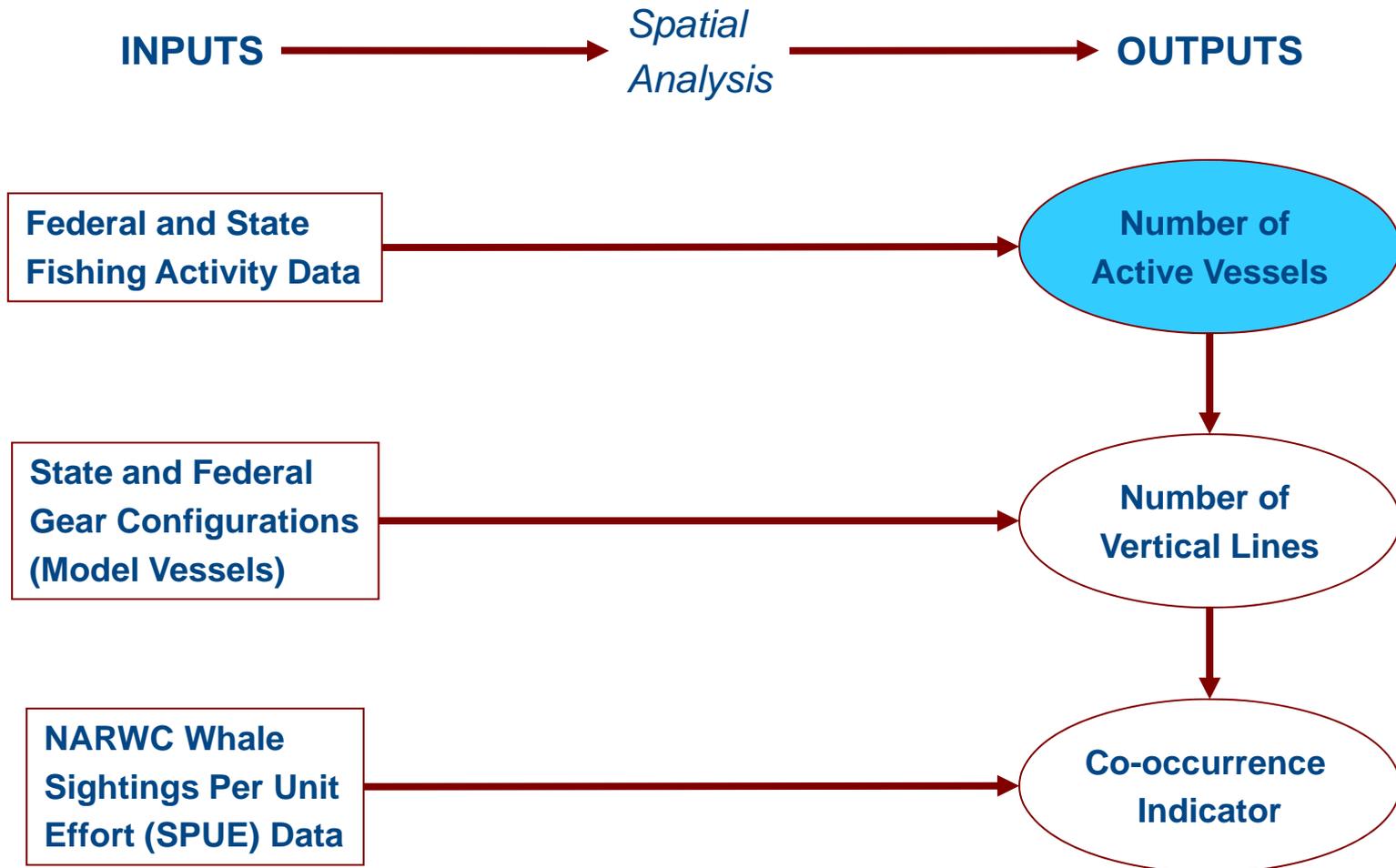
# Model Development Process

- 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
  - Develop capability to evaluate potential management scenarios

# Overview of Indicators



# Overview of Indicators



# Active Vessels: Data Sources

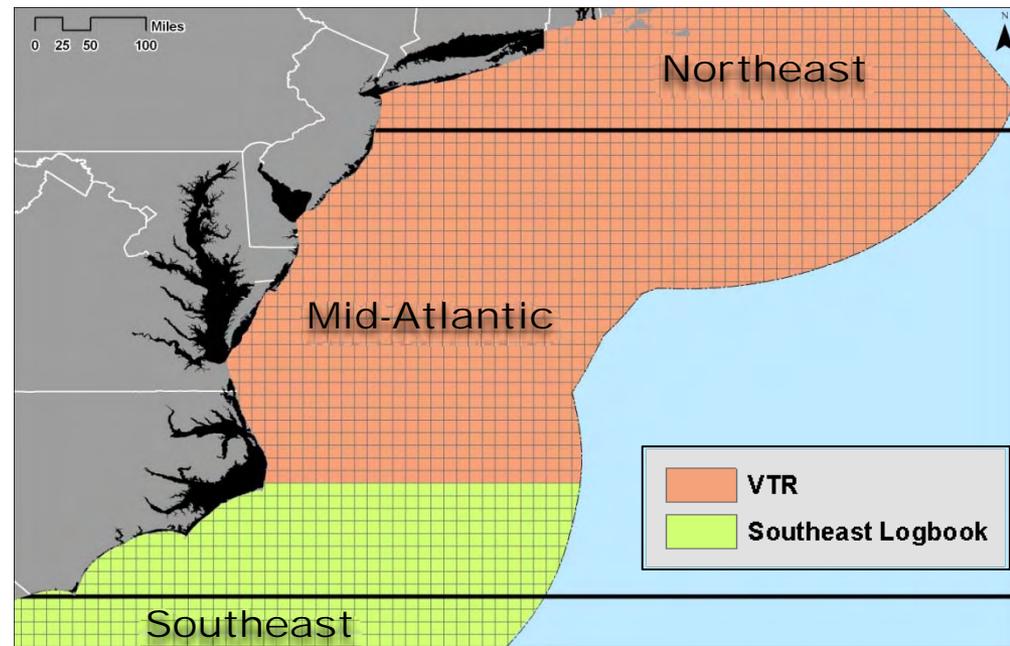
- Federal waters
  - Northeast Vessel Trip Reporting System (VTR)
    - Covers waters North of Cape Hatteras, NC
    - Includes activity from lobster trap/pot, other trap/pot, and gillnet fisheries
    - Vessels report average fishing location per trip (longitude/latitude)
  - NMFS permit data (Northeast only)
  - NMFS Southeast Logbook
    - South of Cape Hatteras, North Carolina (some overlap with VTR)
    - Includes other trap/pot and gillnet fisheries (little to no American lobster trap/pot activity)
    - Fishermen report activity using 1-degree square grids
- State waters
  - Data varies by state

# Active Vessels: VTR Analysis

## Limitations of VTR

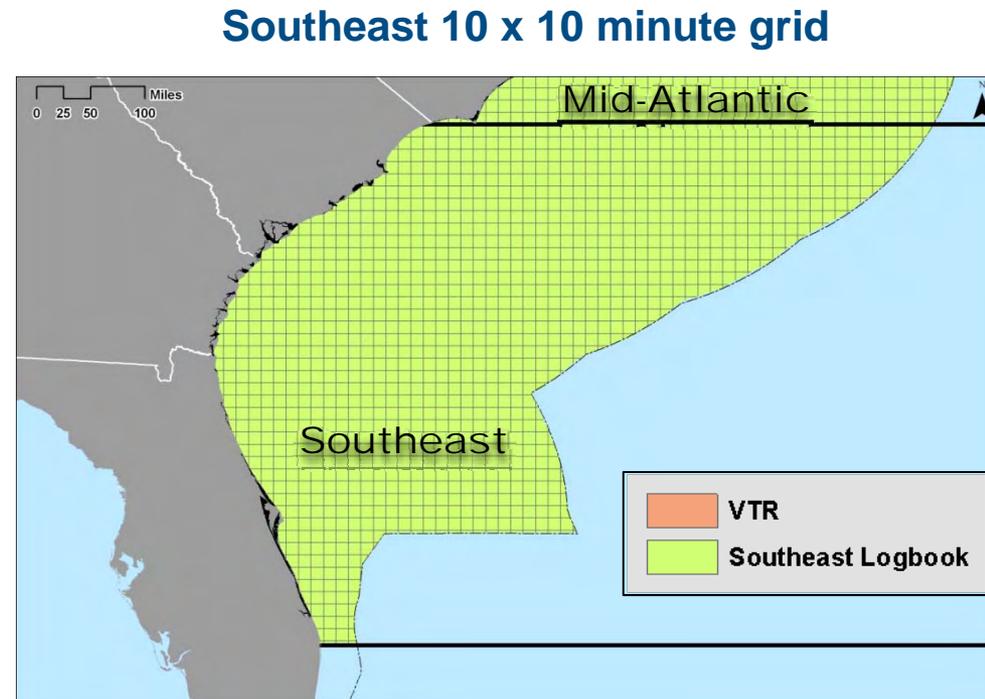
- Several groups not required to submit VTR reports, including:
  - Fishermen who hold only a federal lobster permit
  - Fishermen who hold only state fishing permits
- Activity extends beyond the single point reported in VTR
  - We summarize activity by using a grid model
  - Each cell is 1-minute by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

Mid-Atlantic 10 x 10 minute grid



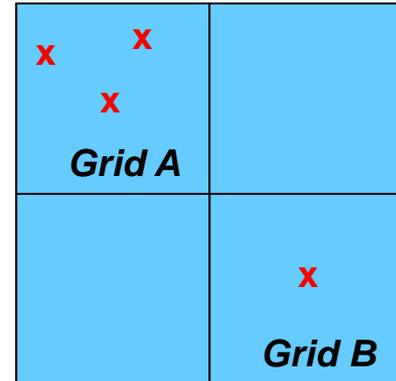
# Active Vessels: SE Logbook Analysis

- Limitations of SE Logbook
  - Fishing activity only reported to 1-degree square area
    - We summarize activity by using a grid model
    - Apportion activity to 10-minute by 10-minute grid for mapping to be consistent with Northeast/Mid-Atlantic and whale SPUE data
  - Fishermen holding only state permits are not required to file Logbook reports
    - Conduct state-specific data collection



# Active Vessels: VTR & Southeast Logbook 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

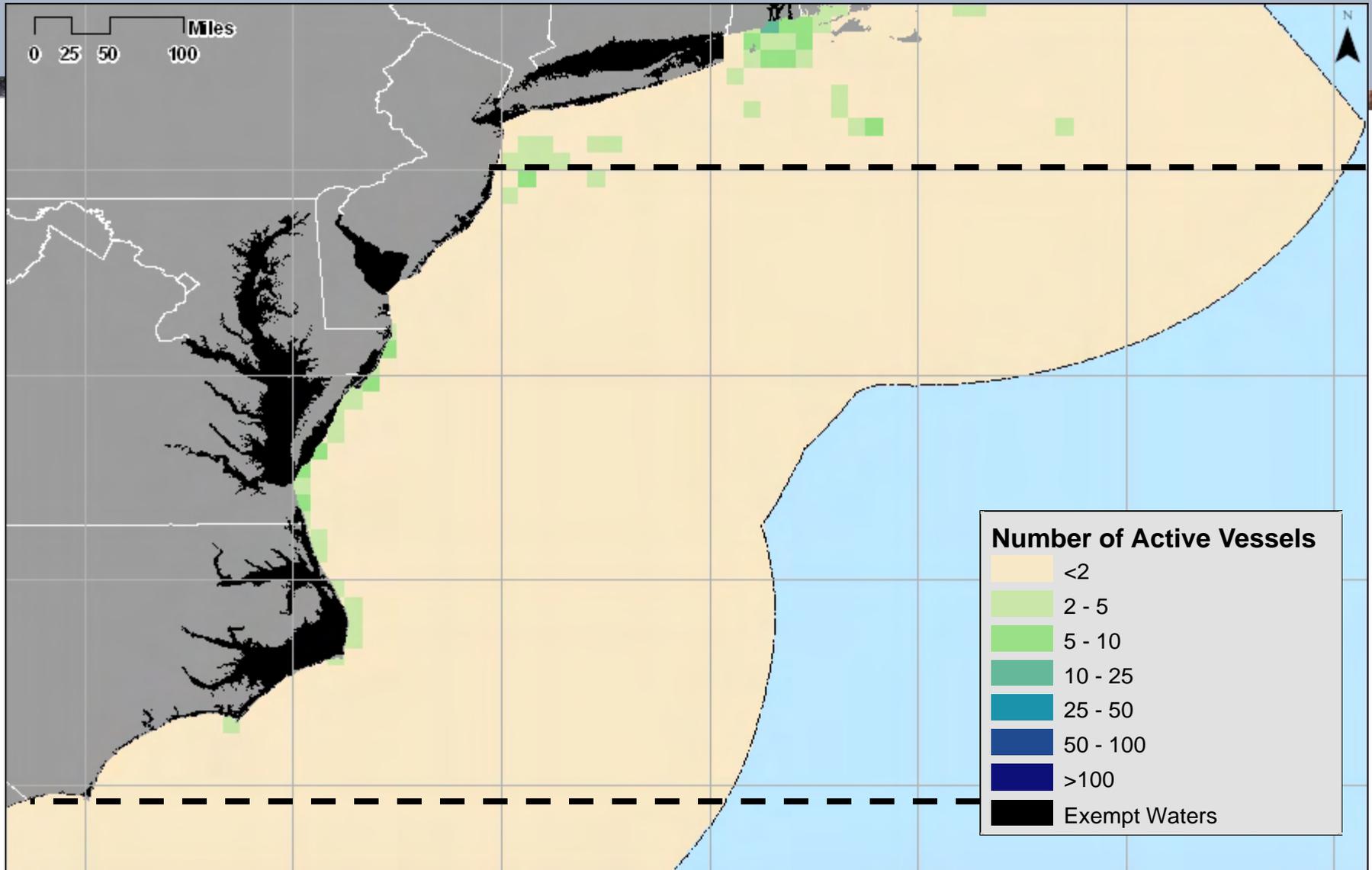
## Hypothetical Example:

- 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 vessels in GRID A
  - 0.25 vessels in GRID B

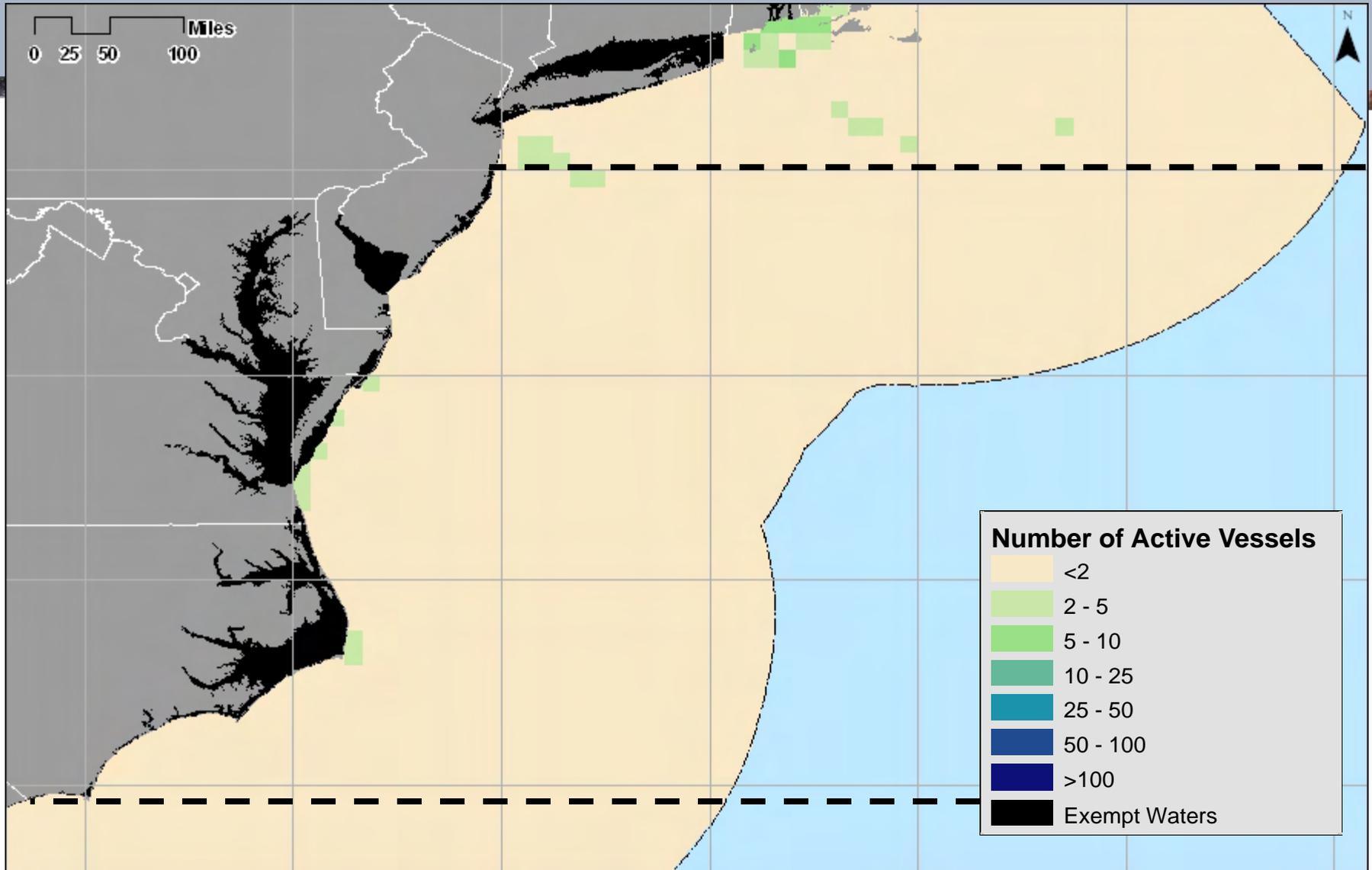
# Active Vessels: State-Permitted Vessels

- State-specific methods for determining the number of active vessels in state waters
- Number of state vessels incorporated by distributing activity across cells within state fishing areas
- To ensure that we only count those vessels that fish in areas subject to the ALWTRP, we exclude vessels fishing in exempt waters
- In the process of revising estimates of activity in Florida exempt waters

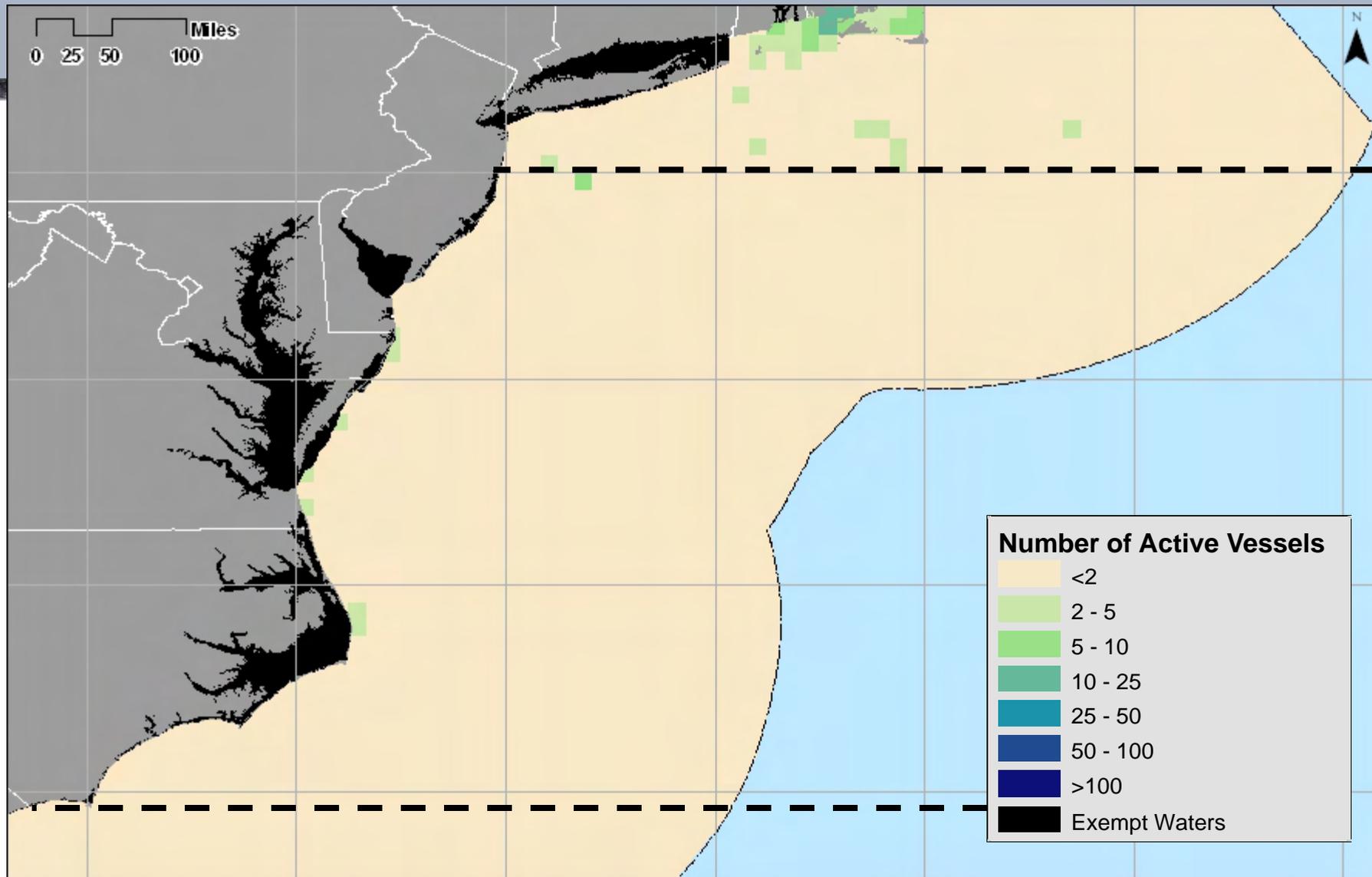
# January 2008 Active Vessels: Mid-Atlantic



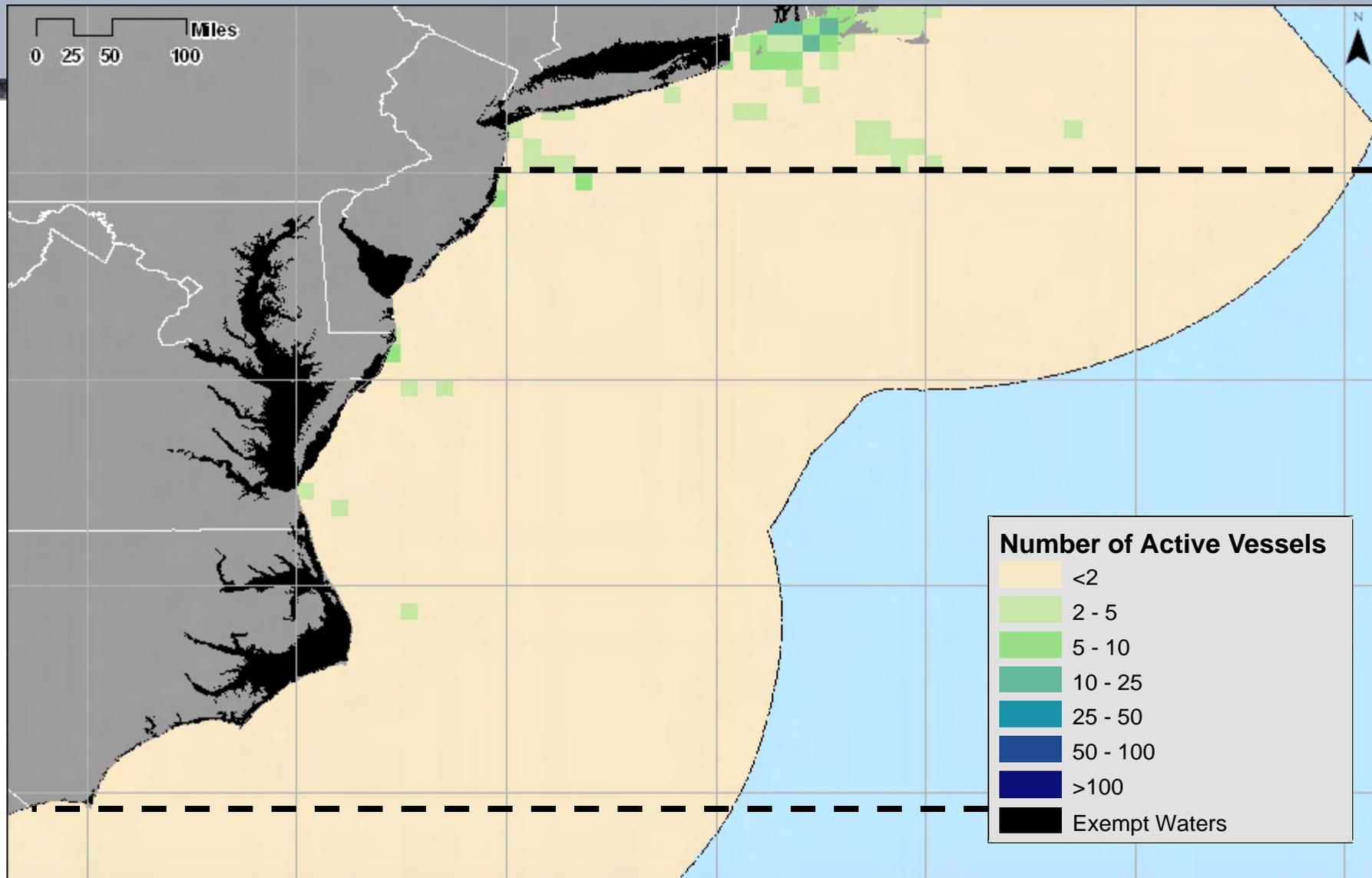
# February 2008 Active Vessels: Mid-Atlantic



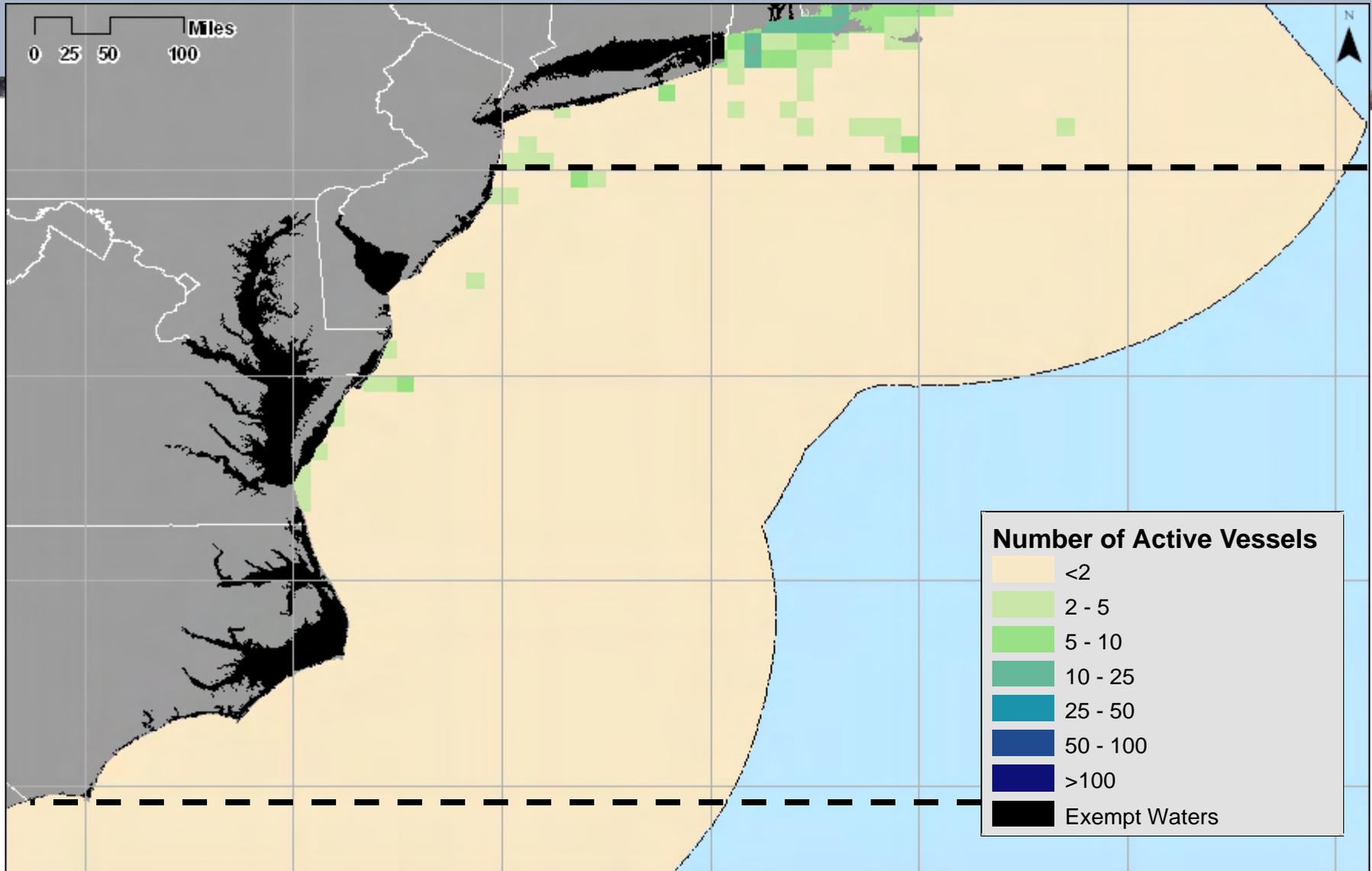
# March 2008 Active Vessels: Mid-Atlantic



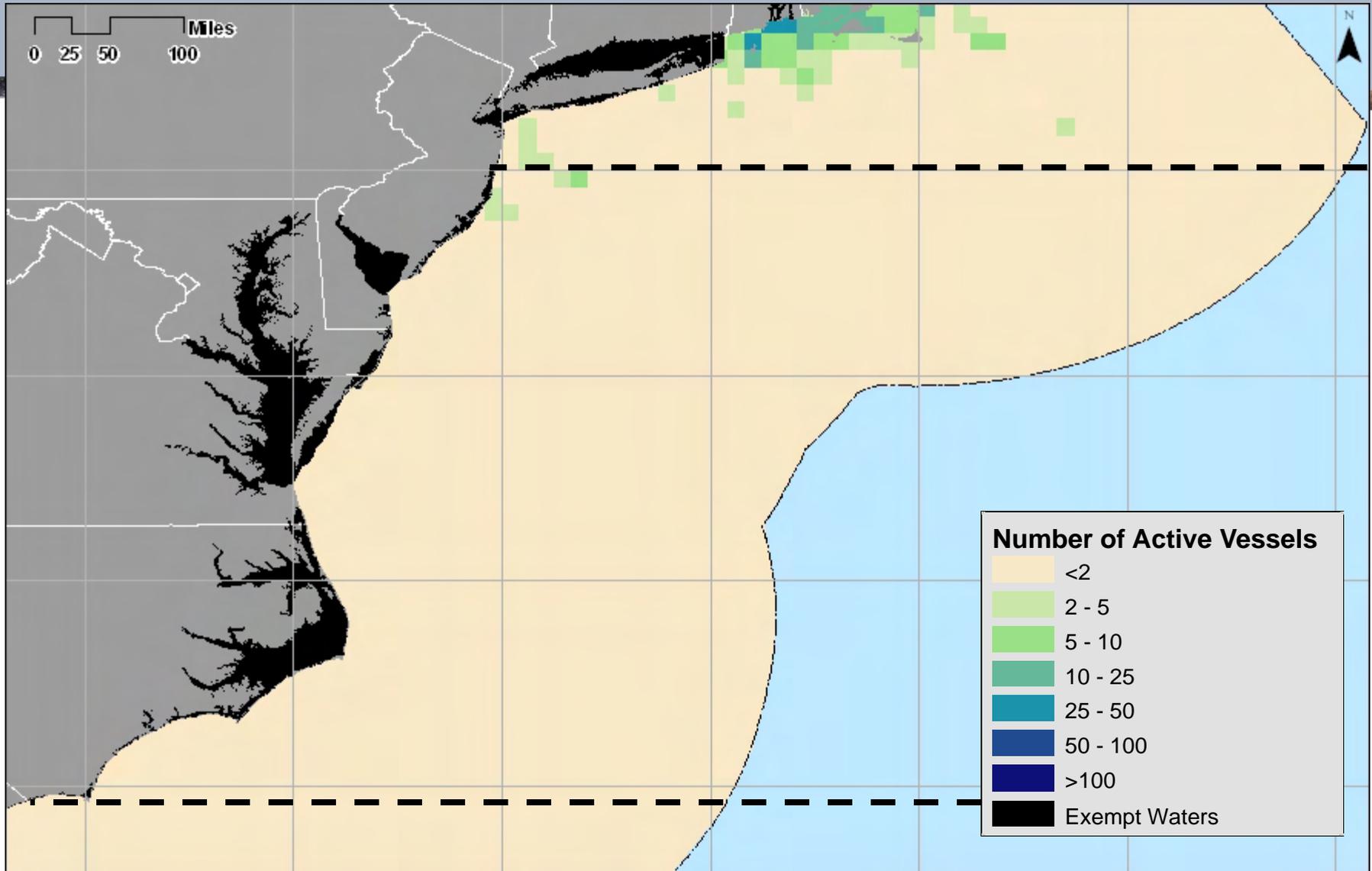
# April 2008 Active Vessels: Mid-Atlantic



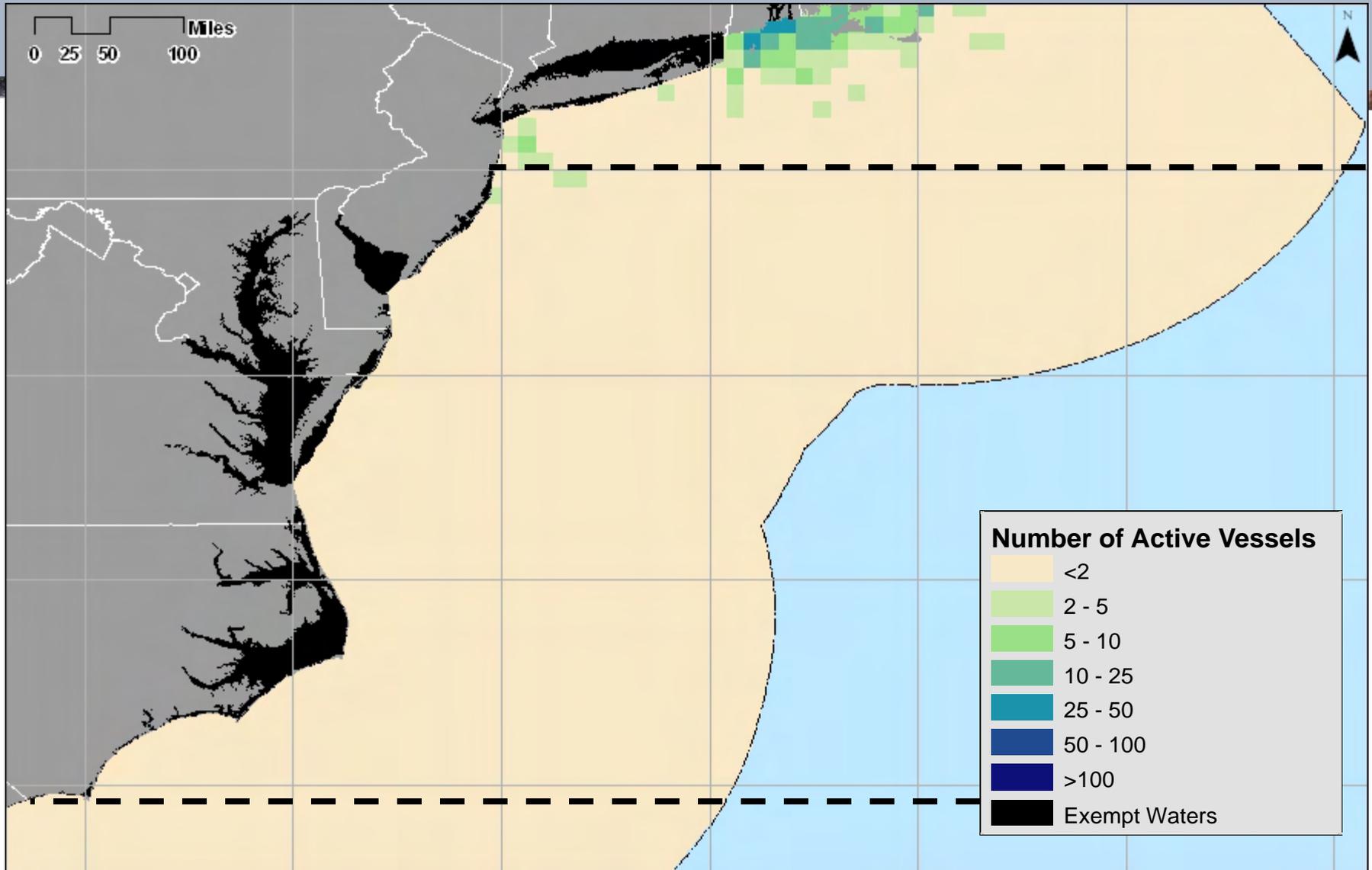
# May 2008 Active Vessels: Mid-Atlantic



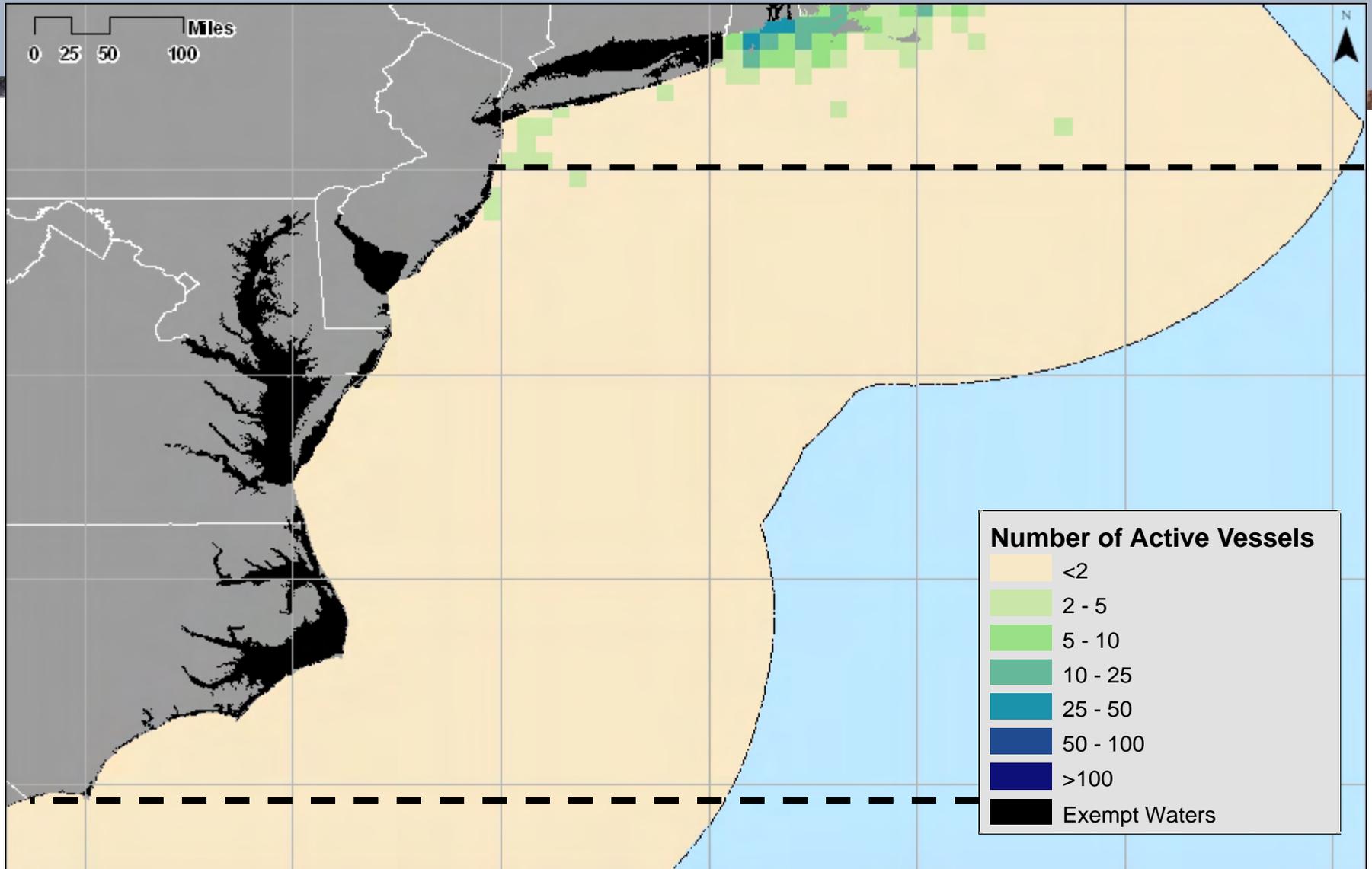
# June 2008 Active Vessels: Mid-Atlantic



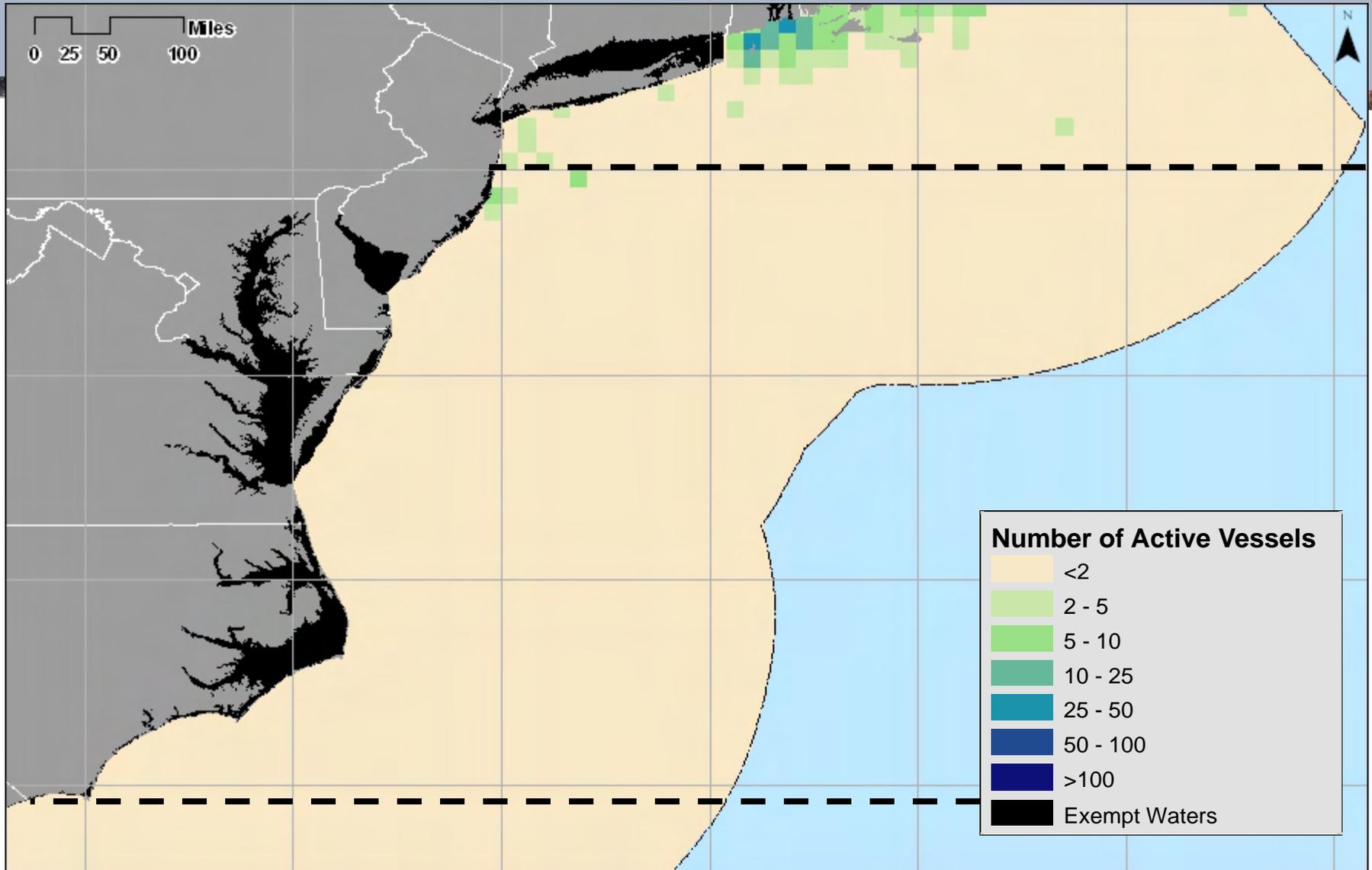
# July 2008 Active Vessels: Mid-Atlantic



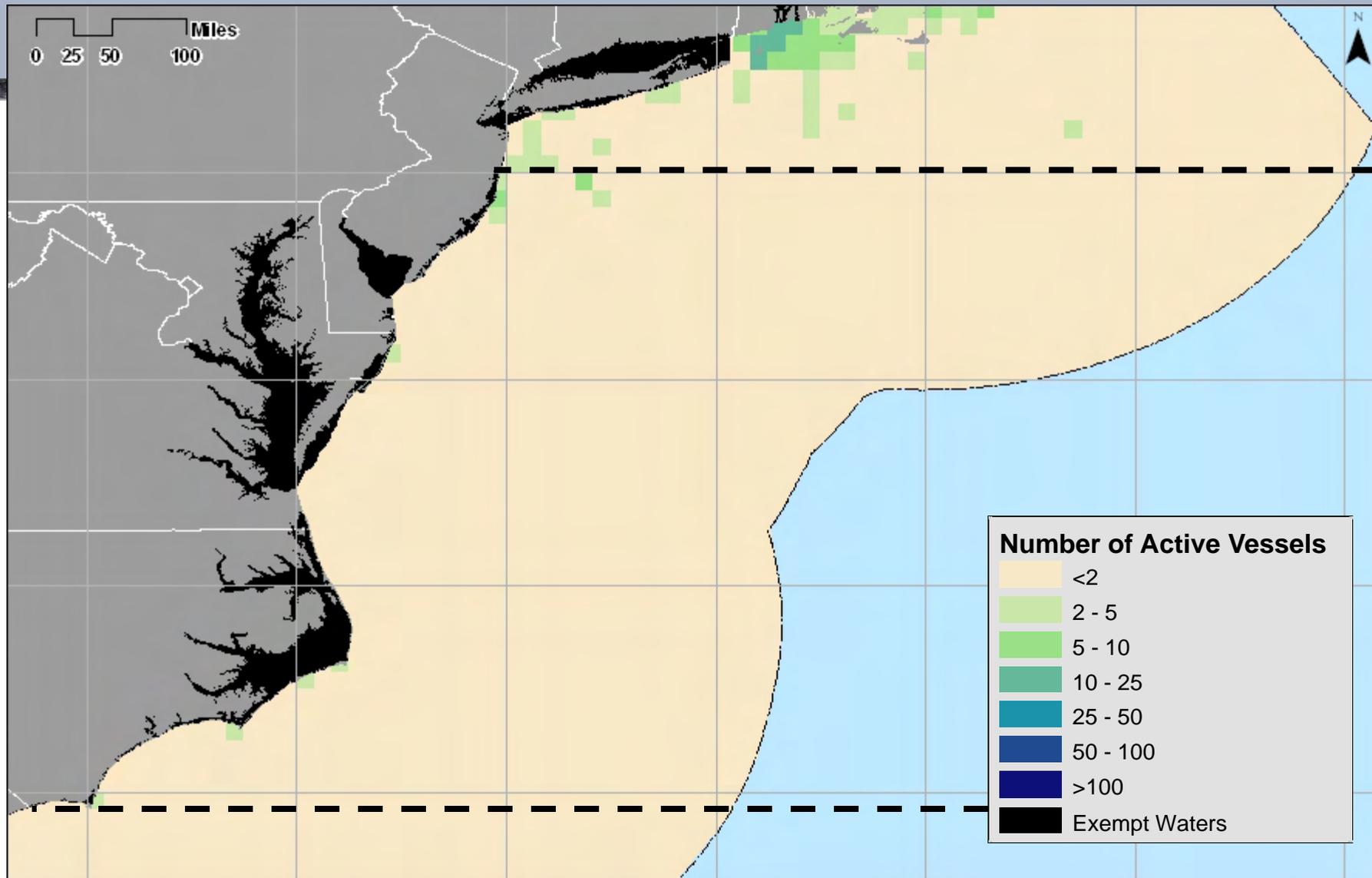
# August 2008 Active Vessels: Mid-Atlantic



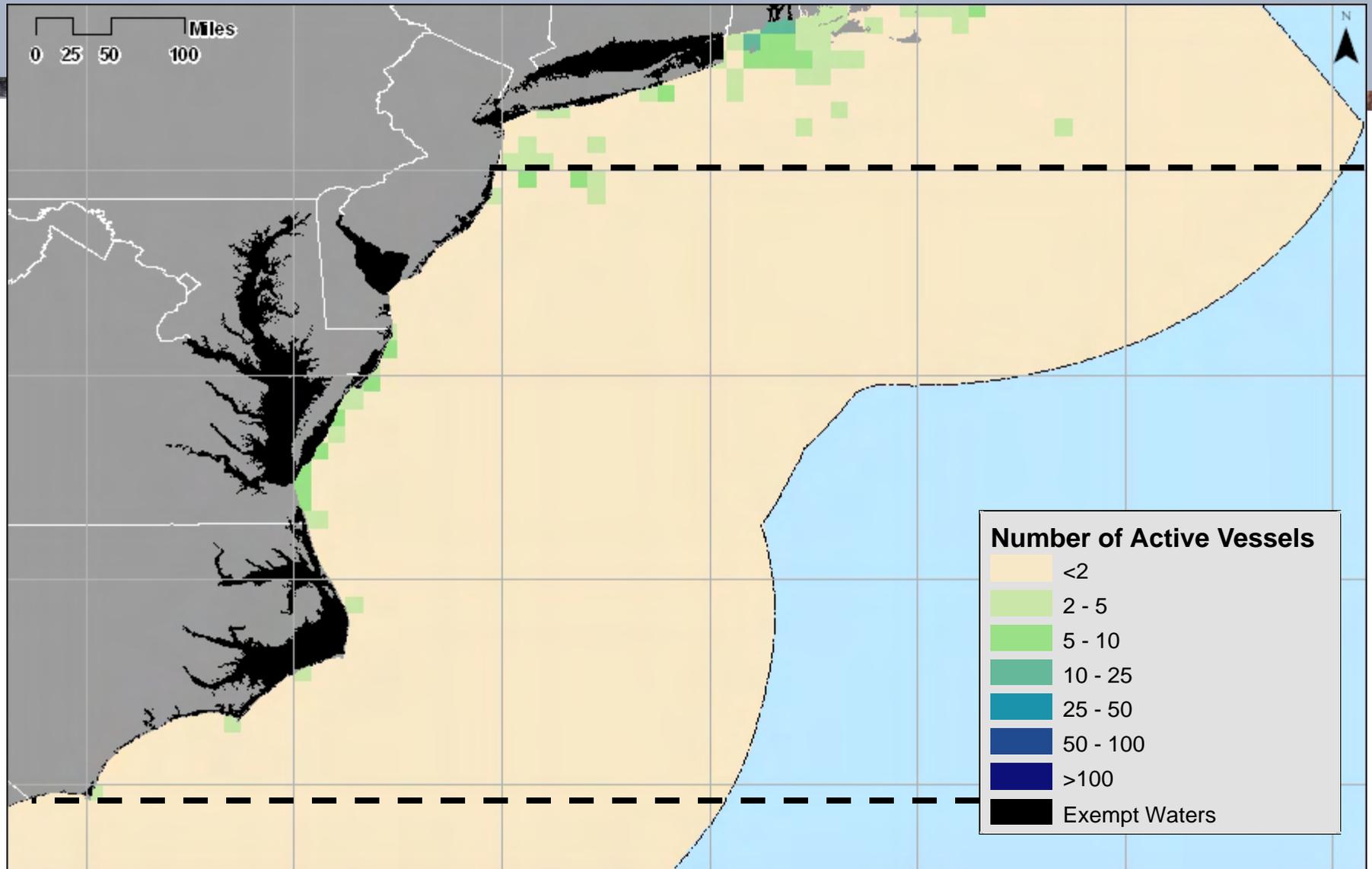
# September 2008 Active Vessels: Mid-Atlantic



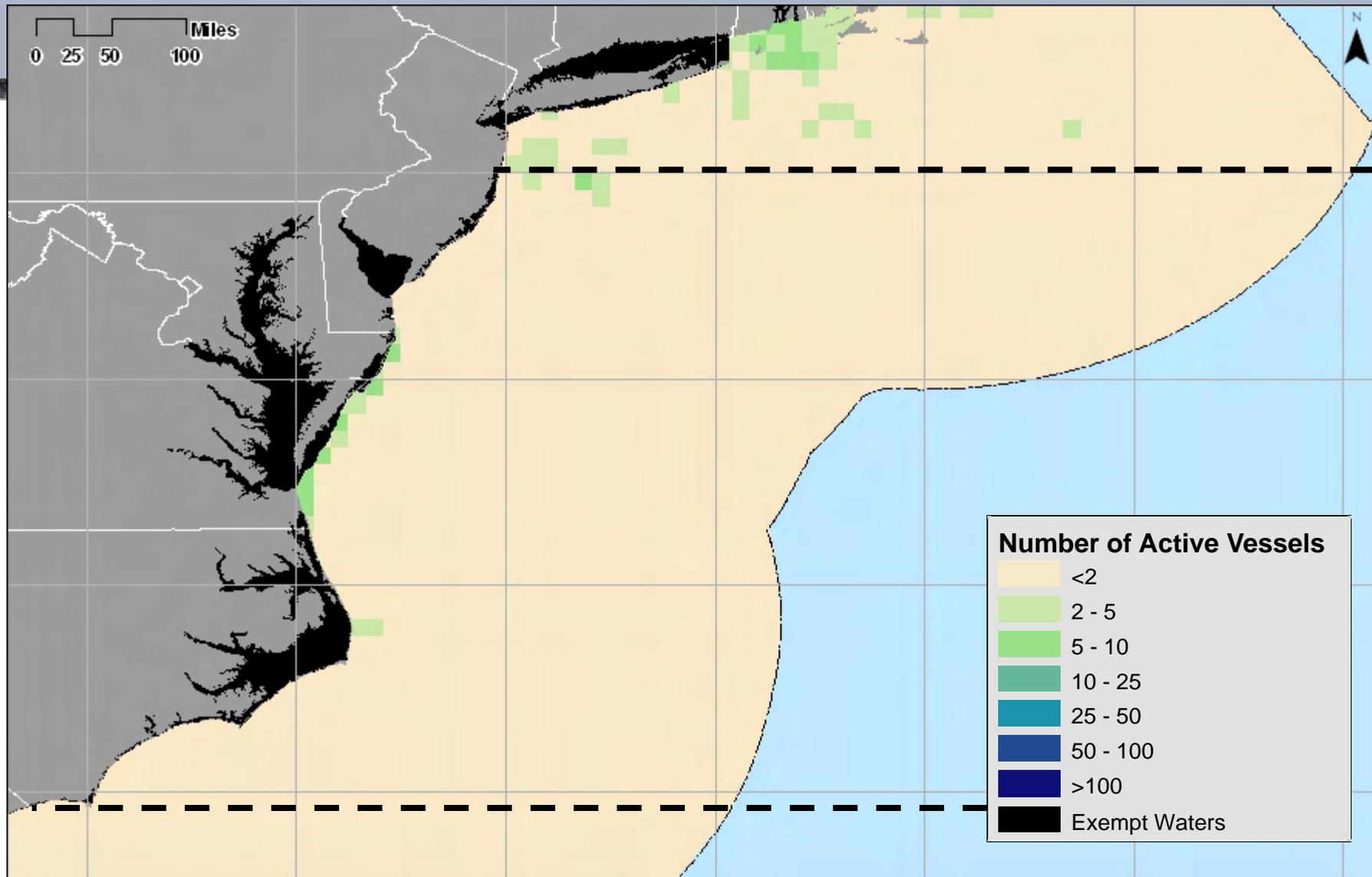
# October 2008 Active Vessels: Mid-Atlantic



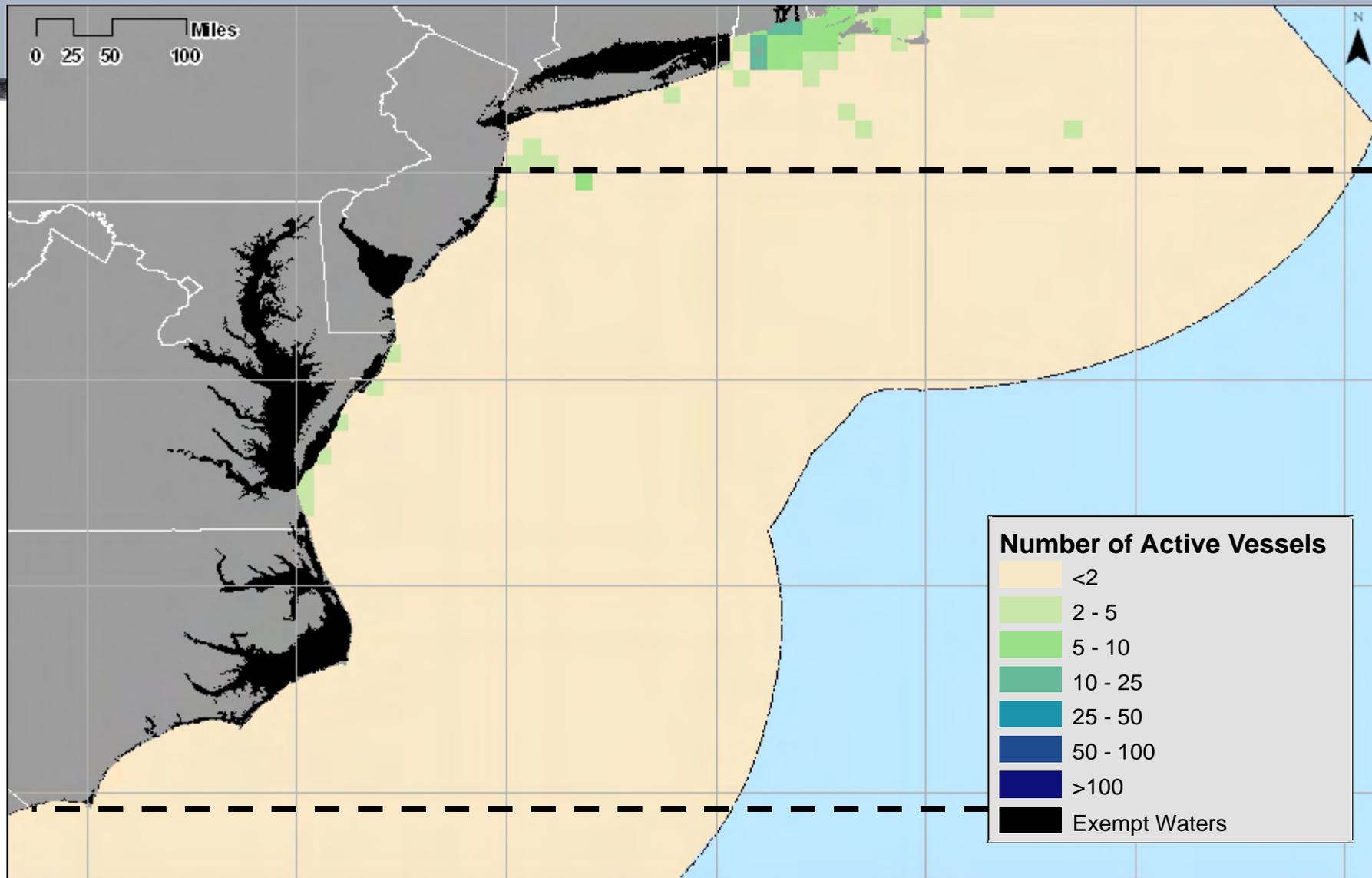
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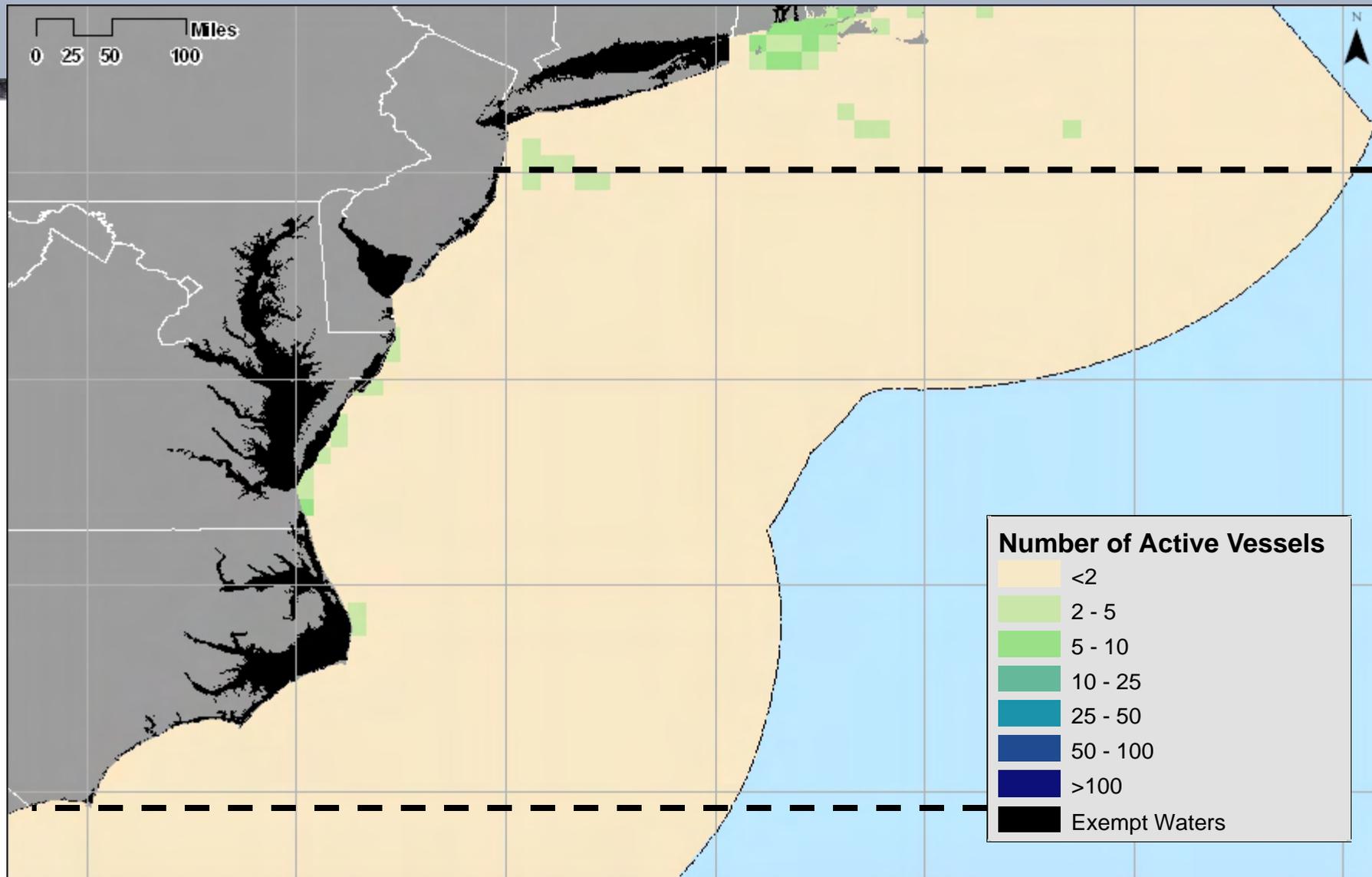
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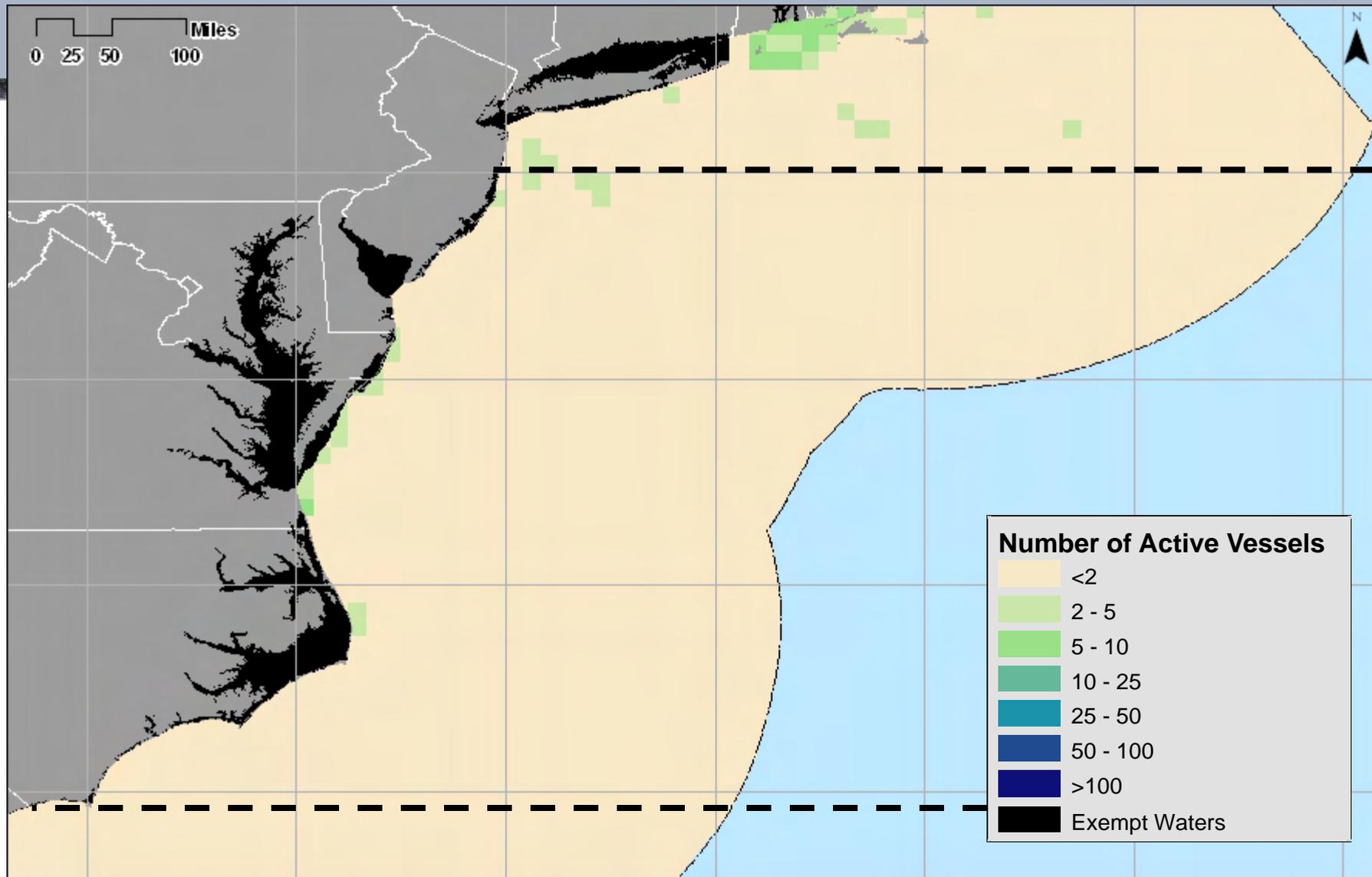
# Average 2008 Active Vessels: Mid-Atlantic



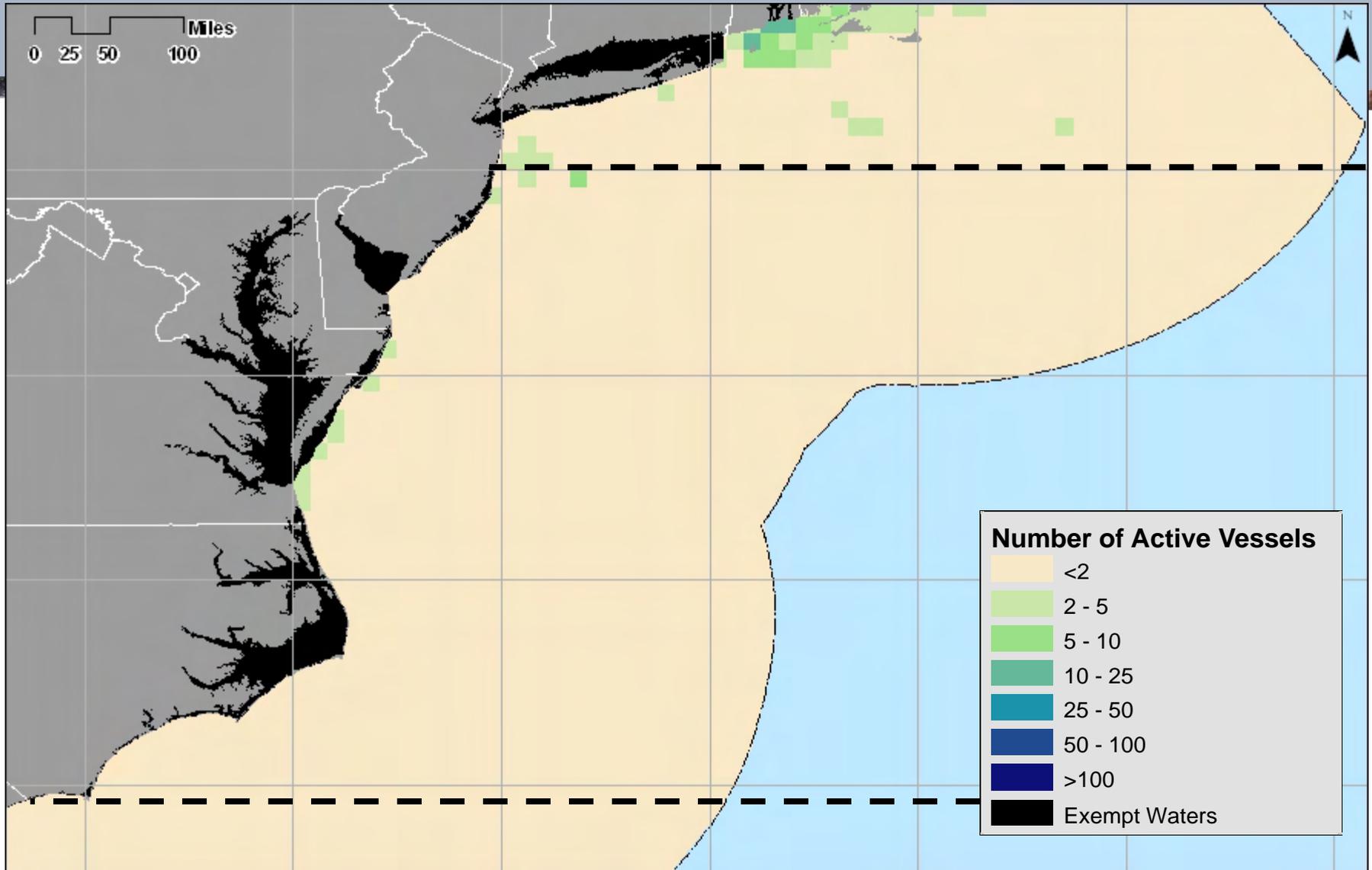
# December-March 2008 Active Vessels: Mid-Atlantic



# November-April 2008 Active Vessels: Mid-Atlantic



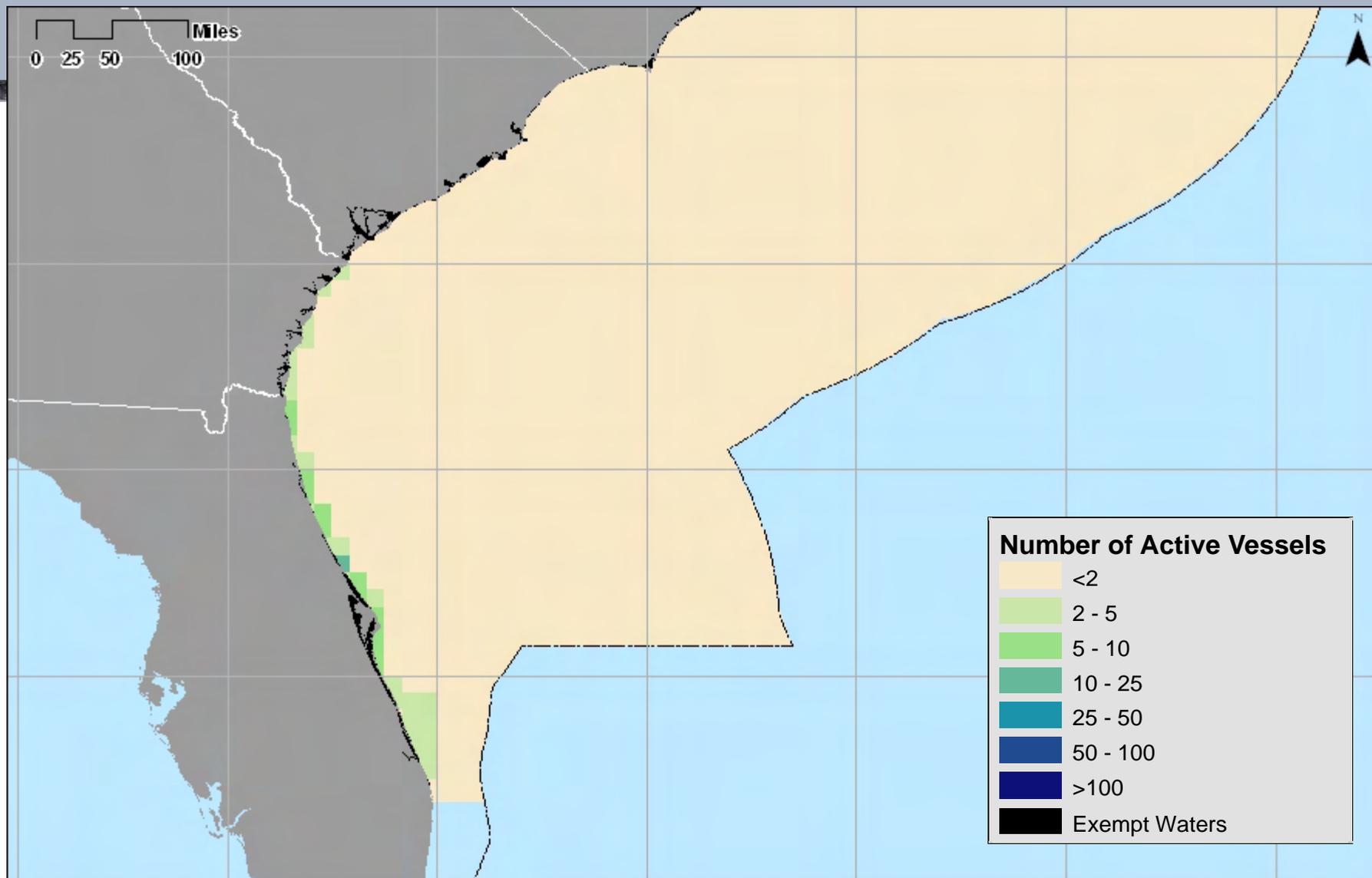
# September-May 2008 Active Vessels: Mid-Atlantic



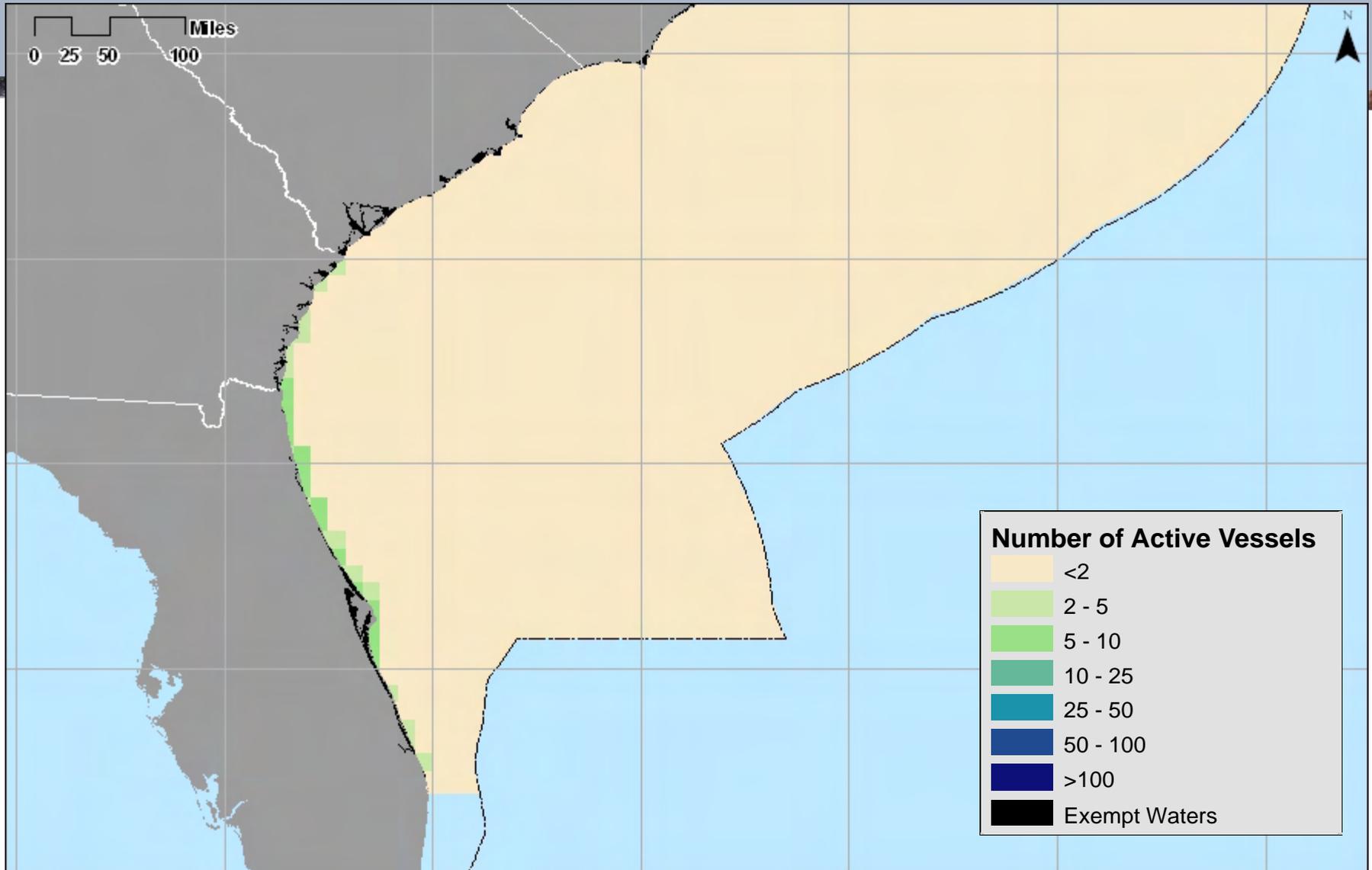
# General Observations

- Relatively few vessels fishing throughout the Mid-Atlantic compared to the Northeast
- In comparison to the rest of the Mid-Atlantic, higher activity:
  - Year-round off the coast of NJ (near the border of the Northeast and Mid-Atlantic areas)
  - Fall and winter months off Delmarva peninsula and NC

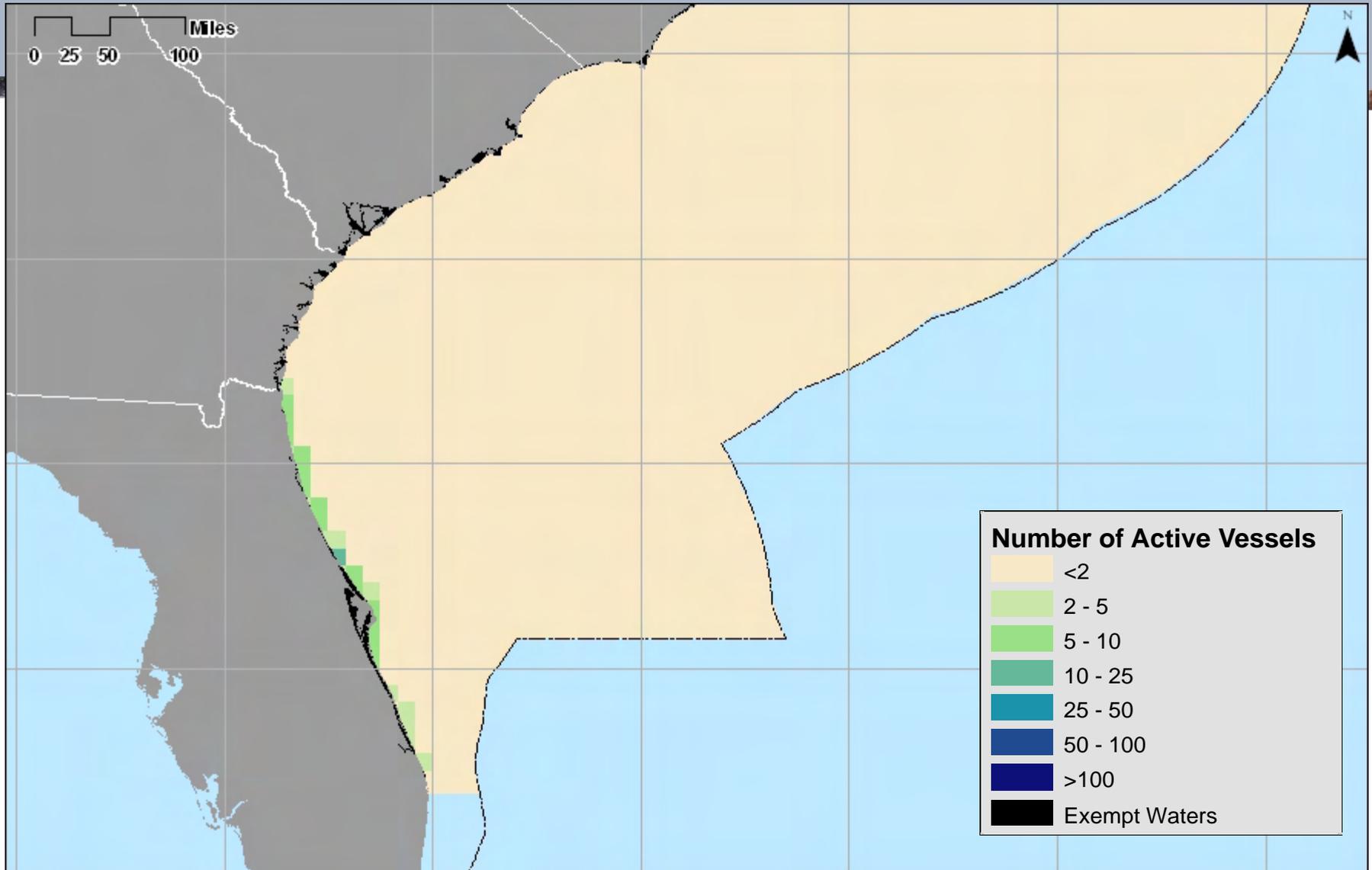
# January 2008 Active Vessels: Southeast



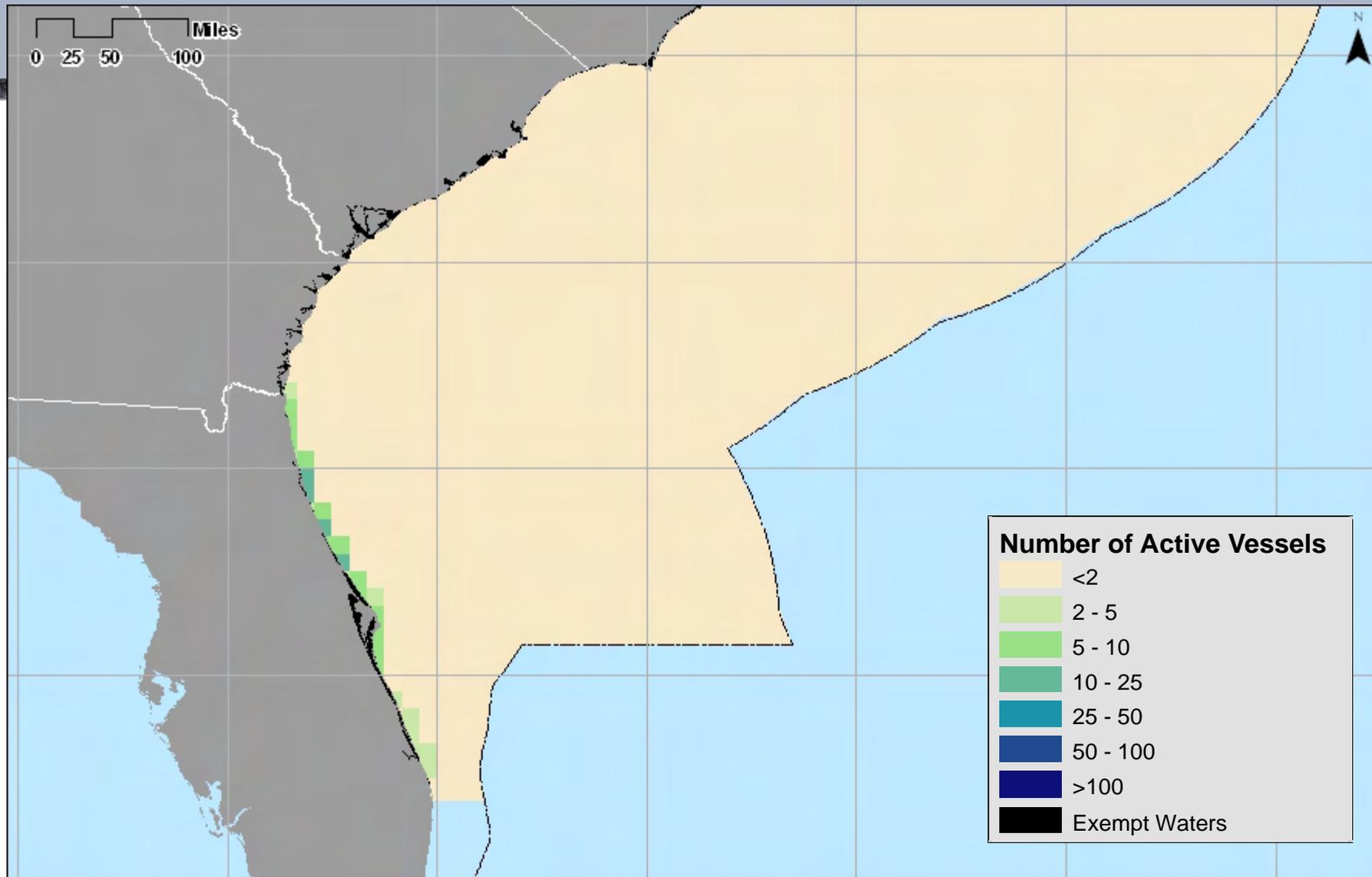
# February 2008 Active Vessels: Southeast



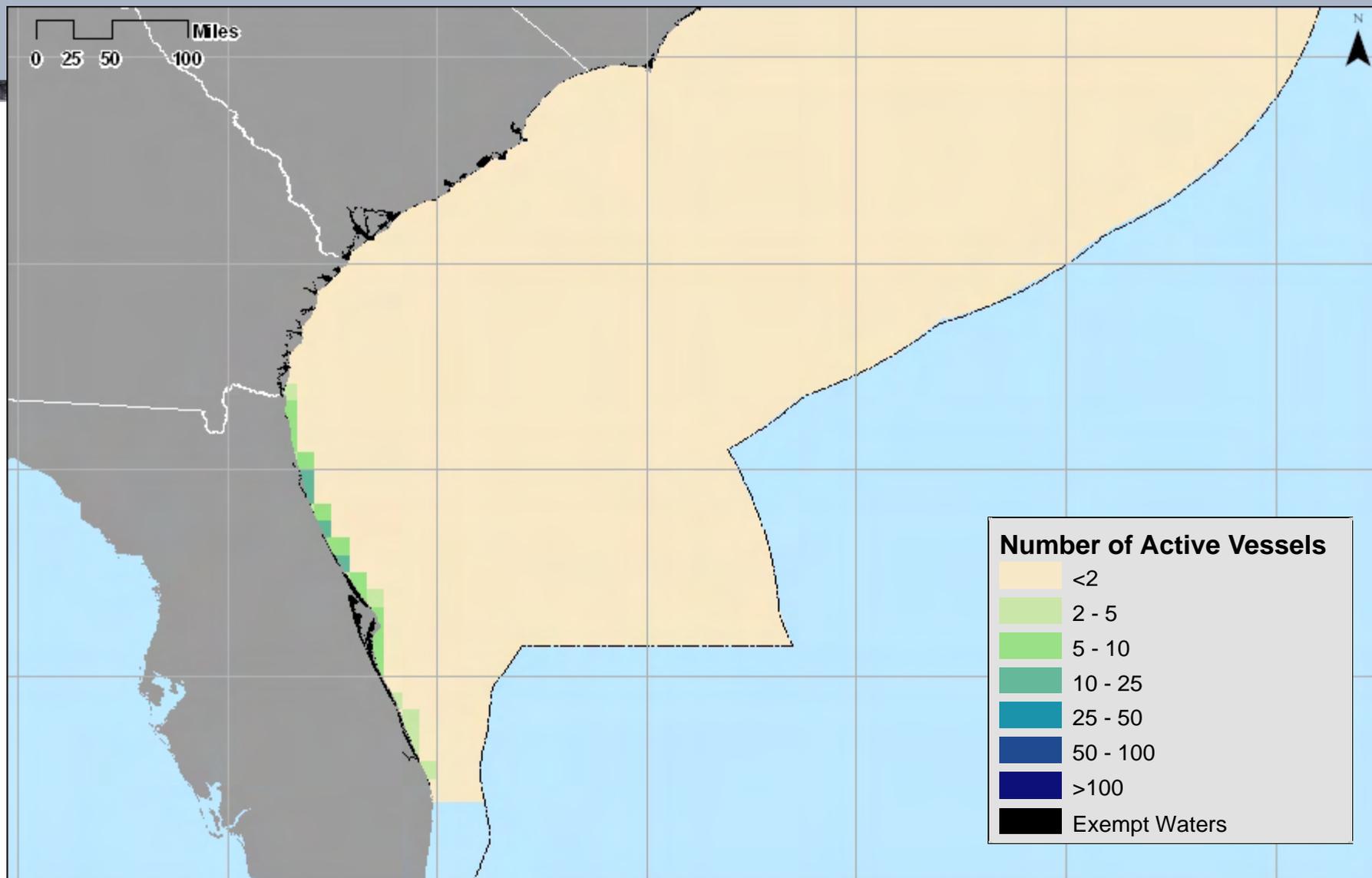
# March 2008 Active Vessels: Southeast



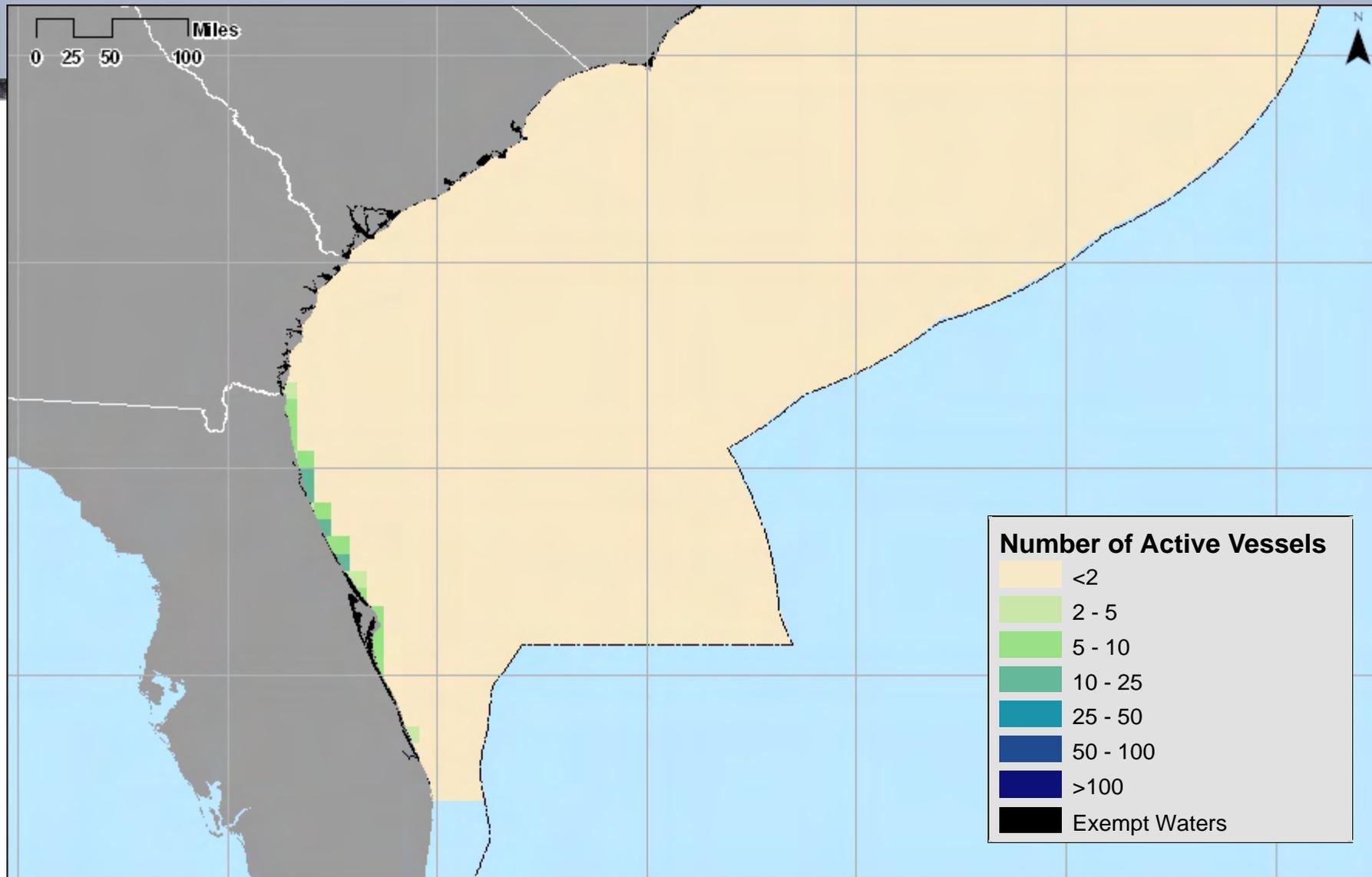
# April 2008 Active Vessels: Southeast



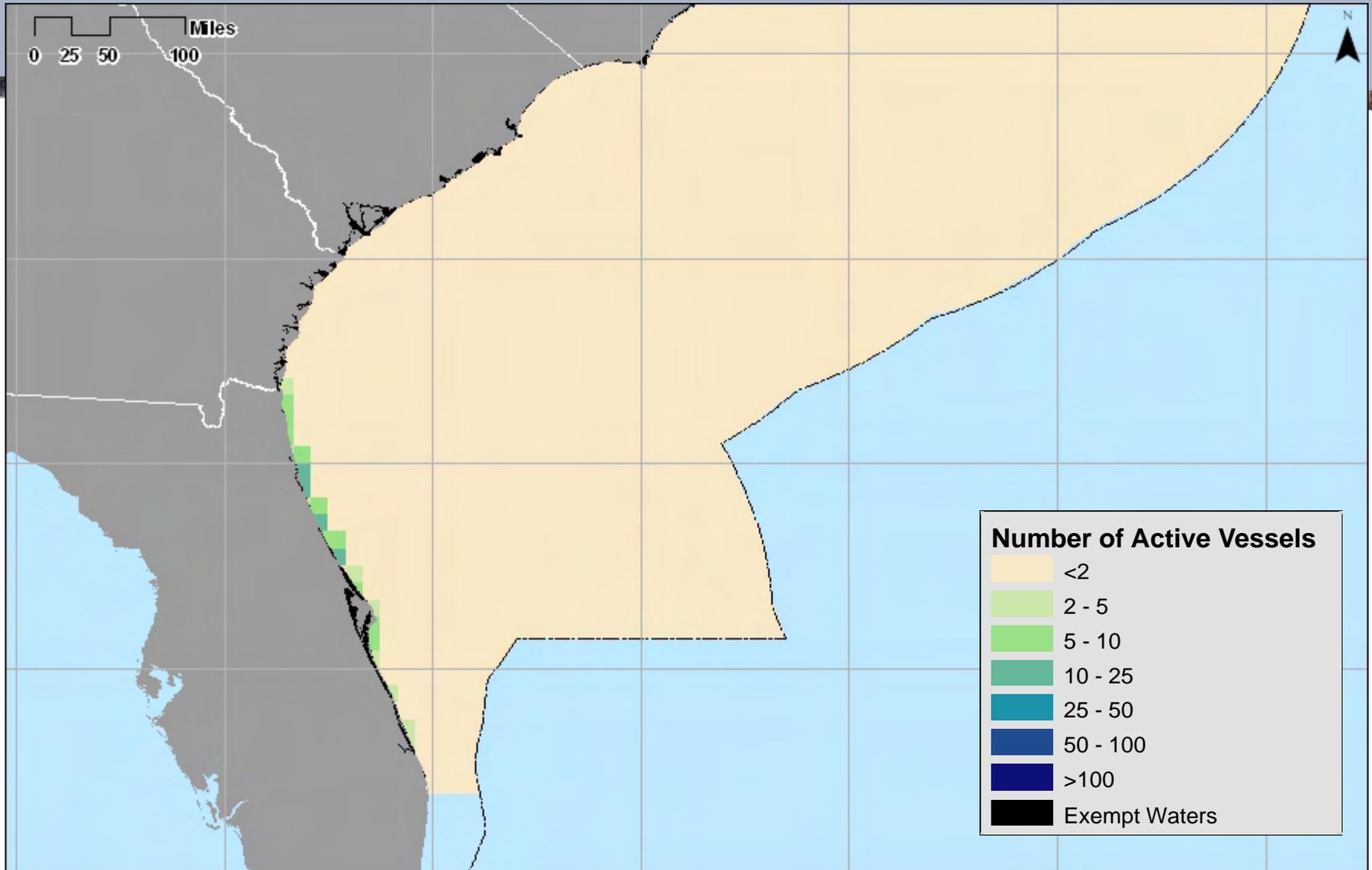
# May 2008 Active Vessels: Southeast



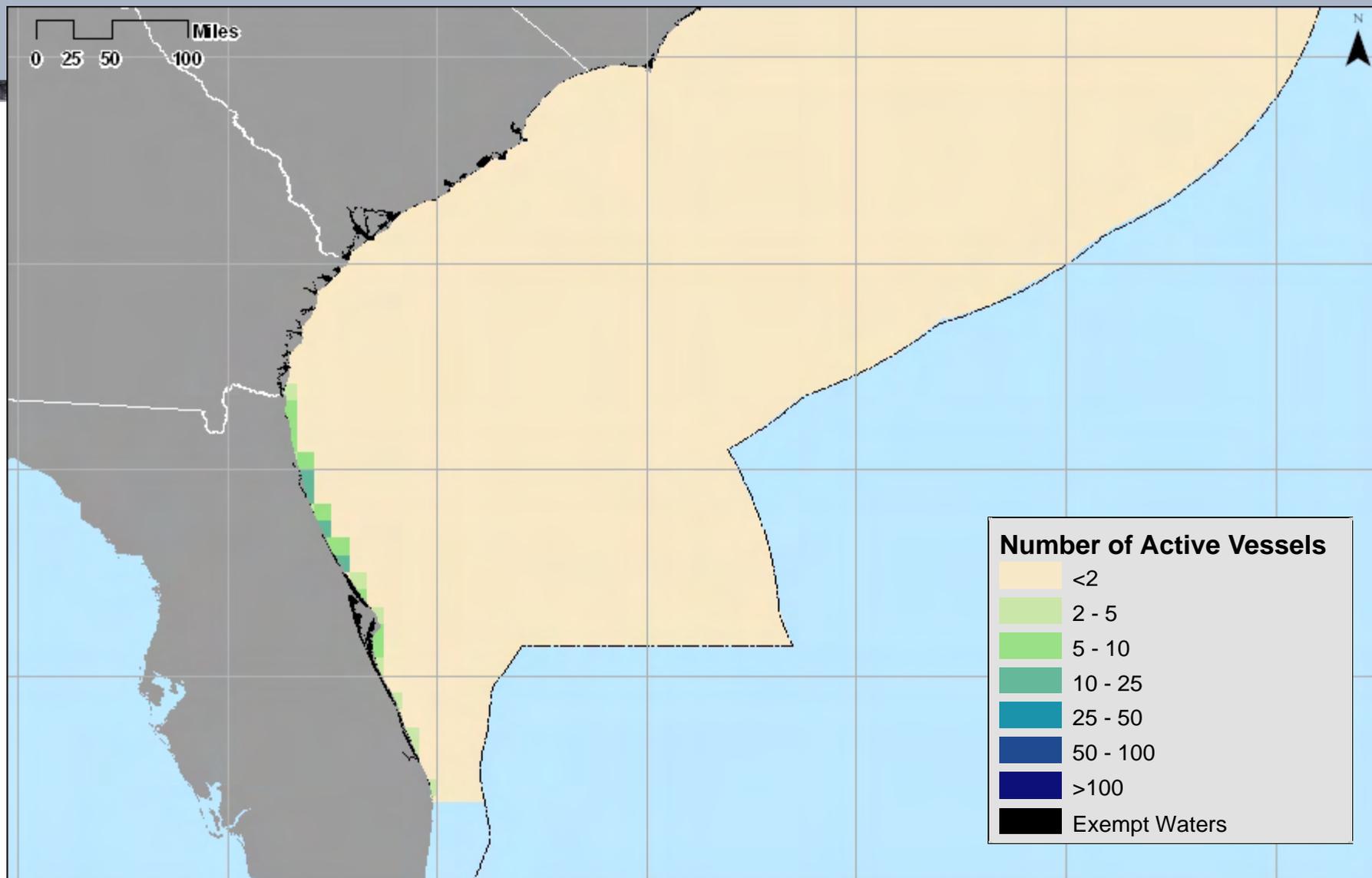
# June 2008 Active Vessels: Southeast



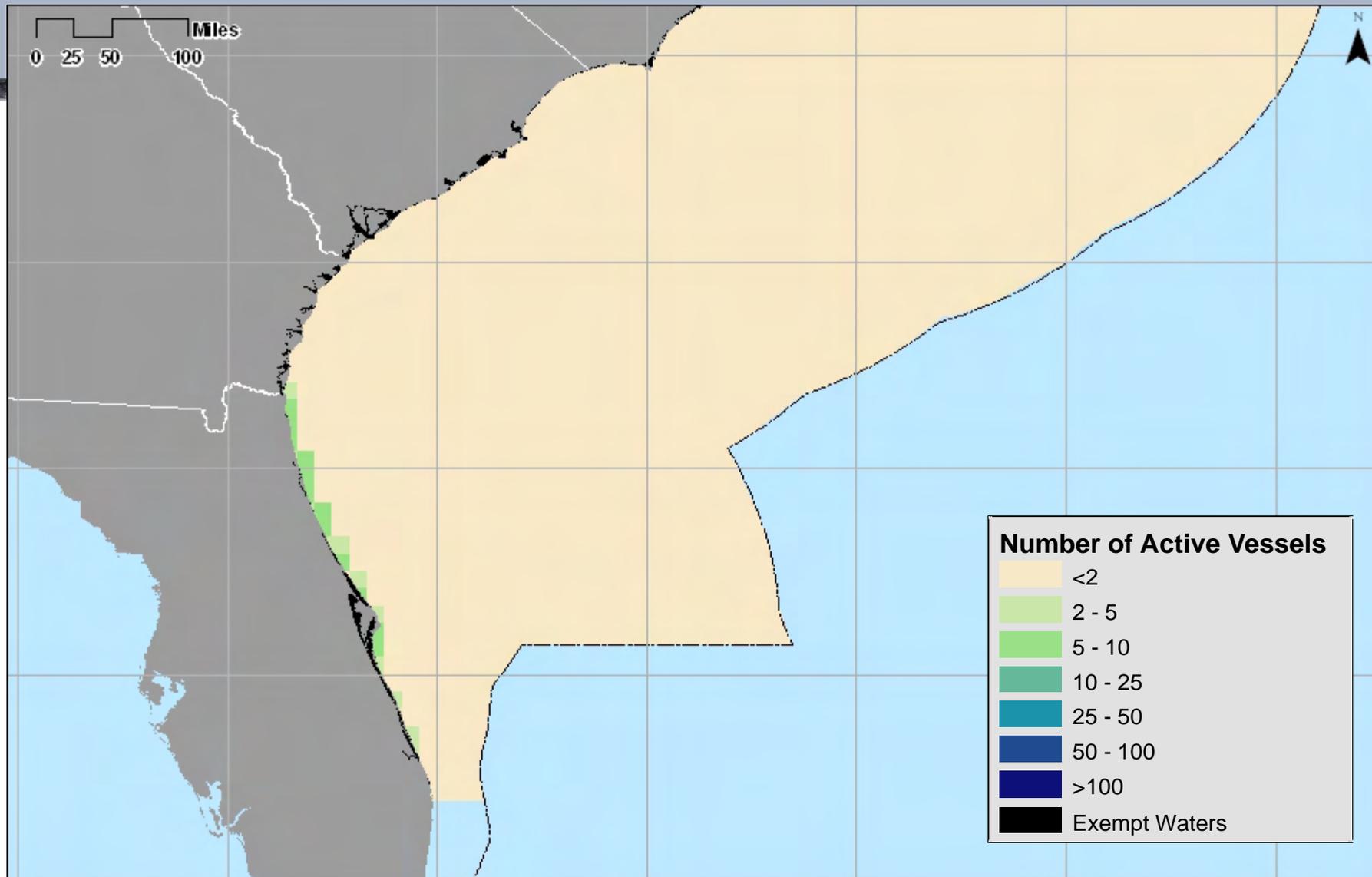
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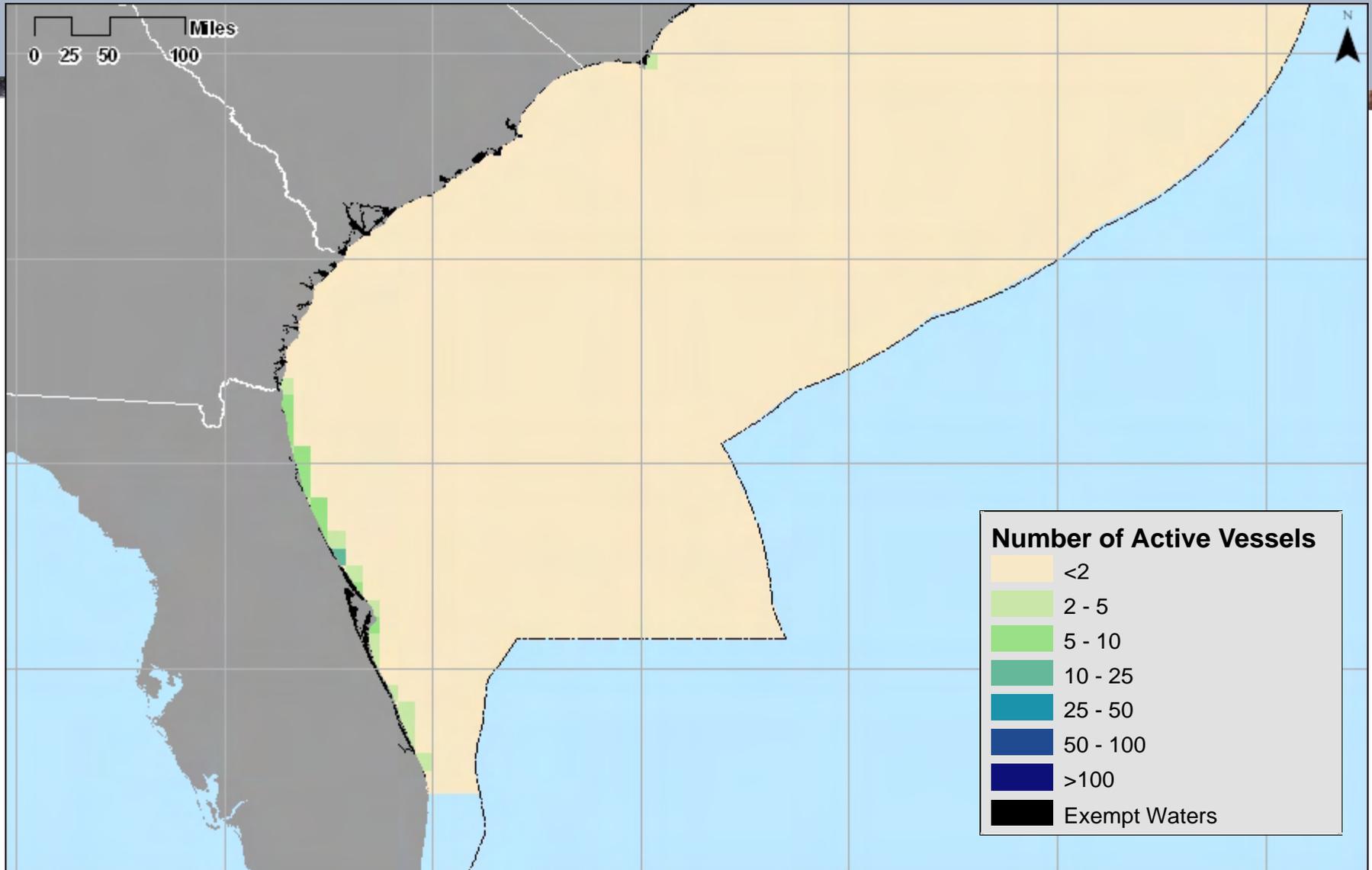
# August 2008 Active Vessels: Southeast



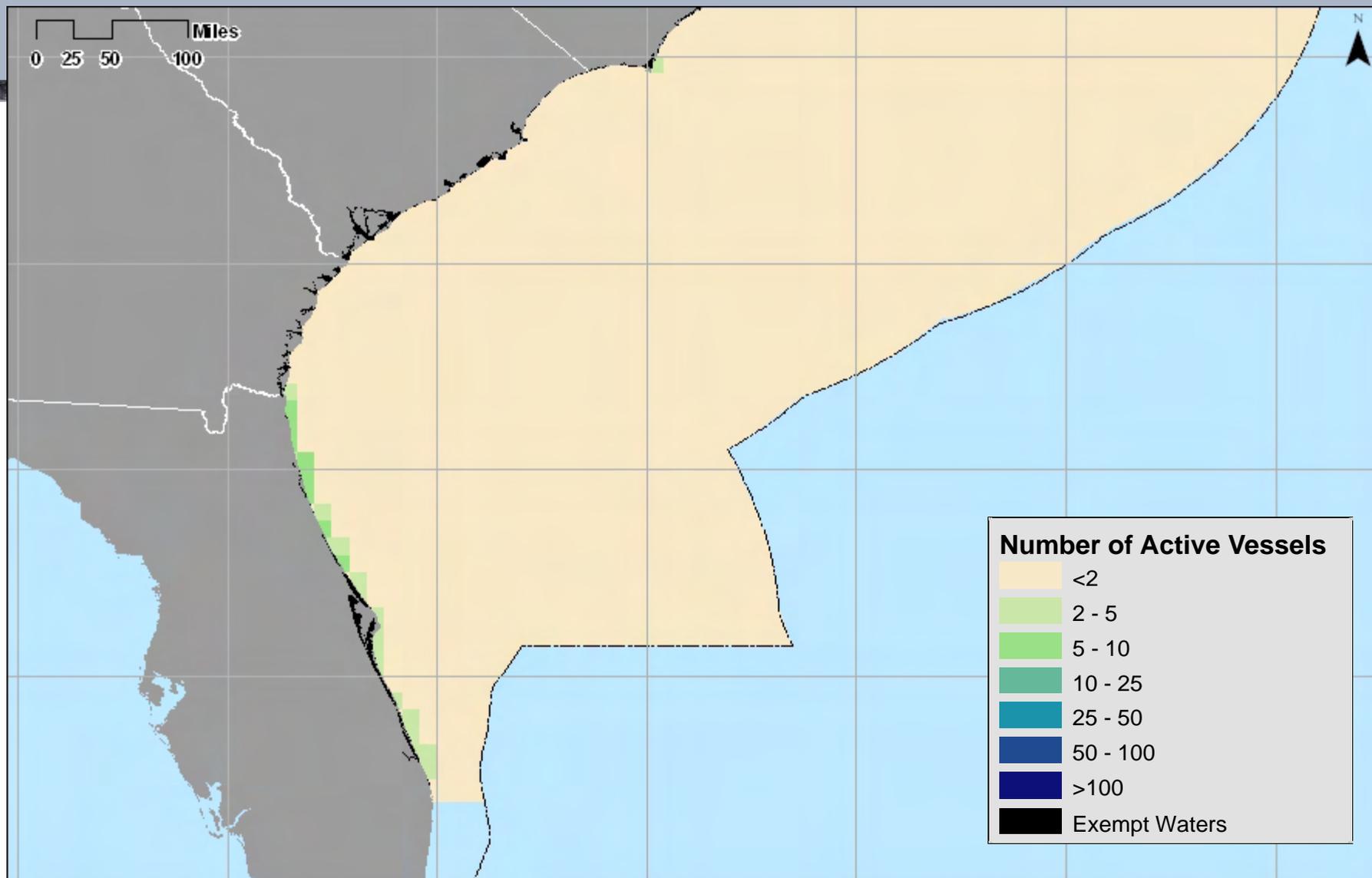
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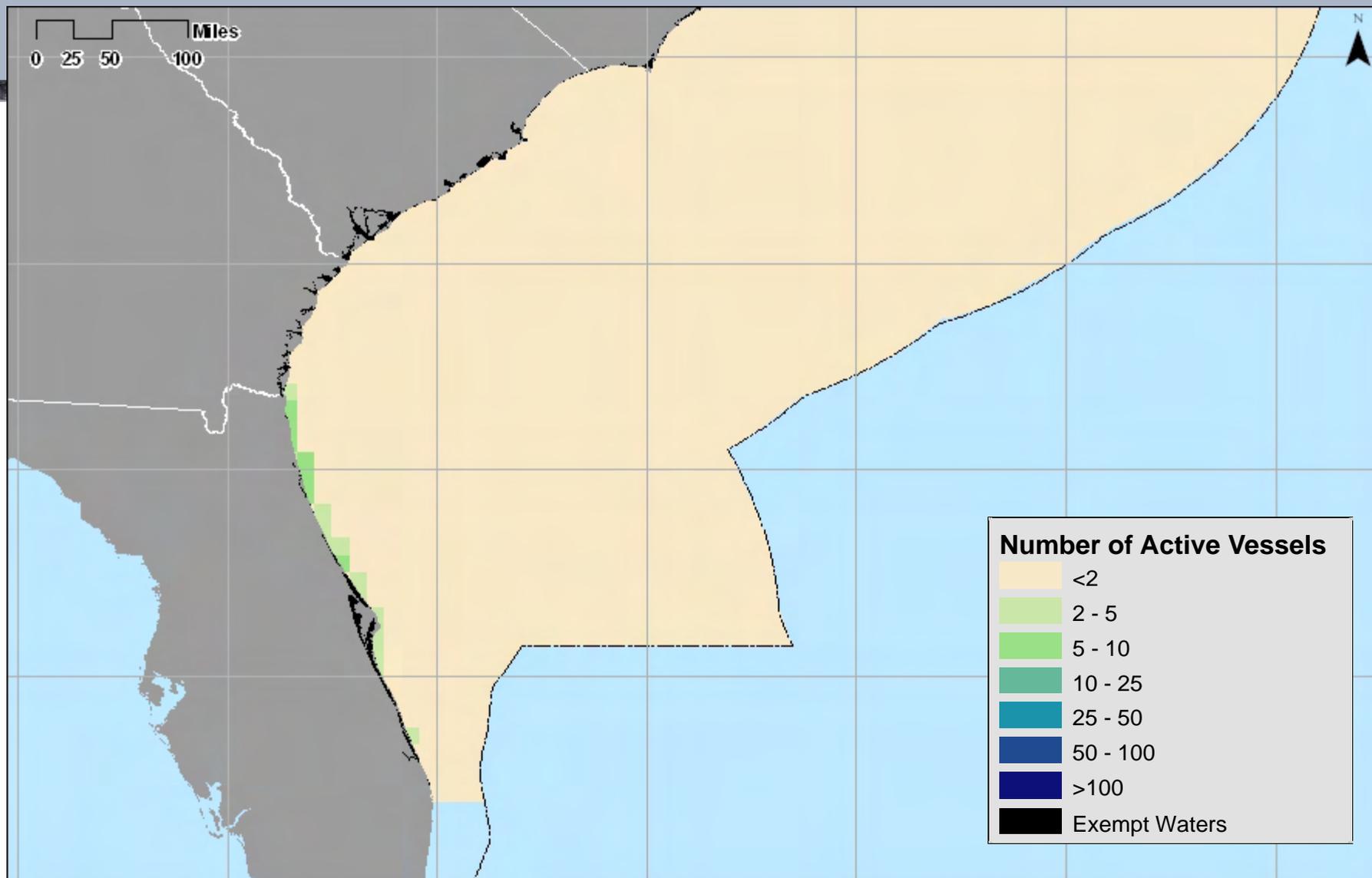
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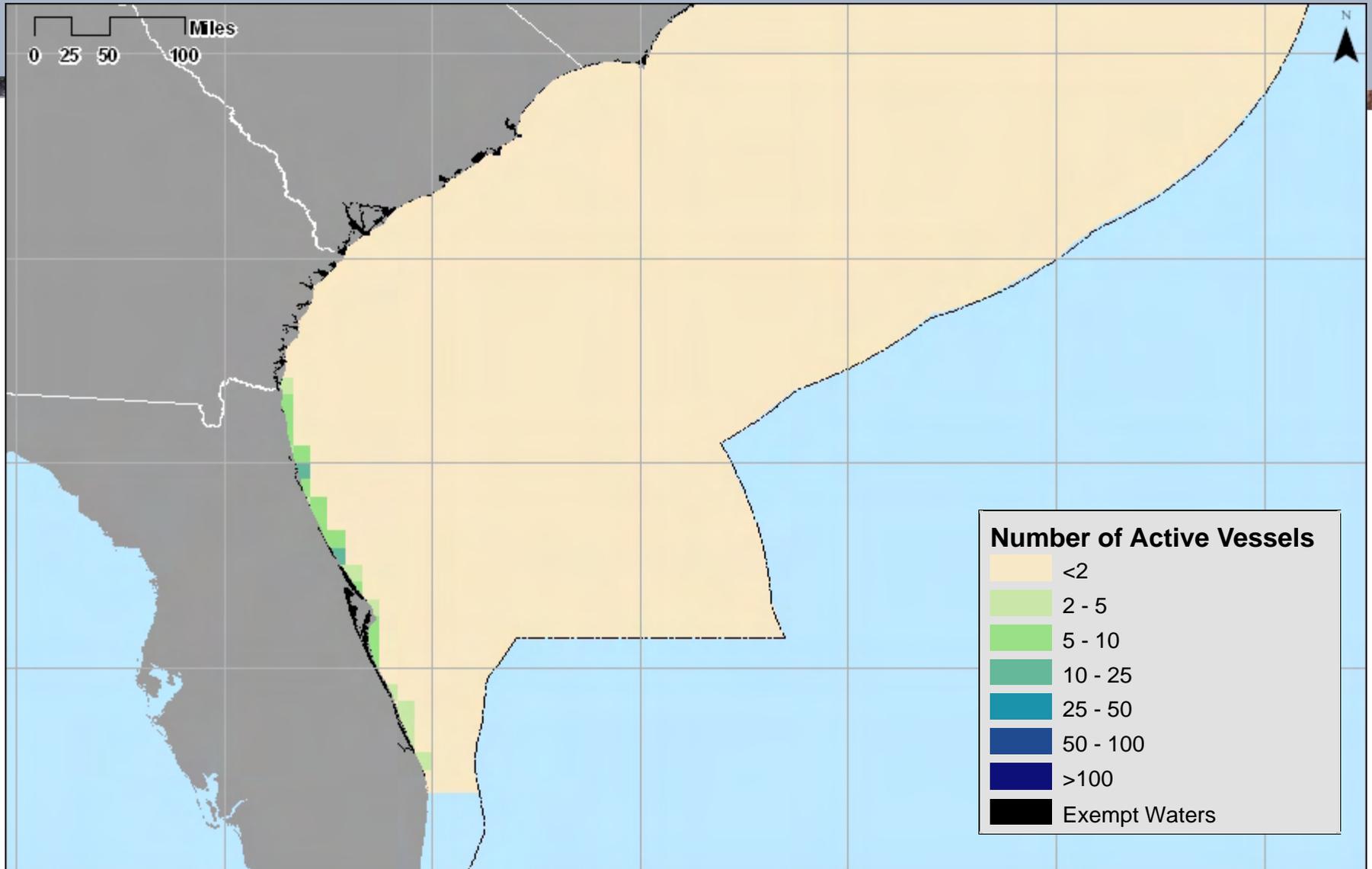
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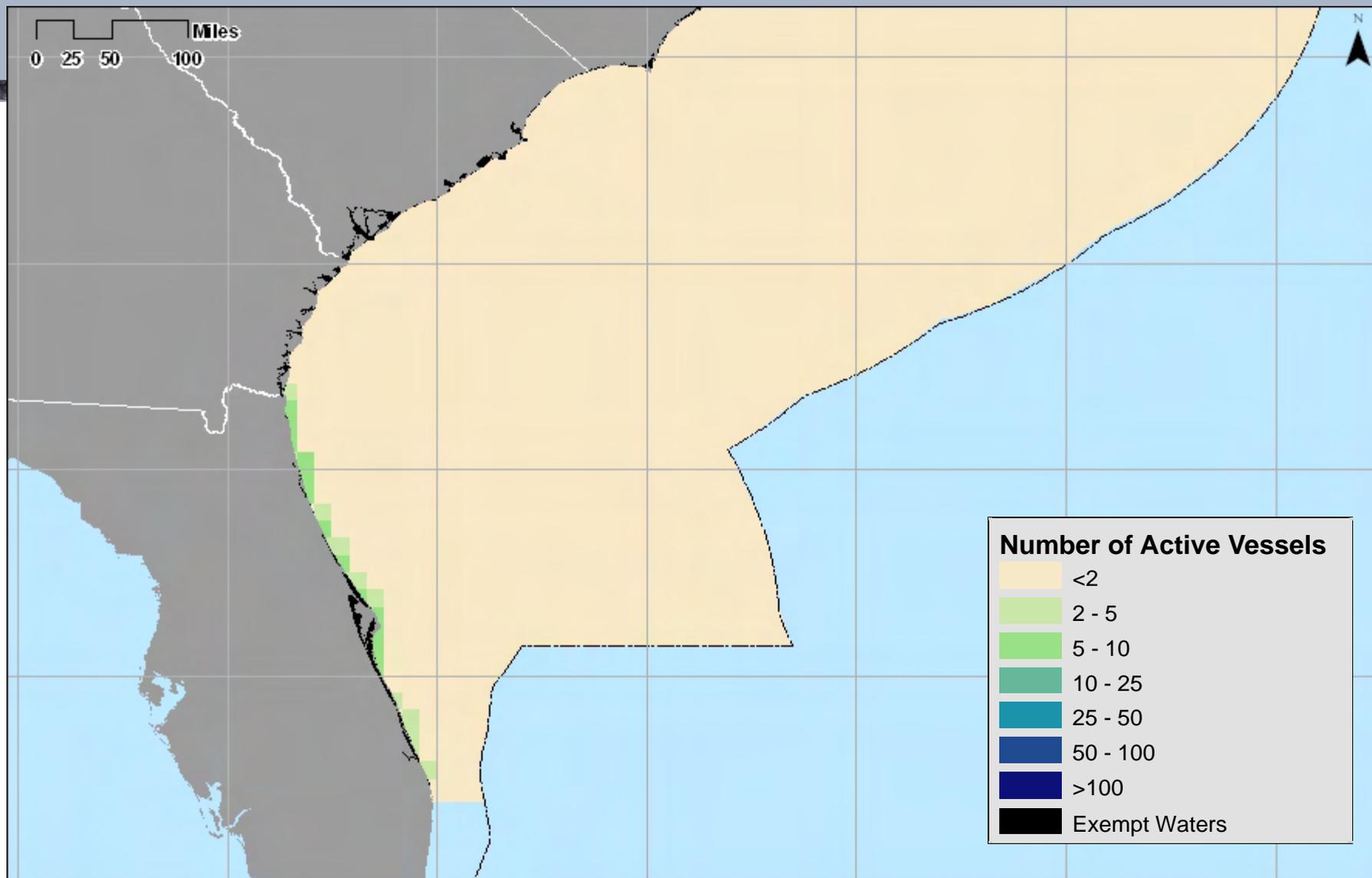
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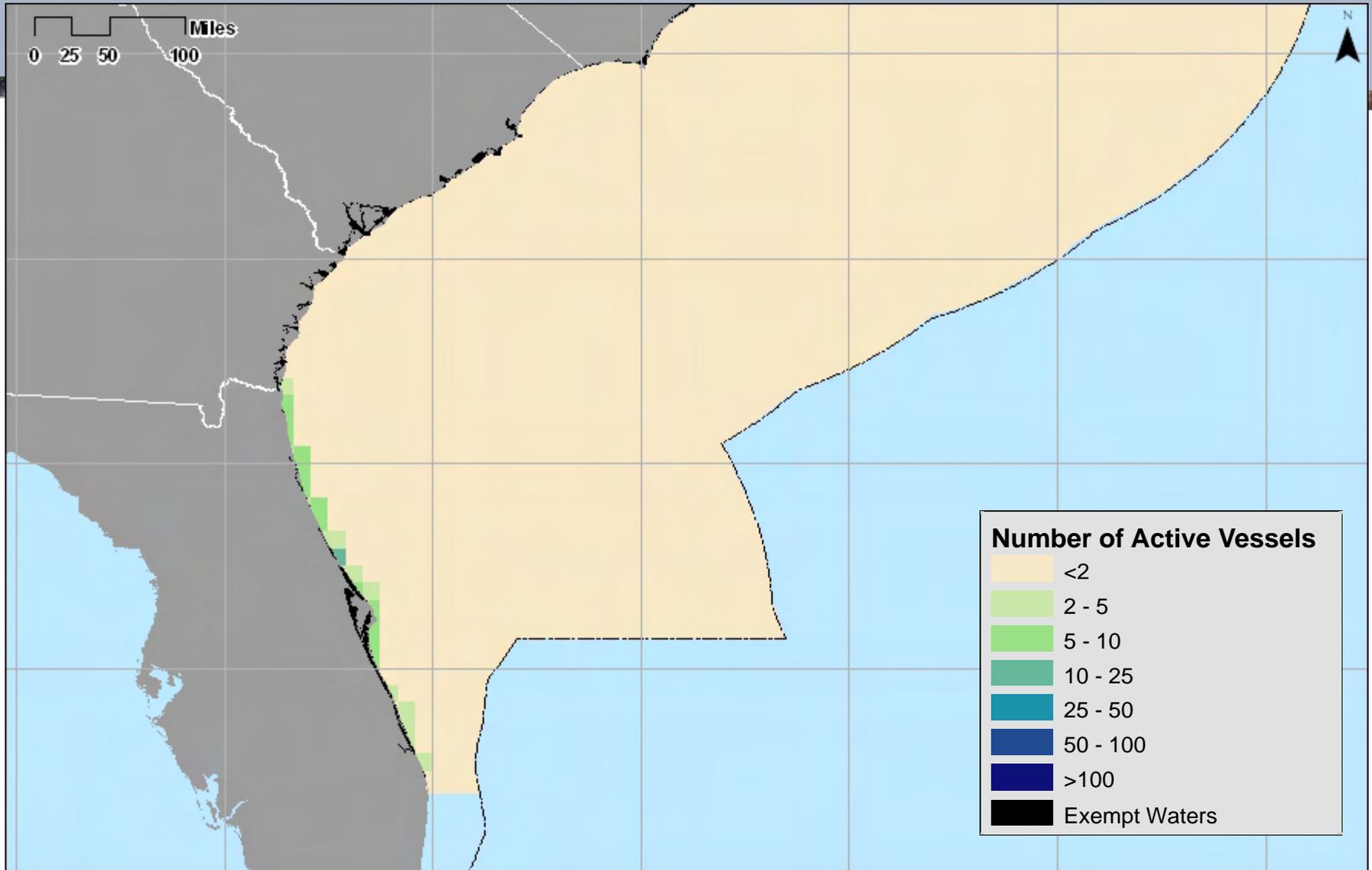
# Average 2008 Active Vessels: Southeast



# December-March 2008 Active Vessels: Southeast



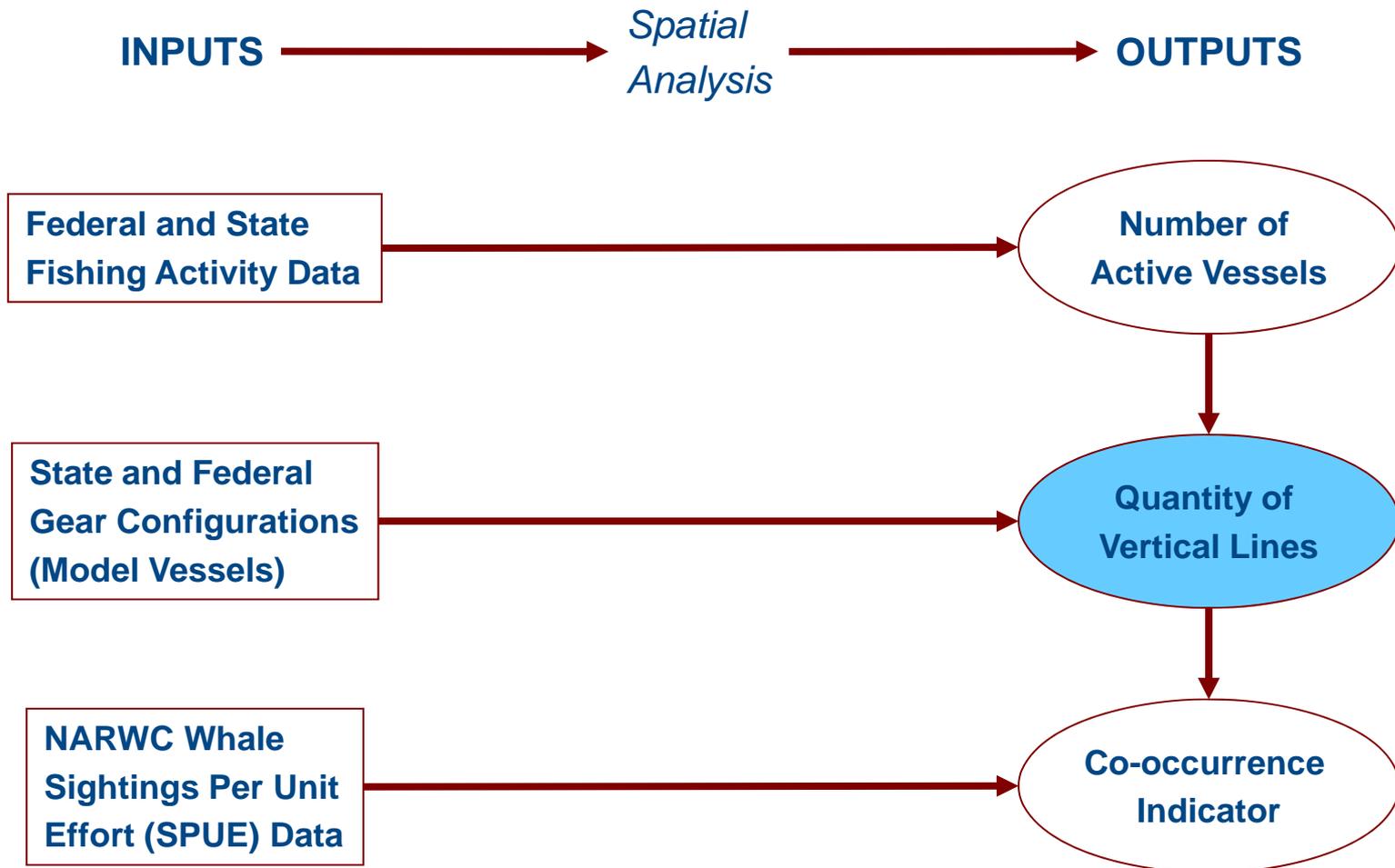
# September-May 2008 Active Vessels: Southeast



# General Observations

- Relatively few vessels fishing the Southeast compared to the Northeast
  - Partly the result of distributing vessels across 10-minute grid cells
- In comparison to the rest of the Southeast, higher activity off the coast of Florida
  - Currently updating assumptions regarding activity in Florida's exempt and non-exempt waters
  - Existing assumptions may overstate activity in non-exempt waters

# 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
- 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:
  - 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 / State gear specialists/State surveys
  - For gillnet fishery, NMFS Observer data

# Vertical Line: Analysis Methods

## 1. Estimate the number of vertical lines for each model vessel

### Example 1: A trap/pot 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. Estimate the number of vessels represented by each model vessel
3. Combine vertical line estimates with the number of active vessels represented by each model vessel

## Example 1: Using the same trap/pot 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**

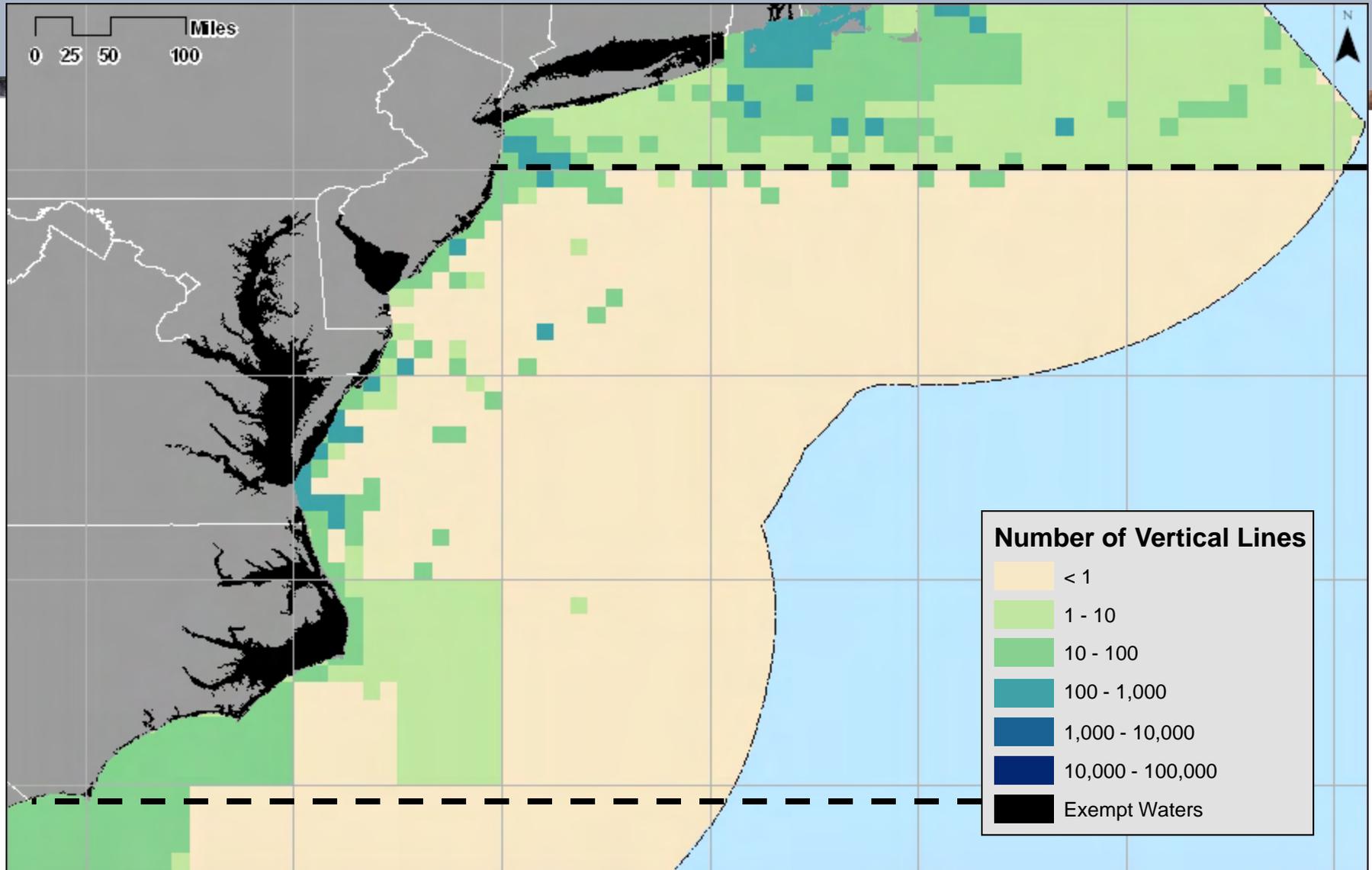
# Vertical Line: Analysis Methods

- 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 only 200 traps are fished per vessel, then the monthly scalar for March would be 0.4 [= 200 / 500].

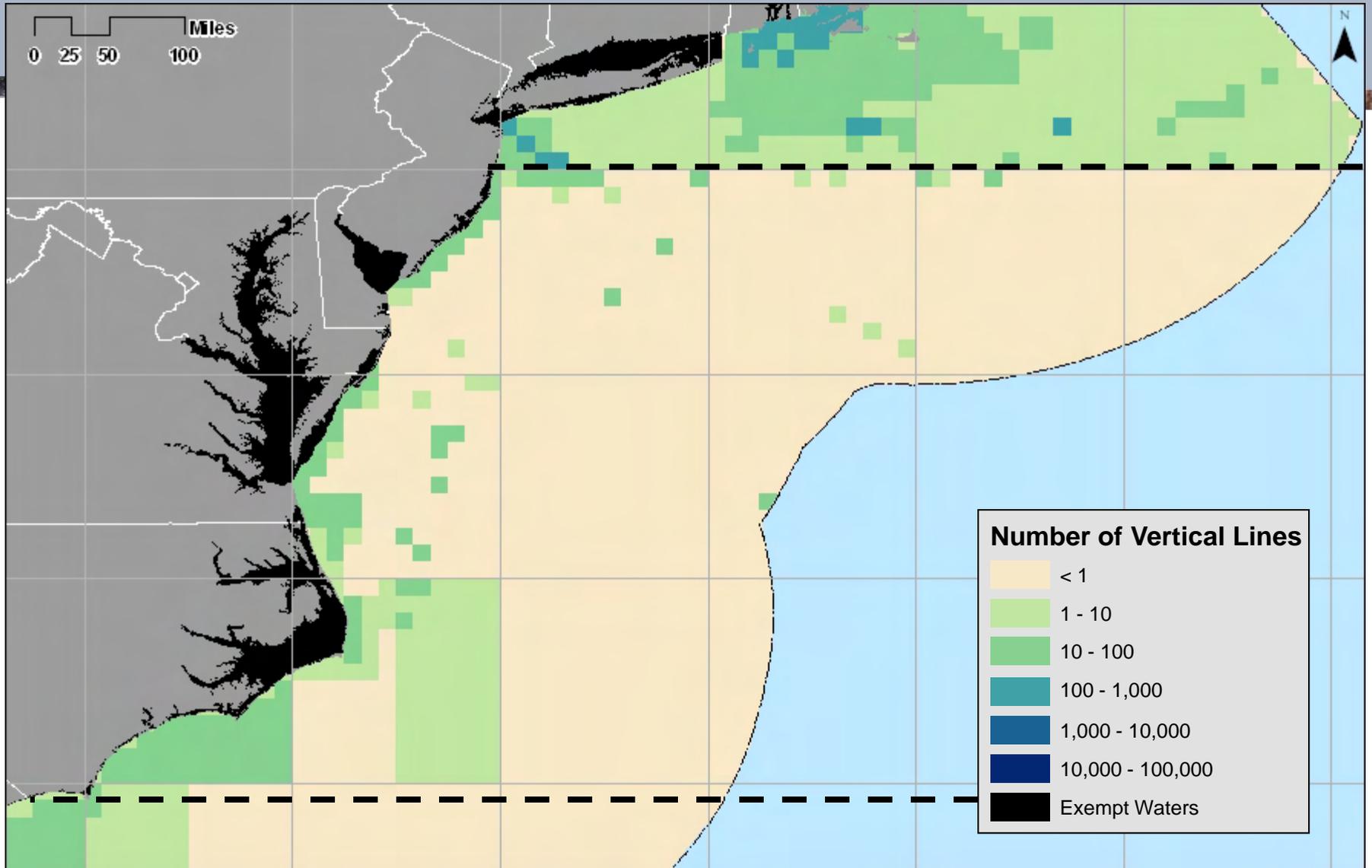
# Model Vessel Configurations

- Federal waters
  - Lobster: based on discussions with NMFS gear experts
    - Nearshore: 700 traps, 15 traps/trawl, 2 endlines/ trawl
    - Offshore: 1200 traps, 40 traps/trawl, 2 endlines/trawl
  - Gillnet: based on NMFS Observer data (2000-2008)
    - Mid-Atlantic: 4 Strings, 2 endlines/string
    - Southeast: 4 Strings, 2 endlines/string
  - Other trap/pot: based on discussions with NMFS gear experts
    - MA Nearshore: equal distribution of hagfish, black sea bass, scup, conch/whelk
    - MA Offshore: equal distribution of black sea bass, scup, conch/whelk, red crab
    - SE Nearshore/Offshore: equal distribution scup, conch/whelk, red crab
- State waters
  - State-specific studies
  - State gear experts

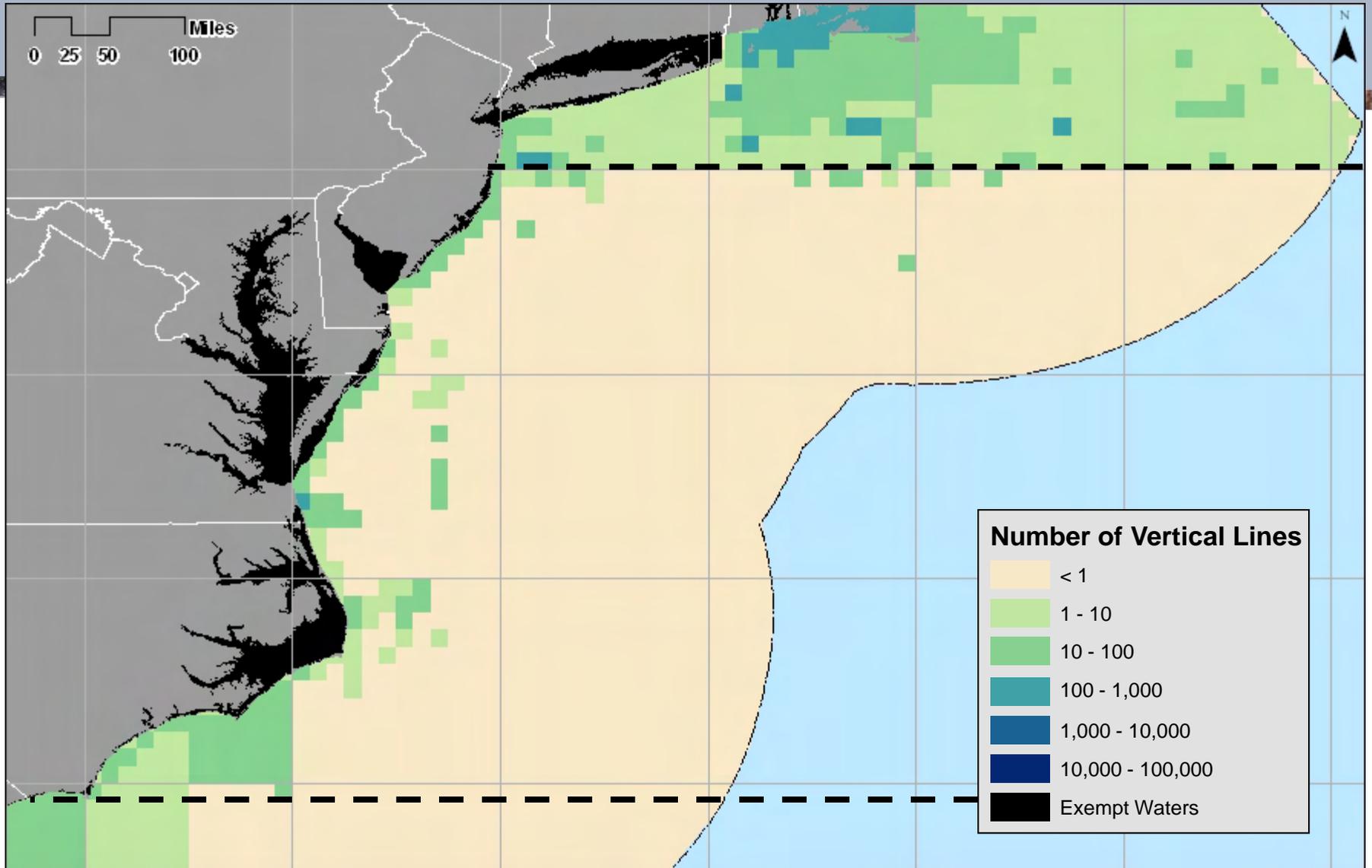
# January 2008 Vertical Line: Mid-Atlantic



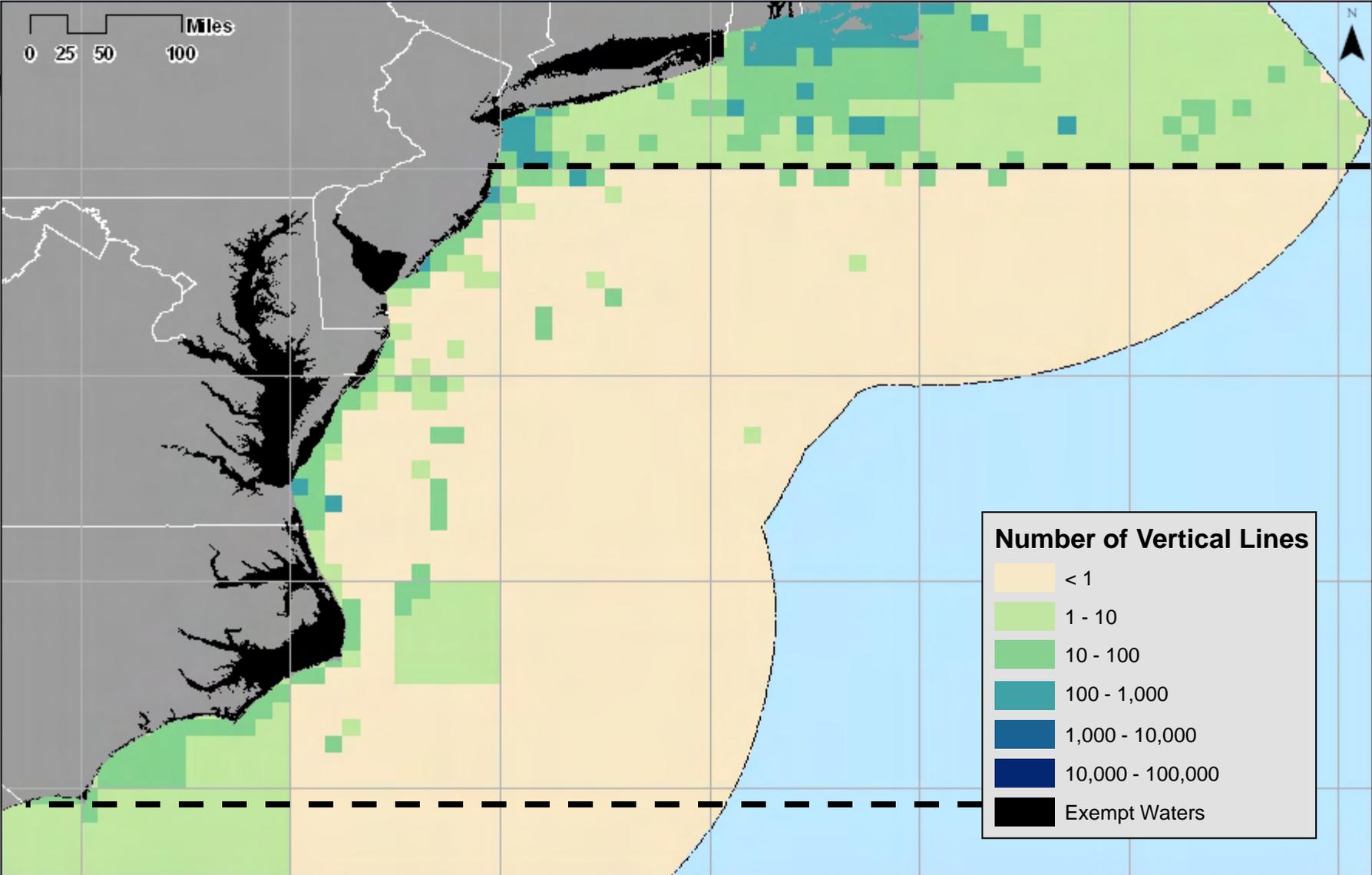
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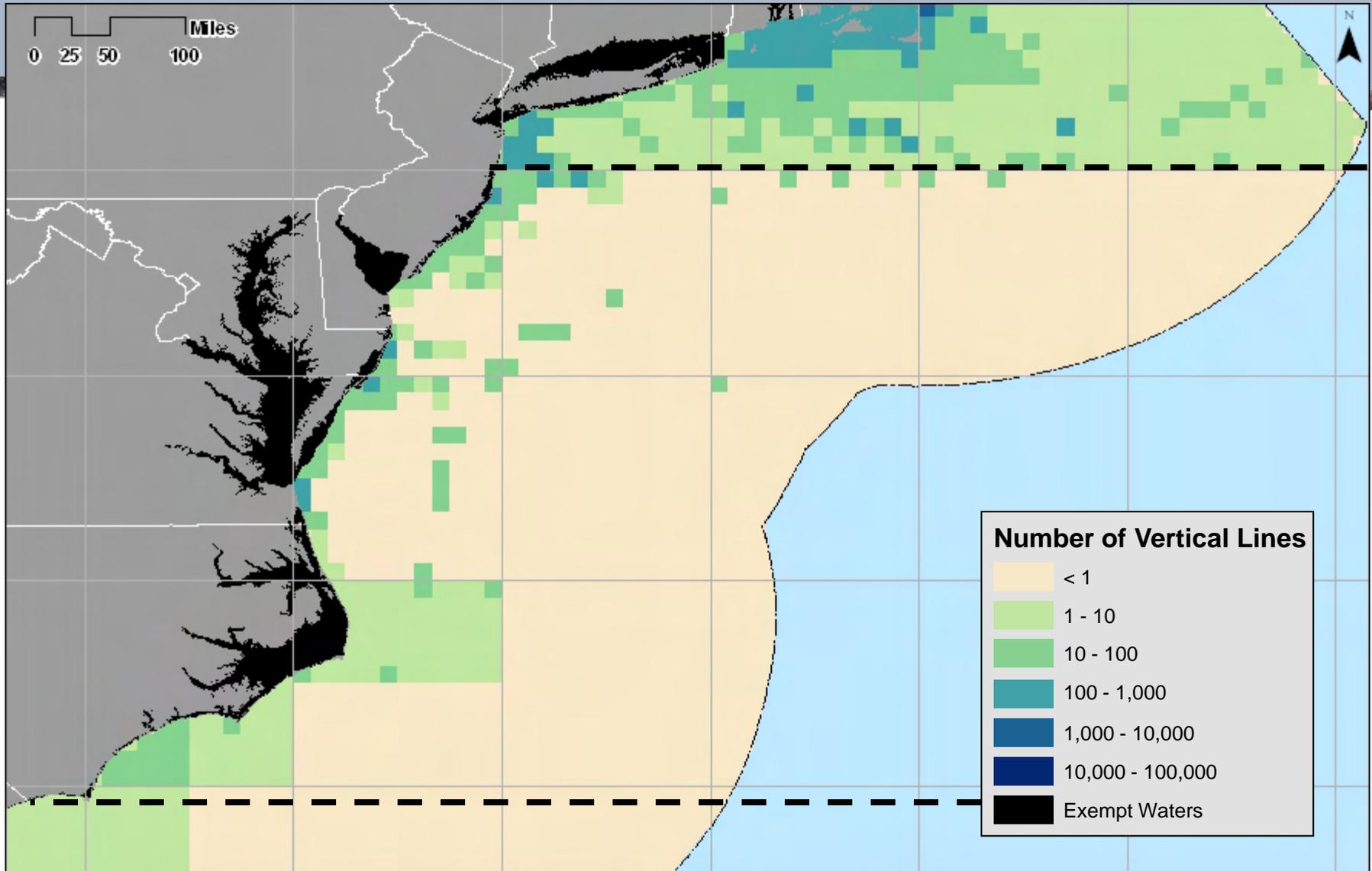
# March 2008 Vertical Line: Mid-Atlantic



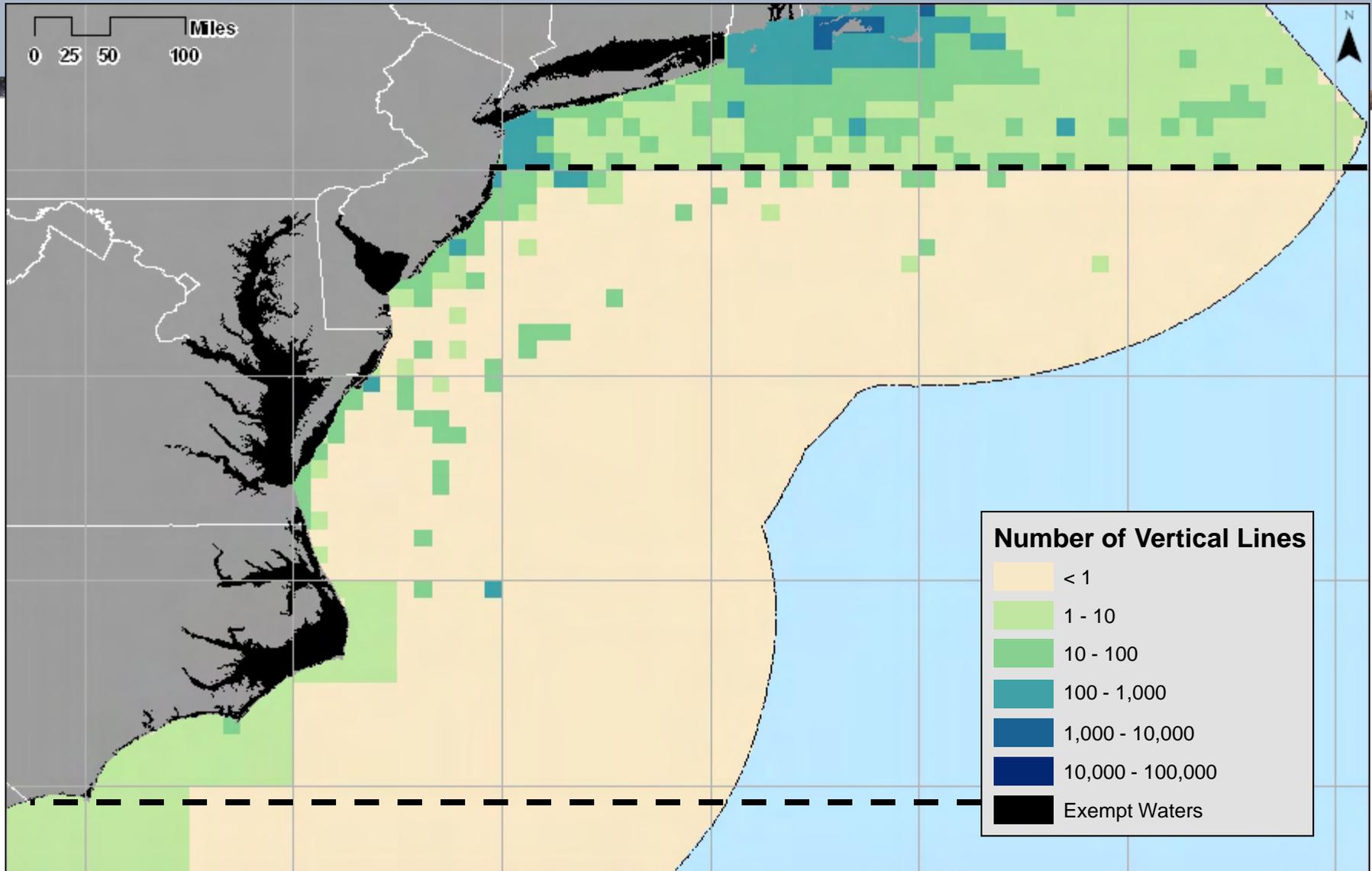
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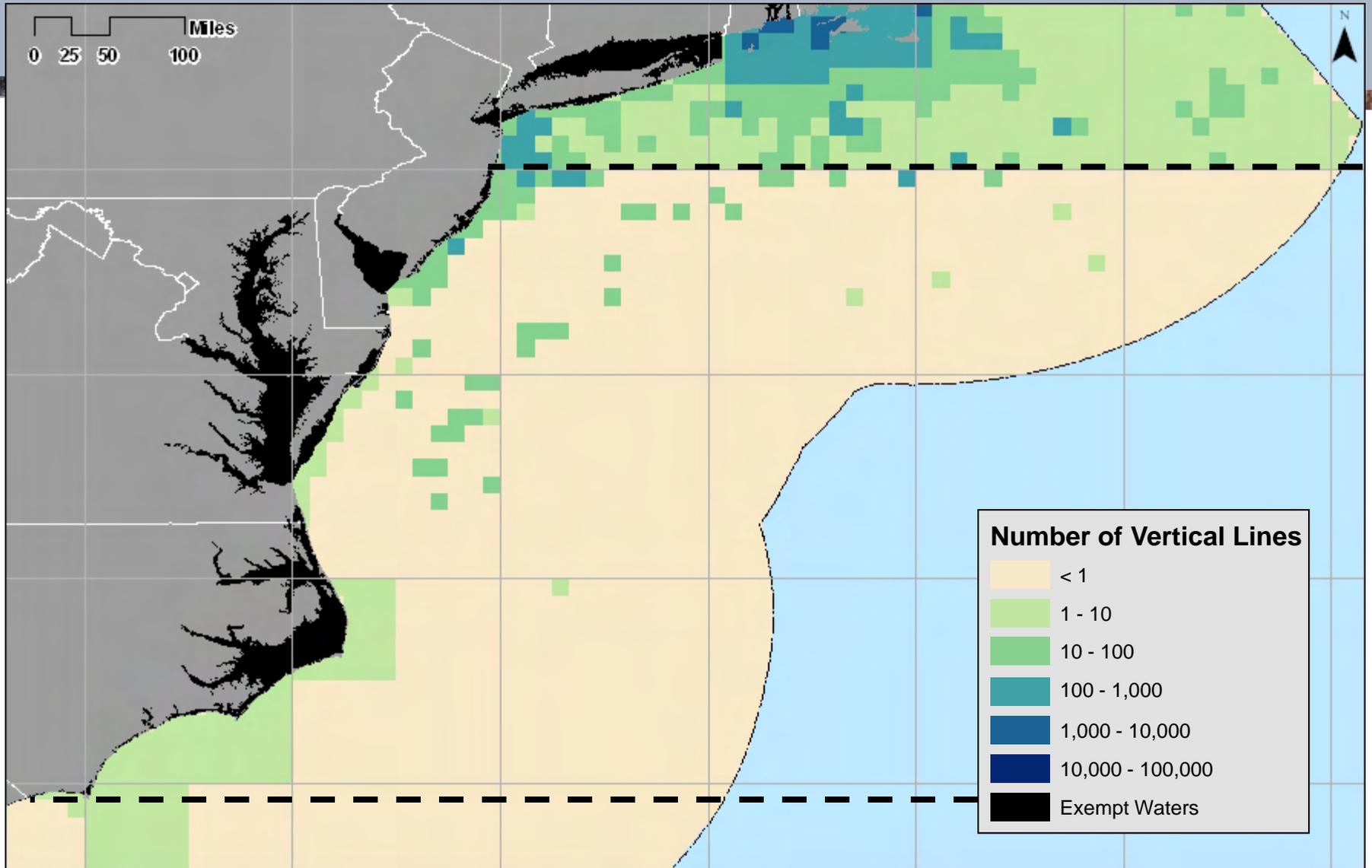
# May 2008 Vertical Line: Mid-Atlantic



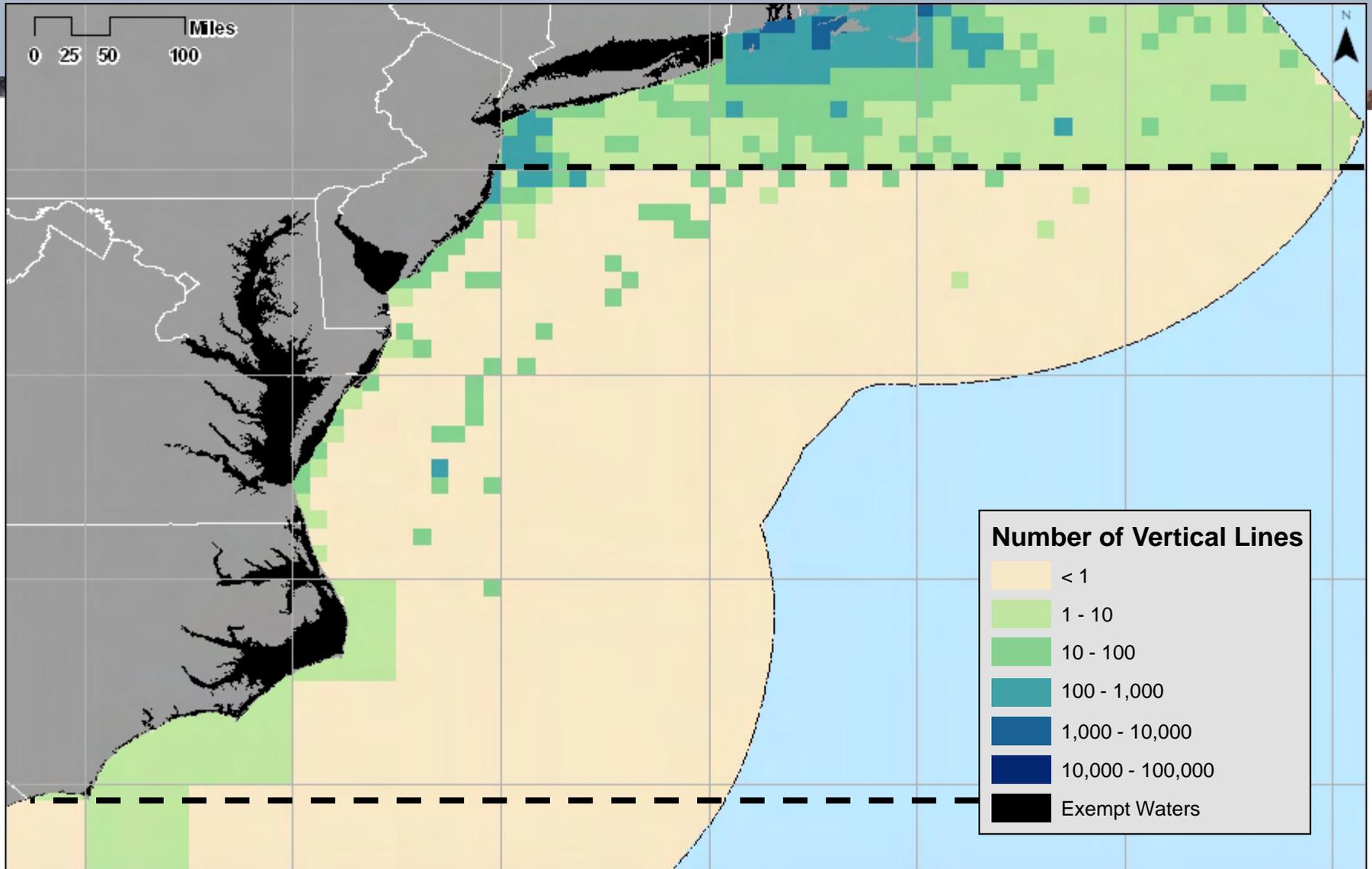
# June 2008 Vertical Line: Mid-Atlantic



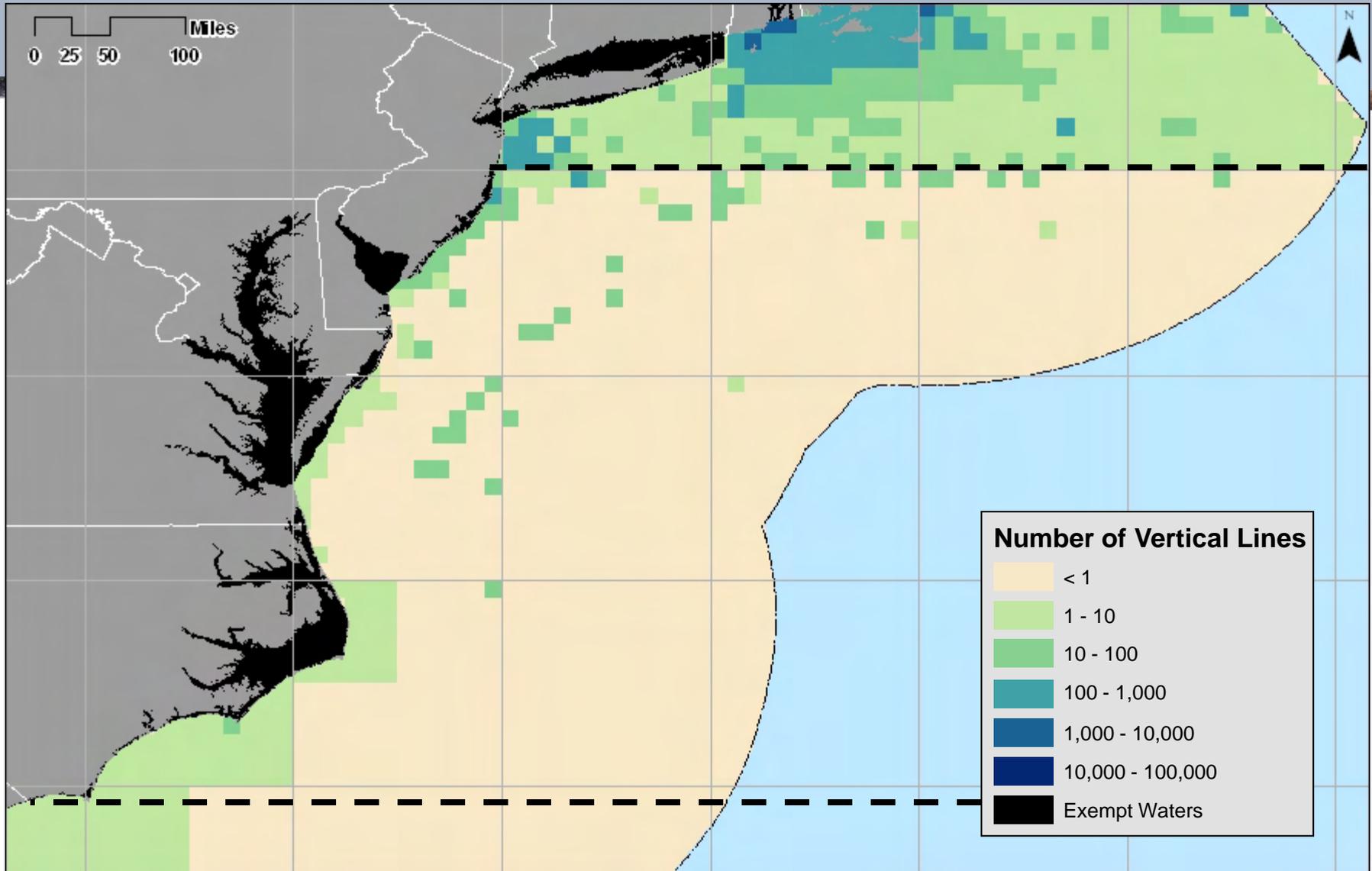
# July 2008 Vertical Line: Mid-Atlantic



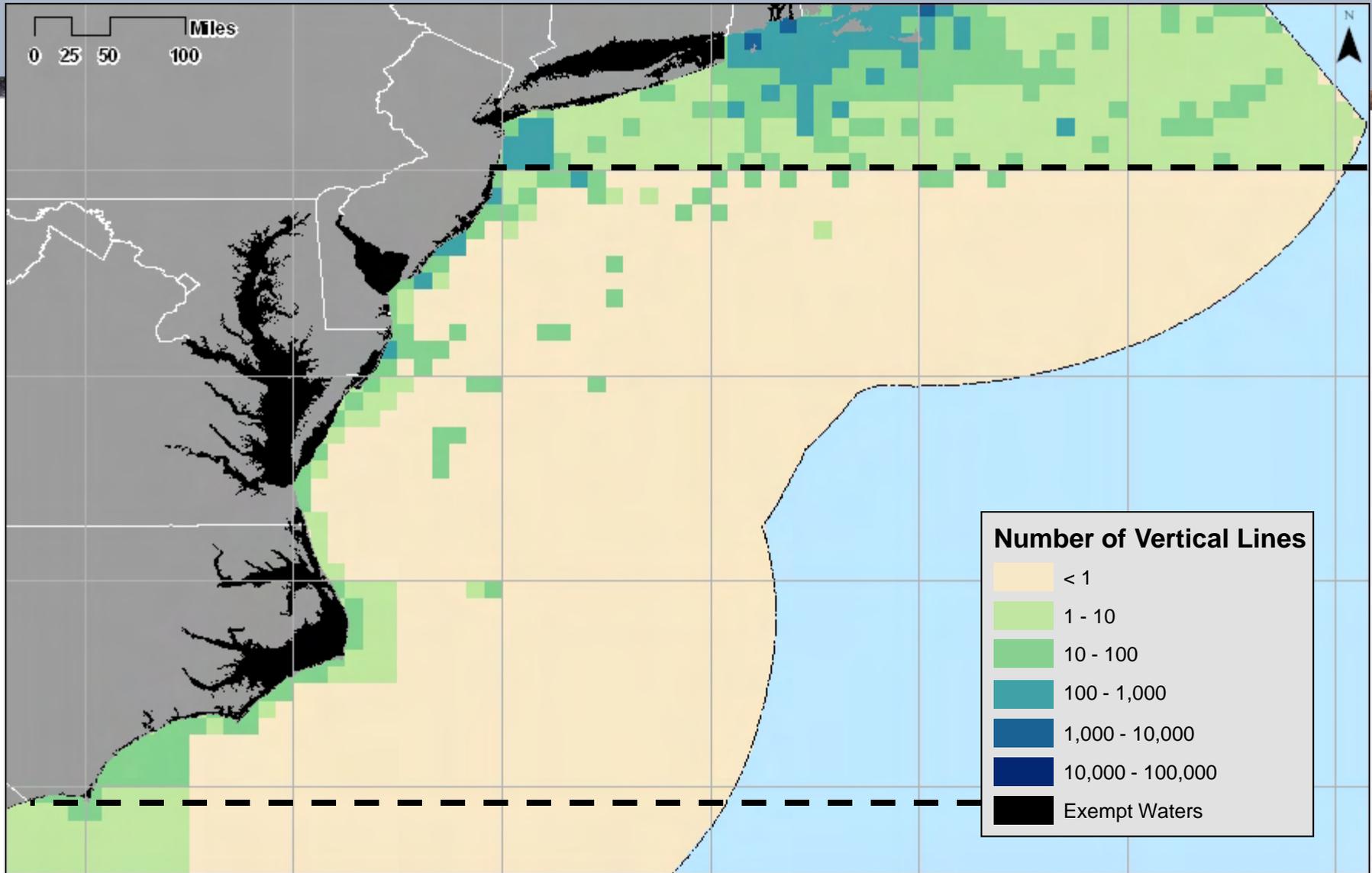
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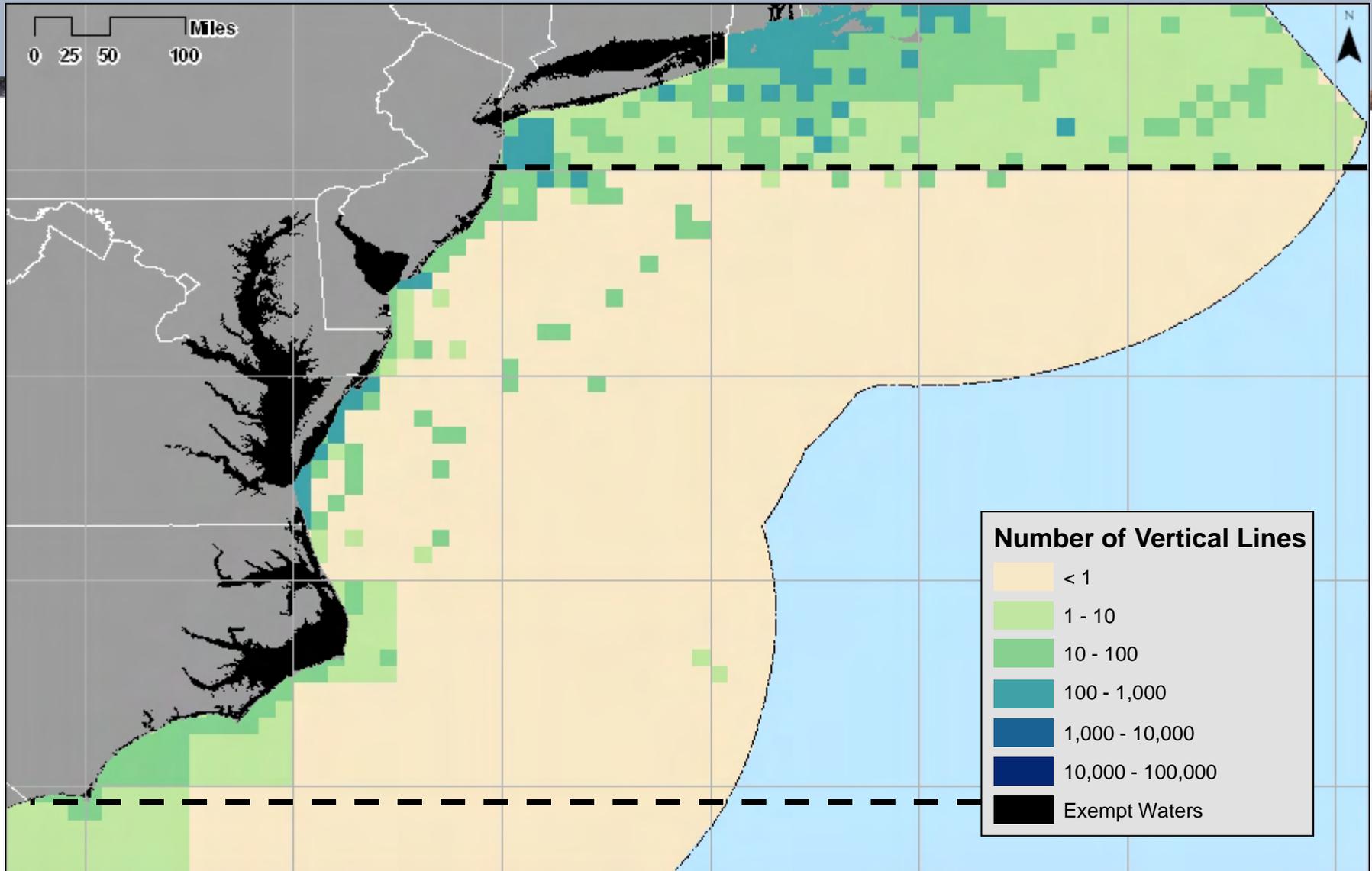
# September 2008 Vertical Line: Mid-Atlantic



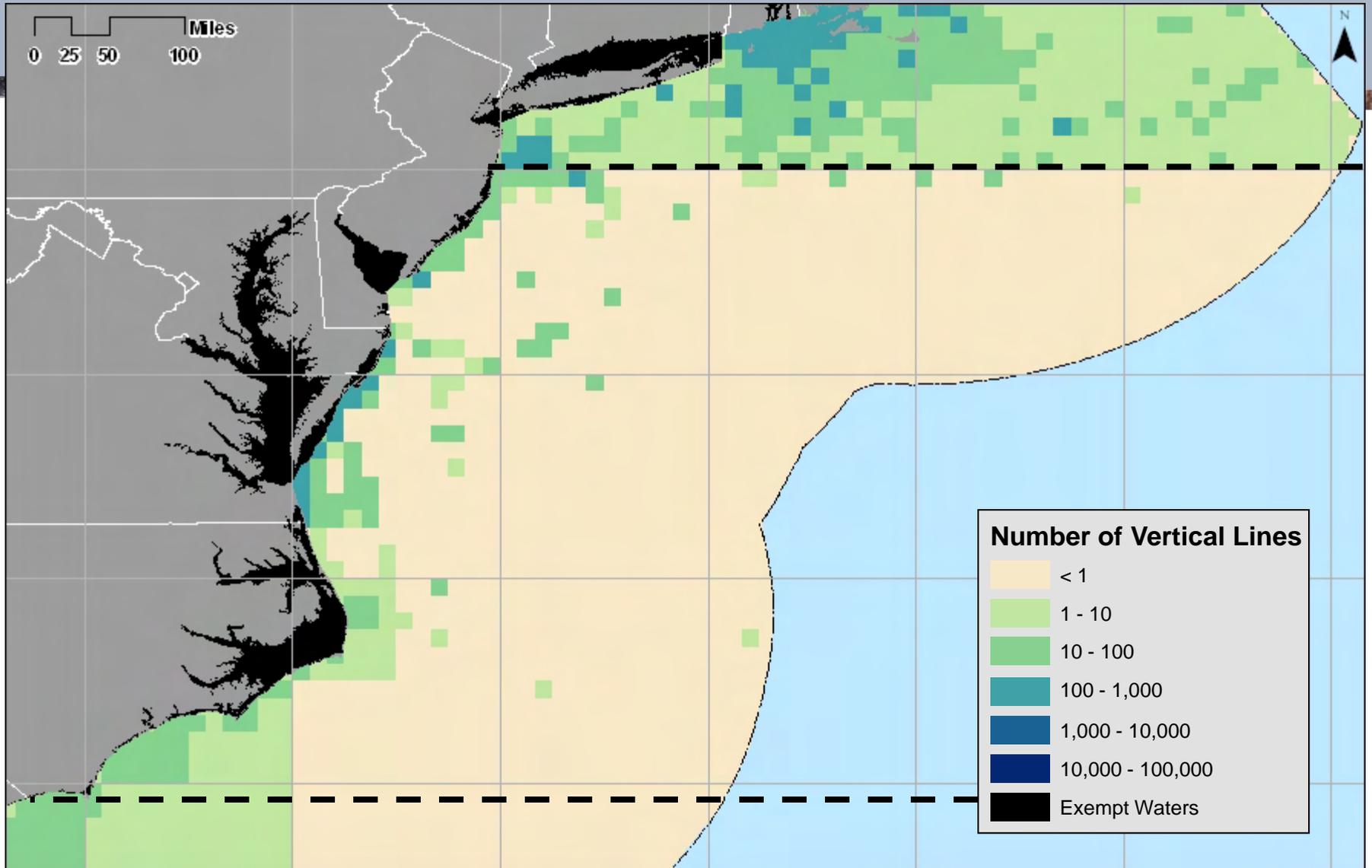
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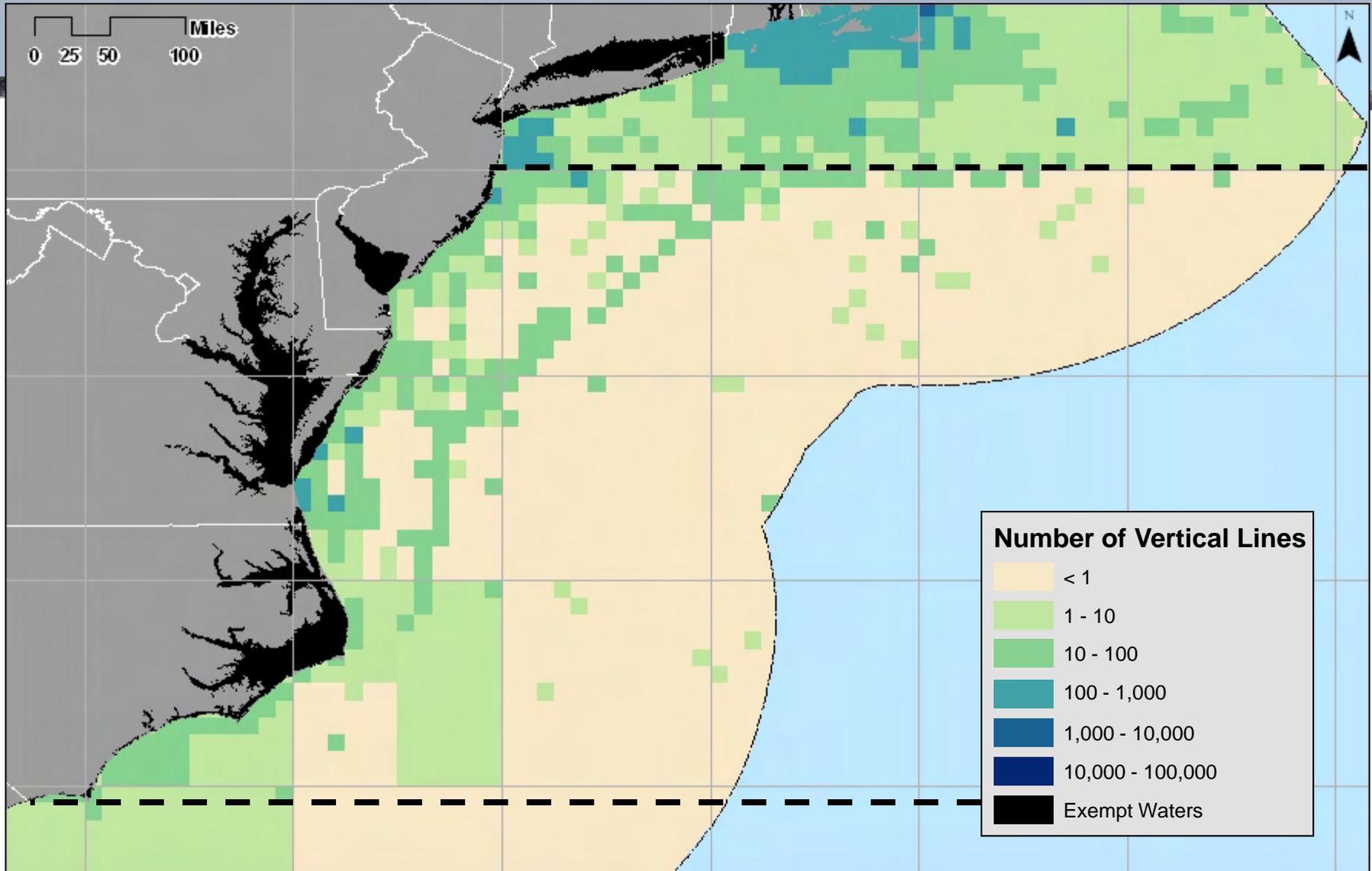
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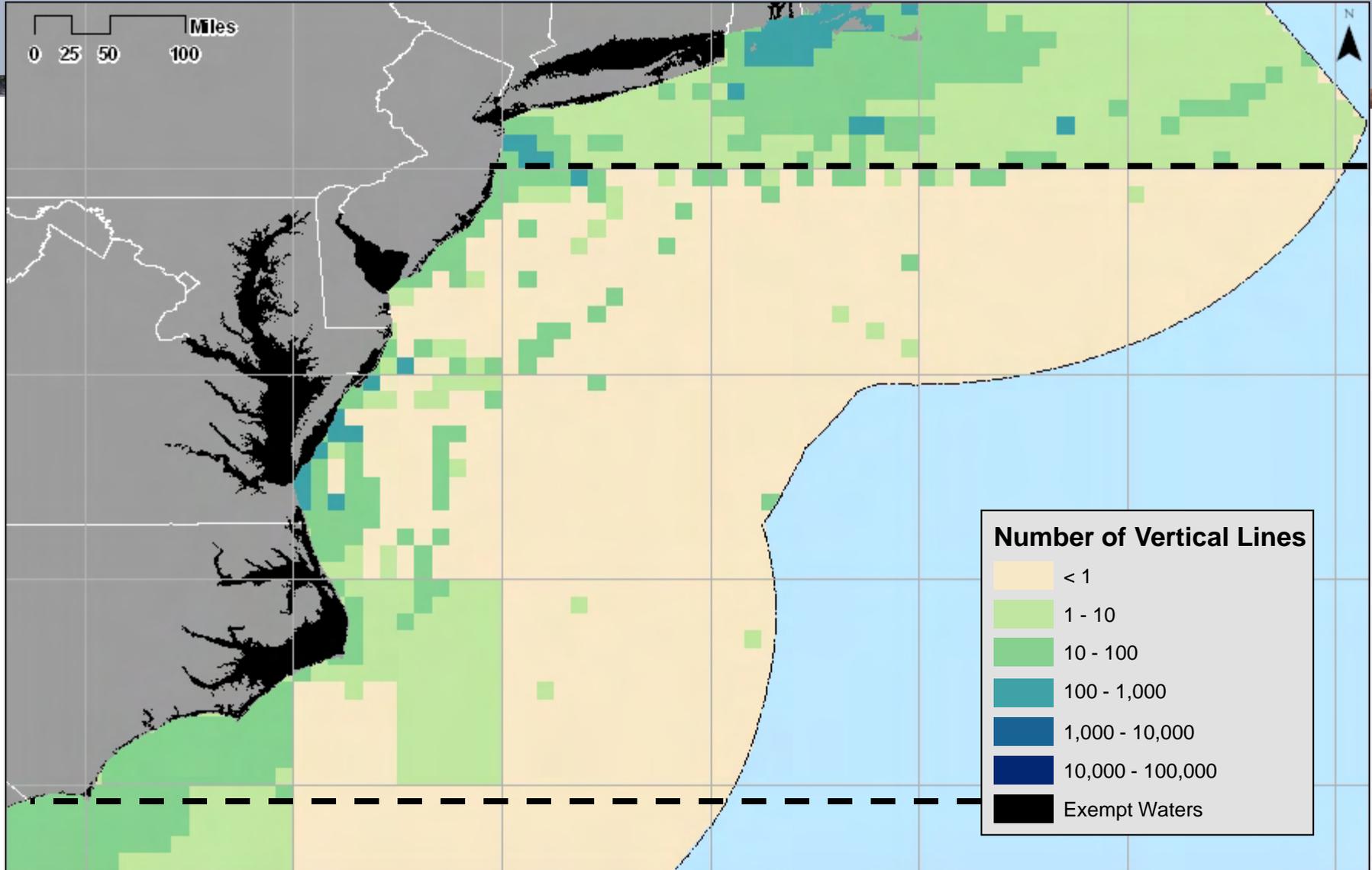
# December 2008 Vertical Line: Mid-Atlantic



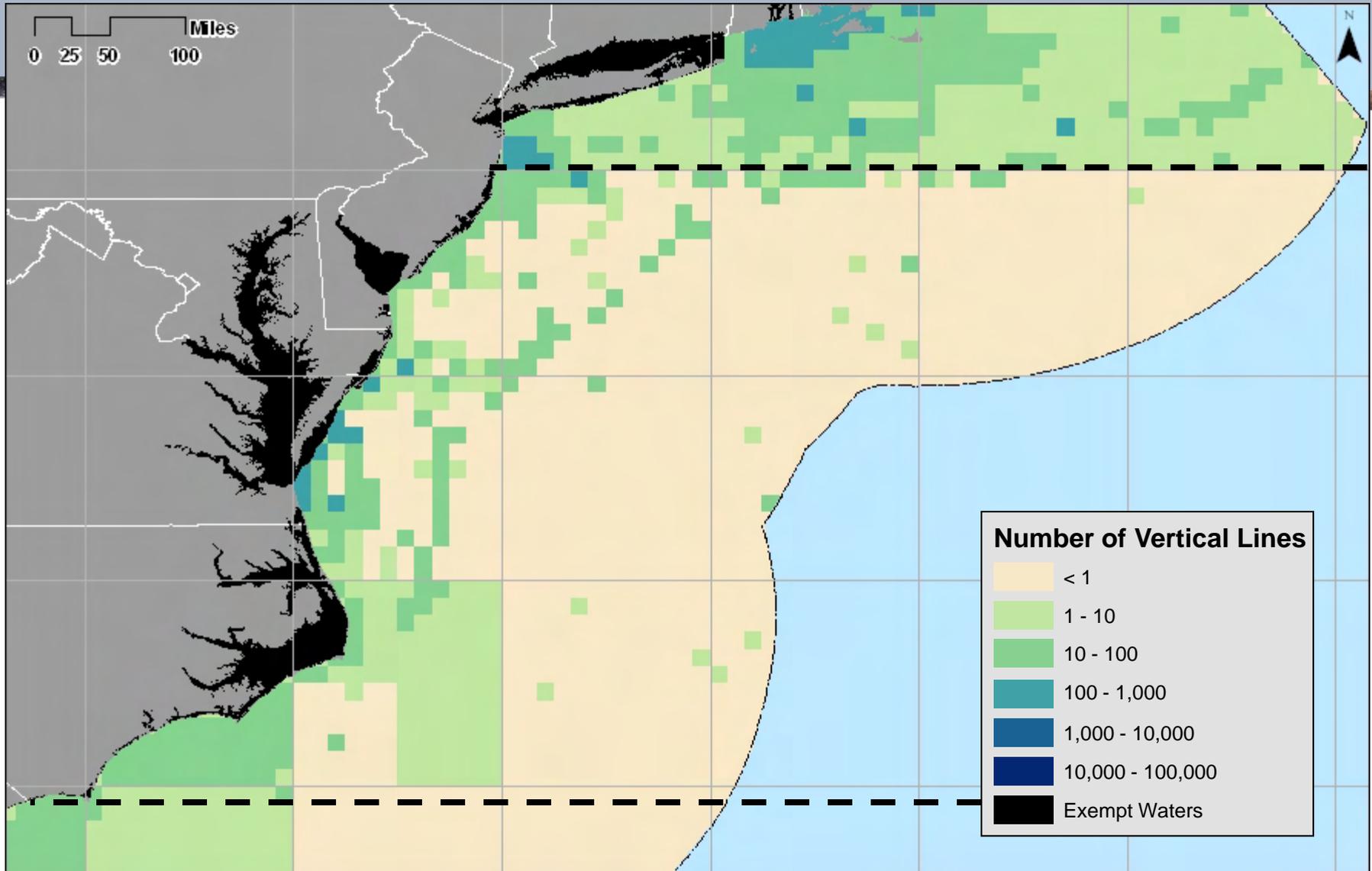
# Average 2008 Vertical Line: Mid-Atlantic



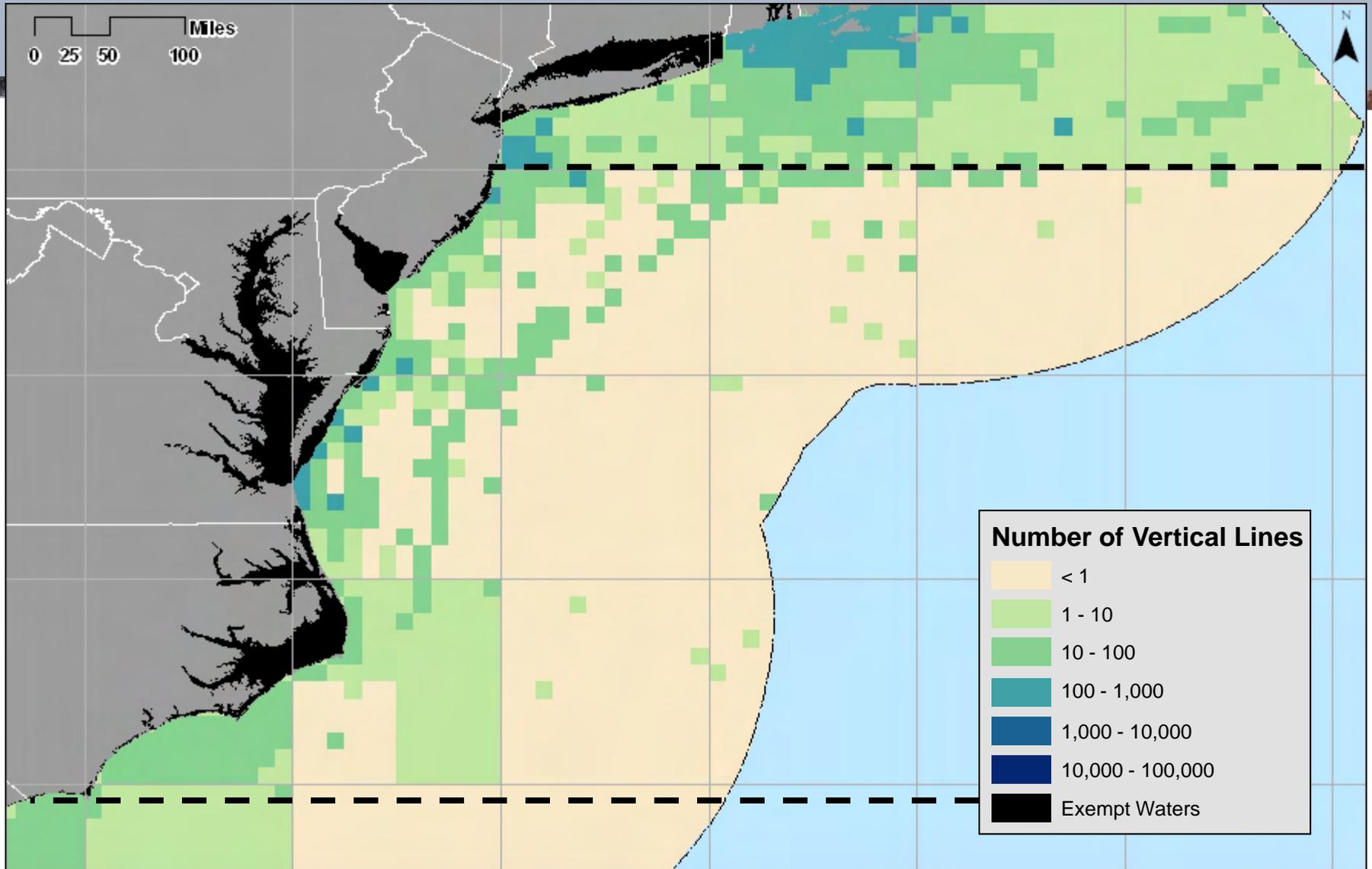
# December-March 2008 Vertical Line: Mid-Atlantic



# November-April 2008 Vertical Line: Mid-Atlantic

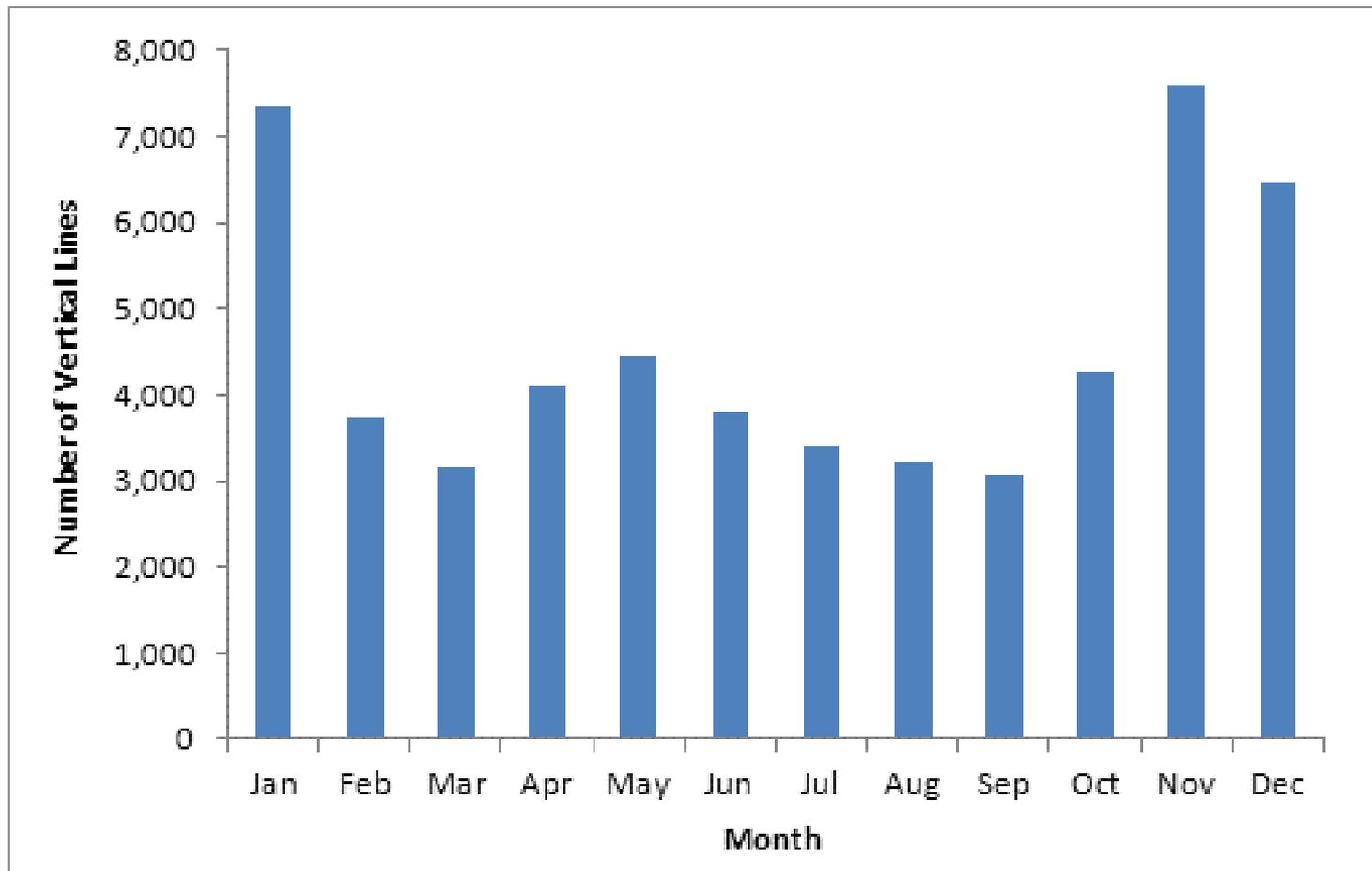


# September-May 2008 Vertical Line: Mid-Atlantic



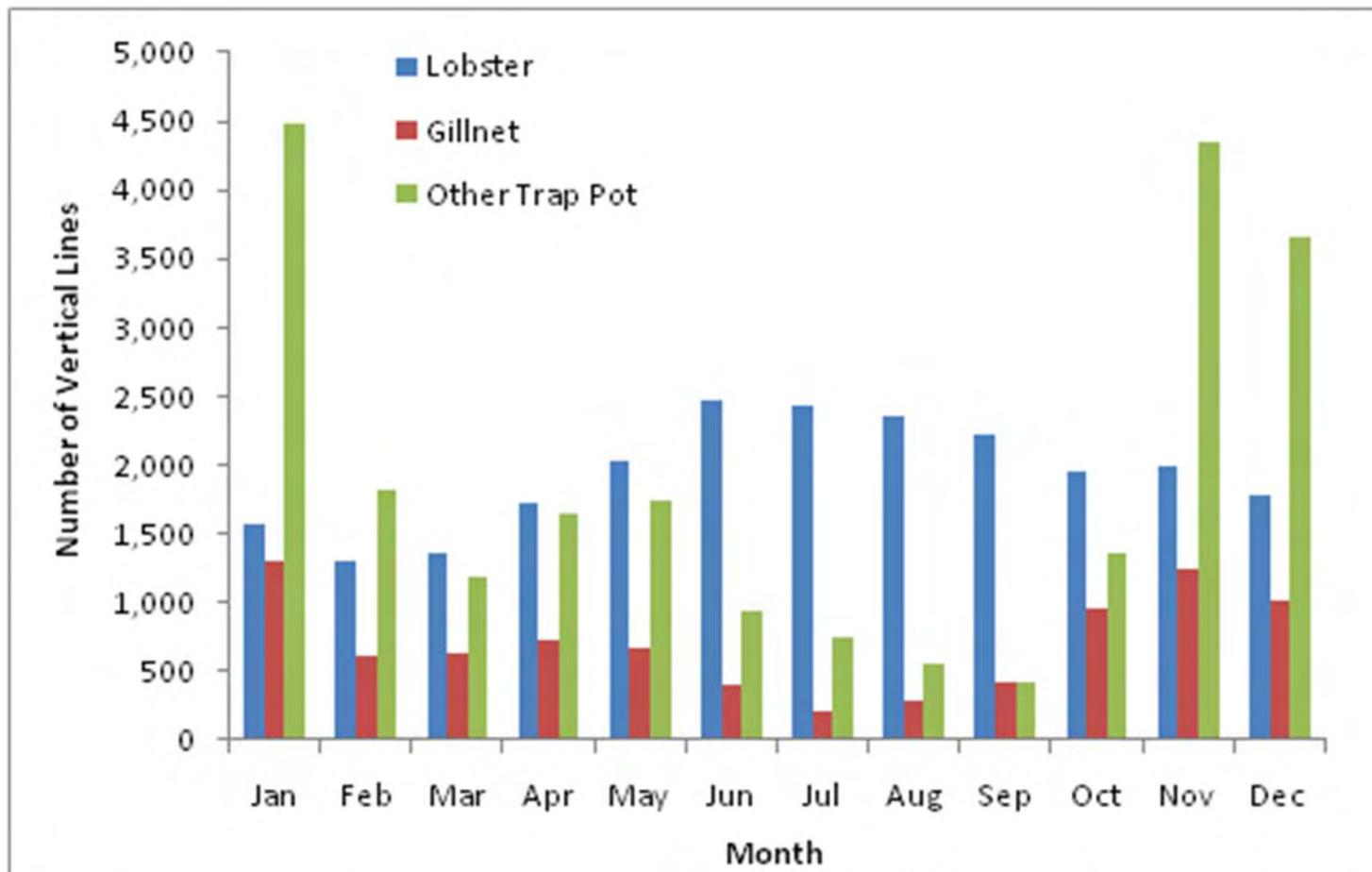
# Baseline Results: Vertical Line

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



# Baseline Results: Vertical Line

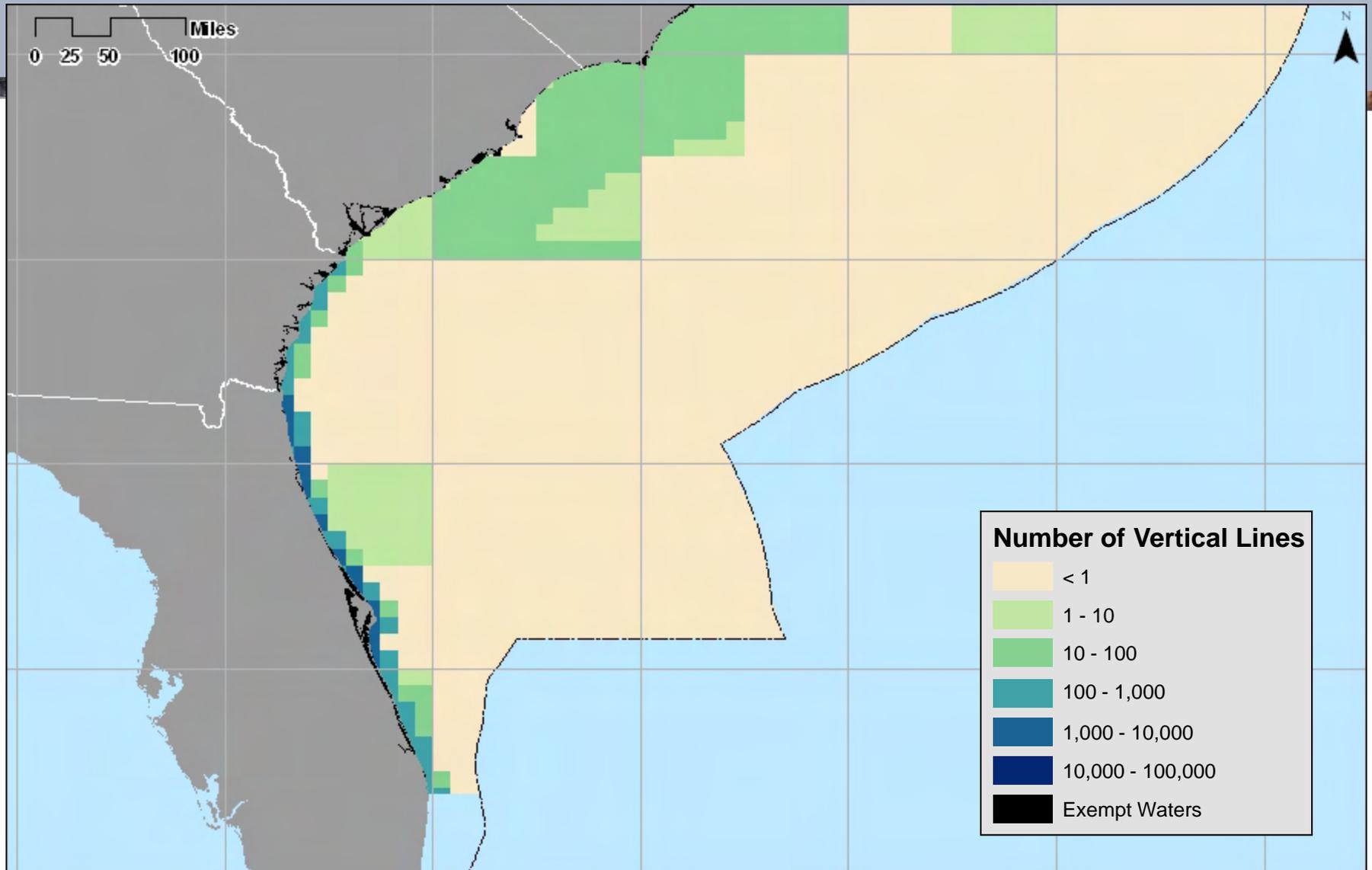
Number of Vertical Lines in Mid-Atlantic Non-Exempt Waters (2008) by Fishery



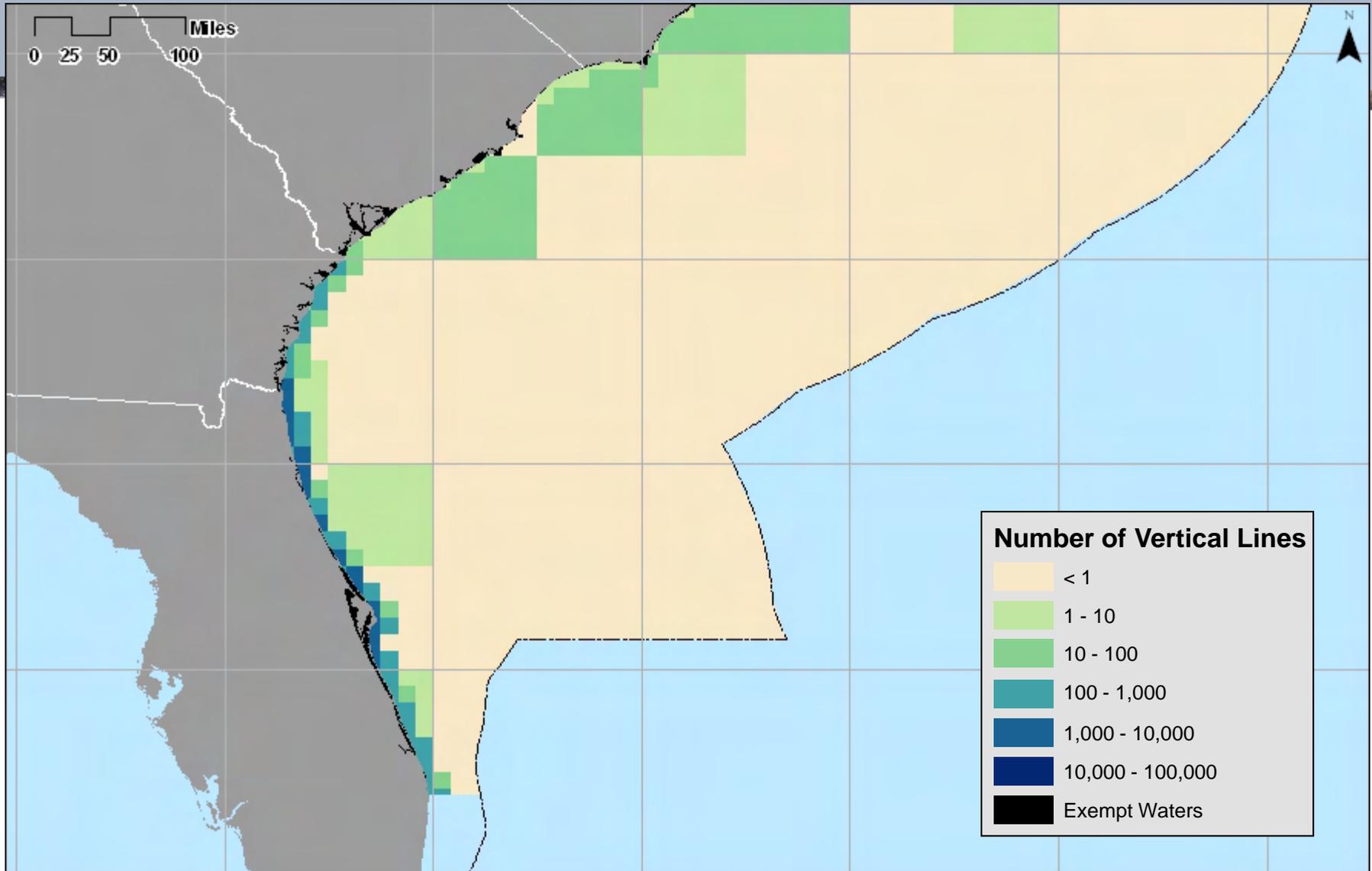
# General Observations

- Greatest concentration of vertical line in nearshore waters off New Jersey and the Delmarva peninsula
- Greatest concentration of vertical line found November through January
- Trap/pot fisheries are the highest contributors to vertical line in the Mid-Atlantic; gillnet contributes less
- Concentrations of vertical line are relatively low in comparison to the Northeast

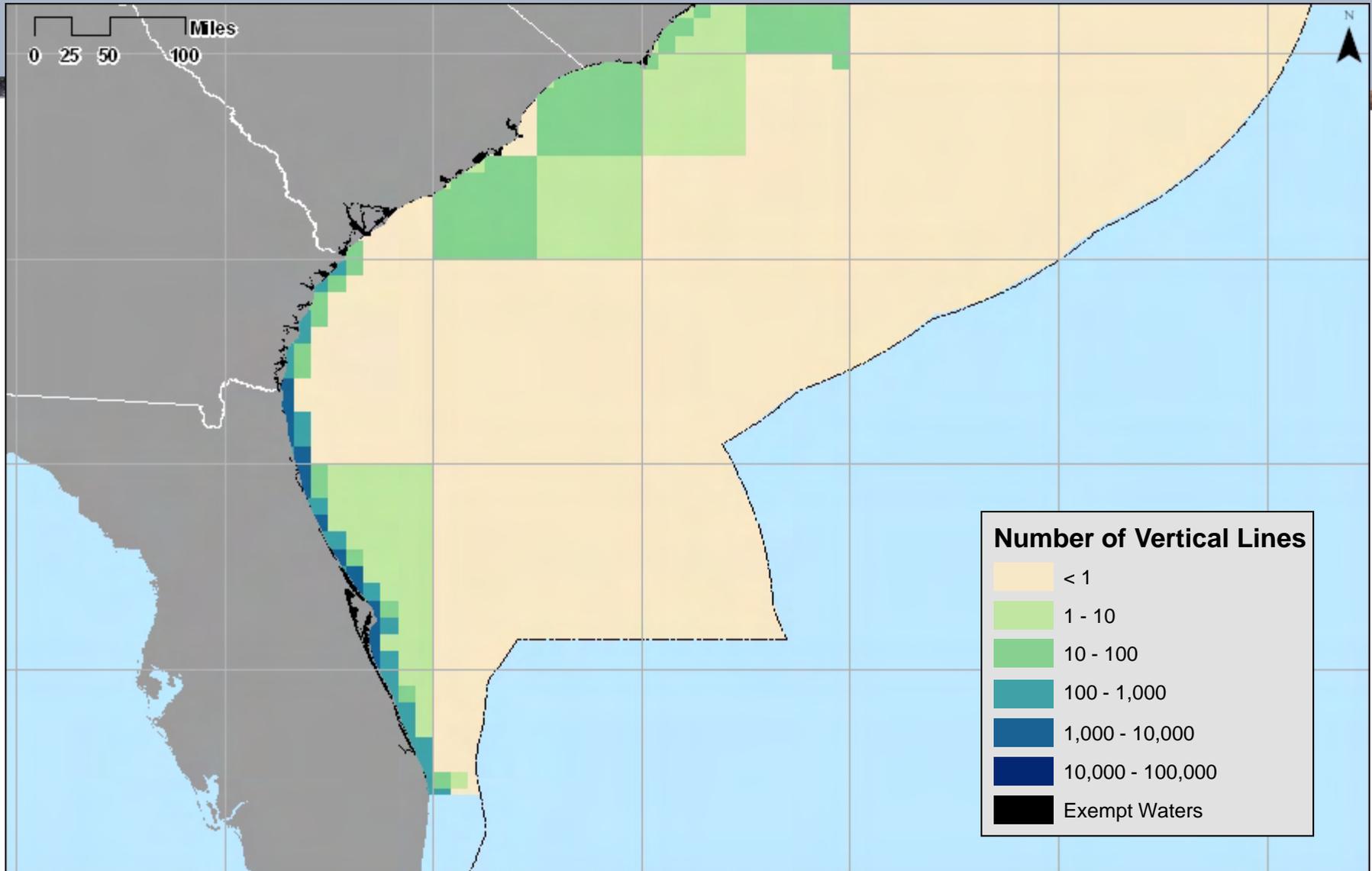
# January 2008 Vertical Line: Southeast



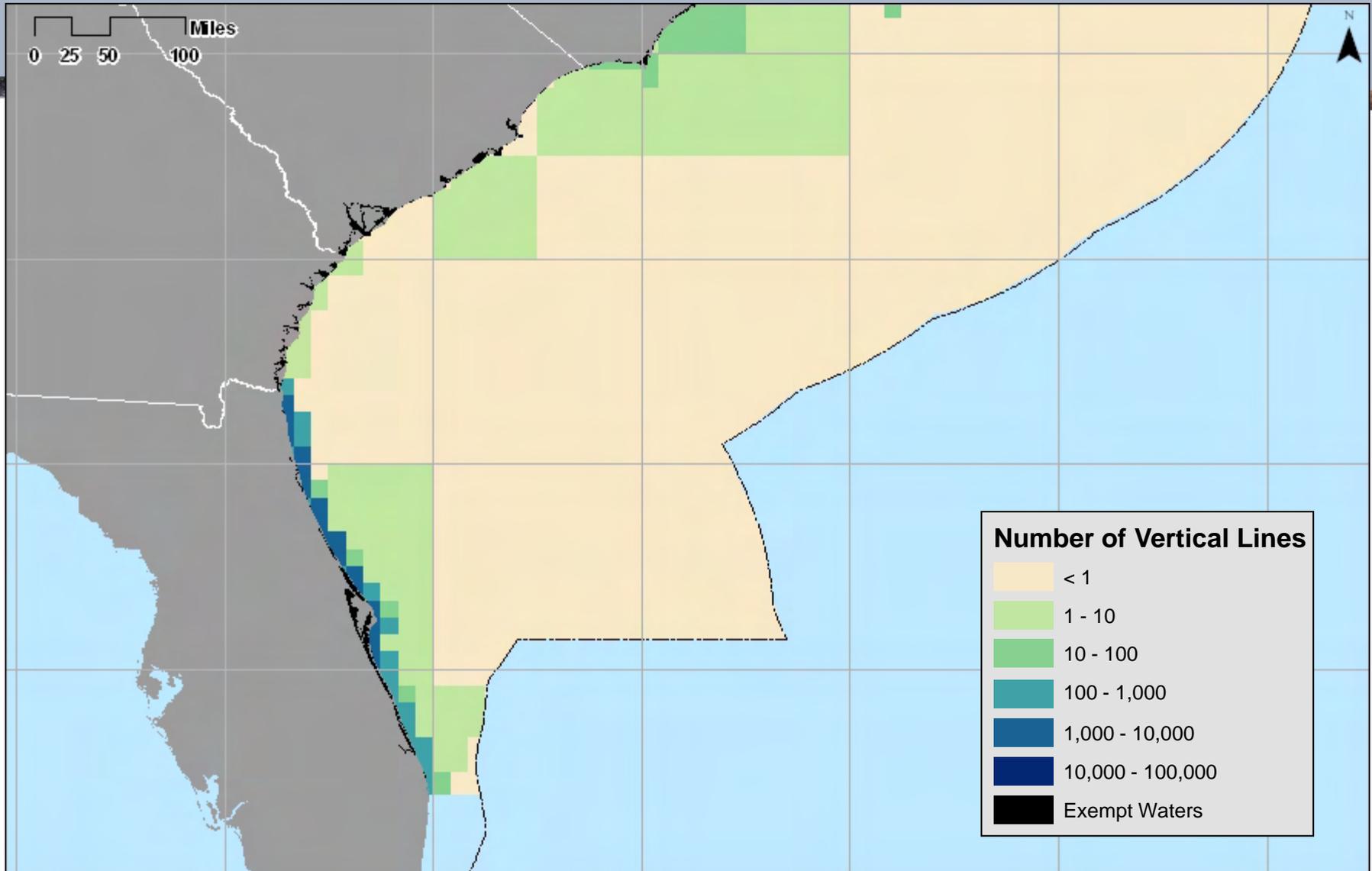
# February 2008 Vertical Line: Southeast



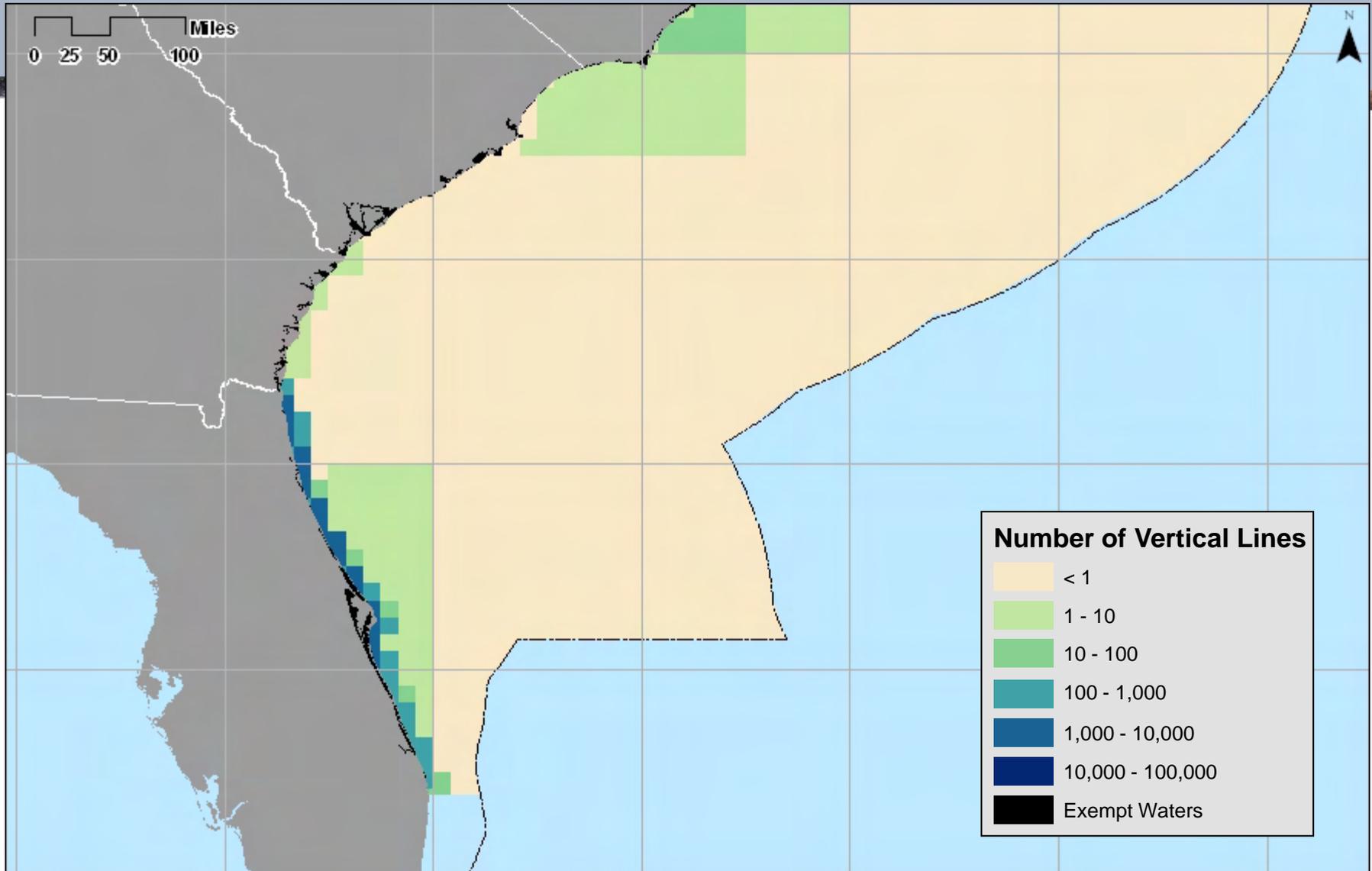
# March 2008 Vertical Line: Southeast



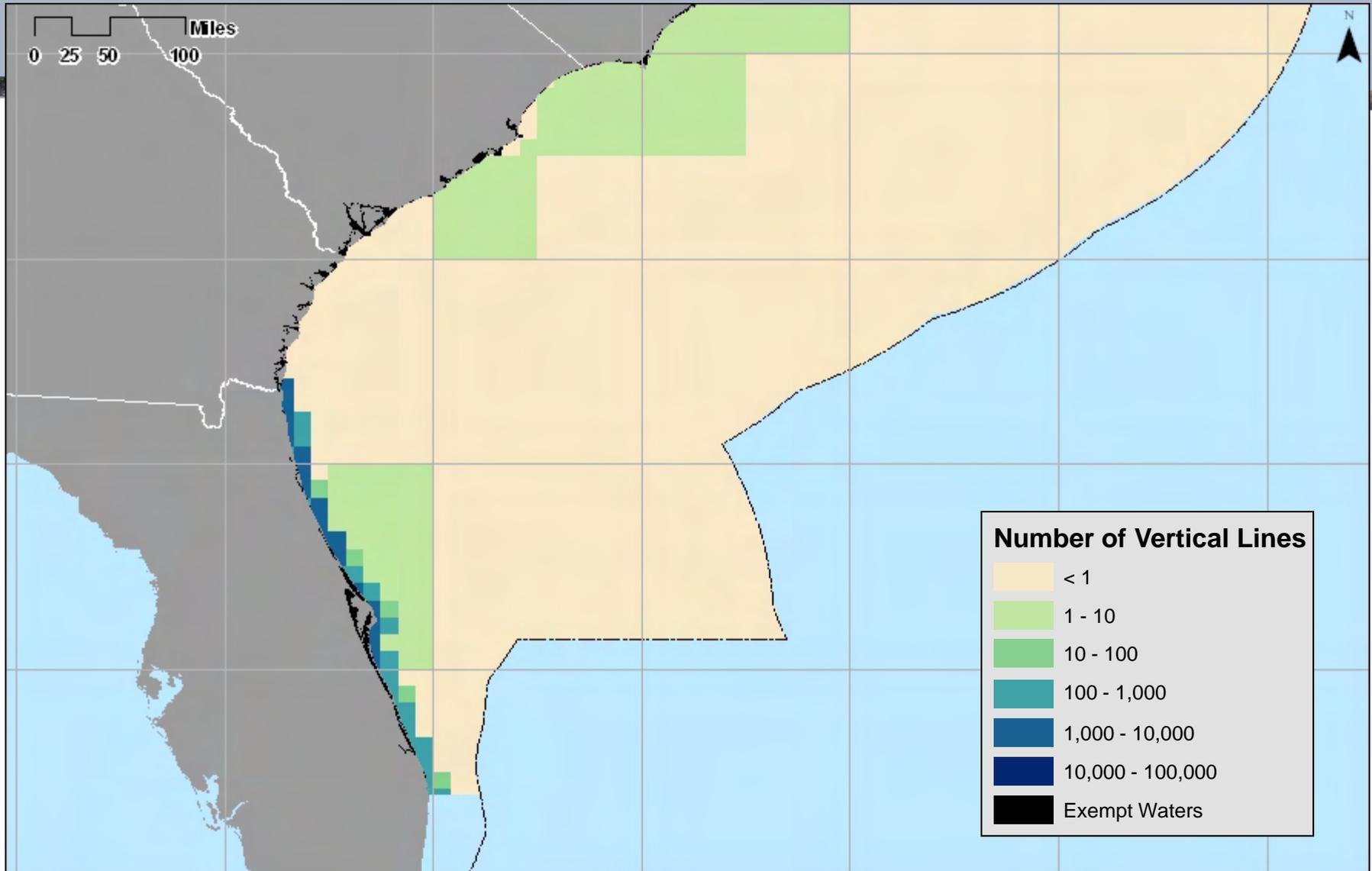
# April 2008 Vertical Line: Southeast



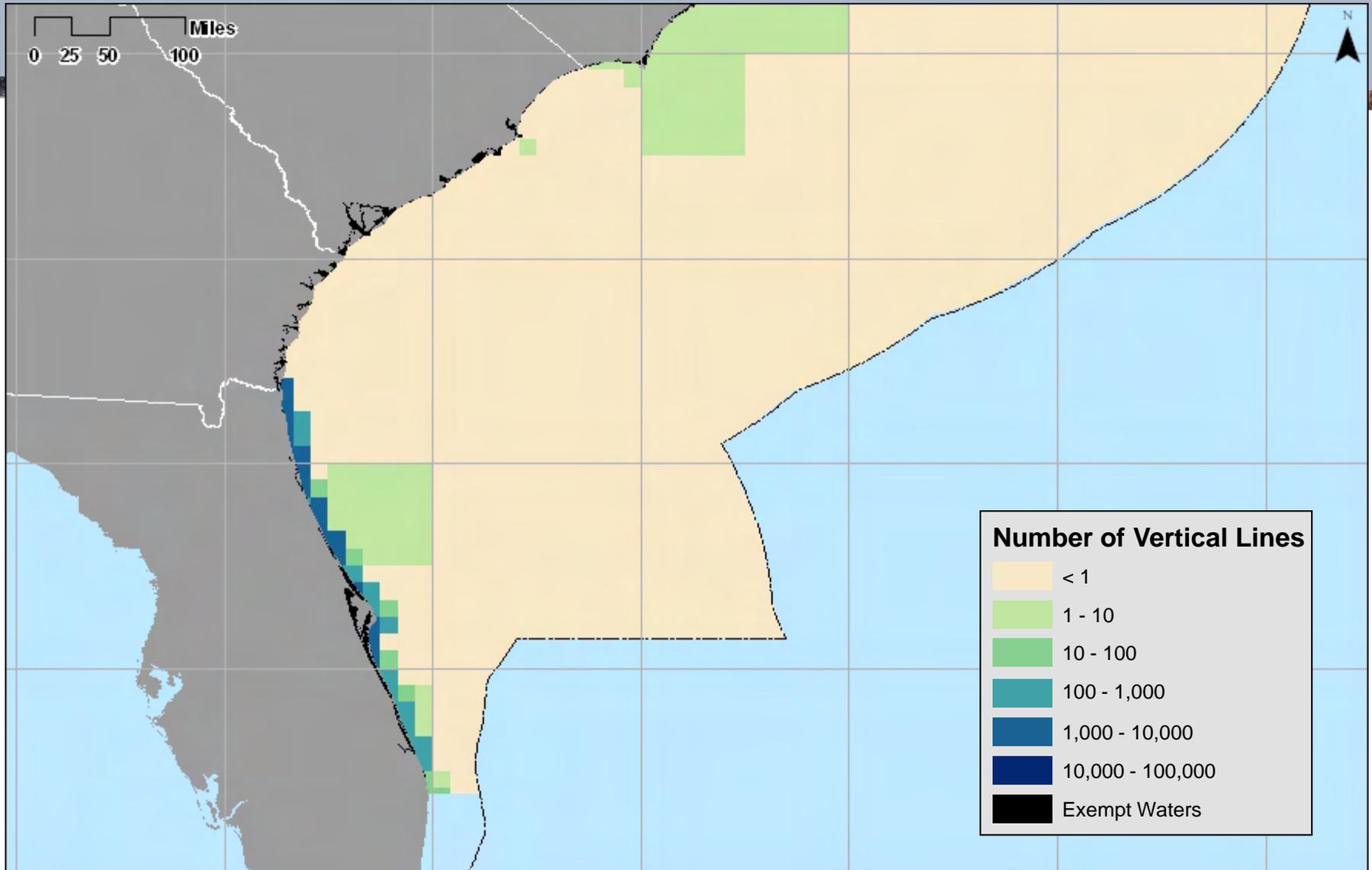
# May 2008 Vertical Line: Southeast



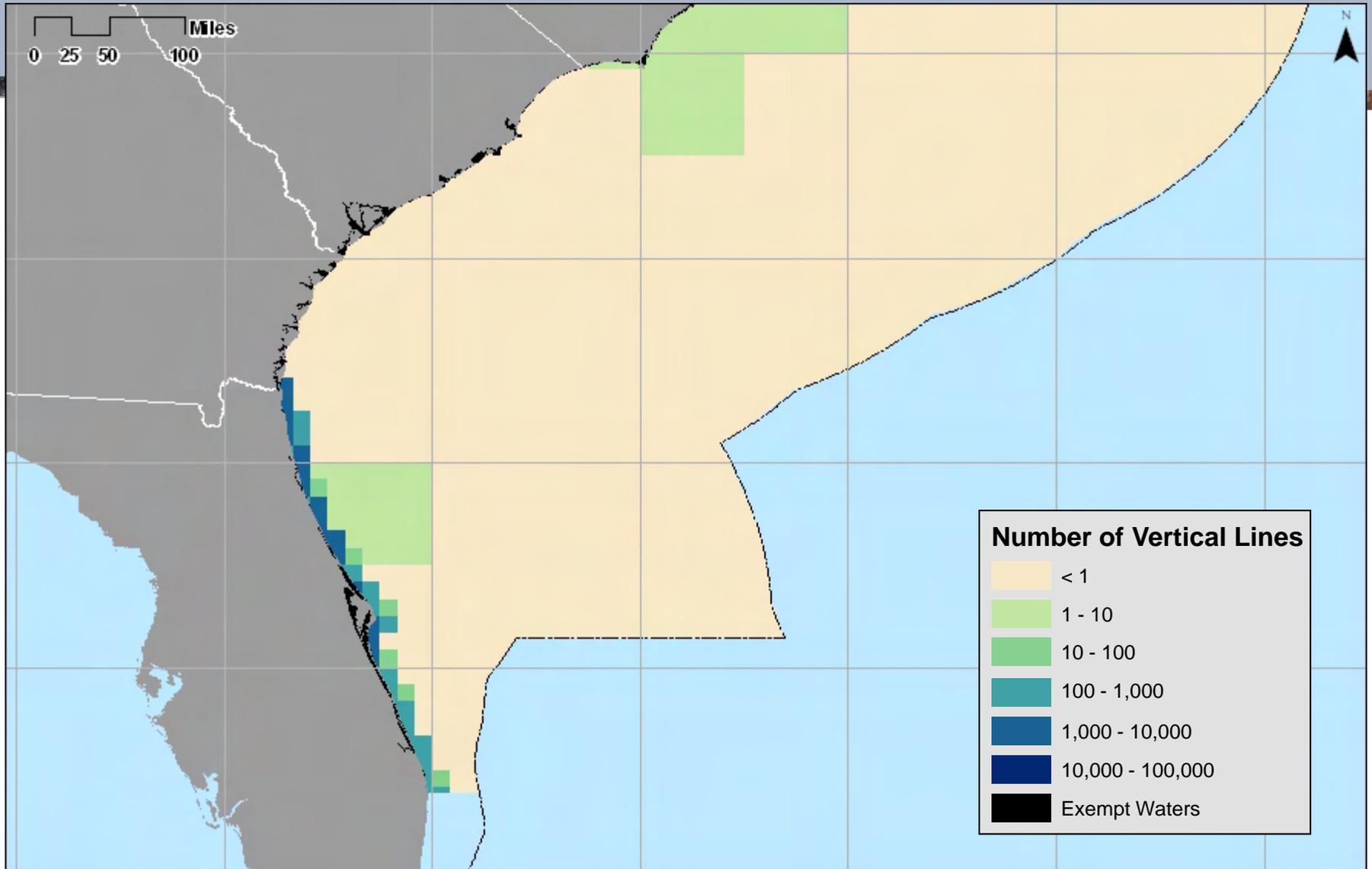
# June 2008 Vertical Line: Southeast



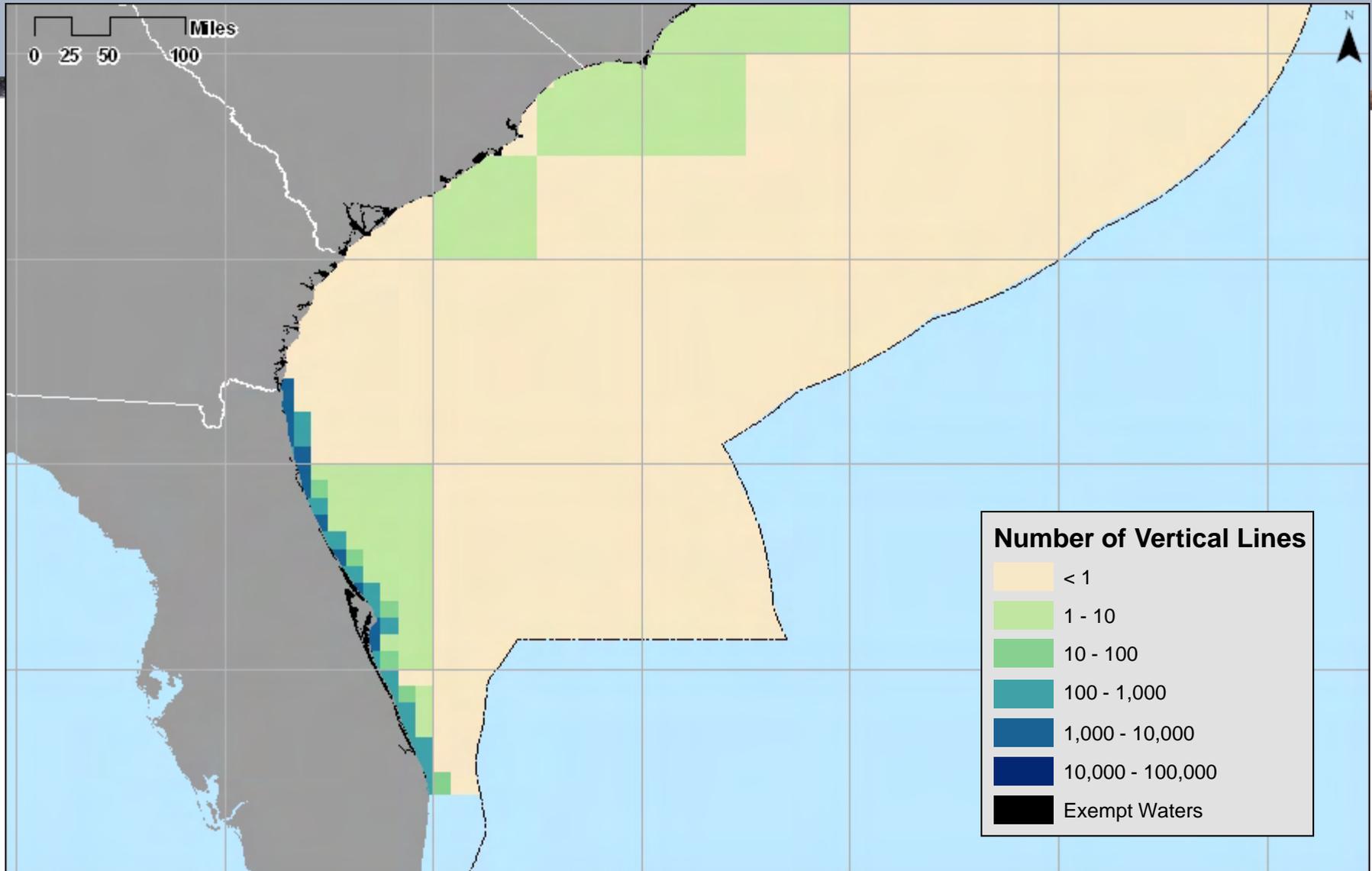
# July 2008 Vertical Line: Southeast



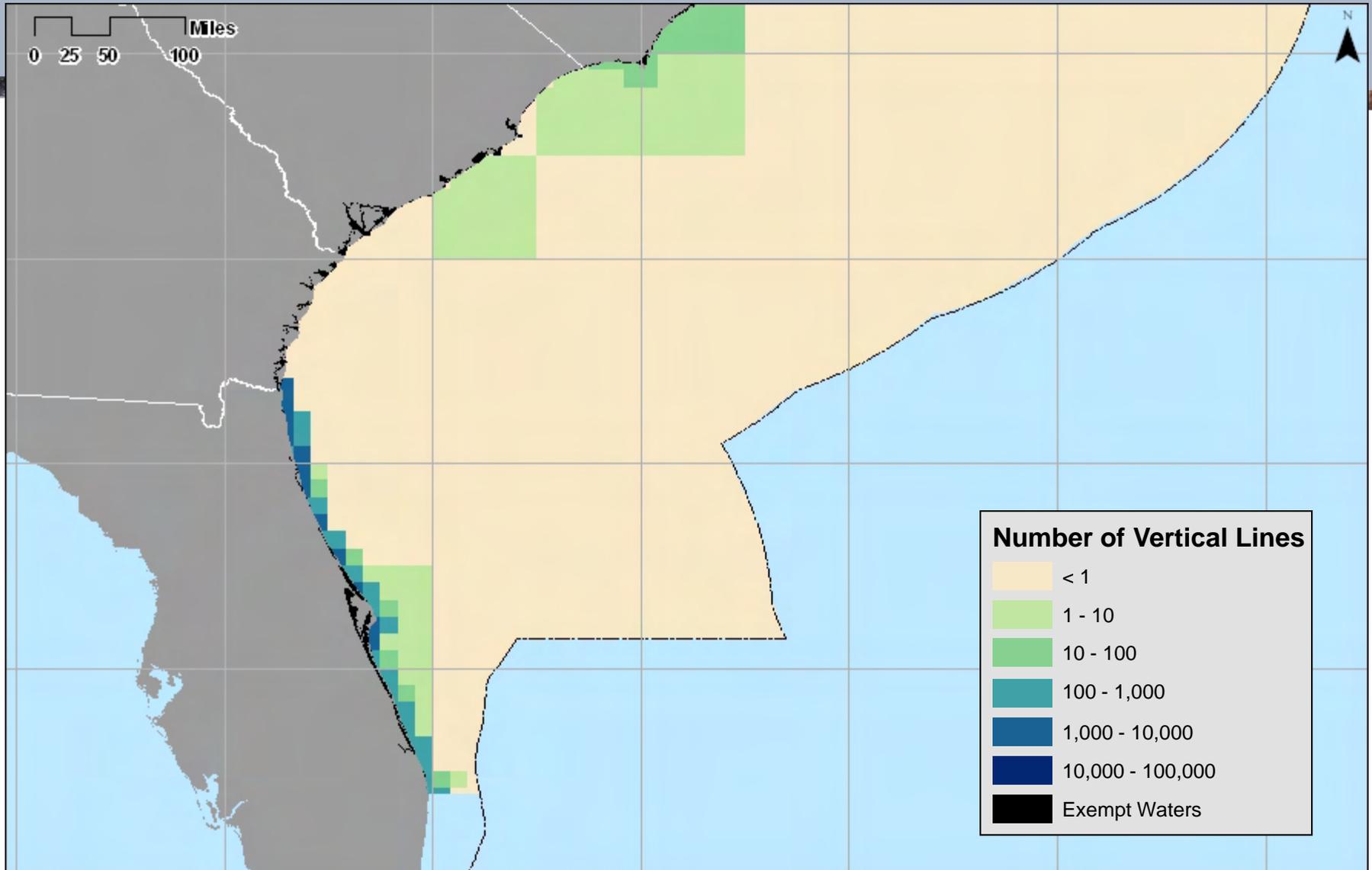
# August 2008 Vertical Line: Southeast



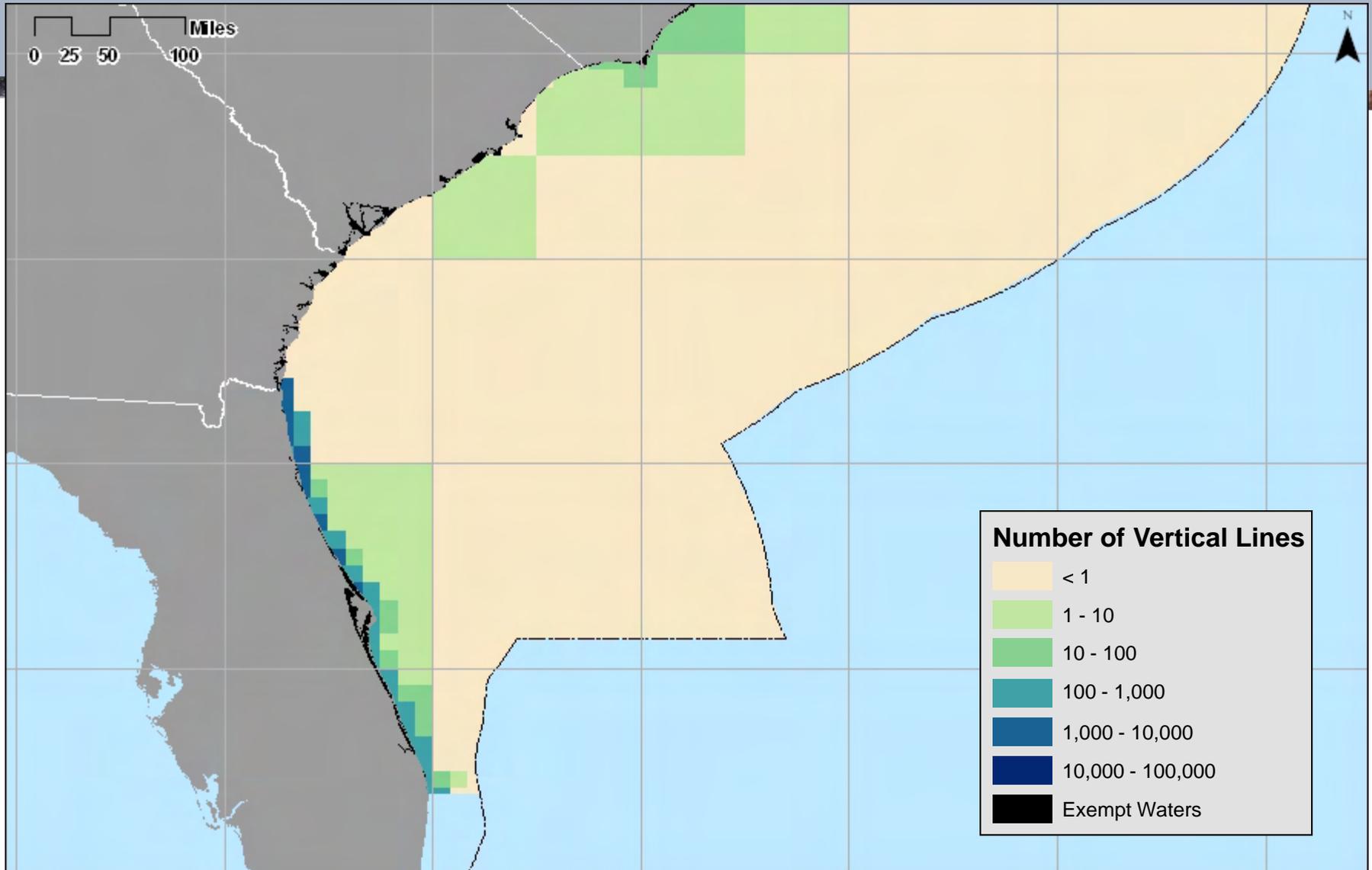
# September 2008 Vertical Line: Southeast



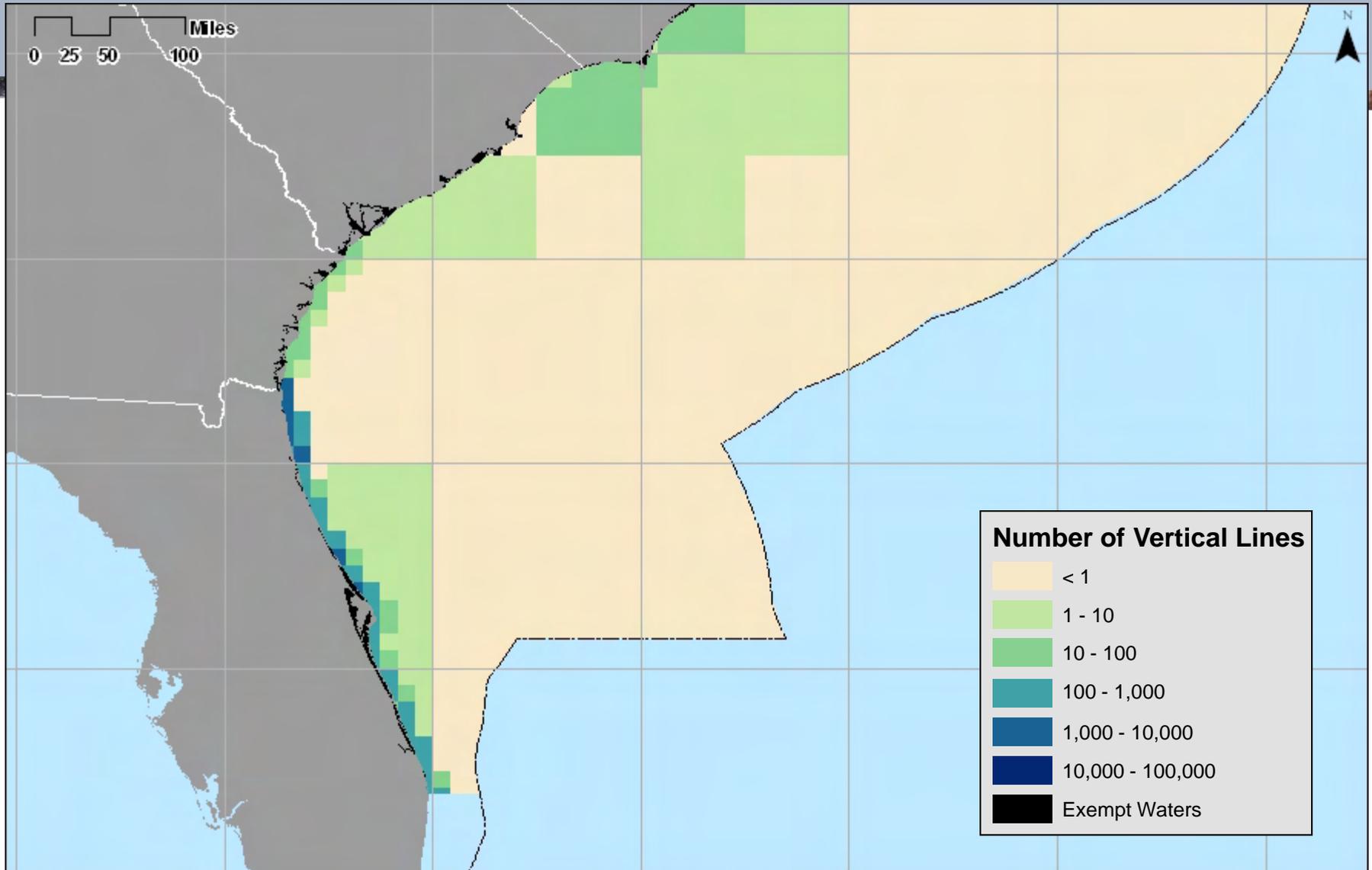
# October 2008 Vertical Line: Southeast



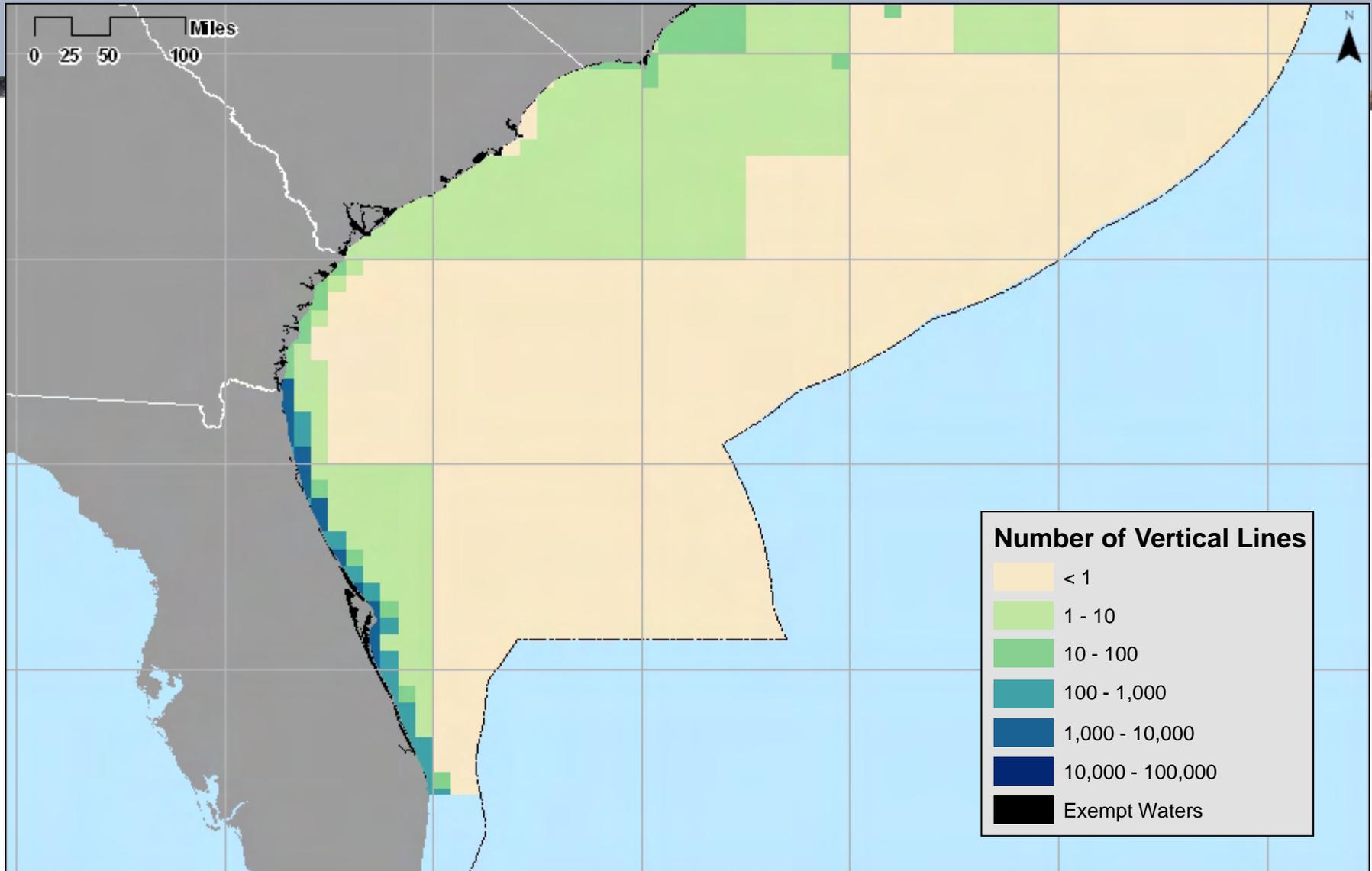
# November 2008 Vertical Line: Southeast



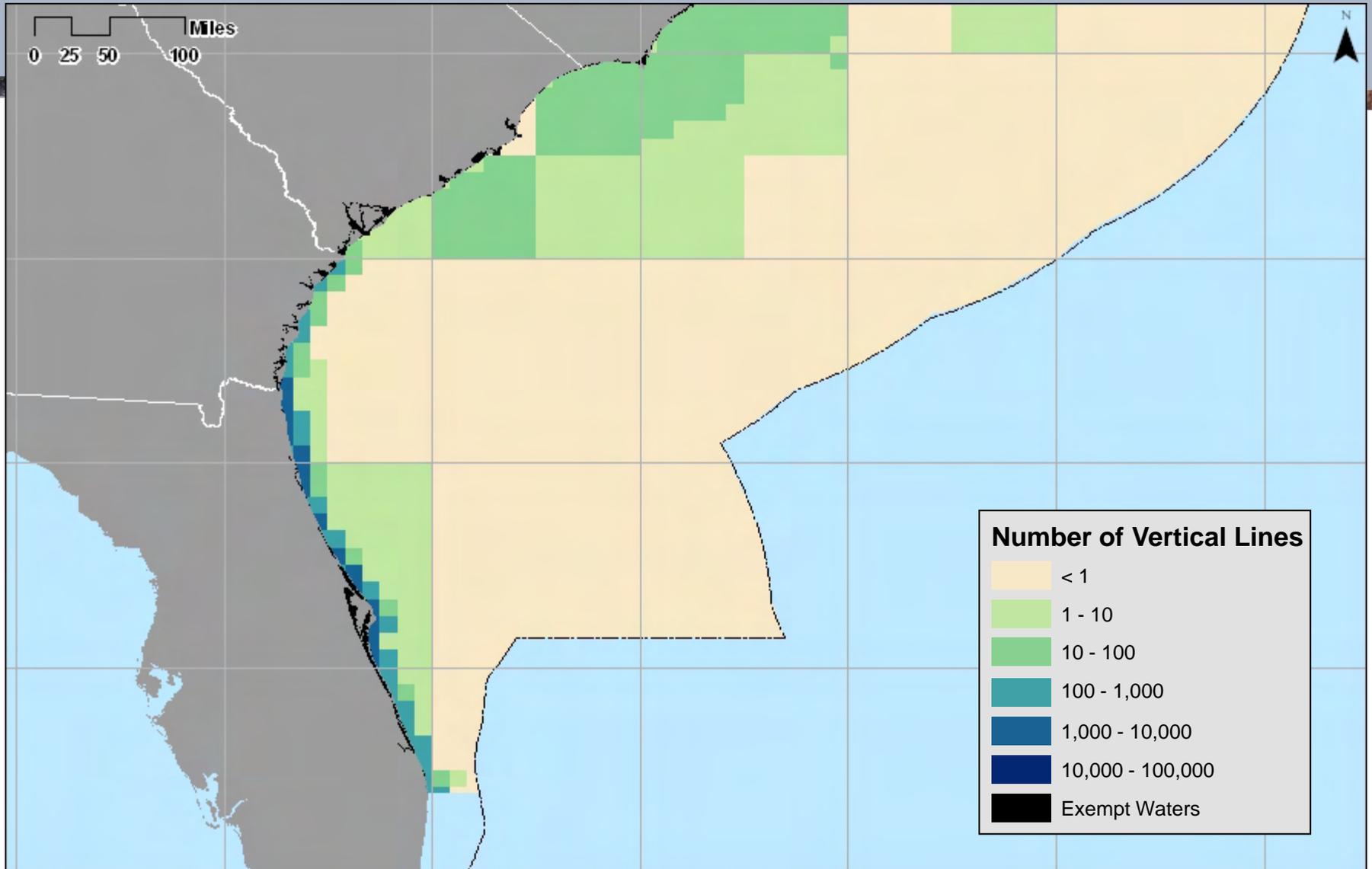
# December 2008 Vertical Line: Southeast



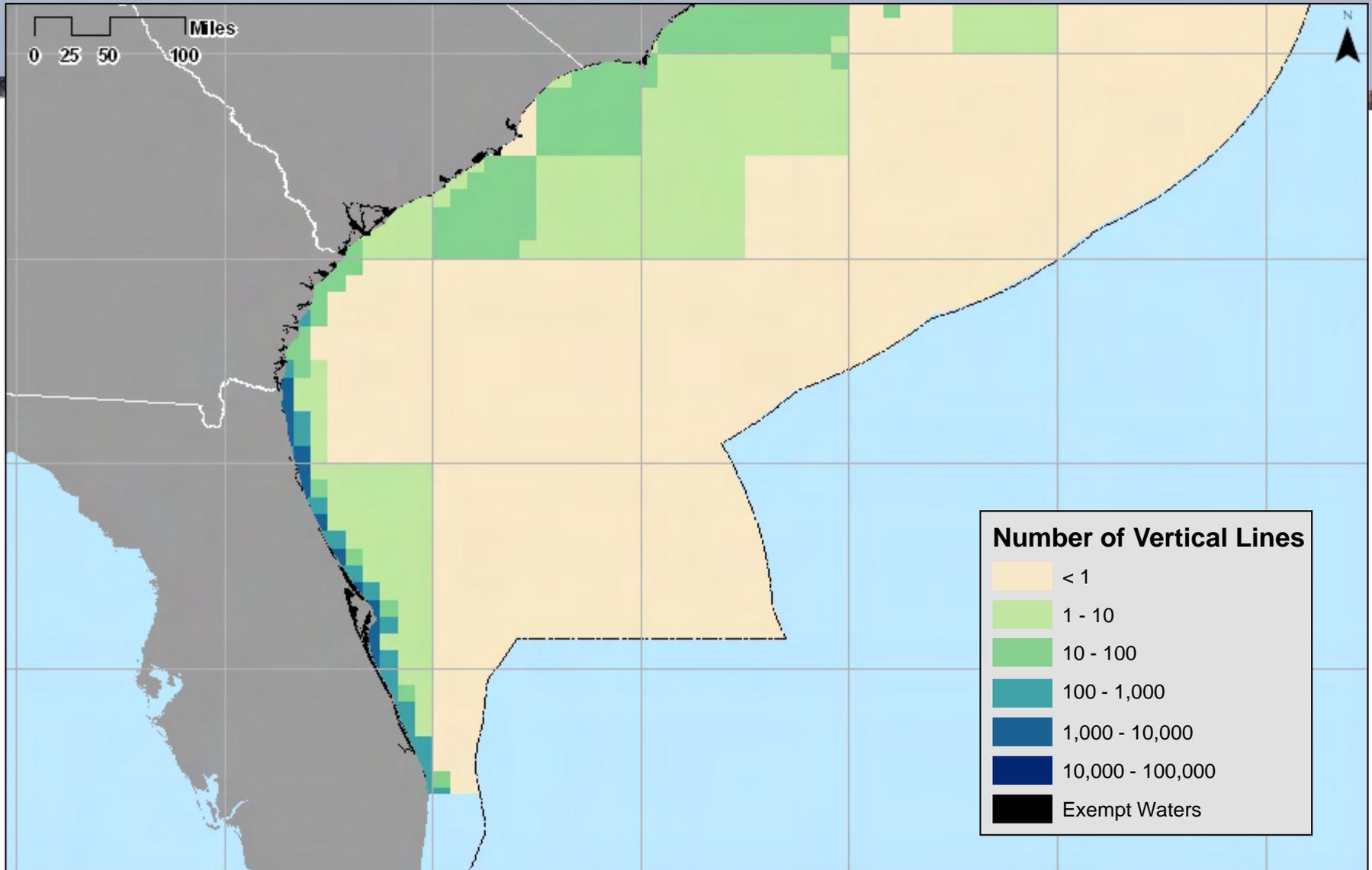
# Average 2008 Vertical Line: Southeast



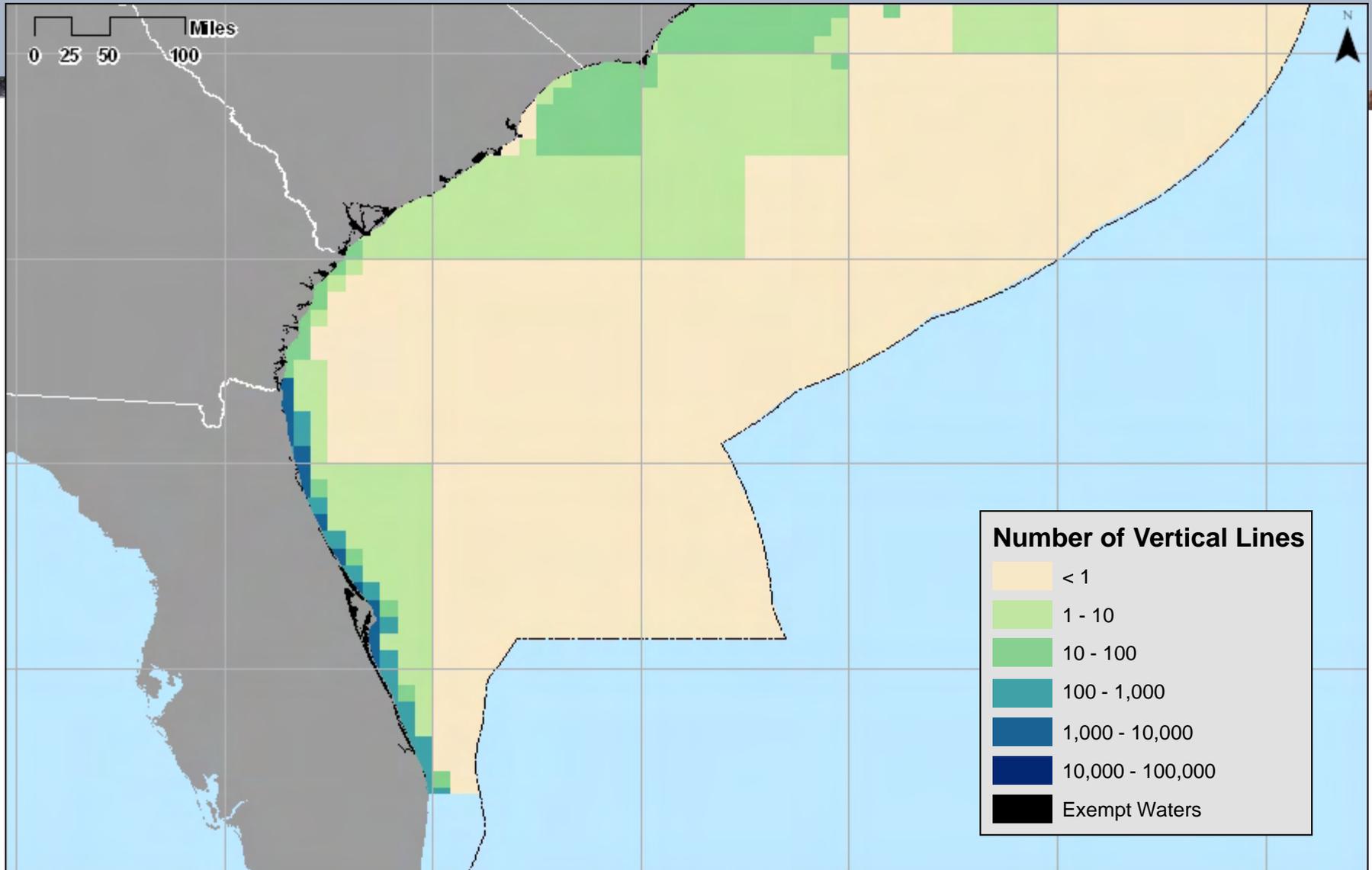
# December-March 2008 Vertical Line: Southeast



# November-April 2008 Vertical Line: Southeast

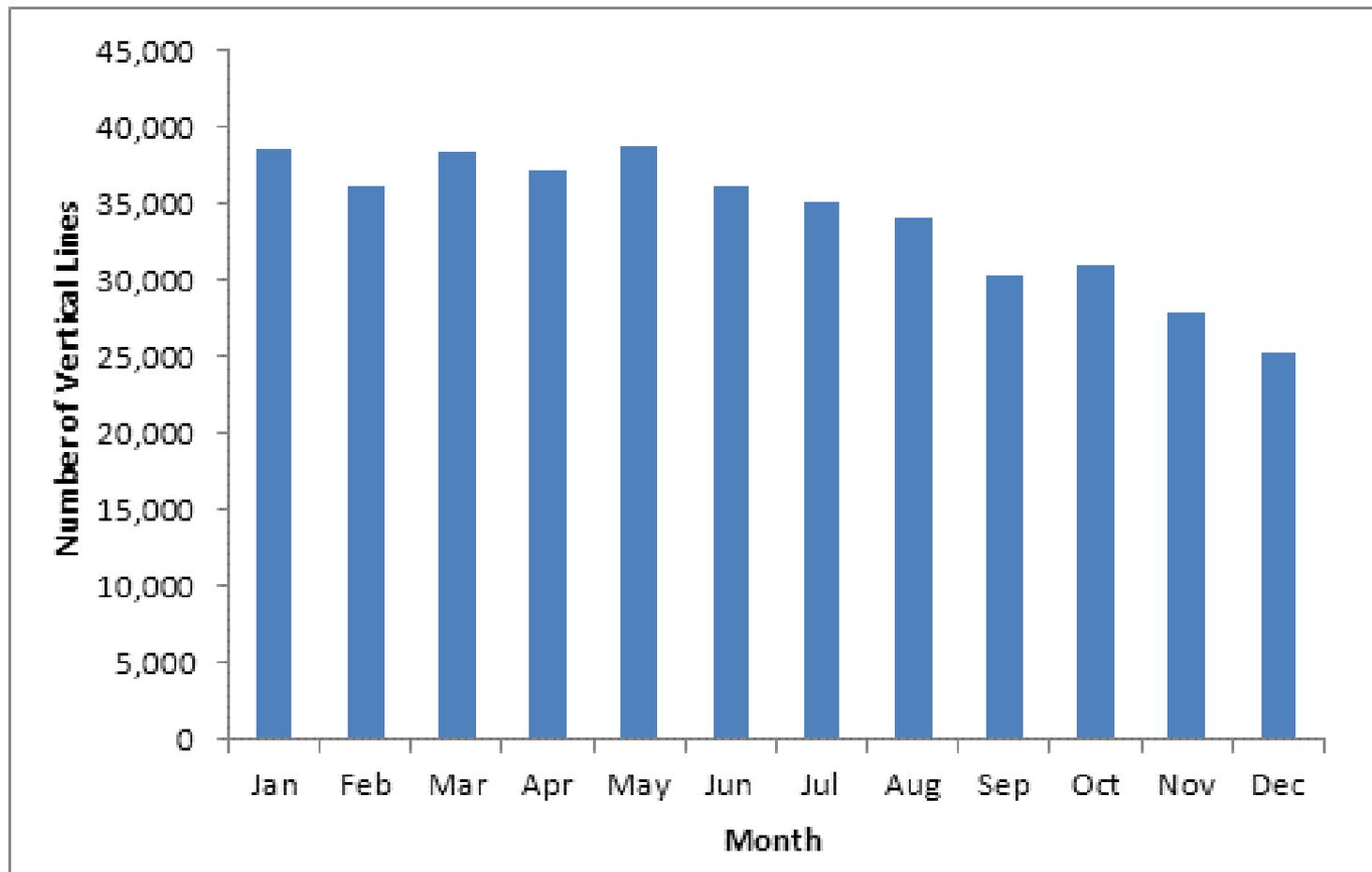


# September-May 2008 Vertical Line: Southeast



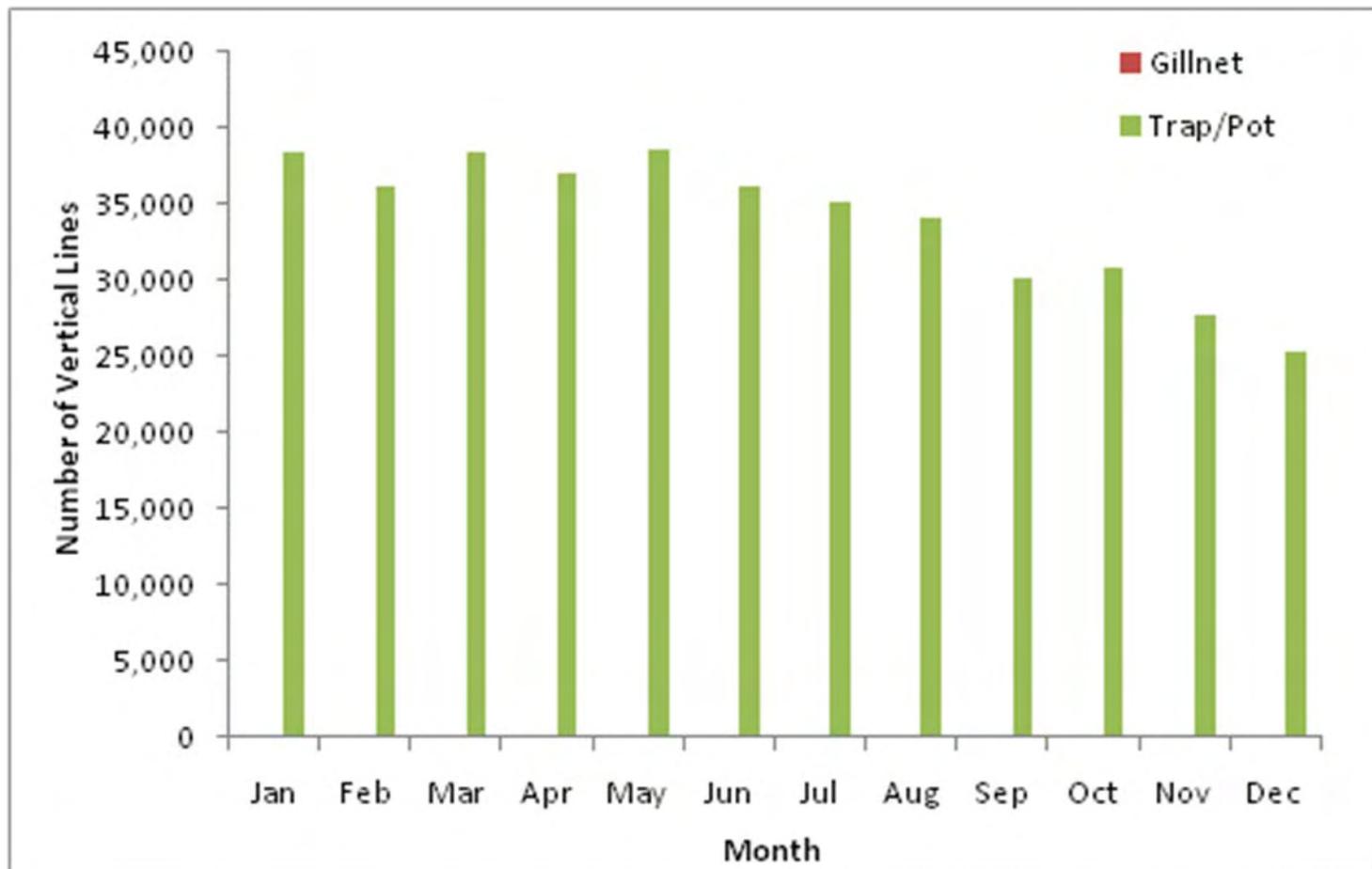
# Baseline Results: Vertical Line

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



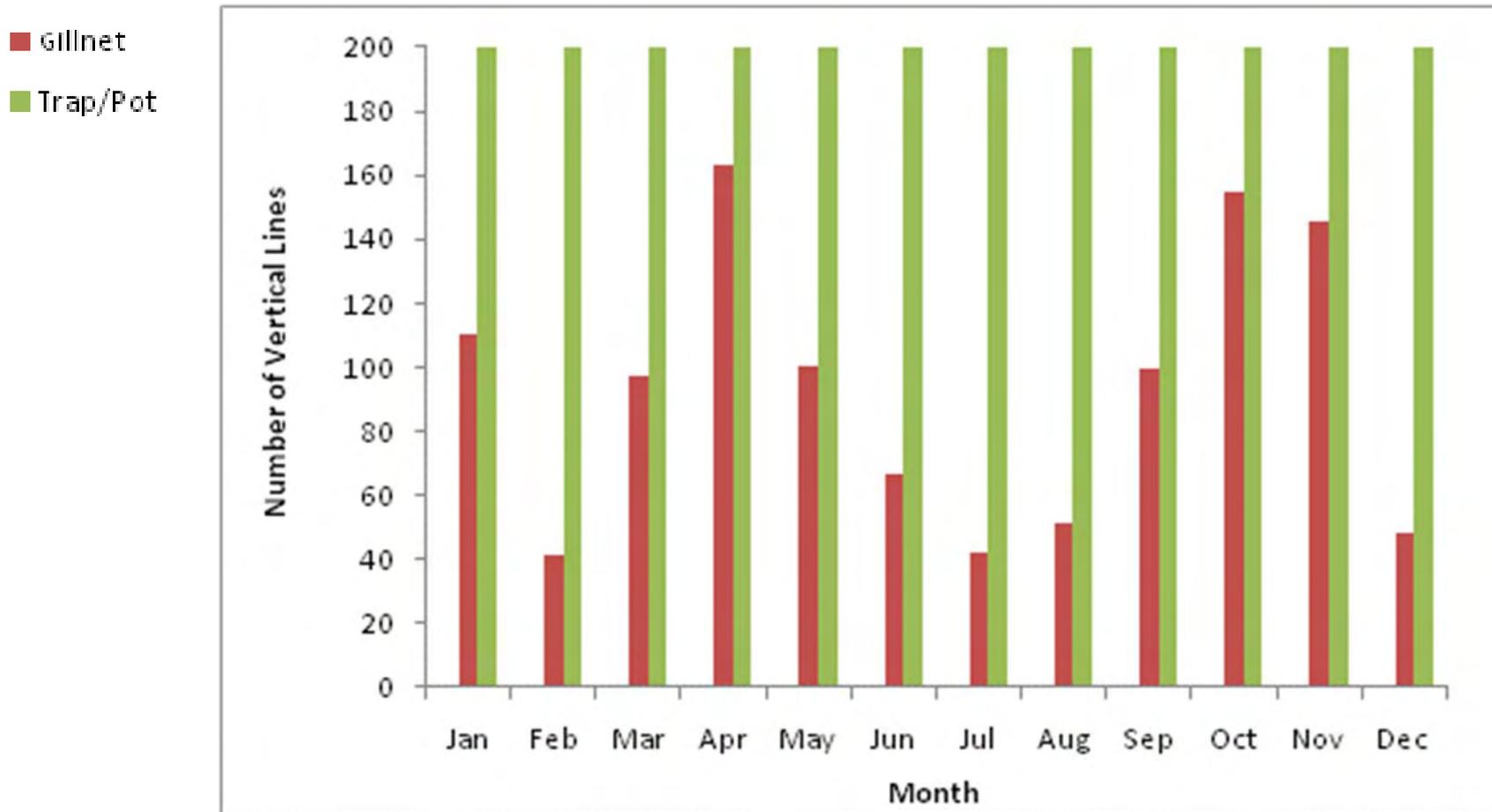
# Baseline Results: Vertical Line

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



# Baseline Results: Vertical Line

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

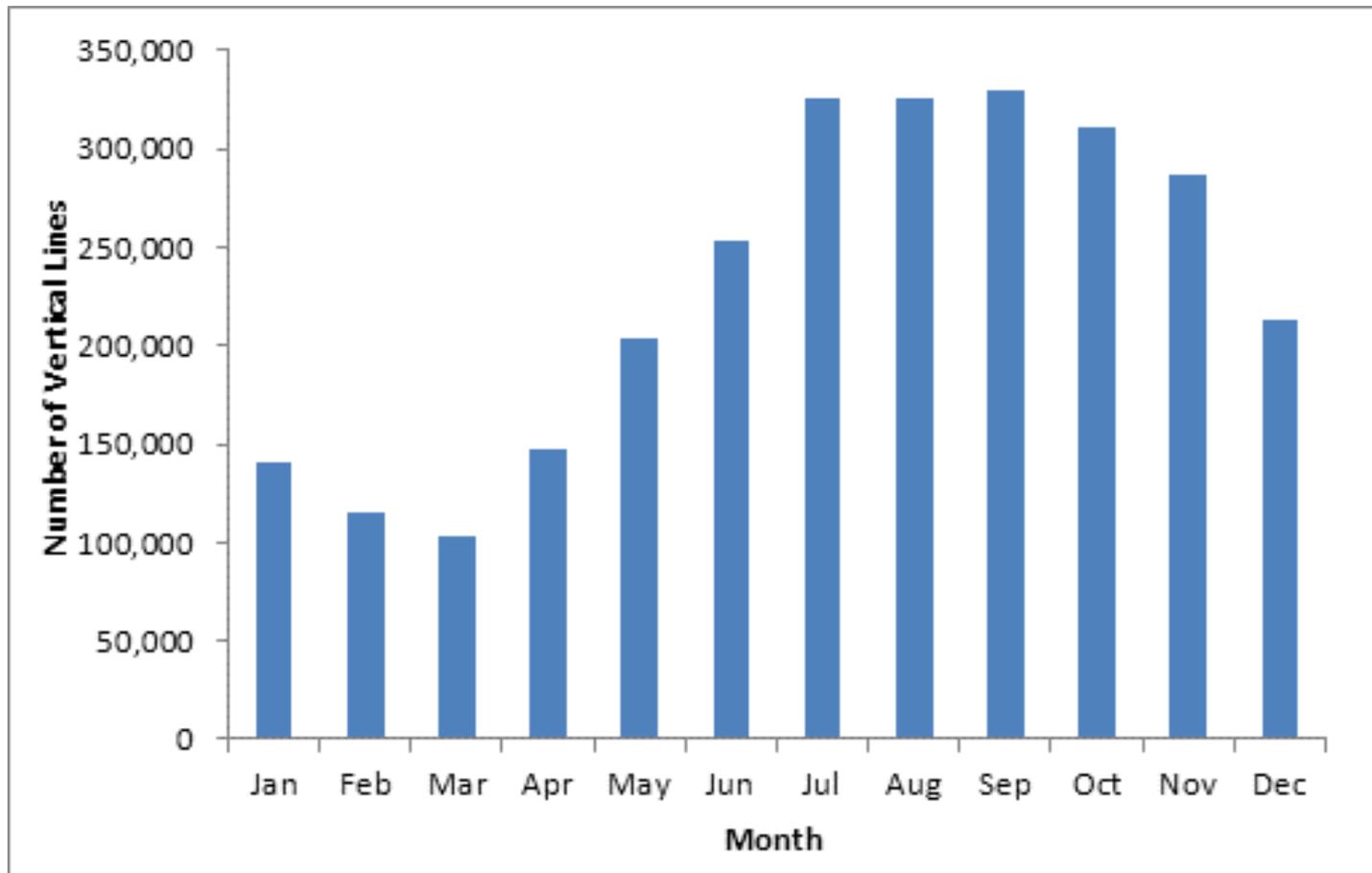


# General Observations

- Greatest concentration of vertical line in state and nearshore waters of the coast of Florida and Georgia
  - Currently updating assumptions regarding activity in Florida's exempt and non-exempt waters
  - Existing assumptions may overstate activity in non-exempt waters in Florida
- Trap/pot fisheries contribute the highest concentration of vertical line; few vertical lines attributed to gillnet fisheries
- Greatest concentration of vertical line found between January and May
- Concentrations of vertical line are relatively low in comparison to the Northeast

# Baseline Results: Vertical Line

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



# Baseline Results: Vertical Line

Comparison of the Number of Vertical Lines in ALWTRP Waters  
Non-Exempt Waters (2008)

