Don't Flip Out!

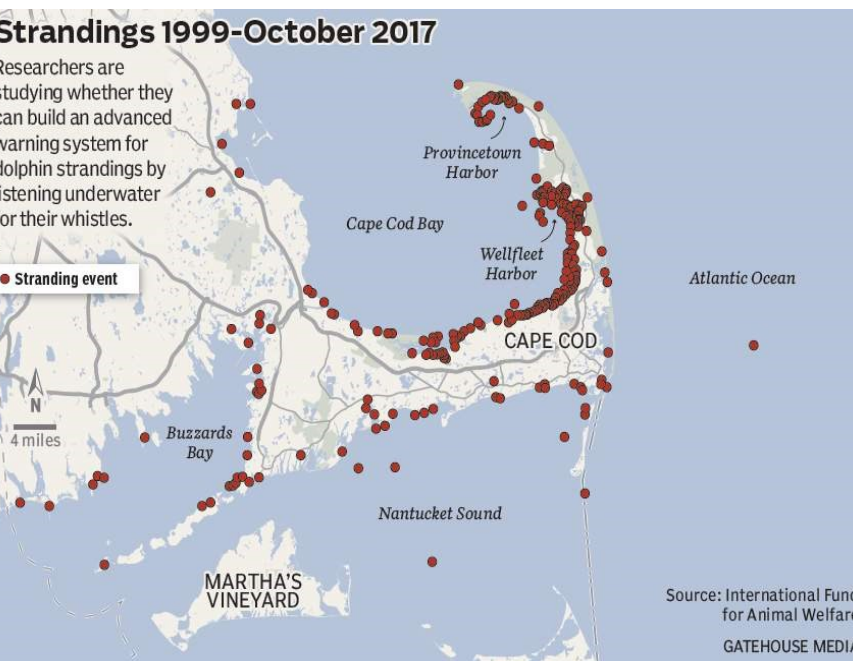## A Risk Assessment for Dolphin Strandings on Cape Cod, MA

Dolphin Ecology

The two most common species of dolphin found on Cape Cod, MA are the Atlantic white-sided dolphin and short-beaked common dolphin. Other species include Risso's dolphin and the Atlantic spotted dolphin.

Dolphins are highly social. Short-beak common dolphins are found in groups of 100s and even in "megapods" of up to 10,000. They use whistle noises to communicate, and scientists have noted frequent calls before stranding events. Atlantic white-sided dolphins have been observed to increase their group size when they have calves during summer months. Dolphins sometimes swim alongside ships and ride vessel waves, a behavior called "bow riding." Dolphins are important ecologically as carnivores who feed on fish and squid, thereby regulating their populations.
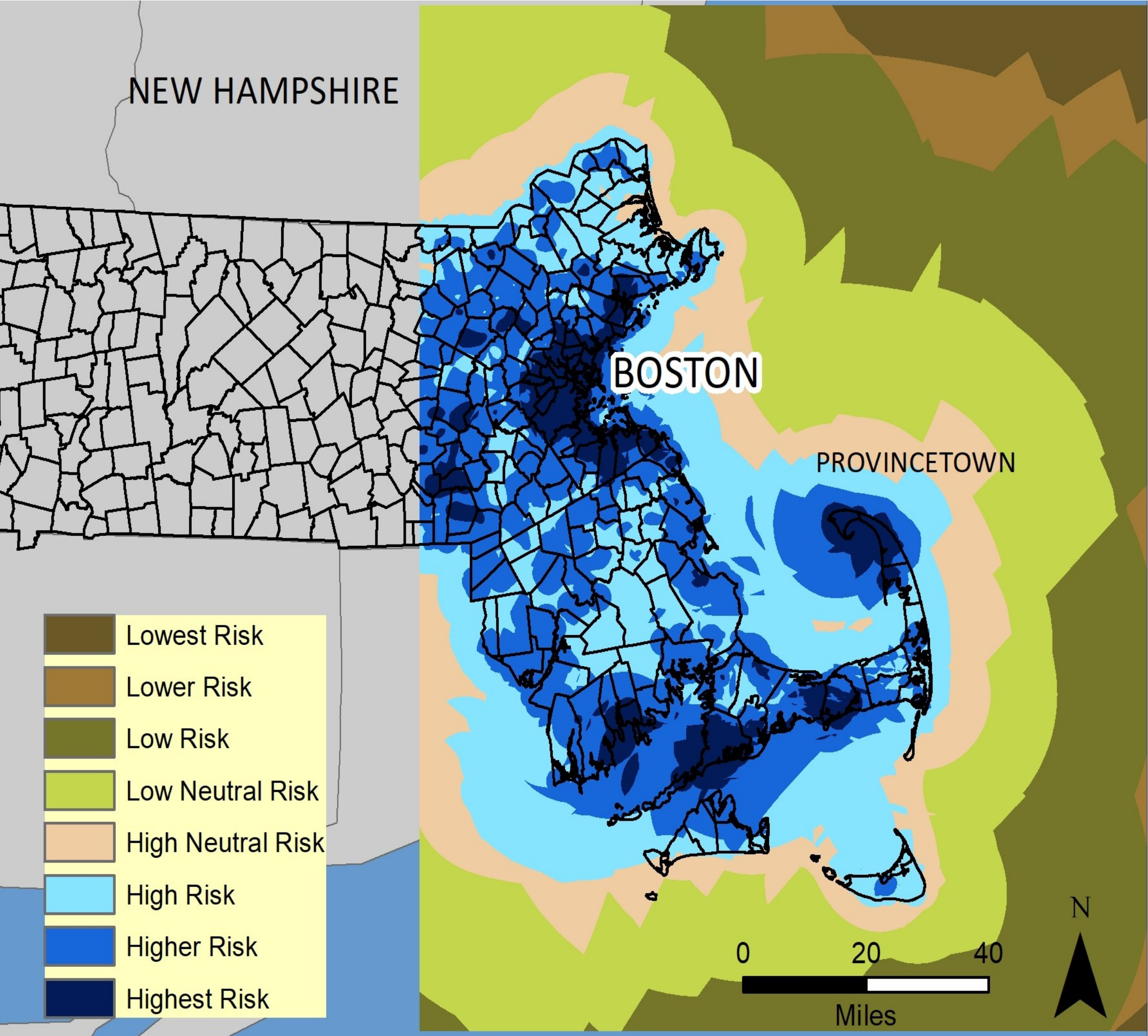
Why do Dolphins Strand?

Mass stranding events are frequently observed on Cape Cod, MA. Dolphins swim inland into mud flats and tidal creeks and get stranded when tides recede. Several factors may be exacerbating this issue such as noise pollution, weather, and coastal erosion caused by increased housing development.

Strandings 1999–October 2017
Researchers are studying whether they can build an advanced warning system for dolphin strandings by listening underwater for their whistles.
Source: International Fund for Animal Welfare / GATEHOUSE MEDIA

Stranded animals require rapid response, and rehabilitation resources are limited. Creating a risk analysis will allow for better response and will inform future management decisions and policy changes.

Final Risk Analysis

NEW HAMPSHIRE
BOSTON
PROVINCETOWN

Legend:
- Lowest Risk
- Lower Risk
- Low Risk
- Low Neutral Risk
- High Neutral Risk
- High Risk
- Higher Risk
- Highest Risk

0   20   40 Miles

Methodology

A risk assessment was performed based on six factors: housing development, hazardous waste sites, flood zones from hypothetical three foot sea level rise, hurricane tracks, location of wetlands, and ferry traffic. Kernel density was run on three of the datasets, and Euclidean distance was run on the other three. All six datasets were reclassified and then compiled using Raster Calculator to arrive at final risk scores.
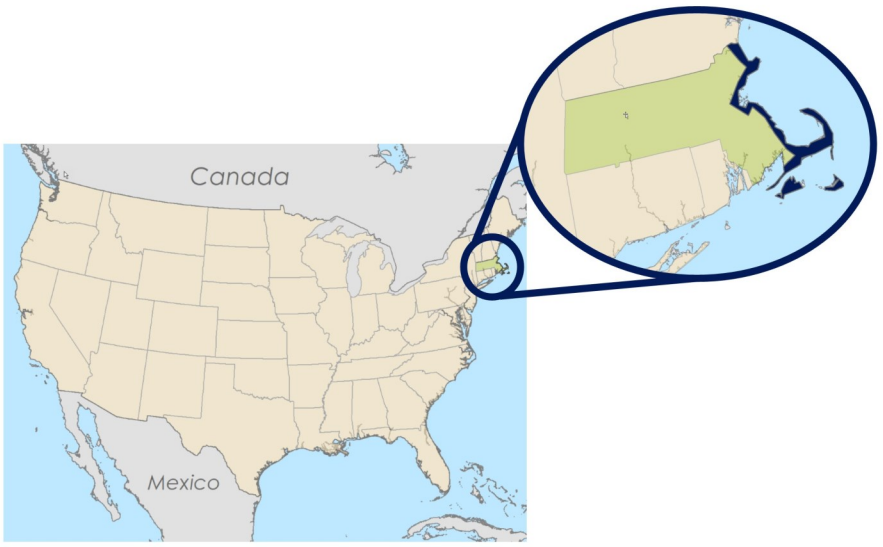
Results and Conclusions

A final risk analysis map was created ranging from the highest risk location for stranding to the lowest risk location. The highest risk locations were the Northeast tip of the Cape near Provincetown and the Southern coast. These locations do match up with some of the past stranding events. Future studies could investigate whether the predicted high risk locations match up with future stranding events. Researchers could also investigate other factors such as overfishing, disease, and water temperatures.

References

Bogomolni, Andrea L., Katie R. Pugliares, Sarah M. Sharp, Kristen Patchett, Charles T. Harry, Jane M. LaRocque, Kathleen M. Touhey, and Michael Moore. "Mortality trends of stranded marine mammals on Cape Cod and southeastern Massachusetts, USA, 2000 to 2006." Diseases of aquatic organisms 88, no. 2 (2010): 143-155.

Sampson, Kate, Constance Merigo, Kerry Lagueux, James Rice, Robert Cooper, E. Scott Weber III, Philip Kass, John Mandelman, and Charles Innis. "Clinical assessment and postrelease monitoring of 11 mass stranded dolphins on Cape Cod, Massachusetts." Marine Mammal Science 28, no. 4 (2012): E404-E425.
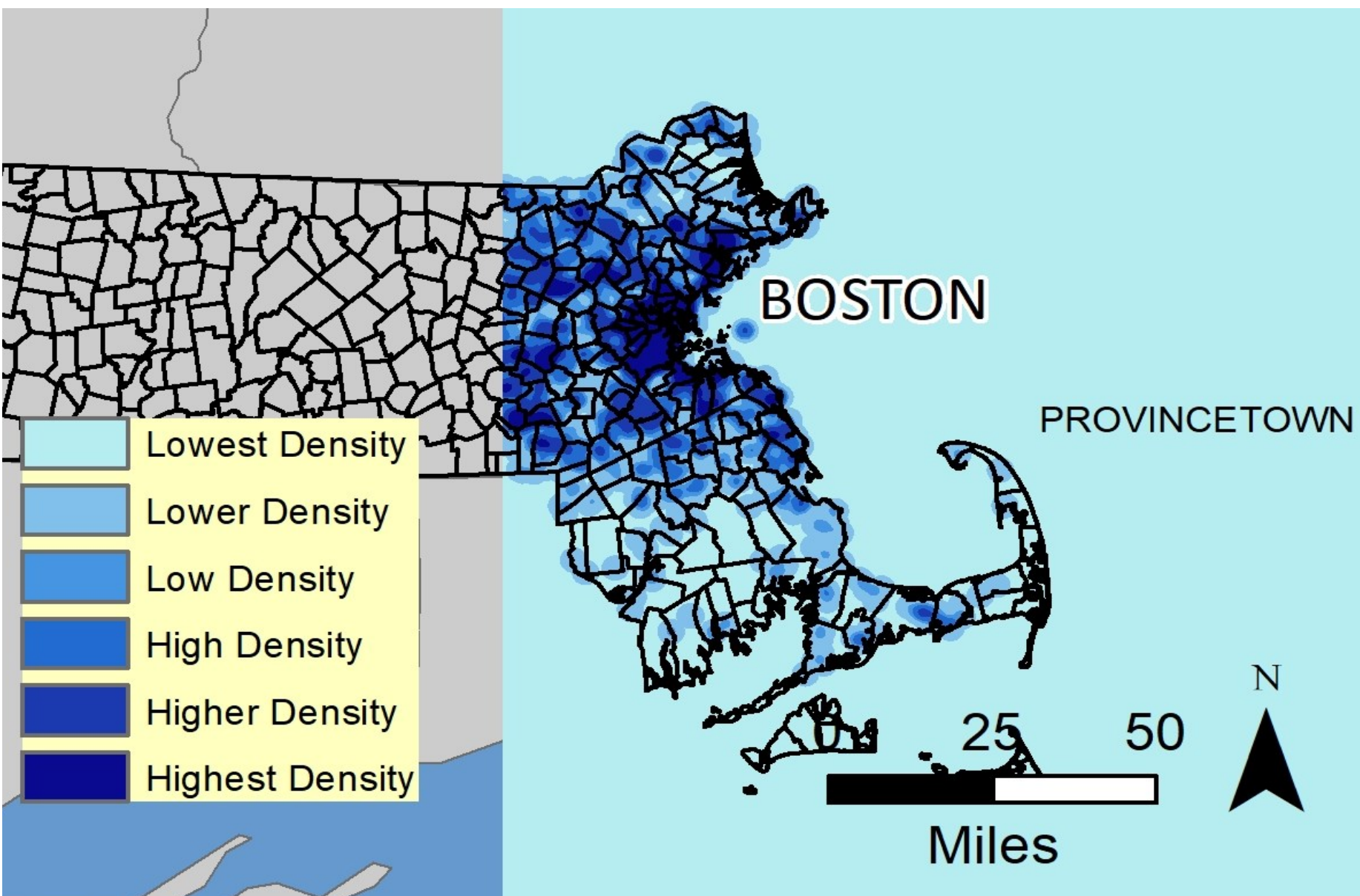
Weinrich, Mason T., Cynthia R. Belt, and David Morin. "Behavior and ecology of the Atlantic white-sided dolphin (Lagenorhynchus acutus) in coastal New England waters." Marine Mammal Science 17, no. 2 (2001): 231-248.

https://www.fisheries.noaa.gov/
https://www.capecodtimes.com/news/20171119/study-offers-hope-of-solution-to-dolphin-strandings
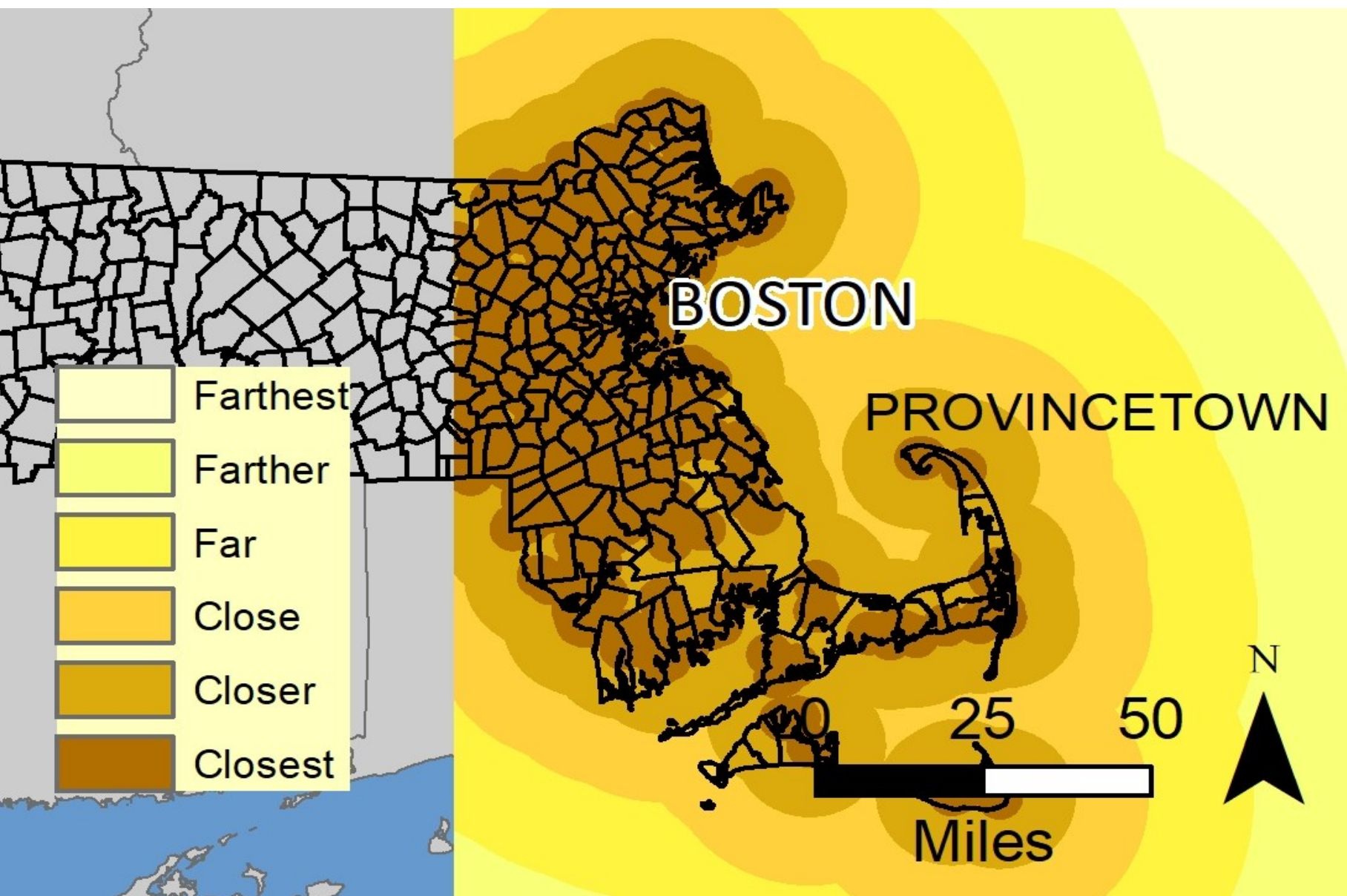https://www.sciencedirect.com/science/article/pii/B9780128043271000765

Housing Development

Kernel density was run on a dataset of housing developments in Massachusetts, including current, in construction, and projected.
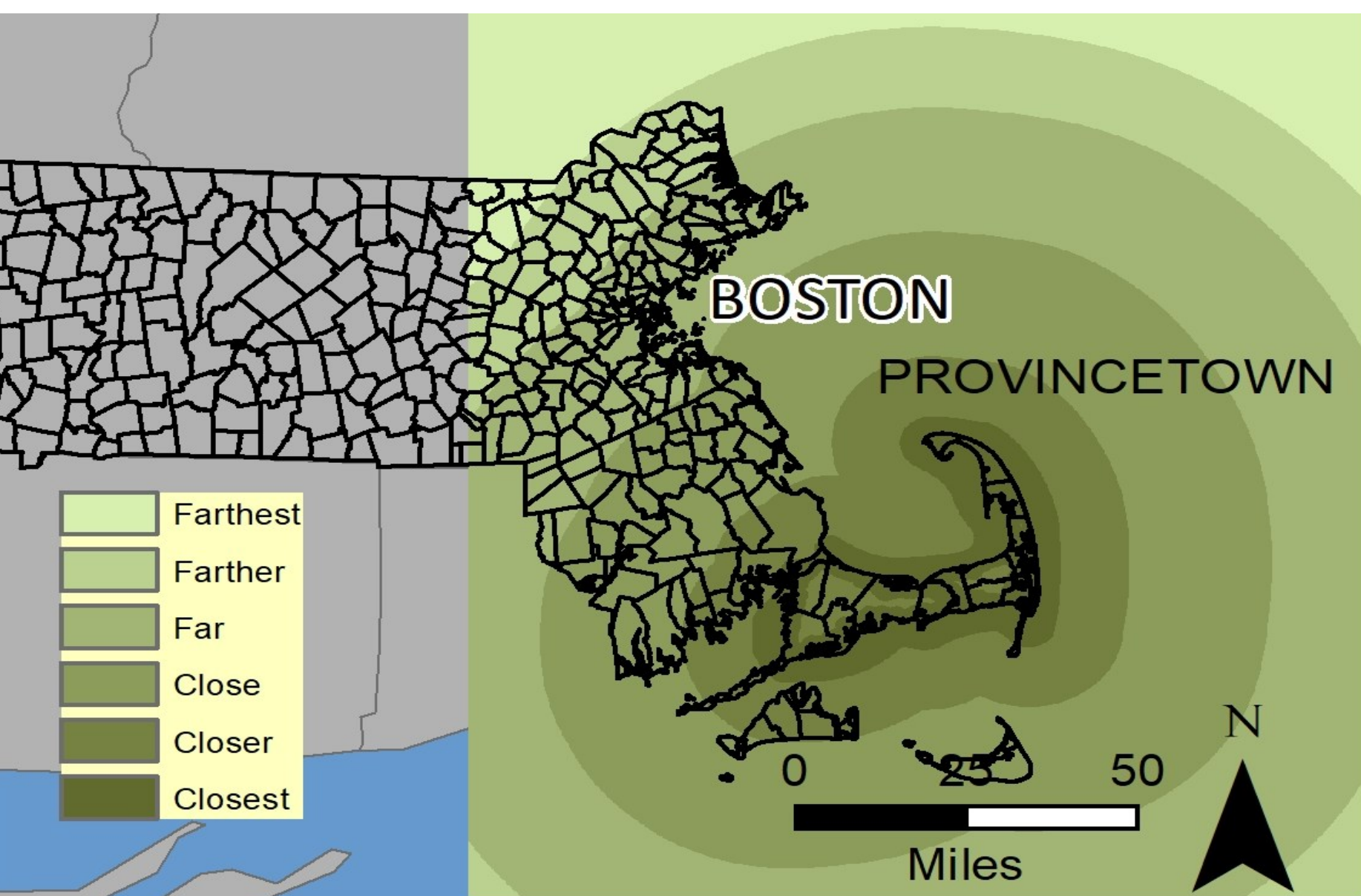
BOSTON
PROVINCETOWN

Legend:
- Lowest Density
- Lower Density
- Low Density
- High Density
- Higher Density
- Highest Density

25   50 Miles

Hazardous Waste

Euclidean distance was run on a dataset of hazardous waste and oil sites.

BOSTON
PROVINCETOWN

Legend:
- Farthest
- Farther
- Far
- Close
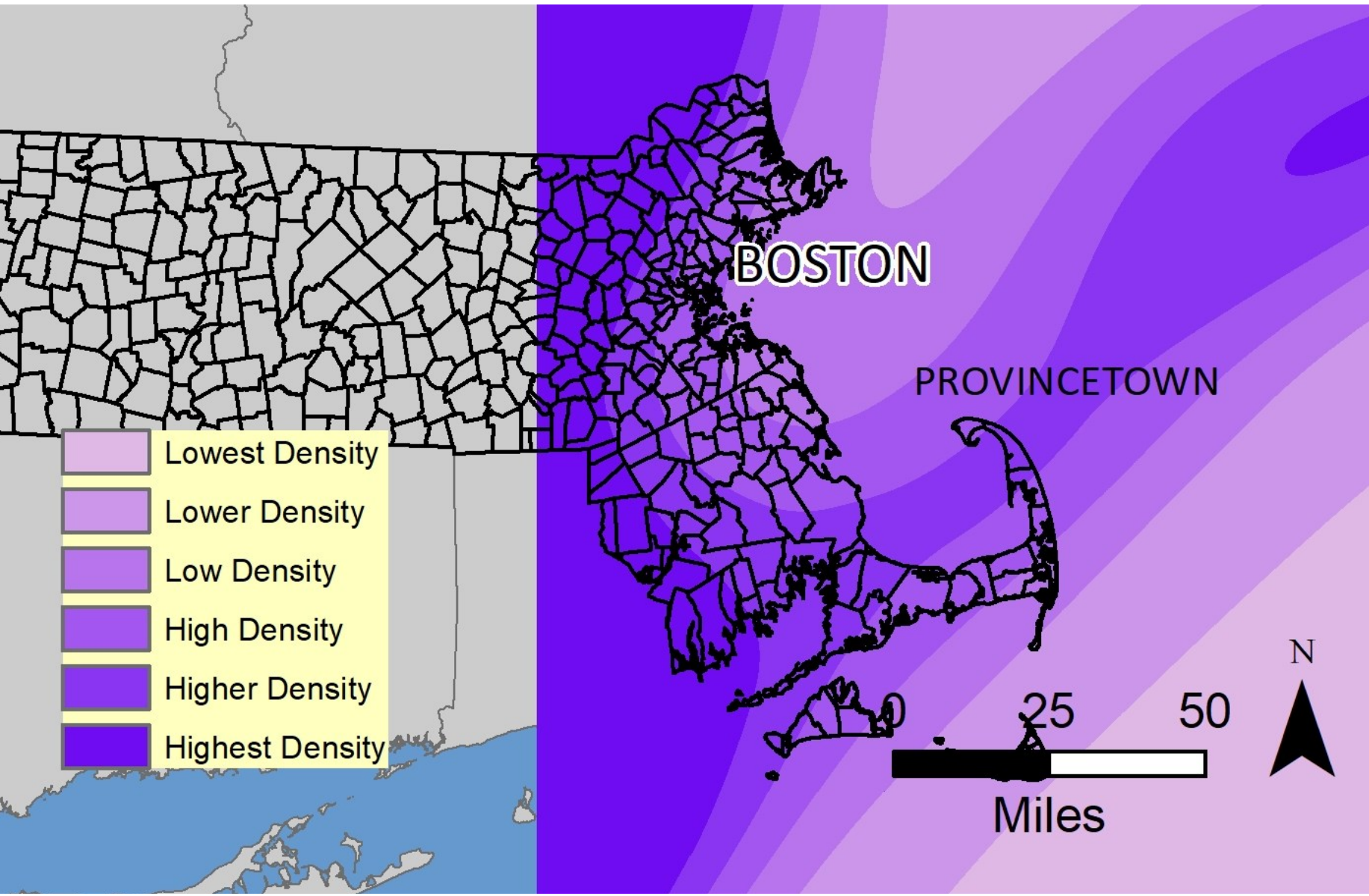- Closer
- Closest

25   50 Miles

Sea Level Rise

A hypothetical sea level rise of three feet would cause the Cape Cod coastline to flood. Euclidean distance was run on the flood inundation dataset.
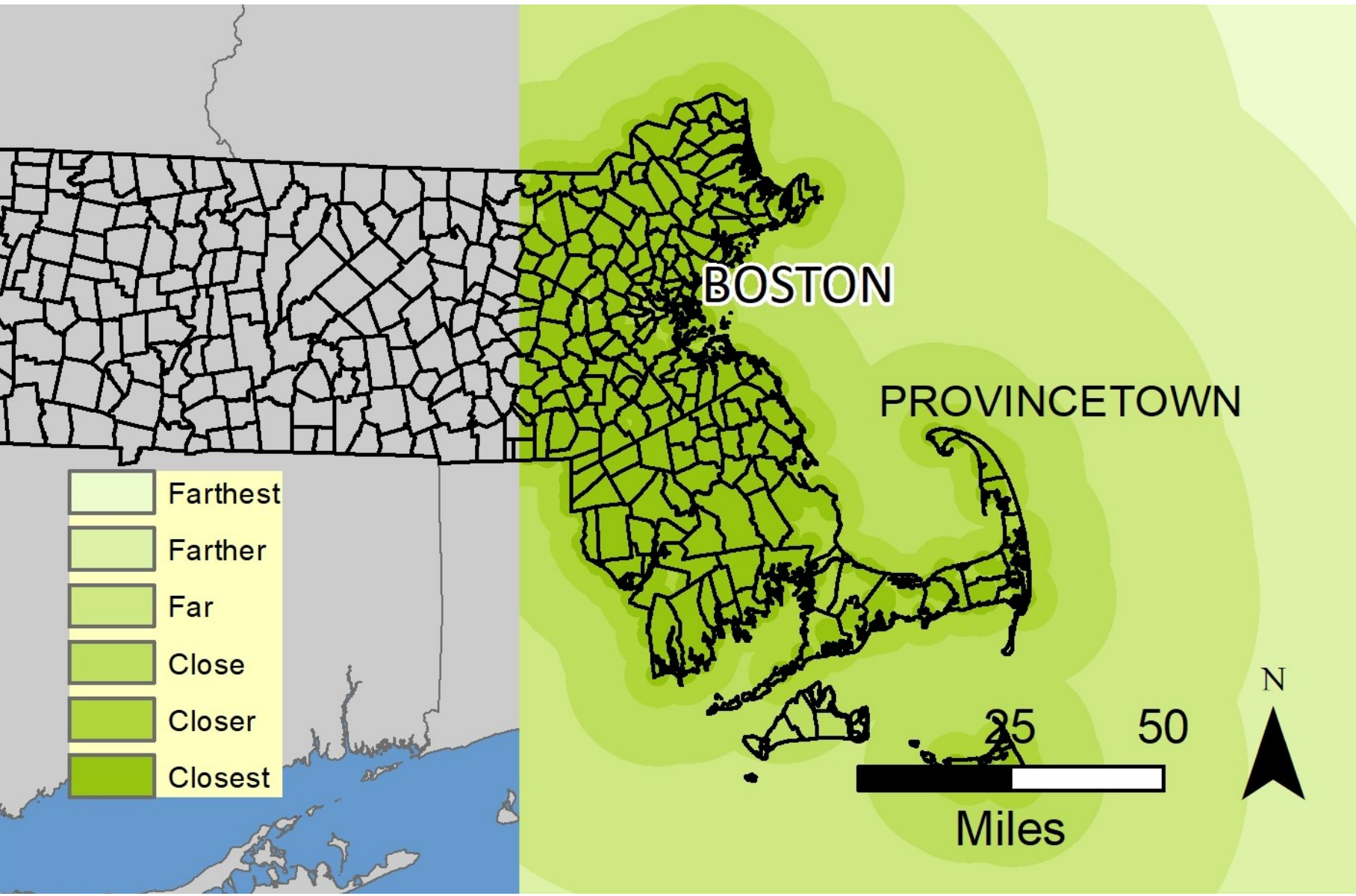
BOSTON
PROVINCETOWN

Legend:
- Farthest
- Farther
- Far
- Close
- Closer
- Closest

0   50 Miles

Hurricanes

Kernel density was run on a dataset of hurricane tracks.

BOSTON
PROVINCETOWN

Legend:
- Lowest Density
- Lower Density
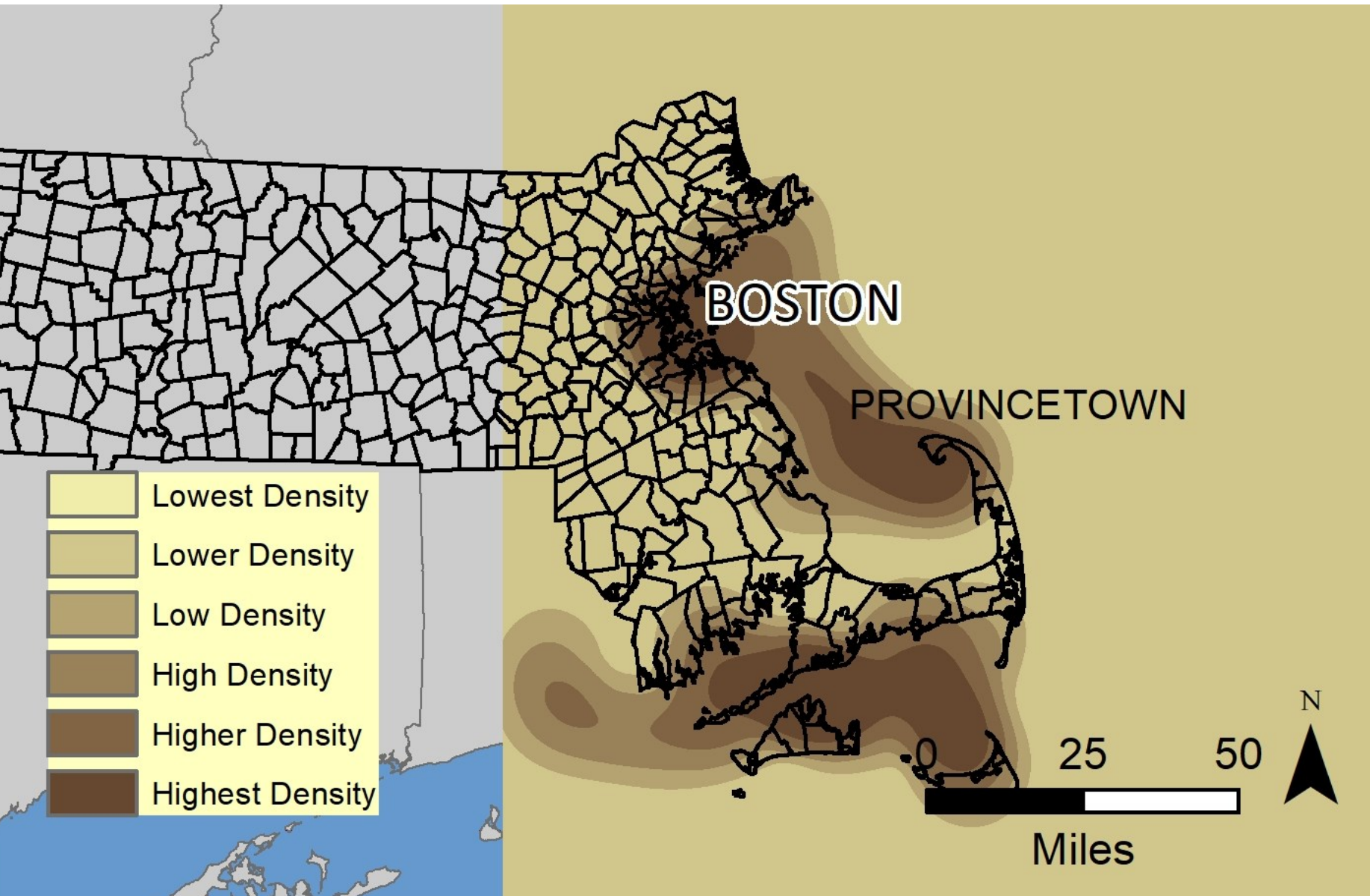- Low Density
- High Density
- Higher Density
- Highest Density

25   50 Miles

Wetlands

Euclidean distance was run on a dataset of wetlands in Massachusetts, with cranberry bogs removed.

BOSTON
PROVINCETOWN

Legend:
- Farthest
- Farther
- Far
- Close
- Closer
- Closest

25   50 Miles

Boating Traffic

Kernel density was run on a dataset of Ferry routes on Cape Cod.

BOSTON
PROVINCETOWN

Legend:
- Lowest Density
- Lower Density
- Low Density
- High Density
- Higher Density
- Highest Density

25   50 Miles

Tufts UNIVERSITY | Cummings School of Veterinary Medicine

Sarah Kinicki
GIS for Conservation Medicine
Projection: NAD 1983 State Plane Massachusetts Mainland FIPS 2001
Sources: MassGIS, Cape Cod Commission, ESRI, US Census, Geodata.tufts.edu
Many thanks to Carolyn Talmadge for all her guidance.