# Wetland Health in Cape Cod

Background

Wetlands play a critical role in many ecosystems. They prevent floods, maintain water quality, and have a rich biodiversity (Mitsch, 2005). Previously, wetlands were viewed as useless areas because they could not be easily developed, so many of them were drained and filled. Part of the Clean Water Act of 1977 addressed the issue by prohibiting any further filling of wetlands. Companies are now required to apply for a permit to build over wetlands and they must restore or create another wetland of equal area (anonymous, 1980). However, studies show that many constructed wetlands fail (Mitsch, 1998) and do not provide the same ecological services. I created a vulnerability index to analyze the health of wetlands on Cape Cod.
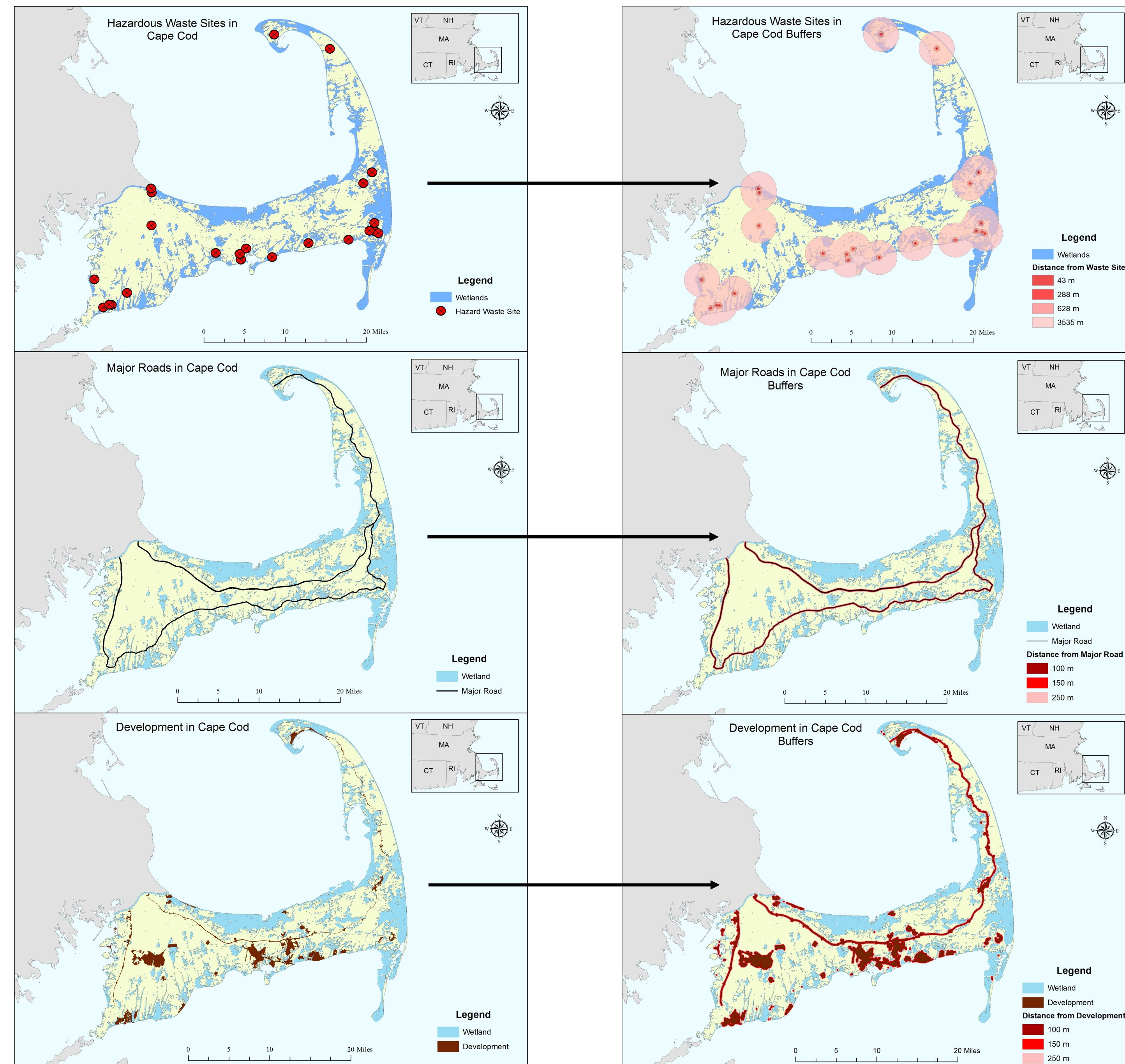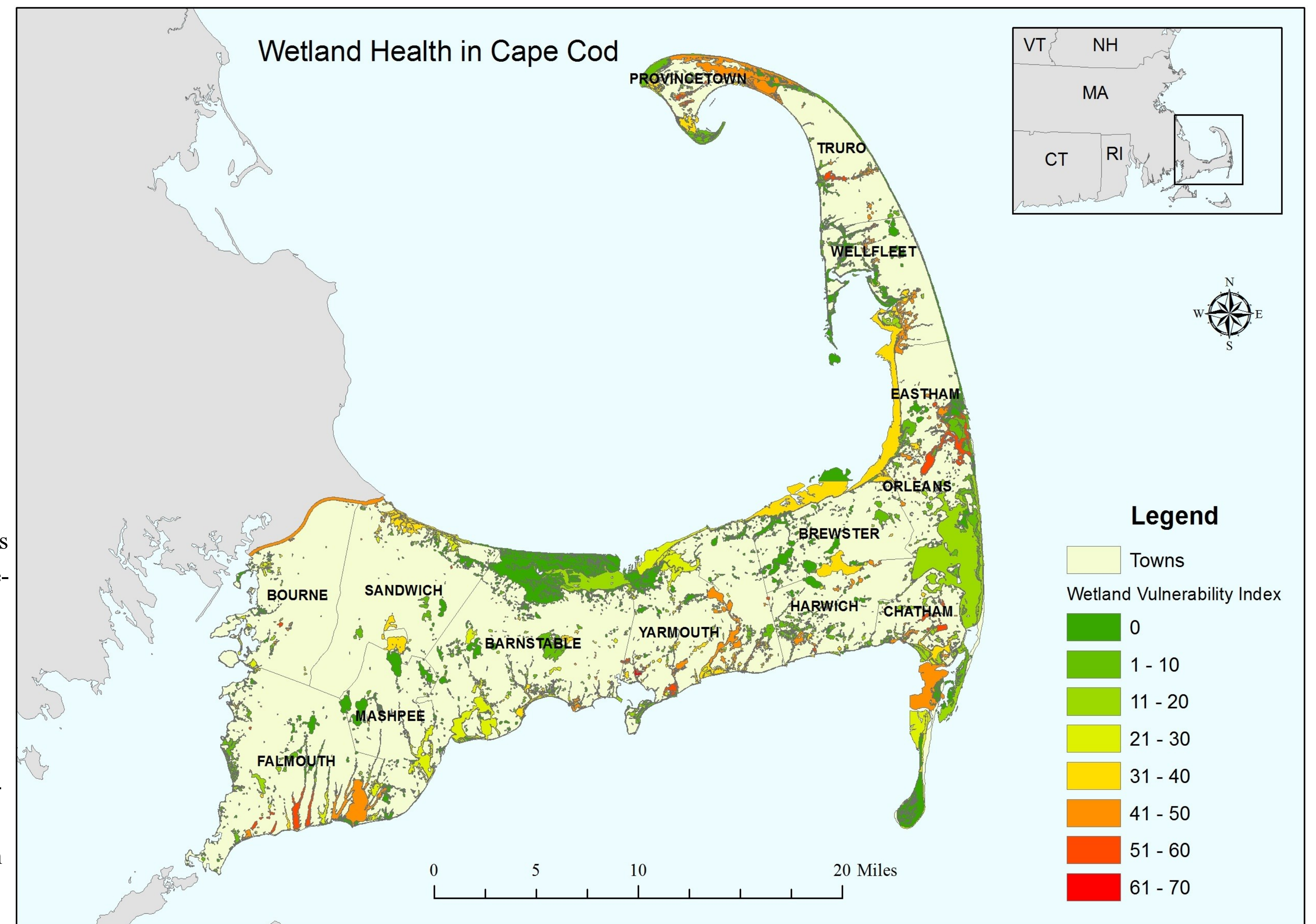
Methods

Hazardous waste sites damage wetlands by polluting their soil and water and disrupting biogeochemical processes. (anonymous, 1997; anonymous, 2007). The construction of roads as well as the secondary effects of their presence such as increased run off, dissolved pollutants, air pollution, noise and increased pedestrian access can greatly damage wetlands (anonymous, 2012). Other structures associated with development and a large population can also negatively impact wetlands. I used these thee factors to analyze wetland health. Non-Potential Drinking Water Source Areas were used as a proxy for population and development.

Analysis Example, Hazardous Waste Sites, Buffer 4

Legend
- Hazardous Waste Sites, Buffer 4
- Wetlands in only Buffer 4
- Wetlands
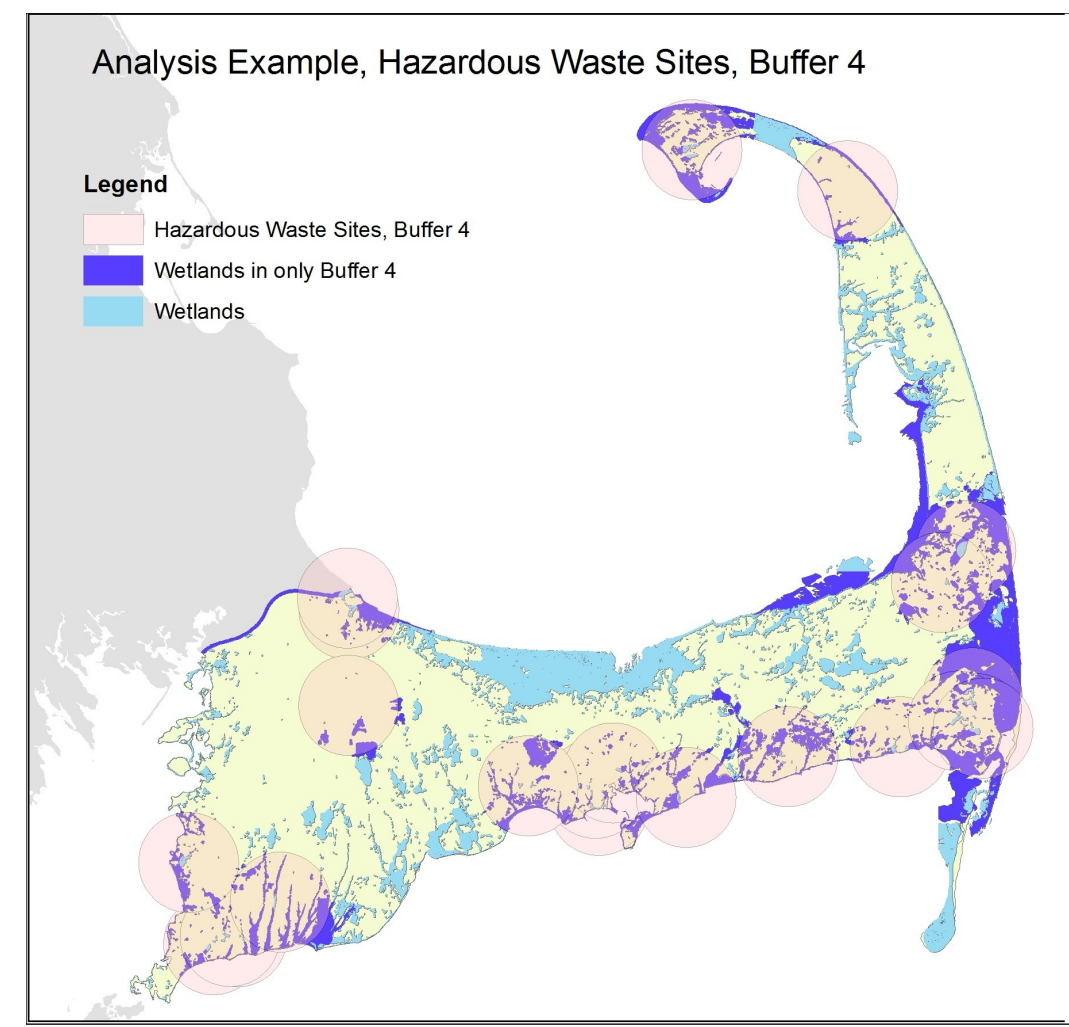
Analysis

Multiple buffer zones were created around each of these three types of structures. There were four zones around the hazardous waste sites and three around the major roads and areas of development. All of the wetlands that were found within each buffer zone for each structure were isolated and assigned points. Wetlands that fell within buffer zones closer to the structures received a higher score. All of the points for each wetland were then added up to create the vulnerability index, which was weighted by area. The results were then divided into 8 classes shown in the Wetland Health map.

Wetland Health in Cape Cod

Legend
- Towns

Wetland Vulnerability Index
- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70

Hazardous Waste Sites in Cape Cod

Hazardous Waste Sites in Cape Cod Buffers

Major Roads in Cape Cod

Major Roads in Cape Cod Buffers

Development in Cape Cod

Development in Cape Cod Buffers

Hazardous Waste Sites

Studies show that type of chemical, size of spill, and time after spill all determine how far hazardous chemicals can travel. I averaged all of the distances different chemicals will travel over a short and long time for a small and large spill. These distances were 42.6 m (short time, small spill), 288.2 m (short time, large spill), 628.2 m (long time, small spill), and 3,535 m (long time, large spill) were used to create four buffer layers. Wetlands that intersected each 10, 8, 6, and 4 points respectively.

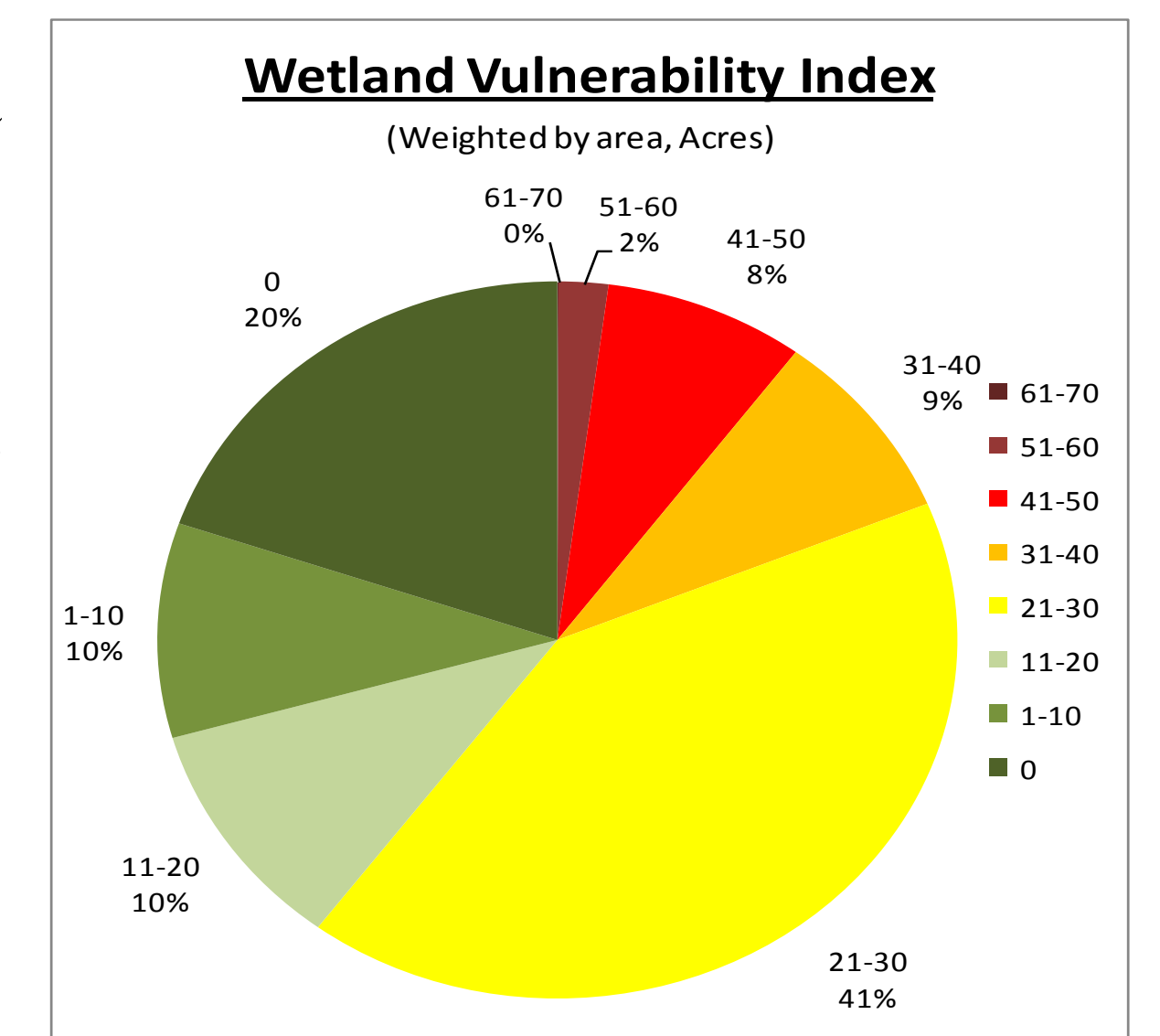| Size of Spill	Time of Exposure	
	Short	Long
Small	42.6 m	628.2 m
Large	288.2 m	3535.1 m

Major Roads

A wetland needs 100 m of buffer area to maintain water quality, 150 m for flooding protection, and 250 m for protection of some wildlife (anonymous, 2007). I used these distances to make three buffer zones around the major roads, which received 10, 8, and 6 points respectively. These numbers were multiplied by 2.

Non-Potential Drinkable Water Supply Areas

The areas were designated by Massachusetts government and were based on population and development. They were defined as areas with populations of over 4400 people or places that were designated urbanized land. Similar guidelines were used to determine these buffer zones as were used for the major roads. Distances of 100 m, 150 m, and 250 m were determined and they were assigned the same points, but multiplied by 3.

Results

The Wetland Health map above shows a wide variety of health ratings. The pie chart displays the area of wetlands in each health class. I considered the first three groups healthy, 4th and 5th groups of middle health, and the last three groups unhealthy. 40% of the wetland area was in the healthiest groups, 50% were in the middle health group, and 10% were in the lowest group. A fair amount of wetlands were in the healthy group compared to the unhealthy group, but the greatest area of wetlands were found in the middle group.

Wetland Vulnerability Index
(Weighted by area, Acres)

- 61-70: 0%
- 51-60: 2%
- 41-50: 8%
- 31-40: 9%
- 21-30: 41%
- 11-20: 10%
- 1-10: 10%
- 0: 20%

Discussion and Conclusion

A larger area of wetlands than expected was found within the middle and lower health classes. This suggests that The Clean Water Act might not be accomplishing its stated goal. These results indicate that further research should be done into the wetlands on Cape Cod to confirm their health status and other options should be considered to increase protection of wetlands.

Cartographer: Sarabeth Buckley
Data source: MassGIS   Date: May 8th 2012
Projected Coordinate System:
NAD_1983_StatePlane_Massachusetts_Mainland

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