Wild for Wetlands:
Species Conservation Priority Analysis in South Shore, MA

Introduction

The Wetland Protection Act of 1977 was passed in order to "minimize the destruction, loss or degradation of wetlands." As a result, wetlands have been well documented by federal governmental agencies such as the US Fish and Wildlife. In addition to the Wetland Protection Act, section 404 of the Clean Water Act states that wetlands may legally be destroyed, but their loss must be compensated for by the restoration, creation, or enhancement of other wetlands.

Thus wetland suitability analysis is extremely important for the 'no wetland loss' policy. The goal of this suitability analysis example is to identify potential wetland mitigation sites in the South Shore region of Massachusetts due to its high economic development pressures and land use changes. This analysis will prioritize **biological** concerns over political and community stakeholder concerns such as distance from existing wetlands, critical habitat for wetland species, and land use.

Methodology

The first step was to choose appropriate criteria and gather the geospatial data from Mass GIS (Table 1). The data layers were then clipped to the South Shore region from the Massachusetts state data. The layers were converted into raster format, a matrix of pixels. The data was reclassified using a scale of 1-10, with 1 representing the least suitable and 10 as most suitable. The reclassified data sets were then put into the weighted overlay and were weighted in terms of their importance for wetland mitigation.

No	Criteria	Weight (%)	Biological explanation
1	Land use/ land cover	30	Urban environments are too disturbed, while forests are other important habitats that require high cost to be converted to wetlands. Agricultural areas are ideal for wetland restoration sites.
2	Proximity to existing wetlands	20	Reduced habitat fragmentation is important for species recruitment and other benefits such as seed banks of wetland plants.
3	Wetland	10	Exclude wetlands, already protected area
4	Open space	10	Exclude open space, already protected area
5	Certified Vernal Pools	10	As close to vernal pools, important biological environments to conserve
6	Estimated critical habitat	20	Include critical habitat for wetland species
7	Size	N/A	Small habitats are ineffective for species conservation and other wetland functions

Table 1. List of biological criteria as well as the explanation of its importance. The weight of each criteria used when combining datasets is also given.

Figures

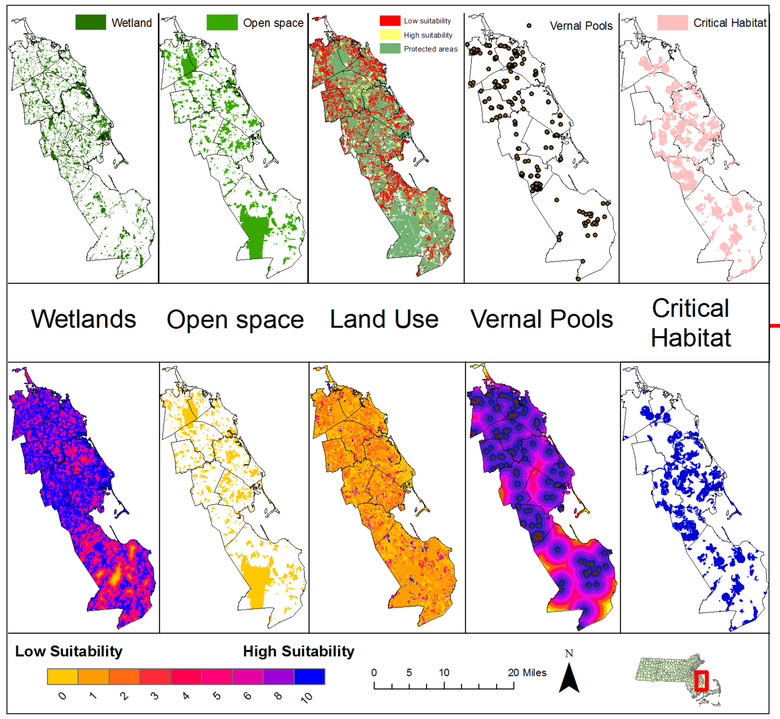


Figure 1. The first row of graphs represent polygon data sets for the biological criteria used. The second row of graphs represent raster data and the suitability index associated with the South shore area.

Error Analysis

The major source of error in this project was the method to weight the criteria, as it was based on personal discretion and knowledge of important habitat requirements for species conservation. Most problematic was the land use layer, because there are two layers of estimation. First, the relative suitability of different values of the land use itself was estimated. For example, agriculture was a 10, while orchard was a 6. Then land use as an overall layer was weighted in comparison to other criteria.

Often wetland suitability analyses use the opinions and values of various community stakeholders, biologists, geologists, politicians and thus each criterion is weighted according a more defined system.

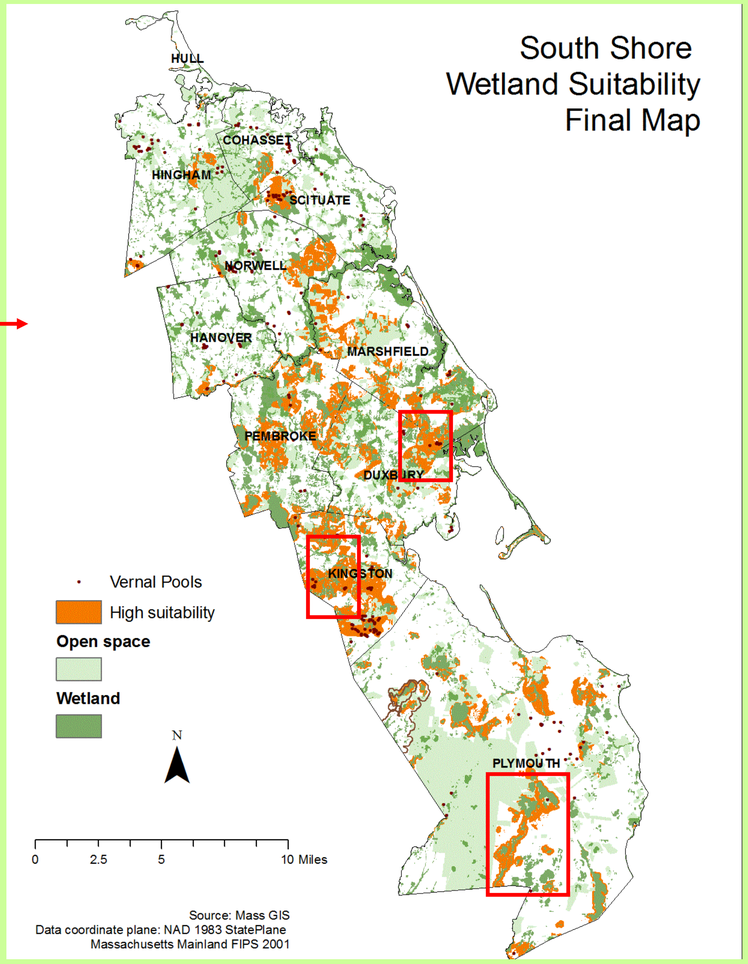
Conclusion

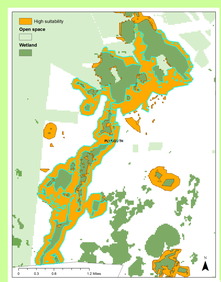
Wetland restoration sites were generally prioritized if they were next to existing wetlands but did not overlap with wetlands or open space. The potential area for wetland restoration was found to be a total of 18,400 acres as compared to 34,000 acres of existing wetlands and 184,000 acres of the total South Shore area.

Tufts

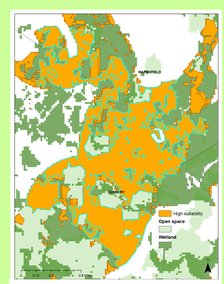
Cartographer: Jessica Oh
UEP 232 Fall 2010
Source: Mass GIS

Results

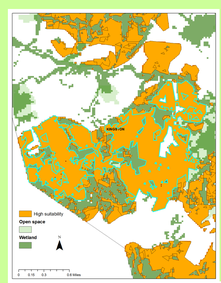




Habitat suitability index - 7
Total area - 1111 acres



Habitat suitability index - 7
Total area - 854 acres



Habitat suitability index - 7
Total area - 853 acres

The three maps above show the top candidates for a wetland restoration site based on biological data as well as largest habitat size. They are located in Plymouth, Duxbury, and Kingston, respectively.