

Massachusetts Wind Power Suitability Analysis

Introduction

Wind power development in Massachusetts has the promise of clean energy and new jobs. Governor Deval Patrick, a strong proponent of wind power development in Massachusetts, has set the goal of 2,000 MegaWatts of wind power by 2020. On May 5th, 2011, he took part in the ceremonial opening of Massachusetts's first on-shore wind farm—the Berkshire Wind Project.

Wind farm siting can be a very difficult process. In addition to wind speeds, other variables to be considered include: proximity to transmission lines, proximity to main roads (for construction and service), proximity to high energy demands, land slope and land use. Using these variables, this project aims to provide a preliminary wind power suitability analysis for Massachusetts.

Methodology

All of Massachusetts was used as the analysis area. First, the Location Score map was created. The variables included in this map are shown in the Location Score Variables Table. The location scores were calculated by summing the scaled preference variables (all the variables except slope) and then assigning restricted values to areas that were categorized as restricted because of slope or land use.

Location Score Variables Table

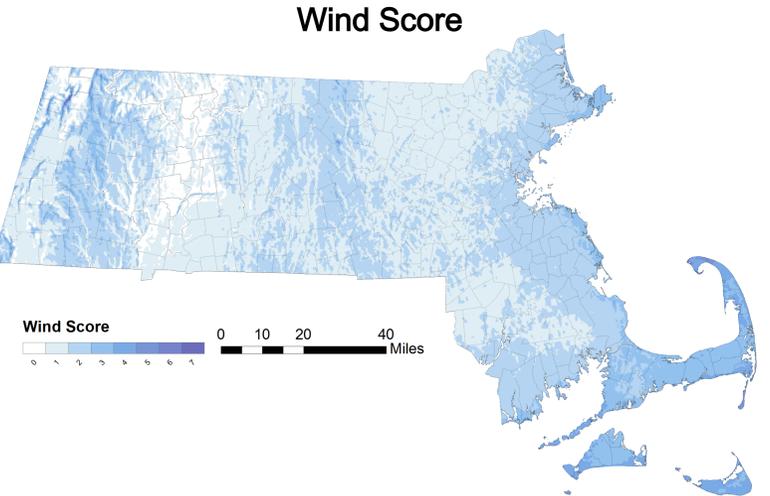
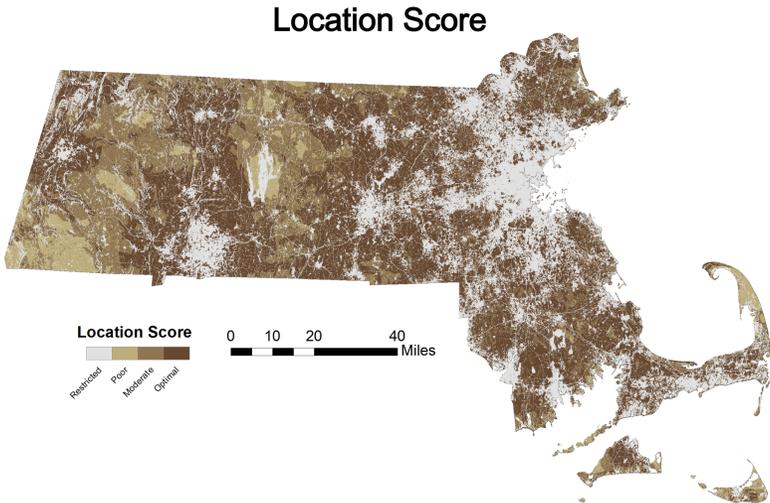
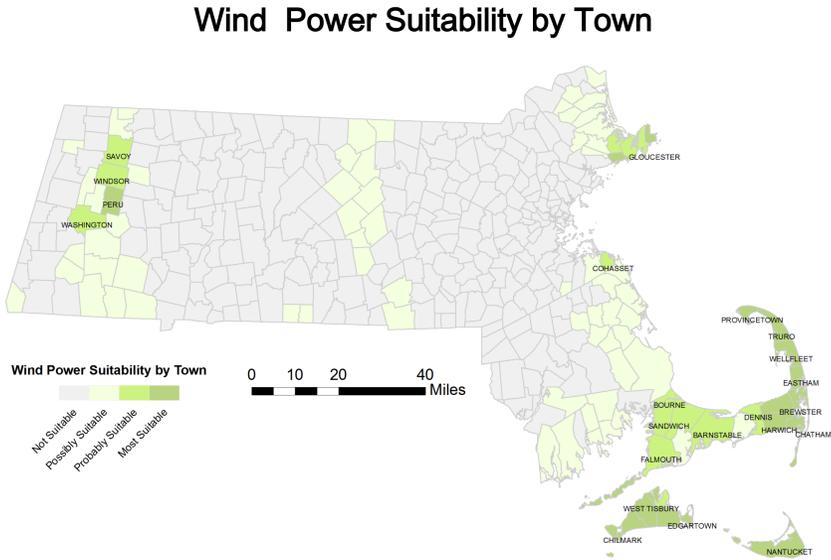
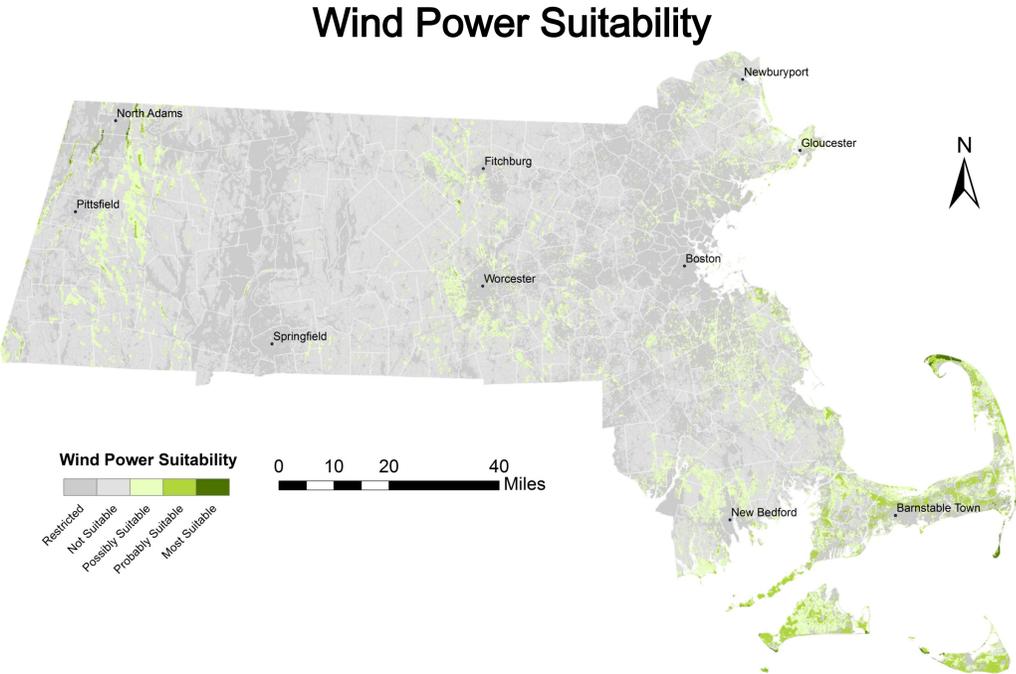
Variables	Scoring Criteria
Distance From Major Roads	The closer the better
Distance from Transmission Lines	The closer the better
Distance from Dense Populations	The closer the better
Land Use	Water, Developed Areas, Wetlands = Restricted Forests < Barren Lands, Farm Lands, Grasslands
Land Slope	Slope greater than 20° = Restricted Slope less than 20° = Allowed

Next, the Wind Score map was created. This map classified sustained mean wind speed at 70 meters above the surface into eight scores (0-7). A score of 0 indicates that the location does not have great enough wind speeds to be considered for wind power development and the score of 7 indicates the highest wind speeds.

Then, the Wind Power Suitability map was created by combining the Location Score map and the Wind Score map. Suitability scores were calculated by multiplying the location scores by the square of the wind scores. The wind score was squared in this analysis which increases its importance on the overall scoring and represent the exponential relationship between wind speed and power generation.

Lastly, the wind suitability scores were used to create the Wind Power Suitability by Town map. Town score were calculated by finding the mean of all the suitability scores in each town.

Data Sources: MassGIS, and National Map (NLCD 2006 and DEM)



Conclusion

The Wind Power Suitability map provides a preliminary guide for future wind farm projects. The Wind Power Suitability Town map identifies towns where wind farm development may be appropriate. This project could be improved by altering the scoring scales and the weighting scheme to make it better fit a cost-benefit analysis. To follow-up on this project, the specified most suitable areas should be considered on a smaller scale analysis that includes wind profiling (using SODAR), bird migration patterns and local NIMBY issues.

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