Wind Turbine Siting in Massachusetts

Wind Power

Wind can be converted into a high-value, highly flexible and useful form of energy called electricity through the use of wind turbines. As air flow passes through the rotor of a wind turbine, the rotor spins and drives the shaft of an electric generator. Wind turbines can be grouped together into wind farms, which have the ability to generate massive amounts of electricity.

Turbine Sizes

Residential: Below 30kW
- Diameter: 1-13 meters
- Height: 18-37 meters
- Example: 20,000 wh/year

Medium: 30-500kW
- Diameter: 13-30 meters
- Height: 35-50 meters
- Example: 600,000 wh/year

Commercial: 500kW-2MW
- Diameter: 47-90 meters
- Height: 50-80 meters
- Example: 4,000,000 Kwh/year

Siting Criteria

The criteria used to evaluate potential wind turbine or wind farm sites in this project was:

- Wind speed
- Land use
- Distance to transmission lines
- Population
- Distance to roads

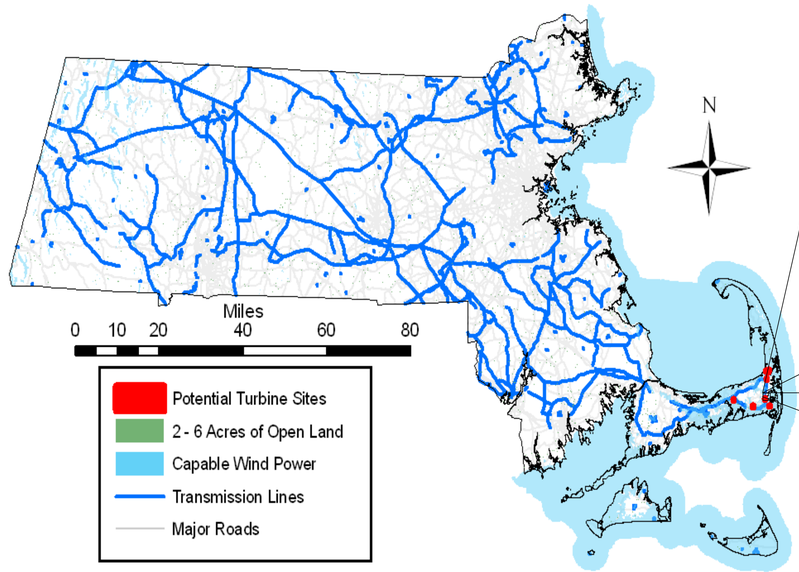
Other criteria that are of importance but were not evaluated in this project are:

- Slope
- Elevation
- Distance to residential parcels
- Distance the area in need of the energy being produced
- Soil type

Vector

Vector data structure consists of points, lines or polygons. Points are pairs of x,y coordinates. Lines are sets of coordinates that define a shape, and polygons are sets of coordinates defining boundaries that enclose areas. The feature layers in vector data layers are linked to an attribute table.

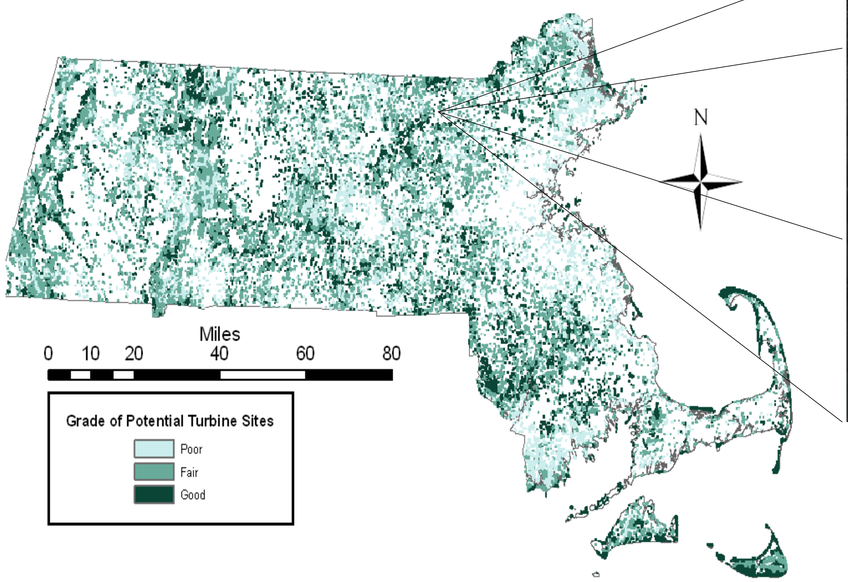
Methods:
1. I began by selecting out areas that were 2-6 acre open land sites.
2. From those sites, sites with appropriate wind speeds were selected. The same was done for distance to transmission lines, distance from major roads, and population density.
3. **After the selections were complete I was left with 9 appropriate locations.**

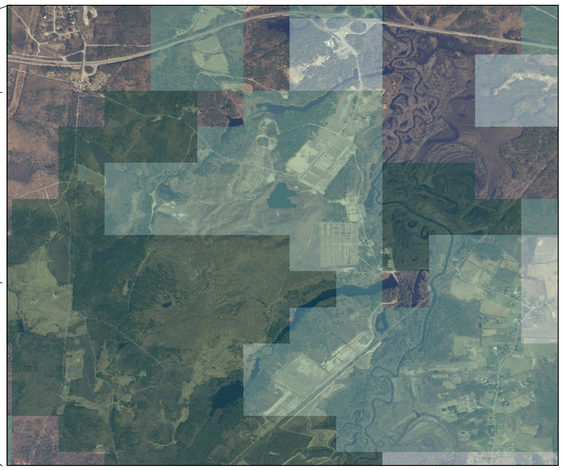


Raster

Raster models display the world as a surface that is divided into a regular grid of cells. Each cell is assigned a quantitative value that represents the presence of the real world attribute being measured. The values that are attached to the individual cells are averaged out within each cell to produce a single set of values.

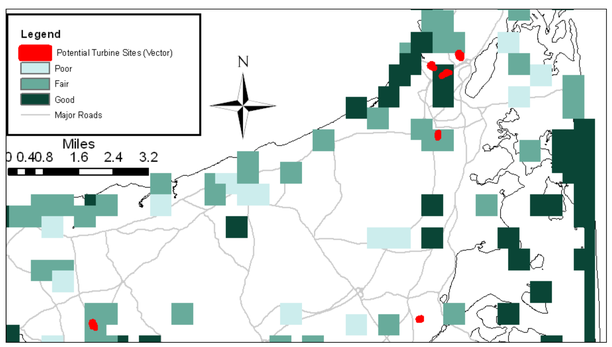
Methods:
1. The layers displaying wind speed , land use, distance from transmission lines, distance from roads, and population density were re-classed into 5 categories: 1-5. Areas possessing the most ideal characteristics of that specific criteria were assigned a score of 5.
2. The scores of each raster layer were summed and broken into 3 levels of appropriateness: Poor, Fair, and Good.





Vector & Raster

The results from the vector and raster analysis are relatively similar. Most if not all of the 9 locations determined through vector analysis were found in areas identified by the raster analysis. However, the raster analysis provided a significantly larger range of results due to the binary-progression overlay.



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Source: Massachusetts GIS
December 12, 2007
Projection: NAD –1983 MA State Plane