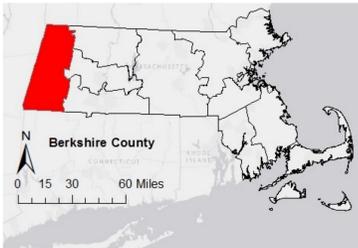


BERKSHIRE COUNTY WIND SUITABILITY ANALYSIS

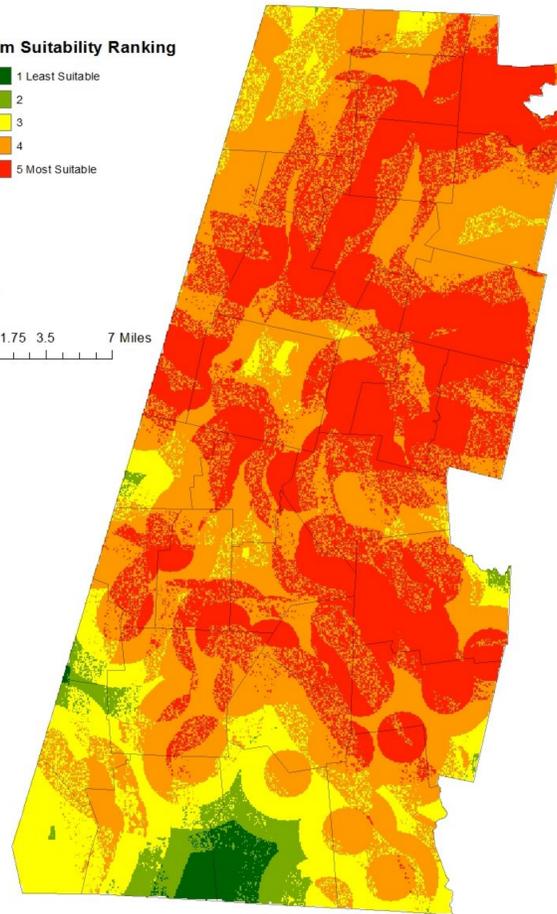
Berkshire County, Massachusetts

Introduction

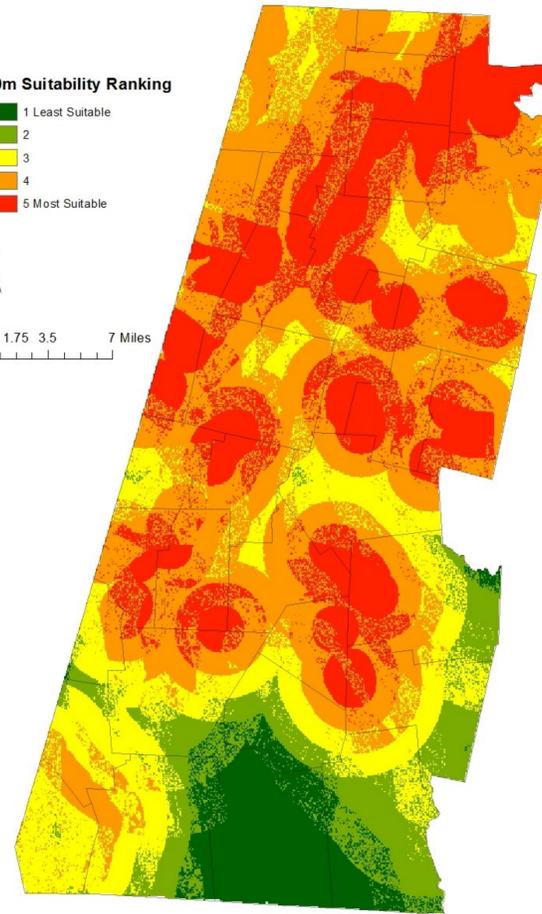
Wind energy has grown substantially throughout the United States over the past decade. Many states have adapted new policies to enhance wind energy development. Massachusetts is one of these states and has set renewable portfolio standards to increase the amount of Class I renewables, which include wind and solar, by 1% each year since 2008. This suitability study focuses on analyzing how suitable Berkshire County (displayed in the map below) in western Massachusetts is for more potential wind energy sites and infrastructure. The Berkshires are already home to Massachusetts second largest wind farm site, Berkshire Wind Power Project, producing 15 megawatts of energy. Massachusetts is only just beginning to tap into its potential wind resources and it has a lot of potential to expand and grow its wind sector, both on and off shore. Using a number of different criteria including: slope, wind speed, proximity to transmission lines and more, we are able to get sufficient evidence on how suitable a site is and we can rank these potential sites in terms of suitability to find the best potential sites. I also took into account the potential zoning issues including building near airports and residential areas which must be taken into account before choosing a suitable site.



70 m Suitability Ranking

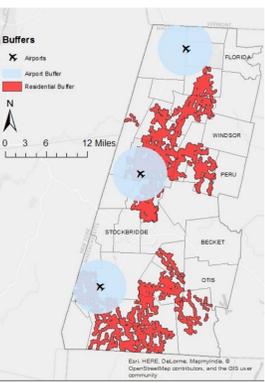


50m Suitability Ranking



Results

After ranking all the individual criteria and using raster calculator to form a new overall criteria for the final ranking, I created the two suitability maps to the left. The suitability maps show us the suitability for wind development throughout Berkshire County. At 70m, wind suitability increases substantially, as seen on the maps on the left. The extra height extends the suitability to cover more of eastern Berkshire County, this is due mainly to the increased wind speeds at the higher height. According to statistics under the properties section of both maps at 70meters the average suitability across the map is ranked at 4, and for 50 meters the average rank is also at 4, but lower in the 4 suitability range and with a higher variance. This shows us that both heights show promise for wind development, given the criteria I have used, but that the 70 meter wind turbines would perform substantially better and could be built in a larger area of Berkshire County. After adding the buffers in, where construction is restricted, we can see that the following towns are the most suitable sites for wind development: Florida, Windsor, Peru, Becket, Otis and Stockbridge. The buffer map is not displayed over the final maps due to overwhelming aesthetics.



Methods

In order to create a final ranking of Berkshire County I developed a set of criteria which were individually ranked to show the important aspects of wind siting. After ranking each criteria individually, each criteria was given a specific weight, related to its importance towards siting, and were combined to form the overall wind suitability ranking maps. The following criteria were used in for ranking:

Distance from Ideal Speed areas: This is the most important individual criteria for wind suitability, and was weighted the most at 40% for the final suitability maps. The most suitable wind development site must have ideal wind conditions in order for the wind turbines to function efficiently, so a closer distance is better. The Euclidean distance tool is used to find this proximity and ranked through the reclassify tool. Two different heights were used for the wind speeds, 70 and 50 meters, to provide a comparison and to see how hub height effects the number of ideal areas in proximity to high wind speed.

Proximity to Major Roads: A close proximity to major roads is important for maintenance and the initial construction phase of a project. It was weighted at 10% for the final map, and the Euclidean distance tool and reclassify tool were both used to create the map.

Proximity to Transmission Lines: Being close to transmission lines reduces the amount of electricity lost through transmission. It also helps for connecting to the existing grid and providing the energy to residents. Euclidean distance and the reclassify tool were used for this map to rank the distance, the closer the distance the more suitable and it was weighted at 20% for the final suitability study.

Slope Ranking: The slope of the land is key for wind energy development. The higher the slope of the land the less suitable it is for the construction of a potential site. The slope tool was used to derive the slope from the digital elevation model, and was then reclassified in order to rank the slopes from most suitable (low slope) to least suitable (high slope). It was given a weight of 15% in the final suitability map.

Elevation Ranking: The elevation is also key for wind energy development. The higher the elevation of the land the more suitable it is for the construction of a potential site, since wind speeds are higher. The slope tool was used to derive the elevation from the digital elevation model, and was then reclassified in order to rank the elevations from most suitable (high elevation) to least suitable (low elevation). It was also weighed at 15% for the final maps.

Suitability Ranking: After all the criteria was ranked using the raster calculator tool I weighed each criteria as stated above and this created the two final suitability maps (displayed above) which give overall rankings of suitable wind sights. A ranking of 5 (in red) is the most suitable and a ranking of 1 is least suitable (dark green).

Buffers: The final part of my study includes airport buffers and residential buffers to display areas where building is not allowed. I used the buffer tool to create the airport buffers, and downloaded the residential buffer layer from MassGIS.

The final step was to include the buffers in the suitability ranking and find the most suitable towns for development.

Limitations and Conclusion

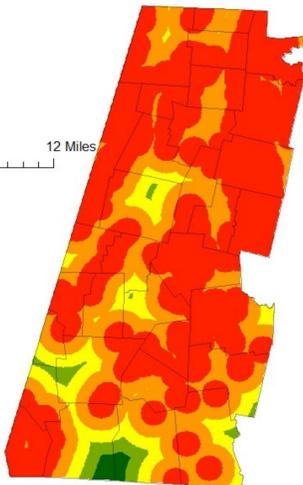
The scope of my project unfortunately doesn't cover all the areas that could be included in a wind suitability study, due to time constraints. These limitations hold back the accuracy of the study to some degree. The following are factors that could be included in future assessments of the Berkshires:

- Land Use Criteria
- Preexisting Sites
- Bird Migration Patterns
- Environmental Criteria

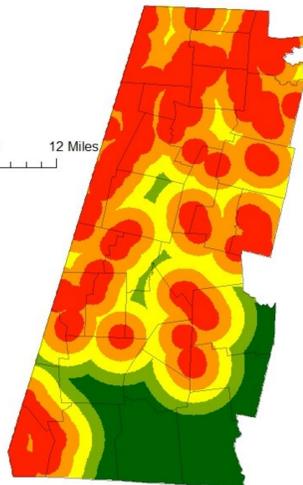


In conclusion it is clear that Berkshire County houses great wind development suitability for Massachusetts. Harnessing this wind potential would help provide jobs for many people in the surrounding areas as well as a clean and environmentally friendly source of energy. I would recommend for Massachusetts to invest in wind development in Berkshire County, and to also look at potential wind development in other areas of Massachusetts such as along the coast and even onshore.

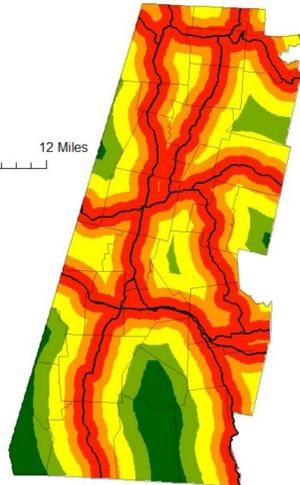
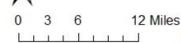
Distance Rank: Ideal Speed 70m



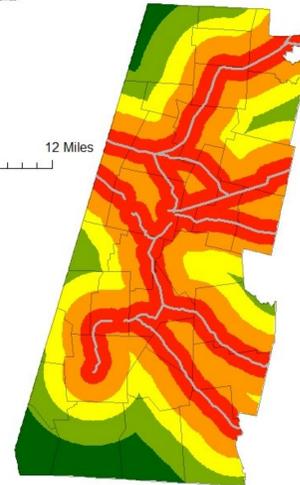
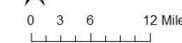
Distance rank: Ideal Speed 50m



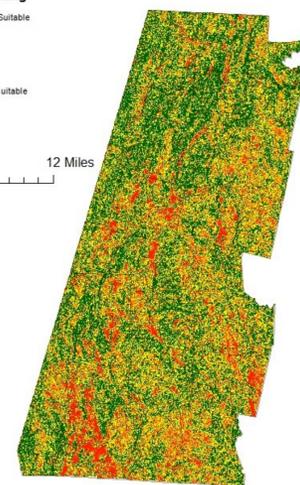
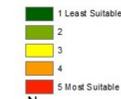
Distance Rank: Proximity to Major Roads



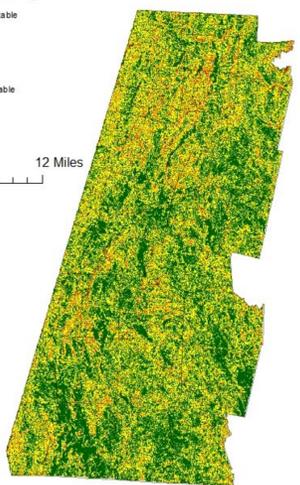
Distance Rank: Proximity to Transmission Lines



Slope Ranking



Elevation Ranking



By: Panayiotis Koutsogeorgas

Projection Info: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001

Data Sources: MassGIS and MassDOT