

Small Wind Turbine Site Suitability Analysis for Berkshire County, Massachusetts

Katie Moore, CEE194GIS, Summer 2008

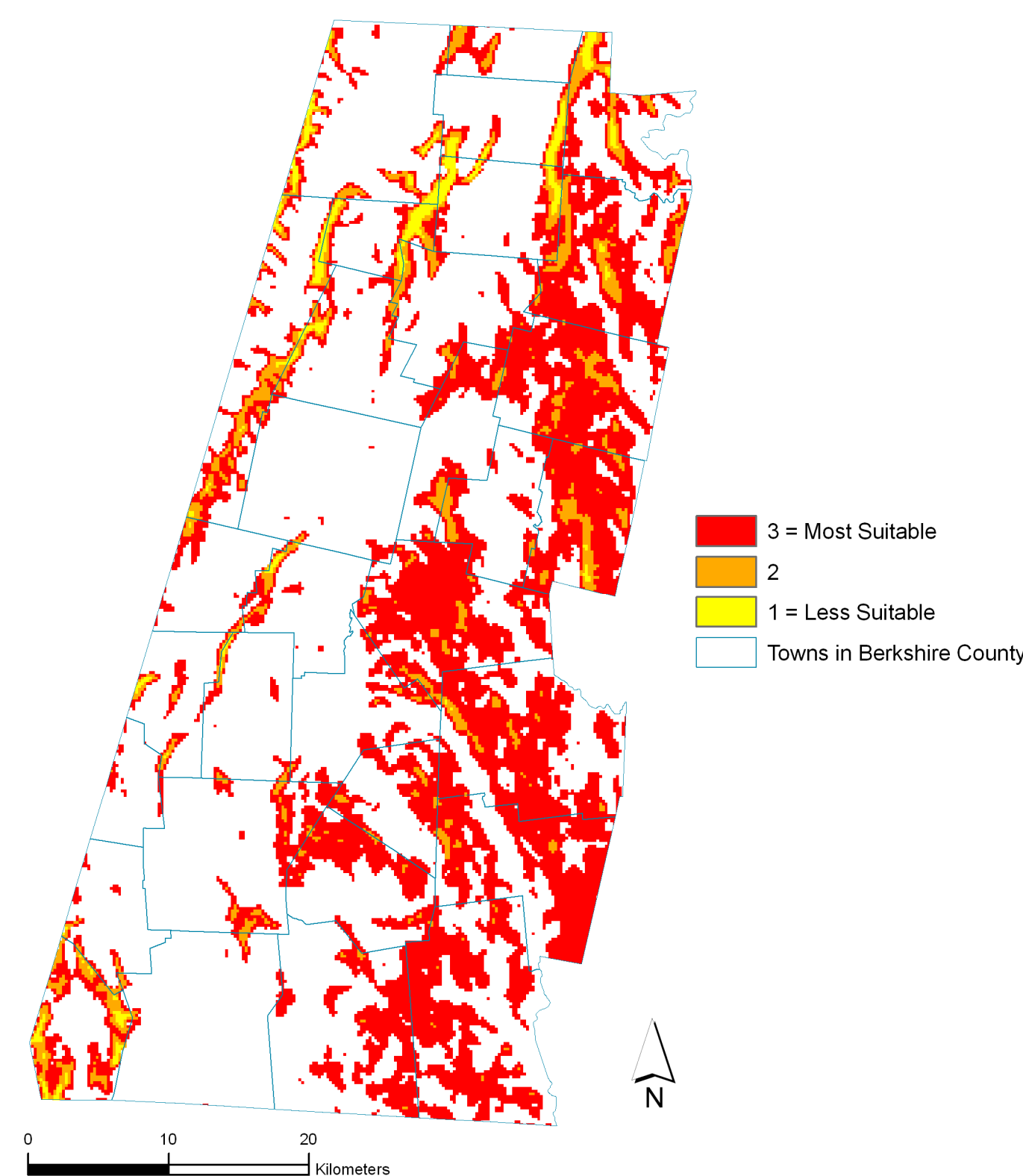


Figure 1: Reclassification of the wind speed factor.

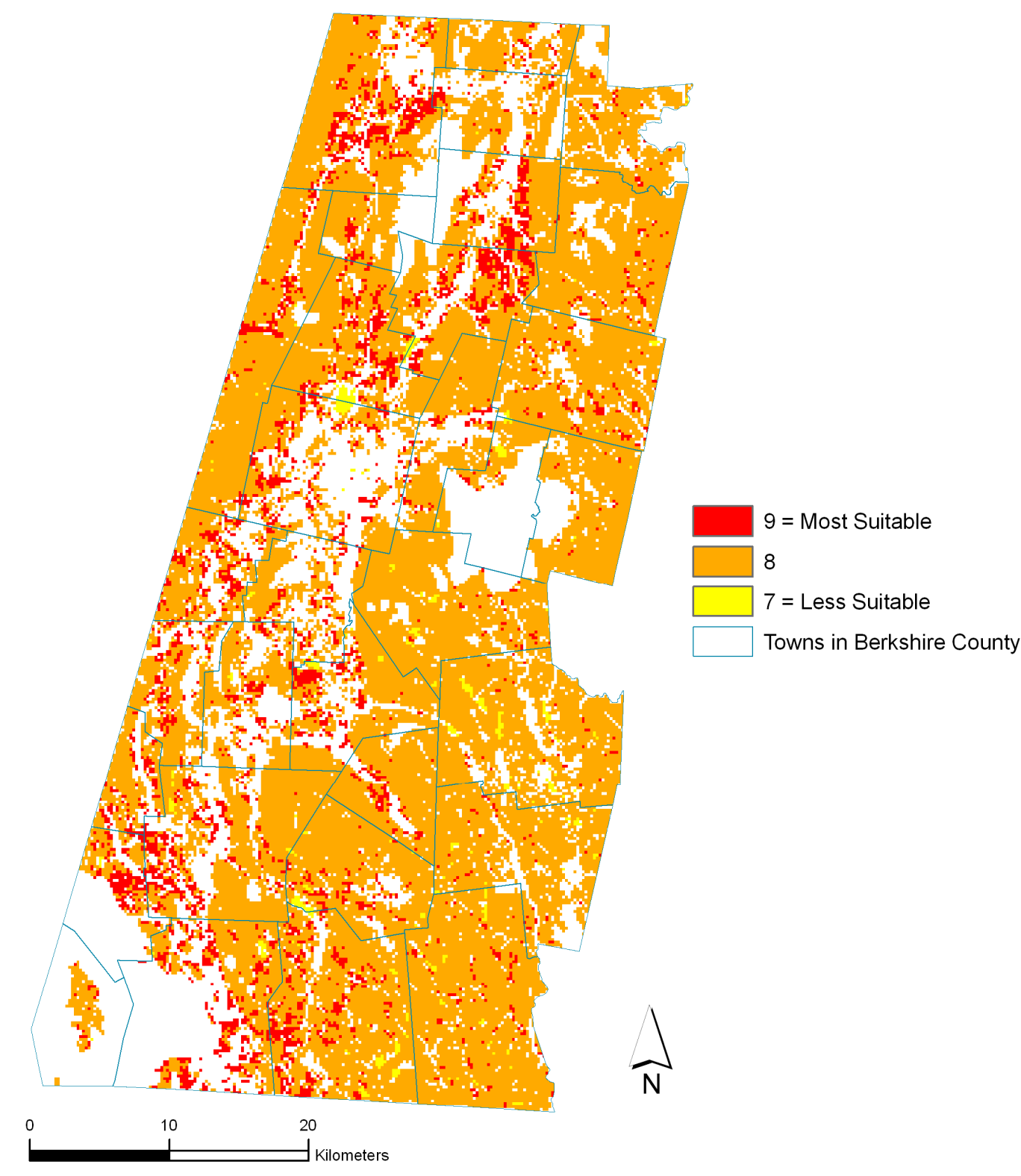


Figure 2: Reclassification of the environmental consideration factors ACECs, Priority Habitats of Rare Species, and Land Use.

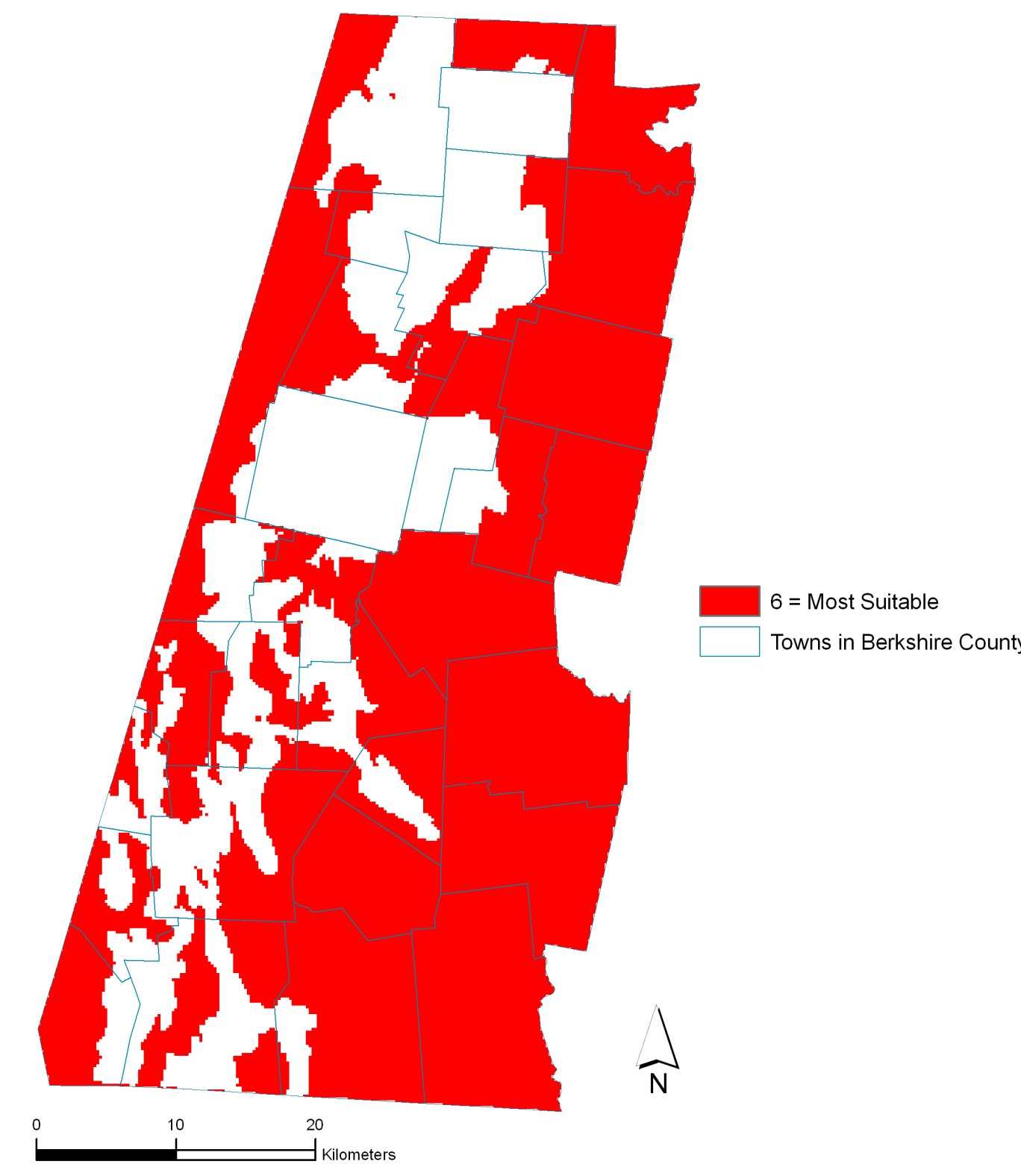


Figure 3: Reclassification of the human impact factors urbanized or urban clusters and scenic landscape.

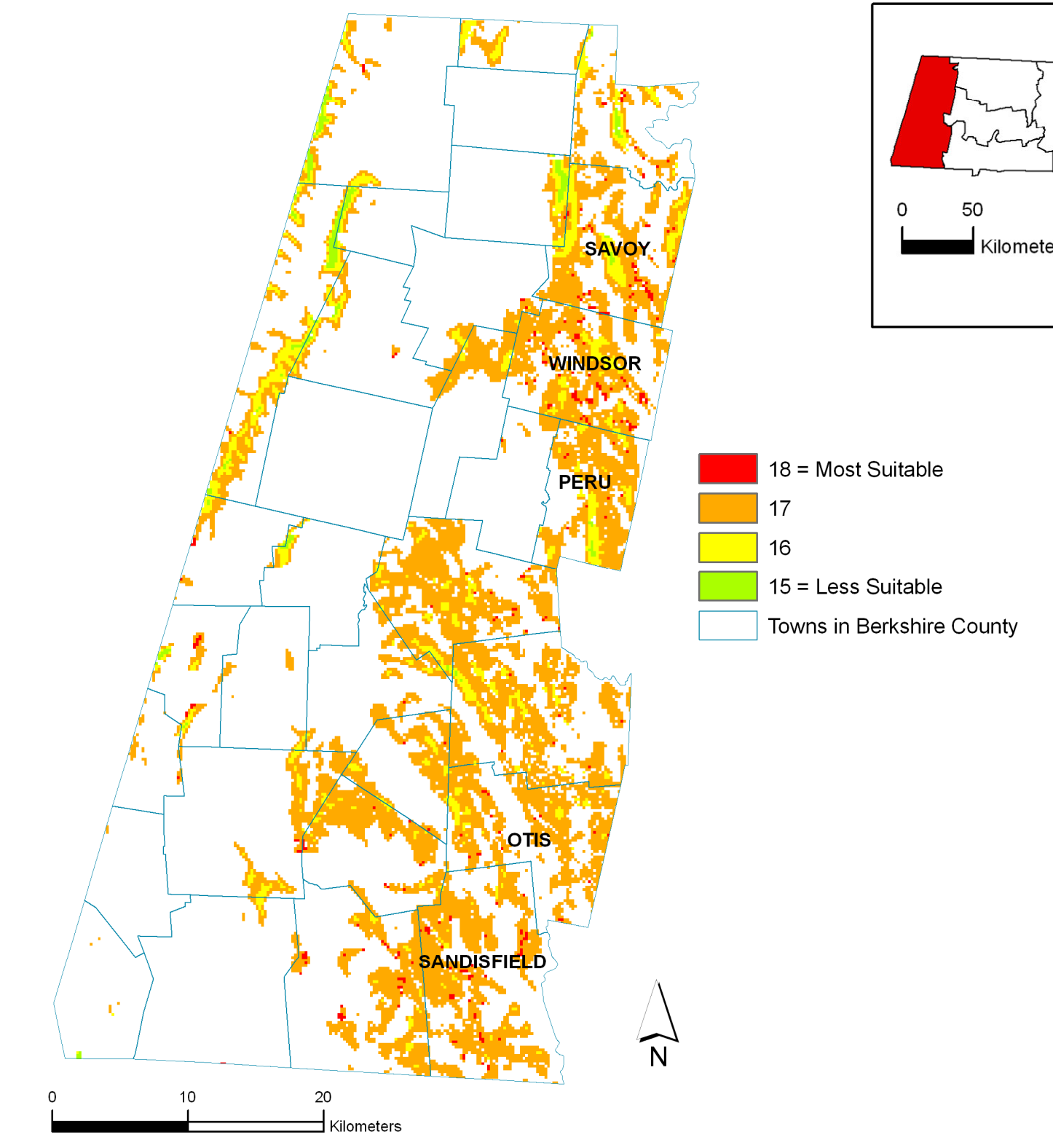


Figure 4: Suitability of sites determined using model of reclassified values for wind speed, environmental considerations, and human impact factors.

Introduction

Why is Wind Power Important?

Energy supply and pricing can be unpredictable, and production can be environmentally unfriendly. As a result, the desire for, and consumption of, energy created via wind power has increased.

What is Small Wind?

Small wind turbines are defined as having a capacity of 100 kilowatts or less. Generally, for a small wind turbine to be economically viable, the average wind speed should be 5-6 m/s (11.2-13.4 mph). Although higher wind speed can be utilized for greater power production, they are not ideal for small turbines.

Small wind turbine projects are best suited for homes, farms and small businesses where wind energy can be used to provide a more reliable power supply and offset utility-supplied electricity.

Why Select Berkshire County?

Berkshire County generally contains the highest elevations within the state, including the highest elevation point at Mt. Greylock (1,064 meters). Based upon an elevation 30m above the ground surface, Berkshire County also has the highest mean wind speed locations among non-coastal areas. Within Berkshire County, 30% of the population is considered rural and 70% are located in urban areas or urbanized clusters.

Methods

A model for suitability was developed based upon reclassified values for wind speed, environmental considerations, and human impact factors.

Wind Speed

The wind speed data was reclassified (Figure 1) such that locations with mean wind speed of 5-6 m/s were given a value of 3 (most suitable), 6-7 m/s was given a value of 2 (fair suitability), and 7-16.5 m/s was given a value of 1 (least suitable). Areas with a mean wind speed less than 5 m/s were not considered.

Environmental Considerations

The area within Berkshire County was reclassified so Areas of Critical Environmental Concern (ACEC) - as designated by the Secretary of Environmental Affairs - and Priority Habitats of Rare Species - as designated by the Natural Heritage & Endangered Species Program - were excluded from the available site locations. Land Use data was reclassified such that cropland, pasture, and open land were given a value of 3 (most suitable), forest was given a value of 2 (fair suitability), and water was given a value of 1 (least suitable). Results of these reclassifications can be seen in Figure 2.

Human Impact

Berkshire County was reclassified so urbanized areas and urban clusters were excluded from available sites. For community support, the County was also reclassified to exclude locations identified as scenic landscape by the Massachusetts Landscape Inventory Project. Results of these reclassifications can be seen in Figure 3.

Findings

Preliminary Results

As seen in Figure 4, the results from the suitability model developed indicate the eastern portion of Berkshire County is best suited for small wind turbine sites. Specifically, the towns of Savoy, Windsor, Peru, Otis, and Sandisfield have the most suitable sites.

Additional analysis of the suitable sites showed that the selected sites within Savoy are not located within a 1-mile distance of current transmission lines. While this does not preclude the sites from being suitable for a wind turbine, it does mean further analysis should determine if these sites are within a mile of a household, farm, or small business.

Future Analysis

The time scope of this project did not allow for an assessment of all related factors. Future analysis should include slope considerations, soil analysis, protected and recreational open space, lower mean wind speed, and parcel data from towns with suitable locations.

Projection: Massachusetts State Plane Mainland, NAD83, meters
Source: MassGIS