

Assessing Potential Conflicts Between Wind Power Development and Other Land Uses

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INTRODUCTION

In the Northeast the primary terrestrial sites for commercial wind power development are higher elevation ridgelines - often the least developed parts of this heavily settled landscape and areas of potentially high ecological, recreational and scenic value. Stakeholders are faced with two worthy but conflicting goals - promoting the development of clean, renewable energy and conserving large tracts of undeveloped forest land.

Currently wind power development projects at sites chosen by developers are evaluated on a case-by-case basis by both regulators and stakeholders. What has been missing is an overall landscape-level assessment that considers all potential sites, and public policies that guide development to the most suitable sites from an overall social benefit perspective.

The Appalachian Mountain Club, working in collaboration with a variety of other interest groups, has developed a methodology for assessing the potential conflicts between wind power development and other land uses and values across broad landscapes. The project is intended to:

- Allow a comparative evaluation of all potential wind power development sites.
- Guide development to the most suitable sites.
- Serve as a starting point for discussion of appropriate state wind power siting policies that address the unique issues associated with this technology.

BASIC ANALYTICAL APPROACH

The method taken in this project involves three steps:

1. Identify potential wind power sites.
2. Identify factors that are potentially in conflict with development.
3. Evaluate each site for each factor.

This process results in a comprehensive database that can then be used to address a wide range of questions, including:

- What potential land use conflicts may affect wind power development at a particular site?
- How does a particular site compare with other potential sites in regards to the extent and nature of potential conflicts?
- Which sites are affected by the most and fewest potential conflicts?
- How much of the wind power potential of any particular region is affected by any particular conflicting value?
- What tradeoffs might need to be made in order to meet specific targets for wind power development across a region of interest?

PILOT PROJECT

The AMC worked in consultation with other organizations with an interest in appropriate wind power siting to develop and test this methodology. The project used the Berkshire Mountains region of western Massachusetts as a pilot study area, with the goal of developing an approach that can be applied to other regions.

This project was not undertaken to provide a plan for wind power development in the Berkshire region, and is not intended to promote or constrain development of any particular site. The region was chosen solely as a pilot area to test the methodology.

CAVEATS

This project represents a starting point for assessing wind power siting across broad regions. However, many caveats must be kept in mind when evaluating the approach and results reported here:

- Not all factors relevant to wind power siting are considered (e.g. bird migration routes).
- The factors considered in the analysis vary in importance, both legally and in the relative importance placed on them by various stakeholders.
- The analysis considers only the spatial relationship between potential development sites and potentially conflicting factors. The presence of a potential conflict does not necessarily create an actual conflict.
- Factors may be related; multiple factors may represent the presence of a single underlying feature or landscape condition.
- The analysis of scenic impact (perhaps the primary factor affecting public view of wind power) is rudimentary and incomplete.
- The analysis does not consider existing land use (though in this area almost all sites lie on undeveloped forest land) or the presence of existing development or infrastructure.
- The analysis does not consider economic factors of interest to developers, such as distance from existing roads or transmission lines.

Although this methodology yields valuable information about potential conflicts between wind power development and other land uses or resource values, in the end a detailed examination of each site is required to determine how development would affect each factor.

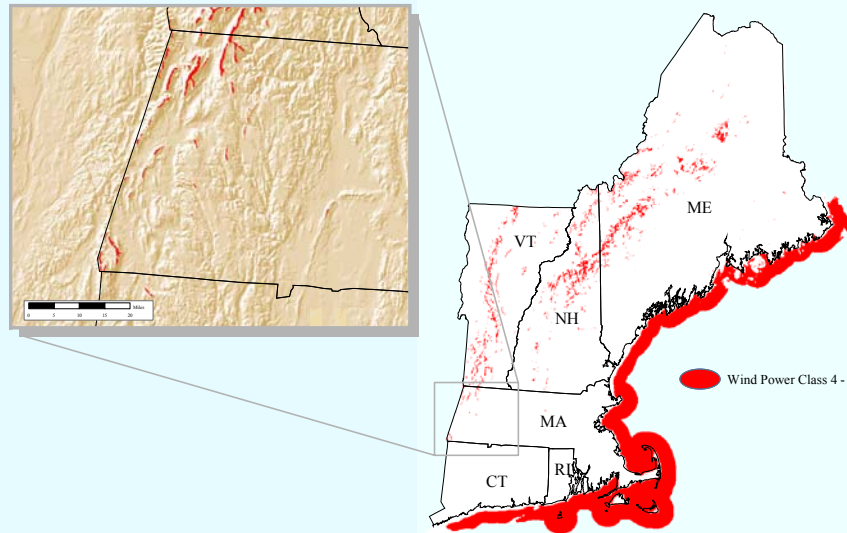
No attempt has been made to weight factors or to develop an overall "suitability rating" for each site. Any attempt to develop such a rating would be inherently subjective, and involves considerations beyond those included in this analysis. In some cases a single factor may create an overriding impediment to development. Developing overall ratings would require the participation of and acceptance by the full range of stakeholder groups with an interest in wind power development.

APPLICABILITY TO OTHER AREAS

The basic methodology outlined should be applicable to other areas. However, the value of the assessment is strongly dependent on the information that is available on potential conflicts, which will vary from region to region (much of it on a state-by-state basis). If available data does not represent a broad range of potential conflicts, the assessment will not give a complete picture of what factors might affect wind power development. Application of the methodology to areas where the suitable wind power resource encompasses broad areas (such as plains, coastal or off-shore areas) rather than discrete and easily delineated ridgelines would require some variation in the analytical approach.

STEP 1 - Identify Potential Wind Power Sites

Wind resource data developed by TrueWind Solutions, LLC was used to identify potential wind power development sites. Areas with a wind power class of 4 or above (considered the minimum suitable for commercial development given current technology and economics) were isolated and the associated ridgeline was digitized by reference to contour line data.



STEP 2 - Identify Factors that are Potentially in Conflict with Development

Data on protected Open Space land and 16 ecological, recreational and scenic factors that might potentially conflict with development was compiled from the Massachusetts Geographical Information System, obtained from other organizations or developed by AMC. (See small maps to the right. Two factors - generalized conservation priorities identified by The Nature Conservancy and snowmobile trails - are not shown).

STEP 3 - Evaluate Each Site for Each Factor

Potential development sites were overlaid with data on Open Space land and each of the 16 factors and assigned a potential conflict rating as described below. Most sites were divided into multiple segments to account for partial overlap with the various factors.

Conservation (Open Space) Status

- A: Land where development is legally restricted or clearly in conflict with the primary purpose (e.g. ecological reserves or Wilderness areas). In this analysis only the Appalachian Trail corridor was considered, though other lands (e.g. no-development easements) could also qualify.
- B: Other Federal or state land for which a primary purpose is conservation.
- C: Other Massachusetts Open Space lands (e.g. conservation easements, municipal land, land owned by non-profit conservation organizations).
- P: Unrestricted private land.

Ecological, Recreational and Scenic factors

Each of the 16 factors was rated as to the level of potential conflict as follows:

Significant potential conflict - segment overlays a feature or condition of primary importance for that factor.

Moderate potential conflict - segment overlays a feature or condition of secondary importance for that factor.

No potential conflict - segment does not overlay that factor.

It is important to recognize that the ratings assess the spatial relationship between a site and the various factors, and thus highlight potential conflicts. The presence of a Significant or Moderate conflict does not necessarily preclude wind power development. Rather it indicates factors that could affect the suitability of a site for development, and which should be considered in more detail if development is to proceed.

Examples of conflict ratings:

BioMap Habitat Areas

- (S) Segment lies within BioMap Core Habitat.
- (M) Segment lies within BioMap Supporting Natural Landscape.
- (X) Segment lies outside of BioMap habitat areas.

High Recreational Use

- (S) Site lies within a high recreational use area* and is accessed by a recreational trail (other than a Long Distance Trail).
- (M) Site is accessed by a trail (other than a Long Distance Trail) but lies outside high recreational use areas.
- (X) Site is not accessed by a recreational trail (other than a Long Distance Trail).

*High recreational use areas were defined as large public lands that have a high density of recreational trails as shown on published recreational trail maps and are promoted as recreational areas by the state.

Appalachian National Scenic Trail Viewshed

- (S) Segment lies within the Foreground zone (<1/2 mile) or Segment lies within the Middleground zone (1/2 to 2 miles) and is visible from any viewpoint or Segment lies within the Background zone (2 to 4 miles) and is visible from two or more viewpoints.
- (M) Segment lies within the Background zone and is visible from one viewpoint.
- (X) Segment lies more than 4 miles from the AT or Segment lies less than 4 miles from the AT but is not visible from any viewpoint.

RESULTS

Among the results derived from this analysis are:

- *93 miles of potentially developable ridgeline were delineated in 62 discrete sites ranging from 0.1 to 5.5 miles in length.
- *15% of the ridgeline lay along the Appalachian Trail corridor (Conservation Status A). Another 38% was on other major state and federal lands (Conservation Status B). Together these two categories (considered "Major Public Lands") encompassed 53% of the potentially developable ridgeline. Another 13% lay on other Open Space lands (Conservation Status C) and 34% on unrestricted private land (Conservation Status P).
- *For individual factors, the proportion of total ridgeline rated Significant ranged from less than 1% to 57% (Table 1).

*For all 16 factors, the proportion of ridgeline rated as having a Significant level of potential conflict was greater for ridgeline on Major Public Lands. For 11 of the 16 factors the proportion rated Significant was at least 50% higher on Major Public Lands.

*Segments rated Significant for many factors involve potential conflicts with a wide range of resource values and may be less suitable for development. The likelihood that a segment involves multiple conflicts is much greater on public conservation lands than on private land. About 40% percent of the ridgeline was rated Significant for two or fewer factors (large map and Table 2a); 63% of this lies on unrestricted private lands (Table 2b). These are the sites that may be most appropriate for initial consideration of wind power development. Another 21% was rated Significant for six or more factors, of which 95% is located on Major Public Lands. These are the sites that may be the least appropriate for wind power development.

Table 1. Percent of ridgeline rated Significant for each factor.

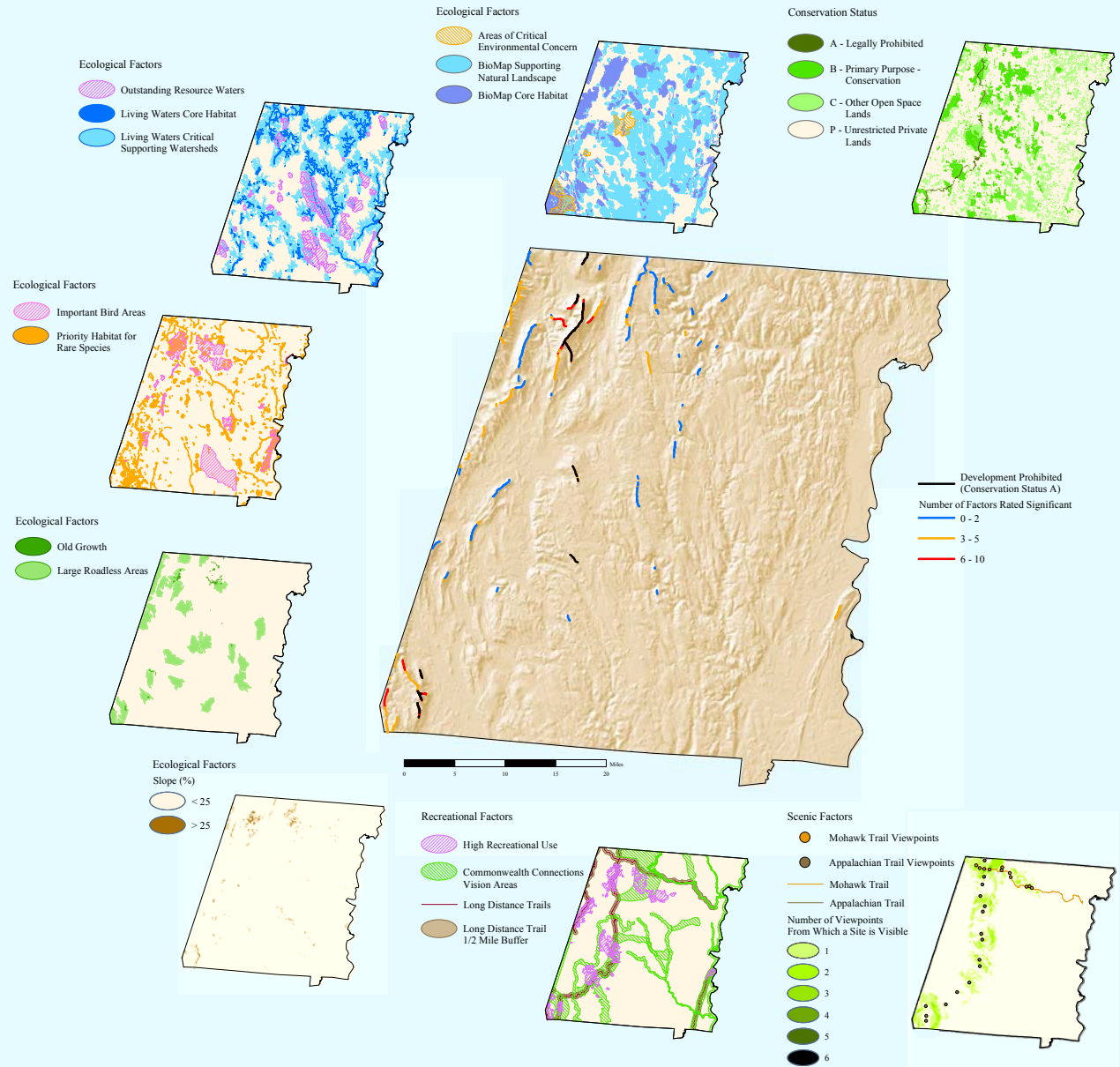
Factor	Percent
BioMap Habitat Areas	57%
Large Roadless Areas	47%
Commonwealth Connections Vision Areas	41%
High Recreational Use	37%
Nature Conservancy Priority Areas	30%
Long Distance Trails	30%
Appalachian National Scenic Trail Viewshed	28%
Habitat for Rare Species	26%
Topography (steep slopes)	25%
Important Bird Areas	25%
Snowmobile Trails	16%
Mohawk Trail Scenic Byway Viewshed	12%
Outstanding Resource Waters	6%
Areas of Critical Environmental Concern	5%
Old Growth	2%
Living Waters Habitat Areas	<1%

Table 2a. Conservation Status by number of factors rated Significant.

Number of factors rated Significant	Conservation Status				
	A	B	C	P	All
0-2	0%	22%	50%	75%	40%
3-5	27%	56%	48%	22%	39%
6-10	72%	22%	2%	3%	21%
Total	100%	100%	100%	100%	100%

Table 2b. Number of factors rated Significant by Conservation Status.

Number of factors rated Significant	Conservation Status				
	A	B	C	P	Total
0-2	0%	21%	16%	63%	100%
3-5	11%	55%	16%	19%	100%
6-10	54%	41%	1%	4%	100%
All	15%	38%	13%	34%	100%



DATA SOURCES

Wind resource data was provided by TrueWind Solutions, LLC developed under contract to AWS Scientific, Inc. as part of a project jointly funded by the Connecticut Clean Energy Fund, the Massachusetts Technology Collaborative, and Northeast Utilities System.

Important Bird Areas data was provided by the Massachusetts Audubon Society.

The following data was provided by Massachusetts Geographic Information System:

- Protected and Recreational Open Space
- Areas of Critical Environmental Concern
- NHSP BioMap Core Habitat
- NHSP BioMap Supporting Natural Landscape
- Outstanding Resource Waters
- NHSP Living Waters Core Habitat
- NHSP Living Waters Critical Supporting Watersheds
- Priority Habitats of Rare Species
- Long Distance Trails

Large roadless areas

High recreational use areas (a subset of Massachusetts Protected and Recreational Open Space data)

Commonwealth Connections Vision Areas (as part of a cooperative project with the Massachusetts Department of Environmental Management)

Slope derived from USGS 30-meter Digital Elevation Model data

Appalachian National Scenic Trail viewshed

Mohawk Trail Scenic Byway viewshed

Old growth data was provided by Gary Belton and Robert Leverett.

Conservation priorities data was provided by the Massachusetts Chapter of The Nature Conservancy. (This data is not shown as it is not available for public display)

Important Bird Areas data was provided by the Massachusetts Audubon Society.

Snowmobile trail data was obtained from the statewide snowmobile corridor trail map (2002) published by the Statewide Association of Massachusetts. This data was not available in digital form and therefore is not displayed. The relationship between trail locations and potential wind power sites could only be approximately determined.

ADDITIONAL INFORMATION

Detailed information on the objectives, procedures and results of this project can be found in A Methodology for Assessing Potential Conflicts Between Wind Power Development and Other Land Uses (AMC Technical Report 04.2, May 2004). For copies of this report, contact Dr. David Publicover (dp@publicover.com).

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