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3aNSa4. Prevalence of complaints related to wind turbines in northern New England

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As of the end of December 2012, there were over a dozen large operating wind projects with a total capacity exceeding 600 MW in northern New England. This paper evaluates the prevalence of noise complaints to regulatory authorities from those wind projects. A comparison of the distance of complainants and non-complainants from wind farms is made with the goal of assessing the prevalence of complaints at various distances from the wind projects.

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INTRODUCTION AND BACKGROUND

In 2012, Hessler and Hessler[1] investigated serious noise complaints from five wind farms. They found that between 2% and 7% of households, with an average of 4%, within about 2,000 feet of these wind farms registered noise complaints. Overall, they found that the level of complaints was far lower than predicted by others, particularly in the dose-response studies done in Europe by Pederson and Persson Waye [2][3][4].

In this study, we investigated official reports of noise complaints in 15 of the 16 large wind farms that are currently active in the northern New England, specifically the states of Maine, New Hampshire, and Vermont. We then evaluated the location of those complaints with respect to the distance from the wind farm.

METHODOLOGY

A list of wind farms greater than 1 MW in total capacity active in Maine, New Hampshire, and Vermont were obtained from various sources. Because in each of these states, the siting of large wind farms is regulated by the state, state officials were contacted to determine which projects had noise complaints and where those complainant households were located. In addition, some project operators were also contacted to fill in any gaps. In all but one case, the number of complaints, and locations or approximate distances of complainants to the nearest turbine could be identified.

The turbines of each wind farm were mapped, and then buffers of 1 km (0.6 mi), 1.6 km (1 mi), 2 km (1.2 mi), and 3.2 km (2 mi) were extended from the project. These buffer distances were chosen because they are commonly cited in the literature and press. For locations in Maine and New Hampshire, households were then identified via aerial photography. Each identified household was assumed as a single family residence. For locations in Vermont, the state's E911 residential GIS database was used to identify households. The numbers of households in each buffer distance was then counted. An example of the buffer and residence mapping is shown in Figure 1.

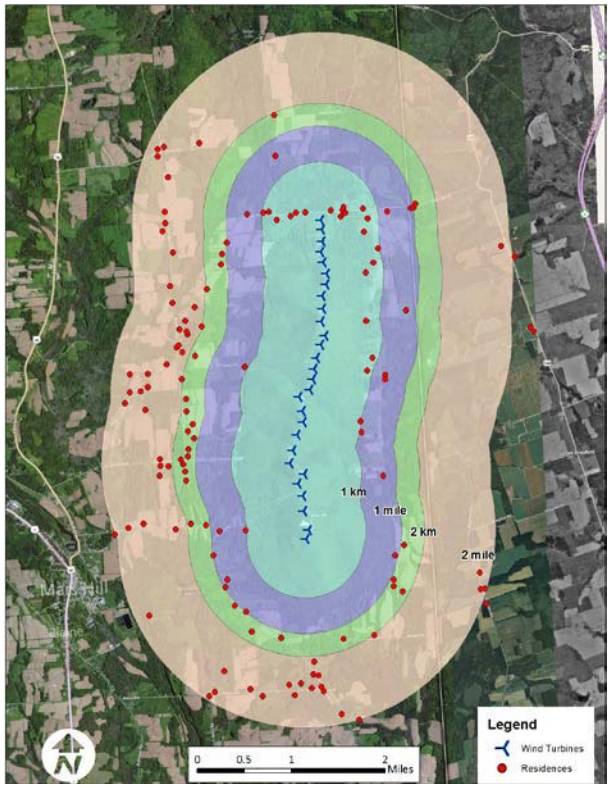

FIGURE 1. Example analysis showing wind turbines, identified households, and 1 kilometer, 1 mile, 2 kilometer, and 2 mile buffers around the wind farm

RESULTS

We were able to identify turbine locations, residential locations, and complainant setback distances from 16 wind farms, accounting for 329 wind turbines and 674 MW of total capacity.

The number of households within each distance band registering at least one noise complaint is shown in Table 1. A total of 29 complaints were noted. As indicated, the percentage of complaints within 1 km (3,280 ft) is 5% similar to the 4% found in Hessler and Hessler [1]. In the five wind farms they analyzed, they found 764 residences within 2,000 feet, whereas our 16 New England wind farms combined had fewer than 150 residences within 3,280 feet. This is a notable characteristic of New England wind farms since the most common standard is 45 dBA, the turbines are generally arrayed in a ridgeline configuration, and the rural nature leads to somewhat larger setbacks than found in other environments.

Of the complaints, 48% occurred at wind farms where a noise violation was found or where a variance from the noise standard existing at the time was obtained during permitting. 14% of the complaints were where subsequent noise testing found the projects to be in compliance with their noise standards (45 dBA in each case), and in the remaining 38%, the results of compliance testing has not yet been reported. About 1/3 of all complaints were registered from a single wind farm.

TABLE 1. Number of residences, number of noise complaints, and percent of noise complaints within various distance bands from the closest wind turbines.

	Distance				
	< 1 km	**1 km to 1.6 km**	**1.6 km to 2 km**	**2 km to 3.2 km**	**> 3.2 km**
Number of residences within band	147	497	816	2214	n/a
Official noise complaints within band	8	11	1	6	3
Noise complaints as a percent of residences	5%	2%	0.1%	0.3%	n/a

TABLE 2. Number of residences, number of noise complaints, and percent of noise complaints within various distances from the closest wind turbines. This is similar to Table 1, but the values are cumulative for each successive distance band. The three complaints beyond 3.2 km are not included here.

	Distance			
	< 1 km	**< 1.6 km**	**< 2 km**	**< 3.2 km**
Number of total residences within each distance	147	644	1460	3674
Official noise complaints within each distance	8	19	20	26
Noise complaints as a percent of residences	5%	3%	1%	0.7%

CONCLUSIONS

The findings from this study identified 5% of households registering at least one noise complaint within 1 km (0.6 mi) of wind turbine projects in northern New England. It should be noted that about half of these complaints are located at wind farms that were either found to be in violation of their applicable noise standard or obtained a variance from the noise standard at the time of permitting.

Beyond 1 km, the frequency of complaints drops off quickly, with a rate of 3% for homes between 1 km (0.6 mi) and 1.6 km (1 mi), and 0.2% from 1.6 km (1 mi) to 3.2 km (2 mi).

We recognize that distance from wind turbines is not a reliable indicator of noise exposure. The projects evaluated here range from 3 turbines to 44 turbines, and thus would have remarkably different sound levels as a function of distance along this range. In addition, there are non-acoustic factors that relate to noise annoyance, as well[5] that have not been identified here. The next step in this research is to change the independent variable to modeled sound levels. Combined with a statistical correlation analysis, this would help identify how and whether noise complaints can be characterized as a function of overall modeled sound levels.

ACKNOWLEDGMENTS

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