



**Aulds Mountain Wind Farm
Preliminary Report
Bird and Bat Mortality Study - Autumn 2015**

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**For
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Abstract

Systematic searching of the two turbines at the Aulds Mountain Wind Farm during the autumn season of 2015 yielded no bird or bat carcasses.

Introduction

Aulds Mountain Wind Farm was commissioned in the spring of 2015. It consists of two wind turbines with a combined plate capacity of 4.6 megawatts. It is located about 20 km east of New Glasgow, and 6 km east of Merigomish, in Pictou County, Nova Scotia.

Due to technical difficulties with the wind turbines, the post-construction monitoring did not commence until August 2015. This document reports on the results of the first season of a two-year, multi-season bird and bat mortality study as required by paragraph 2.2 of the conditions of approval (Nova Scotia Department of Environment 2013) and as proposed in the post-construction monitoring plan approved by the Canadian Wildlife Service and the Nova Scotia Department of Natural Resources (Kearney 2014).

Methods

The mortality study at the Aulds Mountain Wind Farm closely follows the protocols established by the Canadian Wildlife Service (Environment Canada 2007) and the methods of analysis that it recommends (Ontario Ministry of Natural Resources 2011). It also adapts a grid searching method proposed by Broders and Burns (2010) for the gravel pads which surround the turbine towers. As this grid system was originally developed for bat carcass searches, it can thus be used simultaneously to search for both bird and bat carcasses.

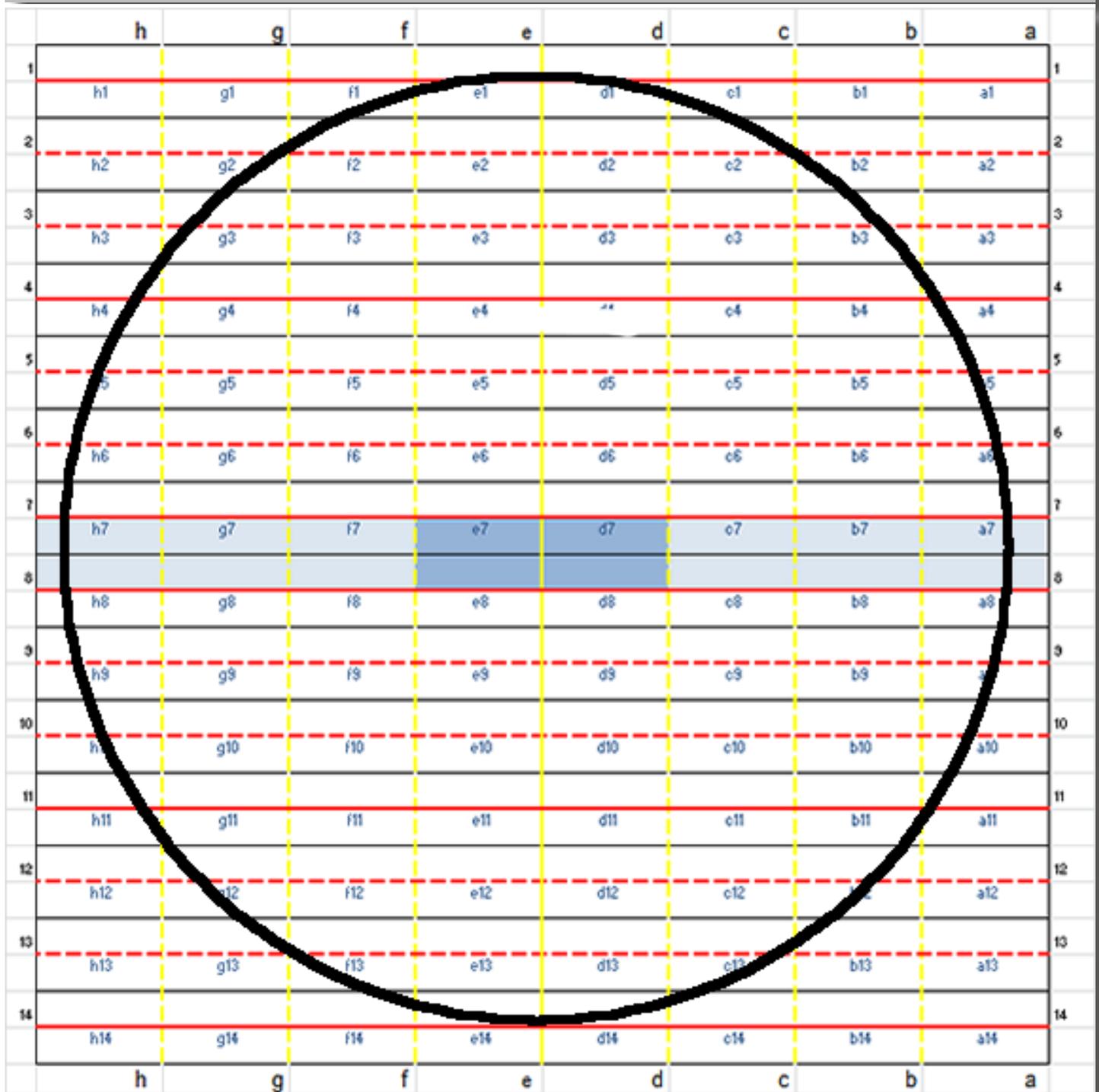
Each grid is a square of 112 meters on each side with the turbine base located in the centre of the grid. The potential search area is 12,544 square meters. The grid is further subdivided in 112 squares that are 8x14 meters, each with a unique grid coordinate, e.g., a1, b2, c3, etc. The layout of a generic grid is shown in Figure 1. The searcher walks through the centre of the grid squares following the red lines shown in Figure 1. Color coded and numbered posts at each end of the grid guide the searcher in following a straight line while looking 4 meters to each side for a bird or bat carcass. Coded and numbered posts to the far left or right of the searcher indicate the "letter" of the grid square. The turbine base is surrounded by squares d7, e7, d8, and e8 as shown in Figure 1. In addition, the road area between 56 meters and 100 meters was also searched.

Carcass searching began with the beginning of autumn migration in mid-August 2015. Searching took place three days a week from August 17 to October 23, 2015.

For any carcass found, the following information would be recorded:

1. The size of the area searched,
2. The date, start and end times of searching,

Figure 1. Generic Grid Design for Carcass Searching with Superimposed 50-meter Radius Circle



3. The time a carcass was found,
4. The state of decomposition,
5. The extent and type of injury sustained,
6. The species, sex, and age (where possible) of the specimen,
7. The grid and GPS coordinates of where the specimen was found, and
8. The substrate where it was found.

For the safe handling of birds and bats, and particularly bats, the guidelines of the Ontario

Ministry of Health and Long-Term Care were followed (Ontario Ministry of Health and Long-Term Care 2010). These procedures are illustrated in the video of the U.S. Fish and Wildlife Service (2009).

Scavenger trials and searcher trials were conducted following the guidelines of the Canadian Wildlife Service (Environment Canada 2007). Culled farm quail and brown mice were the specimens used for the scavenger trials. Carcasses were laid out in the search areas late in the day on turbine pads that were to be searched the next day. Carcasses persisting until the morning of the next day were recorded and left on the pad for up to two weeks. The presence or absence of the carcass was noted each time the pad was searched. Scavenger trials were evenly distributed over the project site.

Searcher trials were also conducted during the season. Test carcasses were randomly placed on the pad the evening before the test and then checked again as soon as possible after the search in order to determine if those carcasses which were not found were still there or had been scavenged during the night. Brown mice (resembling a bat carcass) and culled farm quail were used for the searcher testing. Carcasses for searcher trials were evenly distributed over the project site and proportionately distributed on substrate types according to the abundance of that substrate on the pads.

Estimated mortality is calculated by using the formula recommended by the Canadian Wildlife Service (Ontario Ministry of Natural Resources 2011):

$$C = c / (Se * Sc * Ps) \text{ where}$$

C=the corrected number of bird mortalities, c=the number of carcasses found, Se=proportion of carcasses expected to be found by searchers (searcher efficiency), Sc=proportion of carcasses not removed by scavengers over the search period, and Ps=percent of area searched within a 50 meter radius of the turbines.

Correction factors for time of year and distances beyond 50 meters are derived from Zimmerling et al. (2013).

Results

Search Area

Due to the configuration of each turbine pad relative to the physical characteristics of the surrounding areas, the search grid usually cannot fit completely on each pad. At the Aulds Mountain Wind Farm, this problem is particularly acute, especially at Turbine 1. Rock outcroppings and steep drop-offs limit the amount of search area.

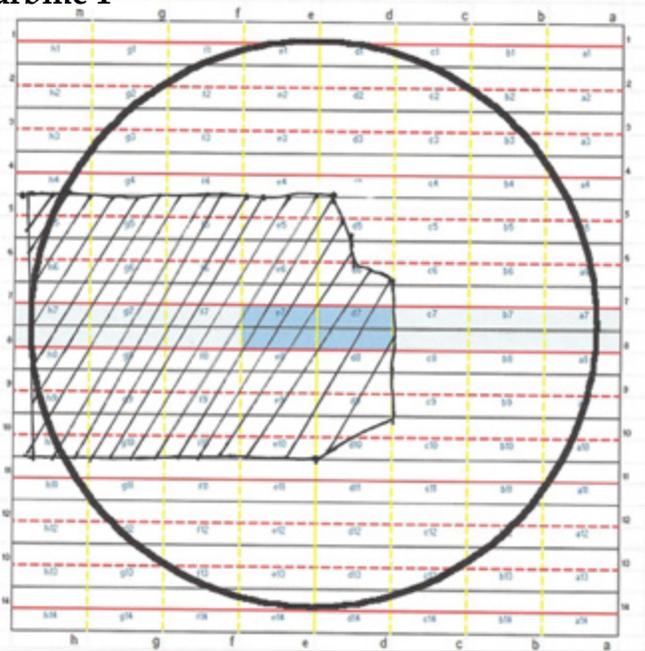
In addition to pad searching, between 880 to 1,000 m² were searched on the access roads leading to the grids.

Following the recommended guidelines of the Canadian Wildlife Service (Ontario Ministry of Natural Resources 2011), it is also necessary to calculate the mortality within a 50-meter radius

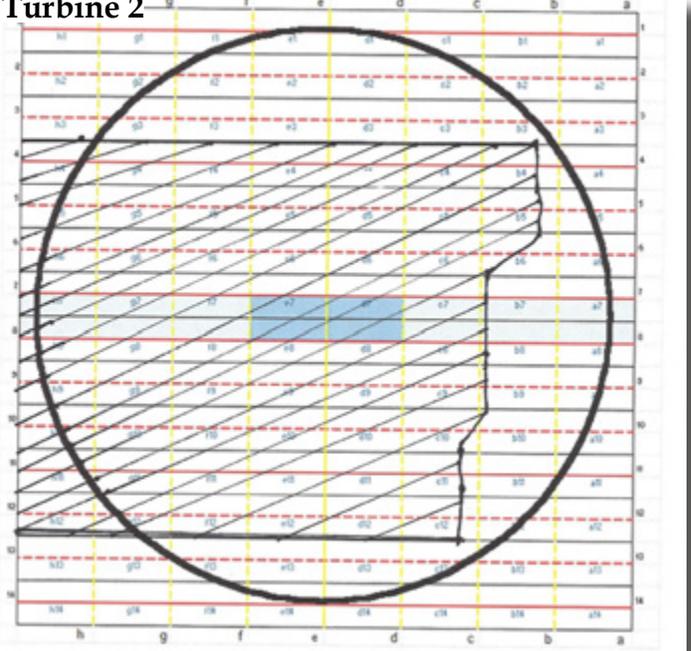
circle. A circle of this size is superimposed on the a generic grid as seen in Figure 1. Figure 2 shows the actual search area available (striped portion) relative the total search area for a 112 square meter grid and 50-meter radius circle. For both turbines, the available search area is well below the desired amount.

Figure 2. Available Search Areas (Striped Portion) Compared to Total Area of 112 m² Square and 50-m Radius Circle

Turbine 1



Turbine 2



Scavenger Efficiency

Scavenger efficiency (S_c) is the proportion of carcasses not removed by scavengers during a search period. It is calculated with the following formula (Ontario Ministry of Natural Resources 2011):

$S_c = \frac{n_{visit1} + n_{visit2} + n_{visit3}}{n_{visit0} + n_{visit1} + n_{visit2}}$ where:

S_c is the proportion of carcasses not removed by scavengers over the search period, n_{visit0} is the total number of carcasses placed, and $n_{visit1} - n_{visit3} \dots$ are the numbers of carcasses remaining on visits 1 through 3.

Four quail carcasses and one mouse carcass were placed on a variety of substrates on the turbine pads. The percentage of carcasses not removed by scavenger was 96.30%, indicating a minimal presence of scavengers on the site.

Searcher Efficiency

Searcher efficiency is the number of test carcasses found by a searcher that were not first removed by a scavenger. At the Aulds Mountain Wind Farm, one carcass searcher was employed for the entire autumn season. The searcher was tested five times with a searcher efficiency rate of 60.00%.

Observed Mortality

Observed mortality (c) is the number of carcasses found during the carcass searches. No bird or bat carcasses were found at either turbine pad or on the access roads during the autumn of 2015.

Corrected Mortality Estimates

Since no bird or bat carcasses were found, the formulas for the corrected mortality estimates are all zero birds and bats per turbine per year.

Discussion

The average corrected estimate of bird mortality across Canada is 8.2 per turbine per year plus or minus 1.4 at the 95% confidence level (Zimmerling et al. 2013). There are no known studies of average mortalities of bats in Canada. The zero mortality of birds and bats at Aulds Mountain certainly indicates that mortality levels are well within acceptable limits. However, the very small search areas raise concern about the level of confidence that can be placed in these results. An effort should be made to find ways to increase the search areas for next stages of this study.

Literature Cited

- Broders, H.G., and L.E. Burns, 2010, Bat Species Composition and Activity at the Maryvale Wind Project, Antigonish County, Nova Scotia, Halifax, Submitted to Fulton Energy Research, 26 pp.
- Environment Canada, Canadian Wildlife Service, 2007, Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds, 33 pp.
- Kearney, John. 2014. "Post-Construction Monitoring Plan for Birds and Bats: Aulds Mountain Wind Farm." For Natural Forces Wind Inc., John F. Kearney & Associates, 9 p.
- Nova Scotia Department of Environment. 2013. "Environmental Assessment Approval: Aulds Mountain Wind Farm." Proponent: Natural Forces Wind Inc., 6 p.
- Ontario Ministry of Health and Long-Term Care. *White Nose Syndrome in Bats* 2010. Available from <http://www.health.gov.on.ca/en/public/publications/pubhealth/whitenose.aspx>.
- Ontario Ministry of Natural Resources, 2011, Birds and Bird Habitats: Guidelines for Wind Power Projects, 32 p.
- United States Fish and Wildlife Service. *How to Properly Dispose of a Dead Bat* 2009. Available from http://www.youtube.com/watch?v=DwysePQG0Sg&playnext_from=TL&videos=A8J3x5.
- Zimmerling, J. Ryan, Andrea C. Pomeroy, Marc V. d'Entremont, and Charles M. Francis. 2013. "Canadian Estimate of Bird Mortality Due to Collisions and Direct Habitat Loss Associated with Wind Turbine Developments." *Avian Conservation and Ecology* no. 8 (2). doi: 10.5751/ace-00609-080210

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