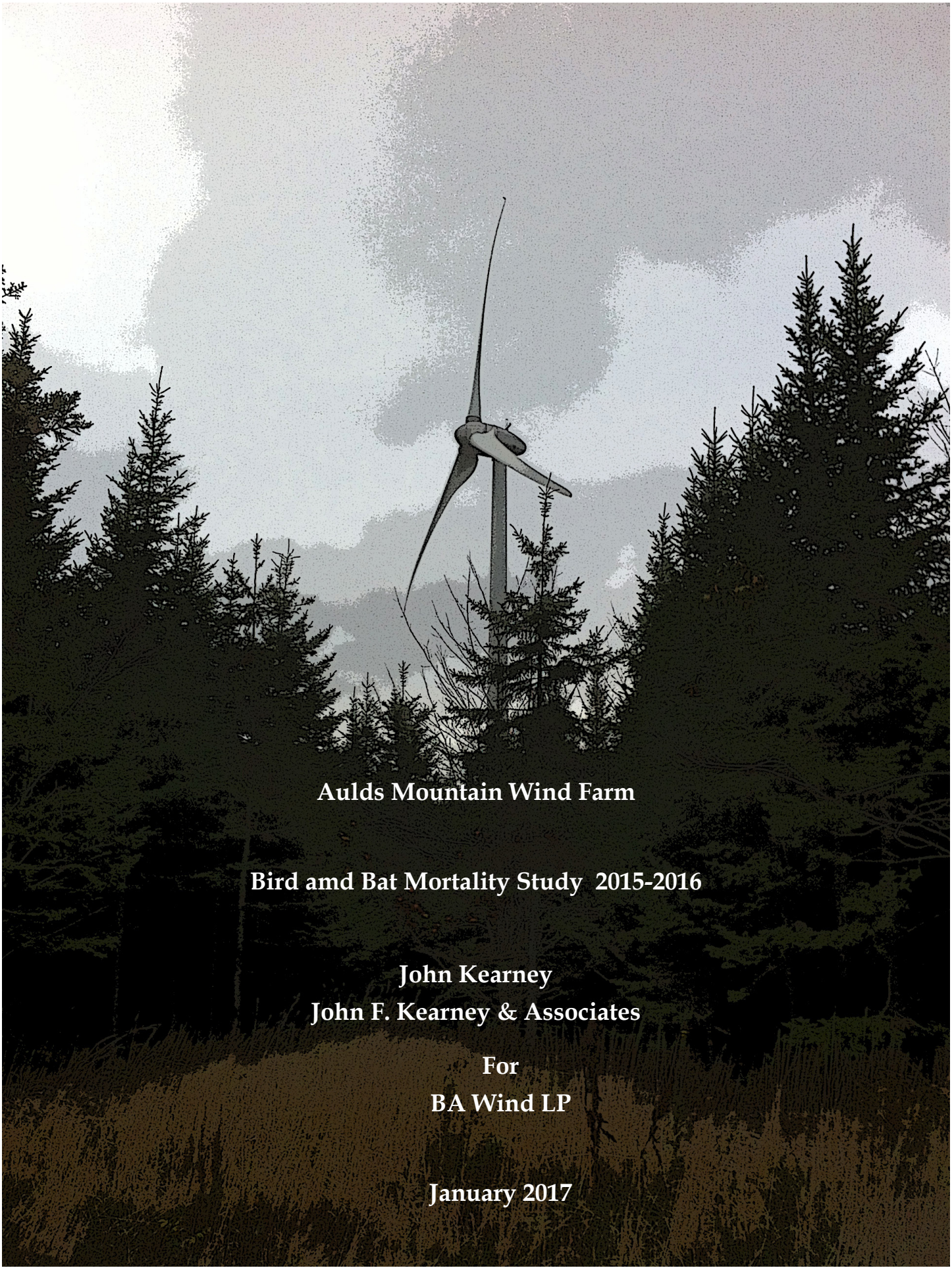

Aulds Mountain Wind Farm

Bird amd Bat Mortality Study 2015-2016

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For
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January 2017

Abstract

Systematic searching of the two turbines at the Aulds Mountain Wind Farm during the autumn season of 2015 and the spring, summer, and autumn seasons of 2016 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 kilometers east of New Glasgow, and 6 kilometers 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 four of six seasons of a two-year, 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).

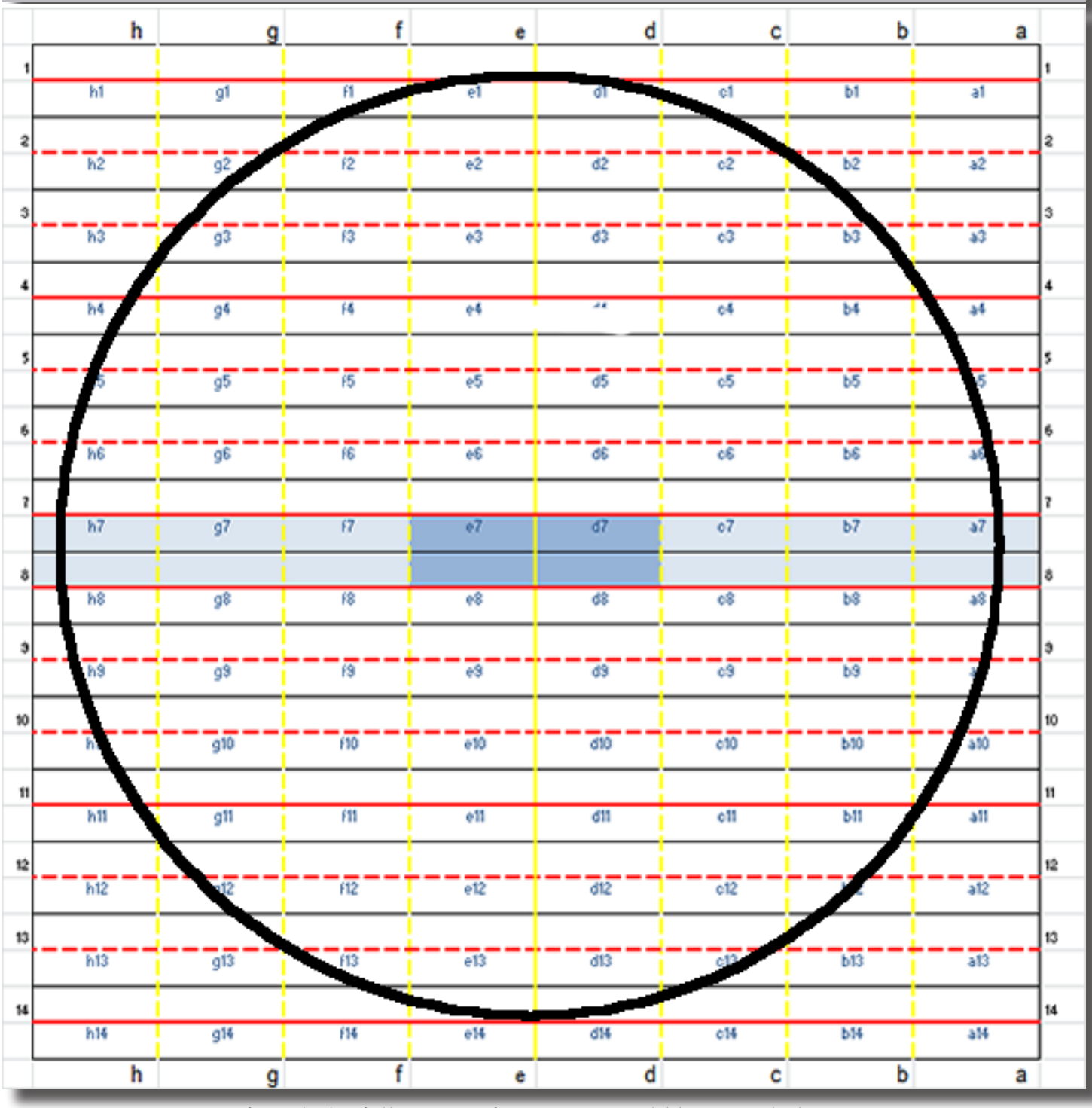
Methods

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 during the autumn migration of 2016, from 17 August to 30 October. Searching resumed in 2017, from 1 April to 30 October. Searching took place three days a week during the spring (1 April-7 June) and autumn migration (15 August-30 October) seasons, and one day a week during the breeding season (8 June-14 August).

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



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,
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 on a periodic basis. 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) 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 the five months when searching is not conducted (0.94) and for birds falling beyond 50 meters (0.48) (see below) were derived from Zimmerling et al. (2013).

Results

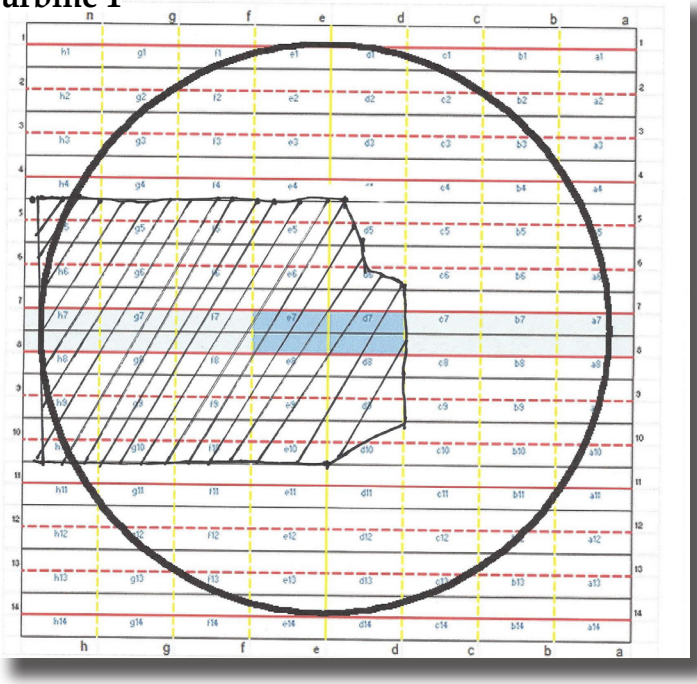
Search Area

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.

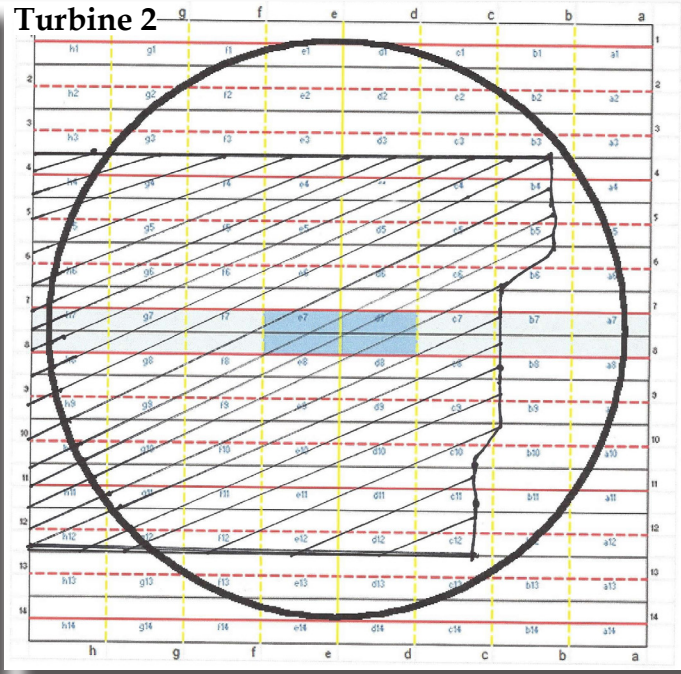
Following the recommended guidelines of the Canadian Wildlife Service (Ontario Ministry of Natural Resources 2011), it is necessary to calculate the mortality within a 50-meter radius circle. A circle of this size is superimposed on the generic grid as seen in Figure 1. Figure 2 shows the actual search area available (black striped portion) relative to 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

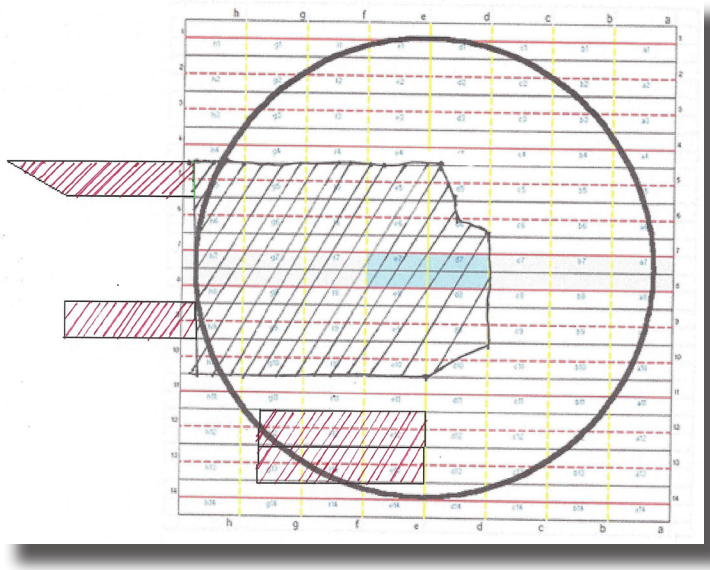
Turbine 1



Turbine 2



Turbine 1 Expanded Search Grid



In April of 2016, the search area at Turbine 1 was expanded by 1904 square meters (red striped portion in lower pane of Figure 2). Unfortunately, much of this off-the-pad search area was covered in grasses by mid-summer. In total the search area for Turbine 1 was 2824 square meters in 2015 and 4128 square meters in 2016. For Turbine 2, the total search area was 7024 in 2015 and 2016. Both turbines had from 880 to 1000 square meters of search area on the roadway leading to the pad.

Carcass searching was carried out as scheduled in the autumn of 2015 and the breeding season of 2016. Two days of scheduled searching were missed in the spring of 2016 and four days in the autumn of 2016 due to poor weather conditions, ice on turbine blades, or searcher scheduling conflicts.

Scavenger Efficiency

Scavenger efficiency (Sc) 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):

Sc = nvisit1 + nvisit2 + nvisit3/nvisit0 + nvisit1 + nvisit2 where:
Sc is the proportion of carcasses not removed by scavengers over the search period, nvisit0 is the total number of carcasses placed, and nvisit1 – nvisit3… are the numbers of carcasses remaining on visits 1 through 3.

Fourteen quail carcasses and one mouse carcass were placed on a variety of substrates on the turbine pads in 2015-2016. Each night that at least one carcass was left on the pad is considered a trial. During three migration seasons, there were 20 trials. Table 1 shows the results of the scavenger efficiency trials at Aulds Mountain in 2015 and 2016 combined. The percentage of carcasses not removed by scavengers in all seasons combined was 80.60%

Table 1: Proportion of Carcasses Not Removed by Scavengers (Sc) in 2015-2016

Season	Carcasses	Trials	Proportion Not Removed
Autumn 2015	5	6	96.30%
Spring 2016	5	3	46.70%
Autumn 2016	5	11	84.00%
Combined	15	20	80.60%

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 each season. Searchers were tested fifteen 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 2015 and 2016.

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). One study (Bird Studies Canada et

al. 2016) reports that the corrected estimated mortality for bats found with 50-meters of a turbine in Atlantic Canada is 0.26 per turbine per year plus or minus 0.11 at the 95% confidence level. The zero mortality of birds and bats at Aulds Mountain certainly indicates that mortality levels are well within acceptable limits. The loss of six searching days during the migration seasons of 2016, a 60% searcher efficiency over the two years, and the small search area at Turbine 1 leave some uncertainly about the true mortality rate.

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Acknowledgements

The author wishes to acknowledge the contributions of Lisa Fulton, Alexandra Rivers, Will Rhynold, Darren Albert, Chris Veinot, and Andy MacCallum to the completion of this study.

The cover photo and all graphics are by John Kearney.