Bird Monitoring Program
to Assess
Impacts of Wind Turbines on Birds at Ramea, Newfoundland

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NOTE: The following bird monitoring program has been modeled on a protocol previously developed by Bird Studies Canada (Kingsley and Whittam, Bird Studies Canada, 2001for Bird Mortality Monitoring Protocol for the Wind Power Facility at North Cape, Prince Edward Island) to evaluate the impact on birds, of a wind generating station located at North Cape, Prince Edward Island. North Cape is in a marine environment at the same latitude as Ramea, Newfoundland. The complete Bird Studies Canada report can be downloaded from www.bsc-eoc.org/peiwind.html

1 INTRODUCTION

The goal of the monitoring program is to determine the effects of six wind turbines erected at Ramea Newfoundland, on birds breeding, staging or migrating in the area. Currently, little is known about the type and abundance of birds using this site, factors that should be determined in order to examine any effect of the wind turbines. The protocol is standardized so that results can be compared among potential and existing wind power facilities elsewhere in Canada or North America. The project will be conducted by Frontier Power Systems staff or their representatives, located on Ramea. Most of these staff members are not trained in bird identification but they will be equipped with identification manuals and digital cameras to record findings. It is desirable that a trained individual be used to conduct these studies but due to the remoteness of the island and the small scale of the project, costs of such an approach are prohibitive. Frontier plans to use the services of a local birder, Richard Northcott, who has been studying the migration patterns of birds through the Ramea Islands for many years, during the high traffic periods of migrations. Through the remaining months, staff from Frontier Power Systems should be able to fulfill the basic protocol.

The number and species of birds at Ramea will vary seasonally, within a season, and according to weather conditions and other environmental factors. For this reason, it is planned to attempt to monitor the site at all times of year, for two years. Most wind test sites are monitored every two weeks (Anderson et al. 1999), when bird activity is high. This is a reasonable interval for Ramea as well, during migration periods, given the small number of turbines involved. When birds activity is substantially reduced, such as in the winter months, once per month should be adequate.

The objectives of this study are as follows:
1. Determine bird utilization rate (# birds observed per unit time and/or area) within the wind plant and at a control site located at some distance from the turbines;

2. Determine bird mortality rate (# carcasses found per unit area) at these same points;

3. Using the above two variables, calculate bird risk (mortality/utilization) at each point;

4. Compare bird risk at turbines and controls;

5. Identify annual periods of high and low risk;

6. Determine the influence of weather on passage rate and mortality risk.

2 METHODOLOGY

The six turbines are located in close proximity with less than 300 meters separating all the turbines. Four of the turbines will be installed on rocky terrain and two of the turbines will be located adjacent to a pathway in a shallow bog area (Plant specialists have been contacted and no unusual or rare plants are present in the area). The wind plant will be compared to a local control area, of identical size to the wind plant, several hundred meters to the east in an area with similar terrain as the wind plant (see figure 1). Generally, control areas are selected at random directions from the wind plant. However due to the constraints of the terrain, and the need to evaluate the bird activity in similar habitat, the control area has been specified.

Each of the six turbines should be considered a single survey point. Each turbine should also be compared with a control point. These control points will be spaced at distances comparable to the turbines. Control points will be flagged and geo-referenced with a GPS and on an aerial photo. This paired design should allow comparison of bird utilization and mortality rates immediately surrounding the turbines and 250 m from the turbines. Note that 250 m may be suitable to determine impacts on small birds like songbirds, but may not be suitable for birds like raptors that range large distances. This should not be a problem since raptors are rare in Ramea.

Both the control and wind turbine areas will be surveyed once a month during non-migratory periods and every week during migration periods (from April 1 – October 31). Surveys will begin at first light, so that carcasses are more likely to be found before they are scavenged. The points will be visited randomly, although each turbine point and its associated control point should be visited successively (e.g. turbine 6, control 6, turbine 1, control 1, etc.). Additional counts may be conducted following large fog events (i.e. 24 hours or more of fog) during migration seasons.

At each point, the observer will record the location, along with the date, start time and weather (temperature, visibility, wind speed and direction, precipitation). After these data have been recorded, a 5-minute point count will be conducted wherein all birds that are near (e.g. within 50 m of) the turbine (or, for control points, within 50 m of the center of the point) should be recorded. For each bird, the following variables should be recorded (from Morrison 1998):

1. Species (if known). If not known, each bird seen should simply be recorded by number.

2. Behaviour (flying, perching, soaring, walking, etc).

3. If flying or soaring, the zone of passage.

If the lattice structure is to be used, any nesting activity on the structure should be noted and species identified.

Four suggested zones (from Morrison 1998) are:
a) within the blade sphere;
b) close to the blades including passes along the edge of the rotation zone;
c) not in the blade sphere but below the bottom tip of the blade; or
d) out of and well above the top of the blade. If at a control point, the bird's location should be recorded in reference to the heights associated with the above zones (e.g. zone d = greater than 75 m high).

Once all 12 points have been surveyed for bird activity (this should take several hours), the points will be revisited and an area of 50m radius around each turbine (or the centre of each control point) should be searched for carcasses. It is important that these searches occur on the same day as the point counts. It is possible to have two different observers conducting the point counts and the carcass counts, so long as they are not at the same point at the same time (to avoid disrupting the point counts). The carcass searches will take longer to complete than the point counts, as all tall grass clumps, shrubs and openings to animal burrows should be searched thoroughly (Morrison 1998). If the carcasses cannot be identified, they will be photographed for future identification. Each carcass should be removed from the search zone after photographing or identification to avoid re-finding it on a later search.

For each carcass found, the observer will record its identity (to species if possible), the condition of the carcass, the estimated time of death (or time since death), the probable cause of death, and justification for why this cause was chosen. The distance and direction from the base of the turbine (or the center of the control point) will be noted and referenced on an aerial photo.

Most carcasses are scavenged within about five days of dying (Kostecke et al. 2001), so clearly not all birds killed at the turbines will be found by this method. (Note: This may not be the case in a location like Ramea where scavengers are somewhat limited). At a study of bird mortality at a TV tower in Florida, an average of 2,248 dead birds were found per year when scavenger control was applied, compared with only 642 carcasses per year when no scavenger control was applied (Crawford and Engstrom 2001). A separate study to determine carcass persistence rates on Ramea may also be conducted at some point in the year (see Anderson et al. 1999) if it is determined there is a need (i.e., if a significant number of carcasses are found).

Observers may discover live birds that have been injured due to potential turbine collisions. These birds will either be captured and examined to determine the cause of injuries (again, permits are required), or the physical abnormalities should be described on the data forms (Anderson et al. 1999). Injured birds should be carefully described on the data form so that it will be recognized if later found dead. Sample data forms are included as Appendix I.

3 ANALYSES

The bird utilization rate (# birds observed/unit time) and bird mortality rate (# dead birds/point) can be calculated for each turbine and control point. Utilization rate can also be calculated separately for each passage zone (a-d). An index of risk can then be calculated as the ratio of mortality to utilization. This ratio can be compared for turbine and control sites, to see if the area immediately around turbines is considered to be more dangerous than the area at some distance from the turbines. Habitat differences between turbine and control points are usually taken into account (by measuring standard habitat variables at each point) but because the habitat is very similar between the wind plant and the control area, it is felt there will be little difference. This ratio can also be compared across the season to determine if risk is higher during the migration, breeding, or wintering seasons, and across various weather conditions to determine if risk is higher during periods of low visibility.

Of particular interest at Ramea will be whether or not the turbines impact waterbirds, especially the sensitive (albeit rare) Harlequin Duck and on Leach's Storm-petrol, which has been noted to be nocturnal and to have an erratic flight pattern. Because all turbine are located along the shore line it will not be possible to differentiate shore bird activity from those birds which are more active inland.

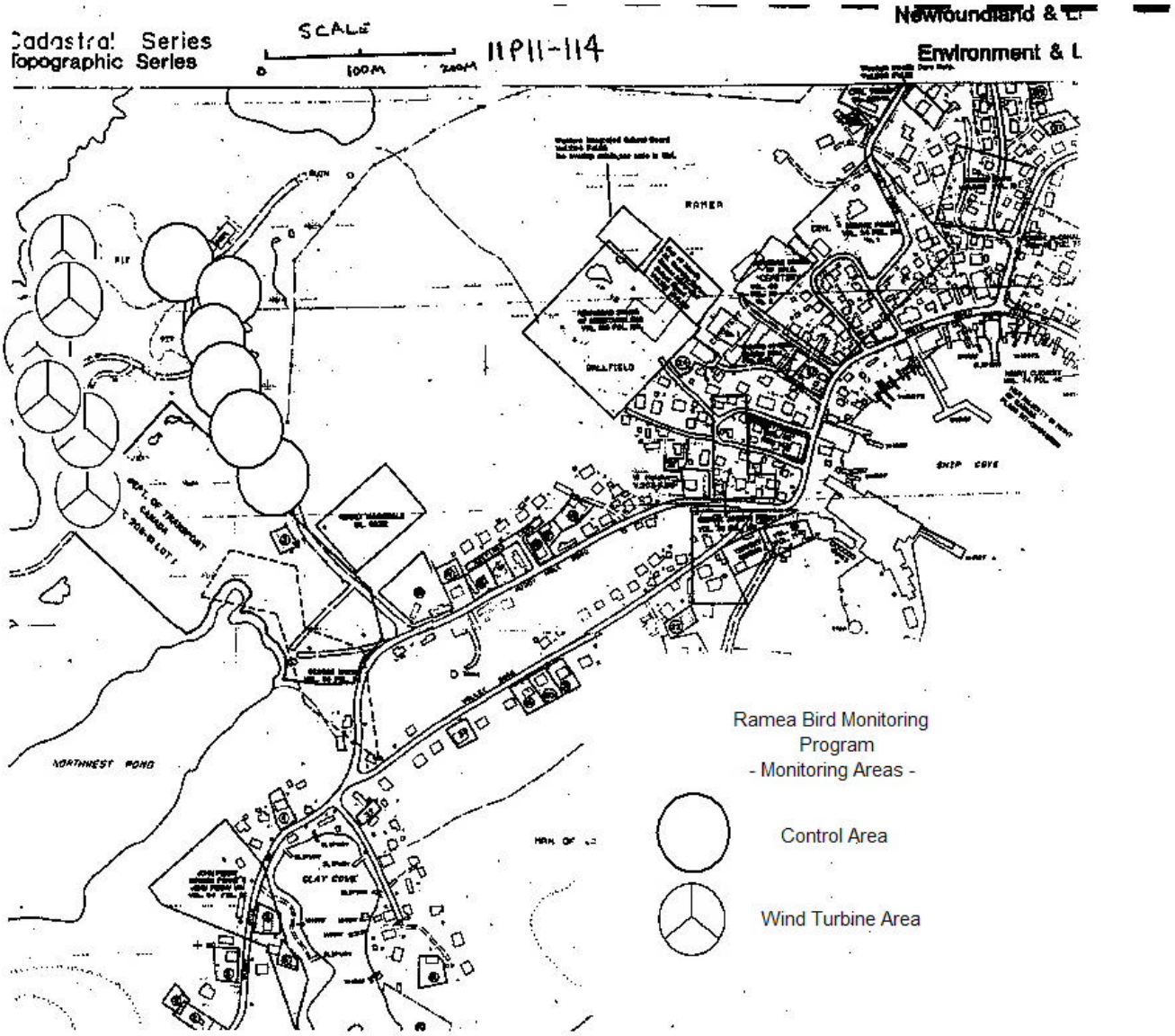
The documents, "Avian Risk and Fatality Protocol" by Morrison (1998) and "Studying wind energy/bird interactions: a guidance document" by Anderson et al. (1999) will be referenced when finalizing the bird mortality protocol.

4 EVALUATION AND REVISION

Canadian Wildlife Service and the provincial Wildlife Division will be provided with the opportunity to review and provide comment on any proposed revisions to the program.

5 REPORTING

A report of the monitoring program, together with any recommended changes, will be completed annually and provided to the Minister of Environment for information purposes. Following completion of the monitoring program, a final report, including an effects analysis, will be produced and provided to the Minister of Environment.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CLAY COVE
Ramea Bird Monitoring Program
- Monitoring Areas -
Control Area
Wind Turbine Area

Figure 1

Figure 1

APPENDIX I

SAMPLE DATA FORM

Date: _____ Start time: _____ Point Number:_____ Turbine Control Observer: _____

Temperature: _____°C Visibility: low medium high Wind speed: _____ Wind direction: _____

Precipitation: none rain snow fog

A. POINT COUNT

Bird Species (if known)	First minute	Second minute	Third minute	Fourth minute	Fifth minute
BCCH	F, d				
YRWA	P	P	P	F, b	

For each minute, record behaviour (F = flying, P = perching, W = walking) and, if flying, zone (a, b, c or d).
In the example above, a black-capped chickadee was observed flying past the turbine at zone d (above the blades) in the first minute, and a yellow rumped warbler was observed perching for the first three minutes, then in the fourth minute it flew past the turbine in zone b.

B. CARCASS SEARCH

Bird species (if known)	Identification procedure	Location relative to turbine	Carcass condition	Estimated time of death	Probable cause of death	Justification of cause, additional comments

The identification procedure should be recorded as Observer ID, Collected, or Photographed. The distance and direction of the carcass from the turbine should be noted and georeferenced if possible. Carcass condition should be recorded as whole, scavenged, skeleton, or other (describe in comments section). Cause of death should be noted as turbine strike, shooting, poisoning, or unknown.