

Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick

**Fish and Wildlife
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(Note: This guideline is adapted from guidelines of other Canadian jurisdictions specifically but not limited to Ontario and Quebec. This guideline is also to be used for birds under the management responsibility of NBDNR)

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1.0 Introduction

This document is to be used as a guideline for developing protocols for post-construction monitoring at wind power facilities for Bats and Birds under the management responsibility of the New Brunswick Department of Natural Resources (NBDNR). NBDNR is exercising a precautionary principle within an adaptive management approach to potential negative impacts to bats and birds from wind power facilities.

Wind power projects have the potential to affect bats and birds directly (e.g., mortality) and indirectly (e.g., disturbance and avoidance). Mortality has been documented at wind power facilities in a variety of habitats across North America. In recent years, there has been elevated concern about bat mortality in particular at wind power facilities because:

- a) Post-construction monitoring and research study results across North America suggest that bats may be more vulnerable to wind turbine mortality than birds,
- b) Bats are a long-lived species with low reproductive rates, which tend to make such populations particularly vulnerable to additional mortality,
- c) There is relatively little scientific information or knowledge about bat populations, long-term population trends and migration routes.
- d) The advent of White-nose Syndrome, a fungal pathogen present in north eastern North America that causes high bat mortality, is expected to place bat populations under unprecedented stress

This guideline is based on the best available information from other jurisdictions on bat and bird interactions with wind power facilities. NBDNR welcomes feedback on these guidelines, including comments from users and information on the latest scientific and technical discoveries from research, industry experience, and practices in other jurisdictions.

Proponents are required to prepare a Post-construction Monitoring Plan for review by the Director of Fish and Wildlife Branch NBDNR prior to their implementation. Information collected throughout the Post-construction Monitoring Plan will be used to inform and direct mitigation when necessary. Post-construction monitoring is to begin with the commencement of operation of the wind power facility. If the facility is constructed in phases, monitoring for each phase is to coincide with the beginning of operation of that phase. Post-construction monitoring should run for a minimum of two years. NBDNR has the option to extend the post-construction monitoring period for operators depending on survey results.

Proponents are required to obtain a 'Scientific Permit' from the Fish and Wildlife Branch NBDNR for bat and bird Mortality Surveys (Address found in Appendix A). All searchers should ensure they have updated rabies pre-exposure vaccinations (contact local health unit for details).

Environment Canada – Canadian Wildlife Service (2007) may be consulted for additional guidance in post-construction monitoring for birds under their jurisdiction and to ensure coordination for migratory bird monitoring.

2.0 Mortality Surveys

Mortality surveys are to identify the number of bats killed per turbine over a known period of time (expressed as bats/turbine/time). This value represents a minimum estimate of bat mortality and is adjusted for bat carcass removal rates (i.e., how quickly a bat carcass will decay and/or be removed by a scavenger) and searcher efficiency (i.e., number of bat fatalities present that are actually detected by the surveyor).

To estimate the number of bats killed at operating wind farms, three techniques must be employed:

- **Standardized Search:** number of carcasses found around the specific turbines during peak activity periods for bats.
- **Carcass Removal Trials:** monitoring of bat carcasses removed by scavengers to estimate the length of time that carcasses remain in the field for possible detection.
- **Searcher Efficiency Trials:** percentage of carcasses found by searchers in the varying habitats throughout the wind farm facility.

2.1 Standardized Search:

2.1.1 Monitoring Effort (turbines, days, season, carcasses)

Bat mortality surveys should occur at all turbines at small wind power developments (i.e. < 10 turbines). For larger sites, a sub-sample of turbines is to be selected to cover representative habitats and spatial extent of the development area, with a minimum of 1/3 the turbines on site being sampled.

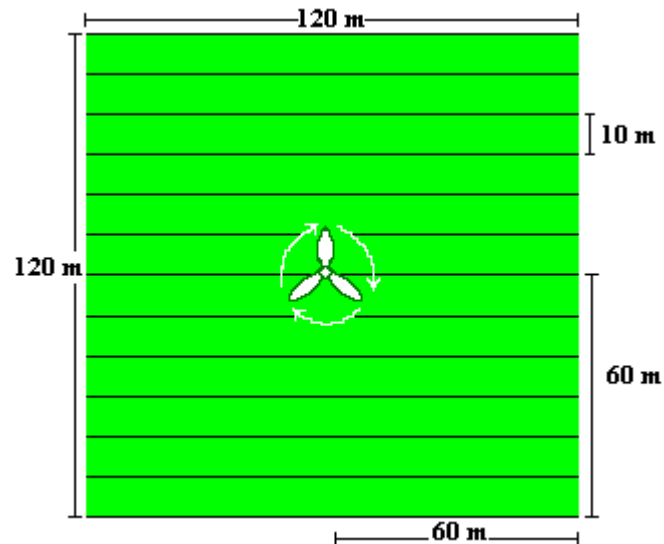
Project Size (# of Turbines)	Turbine Sub-sample (%)
≤ 10 Turbines	100%
11-20 Turbines	10
21-40 Turbines	10 or 1/3 whichever is greater
≥41 Turbines	1/3

Date	Effort	Period
Spring migration	Every 3 -7 days	March 31 st - May 31 st
Summer bird nesting and bat pup-rearing	Every 3 -7 days	June 1 st – July 31 st
Fall Bird and bat migration	Every 3 days	Aug 1 st – Oct 31 st

2.1.2 Transect Size, and Spacing

Search effort must be centered on the turbine and cover an area at least of $\frac{1}{2}$ the maximum turbine height, (e.g. if the turbines are 120m from the tip of the turbine blade to the ground, 60m should be covered in all directions). If the cleared area around the base of the turbine is less than ($<$) $\frac{1}{2}$ the maximum turbine height, then the total area around the base of the turbine should be searched. Searches should be symmetrical around the turbine using linear transects equally spaced, that are less than or equal to (\leq) 10m in separation for search efficiency (Figure 1).

Figure 1. Mortality search pattern for a 120m turbine



Parallel transects should be walked at an approximate pace of 30-40 meters / minute or 1.8 -2.4 km/hr while searching 5 m on either side for carcasses, or evidence of scavenged carcasses.

2.1.3 Data Requirement

All carcasses, or evidence of carcasses, should be photographed in the position found, geo-referenced using a hand-held GPS, collected and data recorded on an appropriate mortality search datasheet. All carcasses should be collected in plastic bags, labeled, and frozen **to be sent to NB Museum for species authentication and retention** (Address found in Appendix A).

For each carcass found, recorded data should include:

- Project Name and Location,
- A unique carcass identification number,
- Turbine/met tower or reference plot number,
- Observer,
- Date and time collected,
- Species,
- Sex,
- Age class,
- Habitat type surrounding the turbine location,
- Distance to and identity of other nearby structures (i.e. fence, power-line, substation),
- Distance from observer at time of detection,
- Carcass condition and any comments indicating the suspected cause of mortality.

Depending on the results from pre-construction surveys and on the first year of post-construction surveys, post-construction protocol may be adjusted for the subsequent years if deemed necessary.

2.2 Carcass Removal Trials

Carcass scavenging rates must be determined through carcass removal trials. The objective of these trials is to estimate the percentage of bat and/or bird fatalities that are scavenged from study areas. Estimates of carcass removal rates will be used to adjust the number of carcasses found during surveys to correct for removal bias.

Carcass removal trials are to be conducted in each search season (spring, summer, and fall), and by distinct habitat type spatially distributed across the wind farm. Trials should take place during the bat mortality survey period as carcass removal rates may vary considerably from site to site as well as seasonally. Each trial should use a minimum of 20 carcasses distributed across the range of different habitats types present. In order to avoid confusion with mortality surveys, trials should not overlap with bat mortality survey search areas. Carcasses should be placed before daylight using gloves to avoid scents that might bias trial results (i.e., attract scavengers, etc.). Trials should continue until all the carcasses are removed or until the end of the carcass removal trial period. To avoid confusion with turbine-related fatalities, trial carcasses should be discreetly marked (e.g., tape on back or abdomen, black-light marker, etc.) with a unique identification number.

If possible, bat carcasses should be used for carcass removal trials. If it is not possible to obtain bat carcasses, trials may use other small mammal (e.g., mouse, vole, etc.) or small brown bird carcasses. If frozen carcasses are used, they should be thawed prior to beginning Carcass Removal Trials. A collection permit to trap small mammals from the area for carcass removal trials can be obtained from the Fish and Wildlife Branch of the New Brunswick Department of Natural Resources (Address found in Appendix A).

2.3 Searcher Efficiency Trials

Searcher efficiency is another important factor in creating an accurate estimate of total bat mortality. Searcher efficiency trials are to be conducted as part of post-construction monitoring at all habitat types and during all survey seasons.

Searcher efficiency trials require a known number of discreetly marked carcasses to be planted around a wind turbine. Searchers examine the wind turbine area, and the number of carcasses detected is compared to the number of carcasses placed in the field.

Searcher efficiency trials should be conducted in each search season (spring, summer, and fall), and distinct habitat types, spatially distributed across the wind farm, during the same period as the bat mortality surveys to determine seasonal, and habitat specific search efficiency. Trials should be conducted for each individual searcher or search team which should not be notified when the trial is taking place (i.e., when trial carcasses are present) to avoid potential search biases. At least 20 trial carcasses discreetly marked with a unique identification number should be used for each searcher, which can be spread out over the trial period and conducted with the bat mortality surveys.

Trial carcasses should be randomly placed within the search area and their location recorded for retrieval if they are not found during the trial. Seasonality should be considered when designing searcher efficiency trials to account for potentially different scavenging rates, species, and rates of decomposition.

If possible, bat carcasses should be used for carcass removal trials. If it is not possible to obtain bat carcasses, trials may use other small mammal (e.g., mouse, vole, etc.) or small brown bird carcasses. If frozen carcasses are used, they should be thawed prior to beginning Carcass Removal Trials. A collection permit to trap small mammals from the area for carcass removal trials can be obtained from the Fish and Wildlife Branch of the New Brunswick Department of Natural Resources (Address found in Appendix A).

3.0 Reporting Requirements

Proponents will be required to submit Post-construction Monitoring Reports (including results and analysis) annually to the Director of Fish and Wildlife Branch NB DNR. Where there are requirements for other environmental effects data collection and monitoring, bat survey and monitoring reports may be submitted as part of a coordinated report. This will ensure joint requirements associated with federal and provincial Environmental Assessments and other environmental approvals are satisfied efficiently. If the proponent considers this material to be proprietary, this should be indicated in the report. Reports should include descriptions of field protocols and sampling methods. Raw data should be included in the report as Appendices, and methods for data analysis should be apparent.

4.0 Post-construction Mitigation

Post-construction mitigation may be necessary if a wind power facility is found to be causing significant bat mortality during the Post-construction Monitoring. Significant bat mortality is considered to be unexpected or unanticipated increased levels of mortality in comparison to other bat mortality surveys throughout North America. The best professional judgment may also be used to inform decision-making around what constitutes significant bat mortality in some circumstances, given the general lack of population level information.

Post-construction mitigation may include selective operational shut-down of turbines during periods of high bat activity/concentrations (e.g., swarming, late summer/fall migration) or under certain weather conditions (e.g., during periods of low wind when power generation is low and bat activity levels are high) when mortality cannot be mitigated by other means (e.g., possibility of emerging bat aversion technologies or other innovative measures). Monitoring the effectiveness of any post-construction mitigation techniques will be necessary to evaluate the level of success.

Further monitoring and activity/movement studies may be required if post-construction mitigation proves to be ineffective in mitigating unexpected or unanticipated levels of mortality. This additional monitoring will be used in order to help determine the reason for these impacts and further options to mitigate negative impacts.

5.0 Other Considerations

- Post-construction Monitoring (including mortality surveys, carcass removal trials, and searcher efficiency trials) can be combined with the required post-construction bird mortality studies provided the considerations described in this guideline are given to bats. See Environment Canada – Canadian Wildlife Service (2007) for further details pertaining to bird mortality studies.
- Searchers or workers may discover bat carcasses incidental to formal searches. If these carcasses are found outside a scheduled search area they should be processed using the above protocol (e.g. collected, recorded, etc.), and fatality data should be included with the calculation of fatality rates. If an incidental discovered carcass is found within a search plot area, they should be photographed and their location recorded but left for the designated search team to maintain integrity of search efficiency and carcass removal rates.

6.0 References

Environment Canada 2007. Wind Turbines and Birds A Guidance Document for Environmental Assessment. Canadian Wildlife Service, Gatineau, Quebec. 46 pages.

Golder Associates Ltd 2006. Post-Construction Monitoring Program for wind Power Projects in Alberta. Prepared for Suncor Energy Products Inc and ENMAX Corporation. October 2006. 25 pages.

Kunz, T.H., E.B. Arnett., B.M. Cooper., W.P.Erickson., R.P. Larkin., T. Mabee., M.L.Morrisson., M.D. Strickland. and J.M.Szewczak. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management . 71(8): 2449-2486

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Ministry of Natural Resources 2007- Developmental working draft. Guideline to assist in the review of wind power proposals. Potential Impacts on Bats and Bat Habitats. Wildlife and Renewable Energy Section. Ontario. 28 pages.

7.0 Appendix A

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