

Appendix B-5
Avian and Bat Casualty Monitoring Protocol

Avian and Bat Casualty Monitoring Protocol

**Rollins Wind Project
Evergreen Wind Power III LLC
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Objective

The objective of this casualty monitoring protocol is to document injuries and fatalities of birds and bats once the Rollins Wind Project becomes operational.

Background

This post-construction monitoring protocol is based on the development of similar post-construction monitoring plans at existing or proposed projects in Maine and Vermont. Those plans were developed in consultation with natural resource agencies in both states. The draft guidance of the Maine Wind Power Advisory Group was also considered. This draft guidance includes contributions by several recognized experts in the field of wind energy and wildlife interaction and other State-sponsored wind-wildlife survey protocols, such as the Pennsylvania Game Commission's post-construction monitoring protocols. Finally, other recent studies of bird and bat fatalities at wind power projects in the U.S. and Europe were reviewed with regard to methods and search techniques (*e.g.*, Arnett et al. 2008, Arnett 2005, Kerns and Kerlinger 2004, Barrios and Rodriguez 2004, de Lucas et al. 2004, Krewitt and Nitchs 2003, and Osborn et al. 2000).

Proposed Casualty Monitoring Protocol

At a minimum, Evergreen III proposes to fund and conduct the following wildlife casualty monitoring protocols during Year 1 operations:

- 1) Standardized searches during peak activity periods for birds and bats (spring migration, summer nesting and pup-rearing, late-summer swarming, and fall migration);
- 2) Searcher efficiency trials to estimate the percentage of carcasses found by searchers in each habitat surrounding the turbines; and
- 3) Carcass removal trials to estimate the length of time that carcasses remain in the field for possible detection.

Other survey methods will also be employed in Year 1. These methods will include documentation of casualties outside the standard search plots and monitoring of weather conditions (see Additional Survey Methods, below). A more detailed work scope for

these surveys will be developed in consultation with the Maine Department of Inland Fisheries and Wildlife (MDIFW) between the time that construction is initiated and the first spring survey period that occurs after construction (currently planned as Spring 2010). Timing of the final work scope development in such a way will allow for the incorporation of survey results from two years of post-construction monitoring at the Mars Hill and one year of monitoring at the Stetson Mountain Wind Farm.

In addition, Evergreen III proposes to conduct follow-up monitoring in two subsequent years (e.g., Year 3 and Year 5). The scope and timing of the follow-up monitoring will be determined in cooperation with the Maine Department of Inland Fisheries and Wildlife (MDIFW) based on the Year 1 findings, with consideration of current research priorities within the industry and the region.

Standardized Searches

Monitoring will entail regular, systematic searches of the area beneath a subset of turbines and the two guyed meteorological measurement towers (met towers) by trained technicians. As requested by MDIFW, search preference will be given to those turbines with the largest clearings/openings, and the same locations will be maintained throughout the duration of the monitoring.

Schedule and Search Effort

Monitoring will be conducted during the first full year following completion of the project to operational status. Subsequent survey efforts will be evaluated based upon the number of casualties documented during the initial year of survey, indications of correlations between casualties and weather, or indications of correlations between casualties and bird or bat activity.

Four distinct survey periods will occur. The timing of these periods will result in a total of 24 consecutive weeks of surveys. These survey periods are as follows:

- April 15 – May 31 for spring migration;
- June 1 – July 14 for summer bird nesting and bat pup-rearing;
- July 15 – August 15 for late-summer bat activity; and
- August 15 – October 15 for fall bird and bat migration.

During each time period, a total of 20 turbines (50% of all turbines) will be searched weekly. Additionally, the cleared area under one of the met towers (which primarily lies directly underneath the guy wires) will be searched once per week. The turbines searched will be randomly selected, though the selection will be stratified to ensure that the proportion of lighted and unlighted turbines in the searched set will be proportional to the entire project.

Search Plot Sizes

Fatalities may be found at considerable distances from the base of the turbine, *e.g.*, at distances equal to or greater than the total height of the turbine and rotor, commonly in the range of 300-400 feet (Erickson *et al.* 2004, 2003 and 2000, Johnson *et al.* 2000a and 2000b). The GE 1.5 MW turbines proposed for the Rollins Wind Project have a maximum structural height of approximately 119 m (389') for the tower and rotor combined. Extending outward from the base this distance would yield a plot size significantly larger than the laydown area that will be cleared and leveled for each turbine (typical diameter of up to 75 m or 250 feet). For example, a square plot based on the full tower height would measure approximately 238 m (780') on a side, and amount to approximately 14 acres. Plots of this size at Rollins Mountain would include substantial areas of mature and mixed age forest cover and steep terrain for many turbines. In comparison, many of the published studies conducted at existing projects in the western U.S. are situated in relatively level agricultural landscapes, where searches are not hindered by terrain or tree cover.

As noted in the draft Maine guidelines, conducting searches at this level of intensity may simply be impractical in hilly and forested terrain. For similar reasons, Kerns *et al.* (2005) scaled down their search areas in consideration of existing site constraints. Offsetting this problem somewhat is the fact that most fatalities are being found much closer to the turbines. For example, working at the Meyersdale project in Pennsylvania, Kerns and Kerlinger (2004) reported that the majority of bird and bat fatalities were found within about 30 m (100') of the turbine bases, and Kerns *et al.* (2005) reported that greater than 80 percent of bat fatalities were found within 40 m (131') of turbines at Meyersdale, PA and Mountaineer, WV. The NEG Micon 1.5 MW wind turbines at Meyersdale and Mountaineer are similar in size to those proposed for Rollins Mountain.

In light of the above, options for tailoring the monitoring methods at the Rollins Wind Project have been considered. It is currently anticipated that the standardized searches will focus on monitoring the cleared and leveled lay-down areas around each selected turbine and applying a correction factor to account for fatalities that fall outside of the smaller search plots. The methods for calculating this correction factor will be determined through further discussions with MDIFW and will incorporate survey results targeting this issue at turbines located in field habitat at the Mars Hill Wind Farm in 2008. In addition, the group of turbines selected can be weighted to include those turbines located in the direct center of the lay-down areas to maximize the chances of fatalities falling within these areas where carcasses are easier to find.¹

Search Timing and Frequency

As noted above, systematic searches will be conducted weekly 20 turbines (50% of all turbines) and one met tower during four survey periods. These survey periods are essentially consecutive time periods ranging from 4 to 8 weeks in length that represent different time periods in the activity and habits of birds and bats. The result will be

¹ The effect of targeting 'centered' turbines on overall survey results is currently being investigated during the 2008, Year 2 monitoring at the Mars Hill Wind Farm.

approximately 24 weeks of consecutive casualty monitoring and a total of 480 individual turbine searches and 24 met tower searches.

Standardized Searches

Plots will be searched by walking along parallel transects located at regular intervals across the turbine laydown area. Initially, transects will be set at 6-8 meters apart. A searcher will walk at a rate of approximately 45-60 meters a minute along each transect, searching on both sides out to 3-4 meters for casualties. Depending upon whether casualties are found, it should take an average of 60 minutes to search each plot and then travel to the next. The distance between transects will be modified, if needed, based on vegetation development within the plots.

All casualties found will be documented on standardized field forms, photographed, collected and, if a state- or federally-listed species, reported within 24 hours of identification. The type of observation or condition of carcasses will be recorded, such as intact carcass, scavenged, or feather spot. The bearing to the center of the wind turbine being searched will be recorded and the distance to the turbine will be determined using a laser range finder and recorded.

All casualties found incidentally during normal on-site operations at the project will also be recorded and collected (only at turbines and along roads not included as search sites). Operations personnel will be instructed on the proper handling and notification requirements for these occurrences.

Searcher Efficiency Trials

Searcher efficiency trials will be conducted in the same area as the searches to estimate the percentage of avian and bat casualties that are found by searchers. The trials will consist of periodic placement of carcasses at the search turbines the night before searches occur (to reduce the likelihood of scavenging). Carcasses will be placed within all available 'search habitats' under the turbines, including the gravel access way immediately surrounding each turbine and the restored (loamed, seeded, and mulched) portions of the lay-down areas. Searchers will be unaware of the timing of these trials. Over the course of the full survey period a target of 50 carcasses (targeting 25 birds and 25 bats) will be placed in the search plots. The number of carcasses placed for searcher efficiency trials will be modified, if necessary, based on the number of searchers used over the course of the surveys.

The carcasses used for these trials will be obtained during earlier searches at Rollins or other facilities and will be marked with a small piece of black electrical tape placed around a leg. If too few carcasses are available then surrogate species of similar size as native species will be obtained. Estimates of searcher efficiency will be used to adjust for detection bias using methods similar to Kerns et al. (2005).

Carcass Removal Trials

Two carcass removal trials will be performed during the survey, one in spring and one in fall, independently of the searcher efficiency trials. The objective will be to estimate the percentage of bird and bat fatalities that disappear from study plots due to scavengers. Estimates of carcass removal will be used to adjust the number of carcasses found, thereby correcting for this removal bias.

For each trial, a minimum of 6 but preferably 25 carcasses (species composition as noted for searcher efficiency trials), will be placed near search plots (but not in plots to avoid contamination from blowing feathers, etc.). All birds will be checked on days 1, 2, 3, 4, 5, 7, 10, and 14, or until all evidence of the carcass is absent. On day 14, all carcasses, feathers or parts will be retrieved and properly discarded.

Additional Survey Methods

Some additional field efforts to monitor bird and bat activity and weather conditions will also be performed during the post-construction casualty monitoring surveys. These efforts are designed to evaluate the efficacy of pre-construction survey methods to predict actual numbers of fatalities resulting from a proposed wind development.

These efforts will be based on the pre-construction surveys conducted at Rollins Mountain and trends in recent post-construction surveys conducted in other parts of the eastern United States, including West Virginia, Maryland, and New York, but more importantly at Mars Hill and Stetson Mountain. These surveys could incorporate bat detectors and radar operated at very specific times and for brief time periods, if deemed necessary, appropriate, and able to answer any small, targeted concerns..

Finally, weather conditions will be recorded throughout the duration of the survey effort to evaluate if correlations with casualty exist. Weather parameters used that will be recorded at the on-site met towers or at the wind turbines themselves will include wind speed and wind direction. Temperature at or near hub height and near the ground will also be recorded. Additional weather data that will be recorded will include barometric pressure, relative humidity, and precipitation.

Reporting

A report will be provided after each full year (spring-fall) of monitoring. The report will summarize the methods and results of monitoring. Estimates of the total number of wind turbine-related fatalities will be based on three components: 1) observed number of carcasses, 2) searcher efficiency expressed as the proportion of trial carcasses found by searchers, and 3) removal rates expressed as the length of time a carcass remains in the study area and is available for detection by searchers, and possibly factors such as the 4) proportion of casualties likely to land or move outside the plot (such as forested portions beyond the cleared area surrounding turbines), 5) an estimate of the number of carcasses found by observers where cause of death could not be attributed to wind energy development, and calculations of the number of bird and bat fatalities on a per turbine per

year basis or other possible measurement methods (i.e. per MW per year, etc.). Calculation methods are presented in Kerns et al. (2005).

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