NedPower Mount Storm Wind Energy Facility Post-Construction Avian and Bat Monitoring NedPower Mount Storm Wind Energy Facility Post-Construction Avian and Bat Monitoring

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Study Area 2
1.2 Project Description 4
2.0 METHODS 6
2.1 Avian and Bat Monitoring Study 6
2.1.1 Search Plots and Sample Size 6
2.1.2 Standardized Searches 8
2.1.3 Searcher Efficiency Trials 9
2.1.4 Carcass Removal Trials 9
2.1.5 Statistical Methods for Mortality Estimates 10
2.1.5.1 Observed Number of Casualties 10
2.1.5.2 Estimation of Observer Detection Rates 10
2.1.5.3 Estimation of Carcass Removal 11
2.1.5.4 Estimation of Casualty Distribution 11
2.1.5.5 Estimation of Facility-Related Mortality 11
2.1.6 Weather Analysis 12
2.2 Bat Acoustic Survey 14
2.3 Turbine Operations Study 15
3.0 RESULTS 17
3.1 Monitoring Study 17
3.2 Bird Casualties 19
3.3 Bat Casualties 23
3.4 Searcher Efficiency Trials 24
3.5 Carcass Removal Trials 24
3.6 Adjusted Mortality Estimates 25
3.6.1 Birds 27
3.6.2 Bats 27
3.7 Weather Analysis 27
3.8 Bat Acoustic Survey 29
3.9 Turbine Operations Study 33
3.9.1 Including Nights with Cancelled Treatments 33
3.9.2 Excluding Nights with Cancelled Treatments 35
4.0 SUMMARY/DISCUSSION 36
4.1 Turbine Operations Study 37
4.2 Other Observations 37
5.0 REFERENCES 38

APPENDIX A – LIST OF ALL BIRD AND BAT CASUALTIES FOUND DURING THE FALL 2010 STUDY PERIOD AT THE NEDPOWER MOUNT STORM WIND ENERGY FACILITY

LIST OF TABLES

Table 1. Descriptions of predictor variable (weather and turbine variable) used in the analyses for associations between turbines and weather characteristics and mortality 13

Table 2. Proportion of the area searched in 10-meter distance bands from the turbines for all search plots at the Mount Storm Wind Energy Facility. 17

Table 3. Number of casualties found by turbine over the study period. 18

Table 4. Species composition and number of casualties at scheduled search plots, incidentals, and all casualties combined. 20

Table 5. Distribution of all bird and bat casualties among directional quadrants and distance from turbines. 21

Table 6. Results of searcher efficiency trials. 24

Table 7. Results of carcass removal trials. 24

Table 8. Mortality estimates for birds and bats for the study period July 15 – October 15 for the NedPower Mount Storm Wind Energy Facility. 26

Table 9. Univariate regressions and correlations between nightly weather and turbine variables and nightly bat mortality rate. 28

Table 10. Multiple regression models containing the best 2-variable and possible interactions between nightly weather and turbine variables and nightly bat mortality rates. 29

Table 11. Results of AnaBat detector sampling during the study period. 30

Table 12. Bat casualties by turbine treatment group for all nights of the turbine operations study. 34

Table 13. Bat casualties by treatment group excluding nights with cancelled treatments 35

LIST OF FIGURES

Figure 1. NedPower Mount Storm Wind Energy Facility location. 3
Figure 2. NedPower Mount Storm Wind Energy Facility. 5
Figure 3. Search plots used in the avian and bat monitoring study, NedPower Mount Storm Wind Energy Facility. 7
Figure 4. Distribution of all bird and bat casualties in relation to turbines. 21
Figure 5. Plotted distribution of all bird and bat casualties around turbines. 22
Figure 6. Number of casualties found during standardized searches by study date. 23
Figure 7. Carcass removal rate by size class or taxa. 25
Figure 8. Bat activity at the turbine Anabat stations by date for the study period. 31
Figure 9. Bat activity at the reference Anabat stations by date for the study period. 32
Figure 10. Comparison of bat casualties and bat activity over the study period. 33

1.0 INTRODUCTION

NedPower Mount Storm LLC (NedPower) is conducting a three year post-construction monitoring study of the *NedPower Mount Storm Wind Energy Facility* (the Project) to study the impacts of the development on birds and bats. The West Virginia Public Service Commission (PSC) certificate of convenience and necessity (certificate) issued to NedPower for development of the Mount Storm site contains two conditions requiring monitoring of post-construction impacts to avian and bat resources for each phase of development. The certificate conditions require that a report be filed with the Commission within 60 days of the completion of each six-months of study. Specifically, the conditions of the certificate related to post-construction monitoring are: (1) for a three-year period, NedPower shall conduct six-month post-construction studies for each phase of the project assessing the mortality of both birds and bats; and (2) for a one-year period, NedPower shall conduct six-month post-construction lighting studies at each phase after each phase begins operation.

The overall objectives of the monitoring study are to:

- estimate bird and bat mortality attributable to the project primarily during the migration seasons; and
- provide a general understanding of the factors associated with the timing, extent, distribution, and location of bird and bat casualties[1] attributable to the project.

The first full year of monitoring occurred in 2009. Two study reports covering both Phases 1 and 2 of the Project were filed with the PSC in August 2009 and February 2010 (Young et al. 2009, 2010a). Based on results from those study periods, and in coordination with the U.S. Fish & Wildlife Service (USFWS), the 2010 study plan was modified slightly to take advantage of study results and information learned during the 2009 study. For example, based on the temporal distribution of casualties in 2009, and in light of significant snow fall still on the ground in late March, monitoring in 2010 began in mid-April and continued straight through to mid-October. A report covering the first half of the 2010 study period, April 16 – July 14, was filed with the PSC in August 2010 (Young et al. 2010b). This report covers the second half of the study period from July 15 to October 15, 2010.

In addition to the avian and bat monitoring study, the 2010 studies also included a bat acoustic study, a weather analysis, and a turbine operations study. The bat acoustic study was intended to provide information related to bat activity within the Project and nearby reference areas. The weather analysis was intended to investigate the relationship between weather conditions and bird and bat mortality. The turbine operations study was intended to investigate the effects of certain operational adjustments to the turbines on overall bat mortality.

[1] Casualty is defined here as a fatality or injured wildlife.

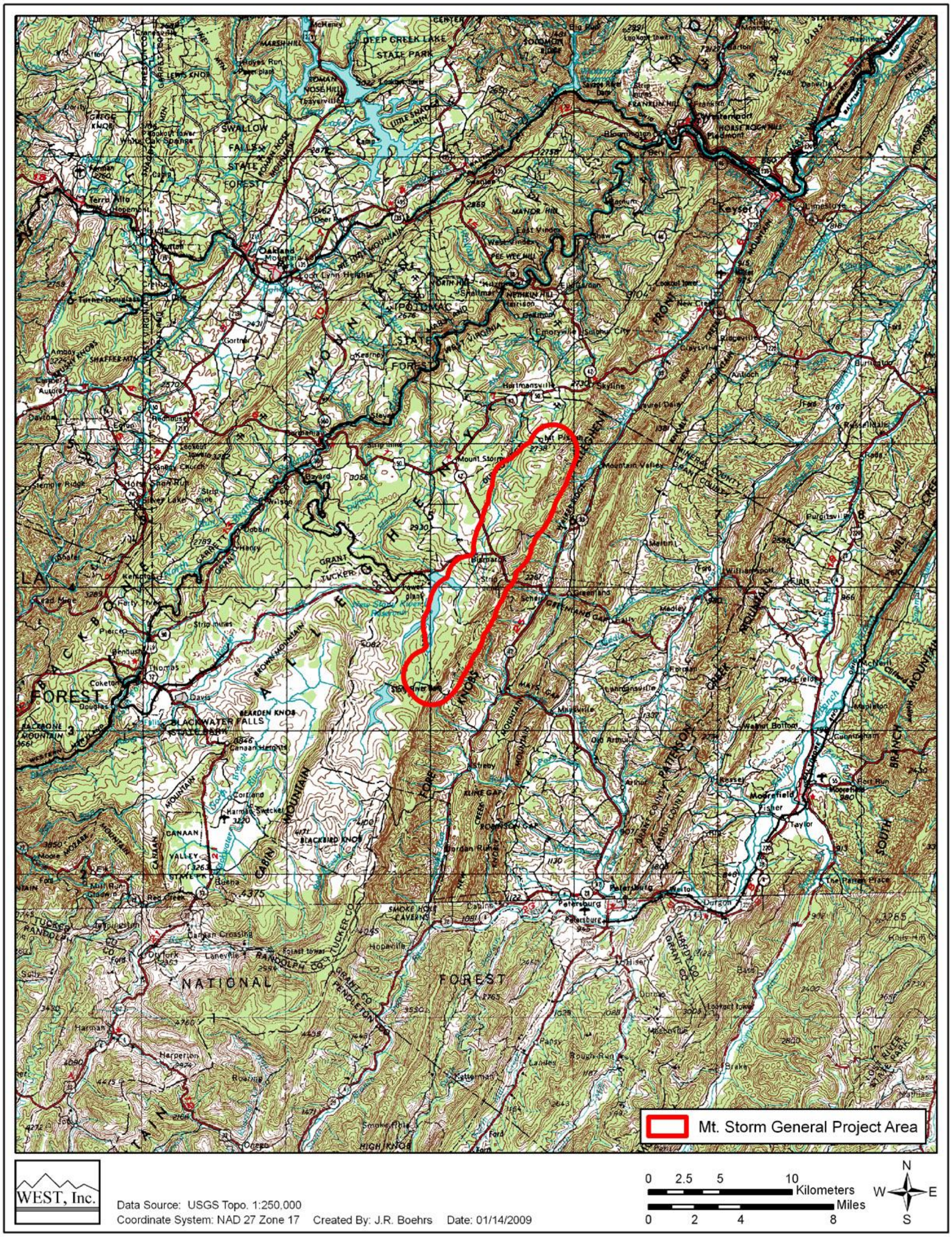
1.1 Study Area

The Project is located in Grant County, in northeast West Virginia (Figure 1). Grant County lies within the Allegheny Mountains physiographic region and is along the western edge of the Ridge and Valley physiographic province (Buckelew and Hall 1994). The Allegheny Mountains are characterized by steep to rolling mountains, ridges, hills and high plateaus. The Project is located on the primary ridgeline of the Allegheny Mountains known as the Allegheny Front approximately one mile east of Mount Storm Lake and approximately four miles east of the town of Mount Storm. West Virginia Highway 42/93 between Bismarck and Scherr bisects the site at approximately the mid-point along with several transmission line right-of-ways. Elevation of the site ranges from approximately 2,625 to 3,800 feet (800-1150 m). The site is private land used for coal mining, logging, and recreation (hunting).

The historical vegetation type throughout the Allegheny Mountains was hardwood and spruce forest (Buckelew and Hall 1994). The hardwood forest type on the site consists primarily of oaks, maples, hickory species, black cherry, black and yellow birch, and beech trees (Canterbury 2002). The spruce and conifer type consists of red spruce, hemlock, and a variety of pines, including red, pitch, and Virginia, used for reclamation of abandoned surface mines (Canterbury 2002). Much of the site was previously strip mined for coal and consists of reclaimed areas and there are a few areas of active mining west of the site. The deciduous forest vegetation type on site has been logged, both recently and historically, and has experienced ice and wind damage from severe winters. Several private cabins are scattered around the site, much of the area around Mount Storm Lake and Hwy 42/93 is developed with private residences and scattered businesses, and a large (1600 MW) coal fired power plant is located on the northwest shore of the lake approximately two miles west of the Project.

The study area for the avian and bat monitoring study was defined as the turbines for Phase 1 and 2 of the NedPower Mount Storm Wind Energy Facility and the areas immediately surrounding turbines where surveys would take place. The Project is roughly 12 miles long from north to south and turbines are generally positioned in rows of variable length oriented along a northeast to southwest axis (parallel to the primary ridgeline of the Allegheny Front).

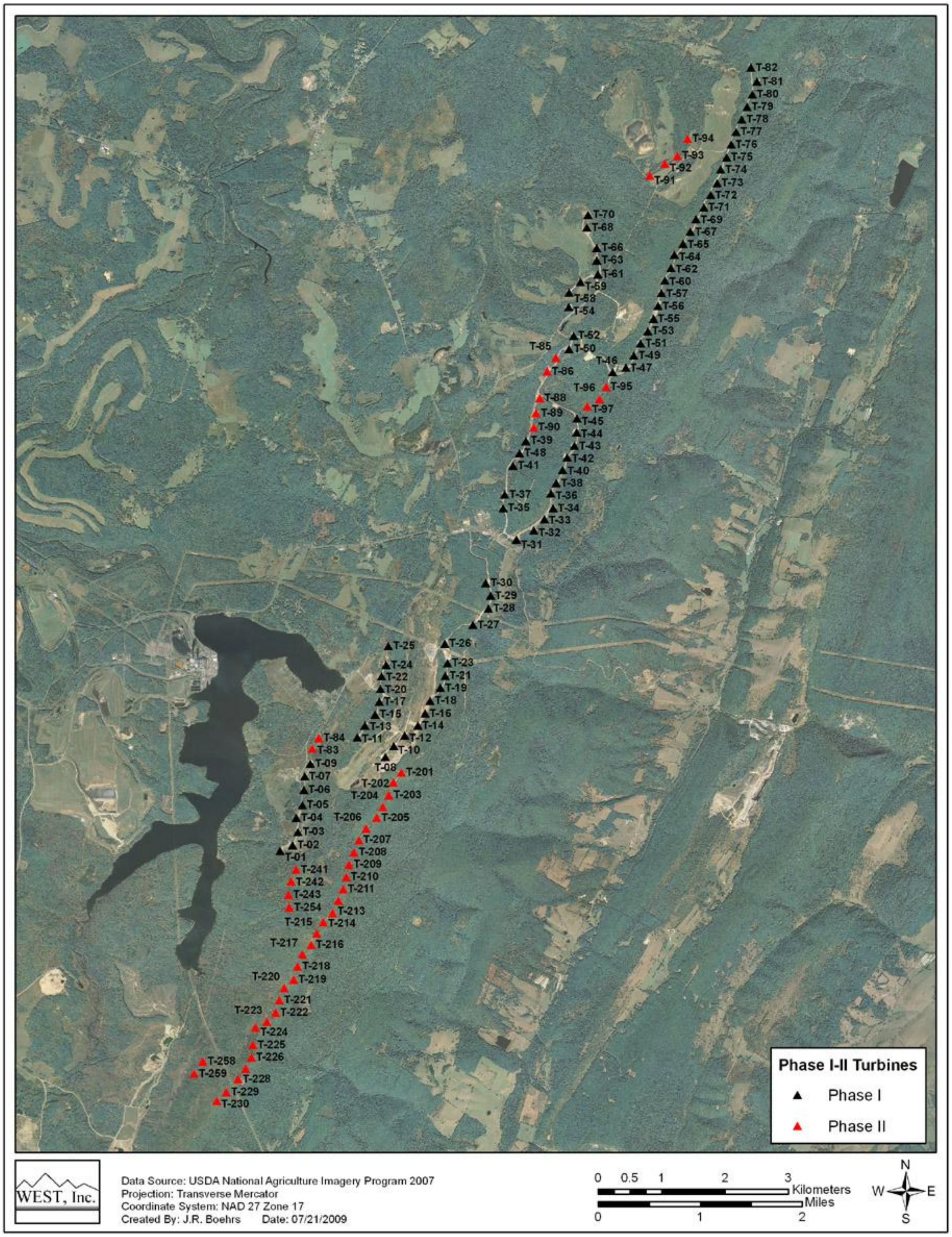
Figure 1. NedPower Mount Storm Wind Energy Facility location.



1.2 Project Description

The Project is located along the Allegheny Front and east of Mount Storm Lake and the town of Mount Storm, Grant County, West Virginia (Figure 1). For Phase 1, 82 turbines were constructed (164 MW); Phase 2 consists of an additional 50 turbines (100 MW), 12 of which are located intermixed within the Phase 1 development area (Figure 2). The turbines are mounted on 78 m (256 ft) tubular steel towers. The rotor diameter of the three-bladed turbines is 80 m (264 ft), resulting in a rotor swept area (RSA) of approximately 5026.5 m^2. The maximum height above ground to the top of the RSA is approximately 118 m (387 ft). The minimum height above ground to the bottom of the RSA is approximately 38 m (125 ft). The wind turbines operate at wind speeds from approximately 14-90 kilometers per hour (kph) (~9-56 mph), at a variable speed of approximately 9.1-19.0 revolutions per minute (rpm). Thirty-seven of the Phase 1 wind turbines and 21 of the Phase 2 turbines are lit with FAA compliant LED (red) beacons of either of two types: (1) Flash Technology FTB 360i LED Integrated L864, and (2) Dialight D264 Series LED with GPS Synchronization. Turbines located at the end of turbine strings, and roughly every third or fourth turbine within turbine strings that have more than five turbines in the string, are equipped with FAA lights.

Figure 2. NedPower Mount Storm Wind Energy Facility.



2.0 METHODS

The 2010 post-construction monitoring study consisted of an avian and bat monitoring study for assessing bird and bat mortality through standardized casualty searches, carcass removal trials, searcher efficiency trials, weather analysis, and turbine operations studies.

2.1 Avian and Bat Monitoring Study

The primary objectives of the avian and bat monitoring study were to: (1) estimate bird and bat mortality attributable to the project during the migration (spring and fall) seasons; (2) provide a more detailed understanding of factors associated with the timing (daily, seasonal) and location of casualties within the Project; and (3) correlate casualty estimates to varying weather conditions.

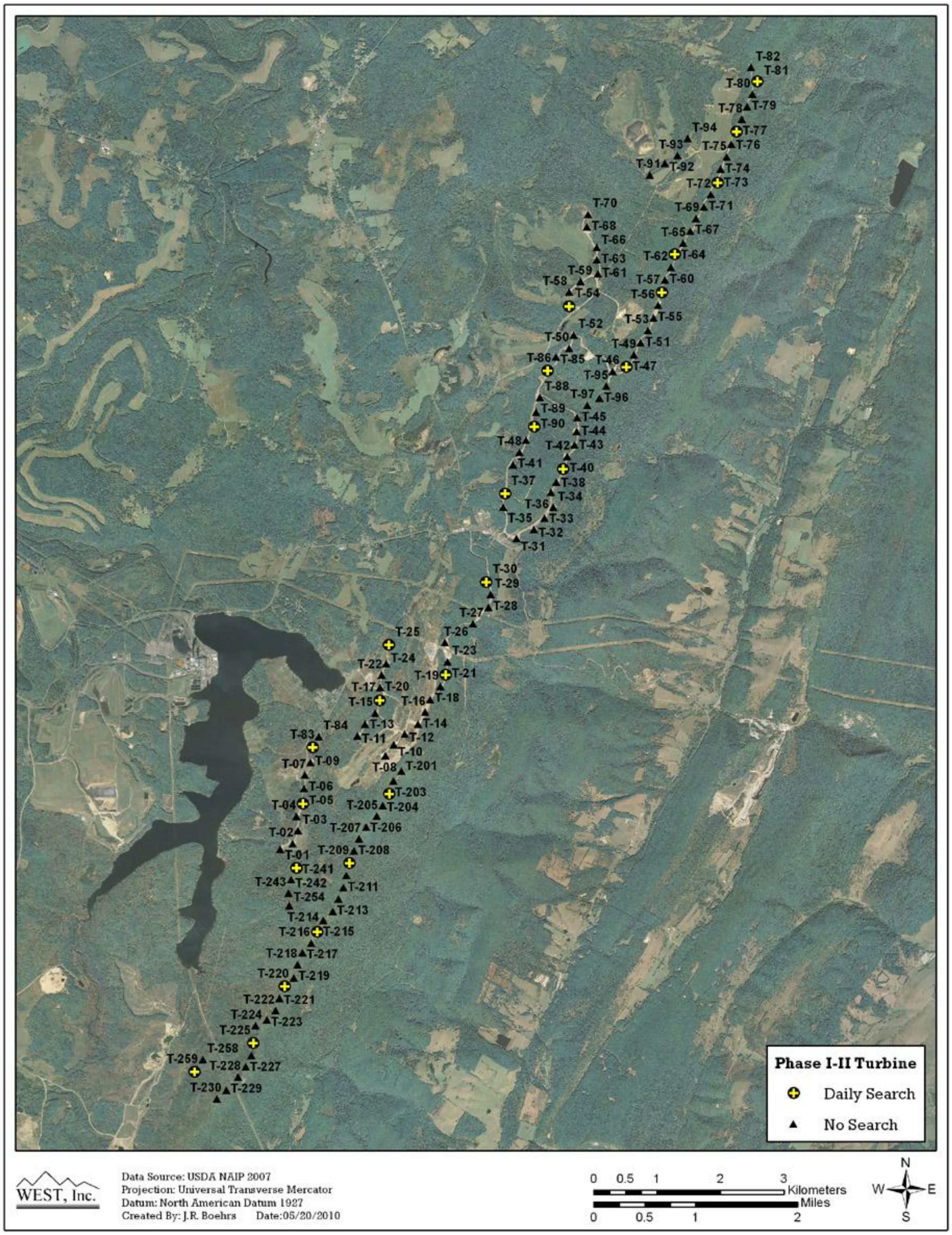
As directed in the PSC certificate, each phase of the development will be studied for a total of three years (i.e., three 6-month studies). Because the migration seasons were of concern, each six-month study is intended to cover the peak of the spring neo-tropical bird migration (April-May), the peak of the fall bat migration (August-September), and the peak of the fall bird migration (September). In 2009, monitoring was conducted from approximately mid-March to mid-June, and mid-July to mid-October. Based on results from those study periods, and in coordination with the USFWS, the 2010 study plan was modified slightly to take advantage of study results and information learned during the 2009 study. For example, based on the temporal distribution of casualties in 2009, and in light of significant snow fall still on the ground in late March, monitoring in 2010 began in mid-April and continued straight through to mid-October. The monitoring period for this report was from July 15 to October 15, 2010. The results from the period April 16 to July 14, 2010 were previously reported in August 2010 (Young et al. 2010b)

The monitoring study was broken into three primary components: (1) standardized casualty searches, (2) searcher efficiency trials, and (3) carcass removal trials. The basis for the number of avian and bat casualties attributable to the project over the study period was the number of avian and bat casualties found in search plots around turbines. All casualties located within areas surveyed, regardless of species, were recorded and a cause of death determined, if possible, based on field inspection of the carcass. Total number of avian and bat casualties were estimated by adjusting for removal bias (e.g., scavenging), searcher efficiency bias, and the sampled area. Casualties where the cause of death was not apparent were also included in the mortality estimates.

2.1.1 Search Plots and Sample Size

A sampling approach was used to determine the survey plots for the study. For the 2010 study, 24 turbines were selected for daily surveys (Figure 3). A 25^{th} turbine was added to the study in mid-July to include in the turbine operations study (see below). Search plots were selected in a systematic fashion to adequately sample the entire project and to survey different turbines from the 2009 study.

Figure 3. Search plots used in the avian and bat monitoring study, NedPower Mount Storm Wind Energy Facility.



Search plots were established around each sampled turbine and were delineated in the field and with a GPS for detailed mapping. Due to the variable nature of the habitat in the Mount Storm project, search plot size and shape varied. Areas up to approximately 20-60 meters from the turbines were generally cleared of vegetation for access and construction purposes. Given the difficulty in finding birds and bats within thick shrub cover or forested areas, the search area was limited to the cleared areas around the turbines. Efforts were made to maximize the search plots but searches were not conducted in forested areas or areas with steep rocky slopes or waste rock piles from construction. The boundary (limits) of the search plots for each turbine was recorded using GPS units and aerial photos of the development as constructed. All 24 turbines selected for searches during this study were searched on a daily basis, rather than the combination of daily and weekly turbine searches conducted in 2009.

2.1.2 Standardized Searches

The objective of the standardized searches is to systematically search a sample of the project for avian and bat casualties that are attributable to the turbines. Personnel trained in proper search techniques conducted the searches. Parallel transects approximately five meters apart that were oriented north-south were established in each search plot. Searchers walked at a rate of approximately 45-60 meters a minute along each transect searching both sides out to two to three meters for casualties. Search area and speed were occasionally adjusted during any given search for the searcher to investigate potential casualties.

The condition of each casualty found was recorded using the following condition categories:

- Live/Injured – a live or injured bird or bat.
- Intact – a carcass that was completely intact, was not badly decomposed, and showed no sign of being fed upon by a predator or scavenger.
- Scavenged – an entire carcass, which showed signs of being fed upon by a predator or scavenger, a portion(s) of a carcass in one or more location(s) (e.g., wings, skeletal remains, legs, pieces of skin, etc.), or a carcass with heavy insect infestation.
- Feather Spot - 10 or more feathers or two or more primaries in one location indicating that predation or scavenging had occurred.

For all casualties found, data recorded included weather conditions during the time of search and estimated for the previous night, species, sex and age when possible, date and time collected, casualty location, condition (e.g., intact, scavenged, feather spot), and any comments regarding potential cause of death or that were potentially relevant. All casualties located were photographed as found and subsequently plotted on a map of the study area showing the location of the wind turbines and project facilities (e.g., roads).

Casualties may potentially be found by maintenance personnel and others not involved in the study or conducting the formal searches or could be found in areas not within a designated search plot (e.g., a non-searched turbine). During the study, casualties found in non-search areas or during periods outside of the standardized searches were treated as incidental finds. When non-study personnel discovered a casualty, a digital photograph was taken (when possible), it was marked in the field with a pin-flag, and a study participant was notified to identify and record the casualty. Incidental discoveries found within search plots, but not during scheduled searches, were included in the mortality estimation as if they would have been found during the next scheduled search. Other incidental discoveries (i.e., outside search areas) were recorded and listed in the overall data set, but not included in the estimated mortality analysis (see below).

2.1.3 Searcher Efficiency Trials

The objective of the searcher efficiency trials was to estimate the percentage of avian and bat casualties that are found by searchers. Searcher efficiency trials were conducted in the same areas standardized searches occurred and throughout the study period. Searcher efficiency was estimated by size of carcass (large or small) and taxa (bird or bat). Estimates of searcher efficiency were used to adjust the number of casualties found, correcting for detection bias.

Trial carcasses were placed at random locations within areas being searched prior to the standardized search on the same day. The searchers were unaware of the date/time and location of the trial carcasses. Carcasses were dropped from shoulder or waist height to simulate a falling bird or bat. Each trial carcass was discreetly marked with a small piece of tape around a leg so that it could be identified as a study carcass after it was found. The number and location of the detection carcasses found during each standardized search was recorded and the number of carcasses available for detection during each trial (those carcasses that were not found by searchers) was determined immediately after the trial by the person responsible for distributing the carcasses. Based on experience from 2009, trial carcasses were placed in the field before light (sun rise) to reduce the likelihood of avian scavengers (ravens and crows) taking the carcasses before the search was conducted.

2.1.4 Carcass Removal Trials

The objective of the carcass removal trials was to estimate the length of time that avian and bat carcasses remain in the search area to potentially be found. Carcass removal includes removal by predation or scavenging, or removal by other means such as mowing. Carcass removal trials were conducted throughout the study period (April – October) to account for varying weather conditions, scavenger abundance, or other factors affecting carcass removal. Carcass removal was estimated by size of carcass (large or small) and taxa (bird or bat). Estimates of carcass removal were used to adjust (correct) carcass counts for removal bias.

Removal trial carcasses were placed within 60m of turbines that were not included in the set of searched turbines. An emphasis was placed on using intact bird and bat carcasses found during the study in removal trials to simulate a fresh kill and determine variable removal rates for birds and bats. Typically a given trial consisted of a small number of carcasses randomly placed throughout the study area and monitored for a 14-day period. Typically, carcasses were checked once a day for the 14-day period. This schedule varied slightly depending on weather and coordination with other surveys, but all carcasses were monitored until they were removed or until the end of the 14-day period at which time all evidence of the carcass that remained was removed by the observer. Experimental carcasses were marked discreetly with a piece of tape on a leg for labeling and recognition by searchers and other personnel as a trial carcass.

2.1.5 Statistical Methods for Mortality Estimates

The estimate of the total number of wind turbine-related casualties is based on four components: (1) the observed number of casualties, (2) searcher efficiency expressed as the proportion of planted carcasses found by searchers, (3) removal rates expressed as the length of time a planted carcass is expected to remain in the study area and, therefore, be available for detection by the searchers, and (4) the estimated percent of casualties that likely fell in non-searched areas based on the distribution of observed casualties and percent of area searched around turbines.

2.1.5.1 Observed Number of Casualties

The estimated average number of casualties ($\overline{c}_i$) observed per turbine per search period from daily searches (i=1) is:

$$\overline{c}_i = \frac{\sum_{j=1}^{n} c_{ij}}{n}$$

where n is the number of turbines searched, and c_{ij} is the number of casualties found during daily searches (i=1) at the *j*th turbine.

2.1.5.2 Estimation of Observer Detection Rates

Searcher efficiency is expressed as p, the average probability a carcass is detected by searchers. Searcher efficiency rates were calculated by dividing the number of trial carcasses observers found by the total number that remained available until the end of the trial. Carcass detection rates were estimated by carcass size and taxa (bird or bat) for the study period (spring season).

2.1.5.3 Estimation of Carcass Removal

Estimates of carcass removal are used to adjust observed casualty counts for removal bias. Mean carcass removal time ($\bar{t}$) is the average length of time a planted carcass remains at the site before it is removed:

$$\bar{t} = \frac{\sum_{i=1}^{s} t_i}{s - s_c}$$

where s is the number of carcasses placed in the scavenging trials and s_c is the number of carcasses censored. This estimator is the maximum likelihood estimator assuming the removal times follow an exponential distribution and there is right-censoring of data. In our application, any trial carcasses still remaining at 14 days are collected, yielding censored observations at 14 days. If all trial carcasses are removed before the end of the trial, then s_c is 0, and $\bar{t}$ is just the arithmetic average of the removal times.

2.1.5.4 Estimation of Casualty Distribution

Due to the irregular shaped and unequal sized plots, adjustments to the mortality estimates were made to account for un-sampled areas, *A*, or area within the plot that was not searched and where some casualties may have fallen. *A* represents an adjustment for the area within the plot that was not searched. The value for *A* was approximated using the following formula:

$$A = \frac{\sum_{k'=1}^{7} \frac{c_{k'}}{p_{k'} s_{k'}}}{\sum_{k'=1}^{7} \frac{c_{k'}}{p_{k'}}}$$

where $c_{k'}$ is the observed number of casualties found in the k^{th} 10-m distance band from the turbine, $p_{k'}$ is the estimated observer detection probability in the k^{th} 10-m distance band from the turbine, and $s_{k'}$ is the proportion of the k^{th} 10-m distance bands that was sampled across all turbines.

2.1.5.5 Estimation of Facility-Related Mortality

Mortality estimates were calculated using a modified form of the estimator proposed by Erickson et al. (2003a). Estimates were calculated for daily searches for large birds, small birds, and bats separately.

The estimated mean number of casualties/turbine/study period (m_i) was calculated for daily searches (i=1) by dividing the observed mean casualty rate (number/turbine/study period) ($\bar{c}_i$)

by $\hat{\pi}_i$, an estimate of the probability a carcass is not removed and is detected, and multiplying by *A*, the adjustment for the area within the plot that was not searched:

$$m_i = A \cdot \frac{\overline{c_i}}{\hat{\pi}}.$$

Estimates of the average probability a bird or bat that dies at a turbine searched daily and is found ($\hat{\pi}_i$) was calculated using the formula:

$$\hat{\pi} = \frac{\bar{t} \cdot p}{I} \cdot \left[\frac{\exp\left(1/t\right) - 1}{\exp\left(1/t\right) - 1 + p} \right]$$

I is the interval between searches (i.e. *I*=1).

Variance and 90% confidence intervals were calculated using bootstrapping methods (Erickson et al. 2003a; Manly 1997). Comparisons of point estimates and variance were used to evaluate accuracy and precision of the methods.

2.1.6 Weather Analysis

Associations between turbine and weather characteristics (Table 1) and fresh bat casualties were investigated using univariate association analyses (Pearson's correlations, simple linear regression), and multiple regression (Neter et al. 1996). The linear regression dependent variable was the average number of fresh bat casualties per turbine per night. Independent variables used in our analyses were quantified from data gathered at turbines and the Project met tower.

The program R was used to fit several regression models to predict the number of fresh bat casualties found at the site. The linear regression models were all of the form:

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_p x_p + \varepsilon,$$

which related the behavior of *y*, and index of the number of fresh bat mortalities, to a linear function of the set of predictor variables $x_1, ..., x_p$. The β_j's are the parameters that specify the nature of the relationship and ε is a random error term $\sim N(0, \sigma^2)$. The SAS Proc GLM (SAS Institute 2000) procedure was used to fit several alternative models using least squares regression (Neter et al. 1996). Each model contained two predictor variables and possibly their interaction (i.e., one model was fit with the interaction term and another model without). To investigate the overall goodness of fit of each model, the coefficient of multiple determination (R^2) was calculated, which measures the proportionate reduction of total variation in fresh bat casualties associated with using the model's predictor variables (Neter et al. 1996). For inferences about each parameter in every model fit, the student's *t* statistic and p-value were calculated using standard statistical procedures for least squares regression models (Neter et al. 1996).

Table 1. Descriptions of predictor variable (weather and turbine variable) used in the analyses for associations between turbines and weather characteristics and mortality.

Predictor Variable [abbreviation]	**Description**
Temperature	
[tempc]	Mean nightly temperature; measured at turbines and averaged across turbines at site.
Energy output	
[powerc]	Mean nightly energy output; measured at turbines and averaged across turbines at site.
Wind Speed	
[wspc]	Mean nightly wind speed; measured at turbines and averaged across turbines at a site.
[wspmc]	Median nightly wind speed; measured at turbines and averaged across turbines at a site.
[wsp2]	Quadratic term for mean nightly wind speed.
[wspm2]	Quadratic term for median nightly wind speed.
[p2c]	Proportion of night (10 min intervals) from 1800 to 0600 hr with wind speed of 0–4 m/s; measured at turbines and averaged across turbines.
[p4c]	Proportion of night (10 min intervals) from 1800 to 0600 hr with wind speed of 4–6 m/s; measured at turbines and averaged across turbines.
[p6c]	Proportion of night (10 min intervals) from 1800 to 0600 hr with wind speed of >6 m/s; measured at turbines and averaged across turbines.
Turbine	
[rpm]	Mean nightly turbine rotor speed (rpm); measured at turbines and averaged across turbines.

All possible two variable models with the data were fit using the predictor variables (Table 1), but no model contained: (1) both proportion of night with a wind speed of <4 m/s and median and mean wind speed at turbines, mean rpm of turbines, mean energy output of turbines, or proportion of night with a wind speed of $\geq$ 6m/s; (2) proportion of night with a wind speed $\geq$6 m/s and median and mean wind speed at turbines, mean energy output of turbines, mean rpm of the turbines, proportion of night with a wind speed <4 m/s, or proportion of night with a wind speed between 4-6 m/s; (3) proportion of night with a wind speed 4-6 m/s and mean energy output of turbines; (4) mean and median wind speed at turbines, mean energy output, and mean rpm of turbines; and (5) the mean and median values of the same measure. These exceptions were due to perceived high correlations between the pairs of variables that could have resulted in severe multicollinearity problems (Neter et al. 1996). This resulted in a total of 34 models fit to the bat casualty data.

To determine the "best" model, the second order variant of Akaike's Information Criterion (AICc) was used (Burnham and Anderson 2002). The model with the lowest AICc value within the set of models was chosen as the best model. The AICc value for each model was calculated as:

$$AICc = n\ln(\hat{\sigma}^2) + 2K + \frac{2K(K+1)}{n-K-1},$$

where *n* was the number of observations, *ln* was the natural logarithm, *K* was the number of parameters in the model + 1 (for $\hat{\sigma}^2$), and $\hat{\sigma}^2$ was the maximum likelihood estimate of σ^2, estimated by:

$$\hat{\sigma}^2 = \frac{\sum \varepsilon_i^2}{n}.$$

2.2 Bat Acoustic Survey

The objective of the acoustic survey for bats was to estimate the seasonal and spatial use of the site by bats during the concurrent avian and bat monitoring study. Bats in the study area were surveyed using passive sampling with Anabat® SD1 bat detectors (Titley Scientific™, Brisbane, Australia) that record echolocation calls of bats as they pass by the detector. Twelve detectors were used for acoustic sampling at fixed stations established in the study area (Figure 5). Four of the stations were fixed stations established at turbines that were included in the daily search schedule as described above. These stations were approximately evenly spaced from north to south in the study area. For each turbine station, two Anabats were used. One was placed on the ground slightly elevated (~ 1 m) above ground vegetation at the base of the turbine and the second was placed on the turbine nacelle approximately 80 m above ground level. Four Anabats were placed at reference stations, which were in areas away from turbines that had similar vegetation and topographic characteristics as turbine locations. The reference Anabat stations were ground-based and slightly elevated (~≤1 m) above ground cover vegetation.

Anabat SD1 detectors record bat echolocation calls with a broadband microphone (10-200 kHz). The SD1 units combine the Anabat detector and ZCAIM (zero crossings analysis interface module), which uses a compact flash memory card for data storage. Commands loaded on the compact flash card in the ZCAIM unit turned each unit on and off at pre-programmed times. Each Anabat detector was programmed to turn on and off each night at the same time, approximately one-half hour before sunset to one-half hour after sunrise, to equate the sampling effort from all stations. All Anabats used in the study were calibrated to similar detection capabilities, and the calibrated sensitivity level for each unit was fixed for the life of the study period. Unless interrupted by random failure or technical issues, the Anabats sampled continuously (i.e., every night) from April 18 through October 15, 2009. Each unit was checked weekly to download data, change batteries, and trouble-shoot any technical issues.

The unit of bat activity was defined as the number of bat passes (Hayes 1997). A pass was defined as a continuous series of more than or equal to two call notes produced by an individual bat with no pauses between call notes of more than one second (Gannon et al. 2003; White and Gehrt 2001). The number of bat passes was determined by downloading the data files to a computer and tallying the number of echolocation passes recorded. Total number of passes was corrected for effort by dividing by the number of detector nights. Bat calls were classified as either high-frequency calls (≥ 40 kHz) that are generally given by *Myotis* species bats (e.g., little brown bat [*Myotis lucifugus*], northern myotis [*Myotis septentrionalis*], tri-colored bats [*Perimyotis subflavus*]); mid-frequency (30-40 kHz) calls (e.g., eastern red bats [*Lasiurus borealis*], evening bats [*Nycticeius humeralis*] in the Mount Storm area); or low-frequency (< 30 kHz) calls that are generally given by larger bats (e.g., big brown bat [*Eptesicus fuscus*], hoary bat [*Lasiurus cinereus*] and silver-haired bat [*Lasionycteris noctivagans*]). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified criteria to be termed a pass were removed from the analysis.

The total number of bat passes per detector night was used as an index for bat use in the study area. Bat pass data represented levels of bat activity rather than the numbers of individuals present because individuals could not be differentiated by their calls. The mean number of bat passes per detector night (averaged across turbine or reference stations) was compared to bat casualty data from the turbines where daily searches occurred.

2.3 Turbine Operations Study

During the period when bat mortality is typically assumed to be the highest (approximately mid-July to mid-October), a study was conducted to investigate the effects of certain turbine operational adjustments on bat mortality. The study was based on results from the fall 2008 (Young et al. 2009a) and 2009 studies (Young et al. 2009b, Young et al. 2010a), which showed that bat mortality was higher on nights with low wind speeds. The study used a predictive design utilizing the Project weather forecasting to predict when bat mortality would be high based on wind speed. The study also was designed to investigate whether limiting rotation of the turbines for first half of the night or the second half of the night was more effective. For nights when wind speeds were predicted to be below the normal turbine cut-in speed [4 meters per second (m/s); approximately 9 mph], turbine rotation was limited by feathering the turbine blades so there was only minimal rotation (< 1 rpm). Normally, the Mount Storm turbines freewheel or spin at up to 9 rpm in winds under the cut-in speed of 4 m/s. Other studies have shown that raising the cut-in speed for turbines has the effect of reduced bat mortality during the fall season (Arnett et al. 2009). However, the risk associated with freewheeling turbines (those spinning below the normal cut-in speed when they are not producing electricity) is unknown. Because bat activity and mortality appears to increase during periods of low wind speeds (see

Young et al. 2009a, Young et al. 2010a) it is assumed that turbines that are not rotating during these conditions will have minimal impact on bats.

For the turbine operations study, the effect of restricting turbine rotation up to the cut-in speed for the first half of the night (approximately sunset plus 5 hours) was compared to restricting turbine rotation during the second half of the night (sunrise minus 5 hours). Both of these treatment groups of turbines were compared to turbines that were allowed to operate under normal conditions, to help evaluate when during a night bats are at greatest risk.

The turbine operations study was conducted during the 12-week fall study period, July 15-October 15. Twenty-four turbines included in the 2010 monitoring were assigned to three groups of 8 turbines each. Each turbine group was rotated weekly between the following treatments (I, II, III), such that each group received each treatment for four weeks over the duration of the fall study period:

I. Turbine rotation restricted for first half of the night (approximately 5 hours after sunset).
II. Turbine rotation restricted for second half of the night (approximately 5 hours prior to sunrise).
III. Control group; no change to normal turbine operations.

Groups were rotated weekly as follows (repeated four times over 12 weeks):

Treatment	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
I	A	B	C	A	B	C	A	B	C	A	B	C
II	B	C	A	B	C	A	B	C	A	B	C	A
III	C	A	B	C	A	B	C	A	B	C	A	B

The field methods used for the carcass searches were the same as described above. Searcher efficiency trials and carcass removal trials were continued though the study period as described above. An estimation of avian and bat casualties was calculated for the three treatment groups and compared to determine the efficacy of restricting turbine rotation up to the cut-in speed, either for the first half of the night or for the second half of the night, to reduce bat mortality. The analysis was conducted for each treatment group for the entire 12-week study period and for only the nights when the treatments were performed. Since treatments were cancelled on many nights during the study, only casualties assumed to have occurred the previous night were used in the analysis.

Casualty rates for each treatment were calculated along with corresponding 90% bootstrapped confidence intervals. Estimates without overlapping confidence intervals can be considered significantly different. In addition to using casualty estimates, differences in treatments were examined by building a Poisson model to determine the relative difference in casualty rates based on the type of treatment. The magnitude of model coefficients represents the relative ratio of casualty rates between turbines subject to the treatments and those with no treatment (i.e., normal operations). Tests for variable selection were used to assess the statistical significance of the treatment covariates.

3.0 RESULTS

3.1 Monitoring Study

A total of 2,296 plot searches were conducted over the study period, July 15 to October 15, 2010. From July 15 to October 15 a total of 25 turbines were searched daily. Twenty-four turbines were included in the turbine operations study (see below). Turbine 81 was not included in the operations study and it was operated normally for the entire study period.

The shape of the search plots was variable due primarily to the size of the area cleared for construction. The maximum distance searched from any one turbine was 100 meters, but in most cases the maximum search plot radius was approximately 30 meters (Table 2). The percentage of the total area searched decreased with distance from the turbine due to the constraints of the irregular search plots and limited search area (Table 2).

Table 2. Proportion of the area searched in 10-meter distance bands from the turbines for all search plots at the Mount Storm Wind Energy Facility.

Distance (m)	Total Acres Possible	Searched Acres	Proportion
0 to 10	7,501.60	7,484.71	1.00
10 to 20	22,505.60	21,959.60	0.98
20 to 30	37,558.50	34,832.20	0.93
30 to 40	52,681.80	42,728.30	0.81
40 to 50	67,753.90	41,276.30	0.61
50 to 60	82,843.10	31,647.80	0.38
60 to 70	97,914.40	20,013.60	0.20
70 to 80	112,992.00	11,822.80	0.10

Note: The total possible acres for >100 is calculated as the area from 100m to 150m beyond the turbine.

Bird and/or bat carcasses were found at all 25 of the scheduled search turbines (Table 3). None of the birds of bats found were listed as Federal endangered, threatened, proposed or candidate species.

Table 3. Number of casualties found by turbine over the study period.

Daily Search Turbines			Non-search Turbines (incidentals)		
Turbine	**Bat**	**Bird**	**Turbine**	**Bat**	**Bird**
5	8	1	1	1	0
17	14	0	3	0	1
21	9	4	4	1	0
25	10	1	15	1	0
30	18	1	16	1	0
37	23	3	18	1	0
40	16	2	19	1	0
47	9	0	23	1	0
54	13	1	26	1	2
57	17	2	29	1	0
64	6	0	33	1	0
73	6	2	35	3	0
77	13	1	36	4	0
81	20	1	41	2	1
83	15	1	42	2	0
86	25	0	43	1	0
90	19	2	46	7	0
92	10	3	49	4	0
203	5	2	50	0	1
209	14	1	51	3	0
215	10	1	52	1	0
220	5	1	53	0	1
225	8	0	55	2	0
241	11	5	56	2	0
259	4	1	58	1	0
			60	1	0
			62	2	0
			74	1	0
			75	1	1
			76	3	0
			78	4	0
			79	7	0
			80	1	0
			88	2	0
			96	1	0
			204	1	0
			205	1	0
			206	1	0
			207	1	0
			208	1	0
			210	0	1
			211	1	0
			212	0	1
			213	1	0
			214	1	1
			218	0	1
Subtotals	**308**	**36**		**73**	**11**

3.2 Bird Casualties

Thirty-six casualties (all fatalities) representing twenty-three identifiable species and three unidentified bird types (passerine, warbler, vireo) were located at scheduled search plots, with an additional 11 casualties representing 7 species and one unidentified bird type (corvid) found incidentally outside of designated search plots (Table 4). Bird casualties were found near 20 different turbines included in the standardized searches and 10 turbines not included in the study (incidental finds) (Table 3). The maximum number of bird casualties found at any one turbine was five, found at Turbine 241 (Table 3).

The majority (72.3%) of all bird casualties (including incidentals) were found within 40m of search turbines (Table 5 and Figure 4). More birds were found within the southeast quadrant (44.7%) of the search plots; a similar proportion of the bird casualties were found in the northeast and northwest quadrants of the search plots (25.5% and 19.1%, respectively), with a lower percent of casualties being found in the southwest quadrant (10.6%; Table 5 and Figure 5).

Table 4. Species composition and number of casualties at scheduled search plots, incidentals, and all casualties combined.

Species	Casualties at Scheduled Search Plots		Incidentals		All Casualties	
	Total	Percent Composition	Total	Percent Composition	Total	Percent Composition
black-throated blue warbler	3	8.33	1	9.09	4	8.51
turkey vulture	3	8.33	3	27.27	6	12.77
bay-breasted warbler	2	5.56	0	0.00	2	4.26
red-eyed vireo	2	5.56	2	18.18	4	8.51
Swainson's thrush	2	5.56	0	0.00	2	4.26
unidentified passerine	2	5.56	0	0.00	2	4.26
yellow-bellied sapsucker	2	5.56	0	0.00	2	4.26
yellow-billed cuckoo	2	5.56	0	0.00	2	4.26
Acadian flycatcher	1	2.78	0	0.00	1	2.13
American redstart	1	2.78	0	0.00	1	2.13
black-and-white warbler	1	2.78	0	0.00	1	2.13
black-throated green warbler	1	2.78	0	0.00	1	2.13
blue-winged warbler	1	2.78	0	0.00	1	2.13
cedar waxwing	1	2.78	0	0.00	1	2.13
chestnut-sided warbler	1	2.78	0	0.00	1	2.13
golden-crowned kinglet	1	2.78	1	9.09	2	4.26
magnolia warbler	1	2.78	0	0.00	1	2.13
northern parula	1	2.78	0	0.00	1	2.13
ovenbird	1	2.78	0	0.00	1	2.13
ruby-throated hummingbird	1	2.78	0	0.00	1	2.13
ruffed grouse	1	2.78	0	0.00	1	2.13
sharp-shinned hawk	1	2.78	1	9.09	2	4.26
unidentified vireo	1	2.78	0	0.00	1	2.13
unidentified warbler	1	2.78	0	0.00	1	2.13
winter wren	1	2.78	0	0.00	1	2.13
wood thrush	1	2.78	0	0.00	1	2.13
gray catbird	0	0.00	1	9.09	1	2.13
tree swallow	0	0.00	1	9.09	1	2.13
unidentified corvid	0	0.00	1	9.09	1	2.13
Bird Subtotal	**36**	**100**	**11**	**100**	**47**	**100**
eastern red bat	177	57.14	41	56.16	218	56.95
hoary bat	78	25.32	25	34.25	103	27.03
silver-haired bat	21	6.82	2	2.74	23	6.04
tricolored bat	15	4.87	1	1.37	16	4.20
big brown bat	10	3.25	3	4.11	13	3.41
little brown bat	6	1.95	1	1.37	7	1.84
Seminole bat	2	0.64	0	0	2	0.52
Bat Subtotal	**308**	**100**	**73**	**100**	**381**	**100**

Figure 4. Distribution of all bird and bat casualties in relation to turbines.

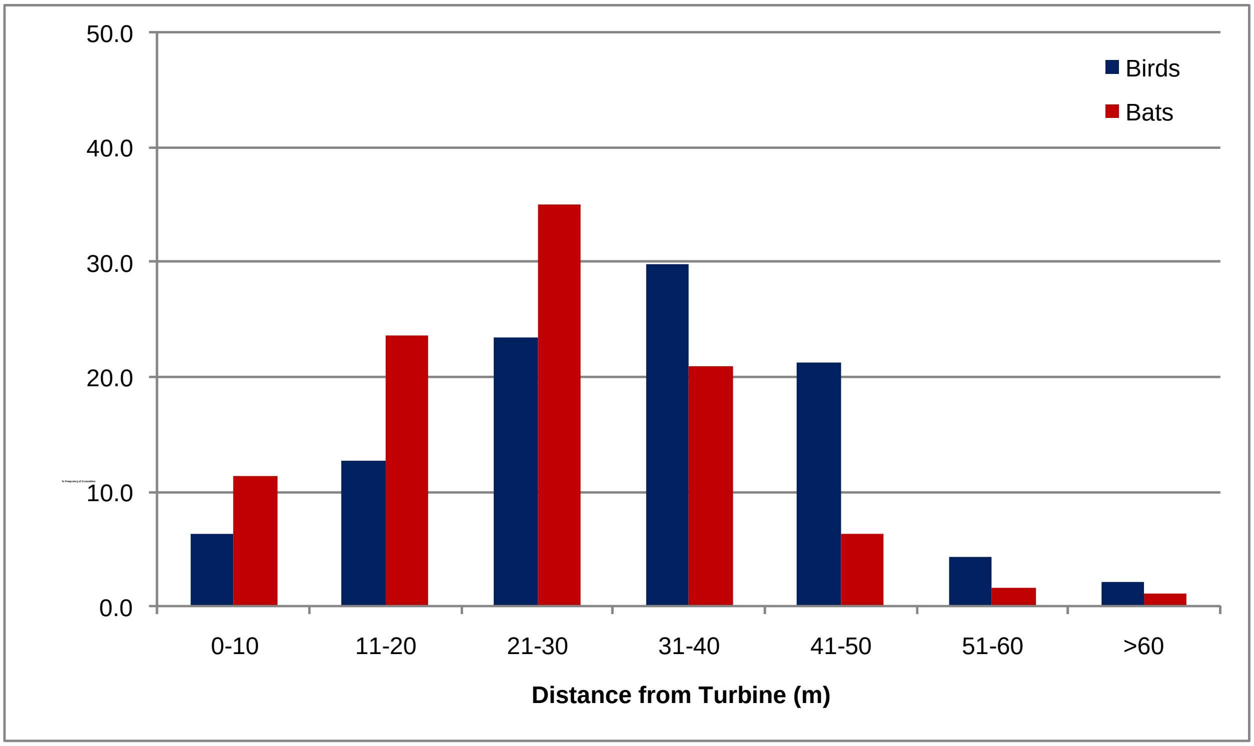
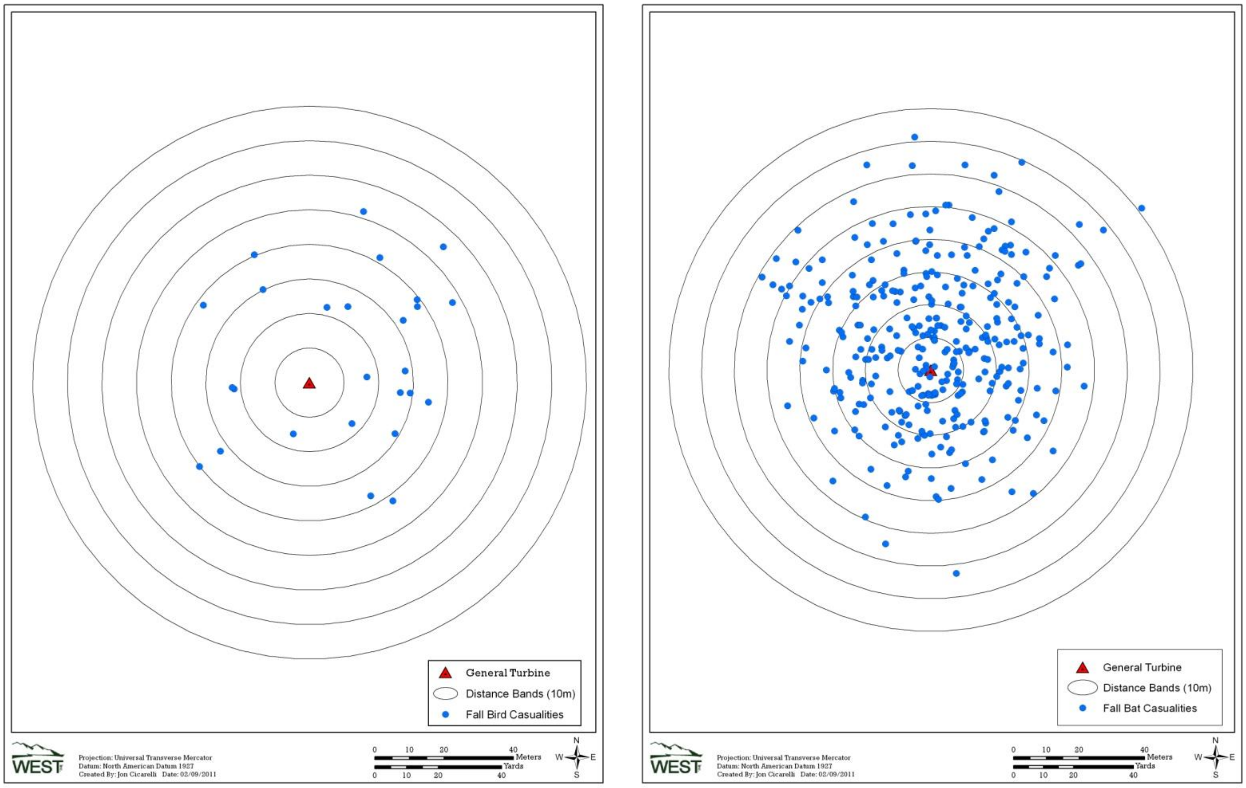


Table 5. Distribution of all bird and bat casualties among directional quadrants and distance from turbines.

	Percent of Bird Casualties	Percent of Bat Casualties
Quadrant		
NE	25.5	21.9
SE	44.7	33.8
SW	10.6	26.6
NW	19.1	17.7
Distance to Turbine (m)		
0 –10	6.38	11.41
11 - 20	12.77	23.61
21 - 30	23.40	35.01
31 – 40	29.79	20.95
41 – 50	21.28	6.37
51 – 60	4.26	1.59
>60	2.13	1.06

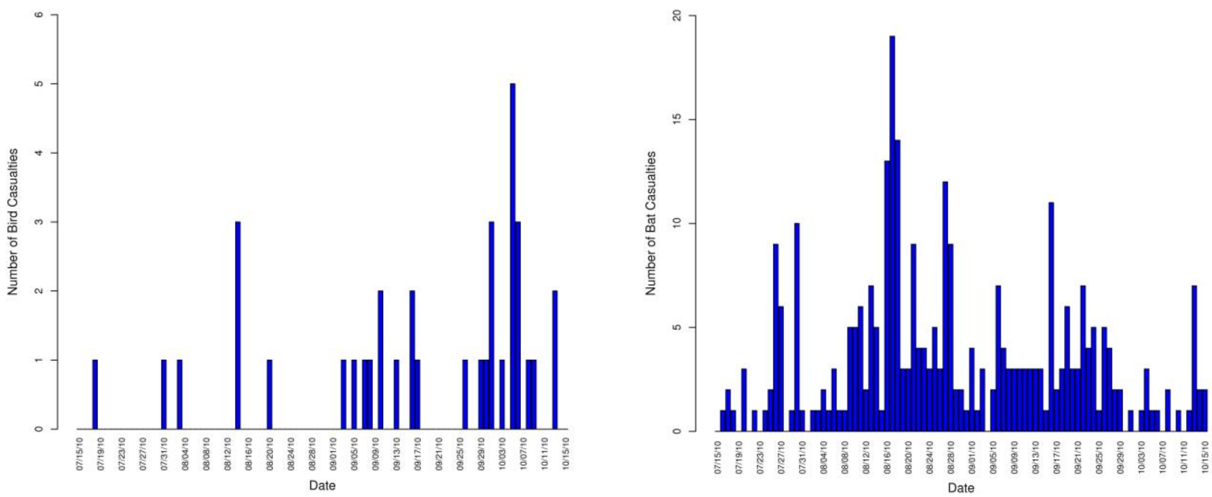
Figure 5. Plotted distribution of all bird and bat casualties around turbines.



The most common bird species found was turkey vulture, which accounted for 12.77% of all bird casualties found (three at scheduled search plots and three incidental finds; Table 4). All other species consisted of four casualties or less (Table 4).

The majority of bird casualties found during standardized searches were found towards the end of the study period (September and October; Figure 6). These casualties were not localized at one specific search turbine, and were spread throughout the study area. A complete account of all bird casualty data is presented in Appendix A.

Figure 6. Number of casualties found during standardized searches by study date.



3.3 Bat Casualties

Three hundred and eight bat casualties, representing seven identifiable species, were found at scheduled search plots, with an additional 73 bat casualties, representing six identifiable species, were found incidentally outside of designated search plots (Table 4). Bat casualties were found near all 25 search turbines and 40 non-searched turbines (incidental finds) (Table 3). The majority (91.0%) of all bat casualties, including incidental finds, were found within 40m of turbines (Table 5 and Figure 4). The majority of bat casualties were found in the southeast and southwest quadrants of the search plots (33.8% and 26.6%, respectively), with a lower percent of casualties being found in the northeast and northwest quadrants (21.9 % and 17.7%, respectively; Table 5 and Figure 5). The maximum number of bat casualties found at any one turbine was 25, at Turbine 86; 23 bats were found at Turbine 37, 20 bats were found at Turbine 81, 19 bats were found at Turbine 90, and 18 bats were found at Turbine 30 (Table 3).

Seven species of bats were found within the study area (Table 4). Eastern red bat was the most commonly found bat species (57.1% of all bat casualties, 217 individuals), followed by hoary bat (27.0%, 103 individuals). Silver-haired bat (23), tricolored bat (16), big brown bat (13), little brown bat (7)[2], and Seminole bat (2) were also found at scheduled search plots or incidentally.

Bat casualties were found throughout the study period (Figure 6). The majority of casualties found during standardized searches occurred during the months of August and September. Geographically, casualties were spread throughout the study area. A complete account of all bat casualty data is presented in Appendix A.

[2] All *Myotis* bats were turned over to WVDNR for species verification. The species identification of the *Myoti*s casualties were confirmed by WVDNR – all were little brown bats.

3.4 Searcher Efficiency Trials

Searcher efficiency trials were conducted throughout the study period from July 15 through October 13, 2010. A total of 24 large bird (hen mallards, rock pigeons) trial carcasses, 71 small bird (miscellaneous passerines provided by WVDNR) trial carcasses, and 87 bat carcasses (red bat, hoary bat, silver-haired bats, big brown bats, tri-colored bats) were used in the searcher efficiency trials (Table 6). The trial carcasses were placed on 26 different dates spread throughout the study period. The searchers were unaware of the date/time and location of the trial carcasses. Detection varied by carcass group with large birds having the highest detection rate (83%), followed by bats (44%), and small birds (37%).

Table 6. Results of searcher efficiency trials.

Size	Number Placed	Number Available	Number Found	Percent Found	90% Confidence Interval
Large Bird	24	23	19	83%	65-94%
Small Bird	71	57	21	37%	26-49%
Bat	87	68	30	44%	34-55%

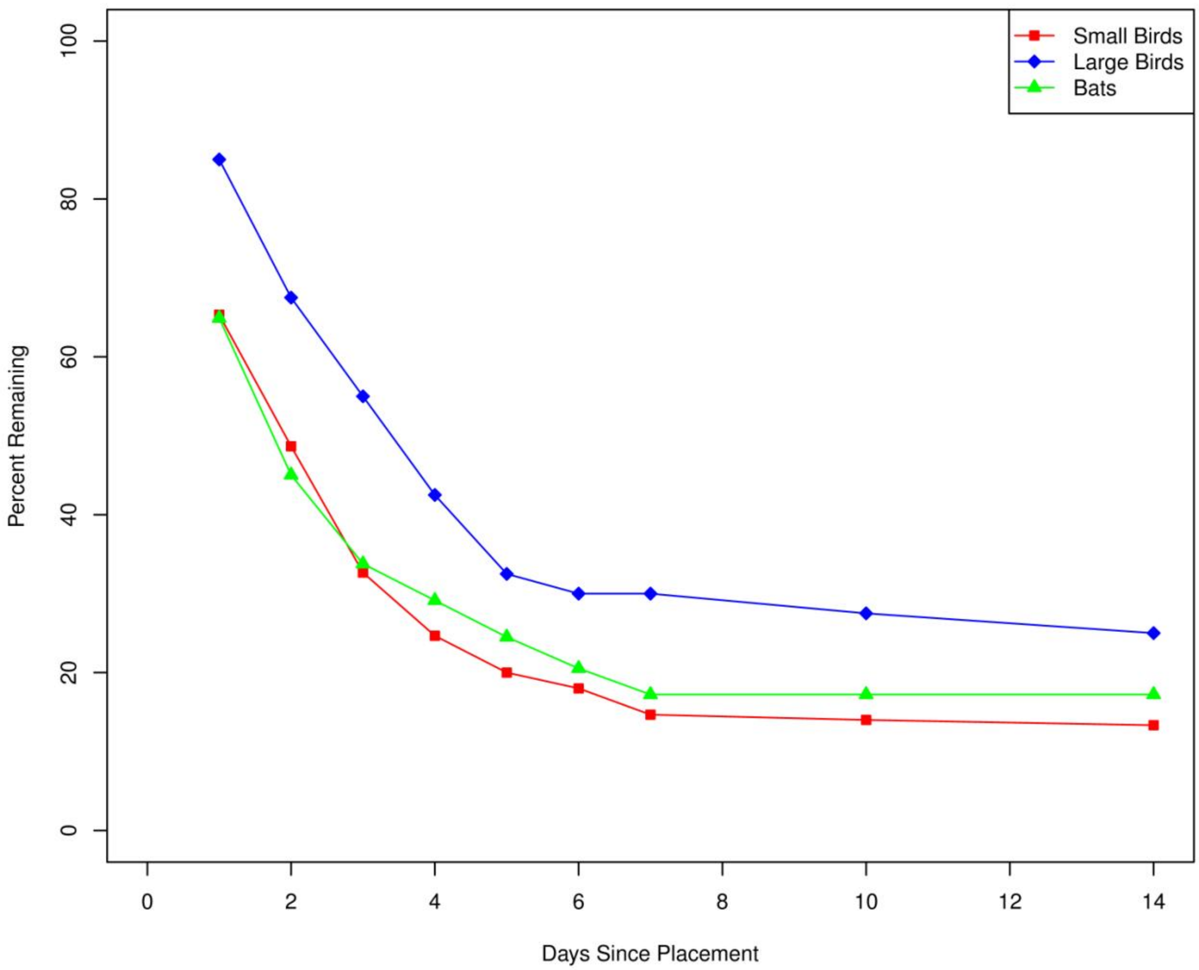
3.5 Carcass Removal Trials

The carcass removal trials were conducted between July 15 and October 7, 2010. A total of 18 large bird (hen mallards, rock pigeon) carcasses, 73 small bird (miscellaneous passerines provided by WVDNR) carcasses, and 73 bat carcasses (red bat, hoary bat, silver-haired bat, big brown bat, tri-colored bat) were placed in the field and monitored over a 14-day period. For large birds the mean length of stay was estimated at 5.20 days, for small birds it 3.08 days, and for bats it was 2.58 days (Table 7). For large birds, approximately 30% of carcasses remained after 14 days, for small birds approximately 18% of carcasses remained after 14 days, and for bats approximately 20% remained after 14 days (Figure 7).

Table 7. Results of carcass removal trials.

Carcass	Number	Mean Length of Stay (days)	90% Confidence Interval	Range (days)
Large bird	18	5.20	3.53-8.38	0.5 - 12
Small bird	73	3.08	2.47-4.06	0.5 - 12
Bat	73	2.58	1.97-3.27	0.5 - 6.5

Figure 7. Carcass removal rate by size class or taxa.



3.6 Adjusted Mortality Estimates

Estimates of mortality, standard errors, and confidence intervals were calculated for: (1) all birds, (2) small birds, (3) large birds, and (4) bats (Table 8). Only turbines that were running under normal operating parameters were used in the overall estimate of mortality. Those casualties found at treatment turbines for the turbine operations study (see Section 3.9 below) were not included in the analysis of overall mortality. All casualties found during standardized searches and any incidentals found within a search plot were used to calculate the mortality estimate. The estimates are adjusted based on the corrections for carcass removal and observer detection biases. The estimated average probability a small bird casualty would remain until a scheduled search and would be found was 0.52. The estimated average probability a large bird casualty would remain until a scheduled search and would be found was

0.85. The estimated average probability a bat casualty would remain until a scheduled search and would be found was 0.53 (Table 8).

Table 8. Mortality estimates for birds and bats for the study period July 15 – October 15 for the NedPower Mount Storm Wind Energy Facility.

	Daily Search Interval		
	Estimate	**SE**	**90% CI**
Search Area Adjustment (*A*)			
Large Birds	1.37		
Small Birds	1.35		
Bats	1.17		
Observer Detection (Searcher Efficiency Rates)			
Large Birds	0.83	0.08	0.70 – 0.96
Small Birds	0.37	0.06	0.26 – 0.47
Bats	0.44	0.06	0.34 – 0.54
Average Probability of Carcass Availability and Detected			
Large Birds	0.85	0.04	0.76 – 0.90
Small Birds	0.52	0.07	0.40 – 0.62
Bats	0.53	0.06	0.42 – 0.61
Observed Mortality Rates (number / turbine / study period)			
Large Birds	0.16	0.06	0.04 – 0.2
Small Birds	0.96	0.22	0.77 – 1.41
All Birds	1.12	0.25	0.86 – 1.59
Bats	10.08	0.84	8.52– 11.26
Estimated Mortality Rates (number / turbine / study period)			
Large Birds	0.26	0.11	0.06 – 0.43
Small Birds	2.51	0.70	1.84 – 4.18
All Birds	2.77	0.76	2.09 – 4.47
Bats	22.39	3.32	18.41 – 29.40

* Due to the limited study period, results of the studies are relevant only to the 13 week study period and should not be considered annual estimates of impacts or representative of other seasons.

3.6.1 Birds
The estimated number of all bird casualties per turbine for the study period and associated 90% confidence limits was 2.77 (2.09 – 4.47; Table 8). The estimate for all birds was the combined estimates for small and large birds. Mortality estimates were determined for large birds and small birds separately because of variable detection probability and removal rates.

Large Birds
The estimated number of large bird casualties per turbine for the study period and associated 90% confidence limits was 0.26 (0.06-0.43; Table 8).

Small Birds
The estimated number of small bird casualties per turbine for the study period and associated 90% confidence limits was 2.51 (1.84-4.18; Table 8).

3.6.2 Bats
The estimated number of bat casualties per turbine for the study period and associated 90% confidence limits was 22.39 (18.41-29.40; Table 8).

3.7 Weather Analysis

Weather data from the Project for the period April 16 through October 15 was used in the analysis. All weather and turbine factors were significantly correlated ($p < 0.1$) to bat mortality, including temperature ($r = 0.220$, $p = 0.003$, turbine blade rpm [$r = -0.314$, $p<0.001$], energy output ($r = -0.300$, $p<0.001$), mean wind speed ($r = -0.289$, $p<0.001$), mean wind speed squared ($r = -0.267$, $p<0.001$), median wind speed ($r = -0.282$, $p<0.001$), median wind speed squared ($r = -0.266$, $p<0.001$), and the proportion of nights with wind speed <4m/sec, 4-6m/sec, or >6m/sec ($r = 0.270$, $p<0.001$; $r = 0.128$, $p=0.084$; and $r = -0.275$, $p<0.001$ respectively; Table 9). A positive value for the correlation coefficient suggests that the two variables are positively correlated, indicating that an increase in the variable corresponds to an increase in bat mortality. A negative value for the correlation coefficient suggests that the two variables are negatively correlated, indicating that an increase in the variable corresponds to a decrease in bat mortality.

Multiple linear regression models were used to investigate all possible two variable models and interactions of variables. AICc values were used to determine the 10 best linear regression models of the total possible model combinations (Table 10). The four models selected as the best linear regression models included the variable tempc (mean nightly temperature; measured at turbines and averaged across sample turbines). Other variables that showed up more than once in the top 10 models included the variables mean nightly energy output, and mean turbine blade rpm. The R^2 values for the top ten models ranged from 0.11–0.13, indicating poor fit to the variation in the data.

Table 9. Univariate regressions and correlations between nightly weather and turbine variables and nightly bat mortality rate.

Variable	B_o	B_1	se	p	R^2	r
temperature (avg. nightly)	-0.005	0.006	0.002	**0.003**	0.048	0.220
turbine blade rpm(avg. nightly)	0.263	-0.015	0.003	**<0.001**	0.099	-0.314
energy output (avg. nightly)	0.142	-0.029	0.007	**<0.001**	0.090	-0.300
wind speed (mean nightly)	0.198	-0.017	0.004	**<0.001**	0.083	-0.289
mean wind speed (squared)	0.138	-0.001	0.0003	**<0.001**	0.071	-0.267
proportion of night with wind speed <4 m/sec	0.051	0.149	0.040	**<0.001**	0.073	0.270
wind speed (median nightly)	0.192	-0.016	0.004	**<0.001**	0.079	-0.282
proportion of night with wind speed >6 m/sec	0.150	-0.116	0.030	**<0.001**	0.076	-0.275
median wind speed (squared)	0.137	-0.001	0.0003	**<0.001**	0.071	-0.266
proportion of night with wind speed 4-6 m/sec	0.067	0.098	0.056	**0.084**	0.016	0.128

B_o = constant or intercept
B_1 = slope coefficient
se = standard error for slope coefficient
p = p-value for test of B_1=0
R^2 = R-squared for regression
r = Pearson's correlation coefficient

Table 10. Multiple regression models containing the best 2-variable and possible interactions between nightly weather and turbine variables and nightly bat mortality rates.

Variable	Coeff	SE	P	Variable	Coeff	SE	P
Model 1: AICc=-716.62, R2=0.13				**Model 6: AICc=-714.32, R2=0.12**			
Intercept	0.174	0.055	0.0017	Intercept	-0.008	0.047	0.8632
tempc	0.004	0.002	0.0191	wsp2	0.000	0.001	0.6789
rpmc	-0.014	0.003	<0.001	tempc	0.009	0.003	0.0012
				wsp2*tempc	0.000	0.000	0.0228
Model 2: AICc=-715.66, R2=0.13				**Model 7: AICc=-713.94, R2=0.11**			
Intercept	0.002	0.051	0.9703	Intercept	0.069	0.038	0.0695
tempc	0.008	0.003	0.0044	tempc	0.004	0.002	0.0316
powerc	0.003	0.016	0.8623	powerc	-0.025	0.007	<0.001
tempc*powerc	-0.002	0.001	0.0545				
Model 3: AICc=-715.66, R2=0.13				**Model 8: AICc=-713.94, R2=0.11**			
Intercept	0.002	0.051	0.9703	Intercept	0.069	0.038	0.0695
powerc	0.003	0.016	0.8623	powerc	-0.025	0.007	0.0004
tempc	0.008	0.003	0.0044	tempc	0.004	0.002	0.0316
powerc*tempc	-0.002	0.001	0.0545				
Model 4: AICc=-715.43, R2=0.13				**Model 9: AICc=-713.78, R2=0.11**			
Intercept	0.075	0.120	0.5337	Intercept	0.113	0.046	0.0142
tempc	0.011	0.007	0.1276	wspc	-0.015	0.004	<0.001
rpmc	-0.006	0.009	0.5577	tempc	0.005	0.002	0.0164
tempc*rpmc	-0.001	0.001	0.355				
Model 5: AICc=-714.90, R2=0.13				**Model 10: AICc=-713.53, R2=0.11**			
Intercept	-0.001	0.079	0.9889	Intercept	-0.030	0.033	0.3543
wspc	0.001	0.010	0.9404	tempc	0.005	0.002	0.0059
tempc	0.012	0.005	0.0103	p2c	0.139	0.039	<0.001
wspc*tempc	-0.001	0.001	0.0779				

3.8 Bat Acoustic Survey

Bat activity was monitored from April 18 to October 15, 2010 at four of the turbines included in the set of daily search turbines and at four reference stations (see Figure 4), for a total of 1,690 detector nights[3], with 706 detector nights at the reference stations and 984 detector nights at the turbine stations. Overall, a total of 74,559 bat passes were recorded for a mean of approximately 30.20 calls per detector-night over all Anabat stations (Table 11). Mean bat activity at the reference stations ranged from 16.56 bat passes per detector night to 42.81 bat passes per detector night, while mean bat activity at the turbine stations ranged from 17.44 bat passes per detector night to 49.70 bat passes per detector night (Table 14).

[3] The sum of the total number of nights each AnaBat was deployed.

Table 11. Results of AnaBat detector sampling during the study period.

		Total Calls				Calls per Detector Night				
Station	Detector Nights	High Freq	Mid Freq	Low Freq	Total	High Freq	Mid Freq	Low Freq	Total	90% Confidence Interval
T203	170	6422	1855	1615	9892	37.78	10.91	9.50	58.19	50.34-66.02
T203N[1]	88	142	349	344	835	1.61	3.97	3.91	9.49	6.00-12.98
T225	171	2162	1501	1199	4862	12.64	8.78	7.01	28.43	24.58-32.28
T225N	28	31	65	76	172	1.11	2.32	2.71	6.14	2.93-9.35
T37	181	1566	427	1161	3154	8.65	2.36	6.41	17.43	15.53-19.32
T37N	88	3	162	334	499	0.03	1.84	3.80	5.67	4.24-7.10
T81	181	3017	1445	3412	7874	16.67	7.98	18.85	43.50	37.95-49.06
T81N	77	109	218	257	584	1.42	2.83	3.34	7.58	5.60-9.57
Ground	703	13167	5228	7387	25782	18.73	7.44	10.51	36.67	34.25-39.09
90 % confidence interval						(17.91-19.55)	(7.21-7.67)	(10.15-10.87)		
Nacelle	281	285	794	1011	2090	1.01	2.83	3.60	7.44	6.31-8.57
90% confidence interval						(0.97-1.06)	(2.77-2.88)	(3.56-3.63)		
Subtotal	984	13452	6022	8398	27872	13.67	6.12	8.53	28.33	26.77-29.89
90% confidence interval						(12.56-14.78)	(5.83-6.41)	(8.10-8.97)		
REF1	170	4290	4929	6218	15437	25.24	28.99	36.58	90.81	80.90-100.7
REF2	181	920	425	848	2193	5.08	2.35	4.69	12.12	11.12-13.11
REF3	181	16321	3581	3514	23416	90.17	19.78	19.41	129.37	109.57-149.15
REF4	174	4175	851	615	5641	23.99	4.89	3.53	32.42	25.15-39.69
Subtotal	706	25706	9786	11195	46687	36.41	13.86	15.86	66.13	60.39-71.97
90% Confidence Interval						(31.51-41.31)	(12.33-15.39)	(13.76-17.95)		
Total	1690	39158	15808	19593	74559	23.17	9.35	11.59	44.12	41.03-47.20
90% confidence interval						(20.95-25.39)	(8.59-10.12)	(10.63-12.56)		

[1] N= nacelle based Anabat unit
* significant difference between reference stations and turbine sampling stations

In general, bat activity appeared to be fairly uniform across most of the sampling locations. More total bat passes were recorded at the reference stations (46,687) than at the turbine stations (27,872) and the overall number of passes per detector-night was higher for reference stations (66.13) than turbine stations (36.67 for ground units). For all the ground based Anabat units, bat activity was highest at reference station 3 and lowest at reference station 2 number (Table 14). Overall the average number of calls per detector-night between the turbine stations and the reference stations was not significantly different, although there were significant differences between individual stations (e.g., REF2 < REF3).

When comparing the different groups of bats (high-frequency, mid-frequency, low-frequency) there were significantly more high-frequency calls recorded than mid-frequency or low frequency calls (Table 11), and more high-frequency calls recorded at reference stations than the turbine stations. When comparing the different turbine based Anabats (ground versus nacelle), there were significantly fewer calls recorded at the nacelle Anabat than the ground based Anabats. For the nacelle Anabats, low-frequency calls were the most abundant (Table 11).

Bat passes per detector night generally increased through the study period (Figures 8 and 9). At the turbine stations the overall number of bat passes recorded increased through the study period but then dropped off substantially after approximately September 23 (Figure 8). For the reference stations, the period of highest all bat activity was from late-May to late-June and there was a second peak in all bat activity from late-August to mid-September (Figure 9). Low-frequency passes were highest at the reference stations in spring but were highest at the turbine stations in the fall (Figure 8 and 9). High-frequency passes generally followed the same pattern for all bat passes at both the reference and turbine stations (Figures 8 and 9).

Figure 8. Bat activity at the turbine Anabat stations by date for the study period.

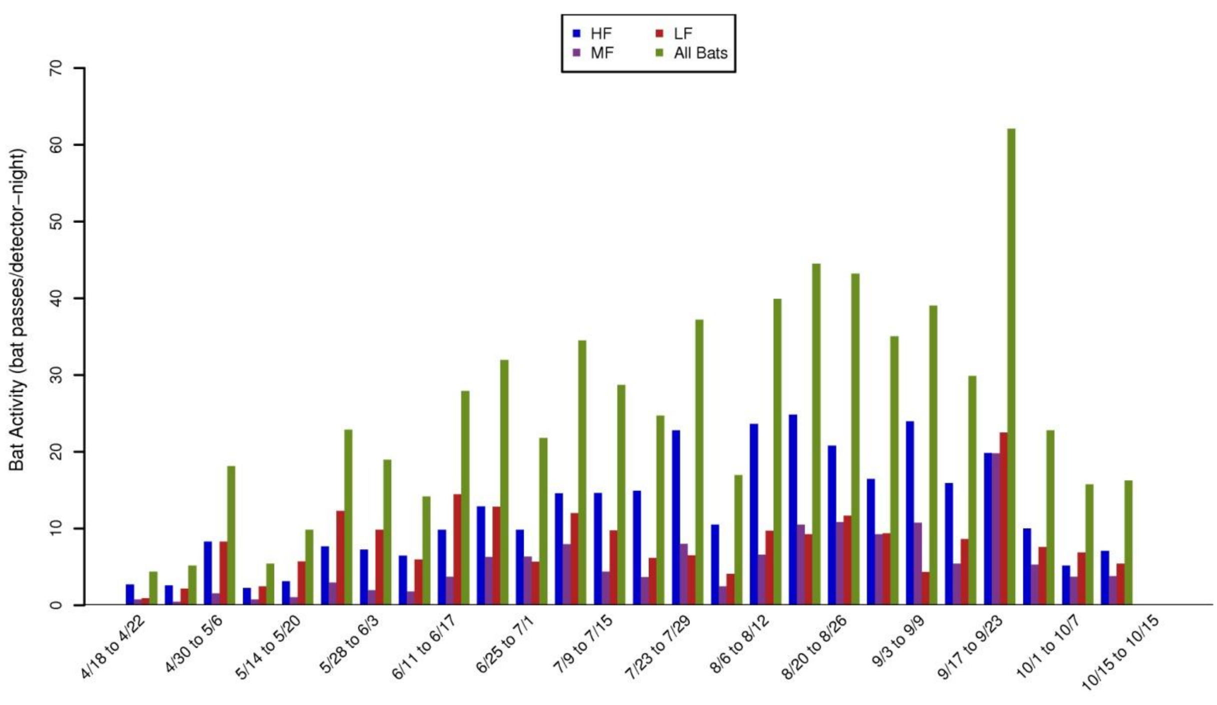
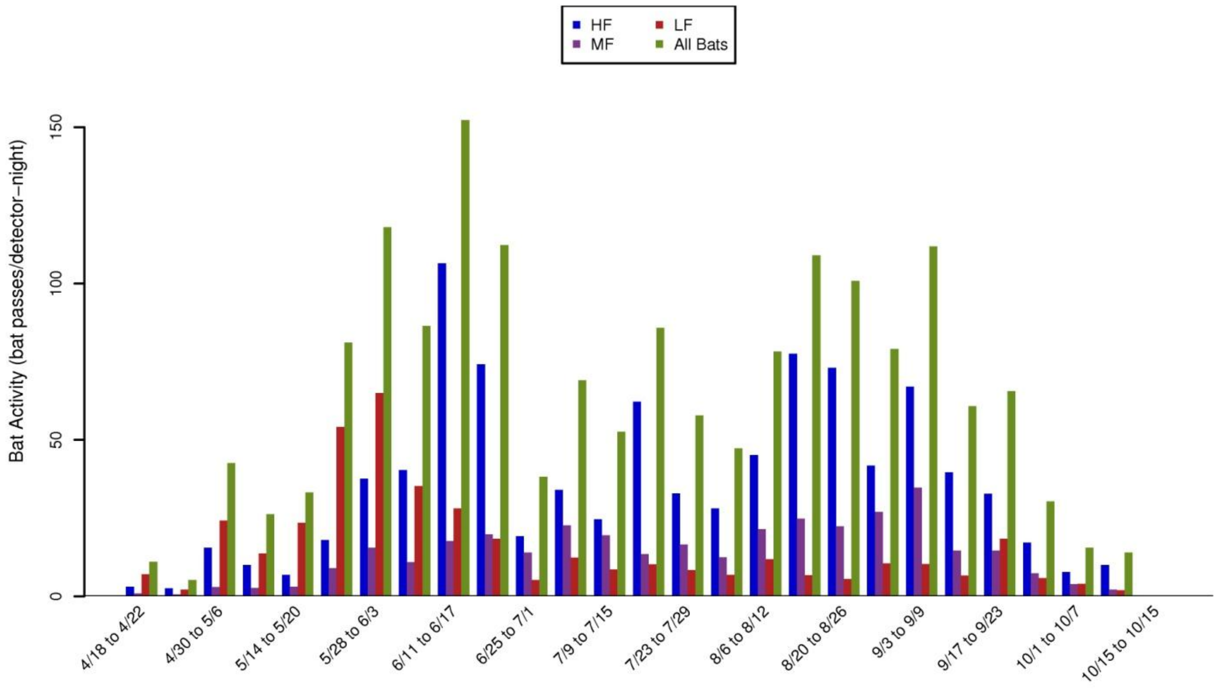
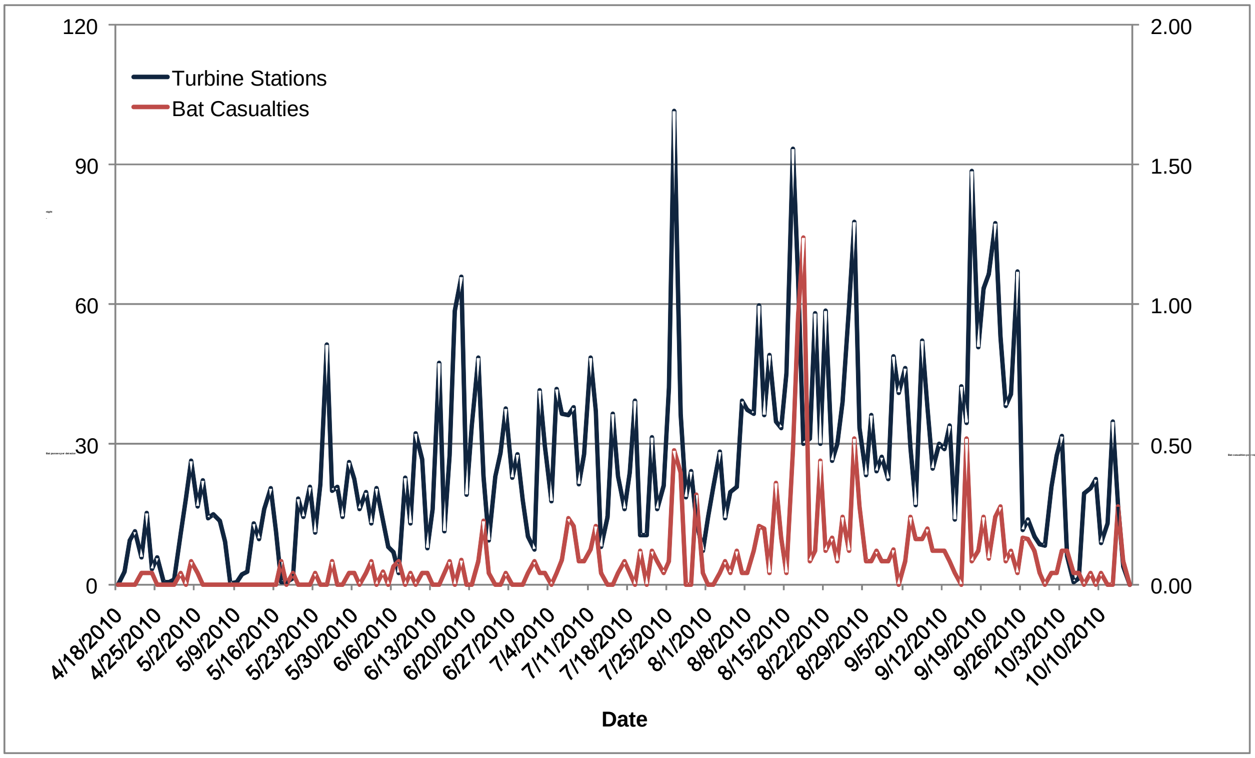


Figure 9. Bat activity at the reference Anabat stations by date for the study period.



Temporal patterns in bat mortality and bat activity did not match closely over the study period (Figure 10). Bat activity was generally highest from August through mid-September, which corresponded to the period with the highest bat mortality; however, from May through July bat activity was fairly high without corresponding high bat mortality (Figure 10).

Figure 10. Comparison of bat casualties and bat activity over the study period.



3.9 Turbine Operations Study

The analysis for the turbine operations study considered two different data sets: those including nights when the treatments were cancelled because the weather forecast was for wind speeds greater than 4.0 m/s (9 mph) and those excluding nights when treatments were cancelled (i.e., only those nights when turbine rotation was restricted).

3.9.1 Including Nights with Cancelled Treatments

A total of 256 bat casualties were found during the study period (July 15 – October 13), and were accounted for in the turbine operations analysis that includes nights with cancelled treatments. One-hundred and eleven bat casualties were found at turbines that were not curtailed (control turbines) during the turbine operations study nights (Table 12). This compares to 59 bat casualties found at turbines with rotation restricted during the first half of the night (treatment A) and 86 bat casualties found at turbines with rotation restricted during the second half of the night (treatment B; Table 12). This resulted in observed daily casualty rates and corresponding 90% bootstrap confidence intervals of 0.151 (0.114 – 0.187), 0.080 (0.052 – 0.109), and 0.117 (0.093 – 0.141) bats/turbine/study period for control, treatment A, and treatment B conditions, respectively (Table 12). Disjoint confidence intervals for observed casualty rates under treatment A and control suggest a significant difference between casualties at turbines with rotation restricted during the first part of the night versus control turbines at a

0.10 alpha level. Overlapping confidence intervals for observed casualty rates under treatment B and control and between treatments A and B suggest that there was no significant difference at a 0.10 alpha level between casualties at turbines with rotation restricted during the second part of the night versus control turbines or treatment A turbines (Table 12).

Table 12. Bat casualties by turbine treatment group for all nights of the turbine operations study.

Species	Total Bats	Control Count	Treatment A	Treatment B
big brown bat	7	3	1	3
eastern red bat	151	63	37	51
hoary bat	66	32	19	15
Seminole bat	1	1	0	0
silver-haired bat	18	7	1	10
little brown bat	3	0	1	2
tri-colored bat	10	5	0	5
Total	**256**	**111**	**59**	**86**
Observed casualty rate[1] (90% CI)		**0.151 (0.114-0.187)**	**0.080 (0.052-0.109)**	**0.117 (0.093-0.141)**

[1] bats/turbine/study period

Poisson modeling of observed casualty rates resulted in significant treatment covariates. The parameter estimate for treatment A (turbine rotation restricted during first part of night) was -0.63, which implies that the odds of a casualty occurring when turbine rotation is restricted during the first part of the night are 1.88 times less likely than with normal operations, with all other variables being equal. Variable selection tests for this covariate were significant ($z = -3.92$, p-value < 0.01), suggesting that restricting turbine rotation during the first part of the night has a significant effect in explaining differences in observed casualty rates among treatment A and control turbines. Parameter estimates for restricted turbine rotation during the second part of the night were also significant in the model ($z= -1.78$, p-value= 0.08) with a value of -0.26. This corresponds to approximately 1.29 times the odds of a casualty occurring with normal operations than when turbine rotation is restricted during the second part of the night, all other variables being equal. A nightly paired t-test comparison between the two treatments (first part of night, and second part of night) showed that the difference between them was significant at alpha=0.10 ($t=-1.84$, $p=0.068$).

3.9.2 Excluding Nights with Cancelled Treatments

A total of 104 bat casualties were found during the study period (July 15 – October 15) on nights when the two treatments were in place, and were accounted for in the turbine operations analysis that excluded nights with cancelled treatments. Fifty-nine of these bat casualties were found at the normally operating turbines (control turbines) during treatment nights (Table 13). This compares to 16 bat casualties found at turbines with rotation restricted during the first half of the night (treatment A) and 29 bat casualties found at turbines with rotation restricted during second half of the night (treatment B; Table 13). This resulted in observed daily casualty rates and corresponding 90% bootstrap confidence intervals of 0.18 (0.13 – 0.22), 0.05 (0.03 – 0.07), and 0.09 (0.06 – 0.12) bats/turbine/study period for control, treatment A, and treatment B conditions, respectively. Disjoint confidence intervals for observed casualty rates under each treatment suggest a significant difference between casualties at turbines with rotation restricted versus control turbines at a 0.10 alpha level.

Table 13. Bat casualties by treatment group excluding nights with cancelled treatments.

Species	Total Bats	Control Count	Treatment A	Treatment B
big brown bat	2	1	0	1
eastern red bat	62	34	9	19
hoary bat	27	14	7	6
seminole bat	1	1	0	0
silver-haired bat	5	5	0	0
tri-colored bat	7	4	0	3
Overall	**104**	**59**	**16**	**29**
Observed casualty rate[1] (90% CI)		**0.18 (0.13-0.22)**	**0.05 (0.03-0.07)**	**0.09 (0.06-0.12)**

[1] bats/turbine/study period

Poisson modeling of observed casualty rates resulted in significant treatment covariates. The parameter estimate for the treatment A (turbine rotation restricted during first part of night) was -1.3, which implies that the odds of a casualty occurring when turbine rotation is restricted during the first part of the night are 3.69 times less likely than with normal operations, with all other variables being equal. Variable selection tests for this covariate were significant ($z = -4.63$, p-value < 0.01), suggesting that restricting turbine rotation during the first part of the night has a significant effect in explaining differences in observed casualty rates. Parameter estimates for restricted turbine rotation during the second part of the night were also significant in the model ($z= -3.13$, p-value < 0.01) with a value of -0.71. This corresponds to approximately 2 times the odds of a casualty occurring with normal operations than when turbine rotation is restricted during the second part of the night, all other variables being equal. A nightly paired t-test comparison between the two treatments (first part of night, and second part of night) showed that the difference between them was not significant (t=-1.57, p=0.124).

4.0 SUMMARY/DISCUSSION

While a primary objective of the study is to help meet conditions of the WVPSC certificate for the facility, it is also the intent of this study to conduct monitoring surveys that will provide basic information about the impacts of the facility on birds and bats, test the field methods and sample design for adequacy in estimating overall impacts, investigate conditions under which bird and bat casualties occur, and investigate the effectiveness of certain turbine operational adjustments on reducing bat mortality. The overall study plan is similar to other studies of wind projects in the region and the eastern U.S. and utilized results from the 2009 monitoring year to help design the study for 2010.

Estimates of searcher efficiency and carcass removal were generally similar to the results of the 2008 and 2009 surveys (see Young et al. 2009a, 2009b, 2010). The estimator used in the analysis for this study is based on the assumption that searcher efficiency is constant as a function of time since death, and that bats or birds missed on a search can be detected on subsequent searches if they are available (not removed). This effectively takes into consideration that a carcass not found on the first day after death may still be available for detection on subsequent search days. The estimator also takes into consideration the variable size and shape of the search plots by accounting for the decreasing percent of area searched with distance from the turbine. In the present study, searcher efficiency and carcass removal values specific to bats were used to estimate bat mortality. Other studies have used bias correction factors for small birds as a surrogate for bats because of limited availability of fresh bat carcasses. As in the previous years, this study used recovered bat carcasses to measure searcher efficiency and carcass removal for bats. These factors included in the calculation provide greater confidence in the estimated mortality rate; however, the estimator does not take into consideration background mortality and so may provide an overestimate of actual mortality due to the turbines. For example, if a carcass is found on the road during scheduled carcass searches the true cause of death is unknown (e.g. road kill or turbine collision), therefore it is included in the data set as observed casualties. Background mortality, however, is more of an issue with birds, and is likely to be low for bats.

During the study, potential differences in search efficiency and carcass removal as a function of visibility due to vegetation conditions were considered. Vegetation management measures, specifically mowing, were conducted periodically throughout the study period with the intent of reducing the variability in visibility due to vegetation within the search plots. During the study, the estimated visibility class (easy visibility, moderate visibility, difficult visibility) in which searcher efficiency and removal trial carcasses were placed was recorded. Based on a comparison of the mean searcher efficiency and mean length of stay for bat carcasses, there were no differences among the visibility classes. For example, searcher efficiency for bats in the easy class was 46%, in the moderate class was 48%, and in the difficult class was 34%.

Mean length of stay for bat carcasses in the easy visibility class was 3.08 days, in the moderate class was 3.06 days, and in the difficult class was 3.90 days. These searcher efficiency or carcass removal rates were not statistically different, so the overall analysis did not require estimates of mortality by the different visibility class. The vegetation management measures appeared to have achieved the desired result of facilitating the monitoring study by minimizing potential biases in casualty recovery due to vegetation.

4.1 Turbine Operations Study

During the 2010 study, the effectiveness of certain turbine operational adjustments on reducing bat mortality was investigated through restriction of turbine rotation (up to the cut-in speed) during nights with projected low wind speed. The study also investigated the effectiveness of employing these operational adjustments during different portions of the night in minimizing bat mortality. Essentially, the first half of the night (defined as five hours after sunset) was compared to the second half of the night (defined as five hours prior to sunrise). For the study, the decision to restrict turbine rotation was made based on the forecasted wind speeds for the night. The previous studies (see Young et al. 2009a, 2010a) found that bat mortality was highest on nights when wind speeds were generally low. The normal turbine cut-in speed (the wind speed at which the turbines begin producing electricity) for the Mount Storm turbines is 4.0 m/s (~ 9 mph). For nights when wind speed was predicted to be less than 9 mph, the turbine blades were feathered to prevent the turbines from freewheeling or only spin at very low rpms (generally less than 1 rpm). The analysis for this study was conducted in two manners – for the entire study period and for only those nights when the operational adjustments were in place. The study period occurred from July 15 to October 13, a period of 13 weeks (91 days). During this period treatment A – the first half of the night – was in place for 32 of 91 days (32%) and treatment B – the second half of the night – was in place for 37 of 91 days (40%). The analysis of the carcass search results was conducted by (1) including all nights of the study and (2) excluding the nights when the treatments were not in effect (when no operational adjustments occurred). For both analyses, restricting turbine rotation during the first half of the night reduced bat mortality by 47% and 72% respectively, which were significantly different than the control group (normally operating turbines). For the second half of the night, the reduction in bat mortality was not as great but still resulted in 22% and 50% reduction for the two analyses respectively. Results of this study confirm the previous findings that bat mortality is greatest on nights with lower wind speeds. Results also suggest that bat mortality is greatest during the first half of the night when other studies have shown that bat activity is greatest (Hayes 1997, Arnett et al. 2005, Kunz 2004, Kunz and Lumsden 2003).

4.2 Other Observations

- None of the birds of bats found were listed as Federal endangered, threatened, proposed or candidate species.

- Overall data and observations from this study period confirm the adequacy of the study design and sampling effort to estimate impacts from the NedPower Mount Storm Wind Energy Facility on birds and bats.

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Appendix A – All Bird and Bat Casualties Found During the Fall 2010 Study Period at the NedPower Mount Storm Wind Energy Facility. *NOTE: highlighted carcasses identified by WVDNR.*

Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
BATS					
071610-BBBA-209-1	7 /16/2010	big brown bat	209	Y	intact
071710-HOBA-5-1	7 /17/2010	hoary bat	5	Y	intact
071710-HOBA-83-1	7 /17/2010	hoary bat	83	Y	intact
071810-ERBA-86-1	7 /18/2010	eastern red bat	86	Y	complete
072010-ERBA-17-1	7 /20/2010	eastern red bat	17	Y	intact
072010-HOBA-17-1	7 /20/2010	hoary bat	17	Y	intact
072010-TRBA-30-1	7 /20/2010	tricolored bat	30	Y	intact
072210-ERBA-35-1	7 /22/2010	eastern red bat	35	N	complete
072210-ERBA-88-1	7 /22/2010	eastern red bat	88	N	intact
072210-HOBA-73-1	7 /22/2010	hoary bat	73	Y	intact
072310-ERBA-36-1	7 /23/2010	eastern red bat	36	N	intact
072310-ERBA-52-1	7 /23/2010	eastern red bat	52	N	intact
072410-HOBA-83-1	7 /24/2010	hoary bat	83	Y	complete
072510-ERBA-25-1	7 /25/2010	eastern red bat	25	Y	complete
072510-HOBA-211-1	7 /25/2010	hoary bat	211	N	intact
072510-HOBA-90-1	7 /25/2010	hoary bat	90	Y	scavenged
072610-ERBA-215-1	7 /26/2010	eastern red bat	215	Y	intact
072610-ERBA-30-1	7 /26/2010	eastern red bat	30	Y	intact
072610-ERBA-57-1	7 /26/2010	eastern red bat	57	Y	complete
072610-ERBA-64-1	7 /26/2010	eastern red bat	64	Y	complete
072610-ERBA-81-1	7 /26/2010	eastern red bat	81	Y	complete
072610-ERBA-86-1	7 /26/2010	eastern red bat	86	Y	complete
072610-HOBA-1-1	7 /26/2010	hoary bat	1	N	intact
072610-HOBA-58-1	7 /26/2010	hoary bat	58	N	intact
072610-HOBA-75-1	7 /26/2010	hoary bat	75	N	scavenged
072610-HOBA-86-1	7 /26/2010	hoary bat	86	Y	complete
072610-HOBA-90-1	7 /26/2010	hoary bat	90	Y	intact
072610-TRBA-77-1	7 /26/2010	tricolored bat	77	Y	complete
072710-BBBA-55-1	7 /27/2010	big brown bat	55	N	intact
072710-ERBA-203-1	7 /27/2010	eastern red bat	203	Y	intact
072710-ERBA-204-1	7 /27/2010	eastern red bat	204	N	intact
072710-ERBA-36-1	7 /27/2010	eastern red bat	36	N	intact
072710-ERBA-55-1	7 /27/2010	eastern red bat	55	N	intact
072710-ERBA-81-1	7 /27/2010	eastern red bat	81	Y	intact
072710-ERBA-92-1	7 /27/2010	eastern red bat	92	Y	intact
072710-HOBA-205-1	7 /27/2010	hoary bat	205	N	intact
072710-HOBA-26-1	7 /27/2010	hoary bat	26	N	intact
072710-HOBA-57-1	7 /27/2010	hoary bat	57	Y	intact
072710-LBBA-5-1	7 /27/2010	little brown bat	5	Y	complete
072710-TRBA-77-1	7 /27/2010	tricolored bat	77	Y	intact
072910-BBBA-30-1	7 /29/2010	big brown bat	30	Y	intact
073010-BBBA-17-1	7 /30/2010	big brown bat	17	Y	intact
073010-BBBA-57-1	7 /30/2010	big brown bat	57	Y	intact
073010-ERBA-220-1	7 /30/2010	eastern red bat	220	Y	intact
073010-ERBA-220-2	7 /30/2010	eastern red bat	220	Y	intact
073010-ERBA-77-1	7 /30/2010	eastern red bat	77	Y	intact
073010-ERBA-81-1	7 /30/2010	eastern red bat	81	Y	intact
073010-HOBA-57-1	7 /30/2010	hoary bat	57	Y	intact
073010-HOBA-83-1	7 /30/2010	hoary bat	83	Y	intact
073010-HOBA-86-1	7 /30/2010	hoary bat	86	Y	scavenged
073010-LBBA-225-1	7 /30/2010	little brown bat	225	Y	intact
073110-BBBA-81-1	7 /31/2010	big brown bat	81	Y	intact
080210-HOBA-86-1	8 /2 /2010	hoary bat	86	Y	scavenged
080310-HOBA-57-1	8 /3 /2010	hoary bat	57	Y	intact
080410-ERBA-209-1	8 /4 /2010	eastern red bat	209	Y	intact

Appendix A – All Bird and Bat Casualties Found During the Fall 2010 Study Period at the NedPower Mount Storm Wind Energy Facility. *NOTE: highlighted carcasses identified by WVDNR.*

Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
080410-HOBA-64-1	8 /4 /2010	hoary bat	64	Y	intact
080510-HOBA-54-1	8 /5 /2010	hoary bat	54	Y	intact
080610-HOBA-37-1	8 /6 /2010	hoary bat	37	Y	intact
080610-HOBA-86-1	8 /6 /2010	hoary bat	86	Y	intact
080610-HOBA-90-1	8 /6 /2010	hoary bat	90	Y	intact
080710-HOBA-77-1	8 /7 /2010	hoary bat	77	Y	intact
080810-ERBA-30-1	8 /8 /2010	eastern red bat	30	Y	intact
080910-ERBA-25-1	8 /9 /2010	eastern red bat	25	Y	intact
080910-ERBA-54-1	8 /9 /2010	eastern red bat	54	Y	intact
080910-HOBA-209-1	8 /9 /2010	hoary bat	209	Y	intact
080910-LBBA-215-1	8 /9 /2010	little brown bat	215	Y	scavenged
080910-TRBA-209-1	8 /9 /2010	tricolored bat	209	Y	scavenged
081010-ERBA-86-1	8 /10/2010	eastern red bat	86	Y	intact
081010-HOBA-30-1	8 /10/2010	hoary bat	30	Y	intact
081010-HOBA-30-2	8 /10/2010	hoary bat	30	Y	intact
081010-HOBA-47-1	8 /10/2010	hoary bat	47	Y	intact
081010-HOBA-90-1	8 /10/2010	hoary bat	90	Y	intact
081110-ERBA-209-1	8 /11/2010	eastern red bat	209	Y	intact
081110-ERBA-215-1	8 /11/2010	eastern red bat	215	Y	scavenged
081110-ERBA-5-1	8 /11/2010	eastern red bat	5	Y	intact
081110-HOBA-30-1	8 /11/2010	hoary bat	30	Y	intact
081110-TRBA-209-1	8 /11/2010	tricolored bat	209	Y	intact
081110-TRBA-81-1	8 /11/2010	tricolored bat	81	Y	intact
081210-ERBA-57-1	8 /12/2010	eastern red bat	57	Y	intact
081210-HOBA-90-1	8 /12/2010	hoary bat	90	Y	intact
081310-BBBA-23-1	8 /13/2010	big brown bat	23	N	intact
081310-BBBA-86-1	8 /13/2010	big brown bat	86	Y	intact
081310-ERBA-40-1	8 /13/2010	eastern red bat	40	Y	intact
081310-ERBA-77-1	8 /13/2010	eastern red bat	77	Y	intact
081310-HOBA-33-1	8 /23/2010	hoary bat	33	N	intact
081310-HOBA-37-1	8 /13/2010	hoary bat	37	Y	intact
081310-HOBA-40-1	8 /13/2010	hoary bat	40	Y	intact
081310-LBBA-83-1	8 /13/2010	little brown bat	83	Y	intact
081310-LBBA-92-1	8 /13/2010	little brown bat	92	Y	intact
081410-ERBA-54-1	8 /14/2010	eastern red bat	54	Y	complete
081410-ERBA-77-1	8 /14/2010	eastern red bat	77	Y	complete
081410-ERBA-81-1	8 /14/2010	eastern red bat	81	Y	intact
081410-ERBA-86-1	8 /14/2010	eastern red bat	86	Y	intact
081410-ERBA-92-1	8 /14/2010	eastern red bat	92	Y	complete
081510-ERBA-40-1	8 /15/2010	eastern red bat	40	Y	intact
081610-BBBA-81-1	8 /16/2010	big brown bat	81	Y	intact
081610-ERBA-21-1	8 /16/2010	eastern red bat	21	Y	intact
081610-ERBA-241-1	8 /16/2010	eastern red bat	241	Y	intact
081610-ERBA-37-1	8 /16/2010	eastern red bat	37	Y	intact
081610-ERBA-73-1	8 /16/2010	eastern red bat	73	Y	intact
081610-ERBA-90-1	8 /16/2010	eastern red bat	90	Y	intact
081610-ERBA-90-2	8 /16/2010	eastern red bat	90	Y	intact
081610-ERBA-90-3	8 /16/2010	eastern red bat	90	Y	dismembered
081610-HOBA-17-1	8 /16/2010	hoary bat	17	Y	intact
081610-HOBA-30-1	8 /16/2010	hoary bat	30	Y	dismembered
081610-HOBA-35-1	8 /16/2010	hoary bat	35	N	complete
081610-HOBA-47-1	8 /16/2010	hoary bat	47	Y	intact
081610-HOBA-86-1	8 /16/2010	hoary bat	86	Y	intact
081610-HOBA-90-1	8 /16/2010	hoary bat	90	Y	scavenged
081710-ERBA-17-1	8 /17/2010	eastern red bat	17	Y	intact
081710-ERBA-17-2	8 /17/2010	eastern red bat	17	Y	intact

Appendix A – All Bird and Bat Casualties Found During the Fall 2010 Study Period at the NedPower Mount Storm Wind Energy Facility. *NOTE: highlighted carcasses identified by WVDNR.*

Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
081710-ERBA-17-3	8 /17/2010	eastern red bat	17	Y	intact
081710-ERBA-17-4	8 /17/2010	eastern red bat	17	Y	intact
081710-ERBA-208-1	8 /17/2010	eastern red bat	208	N	intact
081710-ERBA-225-1	8 /17/2010	eastern red bat	225	Y	intact
081710-ERBA-25-1	8 /17/2010	eastern red bat	25	Y	intact
081710-ERBA-37-1	8 /17/2010	eastern red bat	37	Y	intact
081710-ERBA-37-2	8 /17/2010	eastern red bat	37	Y	intact
081710-ERBA-40-1	8 /17/2010	eastern red bat	40	Y	intact
081710-ERBA-40-3	8 /17/2010	eastern red bat	40	Y	intact
081710-ERBA-42-1	8 /17/2010	eastern red bat	42	N	intact
081710-ERBA-42-2	8 /17/2010	eastern red bat	42	N	intact
081710-ERBA-47-1	8 /17/2010	eastern red bat	47	Y	intact
081710-ERBA-49-1	8 /17/2010	eastern red bat	49	N	intact
081710-ERBA-73-1	8 /17/2010	eastern red bat	73	Y	intact
081710-HOBA-206-1	8 /17/2010	hoary bat	206	N	intact
081710-HOBA-21-1	8 /17/2010	hoary bat	21	Y	intact
081710-HOBA-241-1	8 /17/2010	hoary bat	241	Y	intact
081710-HOBA-25-1	8 /17/2010	hoary bat	25	Y	intact
081710-HOBA-40-2	8 /17/2010	hoary bat	40	Y	intact
081710-HOBA-86-1	8 /17/2010	hoary bat	86	Y	intact
081710-HOBA-86-2	8 /17/2010	hoary bat	86	Y	intact
081710-HOBA-90-1	8 /17/2010	hoary bat	90	Y	intact
081810-ERBA-30-1	8 /18/2010	eastern red bat	30	Y	intact
081810-ERBA-30-2	8 /18/2010	eastern red bat	30	Y	intact
081810-ERBA-37-1	8 /18/2010	eastern red bat	37	Y	scavenged
081810-ERBA-40-1	8 /18/2010	eastern red bat	40	Y	intact
081810-ERBA-46-1	8 /18/2010	eastern red bat	46	N	intact
081810-ERBA-46-2	8 /18/2010	eastern red bat	46	N	intact
081810-ERBA-46-3	8 /18/2010	eastern red bat	46	N	intact
081810-ERBA-49-1	8 /18/2010	eastern red bat	49	N	intact
081810-ERBA-49-2	8 /18/2010	eastern red bat	49	N	intact
081810-ERBA-51-1	8 /18/2010	eastern red bat	51	N	intact
081810-ERBA-51-2	8 /18/2010	eastern red bat	51	N	intact
081810-ERBA-54-1	8 /18/2010	eastern red bat	54	Y	intact
081810-ERBA-54-2	8 /18/2010	eastern red bat	54	Y	intact
081810-ERBA-57-1	8 /18/2010	eastern red bat	57	Y	intact
081810-ERBA-57-2	8 /18/2010	eastern red bat	57	Y	intact
081810-ERBA-60-1	8 /10/2010	eastern red bat	60	N	intact
081810-ERBA-78-1	8 /18/2010	eastern red bat	78	N	intact
081810-ERBA-79-1	8 /18/2010	eastern red bat	79	N	intact
081810-ERBA-81-1	8 /18/2010	eastern red bat	81	Y	intact
081810-ERBA-81-2	8 /18/2010	eastern red bat	81	Y	intact
081810-ERBA-81-3	8 /18/2010	eastern red bat	81	Y	intact
081810-ERBA-90-1	8 /18/2010	eastern red bat	90	Y	intact
081810-HOBA-18-1	8 /18/2010	hoary bat	18	N	intact
081810-HOBA-46-1	8 /18/2010	hoary bat	46	N	intact
081810-HOBA-46-2	8 /18/2010	hoary bat	46	N	intact
081810-HOBA-46-3	8 /18/2010	hoary bat	46	N	intact
081810-HOBA-51-1	8 /18/2010	hoary bat	51	N	complete
081810-HOBA-77-1	8 /18/2010	hoary bat	77	Y	intact
081810-HOBA-78-1	8 /10/2010	hoary bat	78	N	intact
081810-HOBA-79-1	8 /18/2010	hoary bat	79	N	intact
081810-HOBA-79-2	8 /18/2010	hoary bat	79	N	intact
081810-TRBA-37-1	8 /18/2010	tricolored bat	37	Y	intact
081910-ERBA-225-1	8 /19/2010	eastern red bat	225	Y	intact
081910-HOBA-25-1	8 /19/2010	hoary bat	25	Y	intact

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Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
081910-HOBA-30-1	8 /19/2010	hoary bat	30	Y	intact
082010-ERBA-29-1	8 /20/2010	eastern red bat	29	N	intact
082010-ERBA-54-1	8 /20/2010	eastern red bat	54	Y	intact
082010-ERBA-81-1	8 /20/2010	eastern red bat	81	Y	intact
082010-TRBA-54-1	8 /20/2010	tricolored bat	54	Y	scavenged
082110-BBBA-21-1	8 /21/2010	big brown bat	21	Y	intact
082110-BBBA-86-1	8 /21/2010	big brown bat	86	Y	scavenged
082110-ERBA-213-1	8 /21/2010	eastern red bat	213	N	intact
082110-ERBA-30-1	8 /21/2010	eastern red bat	30	Y	intact
082110-ERBA-79-1	8 /21/2010	eastern red bat	79	N	intact
082110-ERBA-81-1	8 /21/2010	eastern red bat	81	Y	intact
082110-HOBA-15-1	8 /21/2010	hoary bat	15	N	intact
082110-HOBA-37-1	8 /21/2010	hoary bat	37	Y	intact
082110-HOBA-86-1	8 /21/2010	hoary bat	86	Y	scavenged
082110-TRBA-225-1	8 /21/2010	tricolored bat	225	Y	intact
082110-TRBA-79-1	8 /21/2010	tricolored bat	79	N	intact
082110-TRBA-90-1	8 /21/2010	tricolored bat	90	Y	intact
082110-TRBA-90-2	8 /21/2010	tricolored bat	90	Y	intact
082210-ERBA-90-1	8 /22/2010	eastern red bat	90	Y	intact
082210-HOBA-64-1	8 /22/2010	hoary bat	64	Y	intact
082210-HOBA-83-1	8 /22/2010	hoary bat	83	Y	intact
082210-HOBA-86-1	8 /22/2010	hoary bat	86	Y	scavenged
082310-ERBA-225-1	8 /23/2010	eastern red bat	225	Y	intact
082310-ERBA-241-1	8 /23/2010	eastern red bat	241	Y	intact
082310-ERBA-30-1	8 /23/2010	eastern red bat	30	Y	intact
082310-ERBA-54-1	8 /23/2010	eastern red bat	54	Y	intact
082410-ERBA-64-1	8 /24/2010	eastern red bat	64	Y	scavenged
082410-ERBA-90-1	8 /24/2010	eastern red bat	90	Y	intact
082410-HOBA-83-1	8 /24/2010	hoary bat	83	Y	intact
082510-ERBA-40-1	8 /25/2010	eastern red bat	40	Y	intact
082510-HOBA-17-1	8 /25/2010	hoary bat	17	Y	intact
082510-HOBA-37-1	8 /25/2010	hoary bat	37	Y	intact
082510-HOBA-37-2	8 /25/2010	hoary bat	37	Y	intact
082510-HOBA-57-1	8 /25/2010	hoary bat	57	Y	intact
082510-HOBA-78-1	8 /25/2010	hoary bat	78	N	intact
082510-HOBA-79-1	8 /26/2010	hoary bat	79	N	scavenged
082610-ERBA-30-1	8 /26/2010	eastern red bat	30	Y	intact
082610-ERBA-47-1	8 /26/2010	eastern red bat	47	Y	intact
082610-SHBA-83-1	8 /26/2010	silver-haired bat	83	Y	dismembered
082710-ERBA-220-1	8 /27/2010	eastern red bat	220	Y	scavenged
082710-ERBA-25-1	8 /27/2010	eastern red bat	25	Y	intact
082710-ERBA-37-1	8 /27/2010	eastern red bat	37	Y	intact
082710-ERBA-40-1	8 /27/2010	eastern red bat	40	Y	intact
082710-ERBA-41-1	8 /27/2010	eastern red bat	41	N	intact
082710-ERBA-64-1	8 /27/2010	eastern red bat	64	Y	intact
082710-ERBA-73-1	8 /27/2010	eastern red bat	73	Y	intact
082710-ERBA-77-1	8 /27/2010	eastern red bat	77	Y	intact
082710-ERBA-81-1	8 /27/2010	eastern red bat	81	Y	intact
082710-HOBA-41-1	8 /27/2010	hoary bat	41	N	scavenged
082710-HOBA-47-1	8 /27/2010	hoary bat	47	Y	intact
082710-HOBA-5-1	8 /27/2010	hoary bat	5	Y	intact
082710-HOBA-81-1	8 /27/2010	hoary bat	81	Y	intact
082710-LBBA-35-1	8 /27/2010	little brown bat	35	N	intact
082710-TRBA-73-1	8 /27/2010	tricolored bat	73	Y	intact
082810-ERBA-209-1	8 /28/2010	eastern red bat	209	Y	complete
082810-ERBA-209-2	8 /28/2010	eastern red bat	209	Y	complete

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Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
082810-ERBA-21-1	8 /28/2010	eastern red bat	21	Y	dismembered
082810-ERBA-225-1	8 /28/2010	eastern red bat	225	Y	complete
082810-ERBA-37-1	8 /28/2010	eastern red bat	37	Y	intact
082810-ERBA-54-1	8 /28/2010	eastern red bat	54	Y	intact
082810-ERBA-57-1	8 /28/2010	eastern red bat	57	Y	intact
082810-HOBA-77-1	8 /28/2010	hoary bat	77	Y	intact
082810-TRBA-81-1	8 /28/2010	tricolored bat	81	Y	intact
082910-TRBA-215-1	8 /29/2010	tricolored bat	215	Y	intact
082910-TRBA-57-1	8 /29/2010	tricolored bat	57	Y	intact
083010-ERBA-86-1	8 /30/2010	eastern red bat	86	Y	intact
083010-ERBA-90-1	8 /30/2010	eastern red bat	90	Y	intact
083110-ERBA-25-1	8 /31/2010	eastern red bat	25	Y	intact
083110-ERBA-36-1	8 /31/2010	eastern red bat	36	N	intact
083110-ERBA-76-1	8 /31/2010	eastern red bat	76	N	intact
090110-BBBA-57-1	9 /1 /2010	big brown bat	57	Y	scavenged
090110-ERBA-57-1	9 /1 /2010	eastern red bat	57	Y	scavenged
090110-ERBA-57-2	9 /1 /2010	eastern red bat	57	Y	scavenged
090110-HOBA-86-1	9 /1 /2010	hoary bat	86	Y	intact
090210-ERBA-36-1	9 /2 /2010	eastern red bat	36	N	intact
090210-HOBA-37-1	9 /2 /2010	hoary bat	37	Y	intact
090210-ERBA-49-1	9 /2 /2010	eastern red bat	49	N	dismembered
090310-ERBA-209-1	9 /3 /2010	eastern red bat	209	Y	intact
090310-ERBA-225-1	9 /3 /2010	eastern red bat	225	Y	intact
090310-HOBA-241-1	9 /3 /2010	hoary bat	241	Y	intact
090510-ERBA-17-1	9 /5 /2010	eastern red bat	17	Y	intact
090510-ERBA-83-1	9 /5 /2010	eastern red bat	83	Y	intact
090610-ERBA-40-1	9 /6 /2010	eastern red bat	40	Y	intact
090610-ERBA-40-2	9 /6 /2010	eastern red bat	40	Y	scavenged
090610-ERBA-77-1	9 /6 /2010	eastern red bat	77	Y	intact
090610-ERBA-86-1	9 /6 /2010	eastern red bat	86	Y	intact
090610-ERBA-92-1	9 /6 /2010	eastern red bat	92	Y	intact
090610-HOBA-73-1	9 /6 /2010	hoary bat	73	Y	intact
090610-HOBA-77-1	9 /6 /2010	hoary bat	77	Y	intact
090710-ERBA-17-1	9 /7 /2010	eastern red bat	17	Y	scavenged
090710-ERBA-241-1	9 /7 /2010	eastern red bat	241	Y	intact
090710-HOBA-207-1	9 /7 /2010	hoary bat	207	N	intact
090710-HOBA-25-1	9 /7 /2010	hoary bat	25	Y	intact
090710-SHBA-220-1	9 /7 /2010	silver-haired bat	220	Y	intact
090810-ERBA-17-1	9 /8 /2010	eastern red bat	17	Y	intact
090810-ERBA-19-1	9 /8 /2010	eastern red bat	19	N	intact
090810-HOBA-37-1	9 /8 /2010	hoary bat	37	Y	intact
090810-HOBA-64-1	9 /8 /2010	hoary bat	64	Y	intact
090910-BBBA-43-1	9 /9 /2010	big brown bat	43	N	intact
090910-ERBA-30-1	9 /9 /2010	eastern red bat	30	Y	intact
090910-SEBA-62-1	9 /9 /2010	seminole bat	62	N	intact
090910-ERBA-81-1	9 /9 /2010	eastern red bat	81	Y	intact
090910-ERBA-86-1	9 /9 /2010	eastern red bat	86	Y	intact
090910-HOBA-62-1	9 /9 /2010	hoary bat	62	N	scavenged
091010-ERBA-25-1	9 /10/2010	eastern red bat	25	Y	intact
091010-HOBA-81-1	9 /9 /2010	hoary bat	81	Y	intact
091010-SHBA-215-1	9 /10/2010	silver-haired bat	215	Y	intact
091110-ERBA-25-1	9 /11/2010	eastern red bat	25	Y	intact
091110-ERBA-37-1	9 /11/2010	eastern red bat	37	Y	intact
091110-ERBA-37-2	9 /11/2010	eastern red bat	37	Y	intact
091210-ERBA-209-1	9 /12/2010	eastern red bat	209	Y	intact
091210-ERBA-76-1	9 /12/2010	eastern red bat	76	N	intact

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Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
091210-HOBA-5-1	9 /12/2010	hoary bat	5	Y	intact
091210-SHBA-203-1	9 /12/2010	silver-haired bat	203	Y	intact
091310-ERBA-209-1	9 /13/2010	eastern red bat	209	Y	intact
091310-ERBA-47-1	9 /13/2010	eastern red bat	47	Y	scavenged
091310-ERBA-5-1	9 /13/2010	eastern red bat	5	Y	intact
091410-ERBA-241-1	9 /14/2010	eastern red bat	241	Y	scavenged
091410-HOBA-37-1	9 /14/2010	hoary bat	37	Y	intact
091410-HOBA-86-1	9 /14/2010	hoary bat	86	Y	intact
091510-ERBA-259-1	9 /15/2010	eastern red bat	259	Y	scavenged
091610-ERBA-21-1	9 /16/2010	eastern red bat	21	Y	intact
091610-ERBA-21-2	9 /16/2010	eastern red bat	21	Y	intact
091610-ERBA-40-1	9 /16/2010	eastern red bat	40	Y	intact
091610-ERBA-47-1	9 /16/2010	eastern red bat	47	Y	intact
091610-ERBA-74-1	9 /16/2010	eastern red bat	74	N	scavenged
091610-ERBA-83-1	9 /16/2010	eastern red bat	83	Y	intact
091610-ERBA-90-1	9 /16/2010	eastern red bat	90	Y	scavenged
091610-ERBA-90-2	9 /16/2010	eastern red bat	90	Y	intact
091610-HOBA-83-1	9 /16/2010	hoary bat	83	Y	intact
091610-HOBA-83-2	9 /16/2010	hoary bat	83	Y	intact
091610-SEBA-83-1	9 /16/2010	seminole bat	83	Y	intact
091610-SHBA-40-1	9 /16/2010	silver-haired bat	40	Y	intact
091610-SHBA-56T1	9 /16/2010	silver-haired bat	56	N	intact
091610-SHBA-88-1	9 /16/2010	silver-haired bat	88	N	intact
091710-ERBA-30-1	9 /17/2010	eastern red bat	30	Y	intact
091710-SHBA-37-1	9 /17/2010	silver-haired bat	37	Y	intact
091810-ERBA-215-1	9 /18/2010	eastern red bat	215	Y	intact
091810-SHBA-241-1	9 /18/2010	silver-haired bat	241	Y	intact
091810-SHBA-259-1	9 /18/2010	silver-haired bat	259	Y	intact
091910-ERBA-21-1	9 /19/2010	eastern red bat	21	Y	intact
091910-ERBA-241-1	9 /19/2010	eastern red bat	241	Y	intact
091910-ERBA-92-1	9 /19/2010	eastern red bat	92	Y	intact
091910-HOBA-92-1	9 /19/2010	hoary bat	92	Y	intact
091910-SHBA-241-1	9 /19/2010	silver-haired bat	241	Y	intact
091910-SHBA-92-1	9 /19/2010	silver-haired bat	92	Y	intact
092010-ERBA-241-1	9 /20/2010	eastern red bat	241	Y	intact
092010-ERBA-81-1	9 /20/2010	eastern red bat	81	Y	intact
092010-ERBA-86-1	9 /20/2010	eastern red bat	86	Y	intact
092110-ERBA-259-1	9 /21/2010	eastern red bat	259	Y	intact
092110-ERBA-46-1	9 /21/2010	eastern red bat	46	N	intact
092110-ERBA-56-1	9 /21/2010	eastern red bat	56	N	intact
092110-ERBA-78-1	9 /21/2010	eastern red bat	78	N	intact
092110-ERBA-96-1	9 /21/2010	eastern red bat	96	N	intact
092110-LBBA-5-1	9 /21/2010	little brown bat	5	Y	intact
092110-SHBA-215-1	9 /21/2010	silver-haired bat	215	Y	intact
092210-ERBA-241-1	9 /22/2010	eastern red bat	241	Y	intact
092210-ERBA-47-1	9 /22/2010	eastern red bat	47	Y	intact
092210-HOBA-16-1	9 /22/2010	hoary bat	16	N	intact
092210-HOBA-86-1	9 /22/2010	hoary bat	86	Y	intact
092210-SHBA-37-1	9 /22/2010	silver-haired bat	37	Y	intact
092210-SHBA-86-1	9 /22/2010	silver-haired bat	86	Y	intact
092210-SHBA-86-2	9 /22/2010	silver-haired bat	86	Y	intact
092210-SHBA-86-3	9 /22/2010	silver-haired bat	86	Y	intact
092310-ERBA-54-1	9 /23/2010	eastern red bat	54	Y	intact
092310-ERBA-54-2	9 /23/2010	eastern red bat	54	Y	scavenged
092310-ERBA-57-1	9 /23/2010	eastern red bat	57	Y	intact
092310-HOBA-90-1	9 /23/2010	hoary bat	90	Y	intact

Appendix A – All Bird and Bat Casualties Found During the Fall 2010 Study Period at the NedPower Mount Storm Wind Energy Facility. *NOTE: highlighted carcasses identified by WVDNR.*

Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
092410-ERBA-37-1	9 /24/2010	eastern red bat	37	Y	intact
092410-ERBA-83-1	9 /24/2010	eastern red bat	83	Y	scavenged
092410-HOBA-17-1	9 /24/2010	hoary bat	17	Y	dismembered
092410-HOBA-259-1	9 /24/2010	hoary bat	259	Y	scavenged
092410-SHBA-54-1	9 /24/2010	silver-haired bat	54	Y	intact
092510-HOBA-81-1	9 /25/2010	hoary bat	81	Y	intact
092610-ERBA-203-1	9 /26/2010	eastern red bat	203	Y	intact
092610-ERBA-21-1	9 /26/2010	eastern red bat	21	Y	intact
092610-ERBA-57-1	9 /26/2010	eastern red bat	57	Y	intact
092610-ERBA-77-1	9 /26/2010	eastern red bat	77	Y	intact
092610-SHBA-83-1	9 /26/2010	silver-haired bat	83	Y	intact
092710-ERBA-203-1	9 /27/2010	eastern red bat	203	Y	intact
092710-ERBA-215-1	9 /27/2010	eastern red bat	215	Y	intact
092710-ERBA-30-1	9 /27/2010	eastern red bat	30	Y	intact
092710-ERBA-5-1	9 /27/2010	eastern red bat	5	Y	intact
092810-ERBA-220-1	9 /28/2010	eastern red bat	220	Y	intact
092810-HOBA-80-1	9 /28/2010	hoary bat	80	N	intact
092810-SHBA-40-1	9 /28/2010	silver-haired bat	40	Y	intact
092910-ERBA-21-1	9 /29/2010	eastern red bat	21	Y	intact
092910-ERBA-4-1	9 /29/2010	eastern red bat	4	N	intact
092910-ERBA-92-1	9 /29/2010	eastern red bat	92	Y	scavenged
100110-ERBA-37-1	10/1 /2010	eastern red bat	37	Y	intact
100210-ERBA-214-1	10/2 /2010	eastern red bat	214	N	intact
100310-ERBA-209-1	10/3 /2010	eastern red bat	209	Y	intact
100310-ERBA-76-1	10/3 /2010	eastern red bat	76	N	intact
100310-ERBA-79-1	10/3 /2010	eastern red bat	79	N	intact
100410-ERBA-209-1	10/4 /2010	eastern red bat	209	Y	intact
100410-ERBA-37-1	10/4 /2010	eastern red bat	37	Y	intact
100410-SHBA-215-1	10/4 /2010	silver-haired bat	215	Y	intact
100510-ERBA-40-1	10/5 /2010	eastern red bat	40	Y	intact
100610-ERBA-54-1	10/6 /2010	eastern red bat	54	Y	intact
100810-ERBA-57-1	10/8 /2010	eastern red bat	57	Y	intact
100810-SHBA-37-1	10/8 /2010	silver-haired bat	37	Y	scavenged
101010-ERBA-83-1	10/10/2010	eastern red bat	83	Y	intact
101210-ERBA-77-1	10/12/2010	eastern red bat	77	Y	intact
101310-ERBA-17-1	10/13/2010	eastern red bat	17	Y	intact
101310-ERBA-203-1	10/13/2010	eastern red bat	203	Y	intact
101310-ERBA-209-1	10/13/2010	eastern red bat	209	Y	intact
101310-ERBA-215-1	10/13/2010	eastern red bat	215	Y	intact
101310-ERBA-225-1	10/13/2010	eastern red bat	225	Y	intact
101310-ERBA-92-1	10/13/2010	eastern red bat	92	Y	intact
101310-ERBA-92-2	10/13/2010	eastern red bat	92	Y	intact
101410-ERBA-40-1	10/14/2010	eastern red bat	40	Y	intact
101410-SHBA-30-1	10/14/2010	silver-haired bat	30	Y	scavenged
101510-ERBA-47-1	10/15/2010	eastern red bat	47	Y	scavenged
101510-SHBA-81-1	10/15/2010	eastern red bat	81	Y	scavenged
BIRDS					
071810-SSHA-40-1	7 /18/2010	sharp-shinned hawk	40	Y	complete
072510-TUVU-50-1	7 /25/2010	turkey vulture	50	N	scavenged
073110-CEWA-21-1	7 /31/2010	cedar waxwing	21	Y	intact
080210-SSHA-26-1	8 /2 /2010	sharp-shinned hawk	26	N	intact
080310-TUVU-90-1	8 /3 /2010	turkey vulture	90	Y	intact
080410-TUVU-26-1	8 /4 /2010	turkey vulture	26	N	scavenged
081410-AMRE-203-1	8 /14/2010	American redstart	203	Y	intact
081410-ACFL-209-1	8 /14/2010	acadian flycatcher	209	Y	intact

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Sample ID	Date	Species	Turbine	Scheduled Search?	Condition
081410-BBWA-73-1	9 /14/2010	bay-breasted warbler	73	Y	partial
082010-RTHU-220-1	8 /20/2010	ruby-throated hummingbird	220	Y	intact
082710-TRES-3-1	8 /27/2010	tree swallow	3	N	intact
082710-UNCV-41-1	8 /27/2010	unidentified corvid	41	N	feather spot
090310-UNPA-90-1	9 /9 /2010	unidentified passerine	90	Y	feather spot
090510-BAWW-37-1	9 /5 /2010	black-and-white warbler	37	Y	intact
090710-TUVU-25-1	9 /7 /2010	turkey vulture	25	Y	scavenged
090810-TUVU-210-1	9 /8 /2010	turkey vulture	210	N	scavenged
090810-TUVU-81-1	9 /8 /2010	turkey vulture	81	Y	scavenged
090910-REVI-53-1	9 /9 /2010	red-eyed vireo	53	N	scavenged
091010-BWWA-215-1	9 /10/2010	blue-winged warbler	215	Y	intact
091010-REVI-30-1	9 /10/2010	red-eyed vireo	30	Y	intact
091210-BTBW-212-1	9 /12/2010	black-throated blue warbler	212	N	intact
091310-YBCU-241-1	9 /13/2010	yellow-billed cuckoo	241	Y	intact
091610-BTBW-57-1	9 /16/2010	black-throated blue warbler	57	Y	intact
091610-REVI-77-1	9 /16/2010	red-eyed vireo	77	Y	scavenged
091710-UNVI-241-1	9 /17/2010	unidentified vireo	241	Y	scavenged
092110-GRCA-75-1	9 /21/2010	gray catbird	75	N	dismembered
092610-MAWA-37-1	9 /26/2010	magnolia warbler	37	Y	scavenged
092710-REVI-218-1	9 /27/2010	red-eyed vireo	218	N	intact
092910-RUGR-73-1	9 /29/2010	ruffed grouse	73	Y	feather spot
093010-UNPA-92-1	9 /30/2010	unidentified passerine	92	Y	scavenged
100110-SWTH-203-1	10/1 /2010	Swainson's thrush	203	Y	intact
100110-YBCU-5-1	10/1 /2010	yellow-billed cuckoo	5	Y	intact
100110-YBSA-21-1	10/1 /2010	yellow-bellied sapsucker	21	Y	intact
100310-NOPA-54-1	10/3 /2010	northern parula	54	Y	intact
100510-BTBW-92-1	10/5 /2010	black-throated blue warbler	92	Y	scavenged
100510-BTNW-241-1	10/5 /2010	black-throated green warbler	241	Y	dismembered
100510-OVEN-83-1	10/5 /2010	ovenbird	83	Y	dismembered
100510-SWTH-21-1	10/5 /2010	Swainson's thrush	21	Y	injured
100510-WOTH-241-1	10/5 /2010	wood thrush	241	Y	intact
100610-BTBW-21-1	10/6 /2010	black-throated blue warbler	21	Y	intact
100610-UNWA-57-1	10/6 /2010	unidentified warbler	57	Y	intact
100610-YBSA-241-1	10/6 /2010	yellow-bellied sapsucker	241	Y	intact
100810-WIWR-37-1	10/8 /2010	winter wren	37	Y	intact
100910-BBWA-40-1	10/9 /2010	bay-breasted warbler	40	Y	scavenged
101110-GCKI-214-1	10/11/2010	golden-crowned kinglet	214	N	intact
101310-GCKI-92-1	10/13/2010	golden-crowned kinglet	92	Y	scavenged
101310-CSWA-259-1	10/13/2010	chestnut-sided warbler	259	Y	scavenged