

**Post-construction Monitoring Study for the
Blue Creek Wind Farm
Van Wert and Paulding Counties, Ohio**

**Intensive Monitoring - Year 1
Final Report
August 1 – October 15, 2020**



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EXECUTIVE SUMMARY

Blue Creek Wind Farm, LLC (Blue Creek) is operating the Blue Creek Wind Farm (the Project) in Van Wert and Paulding counties, Ohio. The Project became operational in 2012 and consists of 152 2.0-megawatt (MW) Gamesa G90 wind turbines that have a 100 meter (m; 328 foot [ft]) hub height and a 45 m (148 ft) blade length. This report details the post-construction monitoring studies conducted in 2020, consistent with Section 6.1.2 of the Project's Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP; TE69307D-0) for Indiana and northern long-eared bats.

Post-construction monitoring was conducted in accordance with the 2020 Post-construction Monitoring Study Plan (Study Plan) for the Blue Creek Wind Farm, which was approved by the US Fish and Wildlife Service (USFWS) on March 19, 2020. This report includes the results of the post-construction fatality monitoring for the fall monitoring period (August 1 – October 15). Blue Creek contracted WEST to complete spring and fall post-construction fatality monitoring; however, due to the coronavirus (COVID-19) outbreak and Ohio's subsequent Stay At Home order issued March 22, 2020, spring monitoring was not able to be conducted.

Standardized carcass searches were completed for bat carcasses at two plot types: full plots and road and pads. Full plots were circular and extended to 65-m (213-ft) radius from turbines. Road and pad plot searches occurred within 100 m (328 ft) of the turbine on gravel roads and pads. Forty (40) full plots were searched twice per week and 112 road and pad plots were searched weekly. Searcher efficiency and carcass persistence trials were conducted to correct for detection and scavenger bias. The Study Plan was designed to achieve an overall probability of detection (g) of 0.1447 during the fall monitoring period.

No Indiana bat or northern-long eared bats were found. The most commonly found bat species were eastern red bat (145 carcasses; 38.7% of total carcasses) and silver-haired bat (143 carcasses; 38.1%), followed by hoary bat (50 carcasses; 13.3%) and big brown bat (33 carcasses; 8.8%). Four seminole bats (1.1%) were also found. The overall bat fatality estimate was 8.05 bats per megawatt (90% Confidence Interval [CI]: 5.55-13.07) using the Huso estimator.

The 90% confidence interval surrounding g during the fall monitoring period indicates that the expected g for the fall monitoring period was met. Based on the count of Indiana bat and northern long-eared bat carcasses (both zero) and the g of 0.147 (90% CI: 0.117 – 0.179), we estimated that no more than one fatality of either species occurred (i.e. cumulative take at $\alpha = 0.5$ is no more than 1). These values fall below the permitted take for each species, meaning the cumulative Covered Species take estimates are in compliance with the ITP. The probability that the fall monitoring period take rates exceeded the adaptive management thresholds for Indiana bat and northern long-eared bat did not exceed 95%, indicating the Project did not trigger any short or long-term adaptive management triggers. Although spring surveys were not conducted due to COVID-19, HCP monitoring objectives were able to be completed during the fall monitoring period and the information collected during this time demonstrated that the expected g for the monitoring

period was met, the Project is in compliance with the ITP, and no adaptive management is necessary.

Table A. Habitat Conservation Plan and Incidental Take Permit compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Requirement	Source	Status Based on Fall 2020 Intensive Monitoring Results
Conduct Intensive Monitoring in spring	HCP Section 6.1.2	Not completed due to the COVID-19 outbreak and subsequent Stay At Home order for the state of Ohio on March 22, 2021; Blue Creek has committed to conduct spring monitoring in 2022 to ensure that the data collected under Intensive Monitoring are consistent with the intent of the study plan (M. Becker, personal communication, July 31, 2020).
Conduct Intensive Monitoring in fall	HCP Section 6.1.2	Completed
Meet an annual (spring + fall) probability of detection (g) of 0.15	HCP Section 6.1.2	Spring monitoring not conducted. Fall monitoring met the expected fall monitoring period g of 0.1447 (estimated g was 0.147, 90% CI 0.117 – 0.179).
Estimate mean take rates for the Covered Species	HCP Section 6.1.5	Mean take rates were 3.468 (90% CI: 0.014 – 13.37) Indiana bats per fall monitoring period and 3.468 (90% CI: 0.014 – 13.37) northern long-eared bats per fall monitoring period.
Estimate cumulative (ITP term to date) take estimates for the Covered Species	HCP Section 6.1.5	Cumulative take estimates were no more than one fatality of either Covered Species during 2020 fall monitoring period.
Evaluate whether the short-term adaptive management threshold has been exceeded at the 95% credibility level	HCP Section 6.3.1	Probabilities that estimate take rates exceeded the short-term adaptive management thresholds were 25.9% for Indiana bat and 35.4% for northern long-eared bat, indicating no adaptive management was triggered.
Evaluate whether the cumulative take amount (M*) has exceeded the permitted take amount at the 50% credibility level	HCP Section 6.3.1	The cumulative take estimates of no more than one fatality of either Covered Species falls below the total permitted take for both of the Covered Species (154 Indiana bats and 103 northern long-eared bats), indicating the Project is in compliance with its permitted take levels.
Submit Intensive Monitoring report to the USFWS by April 1	HCP Section 6.1.6	Report submitted prior to April 1

Table A. Habitat Conservation Plan and Incidental Take Permit compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Requirement	Source	Status Based on Fall 2020 Intensive Monitoring Results
Intensive Monitoring Report will include:	HCP Section	Report includes the required information in the following Sections:
1. Information necessary to estimate take of Covered Species, such as: date, time, location, species, and sex, of all bat carcasses documented	6.1.6	1. Appendix A
2. Bias trial data		2. Section 4.2
3. Calculated g value		3. Section 4.3.5.1
4. Estimated average annual take rates and cumulative take estimates of the Covered Species		4. Section 4.3.4 and 4.3.5.2
5. Adaptive management triggers activated (if any) and planned response		5. Sections 4.3.5.3 and 4.3.5.4
6. EoA inputs for the monitoring year		6. Appendix C
7. All-bat fatality rate		7. Section 4.3.4
8. A record of ambient temperatures and wind speeds and the application of cut-in speeds during a representative sample of the minimization period		8. Will be provided in a separate document.
Report any Covered Species fatality to the USFWS and ODNR by phone within 24 hours of positive species identification	HCP Section 6.1.6	No Covered Species carcasses were found
Provide the monitoring protocol the upcoming year of monitoring to the USFWS	HCP Section 6.1.2	Provided separately in the <i>2021 Post-Construction Monitoring Study Plan for the Blue Creek Wind Farm, Van Wert and Paulding counties, Ohio.</i>

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REPORT REFERENCE

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1.0 INTRODUCTION

Blue Creek Wind Farm, LLC (Blue Creek), a subsidiary of Avangrid Renewables, LLC, is operating the Blue Creek Wind Farm (Project) in Van Wert and Paulding counties, Ohio. Blue Creek obtained an Incidental Take Permit (ITP; TE69307D-0) for the federally listed endangered Indiana bat (*Myotis sodalis*) and the federally listed threatened northern long-eared bat (*Myotis septentrionalis*; hereafter Covered Species) from the US Fish and Wildlife Service (USFWS) dated March 13, 2020.

The Habitat Conservation Plan (HCP) requires Compliance Monitoring to determine the level of take of the Covered Species relative to the amount authorized by the ITP. Blue Creek contracted WEST to complete spring and fall post-construction fatality monitoring in 2020. However, due to the coronavirus (COVID-19) outbreak and Ohio's subsequent Stay At Home order issued March 22, 2020, spring monitoring was not able to be conducted. As such, this report covers results for the fall monitoring period (August 1 – October 15). The fall monitoring period provided the information necessary to: 1) provide an all-bat fatality estimate per megawatt (MW) and per turbine, 2) estimate the fatalities of the Covered Species over the monitoring period and over the ITP term, 3) signal if adaptive management actions were triggered, and 4) signal if an amendment to the ITP is necessary.

2.0 STUDY AREA

The Project became operational in 2012 and consists of 152 2.0-megawatt (MW) Gamesa G90 wind turbines that have a 100-meter (m; 328-foot [ft]) hub height and a 45-m (148-ft) blade length. The Project is located approximately six kilometers (km; four miles [mi]) north of the town of Van Wert, Ohio (Figure 1). The Project has an elevation of approximately 230 m (754 ft) above mean sea level with relatively flat topography. Approximately 93% of the nearly 164-square kilometer (km²; 40,427-acre [ac]) Project Area is composed of cropland. Corn (*Zea mays*) and soybean (*Glycine max*) are the most common crop types. The next most common land cover is developed area (e.g., farmsteads), which accounts for approximately 6% of the Project Area. Deciduous forest, herbaceous cover, open water, barren land, and wetlands each account for less than 1% of the total land cover (Figure 1).

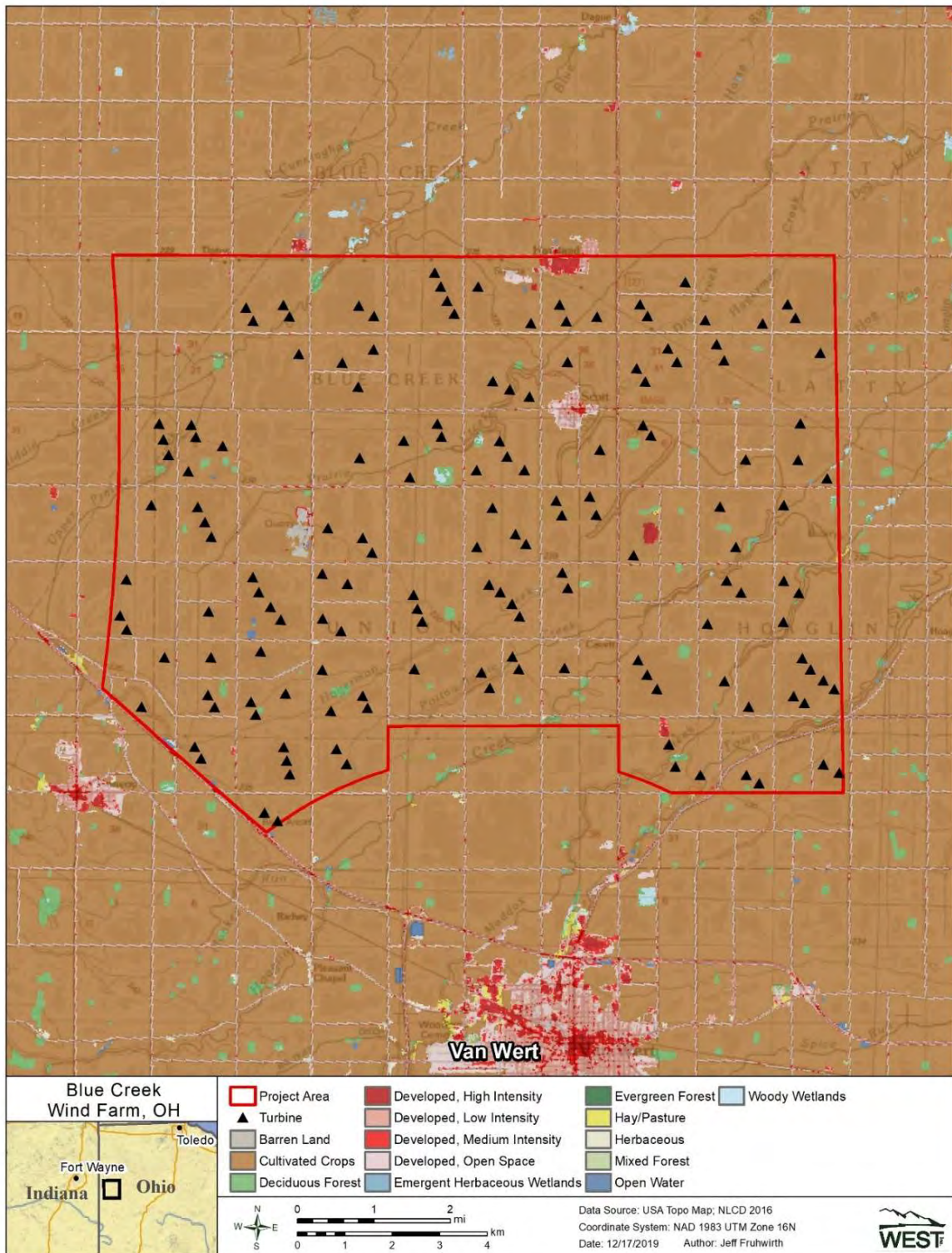


Figure 1. Land cover types and turbine locations at the Blue Creek Wind Farm, Van Wert and Paulding counties, Ohio.

3.0 METHODS

Fall monitoring was conducted in accordance with the 2020 Post-construction Monitoring Study Plan for the Blue Creek Wind Farm (Study Plan) which was approved by the USFWS on March 19, 2020. The Study Plan was developed in accordance with the HCP's monitoring program to achieve an overall probability of detection (g) of 0.15 (i.e., a 15% probability of detecting a single bat carcass) cumulatively across the spring and fall monitoring periods.

Due to the lack of spring surveys, Blue Creek submitted a revised study plan to USFWS on June 26, 2020. The revised study plan proposed alternative fall monitoring to achieve an annual estimate of g of 0.15 using only the 2020 fall monitoring period. On July 27, 2020, USFWS responded to Blue Creek requesting that 1) the 2020 spring monitoring be made up in the spring 2022, and 2) Blue Creek implement the fall monitoring period as identified in the original Study Plan. Blue Creek responded via email on July 31, 2020 committing to USFWS recommendations to conduct the spring 2022 monitoring and implemented the original Study Plan with an expected fall monitoring period-only g of 0.1447 in the fall of 2020.

3.1 Standardized Carcass Searches

3.1.1 Number of Turbines Sampled, Search Frequency, and Plot Size

All 152 turbines at the Project were included in the study. Technicians conducted standardized carcass searches at two plot types: full plots and road and pads. Forty turbines were searched as full plots and the remaining 112 turbines were searched as road and pads (Figure 2). Full plots were circular and extended to a maximum of 65-m (213-ft) radius from turbines. Due to the majority of the Project being composed of corn and soybean fields, full plots were mowed prior to the start of fall surveys and were regularly mowed through October 15 to ensure vegetation did not exceed a maximum height of 15 centimeters (6 inches) to increase the detectability of carcasses on full plots. Road and pad searches occurred within 100 m (328 ft) of the turbine on gravel roads and pads.

Full plots were searched twice per week, with an average of 3.5 days between searches. Road and pads plots were searched once every 7 days. Before standardized carcass searches began on August 1, a clearing search at all 152 turbines occurred on July 30 and 31, 2020.

3.1.2 Search Methods

Technicians searched for carcasses on transects spaced 5 m (16 ft) apart at a rate of approximately 45–60 m per minute (min; 148–197 ft/min) on all full plots and roads and pads. Technicians scanned the area for fatalities on both sides of the transect out to approximately 2.5 m (8.2 ft) to ensure full visual coverage of each plot or road and pad.

3.1.3 Data Collection

Carcass searches began after first light and ended by 1700 hours. Technicians recorded the date, start and end times, technician name, turbine number, weather data, type of search (full plot or

road and pad), and any injured bats or bat carcasses found. If a bat was found, technicians placed a flag near the bat and continued the search.

After searching the entire plot, the technician returned to each found bat and recorded information on a fatality data sheet including the following: the date and time, species, sex and age (when possible), technician name, turbine number, distance from turbine, azimuth from turbine, location of bat as Universal Transverse Mercator (UTM) coordinates, habitat surrounding the bat, and estimated time of death (e.g., less than one day, two days, etc.). Technicians took digital photographs of the bat, any visible injuries, and the surrounding habitat. Bats found in non-search areas (e.g., outside of a plot boundary), or outside of the scheduled study period, were coded as incidental discoveries and were documented following the same protocol as those found during standard carcass searches but not included in the analyses.

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

- Intact – a carcass that was complete, not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.
- Scavenged – the carcass showed signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass, etc.), or a carcass that was heavily infested by insects.
- Dismembered – an entire carcass was found in multiple pieces distributed more than 1.0 m (3.3 ft) apart from one another due to scavenging or other reasons.
- Injured – a bat found alive.

Bat carcasses were collected under the the Project's ITP (TE69307D-0) and WEST's Ohio Division of Wildlife Wild Animal Permit (21-086). All bat carcasses found were placed in a re-sealable plastic bag and labeled with the unique carcass identification number, turbine number, and date, before being placed in a freezer on site. Leather and rubber gloves were used to handle all bat carcasses to eliminate possible transmission of rabies or other diseases. Injured bats were recorded and treated as a fatality for the purposes of this analysis. All species identifications were verified by biologists permitted to identify and handle federally and state listed bat species. One heavily scavenged unidentified bat wing was found on September 25, 2020 that could not be identified to species by searchers or by a WEST permitted bat biologist. Megan Seymour was notified via on November 6, 2020 email and agreed via email on November 9, 2020 with the decision to send a tissue sample to Northern Arizona University for genetic testing. Genetic testing determined that the previously unidentified bat was a silver-haired bat. If an injured or dead Covered Species had been positively identified, the USFWS and ODNR would have been notified within 24 hours.

3.2 Bias Trials

3.2.1 Searcher Efficiency Trials

The objective of searcher efficiency trials was to estimate the percentage of bats found by observers. Estimates of searcher efficiency were used to adjust the number of bats found for those missed by observers to account for detection bias in fatality estimates.

Searcher efficiency trials were conducted in the same areas where standardized carcass searches occurred. Trials were conducted throughout the study. A total of 43 fresh-frozen bat carcasses obtained from the ODNR were used for searcher efficiency trials. A total of 21 bats were placed on full plots and 22 were placed on road and pad plots.

Searcher efficiency trials began when standardized carcass searches began. Technicians conducting carcass searches did not know when searcher efficiency trials were conducted or the location of trial carcasses. Each trial carcass was discreetly marked with a black zip-tie around the upper forelimb for identification as a searcher efficiency carcass after it was found. Trial carcasses were placed by the trial administrator prior to the standardized carcass searches scheduled for that day. Trial carcasses were dropped from waist-height or higher and allowed to land in a random posture. The number and location of trial carcasses found were recorded, and the number of trial carcasses available for detection during each search was determined immediately after each trial by the trial administrator. Searchers had one chance to locate trial carcasses during the first search after carcass placement. Twenty trial carcasses were left in place and used for carcass persistence trials.

3.2.2 Carcass Persistence Trials

The objective of carcass persistence trials was to estimate the average probability a carcass persisted, or was available for detection, in the field. Carcasses may be removed by scavenging or rendered undetectable by typical farming activities. Estimates of carcass persistence were used to adjust the number of bat carcasses found for those removed from the study area, thereby accounting for persistence bias. Of the 43 bats used for searcher efficiency trials (see above), 20 fresh-frozen bat carcasses obtained from the ODNR were used for carcass persistence trials.

Technicians conducting carcass searches monitored the trial carcasses over a 30-day period according to the following schedule as closely as possible. Carcasses were checked daily for the first four days (days 1–4 after placement), then on day 7, 10, 14, 21, and 30. Trial carcasses were left at the dropped location until removal by scavenging or other means, completely decomposed, or were at the end of the carcass persistence trial, whichever occurred first. At the end of the 30-day period, any remaining evidence of a carcass was removed from the search plot.

3.3 Search Plot Mapping

The boundaries and unsearchable areas of all search plots were recorded using a Trimble submeter global positioning satellite unit. The boundaries and unsearchable areas were used to quantify the amount of area searched relative to distance to turbine and to inform the distribution

of carcasses around turbines to estimate the number of carcasses that fell outside search plot boundaries or within unsearchable areas (see Section 3.4.1.5 below).

3.4 Statistical Analysis

Two fatality estimates were calculated: an all-bat fatality estimate based on the Huso estimator, as specified in the HCP (Huso et al. 2015b), and a take estimate based on Evidence of Absence (EoA) for Covered Species (Dalthorp et al. 2017, Huso et al. 2015). Estimates of facility-related fatalities were based on:

1. Observed number of bats found during standardized searches;
2. Searcher efficiency, expressed as the proportion of searcher efficiency trial carcasses found by observers;
3. Carcass persistence rates, expressed as the estimated average probability a trial carcass remained in the study area and was available for detection by the observers during searches;
4. Searched area adjustment.

3.4.1 Estimator Inputs For The Two Fatality Estimates

3.4.1.1 Carcasses Included In Fatality Estimates

One of the underlying assumptions of the Huso estimator, used for the all-bat estimate, is that searchers have a single opportunity to discover a carcass (Huso et al. 2015b, Huso et al. 2016). In practice, particularly when carcass persistence times are long, carcasses may be discovered that have been available for more than one search. In order to meet the assumptions of the Huso estimator, the time since death was estimated for each carcass in the field based on physical characteristics of the carcass in hand. A carcass was included in the fatality estimate if the estimated time since death was less than the search interval associated with that carcass, or if there was uncertainty about the estimated time since death. Unlike the all-bat estimate, all Covered Species found during carcass searches would have been included in the Covered Species take estimate because the EoA estimator does not assume searchers have a single opportunity to discover a carcass (Huso et al. 2015a, Dalthorp et al. 2017).

3.4.1.2 Estimation of Searcher Efficiency Rates

The all-bat fatality rate estimation and the Covered Species take estimation had identical methods for estimating searcher efficiency. For both methods the probability of a carcass being detected by a searcher, given the carcass was available to be found, was calculated using a logit regression model (Dalthorp et al. 2018). Potential covariates for the logit regression models included plot type (full plot or road and pad). The best model was selected using an information theoretic metric known as AICc, or corrected Akaike Information Criteria (Burnham and Anderson 2002). The most parsimonious model within two AICc units of the model with the lowest AICc value was selected.

3.4.1.3 Estimation of Carcass Persistence Rates

The all-bat fatality rate estimation and Covered Species take estimation had identical methods for estimating carcass persistence rates. Both methods used data collected during carcass persistence trials to estimate the average probability that a carcass persisted through a search interval and remained available to be located by searchers. Carcass persistence data were modeled using an interval-censored survival regression. Four candidate persistence distributions were considered: exponential, log-logistic, lognormal, and Weibull distributions (Kalbfleisch and Prentice 2002, Huso et al. 2015b, Dalthorp et al. 2018). No covariates were considered in the carcass persistence models. The most parsimonious model within two AICc units of the model with the lowest AICc value was selected as the best-fit model.

3.4.1.4 Detection Reduction Factor

For the Covered Species take estimation, the change in searcher efficiency between successive searches was defined by a parameter called the *detection reduction factor* (k) that ranged from zero to one. When k is zero it implies that a carcass that was missed on the first search would never be found thereafter. A k of one implies searcher efficiency remains constant no matter how many times a carcass is missed. The detection reduction factor was a required parameter for take estimation in EoA; a value of $k = 0.80$ was used for this study (per Appendix A of the Study Plan). The Huso estimator implicitly assumes $k = 0$ and does not take this parameter as an input.

3.4.1.5 Searched Area Adjustment

The searched area adjustment process was identical for the all-bat fatality rate estimation and the Covered Species take estimation but the carcasses included in the modeling process differed for the two estimators. All bat carcasses found during standardized searches were used to calculate the area adjustment for the Covered Species take estimate. Only carcasses that were estimated to have died within the search interval were used to estimate the area adjustment for the all-bat fatality estimate due to the Huso estimator's implicit assumption of $k = 0$ (see Detection Reduction Factor section above).

The searched area adjustment accounted for all unsearched areas within 100 m (328 ft) of turbines, as well as carcasses that fell outside of road and pad plot boundaries, and the area between the full plot boundary and 100 m (328 ft). The searched area adjustment was calculated as a probability that ranged from zero to one. For example, an area adjustment of 0.75 meant that an estimated 75% of carcasses fell within the search area. The searched area adjustment was estimated as the product of the searched area around each turbine and a carcass-density distribution (within 100 m [328 ft] from the turbine base). The carcass density distribution was modeled using carcass location data collected during all of 2020 (this study; e.g. Huso and Dalthorp 2014). A truncated weighted maximum likelihood (TWL) modeling approach (Khokan et al. 2013) as implemented in the windAC package (Studyvin et al. 2020) was used to estimate the carcass-density distribution. The TWL approach weights each carcass by the inverse of the product of the probability of detection and the proportion of area searched in each 1.0-m (3.3 ft) annulus around the turbine. Normal, gamma, Gompertz, Rayleigh and Weibull (parameterized according to R Development Core Team [2016], or Yee [2010]) distributions were fitted and used AICc to select the best model.

The amount of searchable area within plots was measured in the field using sub-meter GPS technology. The proportion of area searched was calculated in GIS as the amount of area searched divided by the total area within each 1.0-m (3.3 ft) annulus around the turbine.

3.4.2 All-bat Fatality Rate Estimation

The all-bat fatality rate was calculated using the Huso estimator (Huso 2011, Huso et al. 2015). Inputs and assumptions of the Huso estimator are described in Section 3.4.1 above.

3.4.2.1 All-bat Fatality Estimate

All-bat fatality estimates per MW and turbine were calculated by plot type (full plot versus road and pad). The weighted average of estimates by plot type was combined by the relative proportion of plots in each category (i.e., 40/152 for full plots and 112/152 for road and pads) to calculate overall fatality estimates.

3.4.2.2 Confidence Interval Calculation for All-bat Fatality Estimate

The 90% confidence intervals (CI) for each estimate were calculated using bootstrapping (Manly 1997; Appendix B). Bootstrapping is a computer simulation technique that is useful for calculating variances and confidence intervals for complicated test statistics. A total of 1,000 bootstrap replicates were used to calculate the 90% confidence interval of each estimate. The lower 5th and upper 95th percentiles of the 1,000 bootstrap estimates were estimates of the lower limit and upper limit of 90% confidence intervals.

3.4.3 Covered Species Take Estimation

The EoA model and software (Husto et al. 2015a, Dalthorp et al. 2017) was used to calculate estimates of take and take rates of the Covered Species. The inputs into EoA were modeled using GenEst (a generalized estimator of fatality; Dalthorp et al. 2018, Simonis et al. 2018) and are described in Section 3.4.1 above.

3.4.3.1 Site-Wide Probability of Detection (*g*)

A site-wide probability of detection (*g*) was calculated using EoA (Dalthorp et al. 2017; Appendix C) to enable the calculation of take estimates for the Covered Species. The estimate of *g* was based on the searcher efficiency rate, carcass persistence, searched area adjustment and sampling fraction for each plot type, the arrival proportion (i.e., the estimated proportion of Covered Species expected to occur in the fall monitoring period), and the detection reduction factor (*k*; see definition in section 3.4.1.4) taken from the HCP. Estimates were calculated using the EoA R package (EoA version 2.0.7), using the Single Class and Multiple Class modules of EoA. An arrival proportion of 1.0 was used for the fall monitoring period meaning the estimates presented here are for the fall monitoring period only, and assume that the fall monitoring period was sufficient to cover the entire period of fall risk to the Covered Species.

3.4.3.2 Assessment of Adaptive Management Triggers

The take rates of the Covered Species (λ in the EoA model/software) were calculated to assess whether the short-term adaptive management trigger (Section 6.3.1 of HCP) was met and if

adaptive management responses were needed. The cumulative (ITP term to date) take estimates of both Covered Species were calculated to assess whether the estimated cumulative take (M^* in the EoA model/software) exceeded the permitted take.

3.5 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, technicians were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the technician and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes were made in all affected steps.

3.6 Data Compilation and Storage

A Microsoft® SQL database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. All data forms and electronic data files were retained for reference.

4.0 RESULTS

The fall monitoring period (August 1 – October 15) post-construction fatality monitoring met the expected g of 0.1447 as designed and is consistent with the USFWS-approved Study Plan (see Appendix B3–B4 of the Study Plan), with an estimated g of 0.147 (90% CI: 0.117 – 0.179).

4.1 Standardized Carcass Surveys

Forty full plot turbines were searched every 3.5 days and road and pad turbines were searched every 6.5 days for a total of 2,271 turbine searches throughout the fall monitoring period (Figure 2, Table 1). Over 99% of scheduled searches were completed. One full plot search was missed on October 9, 2020, at Turbine 40 due to turbine maintenance. A total of 375 bat carcasses were found during the clearing search, scheduled surveys, and incidentally (Table 2, Appendix A).

Table 1. Number of searches per plot type at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Season	Plot Type	Search Interval	Number of Searches
Fall Monitoring Period (August 1 – October 15)	100-m road/pad	weekly	1,351
	65-m cleared plot	twice per week	920
Overall			2,271

m=meter.

4.1.1 Species Composition

No federally or state-listed bat species, and therefore no Covered Species, were found during the clearing search, scheduled surveys, or incidentally. The most commonly found bat species across

all surveys and incidentally were eastern red bat (*Lasiurus borealis*; 145 carcasses; 38.7%), silver-haired bat (*Lasionycteris noctivagans*; 143 carcasses; 38.1%), hoary bat (*Lasiurus cinereus*; 50 carcasses; 13.3%), and big brown bat (*Eptesicus fuscus*; 33 carcasses; 8.8%). Four seminole bats (*Lasiurus seminolus*; 1.1%) were also found (Table 2: Appendix A).

4.1.2 Carcasses Used In Bat Fatality Estimates

Two hundred sixty-six bats were included in the all-bat fatality estimate and search area adjustment; whereas no Covered Species were found and 356 bats were included in the the Covered Species searched area adjustment (Table 2). Eleven bat carcasses were excluded from both analyses because they were found off plot (e.g. outside the graveled search area of a turbine that was searched only as a road and pad). Eight additional bats were excluded from both analyses because they were found during the initial clearing search. Ninety bats were excluded from the all-bat fatality estimate as they had an estimated time of death longer than the search interval (e.g., a carcass found on a road and pad search plot was estimated to have a time of death longer than 6.5 days). Those same 90 bats were included in the Covered Species searched area adjustment.

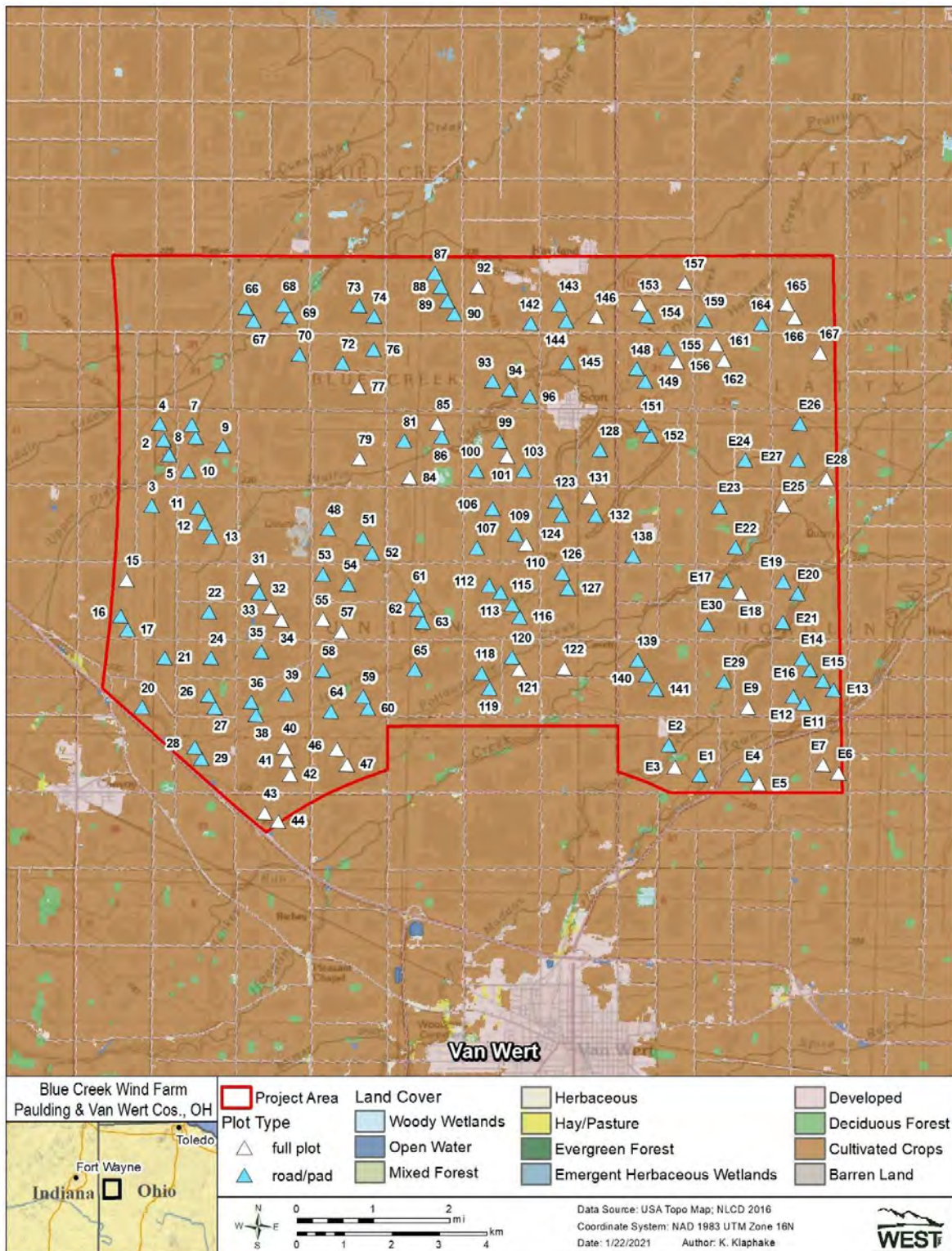


Figure 2. Search plot types used during the fall 2020 monitoring at the Blue Creek Wind Farm.

Table 2. Total number of carcasses and percent composition of carcasses discovered at the Blue Creek Wind Farm from August 1, 2020 – October 15, 2020.

Species	Total Fatalities		Outside Plot		Clearing Search		Total for Covered Species Searched Area Adjustment ¹		Removed Due to Estimated Time of Death for Huso ²		Total for All-Bat Fatality Estimate and Searched Area Adjustment ²	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Full Plots												
silver-haired bat	124	39.0	1	50.0	0	0	123	39.9	26	31.7	97	42.9
eastern red bat	125	39.3	1	50.0	7	87.5	117	38.0	39	47.6	78	34.5
hoary bat	41	12.9	0	0	0	0	41	13.3	13	15.9	28	12.4
big brown bat	24	7.6	0	0	1	12.5	23	7.5	3	3.7	20	8.9
Seminole bat	4	1.3	0	0	0	0	4	1.3	1	1.2	3	1.3
northern long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0
Indiana bat	0	0	0	0	0	0	0	0	0	0	0	0
Full Plots Overall	318	100	2	100	8	100	308	100	82	100	226	100
Road and Pads												
silver-haired bat	19	33.3	2	22.2	0	0	17	35.4	3	37.5	14	35.0
eastern red bat	20	35.1	2	22.2	0	0	18	37.5	2	25.0	16	40.0
hoary bat	9	15.8	2	22.2	0	0	7	14.6	3	37.5	4	10.0
big brown bat	9	15.8	3	33.3	0	0	6	12.5	0	0	6	15.0
Seminole bat	0	0	0	0	0	0	0	0	0	0	0	0
northern long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0
Indiana bat	0	0	0	0	0	0	0	0	0	0	0	0
Road and Pads Overall	57	100	9	100	0	0	48	100	8	100	40	100

¹ The Covered Species searched area adjustment used the GenEst criteria for fatalities to include in the searched area adjustment modeling. Fatalities were removed from the search area adjustment if they were found during the clearing search or off the plot. Because there were no fatalities of Covered Species, there are no totals for bat fatalities for this estimate.

² The all-bat fatality estimate used the Huso criteria for fatalities to include in the estimate. Fatalities were removed if they were found during the clearing search, outside the plot, or if they had an estimated time of death longer than the search interval.

4.2 Bias Trials

4.2.1 Searcher Efficiency Trials

Forty-three bat carcasses (6 big brown bats, 16 eastern red bats, 8 hoary bats, and 13 silver-haired bats) were placed on four separate dates (August 18, September 7, September 24, and October 6) for searcher efficiency trials, of which 40 were available for searchers to find. Searcher efficiency rates were 75.0% in full plots and 70.0% in road and pad plots. For both the Covered Species take estimate and the all-bat fatality rate, searcher efficiency was modeled using the best-fit model to determine if searcher efficiency varied by plot type. The best-fit model lacked covariates, indicating that searcher efficiency did not vary by plot type (Table 4), so the overall searcher efficiency rate was 72.5% (Table 3).

Table 3. Searcher efficiency results at the Blue Creek Wind Farm as a function of plot type, August 1 – October 15, 2020.

Plot Type	Number Placed	Number Available	Number Found	% Found
Full Plots	21	20	15	75.0
Road and Pads	22	20	14	70.0
Overall	43	40	29	72.5

Table 4. Searcher efficiency logit regression models for bats from the searcher efficiency trials at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Covariates	AICc	DeltaAICc
No Covariates	49.16	0*
Plot Type	51.25	2.09

*Selected model.

AICc = corrected Akaike Information Criterion.

4.2.2 Carcass Persistence Trials

Twenty bat carcasses (2 big brown bats, 7 eastern red bats, 4 hoary bats, and 7 silver-haired bats) were placed on two dates (August 18 and September 7). Carcass persistence was modeled using the survival regression model (Figure 3; Table 5). The best-fit model for carcass persistence rates was a lognormal distribution with a median removal time of 5.6 days for both the Covered Species take estimate and the all-bat fatality rate.

Table 5. Carcass persistence models and covariates for bats at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
No Covariates	No Covariates	lognormal	88.56	0*
No Covariates	No Covariates	loglogistic	88.57	0.01
No Covariates	No Covariates	Weibull	88.80	0.24
No Covariates	N/A	exponential	93.53	4.97

*Selected model.

AICc = Corrected Akaike Information Criterion.

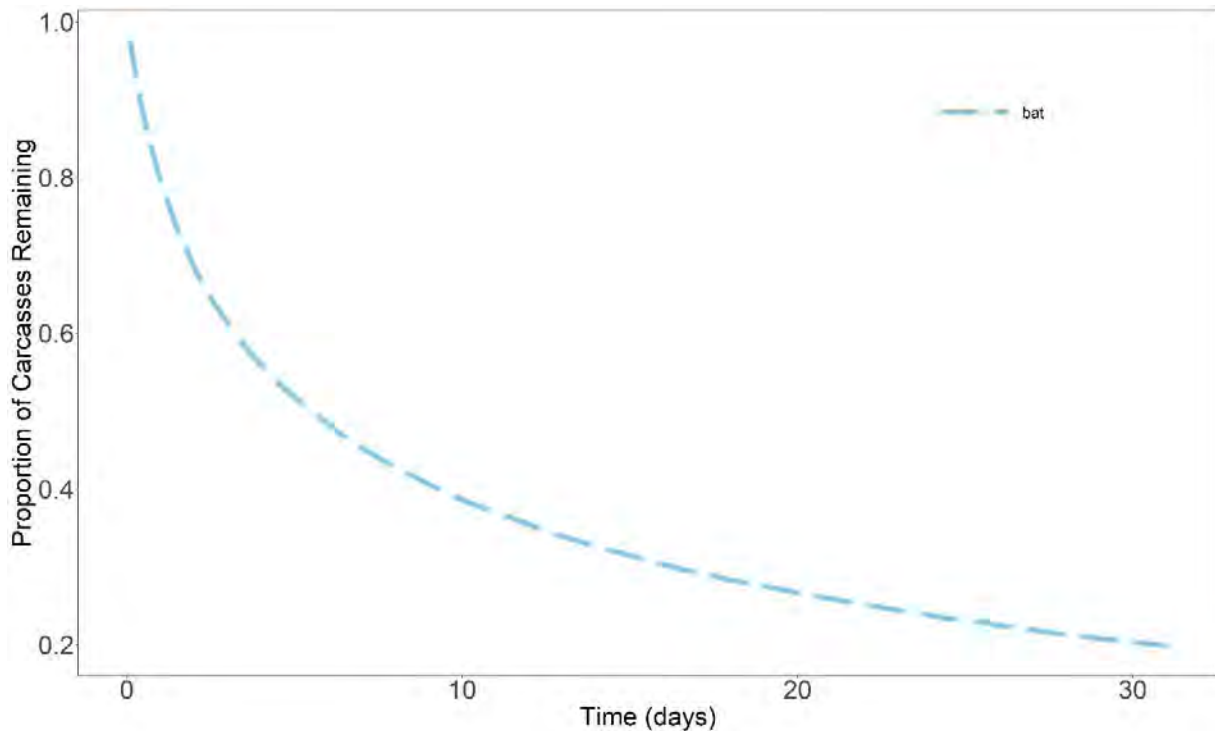


Figure 3. Persistence of bat carcasses through the 30-day carcass persistence trials at the Blue Creek Wind Farm from August 1 – October 15, 2020.

4.3 Statistical Analysis

4.3.1 Searched Area Adjustment

Searched areas at Blue Creek had no obstructions on the full plots or roads and pads. The proportion of area within 100 m that was able to be searched for full plots was 100% searchable out to 50 m (164 ft), 99.5% searchable from 51-60 m (167 – 197 ft), and 49.6% searchable from 60-70 m (197 – 230 ft; Table 6) since the plot boundary ended at 65 m. Minor errors in GPS coordinates during field mapping likely resulted in 99.5% of searcheable area from 51 – 60 m (167 – 197 ft) from turbines. The road and pad area had no obstructions; however, the area searched percentage is based on an ideal circular fall zone within 100 m (328 ft) of the turbine. To calculate the fall monitoring period fatality estimates, the all-bat fatality rate used a Weibull carcass density distribution (Figure 4) and the Covered Species take estimate used a Gompertz carcass density distribution (Figure 5).

The chosen model distribution, parameter estimates, and density weighted proportion (DWP) adjustment results are presented in Figures 4 and 5 and Appendices B and C for both the all-bat fatality rate estimate and the Covered Species take estimate.

Table 6. Proportion of area searched for plot types by distance band at the Blue Creek Wind Farm from August 1 – October 15, 2020.

Distance Band (meters)	Full Plot Proportion of Band Searched	Road and Pad Proportion of Band Searched
0–10	100	48.6
11–20	100	6.21
21–30	100	4.73
31–40	100	3.18
41–50	100	2.41
51–60	99.5	1.94
61–70*	49.6	1.63
71–80	0	1.39
81–90	0	1.27
91–100	0	1.16

* Full plot boundaries ended at 65 meters (213 feet).

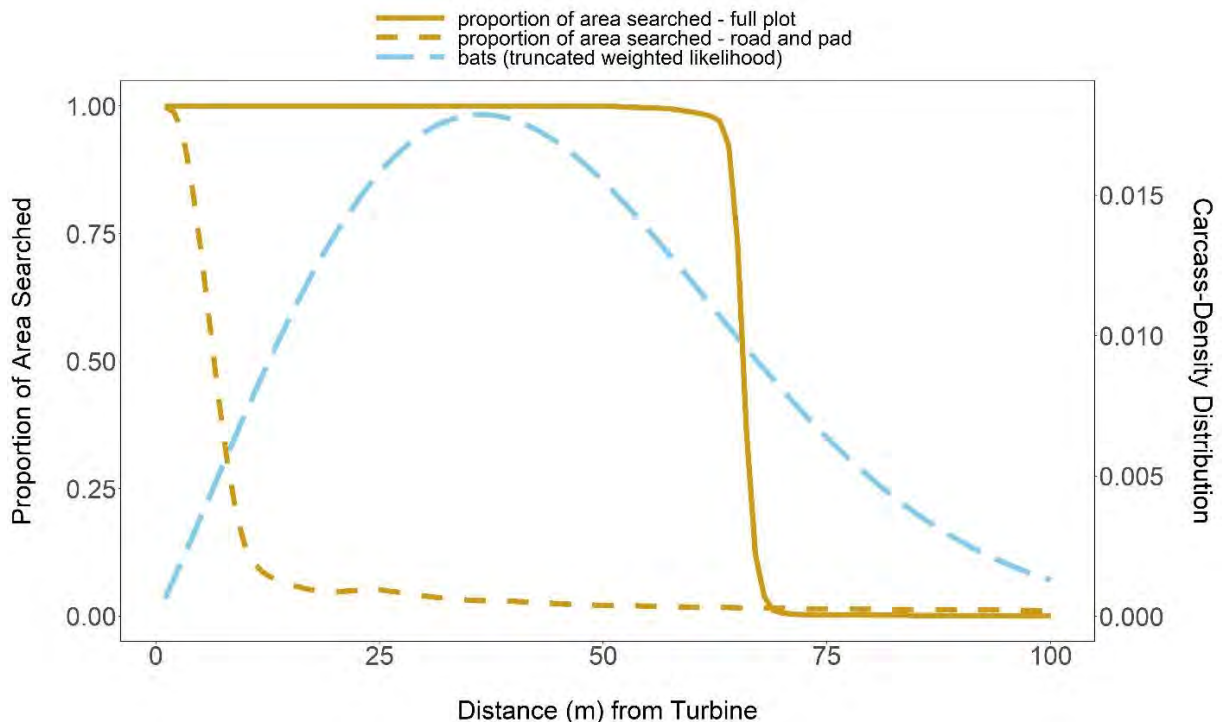


Figure 4. Proportion of area searched by search plot type with the Weibull best-fit distribution of bat carcasses found and used in the all-bat fatality estimate at the Blue Creek Wind Farm, August 1 – October 15, 2020.

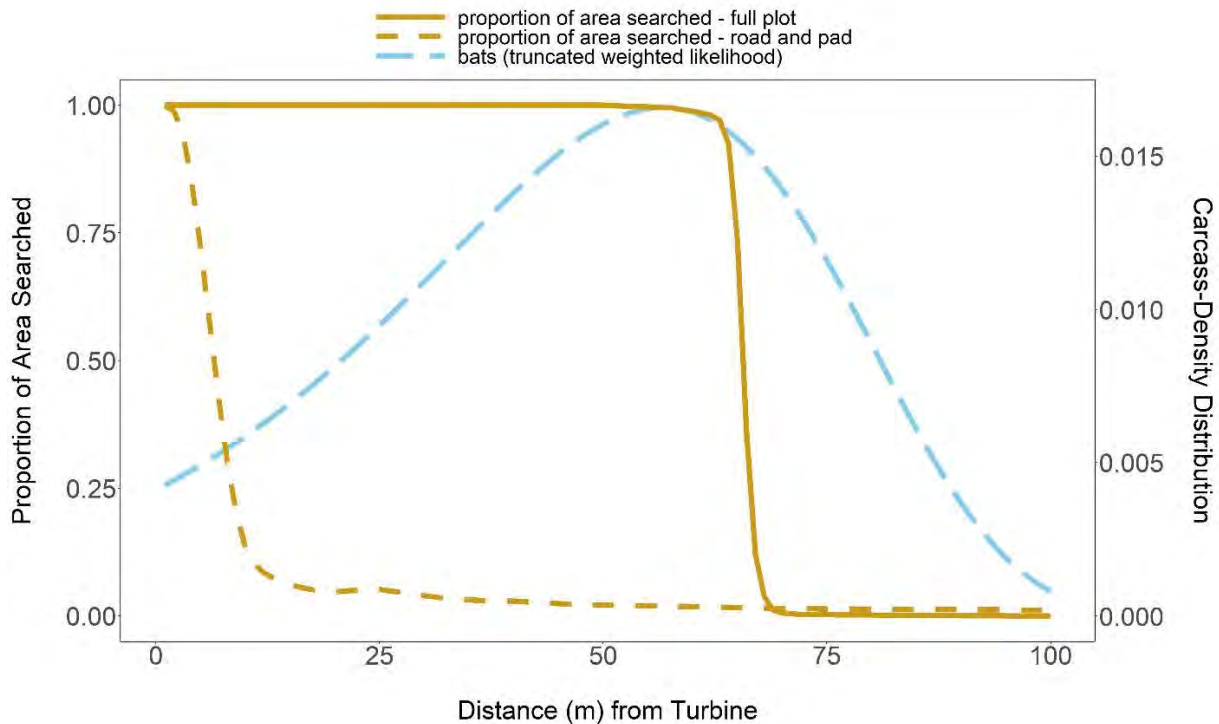


Figure 5. Proportion of area searched by search plot type with the Gompertz best-fit distribution of bat carcasses found and used to calculate Covered Species take estimates at the Blue Creek Wind Farm, August 1 – October 15, 2020.

4.3.2 All-bat Fatality Rate Estimate Searched Area Adjustment Results

The best-fit distribution for all-bats was the Weibull distribution (AICc = 21,277, Table 7, Figure 4, Appendix D). The estimated DWP for bats on roads and pads was 0.04 (90% CI: 0.03 – 0.06) and for full plots the DWP was 0.84 (90% CI: 0.70 – 0.94); that is, road and pad searches within 100 m (328 ft) of the turbine captured an average of 4% of potential bat fatalities while 65 m (213 ft) full plots captured an average of 84% of potential bat fatalities. A total of 266 bat carcasses were used to estimate the searched area adjustment for the all-bat fatality estimate (Table 2).

4.3.3 Covered Species Take Estimate Searched Area Adjustment Results

The best-fit distribution for bats for the Covered Species take estimate was the Gompertz distribution (AICc = 23,879, Table 8, Figure 5, Appendix D). The estimated DWP for bats on roads and pads was 0.05 (90% CI: 0.04 – 0.08) and for full plots the DWP was 0.74 (90% CI: 0.60 – 0.91); that is, road and pad searches within 100 m (328 ft) of the turbine captured an average of 5% of potential bat fatalities while 65 m (213 ft) full plots captured an average of 74% of potential bat fatalities. A total of 356 bat carcasses were used to estimate the searched area adjustment for take estimates (Table 2).

Table 7. Truncated weighted maximum likelihood searched area adjustment estimates for all-bat fatality rate estimation component of the analysis for the Blue Creek Wind Farm, August 1 – October 15, 2020.

Plot Type	Distribution	Scale	Shape	Searched Area Adjustment
Full Plots	Weibull	2.074995	49.9007	0.84
Road and Pads	Weibull	2.074995	49.9007	0.04

Table 8. Truncated weighted maximum likelihood searched area adjustment estimates for Covered Species take estimation component of the analysis for the Blue Creek Wind Farm, August 1 – October 15, 2020.

Plot Type	Distribution	Scale	Shape	Searched Area Adjustment
Full Plots	Gompertz	0.04047	0.00408	0.74
Road and Pads	Gompertz	0.04047	0.00408	0.05

4.3.4 All-bat Fatality Rate Estimate

The all-bat fatality estimates were 8.05 bats per MW (90% CI: 5.55–13.07) and 16.11 bats per turbine (90% CI: 11.10–26.13; Appendix B). All-bat fatality estimates for full plots were 6.28 bats per MW (90% CI: 4.59–9.29) and 12.56 bats per turbine (90% CI: 9.17–18.58). The all-bat fatality estimate for road and pad plots was 8.69 bats per MW (90% CI: 5.53–14.91) and 17.38 bats per turbine (90%: 11.06–29.82; Appendix B).

4.3.5 Covered Species Take Estimate

4.3.5.1 Site-wide Probability of Detection (*g*)

No Indiana bat or northern long-eared bat carcasses were found. The estimated *g* was 0.147 (90% CI: 0.117 – 0.179; Table 9). The study’s expected *g* = 0.1447 falls within the 90% confidence interval for the estimated *g* of 0.147, indicating there is no statistical difference between the target *g* and realized *g* for the 2020 fall monitoring period (Table 9).

Table 9. Estimated detection probability (*g*) using Evidence of Absence at the Blue Creek Wind Farm, August 1 – October 15, 2020¹.

Season	Plot Type	Sampling	Median <i>g</i>	Lower 90% CI	Upper 90% CI
		Fraction (weight)			
Fall	Full Plots	40/152	0.477	0.362	0.5930
Fall	Road and Pads	112/152	0.028	0.021	0.0374
Overall (weighted average)			0.147²	0.117²	0.179²

¹ See screenshots in Appendix C showing the inputs for Evidence of Absence based on these values.

² This value is a quantile from a weighed average of beta distributions and may not exactly match a weighted average of the point estimates above.

CI = confidence interval.

4.3.5.2 Covered Species Take Estimates

The two models that produce a take estimate (M^*) and a take rate estimate (λ) use different priors and produce different types of estimates; thus, the results of the two models will differ in most situations despite using the same search data and carcass count data. The estimate of M^* is the EoA point estimate for the number of bat fatalities that could plausibly have occurred, given the search effort and the number of carcass detections (0). Based on the count of Indiana bat and northern long-eared bat carcasses (both zero) and the detection probability, the cumulative take (M^*) amounted to no more than one fatality of either species during the fall monitoring period (i.e. M^* at $\alpha = 0.5$ is no more than 1). The mean estimated take rates (λ) were 3.468 (90% CI = 0.014 – 13.37) Indiana bats per fall monitoring period and 3.468 (90% CI = 0.014 – 13.37) northern long-eared bats per fall monitoring period (Table 10). The estimate of λ is the EoA estimate for the average annual take rate that could plausibly have given rise to the estimate of M^* . It is often higher than the estimate of M^* and if carcass counts remain constant from year to year, it decreases as more years of monitoring occur.

4.3.5.3 Adaptive Management—Evidence of Absence Short-term Trigger

The short-term trigger assesses the probability that the Covered Species estimated take rate exceeds the expected take rate, $\Pr(\lambda > \tau)$. At a confidence level of $\alpha = 0.05$, $\Pr(\lambda > \tau)$ must be greater than or equal to 0.95 for the short-term trigger to fire. The expected average annual take rate developed in the HCP was approximately 4.39 Indiana bats per year and 2.96 northern long-eared bats per year. For Indiana bat, $\Pr(\lambda > \tau) = 0.259$ (Table 10; Figure 6). For northern long-eared bat, $\Pr(\lambda > \tau) = 0.354$ (Table 10; Figure 6). Neither probability meets or exceeds 0.95, indicating the short-term trigger was not met and a short-term adaptive management response is not triggered.

4.3.5.4 Adaptive Management—Evidence of Absence Long-term Trigger

The cumulative take estimates fall below the total permitted take for both of the Covered Species (154 Indiana bats and 103 northern long-eared bats over the 35-year permit term; Table 11; Figure 7). Thus, the long-term trigger was not met and the Project is in compliance for both species because $M^* < T$ (i.e., total permitted take) for both species. Therefore, a long-term adaptive management response is not triggered.

Table 10. Estimated fall monitoring period fatality rate (λ) and probability that estimated fall take rates exceeded expected annual take using Evidence of Absence for the fall monitoring period at the Blue Creek Wind Farm from August 1 – October 15, 2020.

Species	Estimated Mean λ (90% CI)	Expected Take Rate Developed in HCP (τ)	$\Pr(\lambda > \tau)^*$	Short-term Trigger Fires at $\alpha = 0.05$?
Indiana bat	3.468 (0.014-13.37)	4.39	0.259	No
northern long-eared bat	3.468 (0.014-13.37)	2.96	0.354	No

* $\Pr(\lambda > \tau)$ reads, “the probability that λ (the annual take rate) is greater than τ (the expected annual take rate based on the total permitted take, used as a threshold for adaptive management).” If this probability is less than 0.95 (e.g., $\alpha = 0.05$ for a one-sided test), then no adaptive management is triggered because there is not sufficient evidence that the estimated annual take rate is greater than the expected annual take rate.

Table 11. Cumulative take estimate, permitted take estimate, and long-term trigger to date using Evidence of Absence for studies conducted at Blue Creek Wind Farm, August 1 – October 15, 2020.

Species	Cumulative Take (M^*)	Total Permitted Take (T)	Long-term Trigger Fires at $\alpha = 0.05$?
Indiana bat (50 th credible bound)	1	154	No
northern long-eared bat (50 th credible bound)	1	103	No

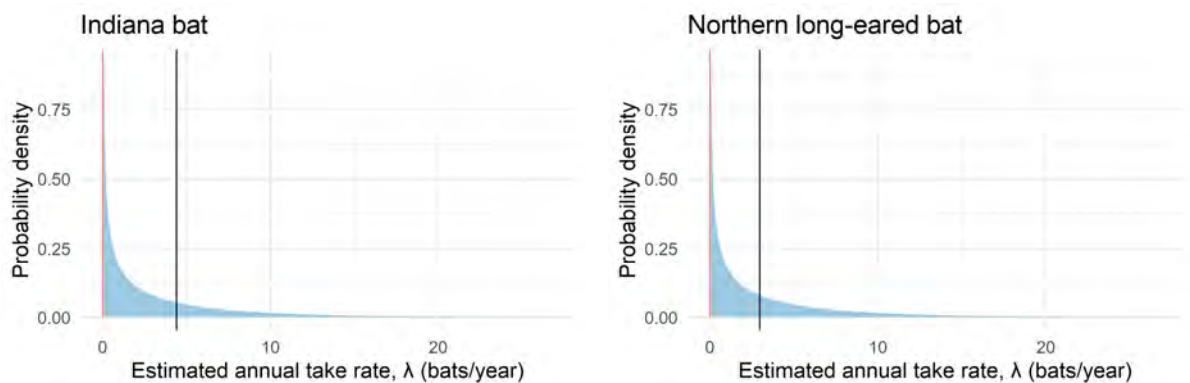


Figure 6. Estimated Covered Species take rates and short-term adaptive management trigger results for Indiana bat (left; *Myotis sodalis*) and northern long-eared bat (right; *M. septentrionalis*) from August 1 to October 15, 2020, at the Blue Creek Wind Farm.

Note: The posterior distribution for the take rate is indicated by the blue and red curve (in both plots above the red portion is near enough to zero and narrow enough that it is invisible). The black reference line indicates the HCP's expected take rate and the trigger would fire when the red portion of the posterior distribution exceeded the expected take rate.

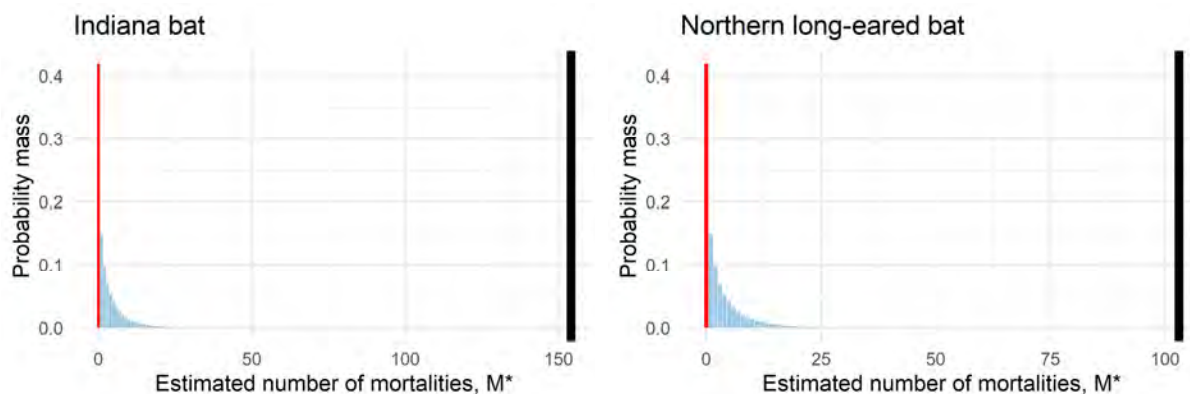


Figure 7. Estimated cumulative take and long-term adaptive management trigger results evaluated for Indiana bat (left; *Myotis sodalis*) and northern long-eared bat (right; *M. septentrionalis*) from August 1 to October 15, 2020, at the Blue Creek Wind Farm.

Note: The posterior distribution of the estimated number of mortalities is given by the bar chart. The red portion of the bar chart indicates the location of the short term AM trigger. The heavy black reference line shows the HCP's permitted take amount. The trigger would fire when the red portion of the posterior distribution equaled the permitted take amount.

4.4 Conclusions

The fall post-construction monitoring was completed per the USFWS-approved Study Plan and met the expected g for the fall monitoring period. The 90% confidence interval surrounding g during the fall monitoring period indicates that the expected g for the fall monitoring period was met. Based on the count of Indiana bat and northern long-eared bat carcasses (both zero) and the g of 0.147 (90% CI: 0.117 – 0.179), we estimated that no more than one fatality of either species occurred (i.e. cumulative take at $\alpha = 0.5$ is no more than 1). These values fall below the permitted take for each species, meaning the cumulative Covered Species take estimates are in compliance with the ITP. The probability that the fall monitoring period take rates exceeded the adaptive management thresholds for Indiana bat and northern long-eared bat did not exceed 95%, indicating the Project did not trigger any short or long-term adaptive management triggers and no adaptive management is necessary. Table 12 provides a summary of HCP and ITP requirements and the status of each requirement. Following recommendations from the USFWS, Blue Creek has committed to conduct spring monitoring in spring 2022 to ensure that the data collected under Intensive Monitoring are consistent with the intent of the Study Plan (M. Becker, personal communication, July 31, 2020).

Table 12. Habitat Conservation Plan and Incidental Take Permit compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Requirement	Source	Status Based on Fall 2020 Intensive Monitoring Results
Conduct Intensive Monitoring in spring	HCP Section 6.1.2	Not completed due to the COVID-19 outbreak and subsequent Stay At Home order for the state of Ohio on March 22, 2021; Blue Creek has committed to conduct spring monitoring in 2022 to ensure that the data collected under Intensive Monitoring are consistent with the intent of the study plan (M. Becker, personal communication, July 31, 2020).
Conduct Intensive Monitoring in fall	HCP Section 6.1.2	Completed
Meet an annual (spring + fall) probability of detection (g) of 0.15	HCP Section 6.1.2	Spring monitoring not conducted. Fall monitoring met the expected fall monitoring period g of 0.1447 (estimated g was 0.147, 90% CI 0.117 – 0.179).
Estimate mean take rates for the Covered Species	HCP Section 6.1.5	Mean take rates were 3.468 (90% CI: 0.014 – 13.37) Indiana bats per fall monitoring period and 3.468 (90% CI: 0.014 – 13.37) northern long-eared bats per fall monitoring period.
Estimate cumulative (ITP term to date) take estimates for the Covered Species	HCP Section 6.1.5	Cumulative take estimates were no more than one fatality of either Covered Species during 2020 fall monitoring period.

Table 12. Habitat Conservation Plan and Incidental Take Permit compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, August 1 – October 15, 2020.

Requirement	Source	Status Based on Fall 2020 Intensive Monitoring Results
Evaluate whether the short-term adaptive management threshold has been exceeded at the 95% credibility level	HCP Section 6.3.1	Probabilities that estimate take rates exceeded the short-term adaptive management thresholds were 25.9% for Indiana bat and 35.4% for northern long-eared bat, indicating no adaptive management was triggered.
Evaluate whether the cumulative take amount (M*) has exceeded the permitted take amount at the 50% credibility level	HCP Section 6.3.1	The cumulative take estimates of no more than one fatality of either Covered Species falls below the total permitted take for both of the Covered Species (154 Indiana bats and 103 northern long-eared bats), indicating the Project is in compliance with its permitted take levels.
Submit Intensive Monitoring report to the USFWS by April 1	HCP Section 6.1.6	Report submitted prior to April 1
Intensive Monitoring Report will include: <ol style="list-style-type: none"> 1. Information necessary to estimate take of Covered Species, such as: date, time, location, species, and sex, of all bat carcasses documented; 2. Bias trial data; 3. Calculated g value; 4. Estimated average annual take rates and cumulative take estimates of the Covered Species; 5. Adaptive management triggers activated (if any) and planned response; 6. EoA inputs for the monitoring year; 7. All-bat fatality rate; and 8. A record of ambient temperatures and wind speeds and the application of cut-in speeds during a representative sample of the minimization period. 	HCP Section 6.1.6	Report includes the required information in the following Sections: <ol style="list-style-type: none"> 1. Appendix A 2. Section 4.2 3. Section 4.3.5.1 4. Section 4.3.5 5. Sections 4.3.5.3 and 4.3.5.4 6. Appendix C 7. Section 4.3.4 8. Will be provided in a separate document.
Report any Covered Species fatality to the USFWS and ODNR by phone within 24 hours of positive species identification	HCP Section 6.1.6	No Covered Species carcasses were found
Provide the monitoring protocol the upcoming year of monitoring to the USFWS	HCP Section 6.1.2	Provided separately in document <i>2021 Post-Construction Monitoring Study Plan for the Blue Creek Wind Farm, Van Wert and Paulding counties, Ohio.</i>

5.0 REFERENCES

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Appendix A. Carcasses Found During the Fall 2020 Post-construction Monitoring at the Blue Creek Wind Farm

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
07/30/2020	big brown bat	52	E6	clearing search	twice per week full plot	intact	unknown	11:50
07/30/2020	eastern red bat	25	156	clearing search	twice per week full plot	scavenged	unknown	12:38
07/30/2020	eastern red bat	25	157	clearing search	twice per week full plot	intact	female	11:35
07/30/2020	eastern red bat	63	162	clearing search	twice per week full plot	scavenged	unknown	09:18
07/30/2020	eastern red bat	31	E5	clearing search	twice per week full plot	intact	unknown	09:50
07/31/2020	eastern red bat	48	110	clearing search	twice per week full plot	scavenged	unknown	15:10
07/31/2020	eastern red bat	39	34	clearing search	twice per week full plot	intact	unknown	13:45
07/31/2020	eastern red bat	42	57	clearing search	twice per week full plot	scavenged	unknown	09:55
07/31/2020	hoary bat	34	E17	clearing search	weekly road and pad	intact	male	11:38
08/03/2020	big brown bat	50	E1	carcass search	weekly road and pad	scavenged	unknown	13:25
08/03/2020	hoary bat	56	161	carcass search	twice per week full plot	intact	unknown	12:07
08/04/2020	eastern red bat	22	15	carcass search	twice per week full plot	intact	male	07:26
08/04/2020	hoary bat	26	151	carcass search	weekly road and pad	intact	unknown	13:16
08/04/2020	hoary bat	55	31	carcass search	twice per week full plot	intact	unknown	12:20
08/04/2020	hoary bat	51	40	carcass search	twice per week full plot	intact	unknown	15:47
08/04/2020	hoary bat	35	41	carcass search	twice per week full plot	intact	unknown	09:28
08/06/2020	eastern red bat	12	68	carcass search	weekly road and pad	intact	unknown	14:08
08/07/2020	hoary bat	12	E21	carcass search	weekly road and pad	dismembered	unknown	13:20
08/10/2020	eastern red bat	38	121	carcass search	twice per week full plot	scavenged	unknown	12:41
08/10/2020	eastern red bat	29	161	carcass search	twice per week full plot	scavenged	male	08:26
08/10/2020	eastern red bat	48	161	carcass search	twice per week full plot	scavenged	male	08:40
08/10/2020	eastern red bat	10	161	carcass search	twice per week full plot	scavenged	unknown	08:27
08/10/2020	eastern red bat	9	E20	carcass search	weekly road and pad	intact	unknown	13:55
08/10/2020	hoary bat	24	153	carcass search	twice per week full plot	scavenged	unknown	10:34
08/10/2020	hoary bat	60	153	carcass search	twice per week full plot	scavenged	unknown	10:45
08/11/2020	big brown bat	25	128	carcass search	weekly road and pad	scavenged	unknown	14:44
08/11/2020	hoary bat	47	41	carcass search	twice per week full plot	scavenged	unknown	09:00
08/11/2020	hoary bat	47	47	carcass search	twice per week full plot	scavenged	unknown	10:51
08/11/2020	hoary bat	32	57	carcass search	twice per week full plot	intact	unknown	08:40
08/13/2020	big brown bat	38	E25	carcass search	twice per week full plot	scavenged	male	10:25
08/13/2020	big brown bat	34	E25	carcass search	twice per week full plot	intact	female	10:20
08/13/2020	eastern red bat	45	122	carcass search	twice per week full plot	intact	unknown	07:35
08/13/2020	eastern red bat	6	146	carcass search	twice per week full plot	intact	unknown	09:20
08/13/2020	eastern red bat	47	153	carcass search	twice per week full plot	intact	unknown	10:20
08/13/2020	eastern red bat	21	161	carcass search	twice per week full plot	intact	unknown	12:14
08/13/2020	eastern red bat	36	74	carcass search	weekly road and pad	scavenged	unknown	14:48
08/13/2020	eastern red bat	22	76	carcass search	weekly road and pad	scavenged	unknown	15:18

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
08/13/2020	eastern red bat	56	89	carcass search	weekly road and pad	scavenged	unknown	13:48
08/13/2020	hoary bat	1	116	carcass search	weekly road and pad	intact	unknown	14:47
08/13/2020	hoary bat	20	165	carcass search	twice per week full plot	scavenged	unknown	12:38
08/13/2020	hoary bat	34	E25	carcass search	twice per week full plot	intact	female	10:20
08/13/2020	hoary bat	39	E28	carcass search	twice per week full plot	scavenged	unknown	11:28
08/14/2020	big brown bat	14	110	carcass search	twice per week full plot	intact	male	12:57
08/14/2020	big brown bat	39	47	carcass search	twice per week full plot	intact	unknown	10:35
08/14/2020	big brown bat	38	57	carcass search	twice per week full plot	scavenged	male	08:51
08/14/2020	big brown bat	40	77	carcass search	twice per week full plot	scavenged	male	11:22
08/14/2020	eastern red bat	52	15	carcass search	twice per week full plot	scavenged	female	07:24
08/14/2020	eastern red bat	14	15	carcass search	twice per week full plot	scavenged	male	07:21
08/14/2020	eastern red bat	18	15	carcass search	twice per week full plot	scavenged	unknown	07:22
08/14/2020	eastern red bat	30	40	carcass search	twice per week full plot	intact	unknown	08:40
08/14/2020	eastern red bat	30	40	carcass search	twice per week full plot	scavenged	unknown	08:43
08/14/2020	eastern red bat	22	44	carcass search	twice per week full plot	intact	unknown	07:30
08/14/2020	eastern red bat	56	57	carcass search	twice per week full plot	scavenged	unknown	08:51
08/14/2020	eastern red bat	33	57	carcass search	twice per week full plot	scavenged	unknown	08:53
08/14/2020	eastern red bat	19	79	carcass search	twice per week full plot	scavenged	unknown	10:48
08/14/2020	eastern red bat	41	84	carcass search	twice per week full plot	scavenged	unknown	09:57
08/14/2020	eastern red bat	19	84	carcass search	twice per week full plot	intact	male	09:50
08/14/2020	hoary bat	36	131	carcass search	twice per week full plot	scavenged	male	13:43
08/14/2020	hoary bat	32	44	carcass search	twice per week full plot	intact	unknown	07:40
08/14/2020	hoary bat	12	84	carcass search	twice per week full plot	scavenged	unknown	09:48
08/17/2020	big brown bat	1	E12	carcass search	weekly road and pad	intact	unknown	14:29
08/17/2020	big brown bat	24	E9	carcass search	twice per week full plot	scavenged	unknown	09:50
08/17/2020	eastern red bat	37	122	carcass search	twice per week full plot	injured	unknown	07:35
08/17/2020	eastern red bat	1	E1	carcass search	weekly road and pad	intact	unknown	14:45
08/17/2020	eastern red bat	69	E13	carcass search	weekly road and pad	scavenged	unknown	13:12
08/17/2020	eastern red bat	29	E28	carcass search	twice per week full plot	feather spot	unknown	11:35
08/17/2020	eastern red bat	42	E5	carcass search	twice per week full plot	scavenged	unknown	07:55
08/17/2020	hoary bat	31	E12	carcass search	weekly road and pad	scavenged	unknown	14:30
08/17/2020	hoary bat	24	E6	carcass search	twice per week full plot	scavenged	unknown	08:34
08/17/2020	hoary bat	28	E6	carcass search	twice per week full plot	scavenged	unknown	08:36
08/18/2020	big brown bat	11	16	carcass search	weekly road and pad	dismembered	unknown	13:48
08/18/2020	big brown bat	42	55	carcass search	twice per week full plot	intact	male	08:37
08/18/2020	big brown bat	39	84	carcass search	twice per week full plot	scavenged	male	08:40
08/18/2020	big brown bat	31	85	carcass search	twice per week full plot	intact	male	11:37

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
08/18/2020	eastern red bat	34	31	carcass search	twice per week full plot	intact	unknown	09:05
08/18/2020	eastern red bat	61	84	carcass search	twice per week full plot	scavenged	unknown	09:25
08/18/2020	eastern red bat	15	84	carcass search	twice per week full plot	scavenged	unknown	09:38
08/18/2020	eastern red bat	20	84	carcass search	twice per week full plot	intact	male	08:28
08/18/2020	hoary bat	9	101	carcass search	twice per week full plot	scavenged	female	12:08
08/18/2020	hoary bat	39	34	carcass search	twice per week full plot	scavenged	unknown	07:23
08/19/2020	hoary bat	5	9	incidental	weekly road and pad	intact	unknown	08:50
08/20/2020	eastern red bat	20	153	carcass search	twice per week full plot	intact	female	10:22
08/20/2020	eastern red bat	15	156	carcass search	twice per week full plot	intact	female	09:37
08/20/2020	eastern red bat	34	92	carcass search	twice per week full plot	scavenged	female	11:30
08/20/2020	hoary bat	60	167	carcass search	twice per week full plot	scavenged	unknown	07:30
08/20/2020	hoary bat	22	E18	carcass search	twice per week full plot	intact	unknown	10:50
08/20/2020	silver-haired bat	46	E28	carcass search	twice per week full plot	intact	unknown	12:32
08/21/2020	big brown bat	7	21	carcass search	weekly road and pad	scavenged	unknown	13:24
08/21/2020	big brown bat	47	57	carcass search	twice per week full plot	intact	unknown	09:25
08/21/2020	eastern red bat	55	110	carcass search	twice per week full plot	scavenged	unknown	10:15
08/21/2020	eastern red bat	12	15	carcass search	twice per week full plot	scavenged	unknown	07:32
08/21/2020	eastern red bat	48	43	carcass search	twice per week full plot	scavenged	female	07:32
08/21/2020	eastern red bat	25	47	carcass search	twice per week full plot	intact	male	10:20
08/21/2020	eastern red bat	33	47	carcass search	twice per week full plot	scavenged	female	10:21
08/21/2020	eastern red bat	57	55	carcass search	twice per week full plot	scavenged	unknown	08:40
08/21/2020	eastern red bat	55	57	carcass search	twice per week full plot	scavenged	unknown	09:27
08/21/2020	hoary bat	22	101	carcass search	twice per week full plot	intact	unknown	11:40
08/21/2020	hoary bat	11	81	carcass search	weekly road and pad	intact	unknown	15:21
08/21/2020	hoary bat	24	84	carcass search	twice per week full plot	scavenged	unknown	12:30
08/24/2020	big brown bat	25	E28	carcass search	twice per week full plot	scavenged	unknown	13:20
08/24/2020	big brown bat	38	E6	carcass search	twice per week full plot	intact	unknown	09:44
08/24/2020	big brown bat	38	E7	carcass search	twice per week full plot	intact	unknown	09:12
08/24/2020	eastern red bat	43	153	carcass search	twice per week full plot	intact	unknown	13:30
08/24/2020	eastern red bat	35	156	carcass search	twice per week full plot	scavenged	unknown	13:00
08/24/2020	eastern red bat	36	157	carcass search	twice per week full plot	scavenged	unknown	12:24
08/24/2020	eastern red bat	21	164	carcass search	weekly road and pad	scavenged	unknown	08:23
08/24/2020	eastern red bat	26	165	carcass search	twice per week full plot	scavenged	unknown	14:04
08/24/2020	eastern red bat	46	E24	carcass search	weekly road and pad	scavenged	unknown	07:27
08/24/2020	eastern red bat	37	E6	carcass search	twice per week full plot	intact	unknown	09:45
08/25/2020	eastern red bat	55	122	carcass search	twice per week full plot	intact	unknown	09:15
08/25/2020	eastern red bat	44	122	carcass search	twice per week full plot	scavenged	unknown	09:20

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
08/25/2020	eastern red bat	49	131	carcass search	twice per week full plot	scavenged	unknown	11:00
08/25/2020	eastern red bat	63	77	carcass search	twice per week full plot	intact	unknown	13:18
08/25/2020	eastern red bat	60	84	carcass search	twice per week full plot	intact	unknown	14:23
08/25/2020	hoary bat	41	110	carcass search	twice per week full plot	intact	unknown	10:02
08/25/2020	silver-haired bat	25	15	carcass search	twice per week full plot	scavenged	unknown	15:35
08/26/2020	eastern red bat	30	40	carcass search	twice per week full plot	intact	unknown	08:22
08/27/2020	eastern red bat	42	122	carcass search	twice per week full plot	intact	unknown	13:30
08/27/2020	eastern red bat	41	157	carcass search	twice per week full plot	intact	unknown	09:40
08/27/2020	eastern red bat	25	161	carcass search	twice per week full plot	intact	unknown	08:36
08/27/2020	eastern red bat	47	92	carcass search	twice per week full plot	intact	unknown	12:03
08/27/2020	eastern red bat	53	E28	carcass search	twice per week full plot	intact	male	11:25
08/27/2020	eastern red bat	13	E7	carcass search	twice per week full plot	scavenged	male	08:40
08/27/2020	eastern red bat	62	E7	incidental	twice per week full plot	intact	unknown	08:50
08/27/2020	eastern red bat	49	E7	incidental	twice per week full plot	intact	unknown	08:50
08/27/2020	eastern red bat	35	E9	carcass search	twice per week full plot	scavenged	unknown	09:47
08/27/2020	Seminole bat	60	161	carcass search	twice per week full plot	intact	unknown	08:49
08/28/2020	big brown bat	32	57	carcass search	twice per week full plot	scavenged	male	08:25
08/28/2020	eastern red bat	59	33	carcass search	twice per week full plot	dismembered	unknown	12:50
08/28/2020	eastern red bat	57	33	carcass search	twice per week full plot	intact	unknown	12:43
08/28/2020	eastern red bat	53	34	carcass search	twice per week full plot	scavenged	unknown	12:00
08/28/2020	eastern red bat	30	40	carcass search	twice per week full plot	dismembered	unknown	08:55
08/28/2020	eastern red bat	64	44	carcass search	twice per week full plot	intact	unknown	07:48
08/28/2020	eastern red bat	35	55	carcass search	twice per week full plot	scavenged	unknown	09:10
08/28/2020	eastern red bat	34	55	carcass search	twice per week full plot	scavenged	unknown	08:58
08/28/2020	hoary bat	64	15	carcass search	twice per week full plot	scavenged	unknown	07:35
08/31/2020	big brown bat	31	E3	carcass search	twice per week full plot	scavenged	male	07:25
08/31/2020	eastern red bat	61	164	carcass search	weekly road and pad	scavenged	unknown	13:15
08/31/2020	eastern red bat	31	166	carcass search	twice per week full plot	intact	male	11:50
08/31/2020	eastern red bat	32	E25	carcass search	twice per week full plot	intact	female	10:45
08/31/2020	eastern red bat	8	E27	carcass search	weekly road and pad	intact	unknown	14:45
08/31/2020	eastern red bat	38	E3	carcass search	twice per week full plot	injured	unknown	07:23
08/31/2020	eastern red bat	47	E9	carcass search	twice per week full plot	intact	female	09:24
08/31/2020	silver-haired bat	43	146	carcass search	twice per week full plot	intact	male	09:10
08/31/2020	silver-haired bat	59	E9	carcass search	twice per week full plot	intact	female	09:40
09/01/2020	big brown bat	19	85	carcass search	twice per week full plot	intact	female	11:10
09/01/2020	eastern red bat	16	31	carcass search	twice per week full plot	scavenged	unknown	14:28
09/01/2020	eastern red bat	23	33	carcass search	twice per week full plot	scavenged	unknown	14:55

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/01/2020	eastern red bat	59	33	carcass search	twice per week full plot	scavenged	unknown	15:13
09/01/2020	eastern red bat	29	34	carcass search	twice per week full plot	intact	male	16:03
09/01/2020	eastern red bat	8	40	carcass search	twice per week full plot	scavenged	unknown	12:01
09/01/2020	eastern red bat	50	40	carcass search	twice per week full plot	scavenged	unknown	12:01
09/01/2020	eastern red bat	46	40	carcass search	twice per week full plot	scavenged	unknown	12:22
09/01/2020	eastern red bat	35	42	carcass search	twice per week full plot	intact	male	10:21
09/01/2020	eastern red bat	57	43	carcass search	twice per week full plot	intact	male	09:00
09/01/2020	eastern red bat	35	44	carcass search	twice per week full plot	intact	unknown	07:25
09/01/2020	eastern red bat	20	46	carcass search	twice per week full plot	scavenged	unknown	13:11
09/01/2020	eastern red bat	20	47	carcass search	twice per week full plot	scavenged	unknown	13:56
09/01/2020	hoary bat	39	131	carcass search	twice per week full plot	scavenged	unknown	13:20
09/01/2020	hoary bat	52	34	carcass search	twice per week full plot	scavenged	unknown	16:00
09/01/2020	hoary bat	38	47	carcass search	twice per week full plot	intact	unknown	14:15
09/01/2020	Seminole bat	54	42	carcass search	twice per week full plot	scavenged	unknown	10:18
09/01/2020	silver-haired bat	41	110	carcass search	twice per week full plot	intact	male	12:23
09/01/2020	silver-haired bat	65	15	carcass search	twice per week full plot	intact	female	07:50
09/01/2020	silver-haired bat	45	31	carcass search	twice per week full plot	intact	male	14:15
09/01/2020	silver-haired bat	55	33	carcass search	twice per week full plot	intact	male	15:10
09/01/2020	silver-haired bat	31	40	carcass search	twice per week full plot	intact	female	12:08
09/01/2020	silver-haired bat	40	40	carcass search	twice per week full plot	intact	female	12:18
09/01/2020	silver-haired bat	20	40	carcass search	twice per week full plot	intact	male	12:02
09/01/2020	silver-haired bat	24	40	carcass search	twice per week full plot	intact	male	12:00
09/01/2020	silver-haired bat	64	42	carcass search	twice per week full plot	intact	unknown	10:13
09/01/2020	silver-haired bat	49	42	carcass search	twice per week full plot	scavenged	female	10:30
09/01/2020	silver-haired bat	31	42	carcass search	twice per week full plot	dismembered	unknown	10:15
09/01/2020	silver-haired bat	45	43	carcass search	twice per week full plot	intact	male	09:20
09/01/2020	silver-haired bat	41	43	carcass search	twice per week full plot	intact	male	09:16
09/01/2020	silver-haired bat	39	43	carcass search	twice per week full plot	intact	unknown	09:15
09/01/2020	silver-haired bat	40	44	carcass search	twice per week full plot	intact	male	07:40
09/01/2020	silver-haired bat	65	44	carcass search	twice per week full plot	intact	male	07:50
09/01/2020	silver-haired bat	38	44	carcass search	twice per week full plot	intact	male	07:35
09/01/2020	silver-haired bat	45	44	carcass search	twice per week full plot	intact	unknown	07:35
09/01/2020	silver-haired bat	58	44	carcass search	twice per week full plot	intact	male	07:45
09/01/2020	silver-haired bat	0	44	carcass search	twice per week full plot	injured	unknown	07:20
09/01/2020	silver-haired bat	46	46	carcass search	twice per week full plot	intact	unknown	13:11
09/01/2020	silver-haired bat	47	46	carcass search	twice per week full plot	intact	unknown	13:11
09/01/2020	silver-haired bat	38	47	carcass search	twice per week full plot	intact	unknown	14:18

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/01/2020	silver-haired bat	14	47	carcass search	twice per week full plot	scavenged	unknown	14:00
09/01/2020	silver-haired bat	39	77	carcass search	twice per week full plot	intact	male	10:25
09/01/2020	silver-haired bat	25	77	carcass search	twice per week full plot	intact	male	10:22
09/01/2020	silver-haired bat	25	77	carcass search	twice per week full plot	scavenged	unknown	10:24
09/02/2020	big brown bat	25	151	carcass search	weekly road and pad	scavenged	unknown	08:49
09/02/2020	big brown bat	26	70	carcass search	weekly road and pad	intact	unknown	07:34
09/02/2020	eastern red bat	34	16	carcass search	weekly road and pad	scavenged	unknown	10:32
09/02/2020	silver-haired bat	23	123	carcass search	weekly road and pad	intact	male	10:45
09/02/2020	silver-haired bat	23	123	carcass search	weekly road and pad	intact	male	10:45
09/02/2020	silver-haired bat	3	124	carcass search	weekly road and pad	scavenged	unknown	10:16
09/02/2020	silver-haired bat	50	16	carcass search	weekly road and pad	scavenged	unknown	10:29
09/03/2020	big brown bat	29	E25	carcass search	twice per week full plot	dismembered	unknown	11:24
09/03/2020	eastern red bat	44	121	carcass search	twice per week full plot	intact	unknown	15:28
09/03/2020	eastern red bat	46	122	carcass search	twice per week full plot	scavenged	unknown	16:22
09/03/2020	eastern red bat	18	146	carcass search	twice per week full plot	intact	male	11:27
09/03/2020	eastern red bat	14	165	carcass search	twice per week full plot	intact	unknown	12:20
09/03/2020	eastern red bat	38	166	carcass search	twice per week full plot	intact	unknown	13:40
09/03/2020	eastern red bat	77	88	carcass search	weekly road and pad	scavenged	unknown	17:39
09/03/2020	hoary bat	39	146	carcass search	twice per week full plot	scavenged	female	11:28
09/03/2020	hoary bat	45	162	carcass search	twice per week full plot	scavenged	unknown	08:10
09/03/2020	hoary bat	47	E5	carcass search	twice per week full plot	dismembered	unknown	08:22
09/03/2020	Seminole bat	31	165	carcass search	twice per week full plot	intact	unknown	12:30
09/03/2020	silver-haired bat	3	109	carcass search	weekly road and pad	injured	unknown	14:22
09/03/2020	silver-haired bat	13	118	carcass search	weekly road and pad	scavenged	female	16:03
09/03/2020	silver-haired bat	51	121	carcass search	twice per week full plot	dismembered	unknown	15:32
09/03/2020	silver-haired bat	51	122	carcass search	twice per week full plot	intact	unknown	16:27
09/03/2020	silver-haired bat	45	122	carcass search	twice per week full plot	intact	unknown	16:24
09/03/2020	silver-haired bat	38	153	carcass search	twice per week full plot	scavenged	male	10:35
09/03/2020	silver-haired bat	33	153	carcass search	twice per week full plot	scavenged	male	10:22
09/03/2020	silver-haired bat	39	153	carcass search	twice per week full plot	intact	female	10:35
09/03/2020	silver-haired bat	34	153	carcass search	twice per week full plot	intact	female	10:28
09/03/2020	silver-haired bat	44	161	carcass search	twice per week full plot	scavenged	female	08:55
09/03/2020	silver-haired bat	39	162	carcass search	twice per week full plot	scavenged	male	08:11
09/03/2020	silver-haired bat	12	162	carcass search	twice per week full plot	scavenged	male	08:03
09/03/2020	silver-haired bat	11	165	carcass search	twice per week full plot	intact	unknown	12:26
09/03/2020	silver-haired bat	32	165	carcass search	twice per week full plot	intact	unknown	12:35
09/03/2020	silver-haired bat	39	165	carcass search	twice per week full plot	intact	unknown	12:29

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/03/2020	silver-haired bat	26	92	carcass search	twice per week full plot	scavenged	female	12:45
09/03/2020	silver-haired bat	30	92	carcass search	twice per week full plot	intact	male	12:44
09/03/2020	silver-haired bat	42	92	carcass search	twice per week full plot	scavenged	male	12:48
09/03/2020	silver-haired bat	46	92	carcass search	twice per week full plot	scavenged	male	12:49
09/03/2020	silver-haired bat	26	92	carcass search	twice per week full plot	scavenged	female	12:41
09/03/2020	silver-haired bat	12	E25	carcass search	twice per week full plot	intact	unknown	11:15
09/03/2020	silver-haired bat	7	E25	carcass search	twice per week full plot	intact	unknown	11:15
09/03/2020	silver-haired bat	32	E25	carcass search	twice per week full plot	intact	male	11:12
09/03/2020	silver-haired bat	44	E28	carcass search	twice per week full plot	intact	unknown	14:25
09/03/2020	silver-haired bat	31	E5	carcass search	twice per week full plot	scavenged	unknown	08:25
09/04/2020	eastern red bat	47	31	carcass search	twice per week full plot	scavenged	unknown	12:45
09/04/2020	eastern red bat	58	31	carcass search	twice per week full plot	scavenged	unknown	12:46
09/04/2020	eastern red bat	22	32	carcass search	weekly road and pad	scavenged	unknown	13:22
09/04/2020	eastern red bat	3	42	carcass search	twice per week full plot	intact	female	09:38
09/04/2020	eastern red bat	83	59	carcass search	weekly road and pad	intact	unknown	14:53
09/04/2020	hoary bat	55	77	carcass search	twice per week full plot	intact	female	11:17
09/04/2020	silver-haired bat	5	110	carcass search	twice per week full plot	scavenged	male	13:29
09/04/2020	silver-haired bat	41	110	carcass search	twice per week full plot	scavenged	unknown	13:49
09/04/2020	silver-haired bat	39	31	carcass search	twice per week full plot	scavenged	male	12:35
09/04/2020	silver-haired bat	52	33	carcass search	twice per week full plot	scavenged	male	11:55
09/04/2020	silver-haired bat	20	55	carcass search	twice per week full plot	scavenged	unknown	08:12
09/04/2020	silver-haired bat	37	57	carcass search	twice per week full plot	scavenged	unknown	09:10
09/04/2020	silver-haired bat	26	79	carcass search	twice per week full plot	scavenged	unknown	10:23
09/04/2020	silver-haired bat	27	79	carcass search	twice per week full plot	scavenged	unknown	10:15
09/04/2020	silver-haired bat	15	85	carcass search	twice per week full plot	scavenged	male	11:38
09/07/2020	silver-haired bat	51	162	carcass search	twice per week full plot	scavenged	unknown	08:30
09/07/2020	silver-haired bat	66	167	carcass search	twice per week full plot	intact	female	07:19
09/07/2020	silver-haired bat	20	167	carcass search	twice per week full plot	scavenged	unknown	07:26
09/07/2020	silver-haired bat	57	167	carcass search	twice per week full plot	scavenged	male	07:38
09/08/2020	big brown bat	4	143	carcass search	weekly road and pad	scavenged	unknown	13:37
09/08/2020	big brown bat	55	92	carcass search	twice per week full plot	scavenged	unknown	10:48
09/08/2020	eastern red bat	57	156	carcass search	twice per week full plot	intact	unknown	08:58
09/08/2020	eastern red bat	6	E13	carcass search	weekly road and pad	scavenged	unknown	12:09
09/08/2020	hoary bat	32	146	carcass search	twice per week full plot	scavenged	unknown	09:54
09/08/2020	silver-haired bat	26	144	carcass search	weekly road and pad	scavenged	unknown	13:54
09/08/2020	silver-haired bat	3	145	carcass search	weekly road and pad	scavenged	unknown	14:28
09/08/2020	silver-haired bat	12	148	carcass search	weekly road and pad	scavenged	unknown	13:04

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/08/2020	silver-haired bat	70	148	carcass search	weekly road and pad	scavenged	male	13:02
09/08/2020	silver-haired bat	17	157	carcass search	twice per week full plot	scavenged	unknown	08:00
09/08/2020	silver-haired bat	43	E18	carcass search	twice per week full plot	scavenged	unknown	07:25
09/09/2020	eastern red bat	26	40	carcass search	twice per week full plot	intact	female	10:30
09/09/2020	eastern red bat	0	41	incidental	twice per week full plot	intact	unknown	08:50
09/09/2020	eastern red bat	34	43	carcass search	twice per week full plot	scavenged	unknown	07:39
09/09/2020	eastern red bat	64	44	incidental	twice per week full plot	injured	unknown	08:50
09/09/2020	hoary bat	21	84	carcass search	twice per week full plot	dismembered	unknown	09:18
09/09/2020	hoary bat	32	85	carcass search	twice per week full plot	intact	female	11:18
09/10/2020	big brown bat	25	153	carcass search	twice per week full plot	intact	female	10:10
09/10/2020	big brown bat	54	165	carcass search	twice per week full plot	scavenged	male	12:45
09/10/2020	eastern red bat	40	E18	carcass search	twice per week full plot	scavenged	unknown	10:30
09/10/2020	silver-haired bat	60	166	carcass search	twice per week full plot	intact	female	13:18
09/10/2020	silver-haired bat	36	E18	carcass search	twice per week full plot	scavenged	unknown	10:40
09/10/2020	silver-haired bat	19	E18	carcass search	twice per week full plot	scavenged	unknown	10:31
09/11/2020	big brown bat	32	85	carcass search	twice per week full plot	intact	male	11:08
09/11/2020	eastern red bat	30	131	carcass search	twice per week full plot	intact	male	13:00
09/11/2020	eastern red bat	25	15	carcass search	twice per week full plot	intact	male	07:45
09/11/2020	eastern red bat	55	36	carcass search	weekly road and pad	intact	female	13:18
09/11/2020	eastern red bat	41	79	carcass search	twice per week full plot	scavenged	unknown	09:58
09/11/2020	eastern red bat	40	79	carcass search	twice per week full plot	intact	male	09:55
09/11/2020	eastern red bat	27	84	carcass search	twice per week full plot	intact	female	09:17
09/11/2020	silver-haired bat	6	88	carcass search	weekly road and pad	scavenged	unknown	13:35
09/14/2020	big brown bat	25	E25	carcass search	twice per week full plot	intact	male	11:30
09/14/2020	eastern red bat	33	122	carcass search	twice per week full plot	scavenged	unknown	14:08
09/14/2020	eastern red bat	44	165	carcass search	twice per week full plot	scavenged	unknown	13:45
09/14/2020	eastern red bat	72	166	carcass search	twice per week full plot	scavenged	unknown	12:45
09/14/2020	eastern red bat	45	167	carcass search	twice per week full plot	intact	unknown	07:45
09/14/2020	eastern red bat	64	E18	carcass search	twice per week full plot	scavenged	unknown	10:58
09/14/2020	eastern red bat	34	E25	carcass search	twice per week full plot	scavenged	unknown	11:40
09/14/2020	eastern red bat	74	E30	carcass search	weekly road and pad	scavenged	female	15:19
09/14/2020	hoary bat	39	142	carcass search	weekly road and pad	intact	unknown	15:16
09/14/2020	hoary bat	37	146	carcass search	twice per week full plot	scavenged	unknown	11:37
09/14/2020	hoary bat	53	146	carcass search	twice per week full plot	intact	unknown	11:45
09/14/2020	hoary bat	44	E27	carcass search	weekly road and pad	scavenged	unknown	15:53
09/14/2020	silver-haired bat	31	121	carcass search	twice per week full plot	intact	unknown	13:31
09/14/2020	silver-haired bat	23	144	carcass search	weekly road and pad	scavenged	unknown	15:47

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/14/2020	silver-haired bat	65	153	carcass search	twice per week full plot	intact	unknown	10:49
09/14/2020	silver-haired bat	35	153	carcass search	twice per week full plot	intact	unknown	10:35
09/14/2020	silver-haired bat	38	154	carcass search	weekly road and pad	scavenged	unknown	16:19
09/14/2020	silver-haired bat	8	159	carcass search	weekly road and pad	scavenged	unknown	15:03
09/14/2020	silver-haired bat	50	165	carcass search	twice per week full plot	scavenged	unknown	13:48
09/14/2020	silver-haired bat	24	92	carcass search	twice per week full plot	scavenged	unknown	12:31
09/14/2020	silver-haired bat	34	E18	carcass search	twice per week full plot	scavenged	unknown	10:40
09/14/2020	silver-haired bat	63	E5	carcass search	twice per week full plot	scavenged	unknown	08:07
09/14/2020	silver-haired bat	19	E7	carcass search	twice per week full plot	scavenged	male	09:07
09/14/2020	silver-haired bat	63	E9	carcass search	twice per week full plot	scavenged	unknown	10:05
09/14/2020	silver-haired bat	14	E9	carcass search	twice per week full plot	scavenged	female	09:51
09/15/2020	big brown bat	25	152	carcass search	weekly road and pad	intact	unknown	13:10
09/15/2020	eastern red bat	0	16	carcass search	weekly road and pad	scavenged	unknown	14:10
09/15/2020	eastern red bat	25	44	carcass search	twice per week full plot	scavenged	unknown	07:30
09/15/2020	Seminole bat	22	41	carcass search	twice per week full plot	dismembered	unknown	10:00
09/15/2020	silver-haired bat	47	34	carcass search	twice per week full plot	scavenged	unknown	12:00
09/15/2020	silver-haired bat	37	34	carcass search	twice per week full plot	scavenged	male	11:55
09/15/2020	silver-haired bat	9	41	carcass search	twice per week full plot	intact	male	10:10
09/15/2020	silver-haired bat	53	44	carcass search	twice per week full plot	scavenged	unknown	07:45
09/15/2020	silver-haired bat	38	77	carcass search	twice per week full plot	intact	unknown	10:28
09/17/2020	eastern red bat	56	122	carcass search	twice per week full plot	scavenged	unknown	13:18
09/17/2020	eastern red bat	43	161	carcass search	twice per week full plot	scavenged	unknown	08:47
09/17/2020	eastern red bat	59	166	carcass search	twice per week full plot	scavenged	unknown	13:48
09/17/2020	eastern red bat	19	E18	carcass search	twice per week full plot	intact	male	10:41
09/17/2020	eastern red bat	56	E5	carcass search	twice per week full plot	intact	unknown	08:12
09/17/2020	eastern red bat	59	E7	carcass search	twice per week full plot	intact	unknown	08:55
09/17/2020	hoary bat	24	161	carcass search	twice per week full plot	intact	male	08:39
09/17/2020	silver-haired bat	45	122	carcass search	twice per week full plot	scavenged	unknown	13:13
09/17/2020	silver-haired bat	42	146	carcass search	twice per week full plot	scavenged	male	11:30
09/17/2020	silver-haired bat	32	153	carcass search	twice per week full plot	intact	female	10:43
09/17/2020	silver-haired bat	33	153	carcass search	twice per week full plot	scavenged	female	10:41
09/17/2020	silver-haired bat	45	162	carcass search	twice per week full plot	scavenged	unknown	08:14
09/17/2020	silver-haired bat	2	67	carcass search	weekly road and pad	injured	unknown	15:10
09/17/2020	silver-haired bat	44	E18	carcass search	twice per week full plot	scavenged	unknown	11:16
09/17/2020	silver-haired bat	52	E7	carcass search	twice per week full plot	intact	unknown	08:41
09/17/2020	silver-haired bat	48	E7	carcass search	twice per week full plot	intact	female	08:48
09/18/2020	hoary bat	24	31	carcass search	twice per week full plot	scavenged	unknown	12:30

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
09/18/2020	silver-haired bat	59	34	carcass search	twice per week full plot	scavenged	unknown	11:55
09/18/2020	silver-haired bat	10	43	carcass search	twice per week full plot	intact	unknown	07:30
09/18/2020	silver-haired bat	40	46	carcass search	twice per week full plot	scavenged	unknown	10:45
09/18/2020	silver-haired bat	61	77	carcass search	twice per week full plot	intact	male	10:30
09/18/2020	silver-haired bat	11	81	carcass search	weekly road and pad	scavenged	unknown	13:56
09/22/2020	silver-haired bat	35	33	carcass search	twice per week full plot	dismembered	unknown	11:28
09/22/2020	silver-haired bat	40	34	carcass search	twice per week full plot	scavenged	unknown	11:00
09/24/2020	eastern red bat	32	E25	carcass search	twice per week full plot	scavenged	unknown	10:45
09/24/2020	silver-haired bat	51	146	carcass search	twice per week full plot	intact	male	11:10
09/24/2020	silver-haired bat	46	156	carcass search	twice per week full plot	scavenged	unknown	09:57
09/25/2020	eastern red bat	12	36	carcass search	weekly road and pad	scavenged	unknown	13:27
09/25/2020	eastern red bat	30	43	carcass search	twice per week full plot	scavenged	female	08:00
09/25/2020	silver-haired bat	25	101	carcass search	twice per week full plot	intact	male	11:42
09/25/2020	silver-haired bat	51	40	carcass search	twice per week full plot	intact	female	09:03
09/25/2020	silver-haired bat	64	40	carcass search	twice per week full plot	scavenged	male	09:10
09/25/2020	silver-haired bat	57	57	carcass search	twice per week full plot	scavenged	unknown	08:16
09/25/2020	silver-haired bat	60	77	carcass search	twice per week full plot	scavenged	female	10:40
09/25/2020	silver-haired bat	30	79	carcass search	twice per week full plot	scavenged	female	09:45
09/25/2020	silver-haired bat	38	43	carcass search	twice per week full plot	dismembered	unknown	07:51
09/28/2020	eastern red bat	23	167	carcass search	twice per week full plot	scavenged	unknown	07:50
09/28/2020	silver-haired bat	40	167	carcass search	twice per week full plot	scavenged	male	08:00
09/28/2020	silver-haired bat	15	92	carcass search	twice per week full plot	scavenged	unknown	11:58
09/28/2020	silver-haired bat	16	E12	carcass search	weekly road and pad	intact	unknown	14:17
09/28/2020	silver-haired bat	3	E16	carcass search	weekly road and pad	intact	male	13:33
09/28/2020	silver-haired bat	15	E25	carcass search	twice per week full plot	injured	unknown	10:45
09/28/2020	silver-haired bat	21	E25	carcass search	twice per week full plot	scavenged	male	10:46
09/28/2020	silver-haired bat	56	E7	carcass search	twice per week full plot	intact	male	09:15
09/29/2020	hoary bat	24	34	carcass search	twice per week full plot	scavenged	unknown	11:45
09/29/2020	silver-haired bat	38	15	carcass search	twice per week full plot	intact	female	07:45
09/29/2020	silver-haired bat	28	41	carcass search	twice per week full plot	intact	male	09:50
09/29/2020	silver-haired bat	20	57	carcass search	twice per week full plot	intact	male	08:40
10/01/2020	eastern red bat	34	E28	carcass search	twice per week full plot	scavenged	unknown	11:25
10/02/2020	silver-haired bat	19	110	carcass search	twice per week full plot	intact	male	12:50
10/02/2020	silver-haired bat	56	34	carcass search	twice per week full plot	intact	female	11:16
10/02/2020	silver-haired bat	26	34	carcass search	twice per week full plot	scavenged	male	11:17
10/02/2020	silver-haired bat	24	59	carcass search	weekly road and pad	scavenged	unknown	10:01
10/05/2020	silver-haired bat	35	E6	carcass search	twice per week full plot	scavenged	unknown	09:27

Appendix A. Carcasses found at the Blue Creek Wind Farm, from August 1 – October 15, 2020.

Found Date	Species	Distance from Turbine (m)	Turbine	Search Type	Search Area Type	Physical Condition	Sex	Time Found
10/06/2020	silver-haired bat	5	40	carcass search	twice per week full plot	intact	female	07:32
10/06/2020	silver-haired bat	56	42	carcass search	twice per week full plot	scavenged	unknown	08:35
10/12/2020	eastern red bat	47	153	carcass search	twice per week full plot	scavenged	unknown	10:40
10/12/2020	eastern red bat	27	156	carcass search	twice per week full plot	scavenged	unknown	09:45
10/12/2020	hoary bat	37	121	carcass search	twice per week full plot	scavenged	female	12:30

**Appendix B. All-bat Fatality Rates and Adjustment Factors for Fall 2020
Post-construction Monitoring Conducted at the Blue Creek Wind Farm, from August 1 –
October 15, 2020**

Appendix B. All-bat fatality rates using the Huso estimator and adjustment factors, with 90% confidence intervals, for all plots during fall 2020 post-construction monitoring conducted at the Blue Creek Wind Farm from August 1 – October 15, 2020.

	Full Plot 40 Turbines Searched		Road and Pad 112 Turbines Searched	
	Estimate	90% CI	Estimate	90% CI
Searched Area Adjustment				
Bat	0.84	0.70–0.94	0.04	0.03–0.06
Searcher Efficiency				
Bat	0.73	0.60–0.83	0.73	0.60–0.83
Average Probability of a Carcass Persisting Through the Search Interval				
Bat	0.74	0.60–0.87	0.64	0.49–0.78
Probability of Available and Detected				
Bat	0.54	0.41–0.68	0.46	0.34–0.60
Estimated Fatality Rates (Fatalities/Turbine/Season)				
Bat	12.56	9.17–18.58	17.38	11.06–29.82
Estimated Fatality Rates (Fatalities/MW/Season)				
Bat	6.28	4.59–9.29	8.69	5.53–14.91

CI = confidence interval, MW = megawatt.

Appendix C. Additional Information for the Evidence of Absence Analysis

EoA, v2.0.7 - Single Class Module

Edit Help

Detection Probability (g)

Search Schedule

Start of monitoring (yyyy-mm-dd)

Formula

Search interval (I)

Number of searches

Custom [Edit/View](#)

span = 182, l (mean) = 7

Spatial coverage (a)

Temporal coverage (v)

[Estimate g](#)

Searcher Efficiency

Carcasses available for several searches

95% CI: $p \in [0.533, 0.674]$, $k \in [0.651, 0.812]$

$\hat{p} = 0.62$, $k = 0.734$ [View](#) [Edit](#)

Carcasses removed after one search

Carcasses available

Carcasses found

$\hat{p} = 0.725$, with 95% CI = [0.575, 0.844]

Factor by which searcher efficiency changes with each search (k)

Persistence Distribution

Use field trials to estimate parameters [View/Edit](#)

Distribution: Lognormal with shape (α) = 4.078 and scale (β) = 1.171

$r = 0.653$ for $l_r = 3.5$, with 95% CI: $r \in [0.531, 0.787]$, $\beta \in [0.488, 1.854]$

Enter parameter estimates manually [View](#)

Parameters

Exponential shape (α)

Weibull scale (β) lwr upr

Log-Logistic $r = 0.742$ for $l_r = 3.5$, with 95% CI: $r \in [0.587, 0.861]$

Lognormal

Fatality estimation (M, λ)

Carcass Count (X) [Estimate M](#) **One-sided CI (M*)** **Two-sided CI**

Credibility level (1 - α) [Estimate \$\lambda\$](#) [Close](#)

```

R Estimated detection probability (g)
Summary statistics for estimation of detection probability (g)
=====
Results:
Full site for full year
  Estimated g = 0.424, 95% CI = [0.323, 0.529]
  Fitted beta distribution parameters for estimated g: Ba = 36.5918, Bb = 49.6538

Full site for monitored period, 01-Aug-2020 through 20-Oct-2020
  Estimated g = 0.477, 95% CI = [0.362, 0.593]
  Fitted beta distribution parameters for estimated g: Ba = 33.3673, Bb = 36.6286
  Temporal coverage (within year) = 0.89

Searched area for monitored period, 01-Aug-2020 through 20-Oct-2020
  Estimated g = 0.641, 95% CI = [0.478, 0.788]
  Fitted beta distribution parameters for estimated g: Ba = 22.6717, Bb = 12.7073
=====
Input:
Search parameters
  trial carcasses placed = 40, carcasses found = 29
  estimated searcher efficiency: p = 0.725, 95% CI = [0.575, 0.844]
  k = 0.8
  Search schedule: Search interval (I) = 3.5, number of searches = 23, span = 80.5
  spatial coverage: 0.743757    temporal coverage: 0.89
-----
Carcass persistence:
  Lognormal persistence distribution
  shape (a) = 4.084 and scale (b) = 1.729
  95% CI b = [0.79, 2.667]
  r = 0.742 for l_r = 3.5 with 95% CI = [0.587, 0.861]
  Parameters entered manually
  Uniform arrivals
  
```


EoA, v2.0.7 - Single Class Module

Edit Help

Detection Probability (g)

Search Schedule

Start of monitoring (yyyy-mm-dd)

Formula

Search interval (I)

Number of searches

Custom [Edit/View](#)

span = 182, I (mean) = 7

Spatial coverage (a)

Temporal coverage (v)

[Estimate g](#)

Searcher Efficiency

Carcasses available for several searches

95% CI: $p \in [0.533, 0.674]$, $k \in [0.651, 0.812]$

$\hat{p} = 0.62$, $\hat{k} = 0.734$ [View](#) [Edit](#)

Carcasses removed after one search

Carcasses available

Carcasses found

$\hat{p} = 0.725$, with 95% CI = [0.575, 0.844]

Factor by which searcher efficiency changes with each search (k)

Persistence Distribution

Use field trials to estimate parameters [View/Edit](#)

Distribution: Lognormal with shape (α) = 4.078 and scale (β) = 1.171

$r = 0.544$ for $I = 6.5$, with 95% CI: $r \in [0.424, 0.671]$, $\beta \in [0.488, 1.854]$

Enter parameter estimates manually [View](#)

Parameters

Exponential

Weibull

Log-Logistic

Lognormal

shape (α)

scale (β) lwr upr

$r = 0.643$ for $I = 6.5$, with 95% CI: $r \in [0.476, 0.788]$

Fatality estimation (M, λ)

Carcass Count (X) [Estimate M](#)

Credibility level (1 - α) [Estimate \$\lambda\$](#)

One-sided CI (M*) Two-sided CI

[Close](#)

Estimated detection probability (g)

Summary statistics for estimation of detection probability (g)

Results:

Full site for full year

Estimated g = 0.025, 95% CI = [0.0178, 0.0333]

Fitted beta distribution parameters for estimated g: Ba = 38.719, Bb = 1511.7594

Full site for monitored period, 01-Aug-2020 through 18-Oct-2020

Estimated g = 0.0281, 95% CI = [0.02, 0.0374]

Fitted beta distribution parameters for estimated g: Ba = 38.6027, Bb = 1337.1813

Temporal coverage (within year) = 0.89

Searched area for monitored period, 01-Aug-2020 through 18-Oct-2020

Estimated g = 0.54, 95% CI = [0.375, 0.701]

Fitted beta distribution parameters for estimated g: Ba = 18.5212, Bb = 15.7592

Input:

Search parameters

trial carcasses placed = 40, carcasses found = 29

estimated searcher efficiency: $p = 0.725$, 95% CI = [0.575, 0.844]

$k = 0.8$

Search schedule: Search interval (I) = 6.5, number of searches = 12, span = 78

spatial coverage: 0.05193 temporal coverage: 0.89

Carcass persistence:

Lognormal persistence distribution

shape (α) = 4.084 and scale (β) = 1.729

95% CI β = [0.79, 2.667]

$r = 0.643$ for $I = 6.5$ with 95% CI = [0.476, 0.788]

Parameters entered manually

Uniform arrivals

EoA, v2.0.7 - Multiple Class Module

Edit Help

Options

Overall

Estimate total mortality (M)

Credibility level (1 - α)

One-sided CI (M*)

Two-sided CI

Estimate overall detection probability (g)

Individual classes

Calculate g parameters from monitoring data

Enter g parameters manually

Actions

Add class Calculate Clear Close

Class	dwp	X	Ba	Bb	ĝ	95% CI
unsearched	0	0	---	---	0	[0, 0]
Full plots	0.2632	0	33.3673	36.6286	0.4767	[0.362, 0.593]
Road and pads	0.7368	0	38.6027	1337.1813	0.02806	[0.02, 0.0374]

Estimated mortality (M) & detection probability (g) for multiple classes

Summary statistics for multiple class estimate

Input: Detection probability, by search class

Search coverage = 1

Class	DWP	X	Ba	Bb	ghat	95% CI
unsearched	0	0	---	---	0	[0, 0]
Full plots	0.263	0	33.37	36.63	0.477	[0.362, 0.593]
Road and pads	0.737	0	38.6	1337	0.028	[0.020, 0.037]

Results for full site

Detection probability

Estimated g = 0.146, 95% CI = [0.116, 0.179]

Fitted beta distribution parameters for estimated g: Ba = 71.6047, Bb = 418.3615

Mortality

M* = 1 for credibility 1 - alpha = 0.5, i.e., P(M <= 1) >= 50%

Estimated annual fatality rate: lambda = 3.48, 95% CI = [0.00341, 17.61]

Appendix D. Truncated Weighed Likelihood Model Fitting Results

Appendix D1. Searched area adjustment models for bats for the all-bat fatality rate component on the analysis from the Blue Creek Wind Farm, from August 1, 2020 – October 15, 2020.

Distribution	AICc	Delta AICc
Weibull	21,276.58	0*
Rayleigh	21,278.18	1.57
normal	21,302.22	25.64
Gompertz	21,321.22	44.64
gamma	21,342.17	65.59

* Selected model.

AICc = corrected Akaike Information Criterion.

Appendix D2. Searched area adjustment models for bats for the Covered Species take estimate component of the analysis from the Blue Creek Wind Farm, from August 1, 2020 – October 15, 2020.

Distribution	AICc	Delta AICc
Gompertz	23,879.35	0*
normal	23,996.03	116.67
Rayleigh	24,043.36	164.01
Weibull	24,044.65	165.30
gamma	24,113.80	234.45

* Selected model.

AICc = corrected Akaike Information Criterion.