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

Intensive Monitoring – Year 3 Final Report

April 1 – May 15 and August 1 – October 15, 2022

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EXECUTIVE SUMMARY

Blue Creek Wind Farm, LLC is operating the Blue Creek Wind Farm (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 fatality monitoring studies conducted in 2022, consistent with Section 6.1.2 of the Project's Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP; TE69307D-1) for Indiana and northern long-eared bats (Covered Species). The Project is in Year 3 of the 35-year ITP, and 2022 was the third year of intensive monitoring under the HCP.

Post-construction fatality monitoring was conducted consistent with the *2022 Post-construction Monitoring Study Plan for the Blue Creek Wind Farm* (Study Plan), which was approved by the US Fish and Wildlife Service and finalized on April 5, 2022. The Study Plan was designed to achieve an overall probability of detection (*g*) of 0.15 based on data collected at the Project in 2021 and input from USFWS. The overall goal of this post-construction fatality monitoring study was to evaluate whether the level of take of Covered Species at the Project was within the level of take authorized by the ITP. More specifically, the objectives of this study were to: 1) estimate the fatalities of the Covered Species over the monitoring period and ITP term, 2) test if adaptive management triggers were met, and 3) provide an all-bat fatality estimate per MW and per turbine.

Standardized carcass searches were completed for bat carcasses at three plot types: road and pads; expanded road and pads, which consisted of the gravel road and pad area and a 5.0-meter (16.0-foot) buffer area beyond the road and pad; and full plots. Searches were conducted by two types of searchers: technicians, who conducted searches of the road and pads and expanded road and pads, and dog-handler teams (consisting of one handler and one dog trained to detect carcasses), that conducted full plot searches. The search interval varied by plot type and season, from every seven days on expanded road and pads in the spring to twice per week on full plots in the fall. Searcher efficiency and carcass persistence trials were conducted to adjust for detection and scavenger bias.

No Covered Species were found during monitoring in 2022. The most commonly found bat species were silver-haired bat (174 carcasses; 45.6% of total carcasses) and eastern red bat (113 carcasses; 29.7%), followed by hoary bat (52 carcasses; 13.7%), and big brown bat (37 carcasses; 9.7%). All other species accounted for 1% or less of all bats found, including evening bat and Seminole bat. The overall all-bat fatality estimate was 3.00 bats per megawatt (90% confidence interval [CI]: 2.13–4.55) using the Huso estimator.

Covered Species fatality rates were estimated using Evidence of Absence. The 2022 overall probability of detection (*g*) value was 0.225 (95% CI: 0.207–0.243). Based on the count of Indiana bat and northern long-eared bat carcasses (one [found in 2021] and zero, respectively) and the ITP term-to-date (2020–2022) *g* of 0.148 (95% CI: 0.132–0.166), we estimated that cumulatively, no more than eight Indiana bat fatalities and one northern long-eared bat fatality could potentially

have occurred during the ITP term to-date. These values fall below the permitted take for each species (154 Indiana bats and 103 northern long-eared bats), meaning the cumulative Covered Species take estimates are in compliance with the ITP and the Project did not meet any long-term adaptive management triggers. Based on the rolling average (fall 2020 and spring and fall 2021 and 2022) *g* of 0.156 (95% CI: 0.138–0.175), the probability that the estimated take rates exceeded the expected take rates for Indiana bat and northern long-eared bat did not exceed 95%, indicating the Project did not meet any short-term adaptive management triggers. Table A provides a summary of HCP and ITP requirements and the status of each requirement.

Table A. Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, April 1 –May 15 and August 1 – October 15, 2022.

Requirement	Source	Status Based on 2022 Intensive Monitoring Results
Conduct Intensive Monitoring in spring.	HCP Section 6.1.2	Completed.
Conduct Intensive Monitoring in fall.	HCP Section 6.1.2	Completed.
Use Evidence of Absence (EoA) software to design a search protocol with a detection probability (g) value of 0.15, based on the prior year's site specific data.	HCP Section 6.1.2	The monitoring plan was designed using the 2021 site specific data, and provided to the US Fish and Wildlife Service (USFWS) for review prior to the field season.
Estimate mean take rates for the Covered Species.	HCP Section 6.1.5	Mean take rates over all monitoring periods since fall 2020 were 3.22 (95% confidence interval [CI]: 0.23–10.07) Indiana bats per year and 1.07 (95% CI: 0.00–5.40) northern long-eared bats per year.
Estimate cumulative (ITP term-to-date) take estimates for the Covered Species.	HCP Section 6.1.5	Cumulative take estimates were no more than eight Indiana bats and one northern long-eared bat during the ITP term-to-date.
Evaluate whether the short-term adaptive management threshold has been exceeded at the 95% credibility level.	HCP Section 6.3.1	Probabilities that estimated take rates exceeded the short-term adaptive management thresholds were 25.1% for Indiana bat and 9.7% for northern long-eared bat, indicating no adaptive management was required.
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 eight Indiana bats and one northern long-eared bat fall 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 March 1.	ITP Section O.3	Report submitted prior to March 1.

Table A. Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, April 1 –May 15 and August 1 – October 15, 2022.

Requirement	Source	Status Based on 2022 Intensive Monitoring Results
Intensive Monitoring Report will include: 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: 1. Appendix A 2. Section 3.2 3. Section 3.3.5 4. Section 3.3.5.4 5. Sections 3.3.5.5 and 3.3.5.6 6. Appendix C 7. Section 3.3.4 8. Provided by Blue Creek Wind Farm, LLC (Blue Creek), on November 21, 2022
Report any Covered Species fatality to the USFWS and Ohio Department of Natural Resources 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	Study Plan submitted February 24, 2022; updated version submitted April 1, 2022. No monitoring is required in 2023.
Provide data and reporting on the supervisory control and data acquisition system from five turbines on April 4, August 4, and August 19.	ITP Section O.5.a.	Provided by Blue Creek in emails dated April 4, August 4, and August 22, 2022.
Provide additional reporting on November 30 to document the implementation of the minimization and monitoring required by the HCP and ITP.	ITP Section O.5.b.	Provided by Blue Creek on November 21, 2022.
Clearly state the fall 2020 estimates of Indiana bats and northern long-eared bats using EoA software were based on normal operations, not on 5.0 meters/second cut-in speeds.	ITP Section O.5.c.	Report accounts for this in analysis (see Section 2.5.3.4).

STUDY PARTICIPANTS

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REPORT REFERENCE

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 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 northern long-eared bat (*Myotis septentrionalis*; hereafter Covered Species) from the US Fish and Wildlife Service (USFWS) dated March 13, 2020. An amended ITP for the Project was received on March 31, 2021 (TE69307D-1).

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 Wind Farm, LLC, 2020). The Project is in Year 3 of the 35-year ITP, and 2022 was the third year of intensive monitoring under the HCP. Blue Creek contracted Western EcoSystems Technology, Inc. (WEST) to complete a post-construction fatality monitoring study designed to achieve a probability of detection, or *g*, of 0.15. Objectives of this study were to: 1) estimate the fatalities of the Covered Species over the monitoring period and ITP term, 2) test if adaptive management triggers were met, and 3) provide an all-bat fatality estimate per megawatt (MW) and per turbine. This report presents the results of the study conducted within the Project during the spring and fall of 2022, and the adaptive management trigger tests based on all monitoring data gathered since the ITP was issued.

2 METHODS

Blue Creek submitted the *2022 Post-construction Monitoring Study Plan for the Blue Creek Wind Farm* (Study Plan; Rodriguez et al. 2022a) to the USFWS via email on February 24, 2022. The USFWS provided comments on the Study Plan on March 18 (Megan Seymour, USFWS, pers. comm.). Blue Creek, USFWS, and WEST participated in a call to further discuss USFWS comments on March 28, 2022. The Study Plan was subsequently revised to incorporate feedback from the USFWS; an updated Study Plan was submitted to the USFWS on April 1 and received approval on April 5, 2022 (Megan Seymour, USFWS, pers. comm). The Study Plan was developed in accordance with the HCP's monitoring program and designed to achieve a *g* of 0.15 (i.e., a 15% probability of detecting a single bat carcass) cumulatively across the spring and fall monitoring periods. In accordance with the Project's ITP, WEST used data from the Project's 2021 post-construction fatality monitoring study (Rodriguez et al. 2022b) to develop the Study Plan.

2.1 Study Area

The Project became operational in 2012 and consists of 152 2.0-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) 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 16,360-hectare (40,427-acre) Project is composed of cropland. Corn (*Zea mays*) and soybean (*Glycine max*) are the most

common crop types (National Land Cover Database [NLCD] 2019). The next most common land cover is developed area (e.g., farmsteads), which accounts for approximately 6% of the Project (NLCD 2019). Deciduous forest, herbaceous cover, open water, barren land, and wetlands each account for less than 1% of the total land cover (NLDC 2019; Figure 1).

2.2 Standardized Carcass Searches

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

All 152 turbines at the Project were included in the study. Carcass searches were conducated at three plot types: full plots, road and pads, and expanded road and pads. Search effort varied by season, and was designed to maximize effort in the fall when the greatest number of Covered Species were expected to occur (Table 1). In the spring, all turbines were searched weekly as expanded road and pads. Expanded road and pads were searched to a maximum 100-m distance from turbines and included a 5-m (16-ft) buffer surrounding the boundary of the gravel road and pad. In the fall, 40 turbines were searched as full plots and the remaining 112 turbines were searched as road and pads (Figure 1). Full plots were circular and extended to a maximum 70-m (230-ft) radius from turbines. Road and pads were searched to a maximum 100-m distance from turbines.

Table 1. Search effort by season and plot type at Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Season	Plot Type	Search Interval	Number of Turbines
Spring (April 1 – May 15)	100-m expanded road and pad	7.0 days	152
Fall (August 1 – October 15)	100-m road and pad	7.0 days	112
	70-m full plot	3.5 days	40

m = meter.

One round of clearance searches occurred at all turbines prior to the start of the spring and fall monitoring seasons to collect carcasses that occurred prior to the spring and fall study periods.

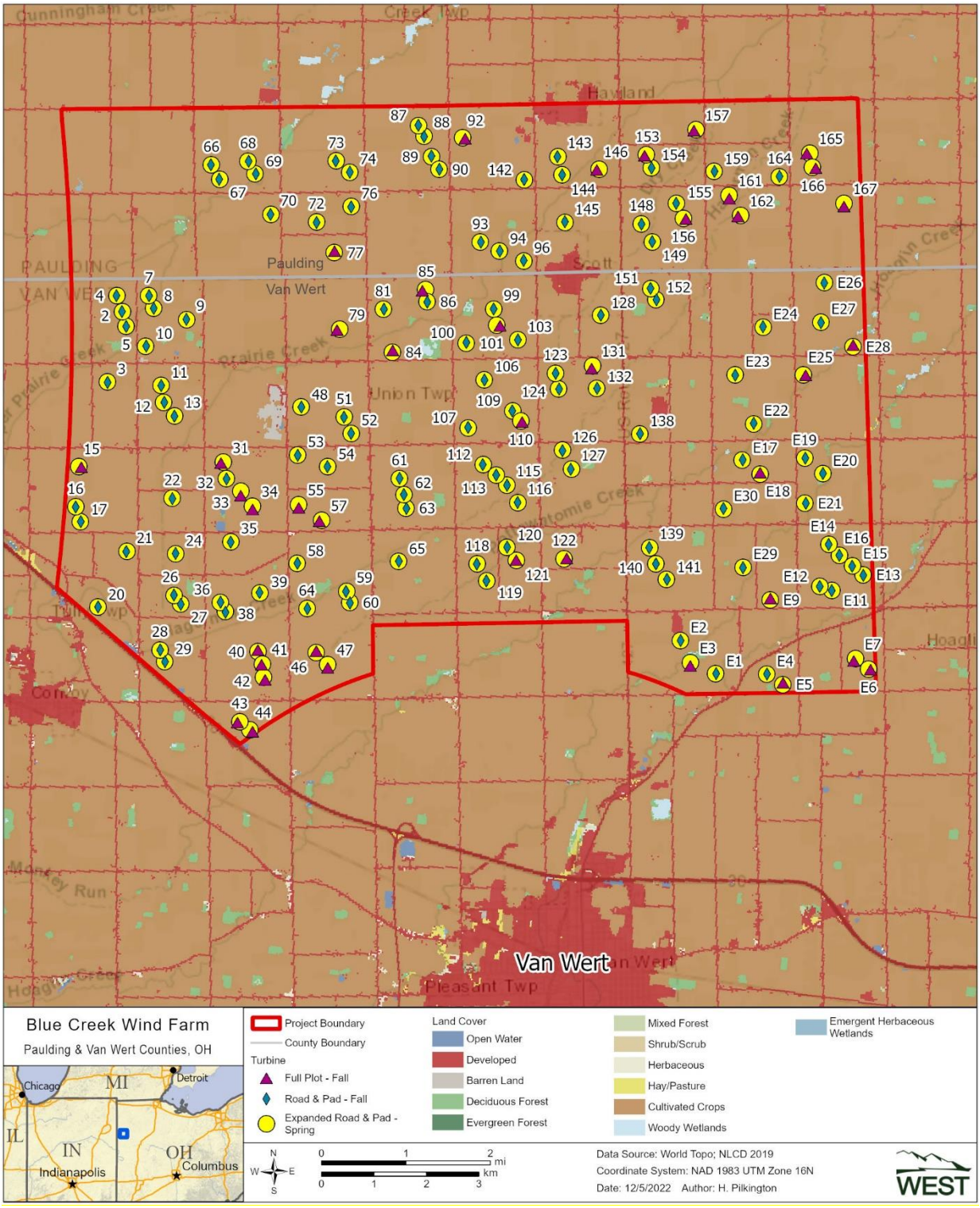


Figure 1. Search plot types used during 2022 post-construction fatality monitoring at the Blue Creek Wind Farm, April 1–May 15 and August 1 – October 15, 2022.

2.2.2 Plot Maintenance

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 (six inches) to increase the detectability of carcasses.

2.2.3 Search Methods

WEST used two types of searchers: 1) a technician, or human only visual search for road and pad and expanded road and pad searches, and 2) a dog-handler team, or olfactory, search for full plot searches where the team consisted of a dog-handler and one detection dog. Blue Creek chose to use dog-handler teams rather than technicians to search full plots, during the fall season, at the Project in 2022 because regional data suggested that searcher efficiency rates for dog-handler teams were stable under a wide range of environmental conditions, therefore minimizing some of the uncertainty in the calculations surrounding *g* (Rodriguez et al. 2022a). All personnel were trained to follow the Project's Study Plan, including proper handling and reporting of carcasses.

2.2.3.1 Road and Pad Searches

Access roads at the Project average 4.0 m (13.1 ft) wide. Technicians walked transects spaced 4.0 m apart along the edge of the road at a rate of approximately 45–60 m per minute (m/min; 148–197 ft/min) on all gravel road and pad areas within 100 m of the turbine. The technicians scanned the area for fatalities on both sides of the transects out to 2.0 m (6.6 ft) to ensure full visual coverage of each search area.

2.2.3.2 Expanded Road and Pad Searches

For expanded road and pads, searches were completed as described above for the road and pad searches, with the following addition: along the gravel road, technicians walked at a decreased rate of approximately 30–45 m/min (98–148 ft/min) to allow the technicians to scan beyond the gravel portion of the road and pad into the adjacent field. Technicians walking along the edge of the road scanned approximately 2.0 m to the center of the gravel road and scanned out 5.0 m (16.0 ft) into the adjacent field.

2.2.3.3 Full Plot Searches

Dog-handler teams searched full plots for bat carcasses. Prior to each search, handlers determined the survey start points and the number of transects needed to cover the plot after taking into account wind speed and direction. Handlers oriented the detection dogs to start searches perpendicular to the wind to maximize scent detection. Windspeed can affect dispersal of the target odor (i.e., bat carcasses) across the search area. To maximize detection rates during an olfactory search, transect width varied, but averaged 15 m (49 ft) apart, with transects being closer during lower winds, and farther apart during higher winds. Detection dogs were rewarded with either food or a short play session when they correctly alerted to a bat carcass.

2.2.3.3.1 Dog-handler Team Evaluation

Detection dogs were considered candidates for carcass searches if they met basic temperament and obedience criteria and demonstrated trainability to detect bat carcasses. Temperament characteristics sought after were high-energy and a high-food or toy drive. Prior to conducting searches at the Project, handlers trained their detection dogs on the scent of bat carcasses following methods derived from search and rescue programs and drug detection (Kay 2012, Helfers 2017). Detection dogs were initially trained with either cotton scent swabs that had been rubbed on bat carcasses, progressing to bat carcasses, or with bat carcasses at increasing distances over a period of three to four weeks. Once the detection dog achieved a passing grade of 80% or higher in a scent recognition test, consisting of ten blind trial lineups using bat carcasses, the detection dog and handler were evaluated in the field to measure their performance. The detection dog coordinator conducted a two day field evaluation of each dog-handler team; after teams achieved a searcher efficiency of 75% or greater for 15–30 bats during evaluation trials, the teams were approved to conduct standardized carcass searches. Breeds used at the Project as detection dogs included a Belgian Tervuren, a German shepard mix, and a cattle dog/husky mix.

2.2.4 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 (e.g., full plot, 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 tablet, 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 latitude and longitude, habitat surrounding the bat, and estimated time of death (i.e., 0–1 days, 2–3 days, 4–7 days, 8–14 days, 15–30 days, greater than 30 days, or unknown). 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 were not included in the analysis.

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 — a carcass with 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), or a carcass that was heavily infested by insects.
- Dismembered — a carcass 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 with visible injuries.
- Alive — a bat that was not visibly injured.

Bat carcasses were collected under the the Project's ITP (TE69307D-1) and WEST's Ohio Division of Wildlife Wild Animal Permit (SC210040). 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 gloves covered by nitrile or latex gloves were used to handle all bat carcasses to eliminate possible transmission of rabies or other zoonotic diseases. All species identifications were verified by biologists permitted to identify and handle federally and state-listed bat species. Carcasses that could not be identified to species were submitted to a USFWS-approved laboratory, East Stroudsburg University Wildlife Genetics Institute, for identification via genetic testing. At the end of the searches, remaining bat carcasses were transferred to the University of Illinois, in coordination with ODNR, per the terms of WEST's Ohio Division of Wildlife Wild Animal Permit.

2.3 Bias Trials

2.3.1 Searcher Efficiency Trials

The objective of searcher efficiency trials was to estimate the probability that a bat carcass was found by searchers. Estimates of searcher efficiency were used to adjust the number of bats found by those missed by searchers to account for detection bias in fatality estimates.

Searcher efficiency trials were conducted in the same areas where standardized carcass searches occured. Trials were conducted throughout the study. One hundred sixty-nine bat carcasses were used for searcher efficiency trials. All bats used for searcher efficiency trials were carcasses collected at the Project that were used with permission from the ODNR. Per the Study Plan, a minimum of 30 bat trial carcasses were placed per plot type, per season. For expanded road and pads, due to expected differences by substate, searcher efficiency trials were split by strata. Therefore, 30 trials were placed on the gravel portion of the plot and 30 trials were placed on the 5-m wide field portion of the plot.

Searcher efficiency trials began when standardized carcass searches began. Searchers 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 and were dropped from waist height or higher and allowed to land in a random posture. The trial administrator walked in a meandering path and dropped trial carcasses for detection dogs the day before searches were scheduled to allow time for the scent to pool and disperse and eliminate a direct scent trail. For technician search trials, the trial administrator placed carcasses prior to the technician searching the plot, either the night before or the morning of searches depending on work schedules. Searchers had one chance to locate trial carcasses during the first search after carcass placement. 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. A subset of the searcher efficiency trials were left in the field to use as carcass persistence trials, per the HCP.

2.3.2 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 by those removed from the study area, thereby accounting for persistence bias. A minimum of 15 carcass persistence trials were dropped per plot type, per season. Of the 169 bats used for searcher efficiency trials (see above), 24 bat carcasses were left in place and used for carcass persistence trials. Twenty-two additional carcasses were placed as carcass persistence trials and did not serve as searcher efficiency trials. Therefore, a total of 46 bat carcasses were used for the 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 days 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. Dog-handler teams determined when carcasses were removed on full plots, while technicians determined the status of carcasses placed on road and pads and expanded road and pads. At the end of the 30-day period, any remaining evidence of a carcass was removed from the search plot.

2.4 Search Plot Mapping

The boundaries and unsearchable areas of all full plots were recorded using a Trimble submeter Global Positioning System (GPS) unit in fall 2022 to accurately map plot boundaries, which may shift slightly between years, based on crop clearing. Road and pad boundaries were previously mapped and/or digitized from aerial maps. 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 (see Section 2.5.1.5 below).

2.5 Statistical Analysis

Three fatality estimates were calculated: one all-bat fatality estimate using the Huso estimator (Huso 2011, Huso et al. 2015a), as specified in the HCP, and one take estimate using Evidence of Absence (EoA) for each of the two Covered Species (Huso et al. 2015b, Dalthorp et al. 2017). 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 searchers;

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 searchers;
4. Searched area adjustment;
5. For EoA, the detection reduction factor (*k*), which was specified as 0.8 in the Study Plan.

2.5.1 Estimator Inputs For The Fatality Estimates

2.5.1.1 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. 2016). In practice, particularly when carcass persistence times are long, carcasses may be discovered that have been available for more than one search. 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, the analysis protocol for the Covered Species was to include all carcasses found during standardized searches in the analysis because the EoA estimator does not assume searchers have a single opportunity to discover a carcass (Huso et al. 2015b, Dalthorp et al. 2017).

2.5.1.2 Estimation of Searcher Efficiency Rates

The all-bat fatality 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). Searcher efficiency was estimated separately for technicians and dog-handler teams to account for different modes of detection (i.e., technicians use sight, whereas detection dogs use scent). Potential covariates for the technician model included ground cover (gravel or field) and season. Because full plots were only searched in the fall, there were no potential covariates included in the model for plots searched by dog-handler teams. The best model was selected using an information theoretic metric known as AICc, or corrected Akaike Information Criterion (Burnham and Anderson 2002). The most parsimonious model within two AICc units of the model with the lowest AICc value was selected.

2.5.1.3 Estimation of Carcass Persistence Rates

The all-bat fatality estimation and Covered Species take estimation had similar 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). As with searcher efficiency, carcass persistence models were estimated separately by search team (i.e., plots searched by technicans

vs. plots searched by dog-handler teams) to account for different modes of detection (dogs are often able to detect carcass remains that are undetectable to humans, so persistence probability is different for human and dog searchers). Season was included as a potential covariate for the technician model. Because full plots were only searched in the fall, there were no potential covariates included in the model for plots searched by dog-handler teams. The modeling process for the EoA estimate can accommodate covariates in both the location and scale parameters of the persistence time distribution, whereas the modeling process for the Huso estimator can accommodate covariates only in the location parameter. Therefore, carcass persistence rates may vary between the Huso and EoA estimates. The most parsimonious model within two AICc units of the model with the lowest AICc value was selected as the best-fit model.

2.5.1.4 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.

2.5.1.5 Searched Area Adjustment

The searched area adjustment process was identical for the all-bat fatality 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 that $k = 0$ (see Detection Reduction Factor, Section 2.5.1.4).

The searched area adjustment accounted for all unsearched areas within 100 m of turbines. 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 from the turbine base). The carcass density distribution was modeled using carcass location data collected during all of 2022 (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 (Rabie and Riser-Espinoza 2022) 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 annulus around the turbine. Normal, gamma, Gompertz, and Weibull (parameterized according to R Development Core Team [2016], or Yee [2010]) distributions were fitted and AICc was used to select the best model.

The amount of searchable area within plots was measured in the field using sub-meter GPS technology (Section 2.4). The proportion of area searched was calculated in a geographic information system program as the amount of area searched divided by the total area within each 1.0-m annulus around the turbine. The EoA analysis workflow estimates separate detection probabilities for each search stratum. For the spring expanded road and pads, there were two search strata (the gravel portion and the 5-m buffer) at each searched turbine. The searched area adjustment for each stratum was estimated separately by considering only the fraction of carcasses expected on the gravel road and pad for one stratum, and only the fraction of carcasses expected within the 5-m buffer for the other.

2.5.2 All-bat Fatality Estimation

The all-bat fatality estimate was calculated using the Huso estimator (Huso 2011, Huso et al. 2015a). Inputs and assumptions of the Huso estimator are described in Section 2.5.1, above.

2.5.2.1 All-bat Fatality Estimate

All-bat fatality estimates were calculated per MW and turbine and by plot type (full plot versus road and pad) and season. 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, 112/152 for road and pads, and 152/152 for expanded road and pads) to calculate overall fatality estimates.

2.5.2.2 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 estimating variances and CIs for complicated test statistics. A total of 1,000 bootstrap replicates were used to calculate the 90% CI 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% CIs.

2.5.3 Covered Species Take Estimation

The EoA model and software (Huso et al. 2015b, Dalthorp et al. 2017) were 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 2.5.1 above.

2.5.3.1 Annual 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 annual 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 spring and fall monitoring periods), and the detection reduction factor (*k*; see definition in Section 2.5.1.4). Estimates were calculated using the EoA R package (EoA version 2.0.7), using the Single Class and Multiple Class modules of EoA.

2.5.3.2 Rolling Average Probability of Detection

The HCP specifies that the short-term adaptive management trigger is tested based on a rolling average detection probability including the most recent six years of monitoring events. At present, that monitoring window includes fall 2020 and spring and fall of 2021 and 2022. Detection probabilities from fall 2020 (Ritzert et al. 2021) and spring and fall of 2021 (Rodriguez et al. 2022b) and 2022 were combined into the rolling average detection probability using the per-study *g* estimates and the relative weights (rho) for each study (Dalthorp et al. 2017). Relative weights were used to incorporate variation in risk to bats from year to year; years when all turbines are fully operational throughout the year and operational curtailment is implemented as specified in the HCP receive a weight of 1.0. Years when some turbines are inoperable (and therefore risk-free), or were curtailed less than typical years, had lower or higher relative weights, respectively.This detection probability was used to estimate the rolling average take rate and to test the short-term adaptive management trigger based on the monitoring data available to date within the six-year rolling interval specified in the HCP.

2.5.3.3 Incidental Take Permit Term-to-date Probability of Detection

The HCP specifies that the long-term adaptive management trigger is tested based on whether the cumulative ITP term-to-date take has exceeded the permitted take numbers. By definition, this test covers the entire period from ITP issuance through the present. Risk periods when monitoring did not occur (spring 2020) were assigned a low, near-zero detection probability (0.00001) as prescribed in the HCP (D. Dalthorp, USGS, pers. comm., December 8, 2017). Detection probabilities from spring and fall of 2020, 2021, and 2022 were combined into the ITP term-to-date detection probability using the per-year *g* estimates and the relative weights (rho) for each year (Dalthorp et al. 2017). This detection probability was used to estimate cumulative take and to test the long-term adaptive management trigger over the ITP term-to-date.

2.5.3.4 Weighting of Fall 2020 Data Based on Normal Operations

Because feathering of the turbine was maintained at 3.0 m/second (m/s; 9.8 ft/s) rather than increased to 5.0 m/s (16.4 ft/s) during fall 2020, when estimating *g* for the take estimates and adaptive management triggers, the relative weight (rho) for 2020 was adjusted to account for a greater level of risk during that season:

$$rho = spring\ arrival\ fraction + fall\ arrival\ fraction * \frac{1 - fatality\ reduction\ @\ 3.0\ m/s}{1 - fatality\ reduction\ @\ 5.0\ m/s}$$

The relative weight for 2020 when estimating *g* for the short-term adaptive management trigger was similar, but omitted the spring arrival fraction term. The expected spring and fall arrival fractions (0.11 and 0.89, respectively), and expected fatality reductions at 3.0 and 5.0 m/s cut-in speeds (0.325 and 0.68, respectively) are provided in the HCP. For 2021 and 2022, the relative weight (rho) was 1.0 for each year, representing one year each of operation with minimization as planned. Relative weights (rho) were used to produce weighted-average estimates of the

detection probabilities, and to scale the estimated baseline take rate (λ) to represent a single, typical year of operation.

2.5.3.5 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.

2.6 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 analysis, and report writing. Following field surveys, technicians were responsible for inspecting data for completeness and accuracy. 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, and appropriate changes were made in all affected steps.

2.7 Data Compilation and Storage

A Microsoft® SQL Server 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.

3 RESULTS

3.1 Standardized Carcass Surveys

A total of 3,012 turbine searches occurred throughout the spring and fall monitoring periods (Table 2). Over 99% of scheduled searches on operational turbines were completed. One expanded road and pad and three full plot searches were missed due to turbine maintenance and active farming activities.

Table 2. Number of searches per plot type at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Season	Plot Type	Search Interval	Number of Searches
Spring (April 1 – May 15)	100-m expanded road and pad	7.0 days	911
Fall (August 1 – October 15)	100-m road and pad	7.0 days	1,223
	70-m full plot	3.5 days	878
Overall			**3,012**

m = meter.

3.1.1 Species Composition

A total of 381 bat carcasses were found during the clearing search, scheduled surveys, and incidentally (Table 3; Appendix A). The most commonly found bat species across all surveys and incidentally were silver-haired bat (*Lasionycteris noctivagans*; 174 carcasses; 45.6%), eastern red bat (*Lasiurus borealis*; 113 carcasses; 29.7%), hoary bat (*Lasiurus cinereus*; 52 carcasses; 13.7%), and big brown bat (*Eptesicus fuscus*; 37 carcasses; 9.7%). All other species accounted for 1% or less of all bats found, including evening bat (*Nycticeius humeralis*) and Seminole bat (*Lasiurus seminolus*; Table 3; Appendix A).

Table 3. Total number of bat carcasses and percent composition of carcasses discovered at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

	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]	
Species	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**
Full Plots												
silver-haired bat	168	46.7	0	0	0	0	168	47.7	48	48.0	120	47.6
eastern red bat	105	29.2	1	100	4	57.14	100	28.4	30	30.0	70	27.8
hoary bat	48	13.3	0	0	2	28.57	46	13.1	11	11.0	35	13.9
big brown bat	34	9.4	0	0	1	14.29	33	9.4	8	8.0	25	9.9
eastern red bat or Seminole bat	3	0.8	0	0	0	0	3	0.9	3	3.0	0	0
evening bat	1	0.3	0	0	0	0	1	0.3	0	0	1	0.4
Seminole bat	1	0.3	0	0	0	0	1	0.3	0	0	1	0.4
northern long-eared bat	0	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	0
Full Plots Overall	**360**	**100**	**1**	**100**	**7**	**100**	**352**	**100**	**100**	**100**	**252**	**100**
Road and Pads												
silver-haired bat	6	28.6	0	0	0	0	6	31.6	0	0	6	33.3
eastern red bat	8	38.1	0	0	1	50.0	7	36.8	0	0	7	38.9
hoary bat	4	19.1	0	0	1	50.0	3	15.8	0	0	3	16.7
big brown bat	3	14.3	0	0	0	0	3	15.8	1	100	2	11.1
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[3]	**21**	**100**	**0**		**2**	**100**	**19**	**100**	**1**	**100**	**18**	**100**
Total for All Plot Types	**381**		**1**		**9**		**371**		**101**		**270**	

[1] The Covered Species searched area adjustment used the GenEst criteria (Dalthorp et al. 2018) to calculate the area adjustment. Fatalities were removed from the searched area adjustment if they were found during the clearing search or off the plot.

[2] The all-bat fatality estimate used the Huso criteria (Huso 2011, Huso et al. 2015a) for fatalities to include in the search area adjustment. 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.

[3] Only one bat, a silver-haired bat, was found on the field portion of the expanded road and pad plots in the spring. That bat is included in the count for the road and pads in this table.

Sums may not equal totals shown due to rounding.

Three heavily scavenged unidentified bat wings were found that could not be identified to species by a WEST permitted bat biologist. Tissue samples were sent out to East Stroudsburg University Wildlife Genetics, for genetic testing. Genetic testing determined that all three of the previously unidentified bats were silver-haired bats.

3.1.2 Carcasses Used In Bat Fatality Estimates

Three fatality estimates were calculated. The all-bat estimate included 270 bats and excluded one that was found off plot (e.g., outside the graveled search area of a turbine that was searched only as a road and pad). Nine additional bats were excluded because they were found during a clearing search. One hundred one bats were excluded because they had an estimated time of death longer than the search interval (e.g., carcasses found on a road and pad search plot in the fall that were estimated to have a time of death longer than seven days). The Indiana bat estimate included zero bats from 2022 (but one from 2021 was included as it occurred within the rolling average interval), and the northern long-eared bat fatality estimate included zero bats.

3.2 Bias Trials

3.2.1 Searcher Efficiency Trials

One hundred sixty-nine bat carcasses (three big brown bats, 53 eastern red bats, 33 hoary bats, and 80 silver-haired bats) were placed across 14 separate dates in the spring and fall (April 6, 12, 25, May 3 and 9, August 17 and 24, September 7, 8, 12, 14, and 22, and October 3 and 6) for searcher efficiency trials, of which 129 were available for searchers to find. Searcher efficiency rates ranged from 55.2% on the field portion of expanded road and pads in the spring to 96.9% on road and pads in the fall (Table 4). For both the Covered Species take estimate and the all-bat fatality estimate, the best-fit model for searcher efficiency for technicians included covariates for plot type and season (Appendix D). No covariates were used in the model for dog-handler teams because dog-handler teams searched only one plot type during one season (Appendix D).

Table 4. Searcher efficiency results as a function of plot type and season at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Model	Season	Plot Type	Number Placed	Number Available	Number Found	% Found
Dog-handler teams	Fall	Full Plots	40	35	27	77.1
Technicians	Spring	Expanded Road and Pad (Gravel Portion)	38	33	27	81.8
	Spring	Expanded Road and Pad (Field Portion)	36	29	16	55.2
	Fall	Road and Pad	55	32	31	96.9

3.2.2 Carcass Persistence Trials

Forty-six carcasses (12 eastern red bats, nine hoary bats, and 25 silver-haired bats) were placed on five dates (April 6, and 12 and August 1, 2 and September 12). The best-fit model for carcass persistence rates for both the Covered Species estimate and all-bat fatality estimate for dog-handler teams was a exponential distribution with no covariates; for technician-searched

plots, the best-fit model for both estimates was an lognormal distribution with no covariates (Figure 2, Appendix D). The median persistence time ranged from 16.0 days on full plots to 6.2 days on road and pads and expanded road and pads (Table 5).

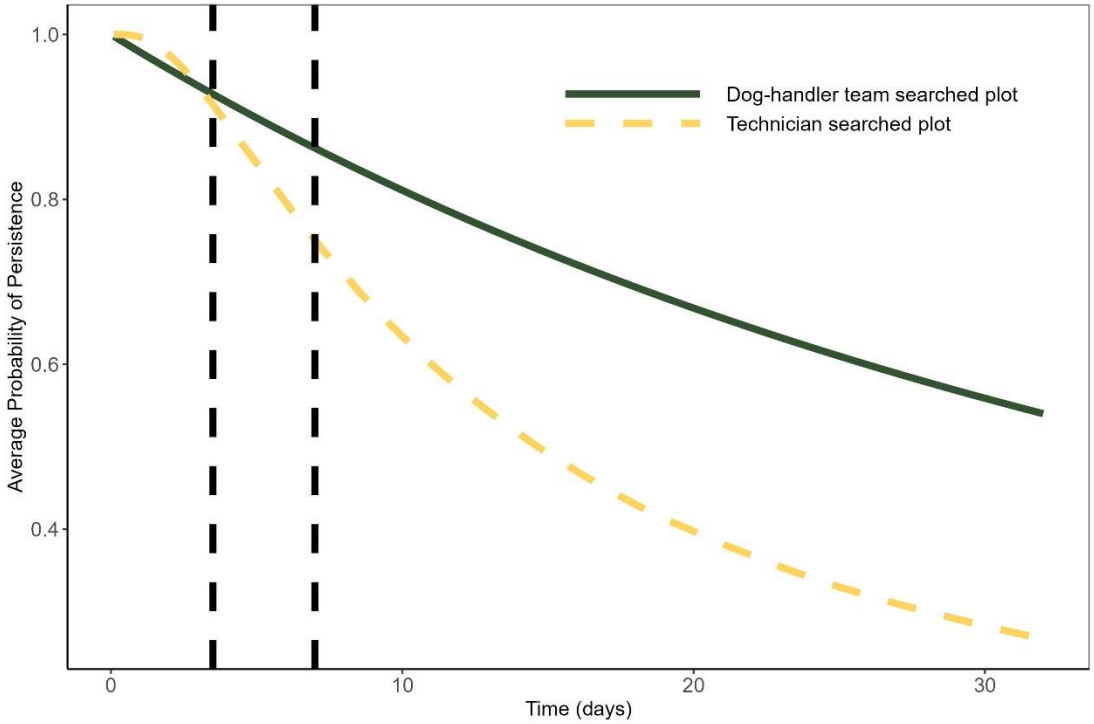


Figure 2. Average probability of persistence for bat carcasses through the 30-day carcass persistence trials at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Note: Vertical lines on the plot represent the search intervals of 3.5 and 7.0 days. The 70-meter full plots were searched by dog-handler teams, and road and pads and expanded road and pads were searched by technicians.

Table 5. Median persistence times for bat carcasses at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Model	Search Interval	Median Carcass Persistence Time (days)
Dog-handler teams	7.0 days	16.0
Technicians	3.5 days	6.2

3.3 Statistical Analysis

3.3.1 Searched Area Adjustment

Searched areas at the Project had no obstructions. Three hundred seventy-one bats were included in the Covered Species searched area adjustment, and 270 bats were included in the all-bat area adjustment (Table 3). Gompertz carcass density distributions (Appendix D) were the best fit for both the all-bat and Covered Species searched area adjustments (Figures 3 and 4).

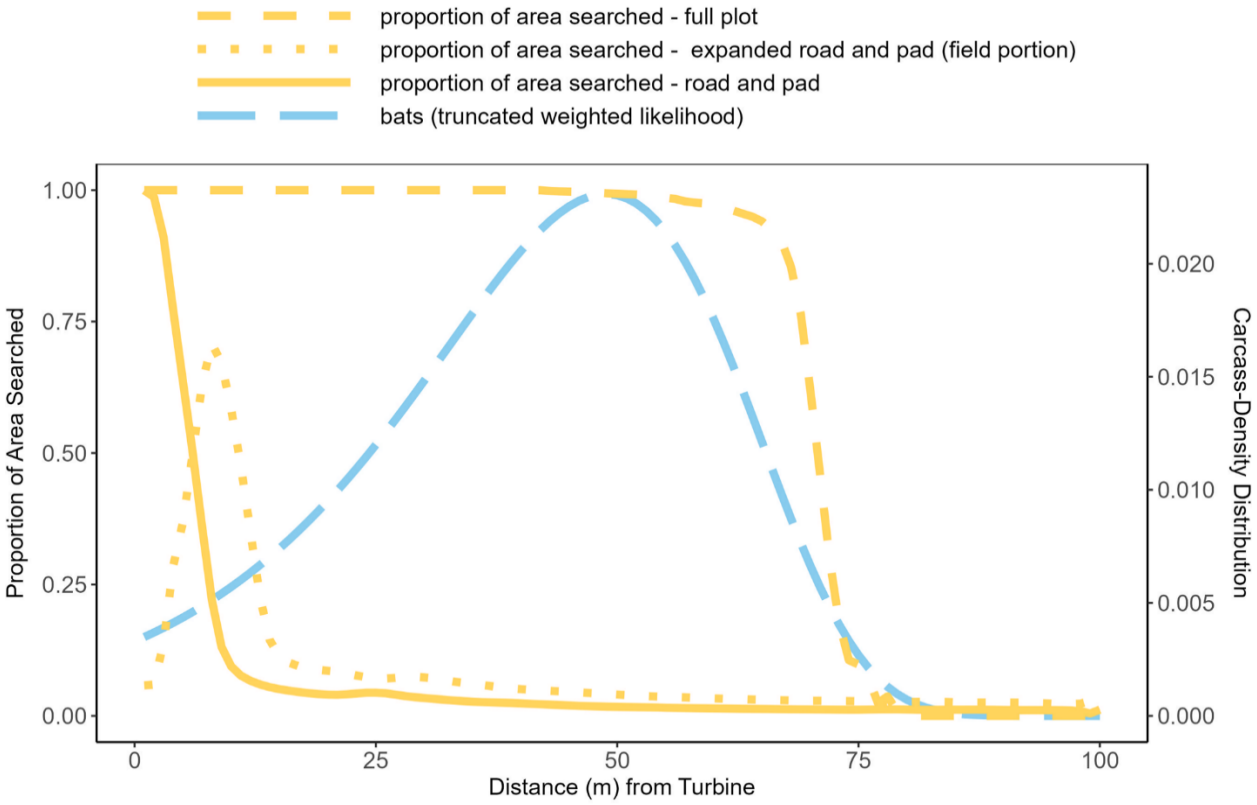


Figure 3. Proportion of area searched by search plot type with the Gompertz best-fit distribution of bat carcasses found and used to calculate all-bat fatality estimates at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Note: The area correction for the expanded road and pad was calculated separately for field and gravel portions of the plot. The gravel portion of the expanded road and pad was grouped with road and pad estimates, while the field portion is displayed separately.

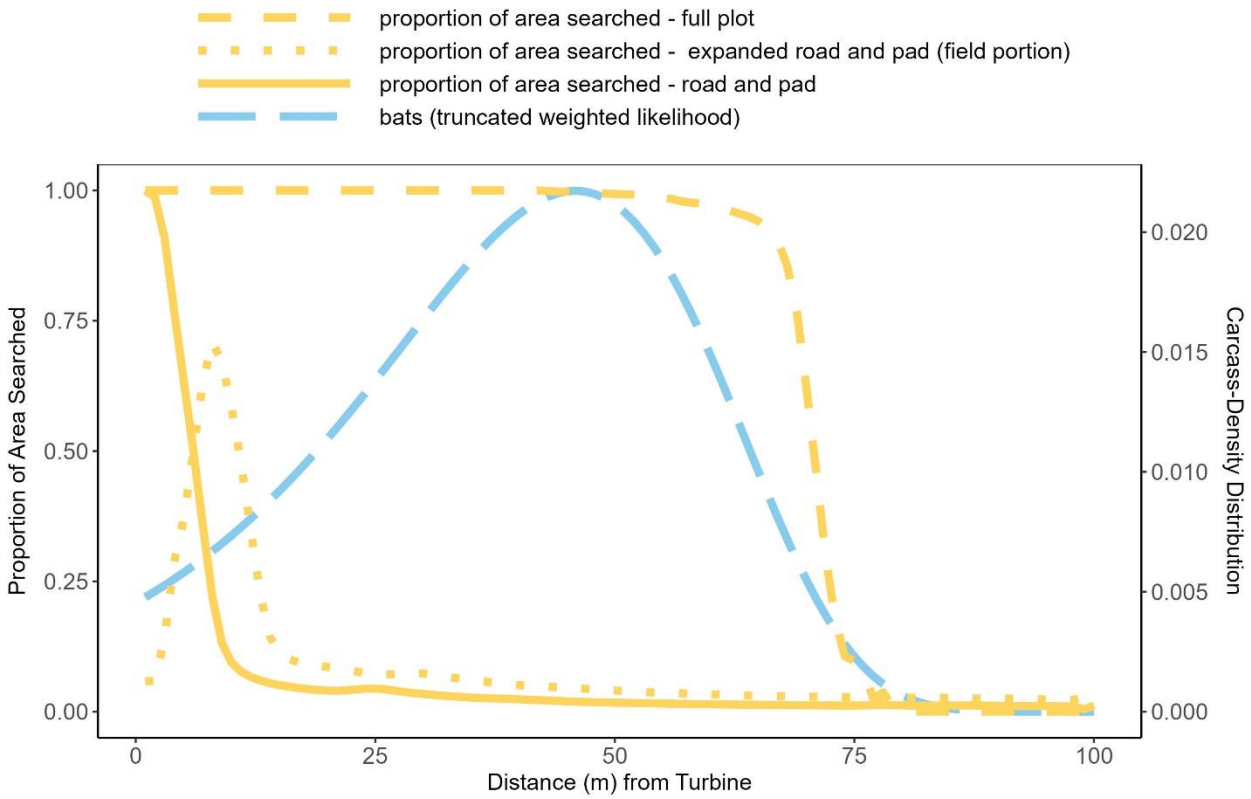


Figure 4. Proportion of area searched by search plot type with the Gompertz best-fit distribution of bat carcasses found and used to calculate Covered Species take estimates at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Note: The area correction for the expanded road and pad was calculated separately for field and gravel portions of the plot. The gravel portion of the expanded road and pad was grouped with road and pad estimates, while the field portion is displayed separately.

3.3.2 All-bat Fatality Estimate Searched Area Adjustment Results

The estimated density weighted proportion (DWP) for the all-bat fatality estimate was 0.05 (90% CI: 0.03–0.07) on road and pads and on the gravel portion of expanded road and pads (Table 6). For the field portion of the expanded road and pads, the DWP was 0.07 (90% CI: 0.05–0.09) and for 70-m full plots, the DWP was 0.96 (90% CI: 0.92–0.99). In other words, road and pad searches within 100 m of the turbine captured an average of 5% of bat fatalities, while the field portion of the expanded road and pads captured an average of 7% of potential bat fatalities and 70-m full plots captured an average of 96% of potential bat fatalities. A total of 270 bat carcasses were used to estimate the searched area adjustment for the all-bat fatality estimate (Table 3).

Table 6. Truncated weighted maximum likelihood searched area adjustment estimates for the all-bat fatality estimate at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Plot Type	Searched Area Adjustment
Road and Pads*	0.05
Expanded Road and Pads (Field Portion)	0.07
Full Plot	0.96

The carcass density followed a Gompertz distribution with the following parameters: 0.059 (Parameter 1) and 0.003 (Parameter 2).

* The area correction for the expanded road and pad was calculated separately for field and gravel portions of the plot. The gravel portion of the expanded road and pad was grouped with road and pad estimates, while the field portion is displayed separately.

3.3.3 Covered Species Take Estimate Searched Area Adjustment Results

The estimated DWP for the Covered Species take estimate was 0.05 (90% CI: 0.04–0.08) on road and pads and on the gravel portion of expanded road and pads (Table 7). For the field portion of the expanded road and pads the DWP was 0.08 (90% CI: 0.06–0.11) and for 70-m full plots the DWP was 0.97 (90% CI: 0.93–0.99). In other words, road and pad searches within 100 m of the turbine captured an average of 5% of bat fatalities while full plots captured 97% of potential bat fatalities, respectively. A total of 371 bat carcasses were used to estimate the searched area adjustment for take estimates (Table 3).

Table 7. Truncated weighted maximum likelihood searched area adjustment estimates for Covered Species take estimate for the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Plot Type	Searched Area Adjustment
Road and Pads*	0.05
Expanded Road and Pads (Field Portion)	0.08
70-meter Full Plot	0.97

The carcass density followed a Gompertz distribution with the following parameters: 0.0541 (Parameter 1) and 0.0045 (Parameter 2).

* The area correction for the expanded road and pad was calculated separately for field and gravel portions of the plot. The gravel portion of the expanded road and pad was grouped with road and pad estimates, while the field portion is displayed separately.

3.3.4 All-bat Fatality Estimate

The all-bat fatality estimate was 3.00 bats per MW (90% CI: 2.13–4.55) and 6.00 bats per turbine (90% CI: 4.27–9.09; Table 8, Appendix B).

Table 8. All-bat fatality estimates per megawatt and per turbine for post-construction fatality monitoring studies conducted at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Plot Type	Estimated Bat Fatalities per Megawatt	90% CI	Estimated Bat Fatalities per Turbine	90% CI
Expanded Road and Pads	0.05	N/A*	0.11	N/A*
Road and Pads	2.35	1.24–4.42	4.71	2.47–8.85
Full Plots	4.61	3.32–6.15	9.22	6.64–12.29
Overall	**3.00**	**2.13–4.55**	**6.00**	**4.27–9.09**

* Confidence intervals (CI) were not calculated for strata with fewer than five fatalities.

3.3.5 Covered Species Take Estimate

3.3.5.1 Annual Site-wide Probability of Detection (*g*)

No Indiana bat or northern long-eared bat carcasses were found. The estimated *g* in 2022 was 0.225 (95% CI: 0.207–0.243; Table 9). Compared to the Study Plan, a higher proportion of carcasess was estimated to occur within search areas than expected, based on the searched area adjustment. Searcher efficiency was higher than projected across all plot types. Carcass persistence was also substantially longer than expected in the fall, and slightly shorter than expected in the spring (Table 10).

Table 9. Estimated detection probability (*g*) using Evidence of Absence at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.[1]

Season	Plot Type	Sampling Fraction	Arrival Proportion	Final Weight (ρ)	Mean *g*	Lower 95% CI	Upper 95% CI
Spring	Expanded Road and Pad (Gravel Portion)	152/152	0.11	0.055	0.035	0.030	0.041
	Expanded Road and Pad (Field Portion)	152/152	0.11	0.050	0.039	0.029	0.050
Fall	Full Plots	40/152	0.89	0.234	0.831	0.764	0.891
	Road and Pads	112/152	0.89	0.656	0.040	0.035	0.045
Overall (weighted average)			**1**	**1**	**0.225[2]**	**0.207**	**0.243**

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

[2] This value is the mean *g* from a weighted average of beta distributions and may not exactly match a weighted average of the point estimates above.

Turbine down-time was negligible in all seasons and plot types, so the final weight did not require an operations component.

CI = confidence interval.

Table 10. Assumptions from the 2022 Study Plan and estimates from the 2022 post-construction fatality monitoring period for the Blue Creek Wind Farm.

	Spring				Fall			
	Expanded Road and Pad (Gravel Portion)		Expanded Road and Pad (Field Portion)		Road and Pads		Full Plots	
Parameter	Study Plan	2022 Field Surveys	Study Plan	2022 Field Surveys	Study Plan	2022 Field Surveys	Study Plan	2022 Field Surveys
Searched Area Adjustment	0.03	0.05 (+)	0.06	0.07 (+)	0.03	0.05 (+)	0.97	0.96 (-)
Searcher Efficiency	80.0%	81.8% (+)	20.0%	**55.2% (+)**	80.0%	89.2% (+)	75.0%	77.1% (+)
Median Carcass Persistence (days)	19.0	16.0 (-)	19.0	16.0 (-)	1.6	**6.2 (+)**	3.9	**16.0 (+)**

(+) indicates a positive change, (-) indicates a negative change; substantial changes are in bold.

3.3.5.2 Rolling Average Probability of Detection

The short-term adaptive management trigger is designed to respond to the recently observed fatality rate at the project. It covers the monitoring periods available to date within the six-year rolling average interval (i.e., fall 2020, spring and fall 2021 and 2022). The estimated *g* used for the short-term adaptive management trigger test was 0.156 (95% CI: 0.138–0.175; Table 11).

3.3.5.3 Incidental Take Permit Term-to-date Probability of Detection

The long-term adaptive management trigger is based on life-of-permit estimated take. It covers all risk periods in the three years since the ITP was issued (i.e., spring and fall, 2020–2022). The estimated *g* used for the long-term trigger adaptive management trigger test was 0.148 (95% CI: 0.132–0.166; Table 11).

Table 11. Per-year, rolling average, and Incidental Take Permit (ITP) term-to-date probabilities of detection (*g*), Ba, Bb, and the relative weight (rho) for the Blue Creek Wind Farm for ITP Years 1–3 (2020–2022).

Year	Ba[1]	Bb[1]	Rho[2]	*g*	95% Confidence Intervals
2020 (fall only, for rolling average)	75.8	442.1	2.11	0.146	0.117–0.178
2020 (spring + fall, for ITP term-to-date)[3]	77.3	515.8	1.99	0.130	0.104–0.159
2021 (spring + fall)	25.9	213.2	1	0.108	0.072–0.150
2022 (spring + fall)	463.6	1599.0	1	0.225	0.207–0.243
Rolling Average	**223.0**	**1,204.4**	**4.1**	**0.156**	**0.138–0.175**
ITP Term-To-Date	**240.6**	**1,379.4**	**4.0**	**0.148**	**0.132–0.166**

[1] Ba and Bb are the parameters for the beta distribution used to characterize the distribution of the probability of detection. The *g* value is the mean of that distribution.

[2] Rho is the weight in the weighted average that is used to combine the probability of detection distributions across years and to scale λ to an annual rate (short term trigger) or interpret *M** (long term trigger). The weights are proportional to relative expected fatality rates for each study. Rho is higher for 2020 because turbines operated at manufactuer cut-in speed during the fall.

[3] Detection probability in spring 2020 was set to an arbitrarily low near-zero value of 0.00001 to account for no monitoring during that season.

3.3.5.4 Covered Species Take Estimates

The two EoA models that produce a take estimate (*M*,* based on the ITP term-to-date *g*) and a take rate estimate (λ, based on the rolling average *g*) 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 (Table 11). 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. Based on the ITP term-to-date counts of Indiana bat and northern long-eared bat carcasses (one and zero, respectively) and *g*, the estimated cumulative take (*M**) amounted to no more than eight Indiana bats and no more than one northern long-eared bat over the ITP term-to-date (i.e., *M** at α = 0.5 is no more than eight for Indiana bats or one for northern long-eared bat). The mean estimated take rates (λ) were 3.22 (95% CI = 0.23–10.07) Indiana bats per year and 1.07 (90% CI = 0.00–5.40) northern long-eared bats per year based on the monitoring data available within the rolling average interval (Table 12). 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*.*

3.3.5.5 Adaptive Management—Evidence of Absence Short-term Trigger

The short-term trigger assesses the probability that the Covered Species estimated take rate exceeded the expected take rate, $Pr(\lambda > \tau)$. At a confidence level of α = 0.05, $Pr(\lambda > \tau)$ must be greater than or equal to 0.95 for to trigger adaptive management. The HCP's expected average annual take rates were 4.39 Indiana bats per year and 2.96 northern long-eared bats per year. For Indiana bat, $Pr(\lambda > \tau)$ = 0.251 (Table 12, Figure 5). For northern long-eared bat, $Pr(\lambda > \tau)$ = 0.097 (Table 12, Figure 5). Neither probability meets or exceeds 0.95, indicating the short-term trigger was not met and a short-term adaptive management response was not required.

Table 12. Estimated take rates (λ), expected take rates, and short-term trigger results using Evidence of Absence for studies conducted within the rolling average interval at the Blue Creek Wind Farm, ITP Years 1–3 (2020–2022).

Species	Estimated Mean λ (95% CI)	Expected Take Rate Developed in HCP (τ)	$Pr(\lambda > \tau)$*	Short-term Trigger Fires at α = 0.05?
Indiana bat	3.22 (0.23–10.07)	4.39	0.251	No
northern long-eared bat	1.07 (0.00–5.40)	2.96	0.097	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., α = 0.05 for a one-sided test), then no adaptive management is required because there is not sufficient evidence that the estimated annual take rate is greater than the expected annual take rate.

ITP = incidental take permit; CI = confidence interval; HCP = habitat conservation plan.

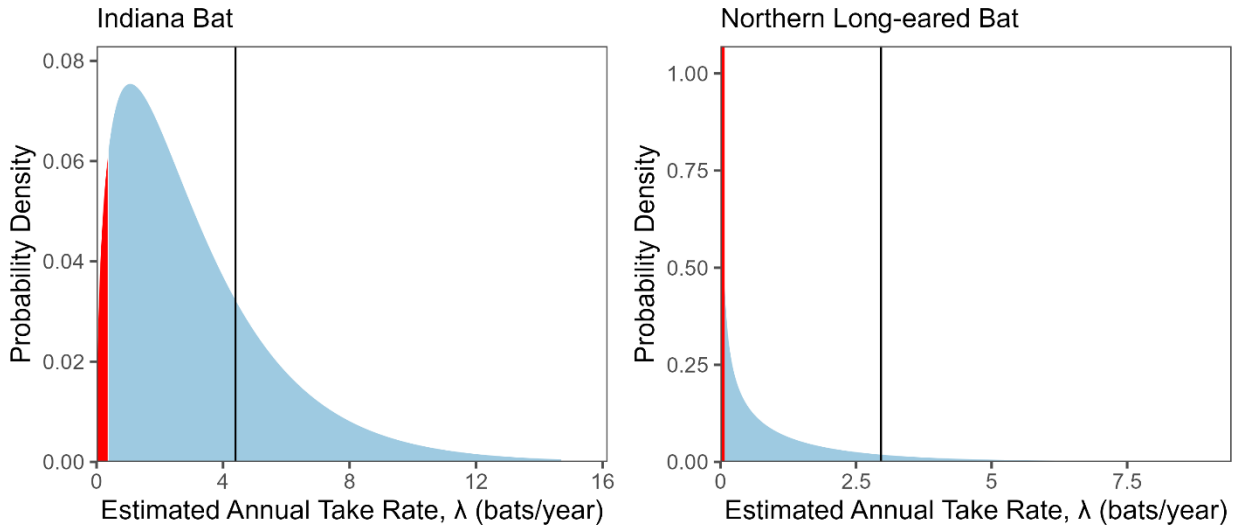


Figure 5. Estimated Covered Species take rates and short-term adaptive management trigger results for Indiana bat (left; *Myotis sodalis*) and northern long-eared bat (right; *M. septentrionalis*) for studies conducted within the rolling average interval at the Blue Creek Wind Farm, Incidental Take Permit Years 1–3 (2020–2022).

Note: The posterior distributions for the take rates are indicated by the curves above, with the lower 5% of the distributions colored in red. The black reference lines indicate the Habitat Conservation Plan's expected take rates. The triggers would fire when the red portions of the posterior distributions exceeded the expected take rates.

3.3.5.6 Adaptive Management—Evidence of Absence Long-term Trigger

The cumulative take estimates were 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 13, Figure 6). Thus, the long-term trigger was not met and the Project was in compliance for both species because $M^* < T$ (i.e, total permitted take) for both species. Therefore, a long-term adaptive management response was not required.

Table 13. Cumulative take estimates, permitted take levels, and long-term trigger results using Evidence of Absence for the Incidental Take Permit (ITP) term-to-date at Blue Creek Wind Farm, ITP Years 1–3 (2020–2022).

Species	Estimated Cumulative Take (*M**)	Total Permitted Take (T)	Long-term Trigger Fires at α = 0.05?
Indiana bat (50th credible bound)	8	154	No
northern long-eared bat (50th credible bound)	1	103	No

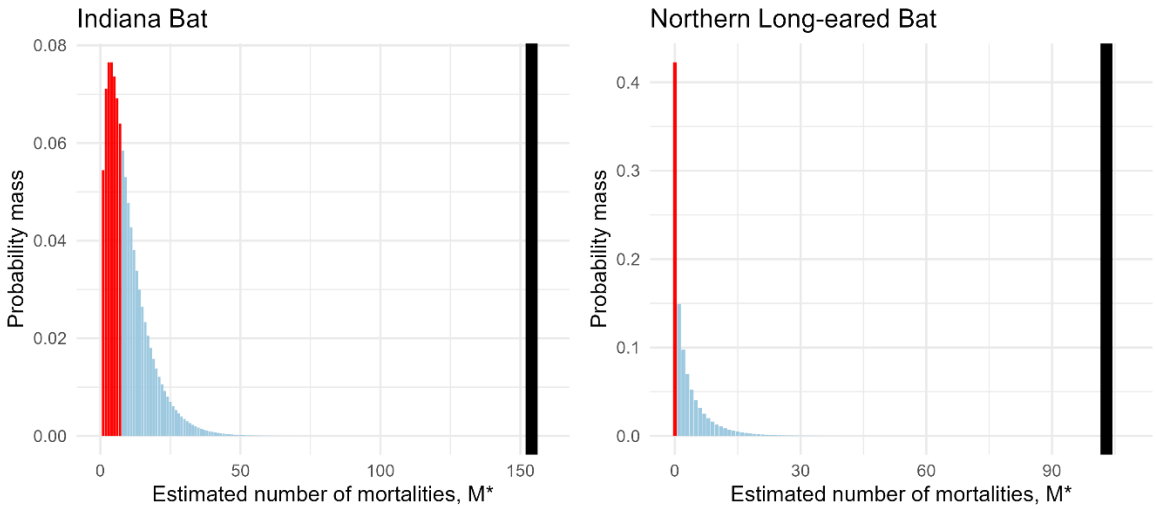


Figure 6. Estimated cumulative take and long-term adaptive management trigger results for Indiana bat (left; *Myotis sodalis*) and northern long-eared bat (right; *M. septentrionalis*) for the Incidental Take Permit (ITP) term-to-date at the Blue Creek Wind Farm, ITP Years 1–3 (2020–2022).

Note: The posterior distributions of the estimated numbers of fatalities are given by the bar charts. The red portions of the bar charts indicate the lower 50% of the distributions (the locations of the long-term triggers). The heavy black reference lines show the Habitat Conservation Plan's permitted take amounts. The triggers would fire when the red portions of the posterior distribution equaled or exceeded the permitted take amounts.

4 CONCLUSIONS

The 2022 post-construction fatality monitoring was completed per the USFWS-approved Study Plan and consistent with the HCP's compliance monitoring requirements. The 2022 overall probability of detection (*g*) value was 0.225 (95% CI: 0.207–0.243). Based on the ITP term-to-date count of Indiana bat and northern long-eared bat carcasses (one and zero, respectively) and estimated *g* of 0.148 (95% CI: 0.132–0.166), it was estimated that cumulatively, no more than eight Indiana bat fatalities and one northern long-eared bat fatality have occurred since the ITP was issued (2020–2022). These values are below the permitted take for each species, meaning the cumulative Covered Species take estimates are in compliance with the ITP and no long-term adaptive management is required. Based on the monitoring period rolling average count of Indiana bat and northern long-eared bat carcasses (one and zero, respectively) and the estimated *g* of 0.156 (95% CI: 0.138–0.175), the probabilities that the annual take rates exceeded the short-term adaptive management thresholds for Indiana bat and northern long-eared bat did not exceed 95%, indicating no short-term adaptive management is necessary. Table 14 provides a summary of HCP and ITP requirements and the status of each requirement. This study represents the third year of intensive monitoring under the Project's ITP. The next year of intensive monitoring is currently scheduled to occur in 2026, per the HCP and ITP.

Table 14. Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, April 1 –May 15 and August 1 – October 15, 2022.

Requirement	Source	Status Based on 2022 Intensive Monitoring Results
Conduct Intensive Monitoring in spring.	HCP Section 6.1.2	Completed.
Conduct Intensive Monitoring in fall.	HCP Section 6.1.2	Completed.
Use Evidence of Absence (EoA) software to design a search protocol with a detection probability (g) value of 0.15, based on the prior year's site specific data.	HCP Section 6.1.2	The monitoring plan was designed using the 2021 site specific data, and provided to the US Fish and Wildlife Service (USFWS) for review prior to the field season.
Estimate mean take rates for the Covered Species.	HCP Section 6.1.5	Mean take rates over all monitoring periods since fall 2020 were 3.22 (95% confidence interval [CI]: 0.23–10.07) Indiana bats per year and 1.07 (95% CI: 0.00–5.40) northern long-eared bats per year.
Estimate cumulative (ITP term-to-date) take estimates for the Covered Species.	HCP Section 6.1.5	Cumulative take estimates were no more than eight Indiana bats and one northern long-eared bat during the ITP term-to-date.
Evaluate whether the short-term adaptive management threshold has been exceeded at the 95% credibility level.	HCP Section 6.3.1	Probabilities that estimated take rates exceeded the short-term adaptive management thresholds were 25.1% for Indiana bat and 9.7% for northern long-eared bat, indicating no adaptive management was required.
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 eight Indiana bats and one northern long-eared bat fall 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 March 1.	ITP Section O.3	Report submitted prior to March 1.

Table 14. Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) compliance requirements and status based on the Intensive Monitoring conducted at the Blue Creek Wind Farm, April 1 –May 15 and August 1 – October 15, 2022.

Requirement	Source	Status Based on 2022 Intensive Monitoring Results
Intensive Monitoring Report will include: 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: 1. Appendix A 2. Section 3.2 3. Section 3.3.5 4. Section 3.3.5.4 5. Sections 3.3.5.5 and 3.3.5.6 6. Appendix C 7. Section 3.3.4 8. Provided by Blue Creek Wind Farm LLC November 21, 2022
Report any Covered Species fatality to the USFWS and Ohio Department of Natural Resources 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	Study Plan submitted February 24, 2022; updated version submitted April 1, 2022. No monitoring is required in 2023.
Provide data and reporting on the supervisory control and data acquisition system from five turbines on April 4, August 4, and August 19.	ITP Section O.5.a.	Provided by Blue Creek Wind Farm LLC in emails dated April 4, August 4, and August 22, 2022.
Provide additional reporting on November 30 to document the implementation of the minimization and monitoring required by the HCP and ITP.	ITP Section O.5.b.	Provided by Blue Creek Wind Farm LLC on November 21, 2022.
Clearly state the fall 2020 estimates of Indiana bats and northern long-eared bats using EoA software were based on normal operations, not on 5.0 meters/second cut-in speeds.	ITP Section O.5.c.	Report accounts for this in analysis (see Section 2.5.3.4).

5 REFERENCES

Blue Creek Wind Farm, LLC. 2020. Indiana Bat and Northern Long-Eared Bat Habitat Conservation Plan, Blue Creek Wind Farm, Van Wert and Paulding Counties, Ohio. Blue Creek Wind Farm, LLC, Portland, Oregon. March 2020. 114 pp + appendices.

Burnham, K. P. and D. R. Anderson. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach. Second Edition. Springer, New York, New York.

Dalthorp, D., M. M. P. Huso, and D. Dail. 2017. Evidence of Absence (V2.0) Software User Guide. US Geological Survey (USGS) Data Series 1055. USGS, Reston, Virginia. 109 pp. doi: 10.3133/ds1055. Available online: https://pubs.usgs.gov/ds/1055/ds1055.pdf

Dalthorp, D. H., J. Simonis, L. Madsen, M. M. Huso, P. Rabie, J. M. Mintz, R. Wolpert, J. Studyvin, and F. Korner-Nievergelt. 2018. Generalized Mortality Estimator (GenEst) - R Code & GUI. US Geological Survey (USGS) Software Release. doi: 10.5066/P9O9BATL.

Esri. 2022. World Imagery and Aerial Photos (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California. Accessed December 2022. Available online: https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=10df2279f9684e4a9f6a7f08febac2a9

Helfers, F. 2017. The Nose Work Handler - Foundation to Finesse. Dogwise Publishing, Wenatchee, Washington. 144 pp.

Horvitz, D. G. and D. J. Thompson. 1952. A Generalization of Sampling without Replacement from a Finite Universe. Journal of the American Statistical Association 47(260): 663-685. doi: 10.2307/2280784.

Huso, M. 2011. An Estimator of Wildlife Fatality from Observed Carcasses. Environmetrics 22(3): 318-329. doi: 10.1002/env.1052.

Huso, M. and D. Dalthorp. 2014. Accounting for Unsearched Areas in Estimating Wind Turbine-Caused Fatality. Journal of Wildlife Management 78(2): 347-358. doi: 10.1002/jwmg.663.

Huso, M., N. Som, and L. Ladd. 2015a. Fatality Estimator User's Guide. US Geological Survey (USGS) Data Series 729. Version 1.1. December 2015. Available online: https://pubs.usgs.gov/ds/729/pdf/ds729.pdf

Huso, M., Dalthorp, D., Dail, D. and Madsen, L. 2015b. Estimating Wind-Turbine-Caused Bird and Bat Fatality When Zero Carcasses are Observed. Ecological Applications, 25: 1213-1225. doi:10.1890/14-0764.1.

Huso, M., D. H. Dalthorp, T. Miller, and D. Bruns. 2016. Wind Energy Development- Methods for Assessing Post-Construction Bird and Bat Mortality. Human–Wildlife Interactions 10(1): 62-70.

Kalbfleisch, J. D. and R. L. Prentice. 2002. The Statistical Analysis of Failure Time Data. John Wiley & Sons, Hoboken, New Jersey.

Kay, D. 2012. Super Sniffer Drill Book - A Workbook for Training Detector Dogs. Coveran Publishing House, 86 pp.

Khokan, M. R., W. Bari, and J. A. Khan. 2013. Weighted Maximum Likelihood Approach for Robust Estimation: Weibull Model. Dhaka University Journal of Science 61(2): 153-156.

Korner-Nievergelt, F., P. Korner-Nievergelt, O. Behr, I. Niermann, R. Brinkmann, and B. Hellriegel. 2012. A New Method to Determine Bird and Bat Fatality at Wind Energy Turbines from Carcass Searches. Wildlife Biology 17(4): 350-363.

Manly, B. F. J. 1997. Randomization, Bootstrap, and Monte Carlo Methods in Biology. Second Edition. Chapman and Hall, London.

National Land Cover Database (NLCD). 2019. National Land Cover Database 2019 - Landcover & Imperviousness (NLCD2019). Available online: https://www.mrlc.gov/data. *As cited* includes:

Homer, C., J. Dewitz, S. Jin, G. Xian, C. Costello, P. Danielson, L. Gass, M. Funk, J. Wickham, S. Stehman, R. Auch, and K. Riitters. 2020. Conterminous United States Land Cover Change Patterns 2001–2016 from the 2016 National Land Cover Database. ISPRS Journal of Photogrammetry and Remote Sensing 162(5): 184-199. doi: 10.1016/j.isprsjprs.2020.02.019.

Jin, S., C. Homer, L. Yang, P. Danielson, J. Dewitz, C. Li, Z. Zhu, G. Xian, and D. Howard. 2019. Overall Methodology Design for the United States National Land Cover Database 2016 Products. Remote Sensing. 2971. doi: 10.3390/rs11242971.

Wickham, J., S. V. Stehman, D. G. Sorenson, L. Gass, and J. A. Dewitz. 2021, Thematic Accuracy Assessment of the NLCD 2016 Land Cover for the Conterminous United States: Remote Sensing of Environment 257: 112357. doi: 10.1016/j.rse.2021.112357.

and

Yang, L., S. Jin, P. Danielson, C. Homer, L. Gass, S. M. Bender, A. Case, C. Costello, J. Dewitz, J. Fry, M. Funk, B. Granneman, G. C. Liknes, M. Rigge, and G. Xian. 2018. A New Generation of the United States National Land Cover Database: Requirements, Research Priorities, Design, and Implementation Strategies. ISPRS Journal of Photogrammetry and Remote Sensing 146: 108-123. doi: 10.1016/j.isprsjprs.2018.09.006.

Rabie, P., D. Riser-Espinoza, and T. McDonald. 2022. windAC: Area Correction Methods. R Package Version 1.2.9. R: A language and environment for statistical computing. Accessed January 2023. Available online: https://cran.r-project.org/web/packages/windAC/index.html

R Development Core Team. 2016. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. Available online: http://www.R-project.org/

Ritzert, J., R. Good, Q. Hayden, and J. Lombardi. 2021. Post-Construction Monitoring Studies for the Blue Creek Wind Farm, Van Wert and Paulding Counties, Ohio, Final Report: August 1 – October 15, 2020. Prepared for Blue Creek, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. March 2021.

Rodriguez, M., K. DuBridge, Q. Hayden, P. Rabie, and R. Good. 2022a. 2022 Post-construction Monitoring Study Plan for the Blue Creek Wind Farm, Van Wert and Paulding counties, Ohio. Prepared for Blue Creek LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Bloomington, Indiana. April 1, 2022.

Rodriguez, M., Q. Hayden, and P. Rabie. 2022b. Post-Construction Monitoring Studies for the Blue Creek Wind Farm, Van Wert and Paulding counties, Ohio, Final Report: April 1 – May 15 and August 1 – October 15, 2021. Prepared for Blue Creek, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Bloomington, Indiana. February 9, 2022.

Simonis, J., D. H. Dalthorp, M. M. Huso, J. M. Mintz, L. Madsen, P. Rabie, and J. Studyvin. 2018. GenEst User Guide—Software for a Generalized Estimator of Mortality. US Geological Survey Techniques and Methods, Volume 7, Chapter C19, 72 pp. doi: 10.3133/tm7C19. Available online: https://pubs.usgs.gov/tm/7c19/tm7c19.pdf

Yee, T. W. 2010. The VGAM Package for Categorical Data Analysis. Journal of Statistical Software 32(10): 1-34.

Appendix A. Bat Carcasses Found during the 2022 Post-construction Fatality Monitoring at the Blue Creek Wind Farm, from April 1 – May 15 and August 1 – October 15, 2022

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
28-Apr-22	silver-haired bat	16	carcass search	8:54:00	100-m road and pad	unknown	40.95077	-84.6966
25-Jul-22	hoary bat	E7	clearance search	9:20:00	70-m full plot	unknown	40.92294	-84.5208
26-Jul-22	big brown bat	156	clearance search	9:30:00	70-m full plot	female	40.99926	-84.5586
26-Jul-22	eastern red bat	121	clearance search	8:10:00	70-m full plot	unknown	40.94108	-84.5974
26-Jul-22	eastern red bat	41	clearance search	8:10:00	70-m full plot	unknown	40.9234	-84.6547
26-Jul-22	eastern red bat	77	clearance search	11:42:00	70-m full plot	unknown	40.99447	-84.6379
26-Jul-22	hoary bat	101	clearance search	11:43:00	70-m full plot	unknown	40.98087	-84.6007
27-Jul-22	eastern red bat	8	clearance search	14:52:00	100-m road and pad	female	40.98443	-84.6786
27-Jul-22	hoary bat	128	clearance search	11:33:00	100-m road and pad	unknown	40.98249	-84.577
28-Jul-22	eastern red bat	34	clearance search	10:48:00	70-m full plot	unknown	40.94994	-84.6567
1-Aug-22	hoary bat	E25	carcass search	7:55:00	70-m full plot	unknown	40.97217	-84.5311
1-Aug-22	hoary bat	E28	carcass search	11:10:00	70-m full plot	unknown	40.97722	-84.5197
2-Aug-22	hoary bat	167	carcass search	6:56:00	70-m full plot	unknown	41.00077	-84.5225
2-Aug-22	hoary bat	156	carcass search	10:29:00	70-m full plot	unknown	40.99907	-84.558
2-Aug-22	hoary bat	41	carcass search	8:10:00	70-m full plot	unknown	40.9236	-84.6549
3-Aug-22	eastern red bat	110	carcass search	10:44:00	70-m full plot	unknown	40.96478	-84.5953
3-Aug-22	eastern red bat	34	carcass search	10:00:00	70-m full plot	unknown	40.95034	-84.6563
3-Aug-22	hoary bat	101	carcass search	8:20:00	70-m full plot	male	40.98117	-84.6001
3-Aug-22	silver-haired bat	79	carcass search	7:52:00	70-m full plot	unknown	40.98085	-84.6372
5-Aug-22	big brown bat	E6	carcass search	8:14:00	70-m full plot	unknown	40.92104	-84.5166
5-Aug-22	eastern red bat	92	carcass search	9:04:00	70-m full plot	unknown	41.01366	-84.6072
5-Aug-22	eastern red bat	122	carcass search	10:27:00	70-m full plot	unknown	40.9412	-84.5852
5-Aug-22	hoary bat	166	carcass search	9:57:00	70-m full plot	unknown	41.00765	-84.5283
5-Aug-22	hoary bat	92	carcass search	8:58:00	70-m full plot	unknown	41.01334	-84.6075
5-Aug-22	hoary bat	146	carcass search	7:56:00	70-m full plot	unknown	41.0075	-84.5777
6-Aug-22	big brown bat	79	carcass search	9:56:00	70-m full plot	unknown	40.98073	-84.6368
6-Aug-22	eastern red bat	44	carcass search	8:29:00	70-m full plot	unknown	40.91174	-84.657
6-Aug-22	eastern red bat	110	carcass search	11:16:00	70-m full plot	unknown	40.9648	-84.5954
6-Aug-22	hoary bat	44	carcass search	8:38:00	70-m full plot	unknown	40.91189	-84.6571
8-Aug-22	big brown bat	165	carcass search	8:18:00	70-m full plot	unknown	41.01004	-84.5303
8-Aug-22	big brown bat	121	carcass search	7:56:00	70-m full plot	unknown	40.94077	-84.5971
8-Aug-22	eastern red bat	E3	carcass search	12:04:00	70-m full plot	unknown	40.92244	-84.558
8-Aug-22	evening bat	E25	carcass search	7:04:00	70-m full plot	unknown	40.97209	-84.5309
8-Aug-22	hoary bat	E25	carcass search	6:59:00	70-m full plot	unknown	40.97208	-84.5308
9-Aug-22	big brown bat	131	carcass search	13:11:00	70-m full plot	male	40.97323	-84.5793
9-Aug-22	big brown bat	101	carcass search	10:20:00	70-m full plot	male	40.98103	-84.6
9-Aug-22	eastern red bat	41	carcass search	10:00:00	70-m full plot	unknown	40.9229	-84.6554
9-Aug-22	eastern red bat	110	carcass search	11:57:00	70-m full plot	unknown	40.96415	-84.5955

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
9-Aug-22	eastern red bat	79	carcass search	6:47:00	70-m full plot	unknown	40.98093	-84.6368
9-Aug-22	eastern red bat	57	carcass search	8:24:00	70-m full plot	unknown	40.94776	-84.6421
9-Aug-22	hoary bat	43	carcass search	6:59:00	70-m full plot	unknown	40.91276	-84.661
9-Aug-22	hoary bat	85	carcass search	9:10:00	70-m full plot	male	40.98656	-84.6178
9-Aug-22	hoary bat	123	carcass search	10:52:00	100-m road and pad	unknown	40.97228	-84.5878
11-Aug-22	big brown bat	E18	carcass search	11:46:00	70-m full plot	unknown	40.95574	-84.5415
11-Aug-22	big brown bat	122	carcass search	12:12:00	70-m full plot	unknown	40.941	-84.5857
11-Aug-22	eastern red bat	E6	carcass search	9:18:00	70-m full plot	unknown	40.92115	-84.5167
11-Aug-22	hoary bat	E3	carcass search	6:50:00	70-m full plot	unknown	40.92235	-84.5578
12-Aug-22	big brown bat	46	carcass search	6:53:00	70-m full plot	unknown	40.92528	-84.6418
15-Aug-22	big brown bat	E28	carcass search	6:58:00	70-m full plot	female	40.97679	-84.5206
15-Aug-22	big brown bat	121	carcass search	11:52:00	70-m full plot	unknown	40.94025	-84.597
15-Aug-22	eastern red bat	146	carcass search	8:36:00	70-m full plot	unknown	41.00707	-84.578
15-Aug-22	eastern red bat	146	carcass search	8:32:00	70-m full plot	unknown	41.00721	-84.5779
15-Aug-22	eastern red bat	122	carcass search	12:55:00	70-m full plot	unknown	40.94097	-84.586
16-Aug-22	hoary bat	55	carcass search	10:20:00	70-m full plot	unknown	40.94976	-84.6467
17-Aug-22	hoary bat	41	carcass search	10:31:00	70-m full plot	female	40.92331	-84.6556
18-Aug-22	big brown bat	E9	carcass search	8:18:00	70-m full plot	unknown	40.93326	-84.5398
18-Aug-22	hoary bat	167	carcass search	9:29:00	70-m full plot	unknown	41.00055	-84.5225
19-Aug-22	big brown bat	44	carcass search	8:33:00	70-m full plot	unknown	40.91154	-84.6575
19-Aug-22	big brown bat	161	carcass search	6:47:00	70-m full plot	unknown	41.0027	-84.5486
19-Aug-22	hoary bat	161	carcass search	6:36:00	70-m full plot	unknown	41.00225	-84.5482
19-Aug-22	hoary bat	44	carcass search	8:42:00	70-m full plot	unknown	40.91204	-84.6576
22-Aug-22	big brown bat	E25	carcass search	12:03:00	70-m full plot	unknown	40.97216	-84.5309
22-Aug-22	big brown bat	162	carcass search	8:13:00	70-m full plot	unknown	40.99959	-84.5462
22-Aug-22	eastern red bat	E5	carcass search	7:34:00	70-m full plot	unknown	40.91862	-84.5373
22-Aug-22	eastern red bat	167	carcass search	12:07:00	70-m full plot	unknown	41.00069	-84.5219
22-Aug-22	hoary bat	92	carcass search	9:15:00	70-m full plot	unknown	41.01297	-84.6081
23-Aug-22	big brown bat	77	carcass search	8:00:00	70-m full plot	male	40.99375	-84.6376
23-Aug-22	eastern red bat	131	carcass search	11:43:00	70-m full plot	unknown	40.97344	-84.5799
23-Aug-22	eastern red bat	77	carcass search	7:57:00	70-m full plot	unknown	40.99423	-84.638
23-Aug-22	eastern red bat	85	carcass search	9:10:00	70-m full plot	unknown	40.98663	-84.6179
23-Aug-22	eastern red bat	79	carcass search	7:11:00	70-m full plot	unknown	40.98008	-84.6373
23-Aug-22	eastern red bat	42	carcass search	10:28:00	70-m full plot	unknown	40.92044	-84.6539
23-Aug-22	eastern red bat	44	carcass search	7:17:00	70-m full plot	unknown	40.91196	-84.6569
23-Aug-22	eastern red bat	55	carcass search	10:50:00	70-m full plot	female	40.94978	-84.6462
23-Aug-22	eastern red bat	101	carcass search	10:22:00	70-m full plot	unknown	40.98058	-84.6002
23-Aug-22	eastern red bat or Seminole bat	131	carcass search	11:48:00	70-m full plot	unknown	40.97306	-84.5797

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
23-Aug-22	hoary bat	44	carcass search	7:06:00	70-m full plot	unknown	40.91222	-84.6574
25-Aug-22	big brown bat	146	carcass search	8:07:00	70-m full plot	unknown	41.00709	-84.578
25-Aug-22	big brown bat	157	carcass search	13:00:00	70-m full plot	unknown	41.01383	-84.5554
25-Aug-22	big brown bat	E18	carcass search	8:02:00	70-m full plot	unknown	40.95583	-84.5416
25-Aug-22	big brown bat	E7	carcass search	10:06:00	70-m full plot	unknown	40.92245	-84.5208
25-Aug-22	eastern red bat	161	carcass search	11:46:00	70-m full plot	unknown	41.00278	-84.548
25-Aug-22	eastern red bat	157	carcass search	12:51:00	70-m full plot	unknown	41.01377	-84.556
25-Aug-22	hoary bat	84	carcass search	10:05:00	70-m full plot	unknown	40.97664	-84.6249
25-Aug-22	silver-haired bat	165	carcass search	8:44:00	70-m full plot	male	41.00979	-84.5299
25-Aug-22	big brown bat	26	carcass search	12:00:00	100-m road and pad	unknown	40.93538	-84.6748
25-Aug-22	eastern red bat	7	carcass search	8:05:00	100-m road and pad	unknown	45.39852	69.51998
26-Aug-22	big brown bat	46	carcass search	12:41:00	70-m full plot	unknown	40.92522	-84.6421
26-Aug-22	big brown bat	131	carcass search	12:31:00	70-m full plot	unknown	40.97376	-84.5797
26-Aug-22	eastern red bat	43	carcass search	7:12:00	70-m full plot	unknown	40.91356	-84.6612
26-Aug-22	eastern red bat	15	carcass search	7:05:00	70-m full plot	unknown	40.9577	-84.6951
26-Aug-22	eastern red bat	34	carcass search	8:21:00	70-m full plot	unknown	40.9504	-84.6565
26-Aug-22	silver-haired bat	77	carcass search	10:07:00	70-m full plot	unknown	40.99467	-84.6373
29-Aug-22	big brown bat	146	carcass search	13:29:00	70-m full plot	unknown	41.00774	-84.5787
29-Aug-22	big brown bat	E18	carcass search	12:57:00	70-m full plot	unknown	40.95532	-84.5414
29-Aug-22	eastern red bat	E25	carcass search	11:26:00	70-m full plot	unknown	40.97202	-84.5318
29-Aug-22	eastern red bat	E18	carcass search	12:42:00	70-m full plot	unknown	40.95538	-84.5424
29-Aug-22	eastern red bat	E18	carcass search	12:49:00	70-m full plot	unknown	40.95564	-84.5423
29-Aug-22	eastern red bat	E28	carcass search	11:28:00	70-m full plot	unknown	40.9775	-84.5202
29-Aug-22	eastern red bat	E28	carcass search	11:20:00	70-m full plot	unknown	40.97705	-84.5207
29-Aug-22	hoary bat	E9	carcass search	14:41:00	70-m full plot	unknown	40.93396	-84.5398
29-Aug-22	hoary bat	E25	carcass search	11:34:00	70-m full plot	unknown	40.97223	-84.5315
29-Aug-22	silver-haired bat	166	carcass search	12:35:00	70-m full plot	unknown	41.00773	-84.5291
29-Aug-22	silver-haired bat	166	carcass search	12:27:00	70-m full plot	unknown	41.00764	-84.5289
29-Aug-22	eastern red bat	166	carcass search[2]	12:40:00	70-m full plot	unknown	41.00751	-84.5293
30-Aug-22	big brown bat	121	carcass search	9:02:00	70-m full plot	unknown	40.94094	-84.597
30-Aug-22	eastern red bat	122	carcass search	6:55:00	70-m full plot	unknown	40.94114	-84.5861
30-Aug-22	eastern red bat	E6	carcass search	8:14:00	70-m full plot	unknown	40.92134	-84.5178
30-Aug-22	eastern red bat	E7	carcass search	7:25:00	70-m full plot	unknown	40.92269	-84.5217
30-Aug-22	eastern red bat	79	carcass search	12:29:00	70-m full plot	unknown	40.98043	-84.6367
30-Aug-22	eastern red bat	101	carcass search	13:22:00	70-m full plot	unknown	40.98147	-84.6002
30-Aug-22	eastern red bat	77	carcass search	11:06:00	70-m full plot	unknown	40.99408	-84.6381
30-Aug-22	hoary bat	44	carcass search	9:35:00	70-m full plot	unknown	40.91195	-84.6578
30-Aug-22	silver-haired bat	42	carcass search	11:19:00	70-m full plot	unknown	40.92112	-84.6542

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
30-Aug-22	silver-haired bat	44	carcass search	9:46:00	70-m full plot	unknown	40.91212	-84.6573
30-Aug-22	silver-haired bat	E3	carcass search	9:55:00	70-m full plot	unknown	40.92262	-84.558
30-Aug-22	silver-haired bat	101	carcass search	13:31:00	70-m full plot	unknown	40.98112	-84.5998
30-Aug-22	hoary bat	E14	carcass search	9:13:00	100-m road and pad	unknown	40.94293	-84.5263
31-Aug-22	eastern red bat	131	carcass search	10:43:00	70-m full plot	unknown	40.97304	-84.5801
31-Aug-22	silver-haired bat	33	carcass search	8:29:00	70-m full plot	unknown	40.95252	-84.6598
1-Sep-22	eastern red bat	122	carcass search	13:03:00	70-m full plot	unknown	40.94126	-84.5851
1-Sep-22	eastern red bat	122	carcass search	12:57:00	70-m full plot	unknown	40.94139	-84.5854
1-Sep-22	eastern red bat	E7	carcass search	8:58:00	70-m full plot	unknown	40.92269	-84.5217
1-Sep-22	eastern red bat	153	carcass search	10:56:00	70-m full plot	unknown	41.00986	-84.5668
1-Sep-22	hoary bat	E3	carcass search	6:44:00	70-m full plot	unknown	40.92248	-84.5585
1-Sep-22	silver-haired bat	E28	carcass search	13:28:00	70-m full plot	unknown	40.9768	-84.5196
1-Sep-22	silver-haired bat	157	carcass search	7:00:00	70-m full plot	unknown	41.01424	-84.5558
1-Sep-22	silver-haired bat	E7	carcass search	9:12:00	70-m full plot	unknown	40.92269	-84.5203
1-Sep-22	silver-haired bat	153	carcass search	11:00:00	70-m full plot	unknown	41.01	-84.567
1-Sep-22	eastern red bat	51	carcass search	10:30:00	100-m road and pad	unknown	45.37619	698963
1-Sep-22	silver-haired bat	116	carcass search	8:00:00	100-m road and pad	unknown	45.36042	702297.3
2-Sep-22	big brown bat	110	carcass search	9:57:00	70-m full plot	unknown	40.96446	-84.5958
2-Sep-22	eastern red bat	101	carcass search	8:54:00	70-m full plot	unknown	40.98064	-84.5997
2-Sep-22	eastern red bat	15	carcass search	14:18:00	70-m full plot	unknown	40.95732	-84.6949
2-Sep-22	eastern red bat	15	carcass search	14:15:00	70-m full plot	unknown	40.95732	-84.6952
2-Sep-22	eastern red bat	47	carcass search	10:59:00	70-m full plot	unknown	40.92236	-84.6393
2-Sep-22	eastern red bat	57	carcass search	13:20:00	70-m full plot	unknown	40.94772	-84.6421
2-Sep-22	hoary bat	42	carcass search	7:24:00	70-m full plot	unknown	40.92034	-84.6543
2-Sep-22	seminole bat	34	carcass search	14:50:00	70-m full plot	unknown	40.94975	-84.6563
2-Sep-22	silver-haired bat	121	carcass search	12:46:00	70-m full plot	unknown	40.94114	-84.5973
2-Sep-22	silver-haired bat	77	carcass search	7:11:00	70-m full plot	unknown	40.99442	-84.6375
2-Sep-22	silver-haired bat	131	carcass search	10:58:00	70-m full plot	unknown	40.97369	-84.5795
2-Sep-22	silver-haired bat	31	carcass search	1:57:00	70-m full plot	unknown	40.95793	-84.6632
2-Sep-22	silver-haired bat	33	carcass search	2:50:00	70-m full plot	unknown	40.95246	-84.6594
2-Sep-22	silver-haired bat	121	carcass search	12:48:00	70-m full plot	unknown	40.94117	-84.5972
2-Sep-22	silver-haired bat	55	carcass search	14:10:00	70-m full plot	unknown	40.94987	-84.6461
2-Sep-22	silver-haired bat	55	carcass search	14:00:00	70-m full plot	unknown	40.95	-84.647
2-Sep-22	eastern red bat	11	carcass search	12:35:00	100-m road and pad	unknown	4538184	695465
2-Sep-22	silver-haired bat	64	carcass search	7:47:00	100-m road and pad	unknown	45.33946	698347.7
2-Sep-22	silver-haired bat	28	carcass search	10:18:00	100-m road and pad	unknown	45.33124	695499.8
5-Sep-22	big brown bat	121	carcass search	2:10:00	70-m full plot	unknown	40.941	-84.5972
5-Sep-22	big brown bat	84	carcass search	12:42:00	70-m full plot	unknown	40.97678	-84.625

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
5-Sep-22	big brown bat	167	carcass search	11:19:00	70-m full plot	unknown	41.00097	-84.5217
5-Sep-22	eastern red bat	84	carcass search	12:30:00	70-m full plot	unknown	40.97727	-84.6242
5-Sep-22	eastern red bat	92	carcass search	11:10:00	70-m full plot	unknown	41.01315	-84.6072
5-Sep-22	hoary bat	165	carcass search	9:00:00	70-m full plot	unknown	41.01029	-84.5303
5-Sep-22	silver-haired bat	84	carcass search	12:34:00	70-m full plot	unknown	40.97702	-84.6243
5-Sep-22	silver-haired bat	161	carcass search	14:35:00	70-m full plot	male	41.00257	-84.5483
5-Sep-22	silver-haired bat	153	carcass search	8:40:00	70-m full plot	unknown	41.00971	-84.5674
5-Sep-22	silver-haired bat	153	carcass search	8:32:00	70-m full plot	unknown	41.01015	-84.5667
5-Sep-22	silver-haired bat	92	carcass search	11:03:00	70-m full plot	unknown	41.01318	-84.6075
5-Sep-22	silver-haired bat	146	carcass search	10:02:00	70-m full plot	unknown	41.00794	-84.5783
5-Sep-22	silver-haired bat	84	carcass search	12:32:00	70-m full plot	unknown	40.97716	-84.6243
5-Sep-22	silver-haired bat	153	carcass search	8:25:00	70-m full plot	unknown	41.01049	-84.5669
5-Sep-22	silver-haired bat	146	carcass search	9:59:00	70-m full plot	unknown	41.00791	-84.5776
5-Sep-22	silver-haired bat	153	carcass search	8:28:00	70-m full plot	unknown	41.01036	-84.5675
5-Sep-22	silver-haired bat	E18	carcass search	10:01:00	70-m full plot	unknown	40.95501	-84.5414
5-Sep-22	silver-haired bat	E25	carcass search	8:22:00	70-m full plot	unknown	40.97203	-84.5307
5-Sep-22	silver-haired bat	E25	carcass search	8:17:00	70-m full plot	unknown	40.97223	-84.5312
5-Sep-22	silver-haired bat	E18	carcass search	9:48:00	70-m full plot	unknown	40.95552	-84.5415
5-Sep-22	silver-haired bat	E18	carcass search	9:51:00	70-m full plot	unknown	40.95546	-84.5413
5-Sep-22	silver-haired bat	E7	carcass search	11:58:00	70-m full plot	unknown	40.92275	-84.5215
5-Sep-22	silver-haired bat	E5	carcass search	13:52:00	70-m full plot	unknown	40.91941	-84.5371
5-Sep-22	silver-haired bat	E7	carcass search	11:42:00	70-m full plot	unknown	40.92323	-84.5209
5-Sep-22	silver-haired bat	E28	carcass search	7:49:00	70-m full plot	unknown	40.97731	-84.5206
5-Sep-22	silver-haired bat	166	carcass search	10:09:00	70-m full plot	unknown	41.00776	-84.5289
5-Sep-22	silver-haired bat	162	carcass search	13:02:00	70-m full plot	unknown	40.99996	-84.5459
5-Sep-22	silver-haired bat	167	carcass search	11:18:00	70-m full plot	male	41.00106	-84.5218
5-Sep-22	silver-haired bat	161	carcass search	14:27:00	70-m full plot	unknown	41.00284	-84.5482
5-Sep-22	silver-haired bat	161	carcass search	14:30:00	70-m full plot	male	41.00268	-84.5481
5-Sep-22	silver-haired bat	165	carcass search	9:06:00	70-m full plot	unknown	41.01011	-84.5308
5-Sep-22	silver-haired bat	162	carcass search	13:20:00	70-m full plot	unknown	40.99923	-84.5463
5-Sep-22	silver-haired bat	167	carcass search	11:16:00	70-m full plot	unknown	41.00128	-84.5224
5-Sep-22	silver-haired bat	161	carcass search	14:28:00	70-m full plot	male	41.00276	-84.5482
5-Sep-22	silver-haired bat	E28	carcass search	7:50:00	70-m full plot	unknown	40.97728	-84.5206
5-Sep-22	silver-haired bat	161	carcass search	14:36:00	70-m full plot	female	41.00263	-84.5483
5-Sep-22	silver-haired bat	167	carcass search	11:24:00	70-m full plot	male	41.00114	-84.5226
5-Sep-22	silver-haired bat	167	carcass search	11:35:00	70-m full plot	male	41.00104	-84.5227
5-Sep-22	silver-haired bat	166	carcass search	10:16:00	70-m full plot	unknown	41.0075	-84.5288
5-Sep-22	silver-haired bat	165	carcass search	8:57:00	70-m full plot	male	41.01037	-84.5303

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
6-Sep-22	eastern red bat	33	carcass search	12:24:00	70-m full plot	unknown	40.9528	-84.6596
6-Sep-22	eastern red bat	34	carcass search	11:16:00	70-m full plot	unknown	40.94968	-84.657
6-Sep-22	eastern red bat	33	carcass search	12:33:00	70-m full plot	unknown	40.95247	-84.6595
6-Sep-22	eastern red bat	33	carcass search	12:46:00	70-m full plot	unknown	40.95203	-84.6591
6-Sep-22	eastern red bat	110	carcass search	13:30:00	70-m full plot	unknown	40.96426	-84.5957
6-Sep-22	eastern red bat	85	carcass search	8:35:00	70-m full plot	unknown	40.98748	-84.6174
6-Sep-22	eastern red bat	101	carcass search	11:09:00	70-m full plot	unknown	40.98093	-84.6008
6-Sep-22	eastern red bat	85	carcass search	8:54:00	70-m full plot	unknown	40.98688	-84.618
6-Sep-22	eastern red bat	40	carcass search	12:35:00	70-m full plot	unknown	40.9257	-84.6563
6-Sep-22	eastern red bat	43	carcass search	9:17:00	70-m full plot	unknown	40.91381	-84.6607
6-Sep-22	eastern red bat	157	carcass search	7:56:00	70-m full plot	unknown	41.01452	-84.5555
6-Sep-22	eastern red bat	43	carcass search	9:09:00	70-m full plot	male	40.91299	-84.6607
6-Sep-22	eastern red bat or Seminole bat	41	carcass search	14:15:00	70-m full plot	unknown	40.92322	-84.6548
6-Sep-22	silver-haired bat	42	carcass search	14:46:00	70-m full plot	unknown	40.92036	-84.6541
6-Sep-22	silver-haired bat	41	carcass search	13:52:00	70-m full plot	unknown	40.92367	-84.6551
6-Sep-22	silver-haired bat	42	carcass search	14:38:00	70-m full plot	unknown	40.9208	-84.6538
6-Sep-22	silver-haired bat	42	carcass search	14:30:00	70-m full plot	unknown	40.92096	-84.6544
6-Sep-22	silver-haired bat	41	carcass search	13:59:00	70-m full plot	unknown	40.9237	-84.6553
6-Sep-22	silver-haired bat	42	carcass search	14:32:00	70-m full plot	unknown	40.92097	-84.6547
6-Sep-22	silver-haired bat	57	carcass search	3:05:00	70-m full plot	unknown	40.94793	-84.6422
6-Sep-22	silver-haired bat	31	carcass search	9:56:00	70-m full plot	unknown	40.95825	-84.6643
6-Sep-22	silver-haired bat	122	carcass search	7:36:00	70-m full plot	unknown	40.94128	-84.586
6-Sep-22	silver-haired bat	33	carcass search	12:30:00	70-m full plot	unknown	40.95257	-84.6592
6-Sep-22	silver-haired bat	15	carcass search	8:54:00	70-m full plot	unknown	40.95775	-84.6957
6-Sep-22	silver-haired bat	34	carcass search	11:20:00	70-m full plot	unknown	40.95012	-84.6572
6-Sep-22	silver-haired bat	57	carcass search	3:10:00	70-m full plot	unknown	40.9477	-84.6419
6-Sep-22	silver-haired bat	47	carcass search	15:09:00	70-m full plot	unknown	40.92304	-84.6405
6-Sep-22	silver-haired bat	85	carcass search	8:49:00	70-m full plot	unknown	40.98716	-84.6184
6-Sep-22	silver-haired bat	85	carcass search	8:38:00	70-m full plot	unknown	40.98767	-84.6176
6-Sep-22	silver-haired bat	131	carcass search	12:16:00	70-m full plot	unknown	40.97371	-84.5799
6-Sep-22	silver-haired bat	40	carcass search	12:14:00	70-m full plot	unknown	40.9256	-84.655
6-Sep-22	silver-haired bat	44	carcass search	10:42:00	70-m full plot	unknown	40.91192	-84.6569
6-Sep-22	silver-haired bat	43	carcass search	9:11:00	70-m full plot	male	40.91332	-84.6606
6-Sep-22	silver-haired bat	44	carcass search	10:40:00	70-m full plot	female	40.91196	-84.6569
6-Sep-22	silver-haired bat	44	carcass search	10:47:00	70-m full plot	male	40.9118	-84.6568
6-Sep-22	silver-haired bat	43	carcass search	9:14:00	70-m full plot	unknown	40.91377	-84.6607
6-Sep-22	silver-haired bat	40	carcass search	12:33:00	70-m full plot	unknown	40.92569	-84.6561
6-Sep-22	silver-haired bat	44	carcass search	10:35:00	70-m full plot	unknown	40.91174	-84.6577

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
6-Sep-22	silver-haired bat	40	carcass search	12:39:00	70-m full plot	unknown	40.92599	-84.6563
6-Sep-22	silver-haired bat	40	carcass search	12:25:00	70-m full plot	unknown	40.92588	-84.6557
6-Sep-22	silver-haired bat	40	carcass search	12:42:00	70-m full plot	unknown	40.92578	-84.6564
6-Sep-22	silver-haired bat	44	carcass search	10:29:00	70-m full plot	unknown	40.91201	-84.6578
6-Sep-22	eastern red bat	42	carcass search	15:42:00	70-m full plot	unknown	40.92081	-84.6545
6-Sep-22	big brown bat	E14	carcass search	12:08:00	100-m road and pad	unknown	40.94292	-84.5263
6-Sep-22	eastern red bat	E4	carcass search	12:48:00	100-m road and pad	unknown	40.92068	-84.5404
6-Sep-22	eastern red bat	E1	carcass search	13:06:00	100-m road and pad	unknown	40.92079	-84.5519
7-Sep-22	eastern red bat	107	carcass search	12:21:00	100-m road and pad	unknown	40.96362	-84.6076
7-Sep-22	hoary bat	138	carcass search	11:45:00	100-m road and pad	unknown	40.96235	-84.5685
8-Sep-22	big brown bat	E3	carcass search	12:42:00	70-m full plot	unknown	40.92224	-84.5581
8-Sep-22	eastern red bat	E28	carcass search	7:53:00	70-m full plot	unknown	40.97667	-84.5204
8-Sep-22	eastern red bat	167	carcass search	10:26:00	70-m full plot	unknown	41.00061	-84.5225
8-Sep-22	eastern red bat	E3	carcass search	12:51:00	70-m full plot	unknown	40.92227	-84.5587
8-Sep-22	eastern red bat	E18	carcass search	8:22:00	70-m full plot	unknown	40.95518	-84.5422
8-Sep-22	eastern red bat	E9	carcass search	9:53:00	70-m full plot	unknown	40.93356	-84.5399
8-Sep-22	silver-haired bat	121	carcass search	8:59:00	70-m full plot	unknown	40.94088	-84.5966
8-Sep-22	silver-haired bat	166	carcass search	8:45:00	70-m full plot	unknown	41.0079	-84.5284
8-Sep-22	silver-haired bat	162	carcass search	11:17:00	70-m full plot	unknown	40.99985	-84.5461
8-Sep-22	silver-haired bat	E3	carcass search	12:31:00	70-m full plot	unknown	40.92258	-84.5581
8-Sep-22	silver-haired bat	E18	carcass search	8:37:00	70-m full plot	unknown	40.95577	-84.5419
8-Sep-22	silver-haired bat	E3	carcass search	12:31:00	70-m full plot	unknown	40.92249	-84.5579
9-Sep-22	eastern red bat	85	carcass search	9:47:00	70-m full plot	unknown	40.98733	-84.6183
9-Sep-22	eastern red bat	131	carcass search	12:56:00	70-m full plot	unknown	40.97329	-84.5801
9-Sep-22	eastern red bat	43	carcass search	7:48:00	70-m full plot	unknown	40.91341	-84.6613
9-Sep-22	eastern red bat	40	carcass search	9:35:00	70-m full plot	unknown	40.92554	-84.6555
9-Sep-22	eastern red bat	43	carcass search	7:43:00	70-m full plot	unknown	40.91302	-84.6611
9-Sep-22	eastern red bat	42	carcass search	10:54:00	70-m full plot	unknown	40.92029	-84.6542
9-Sep-22	silver-haired bat	77	carcass search	8:03:00	70-m full plot	unknown	40.99425	-84.6373
9-Sep-22	silver-haired bat	40	carcass search	9:46:00	70-m full plot	unknown	40.92604	-84.6561
9-Sep-22	silver-haired bat	43	carcass search	7:33:00	70-m full plot	unknown	40.91293	-84.66
12-Sep-22	eastern red bat	E5	carcass search	8:42:00	70-m full plot	unknown	40.9194	-84.5372
12-Sep-22	eastern red bat	E18	carcass search	11:33:00	70-m full plot	unknown	40.9554	-84.5419
12-Sep-22	eastern red bat	146	carcass search	8:25:00	70-m full plot	unknown	41.00758	-84.5784
12-Sep-22	eastern red bat	122	carcass search	12:04:00	70-m full plot	unknown	40.9405	-84.5862
12-Sep-22	eastern red bat	121	carcass search	13:05:00	70-m full plot	unknown	40.94105	-84.5977
12-Sep-22	hoary bat	E28	carcass search	13:35:00	70-m full plot	unknown	40.97736	-84.5209
12-Sep-22	hoary bat	165	carcass search	11:44:00	70-m full plot	unknown	41.0101	-84.5309

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
12-Sep-22	silver-haired bat	167	carcass search	10:32:00	70-m full plot	unknown	41.0005	-84.5221
13-Sep-22	big brown bat	85	carcass search	10:53:00	70-m full plot	unknown	40.98746	-84.6177
13-Sep-22	eastern red bat	15	carcass search	8:22:00	70-m full plot	unknown	40.95782	-84.6955
13-Sep-22	eastern red bat	40	carcass search	13:55:00	70-m full plot	unknown	40.92578	-84.6565
13-Sep-22	eastern red bat	46	carcass search	11:12:00	70-m full plot	unknown	40.92578	-84.6428
13-Sep-22	eastern red bat	43	carcass search	9:40:00	70-m full plot	unknown	40.91366	-84.6607
13-Sep-22	eastern red bat	43	carcass search	9:35:00	70-m full plot	unknown	40.91378	-84.6609
13-Sep-22	eastern red bat	47	carcass search	12:23:00	70-m full plot	unknown	40.92282	-84.6401
13-Sep-22	eastern red bat	42	carcass search	14:29:00	70-m full plot	unknown	40.92064	-84.6547
13-Sep-22	eastern red bat	79	carcass search	8:50:00	70-m full plot	unknown	40.98042	-84.6378
13-Sep-22	eastern red bat	101	carcass search	7:49:00	70-m full plot	unknown	40.98148	-84.6002
13-Sep-22	hoary bat	40	carcass search	14:14:00	70-m full plot	unknown	40.92592	-84.6558
13-Sep-22	hoary bat	44	carcass search	7:47:00	70-m full plot	unknown	40.9119	-84.6578
13-Sep-22	hoary bat	44	carcass search	7:51:00	70-m full plot	unknown	40.91209	-84.6575
13-Sep-22	hoary bat	131	carcass search	13:02:00	70-m full plot	unknown	40.97376	-84.5794
13-Sep-22	silver-haired bat	55	carcass search	12:03:00	70-m full plot	male	40.95012	-84.6466
13-Sep-22	silver-haired bat	44	carcass search	7:53:00	70-m full plot	unknown	40.91143	-84.6576
13-Sep-22	silver-haired bat	41	carcass search	13:15:00	70-m full plot	unknown	40.92324	-84.6555
13-Sep-22	silver-haired bat	131	carcass search	12:50:00	70-m full plot	unknown	40.97375	-84.5799
15-Sep-22	eastern red bat	162	carcass search	12:03:00	70-m full plot	unknown	40.99958	-84.5457
15-Sep-22	eastern red bat or Seminole bat	E18	carcass search	12:12:00	70-m full plot	unknown	40.95586	-84.5416
15-Sep-22	silver-haired bat	165	carcass search	9:57:00	70-m full plot	male	41.01004	-84.5298
15-Sep-22	silver-haired bat	166	carcass search	10:50:00	70-m full plot	unknown	41.0077	-84.529
16-Sep-22	hoary bat	44	carcass search	11:11:00	70-m full plot	unknown	40.91206	-84.6568
16-Sep-22	silver-haired bat	47	carcass search	7:42:00	70-m full plot	unknown	40.92287	-84.6399
16-Sep-22	silver-haired bat	57	carcass search	11:37:00	70-m full plot	unknown	40.94766	-84.641
16-Sep-22	silver-haired bat	77	carcass search	11:34:00	70-m full plot	unknown	40.99452	-84.6377
19-Sep-22	eastern red bat	92	carcass search	11:05:00	70-m full plot	unknown	41.01374	-84.6077
19-Sep-22	hoary bat	E28	carcass search	13:12:00	70-m full plot	unknown	40.97713	-84.5198
19-Sep-22	hoary bat	165	carcass search	10:43:00	70-m full plot	unknown	41.0105	-84.5303
19-Sep-22	hoary bat	156	carcass search	7:58:00	70-m full plot	unknown	40.99928	-84.5581
19-Sep-22	hoary bat	146	carcass search	10:04:00	70-m full plot	unknown	41.00761	-84.5775
19-Sep-22	silver-haired bat	161	carcass search	7:56:00	70-m full plot	unknown	41.00208	-84.5477
19-Sep-22	silver-haired bat	E28	carcass search	13:17:00	70-m full plot	unknown	40.97721	-84.5203
19-Sep-22	silver-haired bat	162	carcass search	8:47:00	70-m full plot	unknown	40.99954	-84.5465
19-Sep-22	silver-haired bat	E25	carcass search	8:06:00	70-m full plot	unknown	40.97219	-84.5315
19-Sep-22	silver-haired bat	E5	carcass search	12:39:00	70-m full plot	unknown	40.91964	-84.5373
19-Sep-22	silver-haired bat	E25	carcass search	7:57:00	70-m full plot	unknown	40.97193	-84.5316

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
19-Sep-22	silver-haired bat	E9	carcass search	10:03:00	70-m full plot	unknown	40.93405	-84.5398
19-Sep-22	silver-haired bat	121	carcass search	13:07:00	70-m full plot	unknown	40.94124	-84.597
19-Sep-22	silver-haired bat	122	carcass search	14:50:00	70-m full plot	unknown	40.94086	-84.5857
20-Sep-22	eastern red bat	131	carcass search	12:05:00	70-m full plot	unknown	40.97331	-84.5803
20-Sep-22	hoary bat	44	carcass search	13:24:00	70-m full plot	unknown	40.91207	-84.6571
20-Sep-22	silver-haired bat	34	carcass search	7:51:00	70-m full plot	unknown	40.95014	-84.6565
20-Sep-22	silver-haired bat	57	carcass search	12:28:00	70-m full plot	unknown	40.94785	-84.642
20-Sep-22	silver-haired bat	47	carcass search	10:14:00	70-m full plot	unknown	40.92295	-84.64
20-Sep-22	silver-haired bat	47	carcass search	10:05:00	70-m full plot	unknown	40.92272	-84.6403
20-Sep-22	silver-haired bat	47	carcass search	10:09:00	70-m full plot	unknown	40.92286	-84.64
20-Sep-22	silver-haired bat	131	carcass search	12:13:00	70-m full plot	male	40.97373	-84.5794
20-Sep-22	silver-haired bat	110	carcass search	13:26:00	70-m full plot	unknown	40.96476	-84.5953
20-Sep-22	silver-haired bat	101	carcass search	11:19:00	70-m full plot	unknown	40.98128	-84.6001
20-Sep-22	silver-haired bat	79	carcass search	9:12:00	70-m full plot	unknown	40.98093	-84.6368
20-Sep-22	big brown bat	94	carcass search	9:26:00	100-m road and pad	unknown	40.99364	-84.6
22-Sep-22	hoary bat	165	carcass search	10:11:00	70-m full plot	unknown	41.01009	-84.5309
22-Sep-22	silver-haired bat	122	carcass search	7:31:00	70-m full plot	female	40.94086	-84.5863
22-Sep-22	silver-haired bat	121	carcass search	8:32:00	70-m full plot	unknown	40.94108	-84.5977
22-Sep-22	silver-haired bat	153	carcass search	12:38:00	70-m full plot	male	41.01048	-84.5672
22-Sep-22	silver-haired bat	E18	carcass search	12:26:00	70-m full plot	unknown	40.95569	-84.5418
22-Sep-22	silver-haired bat	E5	carcass search	8:24:00	70-m full plot	unknown	40.91951	-84.5376
22-Sep-22	silver-haired bat	E9	carcass search	11:33:00	70-m full plot	unknown	40.93378	-84.5401
22-Sep-22	silver-haired bat	E25	carcass search	13:33:00	70-m full plot	unknown	40.97206	-84.5318
22-Sep-22	silver-haired bat	161	carcass search	12:20:00	70-m full plot	unknown	41.00276	-84.5487
22-Sep-22	silver-haired bat	161	carcass search	12:25:00	70-m full plot	unknown	41.00246	-84.5488
22-Sep-22	silver-haired bat	157	carcass search	14:00:00	70-m full plot	unknown	41.01383	-84.5563
22-Sep-22	eastern red bat	116	carcass search	8:28:00	100-m road and pad	unknown	40.95065	-84.5968
22-Sep-22	silver-haired bat	60	carcass search	9:58:00	100-m road and pad	unknown	40.93341	-84.6349
22-Sep-22	silver-haired bat	65	carcass search	9:41:00	100-m road and pad	unknown	40.94057	-84.6237
23-Sep-22	eastern red bat	77	carcass search	9:01:00	70-m full plot	unknown	40.99418	-84.638
23-Sep-22	eastern red bat	41	carcass search	13:46:00	70-m full plot	unknown	40.92343	-84.6556
23-Sep-22	hoary bat	55	carcass search	11:14:00	70-m full plot	unknown	40.9502	-84.6466
23-Sep-22	silver-haired bat	77	carcass search	8:56:00	70-m full plot	unknown	40.99445	-84.6377
23-Sep-22	silver-haired bat	79	carcass search	7:50:00	70-m full plot	unknown	40.98058	-84.6379
23-Sep-22	silver-haired bat	41	carcass search	13:42:00	70-m full plot	unknown	40.92341	-84.6557
23-Sep-22	silver-haired bat	46	carcass search	7:59:00	70-m full plot	unknown	40.9259	-84.643
23-Sep-22	silver-haired bat	47	carcass search	9:48:00	70-m full plot	unknown	40.92251	-84.6408
23-Sep-22	silver-haired bat	46	carcass search	8:02:00	70-m full plot	unknown	40.92589	-84.6429

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
23-Sep-22	silver-haired bat	57	carcass search	10:05:00	70-m full plot	unknown	40.94829	-84.6419
23-Sep-22	silver-haired bat	E28	carcass search	8:13:00	70-m full plot	unknown	40.97758	-84.5206
23-Sep-22	silver-haired bat	34	carcass search	14:01:00	70-m full plot	unknown	40.95013	-84.6572
23-Sep-22	silver-haired bat	15	carcass search	14:52:00	70-m full plot	unknown	40.95776	-84.696
23-Sep-22	silver-haired bat	57	carcass search	10:10:00	70-m full plot	male	40.94807	-84.6421
23-Sep-22	silver-haired bat	55	carcass search	11:23:00	70-m full plot	unknown	40.94995	-84.647
26-Sep-22	hoary bat	161	carcass search	12:40:00	70-m full plot	unknown	41.00223	-84.5485
26-Sep-22	silver-haired bat	122	carcass search	13:52:00	70-m full plot	unknown	40.94089	-84.5851
26-Sep-22	silver-haired bat	156	carcass search	7:52:00	70-m full plot	unknown	40.99943	-84.5581
26-Sep-22	silver-haired bat	121	carcass search	12:22:00	70-m full plot	unknown	40.94099	-84.5977
26-Sep-22	silver-haired bat	121	carcass search	12:29:00	70-m full plot	unknown	40.94113	-84.5972
26-Sep-22	silver-haired bat	122	carcass search	13:45:00	70-m full plot	unknown	40.94096	-84.5863
26-Sep-22	silver-haired bat	161	carcass search	12:46:00	70-m full plot	unknown	41.00192	-84.5484
26-Sep-22	silver-haired bat	E18	carcass search	8:53:00	70-m full plot	unknown	40.95536	-84.5422
26-Sep-22	eastern red bat	131	carcass search	14:03:00	70-m full plot	unknown	40.97345	-84.5795
27-Sep-22	eastern red bat	31	carcass search	10:33:00	70-m full plot	unknown	40.95779	-84.6642
27-Sep-22	silver-haired bat	57	carcass search	12:03:00	70-m full plot	unknown	40.94743	-84.6424
27-Sep-22	silver-haired bat	57	carcass search	11:48:00	70-m full plot	unknown	40.94802	-84.6423
27-Sep-22	silver-haired bat	41	carcass search	10:41:00	70-m full plot	unknown	40.92325	-84.6555
27-Sep-22	silver-haired bat	85	carcass search	9:27:00	70-m full plot	unknown	40.98665	-84.6175
27-Sep-22	silver-haired bat	47	carcass search	8:22:00	70-m full plot	male	40.92279	-84.6402
27-Sep-22	silver-haired bat	43	carcass search	12:59:00	70-m full plot	unknown	40.91322	-84.6612
29-Sep-22	eastern red bat	157	carcass search	13:10:00	70-m full plot	unknown	41.01401	-84.5556
29-Sep-22	eastern red bat	E28	carcass search	7:51:00	70-m full plot	unknown	40.97719	-84.5205
29-Sep-22	silver-haired bat	122	carcass search	13:11:00	70-m full plot	unknown	40.94135	-84.5856
29-Sep-22	silver-haired bat	121	carcass search	12:15:00	70-m full plot	unknown	40.94103	-84.5973
29-Sep-22	silver-haired bat	122	carcass search	13:20:00	70-m full plot	unknown	40.94093	-84.5862
29-Sep-22	silver-haired bat	122	carcass search	13:07:00	70-m full plot	unknown	40.94113	-84.5855
30-Sep-22	hoary bat	77	carcass search	9:36:00	70-m full plot	unknown	40.99398	-84.6374
30-Sep-22	silver-haired bat	57	carcass search	12:05:00	70-m full plot	unknown	40.94793	-84.642

Appendix A. Bat carcasses found at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

Date	Species	Turbine	Survey Type	Time	Plot Type	Sex	Latitude[1]	Longitude[1]
3-Oct-22	silver-haired bat	161	carcass search	9:56:00	70-m full plot	unknown	41.00206	-84.5485
3-Oct-22	silver-haired bat	121	carcass search	12:36:00	70-m full plot	unknown	40.94102	-84.5971
4-Oct-22	hoary bat	57	carcass search	13:15:00	70-m full plot	unknown	40.9476	-84.6419
4-Oct-22	silver-haired bat	34	carcass search	9:24:00	70-m full plot	unknown	40.94974	-84.6563
6-Oct-22	hoary bat	121	carcass search	11:58:00	70-m full plot	unknown	40.94032	-84.5973
6-Oct-22	silver-haired bat	E28	carcass search	13:20:00	70-m full plot	unknown	40.97752	-84.5204
11-Oct-22	silver-haired bat	15	carcass search	11:44:00	70-m full plot	unknown	40.95772	-84.6959
14-Oct-22	big brown bat	41	carcass search	10:32:00	70-m full plot	unknown	40.92363	-84.6552
14-Oct-22	silver-haired bat	46	carcass search	11:28:00	70-m full plot	unknown	40.92584	-84.6427

[1] These coordinates were collected in World Geodetic System (WGS) Sphere Mercator, 1984.

[2] Carcass was found outside the search area.

m = meters.

Appendix B. All-bat Fatality Estimates and Adjustment Factors for 2022 Post-construction Fatality Monitoring Conducted at the Blue Creek Wind Farm, from April 1 – May 15 and August 1 – October 15, 2022

Appendix B. All-bat fatality estimates using the Huso estimator and adjustment factors, with 90% confidence intervals, for all plots during 2022 post-construction fatality monitoring conducted at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022.

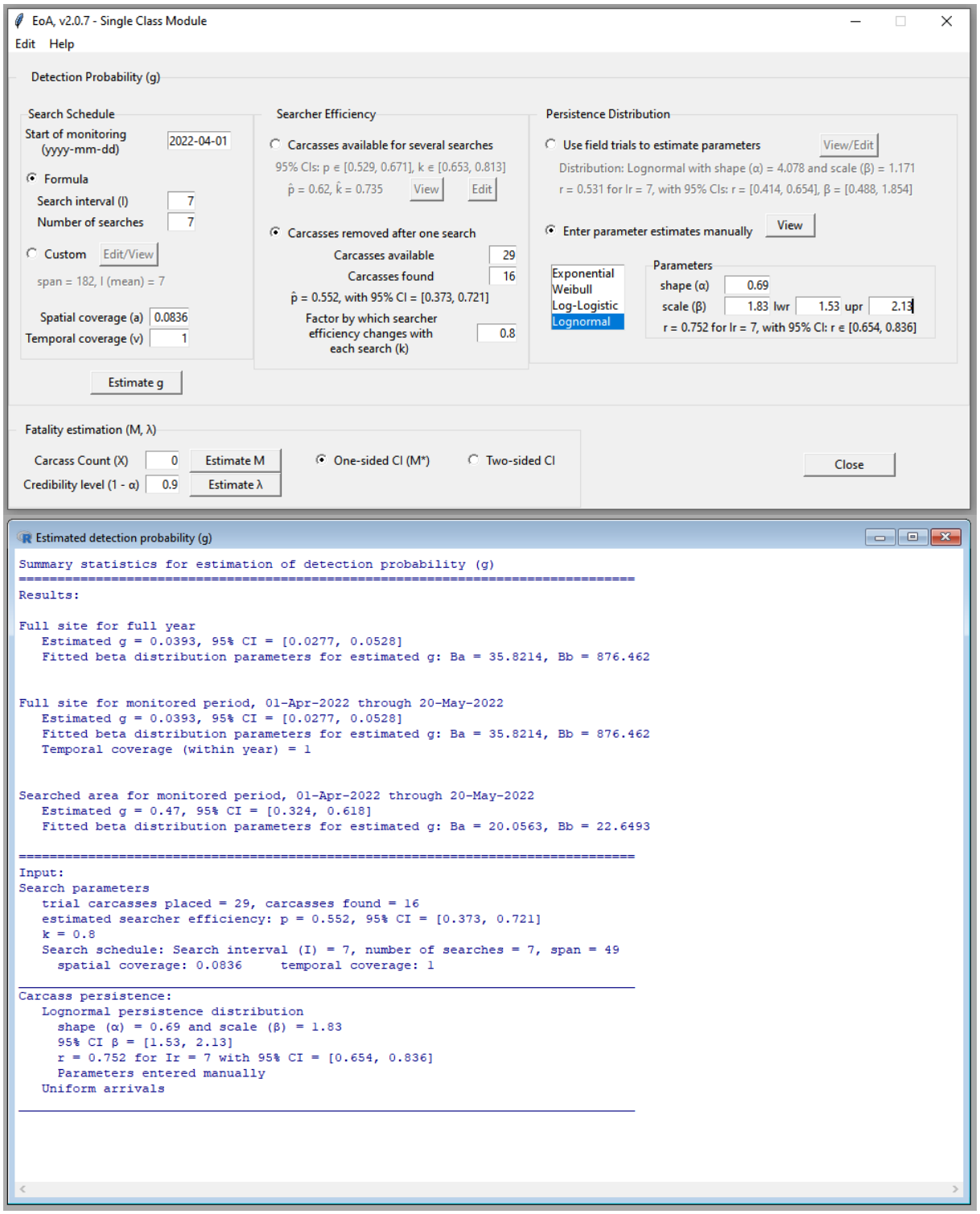
	Expanded Road and Pad (Gravel Portion) 152 Turbines Searched		Expanded Road and Pad (Field Portion) 152 Turbines Searched		Full Plot 40 Turbines Searched		Road and Pad 112 Turbines Searched	
	Estimate	**90% CI**	**Estimate**	**90% CI**	**Estimate**	**90% CI**	**Estimate**	**90% CI**
Searched Area Adjustment								
	0.05	0.03–0.07	0.07	0.06–0.10	0.96	0.92–0.99	0.05	0.03–0.07
Searcher Efficiency								
	0.82	0.70–0.93	0.55	0.41–0.71	0.77	0.65–0.88	0.97	0.91–1.00
Average Probability of a Carcass Persisting Through the Search Interval[2]								
	0.76	0.67–0.83	0.76	0.67–0.83	0.93	0.89–0.96	0.76	0.67–0.83
Probability of Available and Detected								
	0.62	0.51–0.73	0.42	0.30–0.55	0.72	0.60–0.82	0.73	0.64-0.82
Number of Fatalities[3]								
	0	N/A[1]	1	N/A[1]	252	191–317	17	10–25
Estimated Fatality Rates (Fatalities/Turbine/Season)								
	0.0	N/A[1]	0.22	N/A[1]	9.22	6.64–12.29	4.71	2.47–8.85
Estimated Fatality Rates (Fatalities/Megawatt/Season)								
	0.0	N/A[1]	0.11	N/A[1]	4.61	3.32–6.15	2.35	1.24–4.42

[1] Confidence intervals (CI) were not calculated when the number of observed carcasses was fewer than five because Horvitz-Thompson (Horvitz and Thompson 1952) estimators, such as the Huso estimator, are known to be unreliable when carcass counts are fewer than five (Korner-Nievergelt et al. 2012).

[2] In the spring the search interval was weekly on expanded road and pads. In the fall the search interval was weekly on road and pads and twice a week on full plots.

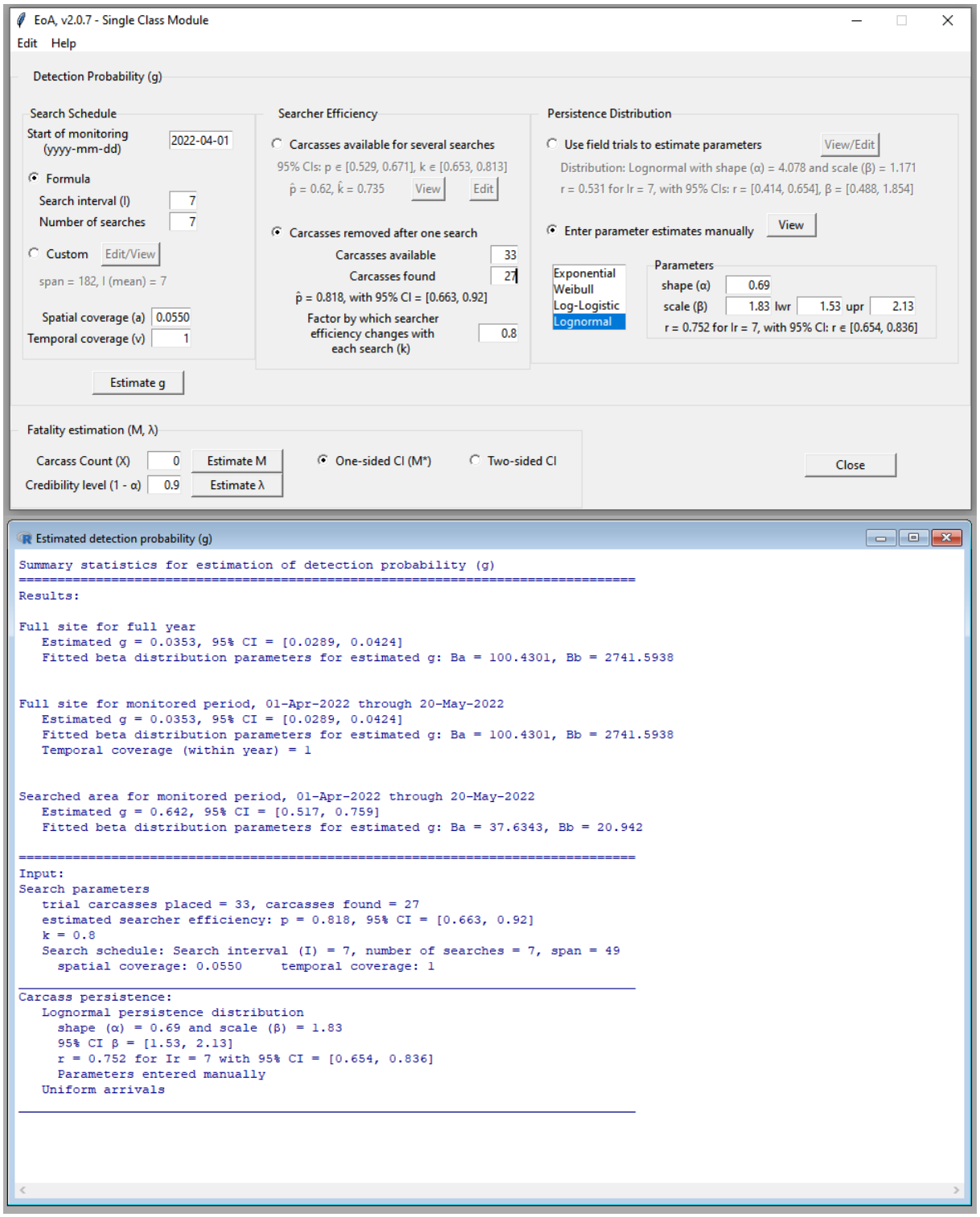
[3] The CIs on the number of fatalities represent the turbine to turbine variation in fatality counts.

Appendix C. Additional Information for the Evidence of Absence Analysis at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022



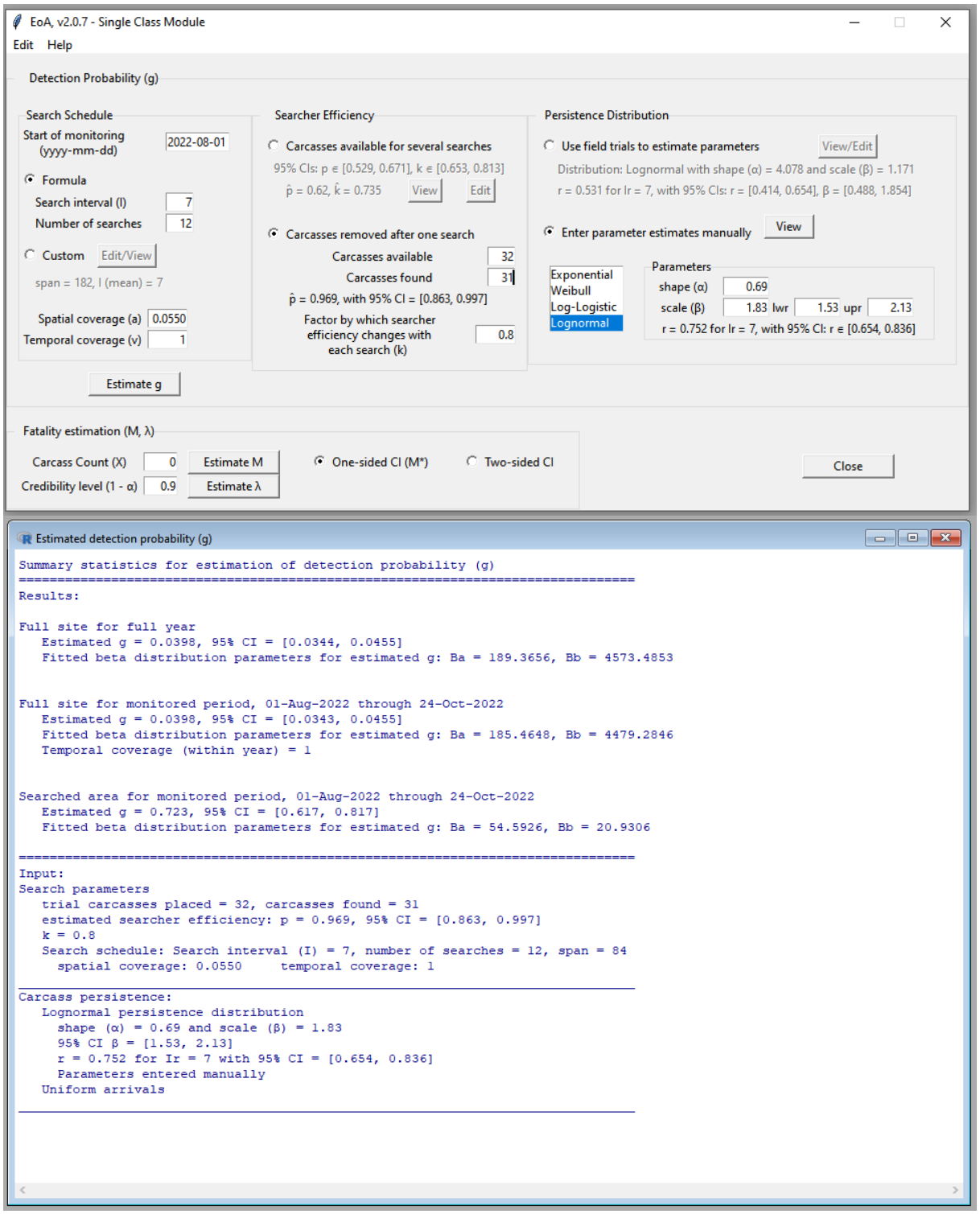
Appendix C1. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Single Class Module for Indiana bat and northern long-eared bat for the expanded road and pads (field portion) during spring 2022. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



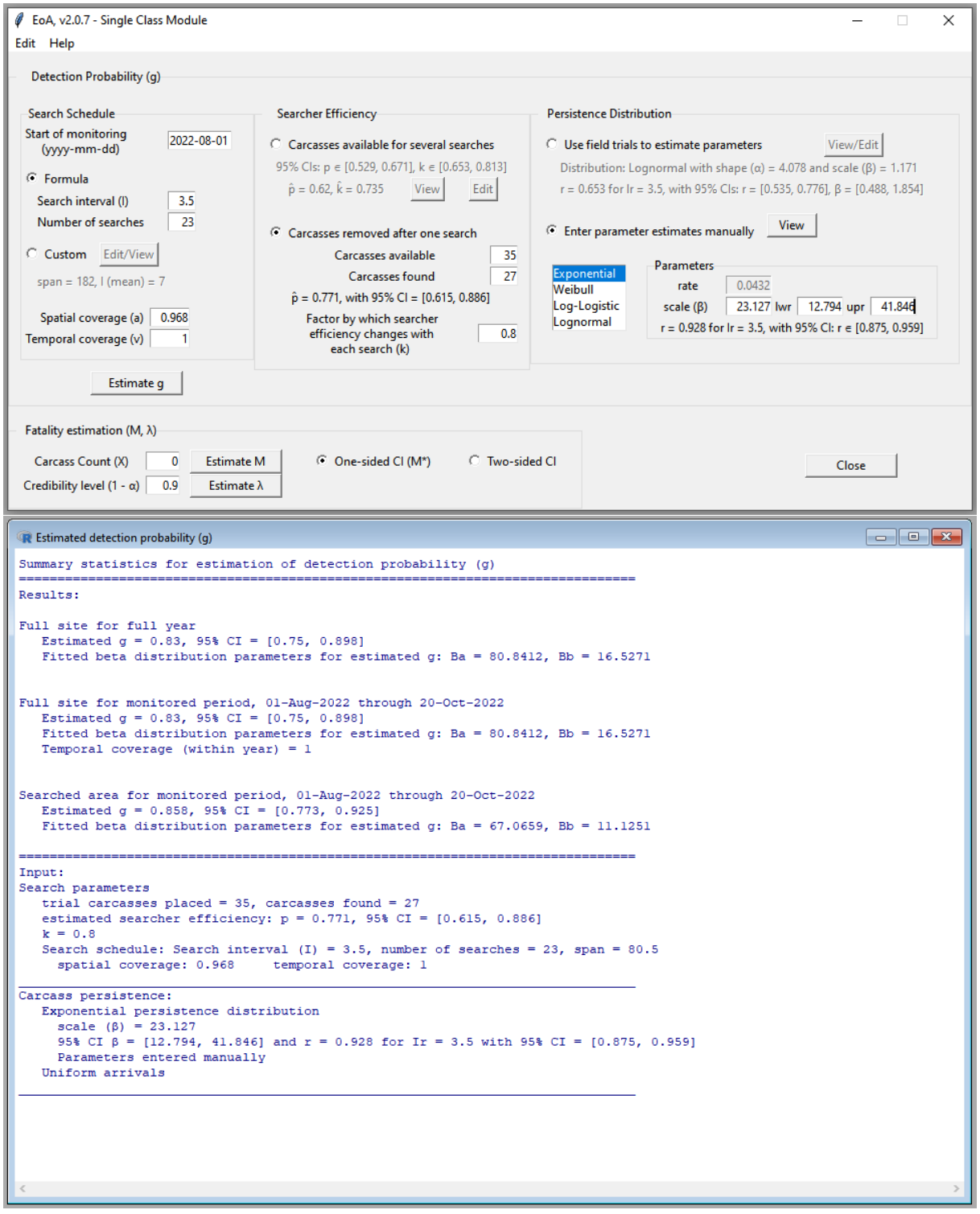
Appendix C2. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Single Class Module for Indiana bat and northern long-eared bat for expanded road and pads (gravel portion) during spring 2022. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



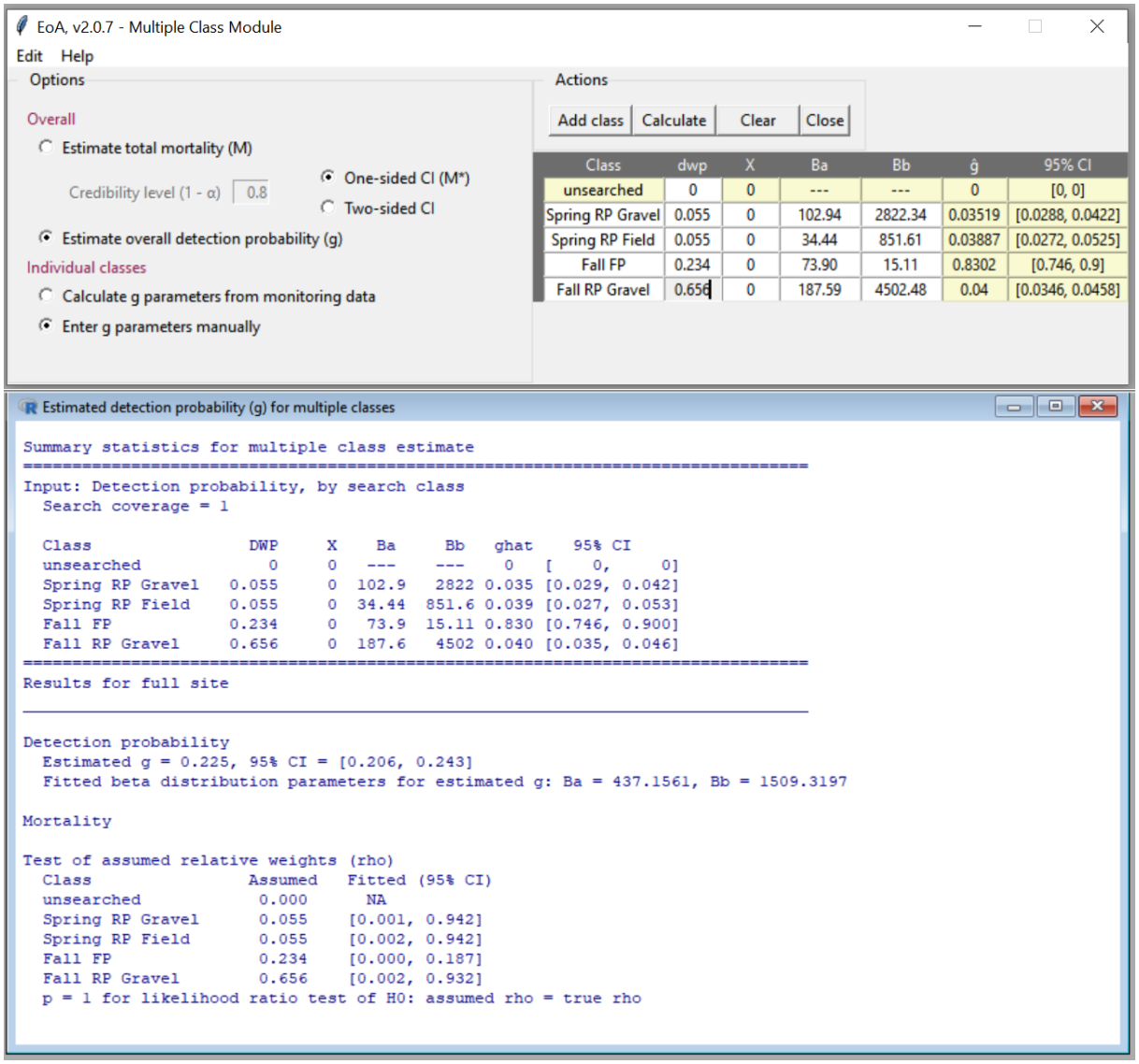
Appendix C3. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Single Class Module for Indiana bat and northern long-eared bat for road and pads during fall 2022. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



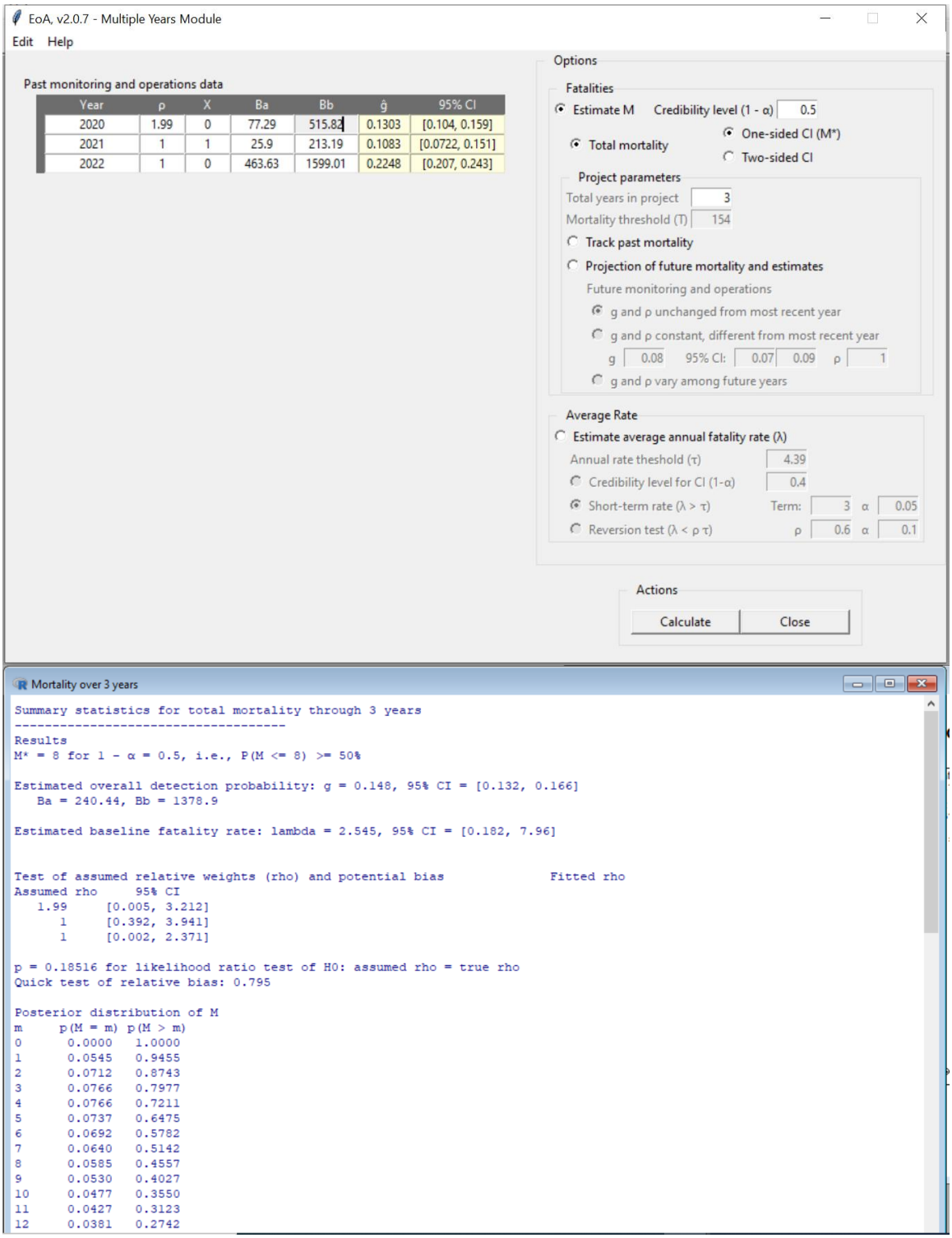
Appendix C4. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Single Class Module for Indiana bat and northern long-eared bat for full plots during fall 2022. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



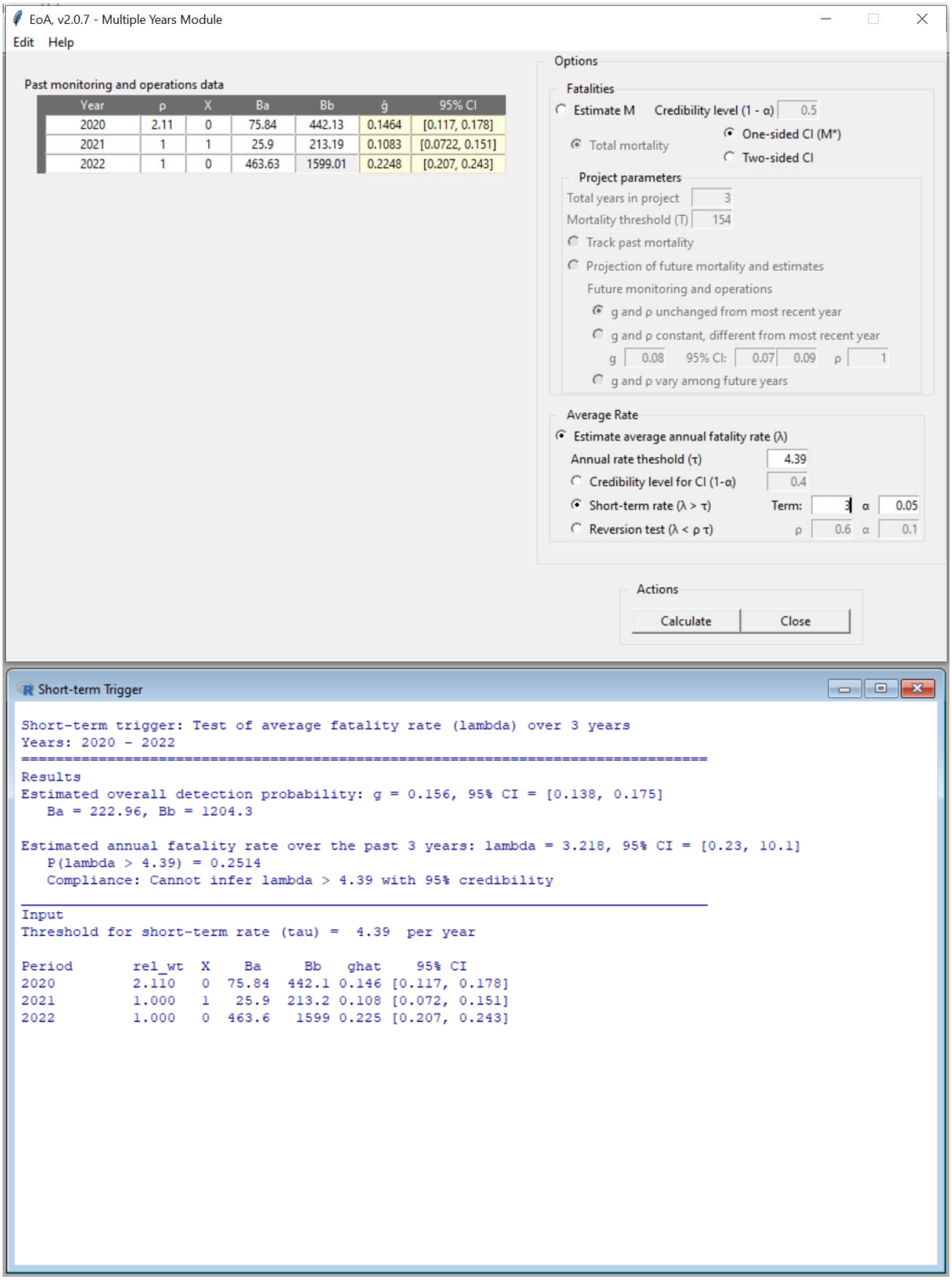
Appendix C5. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Multiple Class Module for Indiana bat and northern long-eared bat rolling average detection probability and short term trigger test. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



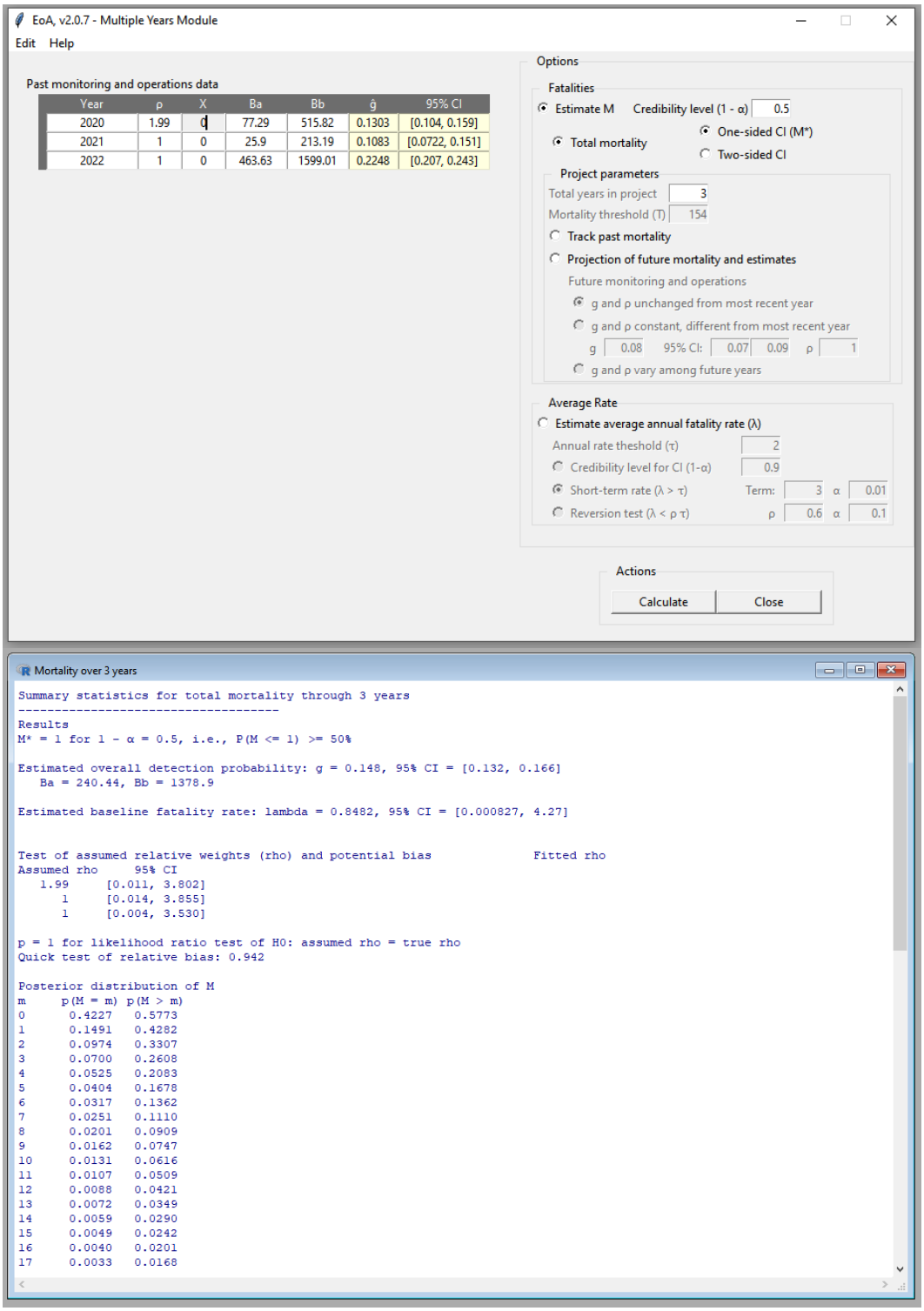
Appendix C6. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Multiple Year Module for Indiana bat ITP term-to-date detection probability and cumulative take estimate (*M). Inputs are based on values reported in the main text.**

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



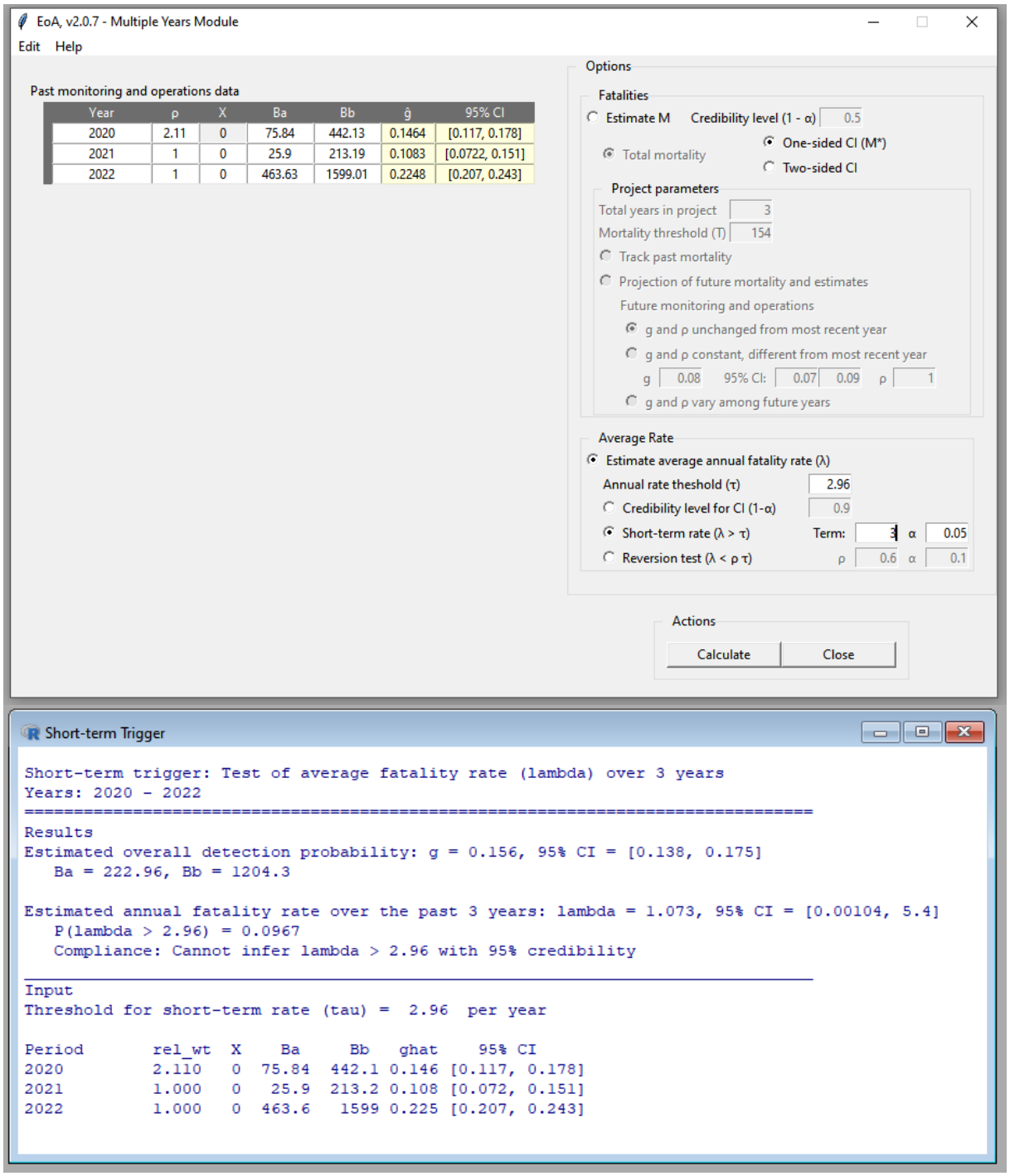
Appendix C7. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Multiple Year Module for Indiana bat rolling average detection probability and short-term adaptive management trigger test. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



Appendix C8. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Multiple Year Module for northern long-eared bat ITP term-to-date detection probability and cumulative take estimate (*M). Inputs are based on values reported in the main text.**

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.



Appendix C9. Inputs and outputs from the Evidence of Absence (EoA)* Graphical User Interface Multiple Year Module for northern long-eared bat rolling average detection probability and short-term adaptive management trigger test. Inputs are based on values reported in the main text.

* EoA estimates of the Ba and Bb parameters are stochastic and will be slightly different every time the estimate is completed. This usually results in differences in estimated *g* values that differ by less than 0.001 between runs, but occasionally, slightly larger differences can occur.

Appendix D. Model Fitting Results for Searcher Efficiency, Carcass Persistence, and Truncated Weighed Likelihood Area Adjusments at the Blue Creek Wind Farm from April 1 – May 15 and August 1 – October 15, 2022

Appendix D1. Searcher efficiency models for dog-handler and technician search teams at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022. All-bat and Covered Species estimates used the same model.

Model	Covariates	AICc	DeltaAICc
Dog-handlers	No covariates	39.75	0*
Technicians	Ground cover + Season	86.35	0*
	Ground cover	88.44	2.09
	Season	89.44	3.09
	No covariates	99.35	13.00

* Selected model.

AICc = corrected Aikake Information Criterion.

Appendix D2. Carcass persistence models for dog-handler and technician search teams at the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022. All-bat and Covered Species estimates used the same model.

Model	Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
Dog-handlers	No Covariates	-	exponential	68.35	0*
	No Covariates	No Covariates	Weibull	70.90	2.55
	No Covariates	No Covariates	log-logistic	71.85	3.50
	No Covariates	No Covariates	lognormal	72.76	4.41
Technicians	No Covariates	No Covariates	lognormal	126.07	0*
	No Covariates	No Covariates	log-logistic	126.30	0.23
	Season	No Covariates	lognormal	128.50	2.43
	No Covariates	Season	lognormal	128.53	2.46
	Season	No Covariates	log-logistic	128.75	2.68
	No Covariates	Season	log-logistic	128.76	2.69
	No Covariates	-	exponential	129.77	3.70
	No Covariates	No Covariates	Weibull	130.40	4.33
	Season	Season	lognormal	131.15	5.08
	Season	Season	log-logistic	131.40	5.33
	Season	-	exponential	132.01	5.94
	Season	No Covariates	Weibull	132.81	6.74
	No Covariates	Season	Weibull	132.84	6.77
	Season	Season	Weibull	135.46	9.39

* Selected model.

AICc = Corrected Akaike Information Criterion.

Appendix D3. Searched area adjustment models for the all-bat fatality estimate for the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Distribution	AICc	Delta AICc
Gompertz	8,789.78	0*
normal	8,848.45	58.67
Weibull	8,860.04	70.26
gamma	8,976.51	186.73

* Selected model

AICc = corrected Akaike Information Criterion.

Appendix D4. Searched area adjustment models for the Covered Species take estimates for the Blue Creek Wind Farm, April 1 – May 15 and August 1 – October 15, 2022.

Distribution	AICc	Delta AICc
Gompertz	8,627.70	0*
normal	8,664.04	36.34
Weibull	8,668.81	41.11
gamma	8,755.05	127.35

* Selected model.

AICc = corrected Akaike Information Criterion.