Post-construction Monitoring Study for the Rosewater Wind Farm White County, Indiana

Final Report

April 1 – May 15 and August 1 – October 15, 2024

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WEST

EXECUTIVE SUMMARY

Rosewater Wind Farm LLC is operating the Rosewater Wind Farm (Project) in White County, Indiana. The Project became operational in 2020 and consists of 20 4.2-megawatt (MW) Vestas V150 wind turbines that have a 105-meter (m) hub height and a 150-m rotor diameter, and five 3.6-MW Vestas V136 3.6-MW wind turbines that have a 105-m hub height and a 136-m rotor diameter. This report details the fourth year of post-construction monitoring studies conducted in 2024, consistent with Section 6.6 of the Project's Habitat Conservation Plan (HCP) and the Incidental Take Permit (ITP; ESPER0003552) for Indiana bats and northern long-eared bats (Covered Species). Turbines were feathered below manufacturer cut-in speed (3.0 m per second) March 15 – July 31 and October 16 – November 15 and below 5.0 m per second in the fall (August 1 – October 15) sunset to sunrise to minimize direct impacts to Covered Species.

Post-construction monitoring was completed in accordance with the Project's study plan, which was approved by the US Fish and Wildlife Service on March 15, 2024. The study plan was designed to achieve a probability of detection, or *g*, of 0.08. The overall goal of this post-construction monitoring study was to generate fatality estimates for the Covered Species and to evaluate compliance with the incidental take authorization granted under the Project's ITP. More specifically, the objectives of this study were to estimate take of Covered Species using the Evidence of Absence (EoA) framework and provide the necessary data to determine if adaptive management is triggered, as outlined in the HCP.

Standardized carcass searches were completed for bat carcasses at roads and pads. Technicians searched all 25 turbines as roads and pads to a distance of 100 m from the turbine, every other week during spring (April 1 – May 15) and fall (August 1 – October 15). Searcher efficiency and carcass persistence trials were conducted during each season to correct for detection and scavenger bias.

No Covered Species were found at the Project during compliance monitoring in 2024. One evening bat and one little brown bat, both of which are state-endangered, were documented at the Project. Fifty-seven bat carcasses were found during the study. The most commonly found bat species were eastern red bat (42.1%) and silver-haired bat (28.1%), followed by big brown bat (12.3%) and hoary bat (10.5%). The overall *g* value for 2024 was 0.072 (95% credible interval: 0.056–0.089). The EoA model estimated the median annual fatality rate at the Project across 2021–2024 was 1.23 Indiana bats and 0.24 northern long-eared bats. No adaptive management was triggered.

STUDY PARTICIPANTS

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REPORT REFERENCE

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INTRODUCTION

Rosewater Wind Farm LLC (Rosewater), a subsidiary of Northern Indiana Public Service Company, is operating the Rosewater Wind Farm (Project) in White County, Indiana. Rosewater obtained an Incidental Take Permit (ITP; ESPER0003552) for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*M. septentrionalis*; hereafter Covered Species) from the US Fish and Wildlife Service (USFWS) dated March 8, 2021. Post-construction compliance monitoring is required by the ITP to determine if the level of take of the Covered Species is in compliance with the authorized take and to evaluate the need for adaptive management measures.

Western EcoSystems Technology, Inc. (WEST), completed a post-construction monitoring study designed to achieve a probability of detection, or *g*, of 0.08 consistent with the Project's Habitat Conservation Plan (HCP). The objectives of this study were to: estimate take of Covered Species using the Evidence of Absence (EoA) framework as outlined in the HCP, and provide the necessary data to determine if adaptive management is triggered. This report presents the results of the fourth year (Year 4) of the post-construction monitoring conducted at the Project from April 1 – May 15 and August 1 – October 15, 2024.

PERMIT AREA

The Project is located in White County, Indiana, 1.6 kilometers northwest of Reynolds, Indiana (Figure 1). The Project's Permit Area, defined as the Project's leased lands in which all turbines are located, covers approximately 6,372 acres. Over 99% of the Permit Area is composed of cultivated cropland and developed areas.

The Project became fully operational in December 2020 and consists of 20 Vestas V150 4.2-megawatt (MW) wind turbines that have a 105-meter (m) hub height and a 150-m rotor diameter, and five Vestas V136 3.6-MW wind turbines that have a 105-m hub height and a 136-m rotor diameter. All turbines are within the migratory range of the Covered Species. During the spring, summer, and fall, Rosewater adjusted turbine operations to minimize impacts to the Covered Species (Table 1).

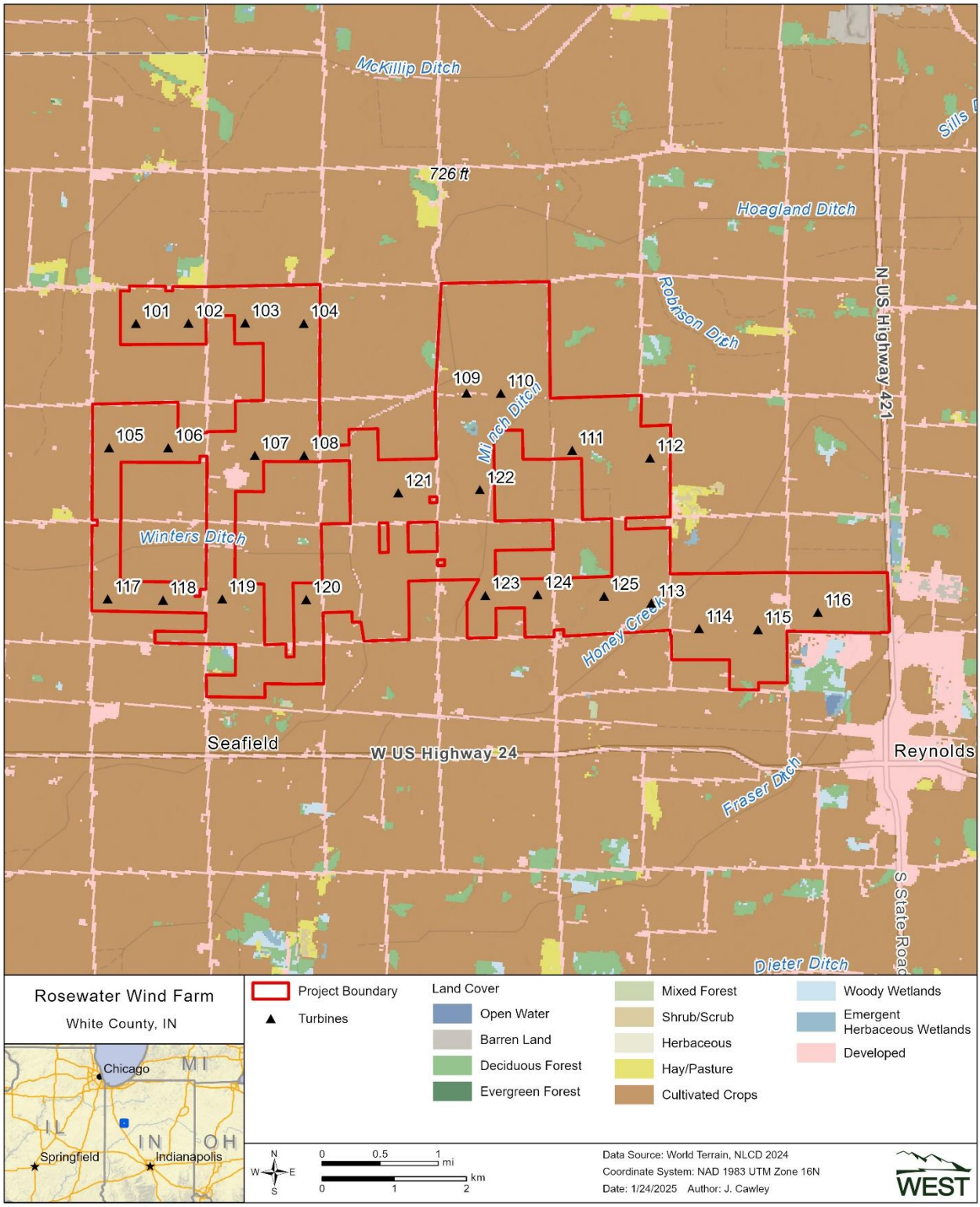

Figure 1. Turbine locations by turbine model at the Rosewater Wind Farm, White County, Indiana.

Table 1. Seasonal curtailment regime at the Rosewater Wind Farm, White County, Indiana.

Season	Turbines	Time of Day	Cut-In Speed	Feathering Below Cut-In[1]?
March 15 – July 31	All	Sunset to sunrise	Manufacturer's rated, minimum of 3.0 m/s[2]	Yes
August 1 – October 15	All	Sunset to sunrise	5.0 m/s	Yes
October 16 – November 15	All	Sunset to sunrise	Manufacturer's rated, minimum of 3.0 m/s[2]	Yes
November 16 – March 14	All	N/A	Manufacturer's setting	No

1. Feathering means that turbine blades will be pitched into the wind such that the blades spin at less than one rotation per minute.

m/s = meters per second; N/A = not applicable.

METHODS

To meet the monitoring commitments in the HCP, WEST developed a study plan that targeted a *g* value of 0.08 using values for searcher efficiency, carcass persistence, and area adjustment from post-construction monitoring data collected during years 2021–2023 at the Project (Rodriguez et al. 2022, 2023a, 2024). Rosewater submitted a study plan to the USFWS by January 31, 2024, in accordance with the ITP; the study plan was approved by the USFWS on March 15, 2024.

Standardized Carcass Searches

Number of Turbines Sampled, Search Frequency, and Plot Size

Technicians conducted standardized carcass searches from April 1 – May 15 and August 1 – October 15, 2024. Search effort was consistent across seasons, with weekly searches at all accessible turbines out to a distance of 100 m (100-m roads and pads; Table 2, Figure 2). Due to safety concerns, with USFWS's approval, searches at turbines 105, 106, 107, and 108 were discontinued after August 21, 2024 (pers. comm. J. Wieringa, USFWS, September 12, 2024).

Table 2. Search effort by season and plot type at the Rosewater Wind Farm, White County, Indiana.

Season	Plot Type	Search Interval	Number of Turbines	Search Team
Spring (April 1 – May 15)	100-m road and pad	7.0 days	25	Technician
Fall (August 1–October 15)	100-m road and pad	7.0 days	25	Technician

m = meter.

Figure 2. Representative photograph of conditions of a 100-meter road and pad plot at the Rosewater Wind Farm, White County, Indiana.

Search Methods

All technicians were trained to follow the Project's study plan, including proper handling and reporting of carcasses. Standardized carcass searches were conducted during the day, beginning as early as first light. During 100-m road and pad searches, the technician started at 100 m from the turbine and walked the access road at a rate of approximately 45–60 m per minute (m/min) toward the turbine, around the turbine along the gravel pad, and back towards their vehicle. The

technician searched out to 2.5 m on each side as they walked, until the entire road/access pad was searched to ensure full visual coverage of each road and pad.

Data Collection

Technicians recorded the date, search start and end times, technician name, turbine number, type of search and if any carcasses were found during each scheduled search. When a bird or bat carcass was found, a flag was placed near it and the search continued. After searching the entire 100-m road and pad, the technician returned to record information for each carcass on a carcass information form, including the date and time the carcass was found, species (or best possible field identification), sex and age (when possible), technician name, turbine number, measured distance from turbine (m), azimuth from turbine, location of the carcass as latitude and longitude, habitat surrounding the carcass, carcass condition, and estimated time of death (e.g., less than one day, two days).

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

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

For bird carcasses, the following category was also used:

- Feather spot—Ten or more feathers (excluding down), or two or more primary feathers found at one location (i.e., one square m), indicating predation or scavenging of a bird carcass.

Digital photographs were taken of each carcass, including any visible injuries, and surrounding habitat. No bird carcasses were collected, but a marker was placed next to each bird carcass to avoid duplicate counting. Bat carcasses were collected under the Project's ITP (ESPER0003552), WEST's Federal Native Endangered and Threatened Species Recovery Permit (ES23412), and WEST's Special Purpose Salvage Permit (2263). Technicians placed all bat carcasses in a re-sealable plastic bag labeled with the unique carcass identification number, turbine number, and date, for storage in a freezer on site. Leather and rubber gloves were used to handle all bat carcasses to eliminate possible transmission of rabies or other diseases. Live, injured bats were recorded and considered fatalities for analysis purposes when observed in search areas and were left in place.

Bird and bat carcasses found in non-search areas (e.g., outside of a plot boundary) or outside of the scheduled study period, were recorded as incidental discoveries and documented following the same protocol for those found during standard searches, but were not included in analysis.

Carcass Identification and Agency Notification

Field identification of bird carcasses were reviewed by biologists with extensive field experience in identification of Midwestern birds and feathers. A federally permitted bat biologist (ESPER0039249) identified all bat carcasses via photographs or in hand. Bat carcasses that were heavily scavenged but did not have potential to be a Covered Species (i.e., fur was present on the wing or uropatagium and/or forearms measured greater than 41 millimeters) were identified to the closest genus or group possible and were not sent off for further identification. In accordance with the Project's ITP and WEST's state and federal salvage permits, the USFWS was notified within 24 hours of positive identification of federally listed species, and the Indiana Department of Natural Resources was notified within three working days of positive identification of state-listed species. Fur and tissue samples and bat carcasses were submitted to the Illinois Natural History Survey repository, at the direction of USFWS and in accordance with permits (J. Wieringa, USFWS, pers. comm., August 29, 2024).

Tissue samples were collected from heavily scavenged or decomposed bat carcasses that could not be positively identified and had potential to be a Covered Species, and were submitted to a USFWS-approved laboratory (East Stroudsburg University Wildlife Genetics Institute) for identification.

Bias Trials

Searcher Efficiency Trials

The objective of searcher efficiency trials was to estimate the probability that a carcass was found by a technician. Searcher efficiency trials were conducted in the same areas where standardized carcass searches occurred. Technicians conducting standardized carcass searches did not know when searcher efficiency trials were being conducted or the location of the trial carcasses. Trial carcasses consisted of eastern red bats (*Lasiurus borealis*), big brown bats (*Eptesicus fuscus*), and silver-haired bats (*Lasionycteris noctivagans*) that had previously been found at the Project. Forty-nine carcasses were placed across all seasons to account for differences in search conditions by season.

Multiple trials were conducted in each season to measure potential changes in plot conditions on searcher efficiency over time. Each trial carcass was discreetly marked with a black zip-tie and/or a piece of electrical tape around the upper forelimb for identification as a trial carcass after it was found. Carcasses were dropped from waist-height or higher and allowed to land in a random posture.

Searchers had one chance to locate trial carcasses during the first search after carcass placement. The number and location of trial carcasses found during the subsequent search were

recorded, and the number of trial carcasses available during each search was determined immediately after each trial.

Carcass Persistence Trials

The objective of carcass persistence trials was to estimate the length of time (in days) a carcass would persist, or be available for detection, in the field. Carcasses could be removed by scavenging or rendered undetectable by typical farming activities. A minimum of 15 trial carcasses were placed in each season to incorporate the effects of varying weather and scavenger densities on carcass persistence. No more than three trial carcasses were placed on a plot at a time to avoid potential over-seeding and attracting scavengers. Twenty-five searcher efficiency trial carcasses were left in place and used for carcass persistence trials, and an additional 10 trial carcasses were dropped, for a total of 35 trial carcasses placed across all seasons.

Technicians monitored the trial carcasses over a 14-day period according to the following schedule, as closely as possible. Carcasses were checked daily for the first four days, then on days 7, 10, and 14. Trial carcasses were monitored until they were completely removed or the trial period ended, whichever occurred first. At the end of the 14-day period, any remaining carcasses were removed.

Search Area Mapping

Road and pad boundaries mapped in Year 1 (2021) were used for spatial verification of carcasses found on 100-m roads and pads. If changes to search areas occurred, technicians documented the changes and affected plots were remapped.

Quality Assurance and Quality Control

Quality assurance and quality control measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following searches, technicians were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the technician and/or Project Manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes and measures were implemented. A Microsoft® SQL database was developed to store, organize, and retrieve search data. All data forms and electronic data files were retained for reference.

Statistical Analysis

The EoA (Dalthorp et al. 2017) modeling framework was used to estimate take of the Covered Species. Data used in the EoA model included number of found Covered Species carcasses, the search area adjustment, and the results of searcher efficiency and carcass persistence trials.

Searcher Efficiency Estimation

EoA uses raw searcher efficiency data (e.g., number of found and available trial carcasses) to inform overall probability of detection. However, to determine if searcher efficiency data should

be pooled, or separated by season, searcher efficiency was modeled using logistic regression, with season included as a potential covariate. Model selection was completed using an information theoretic approach 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 as the best supported model. Searcher efficiency values were input into the EoA software according to the model selection results.

The change in searcher efficiency between successive searches was defined by a parameter called the detection reduction factor (*k*) that can range from zero to one. When *k* is zero, it implies a carcass that was missed on the first search would never be found on subsequent searches. A *k* of one implies searcher efficiency remained constant no matter how many times a carcass was missed. Huso et al. (2017) estimated a value of $k = 0.67$ for bats, and this value was used to calculate estimates for the Covered Species in EoA.

Carcass Persistence Rate Estimation

Data collected during carcass persistence trials were used to estimate the amount of time, in days, carcasses remained available to be located by the technician. The average probability a carcass persisted through the search interval (i.e., the time between scheduled searches) was estimated using an interval-censored survival regression with four potential distributions: exponential, loglogistic, lognormal, and Weibull distributions (Kalbfleisch and Prentice 2002, Dalthorp et al. 2018). As with searcher efficiency, season was included as a potential covariate. The most parsimonious model within two AICc units of the model with the lowest AICc value was selected as the best supported model. The parameter estimates of the selected model (shape and scale, including the 95% confidence interval of scale) were used as inputs in the EoA Single Class Module.

Search Area Adjustment

The search area adjustment accounted for unsearched areas beneath turbines, and was calculated as a probability that ranged from zero to one. The area adjustment was estimated as the product of the searched area around each turbine and a carcass-density distribution. The proportion of area searched was calculated in a geographic information system as the amount of area searched divided by the total area searched at each 1.0-m annulus around the turbine. A truncated weighted maximum likelihood (TWL) modeling approach (Khokan et al. 2013) was used to estimate the carcass-density distribution using site-specific fatality locations. The TWL approach uses weight-based probability of detection and the proportion of area searched in each 1.0-m annulus around the turbine. Although the spring and fall seasons have the potential to have different carcass density distributions due to differences in turbine operation, there was insufficient sample size in the spring to examine these effects. Therefore, the models pooled data from both turbine operation regimes and seasons. Distributions considered were normal, gamma, Gompertz, and Weibull (parameterized according to R Development Core Team (2016) and Yee (2010). The best-supported model was selected using AICc.

Carcasses Excluded from Fatality Estimates

Fatalities were excluded from the area adjustment used in EoA when the carcass was discovered outside of the spatial and temporal scope of the study design. For example, carcasses found outside a designated plot were not included in the analysis because the area adjustment accounts for the carcass by adjusting for unsearched areas. Carcasses found prior to the start of searches (e.g., a carcass found on a plot in the summer that was not searched until the fall) were also excluded because the carcass occurred outside of the study period. Note that carcasses found on a plot incidentally were included in the analysis if that plot had a scheduled search during the next round of searches. If a fatality of a Covered Species had been found outside of the spatial or temporal scope of the study design, it would have been excluded from the area adjustment estimate but would be included in the EoA fatality estimate following Dalthorp et al. (2020).

Covered Species Take and Arrival Proportions

EoA was used to estimate the mean annual take rate (λ) for the Covered Species and the probability of detection (*g*). Estimates were calculated using the EoA method (Dalthorp et al. 2017), using the Single Class, Multiple Class, and Multiple Years modules of EoA.

Detection Probability and Density Weighted Proportion

The probability of detection (*g*) was estimated using the bias corrections for searcher efficiency, carcass persistence, and area searched, as well as the assumed seasonality of risk for the Covered Species, which was 11% in spring and 89% in fall per the Project's study plan. The monitoring and bias trial data were separated into search strata, where each search stratum was defined by a number of turbines, a plot type, a search frequency, the proportion of days in the study period, and a weight that represented the relative risk within the stratum to estimate $g_{stratum}$. Strata were defined to ensure that all the factors that defined them were identical within strata. An unsearched stratum was defined for spring because one turbine was not searched. The fall season was split into two subseasons and an unsearched stratum was defined to account for four of the turbines no longer being searched after August 21. The EoA Single Class module was used to estimate $g_{stratum}$, in each search stratum. This resulted in Ba and Bb parameters that defined the beta distribution of $g_{stratum}$ in each stratum. Unsearched areas were treated as distinct stratum and assigned a detection probability of 10^{-5} by setting the beta distribution parameters to Ba = 0.01 and Bb = 1,000.

The Multiple Class module of the EoA Graphical User Interface (GUI) was then used three times, once to develop the distribution of *g* for each subseason ($g_{subseason}$) by combining $g_{stratum}$ (e.g., road and pads or unsearched areas), using the appropriate weights, again to develop the distribution of *g* for each season by combining $g_{subseason}$, using the appropriate weights, and again to develop the distribution of *g* for the study period by combining g_{season}, using the appropriate weights. Weights ("DWP" in the software) represent the relative fatality risk within each search stratum or season and are used for combining detection probabilities. For each stratum, the DWP was calculated as the product of a number of different weights, which are described in the sections below. DWP within seasons were rescaled to sum to one before calculating seasonal detection probabilities, as required by the EoA GUI. For example, road and pad search areas and

unsearched areas in fall 2 season would obtain a weight as the product of the within-season sampling fraction and relative turbine operations, and re-scaled so that all fall 2 weights sum to one. DWP for combining across subseasons within fall were calculated as the product of the seasonal arrival proportion (divided into each subseason based on the proportion of days in each subseason) and the relative turbine operations, re-scaled so that all fall weights sum to one. DWP for combining across seasons within the study period were calculated as the product of the seasonal arrival proportions and relative turbine operations, re-scaled to sum to one within the study period. Furthermore, the Multiple Years Module was used to combine detection probabilities across years. The Multiple Years Module requires the input ρ, which weights the years appropriately based on relative turbine operations, to combine Beta distribution parameters.

For this study, cross-season relative turbine operations were calculated as the number of operational nights in each season, during which turbines were operating, divided by the total number of operational nights in each season. Given that nominal turbine operations at the Project includes downtime for regular maintenance, operations were considered normal unless the proportion of operational turbine-nights was less than 90% of total turbine-nights during the study period. On an annual basis, the proportion of operational-turbine nights was greater than 0.9, and the full bat active season was surveyed, so ρ was set to one for the 2024 study.

Adaptive Management Trigger

Table 6.5 in the HCP outlines several conditions for adaptive management at the Project. Two conditions are based on bats in hand (i.e., either two or more Indiana bat or northern-long eared bat carcasses found in Years 1–2, or a single Indiana bat or northern long-eared bat carcass found in either the spring or the summer of any year). The remaining conditions for adaptive management are based on EoA estimates. The estimates from the EoA analysis were used to test the adaptive management triggers that the median (50^{th} credible bound) annual take rates (λ) were between one and three bats per year, or greater than three bats per year at Year 3, per the HCP. Outcomes for meeting individual adaptive management triggers would be followed in accordance with the actions outlined in Table 6.5 of the Project's HCP. The adaptive management triggers were tested and reviewed individually for each of the Covered Species. Four years of data were used in this analysis, 2021–2024.

RESULTS

Standardized Carcass Searches

One hundred sixty-two searches were completed in the spring, and 260 searches were completed in the fall. Nineteen searches (4.3%) were missed due to turbine maintenance, weather constraints, and/or safety hazards. The total number of searches missed throughout the monitoring period only considered scheduled searches and excluded the searches that would have occurred at the four turbines that were removed from the study after August 21, 2024.

Fifty-seven bat carcasses and nine bird carcasses were found during searches and incidentally (Appendix A). No Covered Species were found during monitoring. Two state-listed as endangered

species, an evening bat (*Nycticeius humeralis*) and a little brown bat (*Myotis lucifugus*), were documented at the Project at Turbine 116 on May 15 and August 3, 2024, respectively. No other state- or federally listed species were recorded during the ITP monitoring effort.

Thirteen bats were found in the spring and 44 bats were found in the fall (Appendix A). The most commonly found bat species were eastern red bat (24 carcasses; 42.1%) and silver-haired bat (16 carcasses; 28.1%) followed by big brown bat (seven carcasses; 12.3%), hoary bat (*Lasiurus cinereus*; six carcasses; 10.5%). All other species were represented by one individual each (Appendices A and B). Three bat carcasses (two heavily scavenged and one unidentified *Myotis*) were sent off for identification via deoxyribonucleic acid (DNA) analysis and were identified as two silver-haired bats and one little brown bat.

Statistical Analysis

Bias Trials

Searcher Efficiency Trials

Forty-nine bats were placed for searcher efficiency trials on six separate dates and 43 were available for search teams to find. The best-supported model for searcher efficiency supported the inclusion of season as a covariate, meaning there was a substantial difference in searcher efficiency rates between seasons. Searcher efficiency rates ranged from 69.6% in spring to 95.0% in fall (Table 3).

Table 3. Searcher efficiency results on 100-m roads and pads, by season at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Number Placed	Number Available	Number Found	% Found
Spring	24	23	16	69.6
Fall	25	20	19	95.0

Carcass Persistence Trials

Thirty-five carcasses were placed during the study period to estimate carcass persistence. The best-fit model for carcass persistence rates had an exponential distribution and included season as a covariate, meaning that carcass persistence varied substantially by season (Figure 3; Appendix B). Estimated median carcass persistence times were 10.51 days in the spring and 1.56 days in the fall (Appendix B).

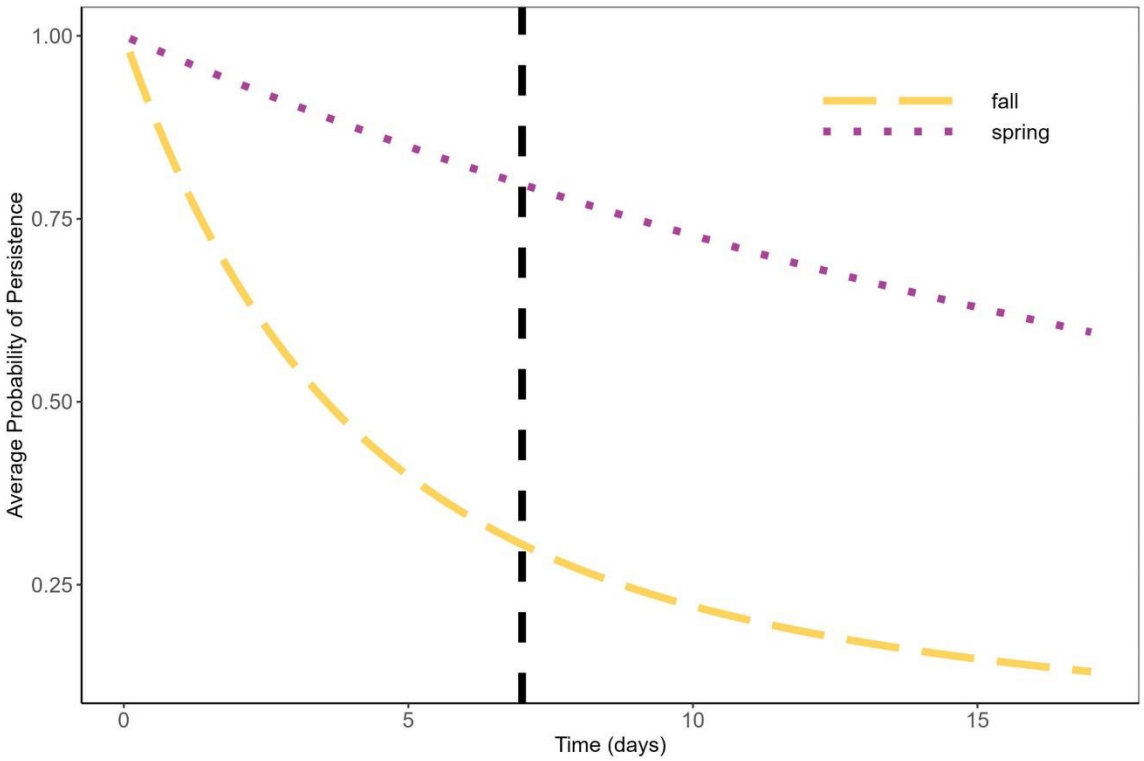

Figure 3. The average probability of persistence of bats on over time (in days) on 100-m roads and pads at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Note: The vertical dashed line indicates the 7-day search interval used in this study.

Search Area Adjustment

Five of the 57 bats found were excluded from modeling the search area adjustment for EoA. Two bat carcasses were excluded from analysis because they were found off plot. Another three bats were excluded because their estimated time of death was prior to the start of the monitoring season (Appendices A and B).

The best-fit model for the distribution of bats with respect to distance from turbine base was a Gompertz distribution (Appendix B). The estimated TWL area adjustment for bats was 0.24 for 100-m roads and pads (Figure 4; Appendix B).

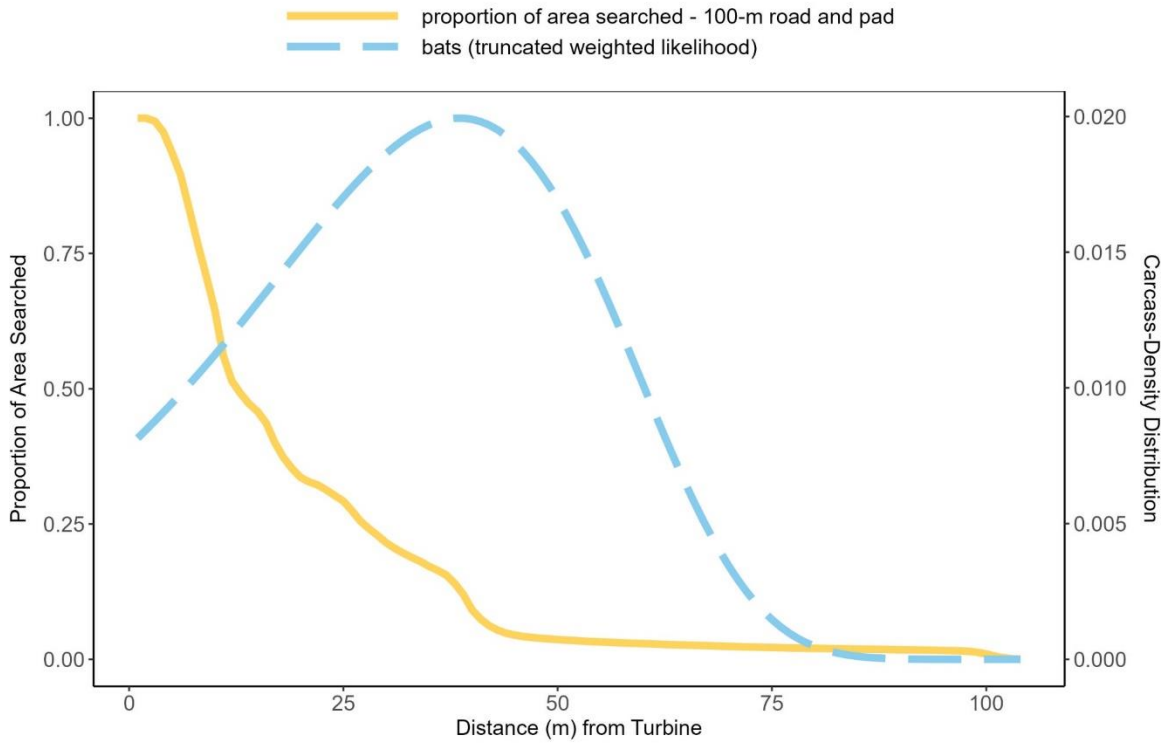

Figure 4. Density of bat carcasses per area searched at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Covered Species Take Estimates

No Covered Species carcasses were found during the 2024 study period; one Indiana bat has been found to date, in 2023. No northern long-eared bats have been found to date under the ITP. The mean *g* for the 2024 monitoring period was 0.07 (95% credible interval [CrI]: 0.06–0.09). The overall *g* achieved for the 2021–2024 monitoring years had a mean of 0.24 (95% CrI: 0.23–0.25; Table 4).

Table 4. Probability of detection (*g*), Ba, and Bb for the Rosewater Wind Farm, White County, Indiana, from 2021–2024.

Year	Ba*	Bb*	*g*	95% CrI
2021	825.190	2,304.680	0.264	0.248–0.279
2022	214.050	475.260	0.311	0.277–0.346
2023	771.332	1,657.162	0.318	0.299–0.336
2024	66.747	860.362	0.072	0.056–0.089
Overall	**1321.722**	**4163.796**	**0.241**	**0.230–0.252**

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

The weight (ρ) for all years was set to 1.

CrI = credible interval.

Evidence of Absence Framework

The median annual take rate from 2021–2024 was 1.23 (95% CrI: 0.11–4.86) Indiana bats and 0.24 (95% CrI: 0.00–2.61) northern long-eared bats (Table 5). Inputs required to run the EoA Single Class Module and stratum-specific *g* distribution values and inputs required for the Multiple Class Module are described in Appendix C.

Adaptive management criteria were assessed using the median annual take rate from Years 1–4. The estimated annual take rate must be greater than three to trigger adaptive management in Year 4. The estimated take rate for both species was less than three, indicating the criteria for adaptive management was not met (Table 5). In this case, per Table 6.5 in the HCP, the Project will continue operational minimization as planned and continue to monitor at $g = 0.08$ for the remaining two years of the ITP. Neither species' estimated take rate exceeded the authorized take rate.

Table 5. Estimated median fatality rate (λ) for the Covered Species based on studies conducted at the Rosewater Wind Farm, White County, Indiana, Incidental Take Permit Years 1–4 (2021–2024).

Species	Carcass Count	Median λ (95% CrI)	Expected Take Rate[a]	Authorized Take Rate
Indiana bat	1	1.23 (0.11–4.86)	1	3
Northern long-eared bat	0	0.24 (0.00–2.61)	1	3

[a] The expected rate, as defined in the HCP, is one per year, which corresponds to overall expected take of six over the 6-year ITP term.

CONCLUSIONS

No Covered Species were found in Year 4. To date, one Indiana bat carcass has been found during the ITP compliance monitoring. The ITP compliance monitoring completed during 2024 provided evidence that the rate of take of Covered Species is compatible with ITP compliance over the duration of the permit term. Adaptive management triggers were evaluated using the EoA results and due to the average annual take of Indiana bats and northern long-eared bats being less than three bats per year at Year 4, operational minimization will continue as planned (Rosewater 2021).

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Appendix A. Carcasses Found during the 2024 Post-construction Monitoring Searches at the Rosewater Wind Farm

Appendix A. Carcasses found at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Found Date	Common Name	Turbine	Search Type	Plot Type	Physical Condition	Latitude	Longitude
Bat Carcasses							
4/18/2024	silver-haired bat	122	carcass search*	100-m road and pad	intact	40.78347	-86.9422
4/18/2024	silver-haired bat	124	carcass search	100-m road and pad	dismembered	40.77059	-86.9322
4/24/2024	silver-haired bat	116	carcass search	100-m road and pad	scavenged	40.76830	-86.8862
4/30/2024	eastern red bat	124	carcass search	100-m road and pad	intact	40.77067	-86.9319
4/30/2024	silver-haired bat	101	carcass search	100-m road and pad	scavenged	40.80433	-86.9979
4/30/2024	silver-haired bat	105	carcass search	100-m road and pad	scavenged	40.78890	-87.0018
5/8/2024	hoary bat	111	carcass search	100-m road and pad	scavenged	40.78837	-86.9263
5/11/2024	eastern red bat	106	carcass search	100-m road and pad	intact	40.78899	-86.9923
5/11/2024	silver-haired bat	101	carcass search	100-m road and pad	dismembered	40.80427	-86.9979
5/15/2024	evening bat	115	carcass search	100-m road and pad	scavenged	40.76606	-86.8960
5/15/2024	hoary bat	104	carcass search	100-m road and pad	scavenged	40.80423	-86.9707
5/15/2024	hoary bat	107	carcass search	100-m road and pad	intact	40.78778	-86.9786
5/15/2024	silver-haired bat	121	carcass search	100-m road and pad	intact	40.78312	-86.9551
8/3/2024	big brown bat	105	carcass search	100-m road and pad	scavenged	40.78875	-87.0023
8/3/2024	big brown bat	122	carcass search	100-m road and pad	scavenged	40.78346	-86.9418
8/3/2024	eastern red bat	104	carcass search	100-m road and pad	scavenged	40.80426	-86.9707
8/3/2024	eastern red bat	108	carcass search	100-m road and pad	scavenged	40.78767	-86.9706
8/3/2024	eastern red bat	113	carcass search	100-m road and pad	scavenged	40.76957	-86.9131
8/3/2024	eastern red bat	120	carcass search	100-m road and pad	scavenged	40.76990	-86.9702
8/3/2024	little brown bat	116	carcass search	100-m road and pad	scavenged	40.76828	-86.8858
8/7/2024	eastern red bat	109	carcass search	100-m road and pad	dismembered	40.79541	-86.9436
8/7/2024	eastern red bat	112	carcass search	100-m road and pad	scavenged	40.78728	-86.9144
8/7/2024	eastern red bat	115	carcass search	100-m road and pad	scavenged	40.76584	-86.8961
8/7/2024	eastern red bat	121	carcass search	100-m road and pad	scavenged	40.78312	-86.9551
8/14/2024	eastern red bat	101	carcass search	100-m road and pad	scavenged	40.80419	-86.9979
8/14/2024	eastern red bat	123	carcass search	100-m road and pad	scavenged	40.77030	-86.9407
8/14/2024	hoary bat	122	carcass search	100-m road and pad	dismembered	40.78352	-86.9419
8/14/2024	unidentified *Lasiurus* bat	115	carcass search	100-m road and pad	dismembered	40.76591	-86.8961
8/21/2024	big brown bat	116	carcass search	100-m road and pad	dismembered	40.76816	-86.8862
8/21/2024	big brown bat	117	carcass search	100-m road and pad	scavenged	40.76992	-87.0027
8/21/2024	eastern red bat	101	carcass search	100-m road and pad	scavenged	40.80439	-86.9980
8/21/2024	eastern red bat	101	carcass search	100-m road and pad	scavenged	40.80434	-86.9979
8/21/2024	eastern red bat	103	carcass search	100-m road and pad	scavenged	40.80439	-86.9803
8/21/2024	eastern red bat	103	carcass search	100-m road and pad	scavenged	40.80460	-86.9803
8/21/2024	eastern red bat	108	carcass search	100-m road and pad	intact	40.78783	-86.9707

Appendix A. Carcasses found at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Found Date	Common Name	Turbine	Search Type	Plot Type	Physical Condition	Latitude	Longitude
8/21/2024	hoary bat	108	carcass search	100-m road and pad	injured	40.78777	-86.9707
8/21/2024	silver-haired bat	125	carcass search	100-m road and pad	intact	40.77020	-86.9211
8/22/2024	eastern red bat	120	incidental	100-m road and pad	scavenged	40.76992	-86.9701
8/28/2024	big brown bat	103	carcass search	100-m road and pad	scavenged	40.80441	-86.9805
8/28/2024	eastern red bat	102	carcass search	100-m road and pad	scavenged	40.80445	-86.9895
8/28/2024	eastern red bat	109	carcass search	100-m road and pad	scavenged	40.79541	-86.9440
8/28/2024	eastern red bat or Seminole bat	114	carcass search	100-m road and pad	scavenged	40.76613	-86.9055
8/28/2024	silver-haired bat	117	carcass search	100-m road and pad	scavenged	40.76996	-87.0024
8/28/2024	silver-haired bat	120	carcass search	100-m road and pad	scavenged	40.76982	-86.9698
9/4/2024	silver-haired bat	115	carcass search	100-m road and pad	scavenged	40.76606	-86.8960
9/18/2024	big brown bat	122	carcass search	100-m road and pad	scavenged	40.78348	-86.9418
9/18/2024	big brown bat	125	carcass search	100-m road and pad	scavenged	40.77024	-86.9210
9/18/2024	silver-haired bat	118	carcass search	100-m road and pad	scavenged	40.77000	-86.9940
9/21/2024	eastern red bat	122	incidental	100-m road and pad	scavenged	40.78347	-86.9416
9/26/2024	eastern red bat	114	carcass search	100-m road and pad	scavenged	40.76592	-86.9056
10/3/2024	silver-haired bat	115	carcass search	100-m road and pad	scavenged	40.76607	-86.8960
10/3/2024	silver-haired bat	118	carcass search	100-m road and pad	injured	40.76982	-86.9937
10/10/2024	eastern red bat	103	carcass search	100-m road and pad	scavenged	40.80472	-86.9805
10/10/2024	eastern red bat	109	carcass search	100-m road and pad	intact	40.79552	-86.9439
10/10/2024	hoary bat	104	carcass search	100-m road and pad	scavenged	40.80410	-86.9708
10/14/2024	silver-haired bat	121	carcass search*	100-m road and pad	dismembered	40.78324	-86.9543
10/14/2024	silver-haired bat	125	carcass search	100-m road and pad	scavenged	40.77030	-86.9209
Bird Carcasses							
4/24/2024	red-winged blackbird	124	carcass search	100-m road and pad	intact	40.77039	-86.9322
4/30/2024	horned lark	123	carcass search	100-m road and pad	scavenged	40.77031	-86.9404
5/15/2024	Blackburnian warbler	112	carcass search	100-m road and pad	intact	40.78749	-86.9140
8/21/2024	red-tailed hawk	125	carcass search	100-m road and pad	injured	40.77019	-86.9211
8/28/2024	Tennessee warbler	116	carcass search	100-m road and pad	intact	40.76820	-86.8859
8/28/2024	turkey vulture	124	carcass search	100-m road and pad	scavenged	40.77069	-86.9324
10/3/2024	black-throated blue warbler	113	carcass search*	100-m road and pad	scavenged	40.76972	-86.9141
10/3/2024	golden-crowned kinglet	104	carcass search	100-m road and pad	scavenged	40.80427	-86.9706
10/14/2024	winter wren	120	carcass search	100-m road and pad	intact	40.76996	-86.9698

* Carcass was found outside the search area.

m = meters.

Appendix B. Searcher Efficiency, Carcass Persistence, and Truncated Weighted Likelihood Area Adjustment Estimate Model Fitting Results

Appendix B1. Searcher efficiency models for 100-meter roads and pads at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Covariates	*k* Value	AICc	Delta AICc
Season	0.67	40.51	0*
No covariates	0.67	43.42	2.91

* Selected model.

AICc is corrected Akaike Information Criterion; Delta AICc is the difference between the AICc of a given model and the lowest AICc value.

Appendix B2. Number of carcass persistence trials placed by season for the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Plot Type	Number of Carcasses Placed
Spring	100-m road and pad	15
Fall	100-m road and pad	20

Appendix B3. Carcass persistence models with covariates and distributions for 100-meter road and pads at the Rosewater Wind Farm, White County, Indiana, April 1–May 15 and August 1 – October 15, 2024.

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
Season	-	exponential	113.93	0*
Season	No Covariates	Weibull	115.59	1.66
Season	No Covariates	lognormal	116.83	2.90
Season	No Covariates	loglogistic	117.73	3.80
Season	Season	Weibull	117.99	4.06
Season	Season	lognormal	119.22	5.29
Season	Season	loglogistic	120.19	6.26
No Covariates	Season	lognormal	129.81	15.88
No Covariates	No Covariates	Weibull	130.60	16.67
No Covariates	Season	loglogistic	130.64	16.71
No Covariates	No Covariates	lognormal	130.72	16.79
No Covariates	No Covariates	loglogistic	130.73	16.80
No Covariates	Season	Weibull	132.13	18.20
No Covariates	-	exponential	136.01	22.08

* Selected model.

AICc is corrected Akaike Information Criterion; Delta AICc is the difference between the AICc of a given model and the lowest AICc value.

Note: Model output is clipped to display the top 10 selected models.

Appendix B4. Carcass persistence top models with covariates, distributions, and model parameters for the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Distribution*	Estimated Median Removal Times (days)	Rate
Fall	exponential*	1.56	0.444
Spring	exponential*	10.51	0.066

* Parameterization follows the base R parameterization for this distribution.

Appendix B5. Number and percent (%) of bat carcasses found at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

	Included in Area Adjustment		Outside Search Area*		Outside Study Period*		Total	
Species	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**
eastern red bat	23	44.2	0	0	1	33.3	24	42.1
silver-haired bat	14	26.9	2	100	0	0	16	28.1
big brown bat	5	9.6	0	0	2	66.7	7	12.3
hoary bat	6	11.5	0	0	0	0	6	10.5
eastern red bat or Seminole bat	1	1.9	0	0	0	0	1	1.8
evening bat	1	1.9	0	0	0	0	1	1.8
little brown bat	1	1.9	0	0	0	0	1	1.8
unidentified *Lasiurus* bat	1	1.9	0	0	0	0	1	1.8
Total	**52**	**100**	**2**	**100**	**3**	**100**	**57**	**100**

* Carcasses not included in analysis.

Sums may not equal totals shown due to rounding.

Appendix B6. Search area adjustment models for bats from the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Distribution	AICc	Delta AICc
Gompertz	5,404.84	0*
normal	5,424.18	19.35
Weibull	5,433.97	29.13
gamma	5,472.38	67.54

* Selected model.

AICc is corrected Akaike Information Criterion; Delta AICc is the difference between the AICc of a given model and the lowest AICc value.

Appendix B7. Truncated weighted maximum likelihood search area adjustment estimates for the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Plot Type	Area Correction	Distribution	Parameter 1	Parameter 2
100-m road and pad	0.24	Gompertz	0.0456	0.0078

n= 52 bats.

Appendix C. Inputs for Single Class and Multiple Class Modules in Evidence of Absence

Appendix C1. Inputs needed to run Evidence of Absence (EoA): Single Class Module for the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

						Searcher Efficiency		Carcass Persistence[b]			
Season[a]	Plot Type	Number of Turbines	Search Interval (*l*)	Number of searches	Spatial Coverage (*a*)	Carcasses Available	Carcasses Found	Shape (α)	Scale (β)	Scale Lower Limit (β)	Scale Upper Limit (β)
Spring	100-m road and pad	24	7	7	0.24	23	16	–	15.16	7.89	29.20
Spring	unsearched	1	–	–	–	–	–	–	–	–	–
Fall 1	100-m road and pad	25	6	4	0.24	20	19	–	2.25	1.43	3.54
Fall 2	100-m road and pad	21	7	8	0.24	20	19	–	2.25	1.43	3.54
Fall 2	unsearched	4	–	–	–	–	–	–	–	–	–

[a.] Seasons were split to allow for the inclusion of an unsearched class for turbines that were non-operational or unsearched during compliance monitoring.

[b.] An exponential distribution was used for the 100-m road and pad carcass persistence distribution.

Note: Values for temporal coverage (*v*) were set to 1, and arrival proportions were accounted for in the Multiple Class Module.

m = meter.

Appendix C2. Inputs needed to run the Evidence of Absence Multiple Class Module used to combine detection probability distributions across strata within subseasons at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Plot Type	Ba	Bb	Within-season Sampling Fraction	Relative Operation of Turbines	Weight (DWP)
Spring	road and pad	44.99	261.88	0.96	1.00	0.99
Spring	unsearched	0.01	1000.00	0.04	0.33	0.01
Fall 2	road and pad	23.42	318.32	0.84	1.00	0.84
Fall 2	unsearched	0.01	1000.00	0.16	1.00	0.16

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

Appendix C3. Weights used to combine detection probability distributions across subseasons within seasons at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Seasonal Arrival Proportion	Relative Operation of Turbines	Weight (DWP)[a]
Spring	0.11	1.00	1
Fall 1	0.25	1.00	0.28
Fall 2	0.64	1.00	0.72

[a] The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum

Appendix C4. Inputs needed to run the Evidence of Absence Multiple Class Module used to combine detection probability distributions across subseasons within seasons at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Weight (DWP)[a]	Ba[b]	Bb[b]	g (95% CrI)[c]
Spring	0.11	45.09	266.79	0.14 (0.11–0.19)
Fall 1	0.28	26.21	312.72	0.08 (0.05–0.11)
Fall 2	0.72	23.71	388.13	0.06 (0.04–0.08)

[a] The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum

[b] Ba and Bb are the parameters for the beta distribution used to characterize the probability of detection.

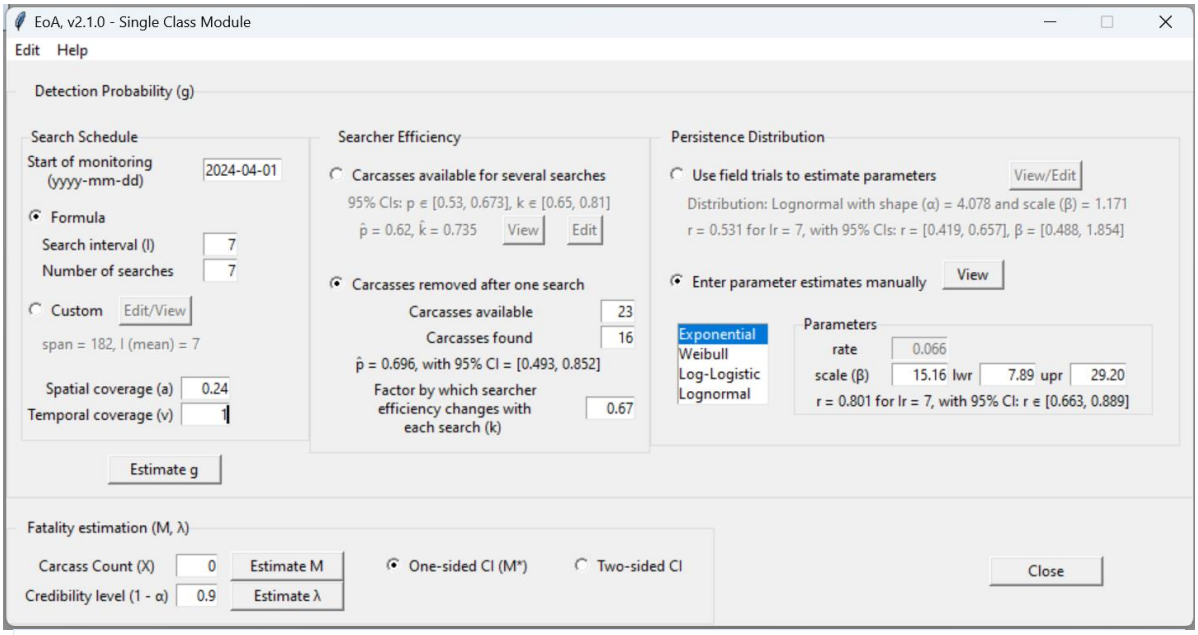
[c] CrI = credible interval

Appendix C5. Inputs needed to run the Evidence of Absence Multiple Class Module used to combine detection probability distributions across seasons within the study period at the Rosewater Wind Farm, White County, Indiana, April 1 – May 15 and August 1 – October 15, 2024.

Season	Ba	Bb	g (95% CrI)	Sampling Fraction	Seasonal Arrival Proportion	Weights (DWP)
Spring	45.09	266.79	0.14 (0.11–0.19)	1	0.11	0.11
Fall	43.80	651.21	0.06 (0.05–0.08)	1	0.89	0.89

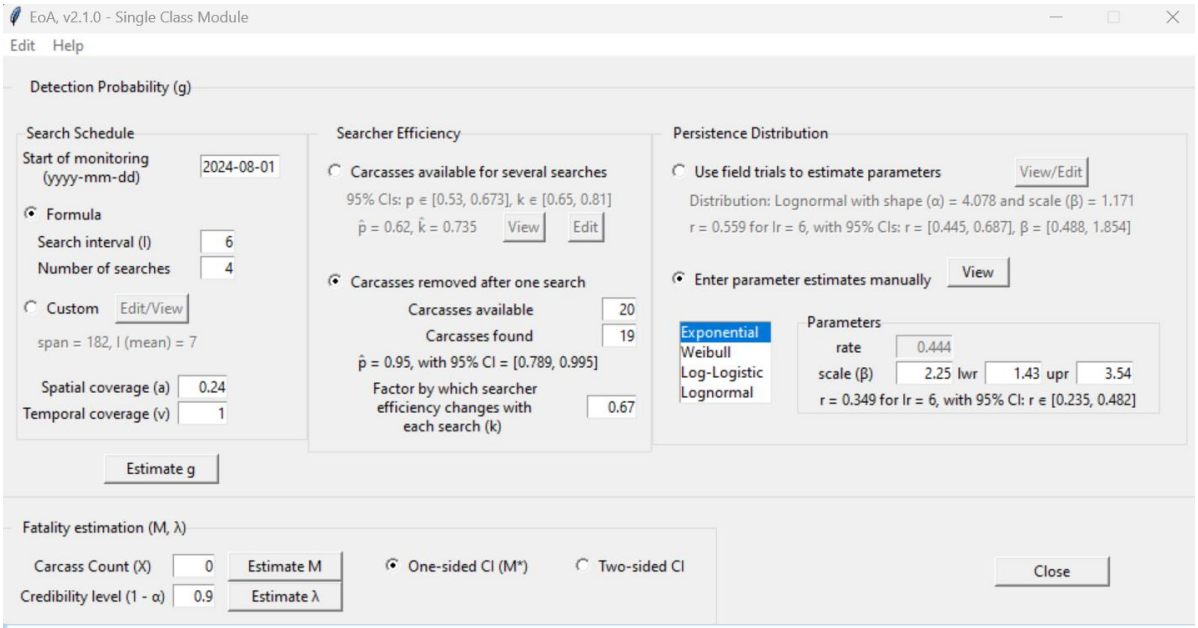
Ba and Bb are the parameters for the beta distribution used to characterize the probability of detection. The *g* value is the mean of that distribution.

m = meter.



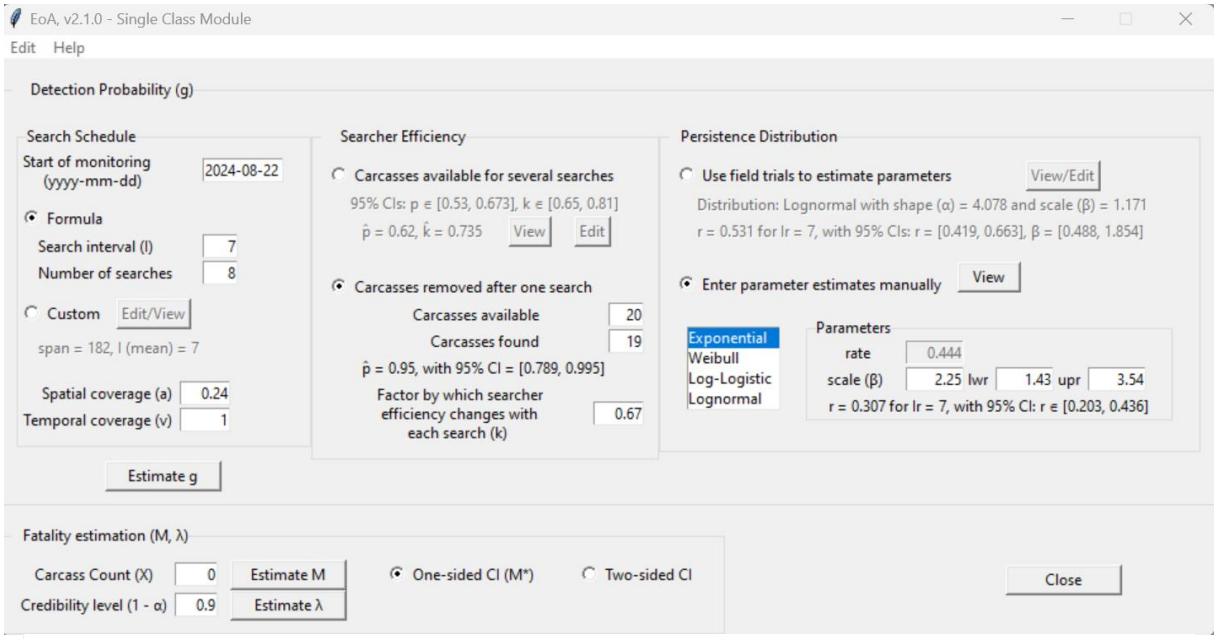

```
Summary statistics for estimation of detection probability (g)
================================================================================
Results:

Full site for full year
   Estimated g = 0.149, 95% CI = [0.111, 0.191]
   Fitted beta distribution parameters for estimated g: Ba = 45.4069, Bb = 259.3317


Full site for monitored period, 01-Apr-2024 through 20-May-2024
   Estimated g = 0.149, 95% CI = [0.111, 0.191]
   Fitted beta distribution parameters for estimated g: Ba = 45.4069, Bb = 259.3317
   Temporal coverage (within year) = 1


Searched area for monitored period, 01-Apr-2024 through 20-May-2024
   Estimated g = 0.621, 95% CI = [0.453, 0.775]
   Fitted beta distribution parameters for estimated g: Ba = 20.8155, Bb = 12.7183

================================================================================
Input:
Search parameters
   trial carcasses placed = 23, carcasses found = 16
   estimated searcher efficiency: p = 0.696, 95% CI = [0.493, 0.852]
   k = 0.67
   Search schedule: Search interval (I) = 7, number of searches = 7, span = 49
     spatial coverage: 0.24     temporal coverage: 1
--------------------------------------------------------------------------------
Carcass persistence:
   Exponential persistence distribution
     scale (β) = 15.16
     95% CI β = [7.89, 29.2] and r = 0.801 for Ir = 7 with 95% CI = [0.663, 0.889]
     Parameters entered manually
   Uniform arrivals
--------------------------------------------------------------------------------
```

Appendix C6. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Single Class Module inputs for spring 2024, 100-meter road and pad searches at 24 turbines, searched at a 7-day interval.



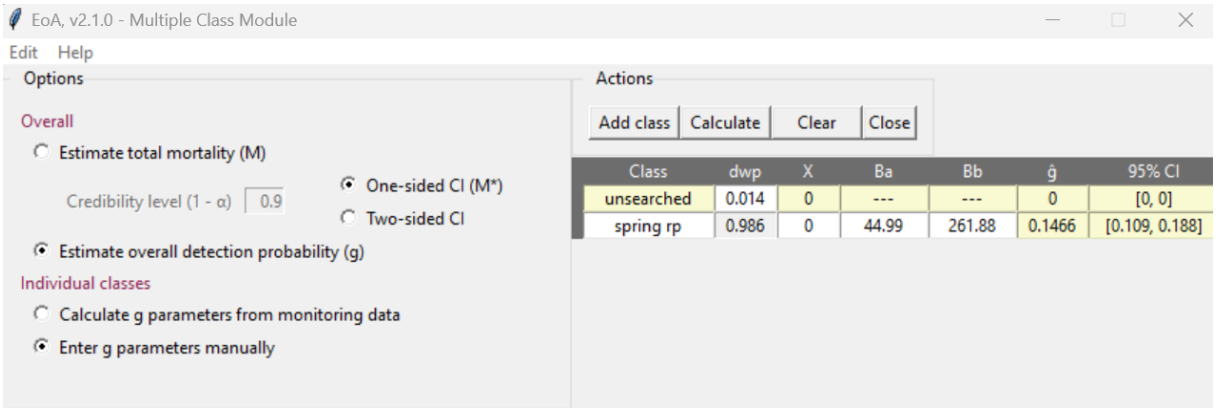

```
Summary statistics for estimation of detection probability (g)
================================================================================
Results:

Full site for full year
   Estimated g = 0.0782, 95% CI = [0.0516, 0.11]
   Fitted beta distribution parameters for estimated g: Ba = 25.4481, Bb = 299.9108


Full site for monitored period, 01-Aug-2024 through 25-Aug-2024
   Estimated g = 0.0782, 95% CI = [0.0516, 0.11]
   Fitted beta distribution parameters for estimated g: Ba = 25.4481, Bb = 299.9108
   Temporal coverage (within year) = 1


Searched area for monitored period, 01-Aug-2024 through 25-Aug-2024
   Estimated g = 0.326, 95% CI = [0.212, 0.452]
   Fitted beta distribution parameters for estimated g: Ba = 18.6222, Bb = 38.5149

================================================================================
Input:
Search parameters
   trial carcasses placed = 20, carcasses found = 19
   estimated searcher efficiency: p = 0.95, 95% CI = [0.789, 0.995]
   k = 0.67
   Search schedule: Search interval (I) = 6, number of searches = 4, span = 24
     spatial coverage: 0.24     temporal coverage: 1
--------------------------------------------------------------------------------
Carcass persistence:
   Exponential persistence distribution
     scale (β) = 2.25
     95% CI β = [1.43, 3.54] and r = 0.349 for Ir = 6 with 95% CI = [0.235, 0.482]
     Parameters entered manually
   Uniform arrivals
--------------------------------------------------------------------------------
```

Appendix C7. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Single Class Module inputs for fall 1 2024, 100-meter road and pad searches at 25 turbines, searched at a 6-day interval.



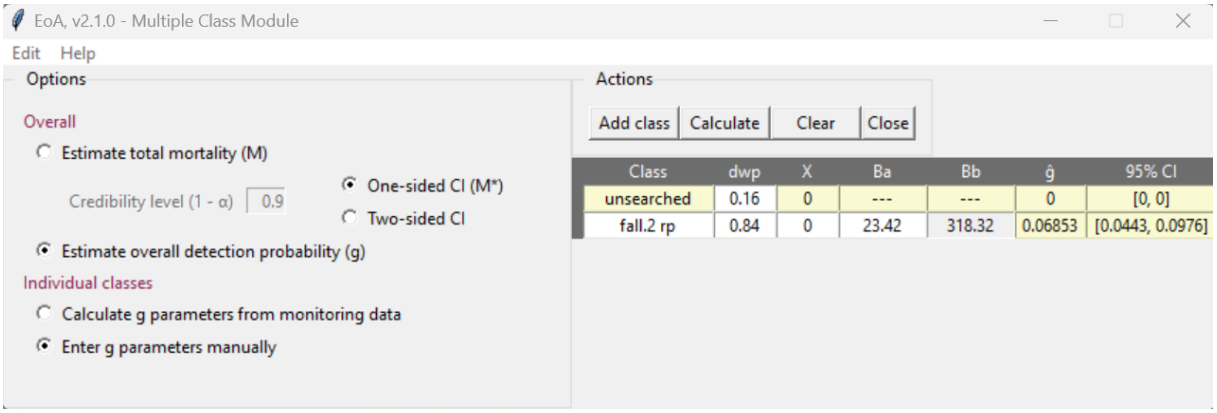

```
Summary statistics for estimation of detection probability (g)
================================================================================
Results:

Full site for full year
   Estimated g = 0.0691, 95% CI = [0.0443, 0.0989]
   Fitted beta distribution parameters for estimated g: Ba = 22.6736, Bb = 305.2298


Full site for monitored period, 22-Aug-2024 through 17-Oct-2024
   Estimated g = 0.0691, 95% CI = [0.0443, 0.0989]
   Fitted beta distribution parameters for estimated g: Ba = 22.6736, Bb = 305.2298
   Temporal coverage (within year) = 1


Searched area for monitored period, 22-Aug-2024 through 17-Oct-2024
   Estimated g = 0.288, 95% CI = [0.182, 0.408]
   Fitted beta distribution parameters for estimated g: Ba = 17.2597, Bb = 42.6349

================================================================================
Input:
Search parameters
   trial carcasses placed = 20, carcasses found = 19
   estimated searcher efficiency: p = 0.95, 95% CI = [0.789, 0.995]
   k = 0.67
   Search schedule: Search interval (I) = 7, number of searches = 8, span = 56
     spatial coverage: 0.24     temporal coverage: 1
--------------------------------------------------------------------------------
Carcass persistence:
   Exponential persistence distribution
     scale (β) = 2.25
     95% CI β = [1.43, 3.54] and r = 0.307 for Ir = 7 with 95% CI = [0.203, 0.436]
     Parameters entered manually
   Uniform arrivals
--------------------------------------------------------------------------------
```

Appendix C8. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Single Class Module inputs for fall 2 2024, 100-meter road and pad searches at 21 turbines searched at a 7-day interval.



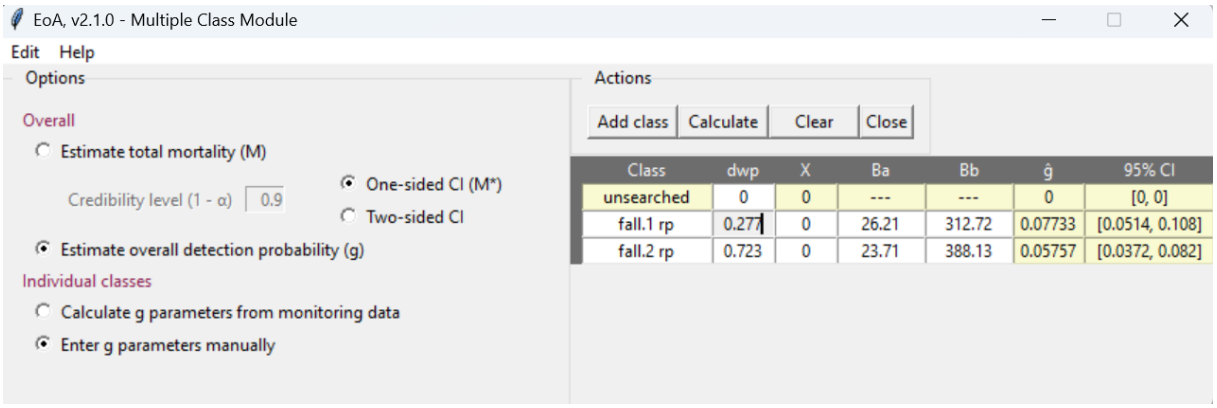

```
Summary statistics for multiple class estimate
================================================================================
Input: Detection probability, by search class
  Search coverage = 0.986

  Class          DWP     X    Ba     Bb    ghat    95% CI
  unsearched   0.014     0   ---    ---     0    [    0,     0]
  spring rp    0.986     0  44.99  261.9 0.147 [0.109, 0.188]
================================================================================
Results for full site
--------------------------------------------------------------------------------

Detection probability
  Estimated g = 0.145, 95% CI = [0.108, 0.186]
  Fitted beta distribution parameters for estimated g: Ba = 45.1006, Bb = 266.8918

Mortality

Test of assumed relative weights (rho)
  Class          Assumed   Fitted (95% CI)
  unsearched       0.014      NA
  spring rp        0.986    [0.986, 0.986]
  p = 1 for likelihood ratio test of H0: assumed rho = true rho
```

Appendix C9. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Class Module inputs for spring 2024, 100-meter road and pad searches at 24 turbines searched at a 7-day interval and 1 unsearched turbine.



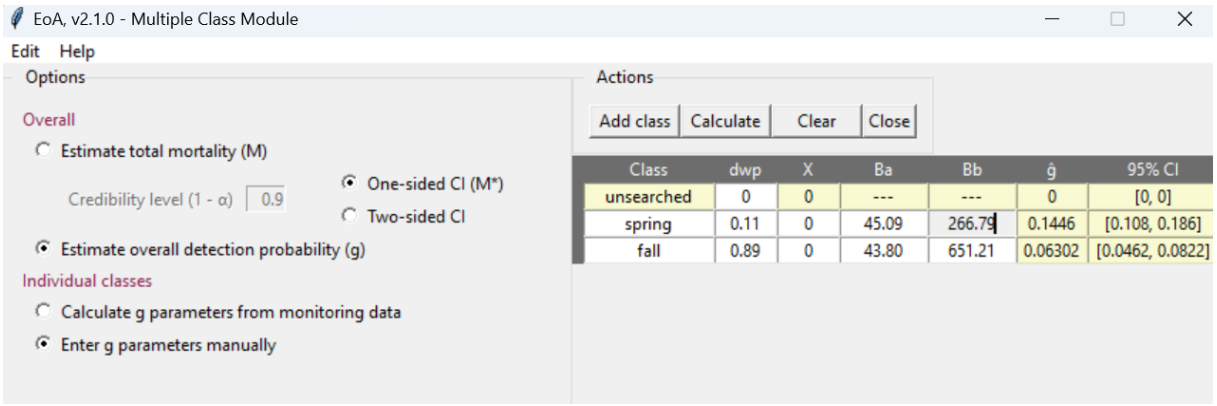

```
Summary statistics for multiple class estimate
================================================================================
Input: Detection probability, by search class
  Search coverage = 0.84

  Class          DWP     X    Ba     Bb    ghat    95% CI
  unsearched    0.16     0   ---    ---     0    [    0,     0]
  fall.2 rp     0.84     0  23.42  318.3 0.069 [0.044, 0.098]
================================================================================
Results for full site
--------------------------------------------------------------------------------

Detection probability
  Estimated g = 0.058, 95% CI = [0.037, 0.082]
  Fitted beta distribution parameters for estimated g: Ba = 23.7076, Bb = 388.1204

Mortality

Test of assumed relative weights (rho)
  Class          Assumed   Fitted (95% CI)
  unsearched      0.160      NA
  fall.2 rp       0.840    [0.840, 0.840]
  p = 1 for likelihood ratio test of H0: assumed rho = true rho
```

Appendix C10. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Class Module inputs for fall 2 2024, 100-meter road and pad searches at 21 turbines searched at a 7-day interval and 4 unsearched turbines.



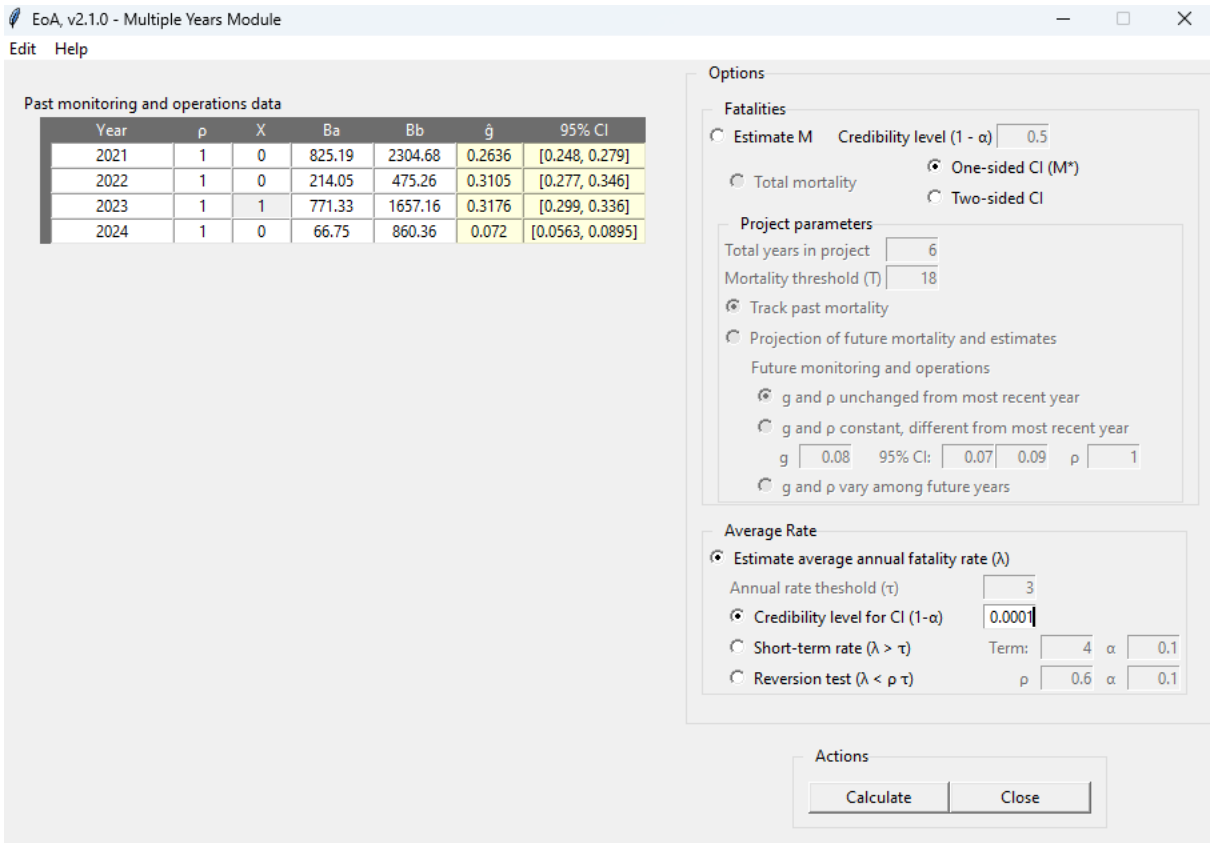

```
Summary statistics for multiple class estimate
================================================================================
Input: Detection probability, by search class
  Search coverage = 1

  Class          DWP     X    Ba     Bb    ghat    95% CI
  unsearched       0     0   ---    ---     0   [    0,     0]
  fall.1 rp    0.277     0  26.21  312.7 0.077 [0.051, 0.108]
  fall.2 rp    0.723     0  23.71  388.1 0.058 [0.037, 0.082]
================================================================================
Results for full site
--------------------------------------------------------------------------------

Detection probability
  Estimated g = 0.063, 95% CI = [0.046, 0.082]
  Fitted beta distribution parameters for estimated g: Ba = 43.8506, Bb = 651.698

Mortality

Test of assumed relative weights (rho)
  Class          Assumed   Fitted (95% CI)
  unsearched       0.000      NA
  fall.1 rp        0.277    [0.003, 0.994]
  fall.2 rp        0.723    [0.006, 0.996]
  p = 1 for likelihood ratio test of H0: assumed rho = true rho
```

Appendix C11. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Class Module inputs for fall subseasons (fall 1and fall 2]) 2024, 100-meter road and pad searches searched at a 7-day interval and unsearched turbines.



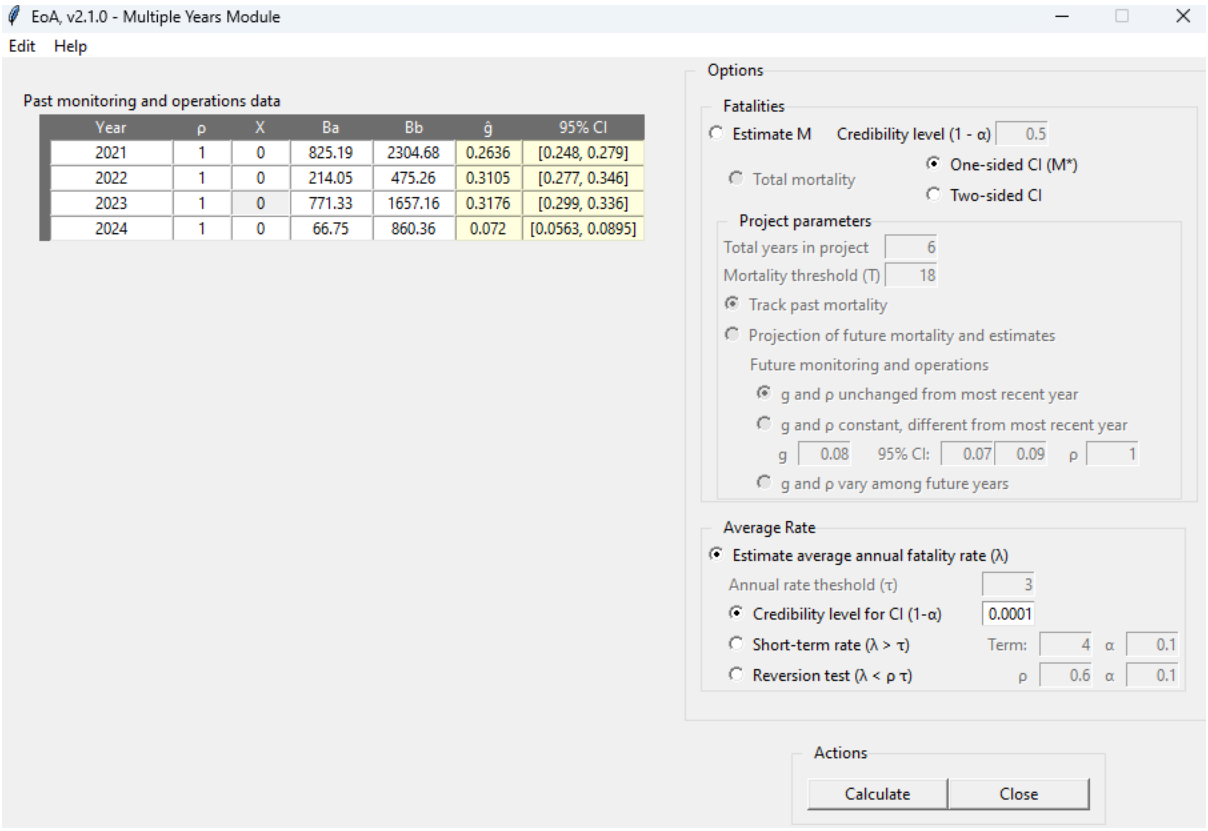

```
Summary statistics for multiple class estimate
================================================================================
Input: Detection probability, by search class
  Search coverage = 1

  Class          DWP     X    Ba     Bb    ghat    95% CI
  unsearched       0     0   ---    ---     0    [    0,     0]
  spring        0.11     0  45.09  266.8 0.145 [0.108, 0.186]
  fall          0.89     0   43.8  651.2 0.063 [0.046, 0.082]
================================================================================
Results for full site
--------------------------------------------------------------------------------

Detection probability
  Estimated g = 0.072, 95% CI = [0.056, 0.089]
  Fitted beta distribution parameters for estimated g: Ba = 66.7438, Bb = 860.3618

Mortality

Test of assumed relative weights (rho)
  Class          Assumed   Fitted (95% CI)
  unsearched       0.000      NA
  spring           0.110    [0.003, 0.989]
  fall             0.890    [0.010, 0.997]
  p = 1 for likelihood ratio test of H0: assumed rho = true rho
```

Appendix C12. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Class Module inputs for seasonal detection probabilities 2024 searched at a 7-day interval in the fall for 100-meter roads and pads and unsearched turbines.




```
Estimation of mortality rate (stochastic) over 4 years
Years: 2021 - 2024
================================================================================
Results
Total number of carcasses recovered: 1
Estimated overall detection probability, g = 0.241, 95% CI = [0.23, 0.252]
   Ba = 1321.7, Bb = 4163.8

Estimated annual fatality rate:
 lambda = 1.56 with 0.01% CI = [1.23, 1.23]

--------------------------------------------------------------------------------
Input
Threshold for short-term rate (tau) =  3  per year

Year (or period) rel_wt  X    Ba     Bb   ghat    95% CI
2021             1.000   0  825.2   2305 0.264 [0.248, 0.279]
2022             1.000   0  214.1  475.3 0.311 [0.277, 0.346]
2023             1.000   1  771.3   1657 0.318 [0.299, 0.336]
2024             1.000   0  66.75  860.4 0.072 [0.056, 0.089]
```

Appendix C13. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Years Module inputs for estimation of annual fatality rate (ʎ) for Indiana bats for 2021–2024. The Evidence of Absence graphical user interface by default produced the mean annual fatality rate; the credible interval converges on the median annual fatality rate when α is near 0. By setting the credibility to 0.0001, the upper and lower bounds of the credible interval produced the median annual fatality rate.




```
Estimation of mortality rate (stochastic) over 4 years
Years: 2021 - 2024
================================================================================
Results
Total number of carcasses recovered: 0
Estimated overall detection probability, g = 0.241, 95% CI = [0.23, 0.252]
   Ba = 1321.7, Bb = 4163.8

Estimated annual fatality rate:
 lambda = 0.519 with 0.01% CI = [0.236, 0.236]

--------------------------------------------------------------------------------
Input
Threshold for short-term rate (tau) =  3  per year

Year (or period) rel_wt  X    Ba     Bb   ghat    95% CI
2021             1.000   0  825.2   2305 0.264 [0.248, 0.279]
2022             1.000   0  214.1  475.3 0.311 [0.277, 0.346]
2023             1.000   0  771.3   1657 0.318 [0.299, 0.336]
2024             1.000   0  66.75  860.4 0.072 [0.056, 0.089]
```

Appendix C14. Screen shot of Evidence of Absence (v2.0.7) graphical user interface, Multiple Years Module inputs for estimation of annual fatality rate (ʎ) for northern long-eared bats for 2021–2024. The Evidence of Absence graphical user interface by default produced the mean annual fatality rate; the credible interval converges on the median annual fatality rate when α is near 0. By setting the credibility to 0.0001, the upper and lower bounds of the credible interval produced the median annual fatality rate.