Post-construction Monitoring Study for the Headwaters II Wind Farm Randolph County, Indiana

Year 3 Final Report

April 1 – October 15, 2024

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WEST

EXECUTIVE SUMMARY

Headwaters II Wind Farm, LLC, a subsidiary of EDP Renewables North America, LLC, is operating the Headwaters II Wind Farm (Project) in Randolph County, Indiana. This report details the post-construction monitoring studies conducted in 2024, consistent with the Project's Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP; ESPER0025999) for Indiana and northern long-eared bats (Covered Species). The Project obtained the ITP on April 22, 2022, and has completed monitoring in 2022, 2023, and 2024.

Post-construction monitoring was completed consistent with the study plan, which was approved by US Fish and Wildlife Service on March 8, 2024. The study plan was designed to achieve a 25% probability of detecting a single bat carcass (*g* of 0.25) for the 49 wind turbines at the Project (i.e., a study-wide *g*). The objectives of this study were to estimate take for the Covered Species using the Evidence of Absence (EoA) framework as outlined in the HCP and to determine if adaptive management was necessary to maintain compliance with the Project's ITP.

Standardized carcass searches for bat carcasses were completed at three plot types: cleared plots, uncleared plots, and road and pads, and were conducted by two types of searchers: a human technician and detection-dog team (consisting of one dog trained to detect carcasses and one handler). The frequency of searches varied across seasons, with more searches occurring when the take of Covered Species was more likely to occur. Searcher efficiency and carcass persistence trials were also conducted during each season to correct for detection and scavenger bias.

Six federally listed endangered Indiana bats were found at the Project throughout the study period, with one found during the summer and five found during the fall season. No northern long-eared bats were found at the Project. State-listed endangered species found included six evening bats (summer: three; fall: three), five little brown bats (summer: one; fall: four), and one tricolored bat (fall). Five hundred seven bats were found during the study. The positively identified bat species were eastern red bat (42.6%), silver-haired bat (32.0%), big brown bat (12.2%), hoary bat (9.1%), evening bat (1.2%), Indiana bat (1.2%), little brown bat (1.0%), and tricolored bat (0.2%).

In accordance with the HCP, three types of adaptive management triggers were tested for the Covered Species: a short-term (general) test of whether the estimated take rate during all seasons exceeded the expected take rate, a short-term (summer) test of whether the estimated summer take rate at the 29 turbines operating under summer curtailment exceeded the expected take during the summer season, and a long-term test of whether the permitted take limit was exceeded. The *g* for 2024 was 0.29 (90% credible interval [CrI]: 0.26–0.33).

Based on the data collected to date (2022, 2023, and 2024 studies), the EoA model estimated the mean annual fatality rates were 19.87 (CrI:12.51–28.64) Indiana bats and 0.60 (CrI: 0–2.31) northern long-eared bats per year. The probability that the annual take rate exceeded the

expected annual take rate was 0.96 for Indiana bat and 0.02 for northern long-eared bat, resulting in a short-term (general) trigger being met for Indiana bat. A short term-test (general) indicates whether the average annual take rate is on pace to meet the expected average rate. Due to the short-term (general) trigger being met, Headwaters II Wind Farm, LLC is planning to amend the HCP to increase the permitted take limit for Indiana bats as an adaptive management response.

The estimates of summer take rates through 2024 were 2.15 (CrI: 0.49–4.77) Indiana bat fatalities and 0.43 (CrI: 0–1.65) northern long-eared bat fatalities. The probability the summer take rate exceeded the expected summer take rate was 0.22 for Indiana bat and 0.18 for northern long-eared bat. The short-term (summer) estimated take rate did not exceed the expected take for the summer season and no short-term (summer) trigger was fired.

The cumulative take estimates for the ITP to date (2022, 2023, and 2024 monitoring years) were 57 Indiana bat fatalities and zero northern long-eared bat fatalities. The long-term trigger was not met since the estimated cumulative take is less than the permitted take. The total take permitted by the ITP is 359 Indiana bats and 93 northern long-eared bats over the 30-year permit term. The estimated levels of Covered Species take are below levels authorized within the ITP; therefore, the Project is in compliance.

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REPORT REFERENCE

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INTRODUCTION

Headwaters II Wind Farm, LLC, a subsidiary of EDP Renewables North America, LLC (EDPR), is operating the Headwaters II Wind Farm (Project) in Randolph County, Indiana. EDPR obtained an Incidental Take Permit (ITP; ESPER0025999, dated April 22, 2022) for the federally listed as endangered Indiana bat (*Myotis sodalis*) and the federally listed as endangered northern long-eared bat (*M. septentrionalis*; collectively, Covered Species) from the US Fish and Wildlife Service (USFWS). The Project has completed monitoring in 2022, 2023, and 2024, as required by the ITP. This report presents the results of the third year of compliance monitoring conducted under the ITP from April 1 to October 15, 2024. The objectives of this study were to estimate take of the Covered Species using the Evidence of Absence (EoA) framework as outlined in the Habitat Conservation Plan (HCP) and determine if adaptive management was necessary to maintain compliance with the Project's ITP.

STUDY AREA

The primary land cover type within 100 meters (m) of the turbines (i.e., within the Permit Area) is cultivated crops, which covers 89.9% of the Permit Area. The next most common land cover types are developed land, which covers approximately 6.2% of the site, deciduous forest (2.3%), and hay/pasture (1.5%). All other land cover types collectively make up less than 1.0% of the total land cover (National Land Cover Database 2024; Figure 1).

The Project became fully operational on August 1, 2021, and consists of 13 Vestas V136 3.6-megawatt (MW; 105-m hub height and 67-m blade length) and 36 Vestas V150 4.2-MW (105-m hub height and 74-m blade length) turbines (Table 1, Figure 1). All turbines are within the migratory range of the Covered Species, and EDPR adjusted turbine operations during the spring, summer, and fall as described within the ITP (Table 2). Some turbines were non-operational for a portion of the study due to maintenance (Appendix A). From May 15 through May 30, 2024, curtailment was not applied correctly, resulting in all 29 turbines, designated as "summer risk" turbines in the HCP, operating under manufacturer's cut-in speed. The curtailment implementation issue was resolved by the night of May 30, 2024 (Appendix A). Non-operational and missed curtailment turbines were accounted for in the analysis.

Table 1. Phases, turbines, and operational dates of the Headwaters II Wind Farm, Randolph County, Indiana.

Phase	Turbine Type	Number of Turbines	Commercial Operational Date	Hub Height (m)	Blade Diameter (m)
I	Vestas V136 3.6-MW	13	2021	105	67
II	Vestas V150 4.2-MW	36	2021	105	74

m = meter; MW = megawatt.

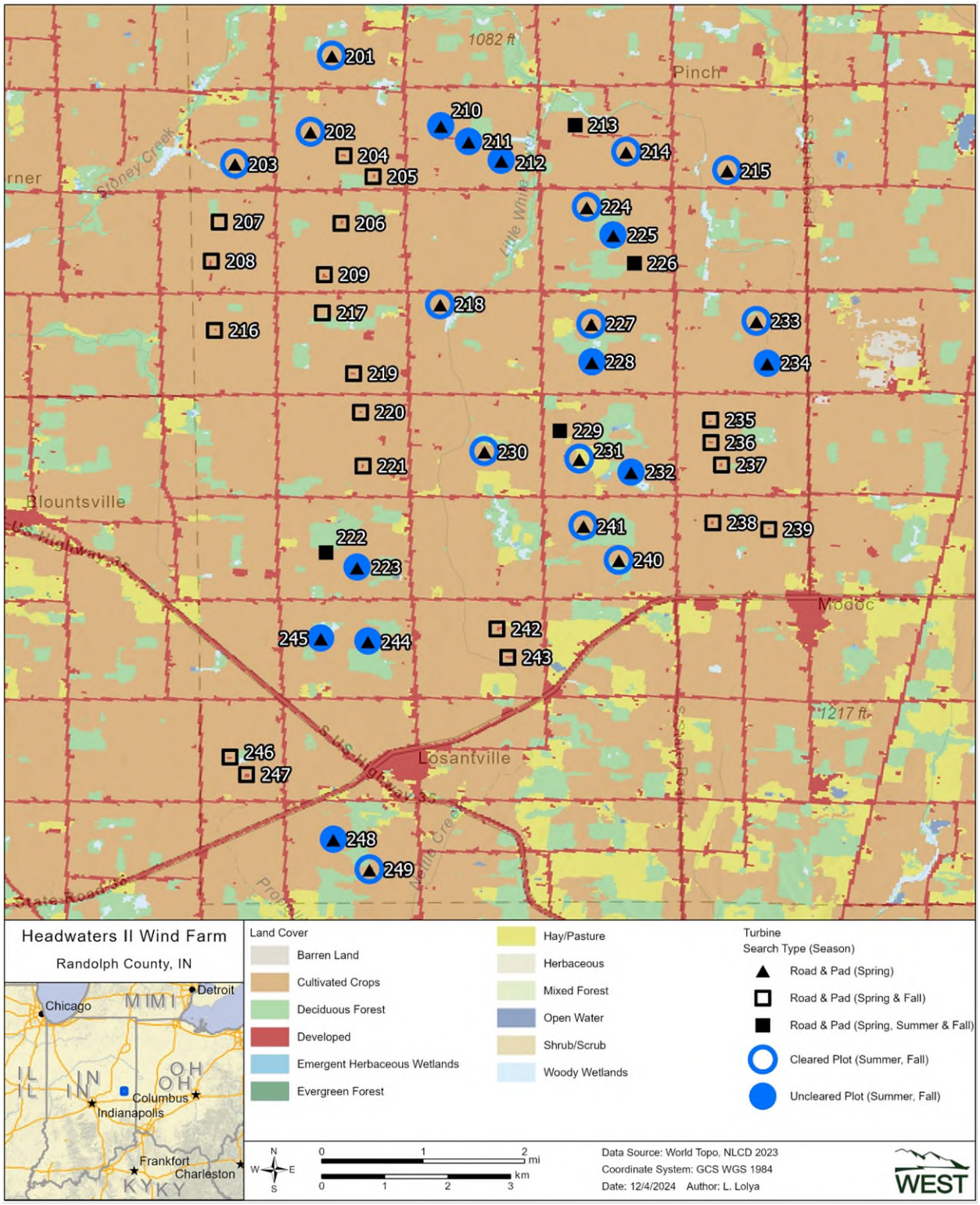


Figure 1. Turbines, by plot type, and surrounding land cover at the Headwaters II Wind Farm, Randolph County, Indiana. **Turbine 247 was not surveyed in the spring due to maintenance.*

Table 2. Seasonal turbine operations regime at the Headwaters II Wind Farm, Randoph County, Indiana.

Season	Turbines	Time of Day	Cut-In Speed	Feathering Below Cut-In?[1]	Temperature Threshold[2]
Spring (April 1 – May 15)	All	0.5 hour before sunset to 0.5 hour after sunrise	Manufacturer's cut-in speed[3]	Yes	10°C
Summer (May 16 – July 31)	20[4]	0.5 hour before sunset to 0.5 hour after sunrise	Manufacturer's cut-in speed[3]	Yes	None
	29	0.5 hour before sunset to 0.5 hour after sunrise	5.0 m/s	Yes	None
Fall (August 1 – October 15)	All	0.5 hour before sunset to 0.5 hour after sunrise	5.0 m/s	Yes	10°C
Winter (October 16 – March 31)	All	Normal turbine operation			

1. Feathering means turbine blades were pitched into the wind such that they spin at less than approximately one rotation per minute.
2. Turbines were feathered below cut-in when temperatures are above 10 degrees Celsius (°C).
3. The manufacturer's cut-in wind speed is 3.0 meters/second (m/s) across all Project turbines.
4. These turbines are >1,000 feet from woodlots and not considered to be turbines with summer risk to Covered Species.

METHODS

Western EcoSystems Technology, Inc. (WEST), used Project-specific data from the previous post-construction monitoring study at the Project (see McAlexander and Byrd 2023) to develop a study plan that targeted a probability of detection (*g*) of 0.25 (McAlexander et al. 2024). A study plan detailing the 2024 monitoring protocols was submitted by WEST to the USFWS by Jan 31, 2024, and received approval March 8, 2024 (J. Wieringa, USFWS, pers. comm.).

Standardized Carcass Searches

Number of Turbines Sampled, Search Frequency, and Plot Size

Human technicians and detection-dog teams (consisting of one dog trained to detect carcasses and one handler) conducted standardized carcass searches (carcass searches) from April 1 – October 15, 2024. Search effort varied by season (Table 3, Figure 1), and was designed to maximize effort when the greatest number of Covered Species were expected to occur.

Table 3. Search effort, by season and plot type, at Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season	Plot Type	Search Interval (days)	Number of Turbines	Search Team
Spring (April 1 – May 15)	100-m road and pad	7.0	48	Technician
Summer (May 16 – July 31)	100-m road and pad	3.5	4	Technician
	80-m cleared plot	7.0	14	Detection-dog team
	80-m uncleared plot	7.0	11	Detection-dog team
Fall (August 1 – October 15)	100-m road and pad	3.5	24	Technician
	80-m cleared plot	7.0	14	Detection-dog team
	80-m uncleared plot	7.0	11	Detection-dog team

m = meter.

A technician searched the gravel road and pad areas (road and pad plots) under 48 of the 49 total turbines to a distance of 100 m from the turbine every week during the spring (Table 4). Turbine 247 was not searched in the spring due to ongoing maintenance.

During the summer, turbines designated as summer risk turbines (29 turbines; Headwaters II Wind Farm, LLC, 2022) were searched. A detection-dog team searched 14 turbines with summer risk as cleared plots and 11 as uncleared plots with an 80-m radius once a week. A technician searched four road and pad plots to a distance of 100 m from the turbine, twice weekly.

All turbines were searched during the fall (Table 3). A technician searched 24 turbines as road and pad plots to a distance of 100 m from the turbine twice a week (Figure 2). Detection-dog teams searched 14 turbines that were regularly mowed with an 80-m radius (80-m cleared plots; Figure 3) and 11 turbines as uncleared plots with an 80-m radius (80-m uncleared plots; Figure 4) weekly.

Vegetation at the 80-m cleared plots was mowed and maintained by Project staff within 10–15 centimeters in height to enhance detectability of carcasses. Uncleared plots were vegetated with soybeans (*Glycine max*) or grass (*Festuca* spp.) and had approximately three transects mowed in a linear star pattern, 1.5 m wide, to assist detection-dog teams with plot access while reducing overall crop damages.

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

Photograph credit: Ross Bailey.

Figure 3. Detection-dog team Kristen VanNess and Quill (detection dog) performing a cleared plot search at the Headwaters II Wind Farm, Randolph County, Indiana.

Photograph credit: Ross Bailey.

Figure 4. Representative photograph of vegetation conditions of an uncleared plot at the Headwaters II Wind Farm, Randolph County, Indiana.

Photograph credit: Whitley Felver.

Search Methods

WEST used two types of search methods: a technician, or human-only visual search, and a detection-dog team, or olfactory search, where the team consisted of one technician/handler and one dog. All personnel were trained to follow the Project's study plan, including proper handling and reporting of carcasses. Carcass searches were conducted during the day, beginning as early as first light.

Road and Pad Searches—Technician Searches

Technicians walked transects spaced five m apart at a rate of approximately 45–60 m per minute on all road and pad plots within 100 m of the turbine. The technicians scanned the area for carcasses on both sides of the transects out to approximately 2.5 m to ensure full visual coverage of each search area. Technician searches were only conducted on road and pad plots.

Plot Searches—Detection-dog Teams

Detection-dog teams searched 80-m full plots (including both uncleared and uncleared 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, as well as crop row direction and density (when applicable). Handlers oriented the detection dog to start searches perpendicular to the wind to maximize scent detection. Both windspeed and crop density 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 with vegetation density and wind speed, ranging from 5–10 m apart in densely vegetated areas, to 10–15 m in shorter vegetation. Detection dogs were rewarded with either a food reward or a short play session when they correctly alerted to a bird or bat carcass.

Detection-dog Team Evaluation

Detection dogs were considered candidates for carcass searches if they met basic temperament and obedience criteria and demonstrated the trainability to detect bat and/or bird 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 or directly with dehydrated 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 10 blind trial lineups using bat carcasses, the dog and handler were evaluated in the field to measure their performance. The detection dog coordinator conducted a 2-day field evaluation of each detection-dog team; after teams achieved a searcher efficiency of 75% or greater for 15–30 bats placed during blind evaluation trials, the teams were approved to conduct carcass searches. Because the objective of the study was to focus on detecting bat carcasses, dogs were not explicitly trained on native bird carcasses; however, all detection dogs alerted on bird carcasses in the field, and handlers rewarded bird finds in the field to encourage future alerts to bird carcasses. Both detection dogs were golden retrievers.

Data Collection

Technicians recorded the date, start and end times, technician name, turbine number, type of search, and if any fatalities were found for each scheduled search. When a carcass was found, technicians placed a flag near it and continued the search. After searching the entire plot, the technician returned to record information for each carcass on a data sheet, including the date and time, species, sex and age (when possible), technician name, turbine number, measured distance from turbine, azimuth from turbine, location of carcass using geographic coordinate system (latitude and longitude), habitat surrounding 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 is complete, not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.
- Scavenged—an entire carcass that shows 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 has been heavily infested by insects.
- Dismembered—a carcass 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 found alive.

For bird carcasses, the following category was also used:

- Feather spot—10 or more feathers (excluding down), or two or more primary feathers at one location indicating predation or scavenging of a bird carcass.

Technicians took digital photographs 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 (ESPER0025999), WEST's Federal Native Endangered and Threatened Species Recovery Permit (ES234121-10), and WEST's State Scientific Collection Permit (2263). Technicians placed each bat carcass in a re-sealable plastic bag labeled with a unique carcass identification number, turbine number, and date, for storage 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. Live, injured bats were recorded and considered fatalities for analysis purposes when observed in search areas and were left in place in accordance with permit conditions.

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.

Carcass Identification and Agency Notification

Identification of bird carcasses were verified by biologists with significant field experience in identification of birds and their feathers. Federally permitted bat biologists identified all bat carcasses via photographs throughout the survey period, or in hand at the end of the surveys. The USFWS and the Indiana Department of Natural Resources were notified within 24 hours of positive identification of any state- or federally listed species.

Tissue samples collected from heavily scavenged or decomposed carcasses that could not be positively identified and had potential to be a Covered Species were submitted to a USFWS-approved laboratory, East Stroudsburg University Wildlife Genetics Institute, for identification. 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 forearms measured > 42 millimeters) were identified to the closest genus or group possible and were not sent off for further identification. Bat carcasses, or representative hair/tissue samples from individual carcasses, are to be delivered to the Illinois Natural Heritage Database repository (J. Wieringa, USFWS, pers. comm.) by January 31, 2025.

Bias Trials

Searcher Efficiency Trials

The objective of the searcher efficiency trials was to estimate the probability that a carcass was found by searchers. Searcher efficiency trials were conducted in the same areas where carcass

searches occurred. Technicians and detection-dog teams conducting carcass surveys 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 on site. Some carcasses had been placed in a freezer and later thawed for use in searcher efficiency trials, and others were refrigerated (i.e., fresh) prior to use. Fresh carcasses were utilized in the fall season, when carcasses were more readily available for trials. For spring and summer, carcasses were kept frozen until the trial dates occurred.

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 secured around the upper forelimb for identification as a study carcass. Carcasses 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 prior to the next search to allow time for the scent to pool and disperse prior to scheduled searches and to eliminate a direct scent trail. For technician trials, the trial administrator placed carcasses prior to searchers' arrival at a plot, either the night before or the morning of searches, depending on work schedules. No more than two carcasses were placed on a plot during a given trial.

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 search were recorded, and the number of trial carcasses available for detection was determined immediately after each trial by the person responsible for distributing the carcasses.

Carcass Persistence Trials

The objective of carcass persistence trials was to estimate the average probability a carcass would persist, or be available for detection, in the field, given the search interval. Carcasses could be removed by scavenging or rendered undetectable by typical farming activities. Trial carcasses were placed in each season and plot type to incorporate the effects of varying weather and scavenger densities on carcass persistence. No more than three trial carcasses were placed on a plot to avoid potential over-seeding and attracting scavengers.

Technicians 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, then on days 7, 10, 14, 21, and 30. Ninety-two carcasses used to test searcher efficiency were left in place and used for carcass persistence trials. No more than three trial carcasses were placed on a plot to avoid potential over-seeding and attracting scavengers. Trial carcasses were monitored until they were completely removed, or the trial period ended. Detection-dog teams were used on the 80-m cleared and uncleared plots to determine when carcasses were removed, while technicians determined the status of carcasses placed on 100-m roads and pads.

Search Area Mapping

Technicians recorded the boundaries of 100-m roads and pads and 80-m cleared plots using an Eos sub-meter Global Positioning System satellite unit. Unsearchable areas within plot

boundaries were also mapped. The plot boundaries were used to verify if carcasses were found inside the search areas and to inform the distribution of carcasses around turbines to estimate the number of carcasses that fell inside or outside of search areas.

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 field surveys, technicians were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the technician and/or Project Manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes and measures were implemented. A Microsoft® SQL database was developed to store, organize, and retrieve survey 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. EoA was used with data collected in the field to estimate the overall probability of detecting a bat fatality, the take rate of Covered Species, and the number of Covered Species carcasses that occurred. Data used in the EoA model included number of Covered Species fatalities, the searched area adjustment ("DWP" in the software), the results of searcher efficiency and carcass persistence trials, the seasonal arrival distribution of bats (described below), and the detection reduction factor (*k*; described below).

Searcher Efficiency Estimation

Searcher efficiency was estimated separately for technicians and detection-dog teams to account for different modes of detection (i.e., technicians use sight, whereas dogs use scent). 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 strata such as season and/or plot type, we modeled searcher efficiency using logistic regression. Season was used as a potential covariate for technician models. Due to observable differences in detection in the field between fresh and thawed searcher efficiency trial carcasses for detection-dog teams, the trial condition (fresh versus thawed) and season were used as covariates in the initial detection-dog team models. For both technicians and detection-dog team models, model selection was completed using an information theoretic approach known as AICc, or corrected Akaike Information Criterion (Burnham and Anderson 2002). The best model was selected as the most parsimonious model within two AICc units of the model with the lowest AICc value. Searcher efficiency data 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 take estimates using EoA per the HCP.

Carcass Persistence Rate Estimation

Data collected during carcass persistence trials were used to estimate the probability carcasses remained available to be located by the searcher, given the search interval (i.e., the time between scheduled searches). The average probability a carcass persisted was estimated using an interval-censored survival regression with four potential distributions: exponential, log-logistic, lognormal, and Weibull distributions (Kalbfleisch and Prentice 2002, Dalthorp et al. 2018). As with searcher efficiency, carcass persistence models were estimated separately by search team type (i.e., plots searched by technicians versus plots searched by detection-dog teams) to account for different modes of detection. Season and plot search type were used as potential covariates for the detection-dog team models. Season was the only potential covariate for the technician models because technicians only searched road and pad plots. The best model was selected as the most parsimonious model within two AICc units of the model with the lowest AICc value. The parameter estimates of the selected model (α [shape] and β [scale], including the 95% confidence interval of β) 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 search area adjustment was estimated as the product of the proportion of 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-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 weights based on probability of detection and the proportion of area searched in each 1-m annulus around the turbine. Due to the variation in turbine sizes, separate search area adjustments were fit a priori for each turbine size. An additional model was fitted with area adjustment pooled across all turbines. Distributions considered were normal, gamma, Gompertz, and Weibull (parameterized according to R Development Core Team [2016] and Yee [2015]). Fitted models were checked for validity and excluded from consideration if the estimated variance was negative or infinite, if the statistical fitting algorithm returned indicated an error, or if the fitted distribution indicated less than 5% of carcasses within the maximum search radius (after Dalthorp and Huso 2023). The best model was selected using AICc after excluding invalid models.

Carcasses Excluded from Analysis

Fatalities were excluded from the analysis when the carcass was discovered outside of the spatial and temporal scope of the survey design. For example, carcasses found outside a designated plot were not included in the analysis because the TWL fitting procedure accounts for unsearched areas. Carcasses found prior to the start of surveys (e.g., a carcass found on a plot in the spring that was estimated to have died prior to April 1) were also excluded because the carcass occurred outside of the study period. Note that carcasses found on a plot incidentally (e.g., found by

maintenance personnel) were included in the analysis if that plot had a scheduled search in the future, but within the same season. If a fatality of a Covered Species had been found outside of the spatial or temporal scope of the survey design, it would still be excluded from the search area adjustment but would be included in the EoA fatality estimate following Dalthorp et al. (2020).

Covered Species Take and Detection Probability Estimates

EoA was used to estimate the median cumulative take to-date (*M**), mean annual take rate (λ), summer annual take rate (λ), evaluate the probability that the estimated take rate (λ) exceeded the expected take rate (τ) for the Covered Species, and evaluate if the cumulative take estimate has exceeded the permitted take (T). Estimates were calculated using the EoA method (Dalthorp et al. 2017), using the Single Class, Multiple Class, and Multiple Years modules of EoA.

The *g* was estimated using the bias corrections for searcher efficiency, carcass persistence, and search area, as well as the assumed seasonality of risk the Covered Species. The seasonal risk was used to weight the contributions of detection probability from different seasons in the overall *g* estimate. Differences in the level of turbine operations within (e.g., turbines down for maintenance for extended periods within a season and cut-in speeds) and across seasons (e.g., reduced summer risk) were also accounted for, as described below.

The study period was separated into search strata, where each search stratum was defined by a number of turbines and a length of time. Within each search stratum, all of the bias corrections were the same. For example, in spring, all road and pad searches at 3.6-MW turbines had the same searcher efficiency, carcass persistence, and search area. The EoA Single Class module was used to estimate the detection probability in each search stratum. This resulted in alpha (α) and beta (β) parameters that defined the beta distribution of detection probability in each stratum.

Each search stratum potentially had a different number of turbines and turbine operations, and a different amount of risk to the Covered Species (i.e., arrival proportion) compared to other search strata. We calculated weights for each strata in order to calculate an overall probability of detection. For example, a search stratum with five turbines had less weight than a search stratum with 15 turbines. The EoA Multiple Class module was used to combine detection probability distributions across strata. In the software, stratum weights are called “DWP.” The module was used three times, first to combine plot search type strata within each subseason (i.e., for summer 1, 80-m cleared plots, 80-m uncleared plots, and roads and pads), second to combine subseason strata within season strata, and finally to combine season strata within the study period.

The weights for combining the plot search type strata within each subseason were the within-season sampling fraction (i.e., the proportion of turbines in fall 1 that were searched as roads and pads) multiplied by the relative operation of turbines (i.e., the proportion of fall 1 road and pad turbines that were operating) and the minimization weight (i.e., the relative risk present when curtailment was not occurring as expected during the summer). Any turbines with low search effort within any subseason were part of an “unsearched” stratum, and the beta distribution parameters

were set to Ba = 0.01 and Bb = 1,000 (a detection probability of 10^{-5}). The weights were standardized to sum to one within each subseason.

Bat fatality is consistently higher in the fall compared to other seasons (Arnett et al. 2008, Lloyd et al. 2023). Therefore, it was important to account for differing amounts of risk by season. Differing risk by season, for spring, summer, and fall were based on the carcass arrival proportions from the Midwest Wind Energy Multi-Species HCP (USFWS 2016): 7% in spring, 36% in summer, and 57% in fall. Summer turbine operations were discounted by 40.8% because 29 (59.2%) of the Project turbines pose risk to Covered Species in the summer. Arrival weights for subseasons within seasons were calculated proportional to the number of days in each subseason relative to the entire season. The weights for combining season strata were carcass arrival proportions (Table 4) multiplied by relative operation of turbines ("Operation Weight") and by the proportion of turbines that posed risk ("Turbine Risk Weight") and by the relative risk present when curtailment was not occurring ("Minimization Weight"). The weights were standardized to sum to one across seasons ("Weight (DWP)").

Table 4. Seasonal arrival proportions for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024, adjusted based on the number of turbines considered to have risk in each season, and differing amounts of turbines that were non-operational in each season.

Season	Seasonal Arrival Proportion	Operation Weight	Turbine Risk Weight	Minimization Weight	Weight (DWP)[1]
Spring	0.07	1	1.00	1.00	0.08
Summer	0.36	1	0.59	1.06	0.26
Fall	0.57	1	1.00	1.00	0.66

1. The DWP is the fraction of carcasses expected within the stratum.

Each year of the study potentially had different impacts to the Covered Species depending on the operation of the turbines. Inoperable turbines were considered to have no chance of killing bats, therefore, a relative turbine operations weight was used to combine detection probability distributions across strata and is defined as the fraction of nights when turbines operated. Given that turbines at every project undergo routine maintenance, starting with 2022, operations were considered normal unless the proportion of operational turbines was less than 0.9 during the study period.

During the summer season, specifically from May 15 through May 30, 2024, curtailment at summer risk turbines (Figure 1) was not implemented properly. Turbines were curtailing below manufacturer's cut-in speed instead of below the raised cut-in speed of 5.0 m per second (m/s). To account for the increased risk relative to a typical year, a minimization weight was used. Per the HCP, a 50% reduction in fatalities is expected when turbines are curtailing below 5.0 m/s when compared to normal operations. Therefore, the minimization weight was calculated by multiplying the proportion of turbine days in each stratum that were not implementing curtailment by 50%.

The Multiple Years Module was used to estimate the site-wide, cumulative detection probability in 2022–2024. The EoA Multiple Years Module weighted the years using the turbine operation

weight and, in the case of 2024, the minimization weight for that year. In the software, the year weights were called ρ. To evaluate the short-term (general) trigger and the summer short-term (summer) trigger, ρ was calculated separately for the entire study period and for the summer period alone. Since ITP monitoring did not begin until partway through the spring of 2022, and significant turbine downtime occurred throughout the year, the value for ρ in 2022 was set to 0.92. The value for ρ was 1.00 in 2023 because the full risk period was surveyed and there was no significant turbine downtime. Since the curtailment regime was not implemented properly for part of the study, more risk to bats occurred relative to a normal year, and ρ was set to 1.06 in 2024 for the entire period.

The results from the Multiple Years Module (Ba and Bb parameters for the detection probability for the permit term to date) were used to estimate:

- M^* (the median cumulative take over the life of the permit)
- λ *summer* (the underlying annual take rate over the past three summer monitoring periods) and its 90% credible interval (CrI)
- λ *general* (the underlying annual take rate over the past three monitoring periods) and its 90% CrI
- the probability that λ *general* > τ, where τ is the authorized take number divided by the number of years in the permit
- the probability that the λ *summer* > τ, where τ is the authorized take number divided by the number of years in the permit
- the probability that $M^* \geq T$, where M^* is the median cumulative take estimate and T is the permitted amount of take for each species

Appendix E describes how the compliance metrics were calculated using the EoA Graphical User Interface.[1]

Adaptive Management Triggers

The estimates from the EoA analysis were used to test three types of adaptive management triggers: a short-term (general), short-term (summer), and a long-term test. The short-term (general) trigger tests whether the average annual estimated take rate for the Project as a whole exceeded the expected take rate. The short-term (summer) trigger test focuses on the average summer take rate at the 29 turbines operating under summer curtailment and is intended to prevent the effect of take on maternity colonies from being greater than anticipated. The long-term trigger tests whether the permitted level of take has been met based on the cumulative estimate take using the median of M^* (Dalthorp and Huso 2015). The short-term (general), short-term (summer), and long-term triggers were tested individually for each of the Covered Species.

[1] There may be very minor differences between screen shots (Appendix F) and the results in the main text because EoA is a stochastic estimator, leading to slightly different estimates each time the modules are run.

Evidence of Absence Short-term (general) Trigger

The EoA short-term (general) trigger is designed as an early warning signal that the Project may be on the path to exceeding permitted take (T) by the end of the permit term. The short-term trigger is designed to determine if an adaptive management response is needed to prevent the *M** from actuating a response to the long-term trigger test. The short-term trigger tests if the estimated $\lambda_{general}$ exceeded the expected take rate (τ = T ÷ years in permit) at a confidence level of α = 0.05, per the HCP. The Project's short-term trigger is designed to evaluate a rolling window of six years of post-construction monitoring data. If, within any 6-year rolling window, the estimated take rate exceeds the expected take rate with 95% confidence, the short-term trigger would be met, indicating the minimization plan in the HCP may need to be adjusted to ensure that the median cumulative take estimate (*M**) remains within the permitted limit over the ITP term, or the ITP take limit should be amended. Three years of data (2022, 2023, and 2024) were used in this analysis.

Evidence of Absence Short-term (summer) Trigger

The EoA summer short-term (summer) trigger is the same as the short-term (general) trigger, except that it is conditional on finding Covered Species carcasses during summer and informed by compliance monitoring data collected during the summer at the 29 turbines designated for curtailment. The trigger is scaled to reflect the proportion of fatalities expected during the summer (May 16 – July 31) period (25.1%; Section 5.4.3.1.2 of HCP). Thus, 11.96 Indiana bat and 3.11 northern long-eared bat were predicted to be taken annually with minimization, and 3.00 Indiana bat and 0.78 northern long-eared bat were expected annually during the summer. The rolling window was also set at six years for this trigger to include at least one year of monitoring data to inform lambda estimate in any given window. If estimates exceed λ_{summer} with 95% confidence (α = 0.05), the summer trigger will be met. Three years of data (2022, 2023, and 2024) were used in this analysis.

Evidence of Absence Long-term Trigger

The EoA long-term trigger is designed to test if *M** is equal to or greater than the permitted take (T). Per the HCP, *M** was estimated at a confidence level of α = 0.5 (using the median, or 50th credible bound, of the posterior distribution of estimated fatality). If *M** at α = 0.5 is less than the total permitted take (*M** < T), then no changes are necessary. If the cumulative take, to date, at α = 0.5 is greater than or equal to the total permitted take (*M** ≥ T), then the take limit has been met and the Project must enact avoidance measures.

RESULTS

Standardized Carcass Searches

A total of 1,450 searches were conducted during the spring, summer, and fall monitoring seasons; 31 searches (less than 2%) were missed due to turbine maintenance, weather constraints, and/or safety hazards (Appendix A).

One Covered Species (Indiana bat; six carcasses; federally listed as endangered) was found. Additionally, one tricolored bat (*Perimyotis subflavus*; proposed federally endangered; state-listed as endangered), five little brown bat (*Myotis lucifugus;* under review for federal listing; state-listed as endangered*)*, and six evening bat (*Nycticeius humeralis*; state-listed as endangered) carcasses were found (Table 5, Figure 5).

Five hundred seven bat carcasses and 114 bird carcasses were found during surveys and incidentally (Appendix B). The most commonly found bat species were eastern red bat (216 carcasses; 42.6%) and silver-haired bat (162; 32.0%), followed by big brown bat (62; 12.2%), and hoary bat (*Lasiurus cinereus*; 46; 9.1%; Appendix B). Six evening bats (1.2%), six Indiana bats (1.2%), five little brown bats (1.0%), two unidentified *Lasiurus* bats (0.4%), one tricolored bat (0.2%), and one unidentified bat (partial wing; 0.2%) were also found. (Appendix B).

Nineteen of these 507 bats were heavily scavenged (e.g., wing membrane only, bones, or partial carcasses) and were sent off for identification via deoxyribonucleic acid (DNA) analysis; five were identified as little brown bat, four were identified as big brown bat, three were identified as silver-haired bat, three were identified as eastern red bat, two were identified as evening bat, and one was identified as a hoary bat. One of the submitted samples resulted in an inconclusive DNA analysis due to the heavily degraded condition of the field collected DNA sample. Four of the six Indiana bats underwent DNA analysis to verify species and gender. DNA testing resulted in a positive identification for all the suspected Indiana bat carcass samples submitted. The remaining two Indiana bat carcasses were found in good condition and identified and sexed in the field by a permitted bat biologist (Aaron McAlexander; TE33467D-0).

Table 5. Covered Species of bats found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Species	Sex	Date Found	Estimated Time of Death	Season Found	Location[2]	Turbine	Plot Type	Summer Risk Turbine?	Distance From Turbine (m)
Indiana bat[1]	male	6/21/24	2–3 days	Summer	40.0899, -85.17919	218	Cleared	Yes	20
Indiana bat[1]	female	8/19/24	0–1 day	Fall	40.09573, -85.15127	226	Road and Pad	Yes	36
Indiana bat[1]	female	9/4/24	0–1 day	Fall	40.08691, -85.15837	227	Cleared	Yes	47
Indiana bat[1]	female	9/9/24	4–7 days	Fall	40.08689, -85.1585	227	Cleared	Yes	60
Indiana bat[1]	female	9/15/24	4–7 days	Fall	40.06746, -85.15907	231	Cleared	Yes	68
Indiana bat[1]	female	9/30/24	0–1 day	Fall	40.07193, -85.16256	229	Road and Pad	Yes	17

1. Indiana bats are federally listed as endangered and are a Covered Species of the Habitat Conservation Plan.

2. Location represents latitude and longitude in decimal degrees (North American Datum 83).

m = meters.

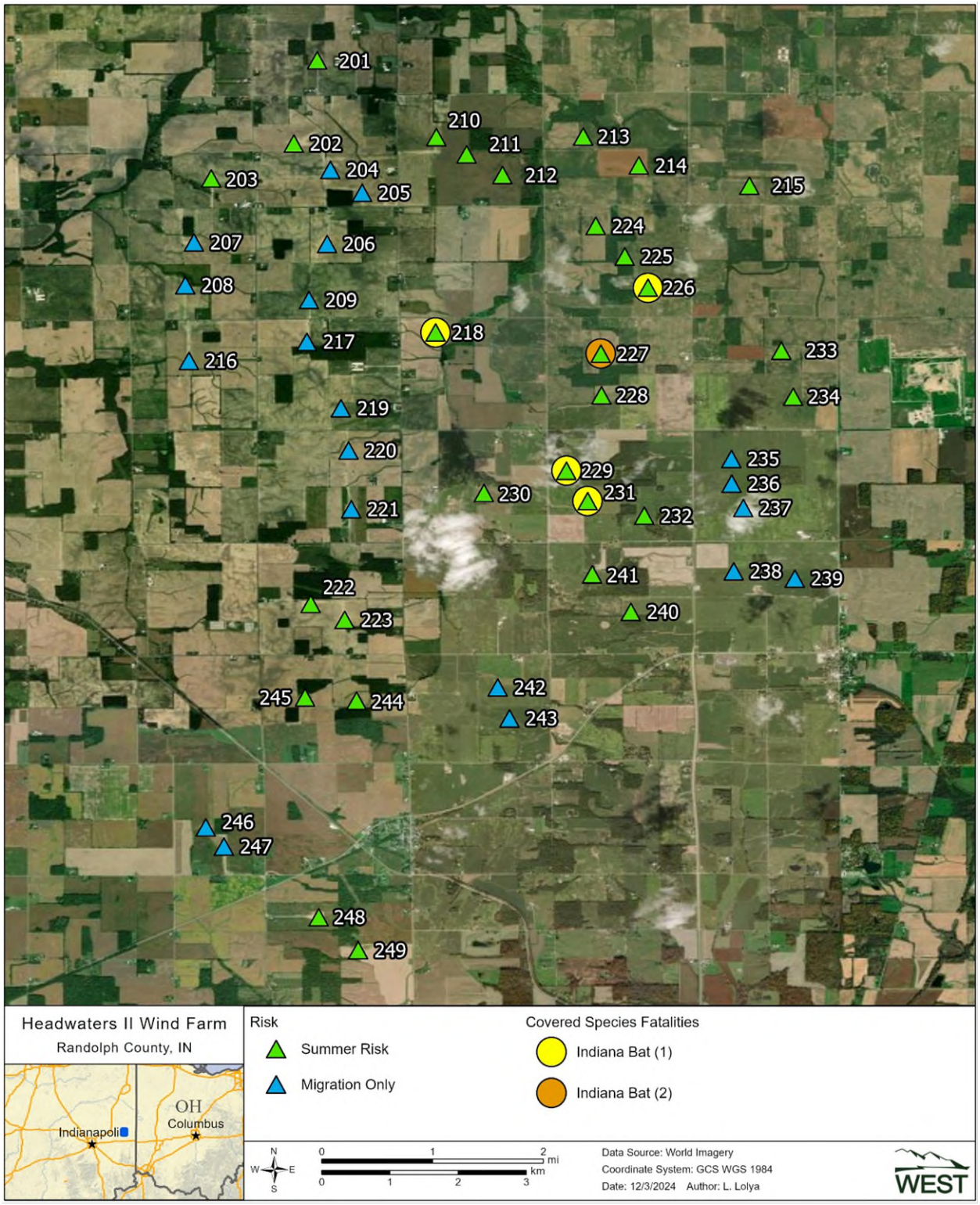


Figure 5. Location of Covered Species carcasses in relation to summer risk turbines at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Statistical Analysis

Bias Trials

Searcher Efficiency Trials

Eighty-nine bats were placed for searcher efficiency trials on 14 separate dates, and 75 were available for search teams to find across all plot types. The best-fit model for searcher efficiency for detection-dog teams did not support the inclusion of plot type as a covariate, meaning there was not a statistically meaningful difference between searcher efficiency rates on uncleared and cleared plots between seasons (Appendix C). The best-fit model for searcher efficiency for technician searchers did not support the inclusion of season as a covariate, meaning there was not a statistically meaningful difference between searcher efficiency rates across seasons (Appendix C). The top model included trial condition as a significant covariate, thus final model selection for the detection-dog team models was completed using only fresh searcher efficiency trials with plot type as a potential covariate. Overall searcher efficiency rates were approximately 93% for roads and pads searched by technicians and 80% on full plots searched by detection-dog teams (Table 6).

Table 6. Searcher efficiency results by plot type at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season	Plot Type	Carcass Type	Number Placed	Number Available	Number Found	% Found**
Spring	Road and pad	Frozen	17	14	14	100
Summer	Road and pad	Frozen	16	15	15	100
	Cleared plot*	Frozen	16*	16*	11*	69*
	Uncleared plot*	Frozen	15*	14*	13*	93*
Fall	Road and pad	Frozen & Fresh	19	16	13	81
	Cleared plot	Frozen	15	10	4	40
	Uncleared plot	Frozen	15	11	6	55
	Cleared plot	Fresh*	21	16	13	81
	Uncleared plot	Fresh*	16	14	11	79
Overall Full Plots (Cleared and Uncleared)		**Fresh***	**37**	**30**	**24**	**80**
Overall Road and Pads		**Frozen & Fresh**	**52**	**45**	**42**	**93**
Overall Used in Analysis		**–**	**89**	**75**	**66**	**88**

Uncleared and cleared plots were combined for analysis.

* Top model for detection-dog teams included only fresh searcher efficiency trials with plot type as a potential covariate. Only Fresh carcasses were used in analysis.

**Percentages are rounded to nearest whole number.

Carcass Persistence Trials

Ninety-two carcasses were placed to estimate carcass persistence. Season and plot search type were used as potential covariates for the detection-dog team models. Season was the only potential covariate for the technician models because technicians only searched road and pad plots. The best-fit model for carcass persistence rates on 80-m cleared and uncleared plots searched by detection dogs was based on a Weibull distribution with season as a covariate, which suggests carcass persistence varied by season (Appendix C). The best-fit model for carcass persistence on technician searched road and pad plots was based on a lognormal distribution

and did not support the inclusion of season as a covariate, meaning it was not a statistically meaningful difference between carcass persistence rates across seasons (Appendix C).

Average probability that a carcass persisted through a 7-day search interval in the spring season is 0.57 (90% confidence interval [CI]: 0.48–0.67) on road and pad plots. The average probability that a carcass persisted through a 7-day search interval is 0.73 (90% CI: 0.63–0.83) in the summer on full plots and 0.42 (90% CI: 0.29–0.58) in the fall on full plots. The average probability that a carcass persisted through a 3.5-day search interval in the summer and fall season is 0.71 (90% CI: 0.61–0.81) on road and pad plots (Figure 6; Appendix B.

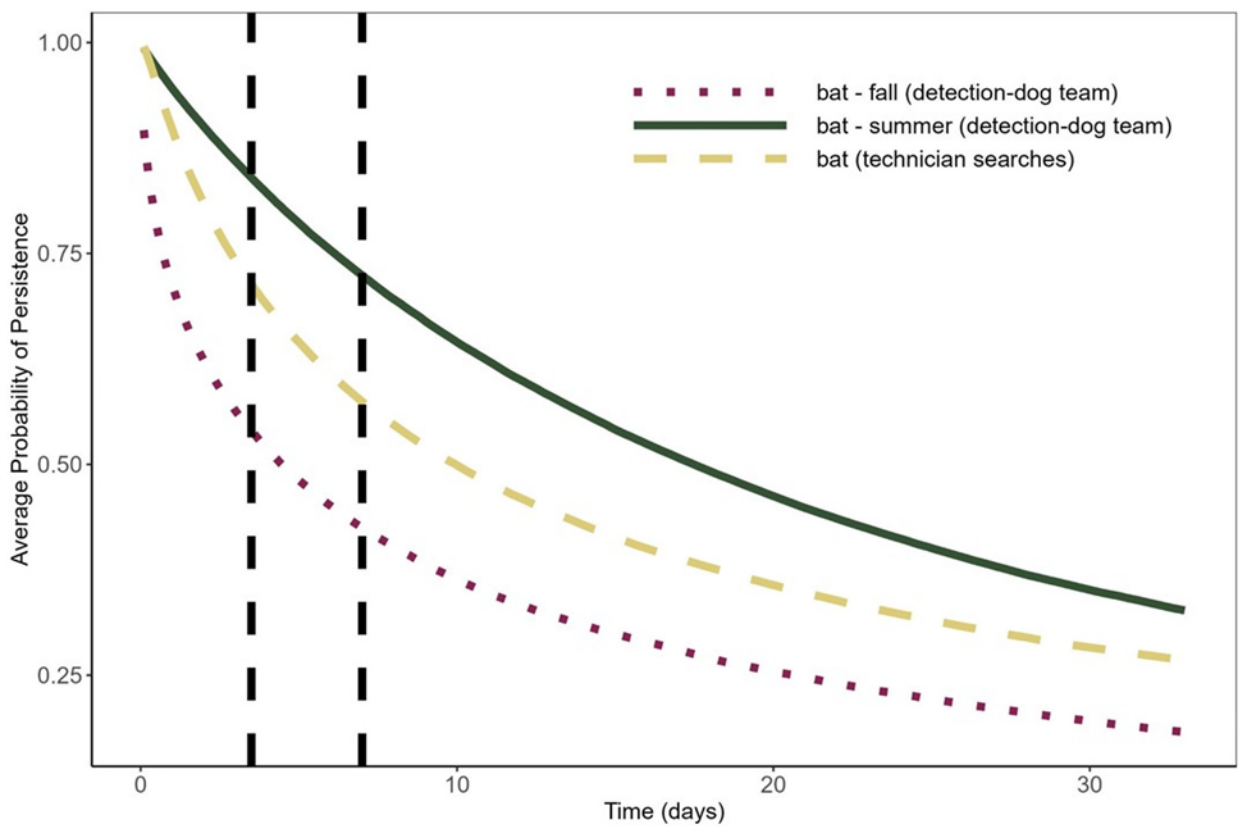


Figure 6. The average probability of persistence, in days, at different search intervals at Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024. Detection-dog teams searched 80-meter cleared and uncleared full plots and technicians searched 100-meter road and pad plots.

Note: The vertical dashed lines indicate the 3.5- and 7-day search intervals used in this study.

Search Area Adjustment

Twenty-five of the 507 bats found during the study period were excluded from modeling the search area adjustment for EoA. Six bat carcasses were excluded from analysis because they were found off plot. Another 19 bats were excluded because their estimated time of death was prior to the start of surveys (Appendix D).

Models of carcass distribution from the turbine base with the lowest AICc followed a Weibull distribution for 3.6-MW turbines and a Gompertz distribution for 4.2-MW turbines (Figures 7a and 7b; Appendix D). The TWL area adjustment for bats at 100-m road and pad plots was 0.16 for 3.6-MW turbines and 0.11 for 4.2-MW turbines. The TWL area adjustment for bats at full plots was 1.00 for both 3.6-MW turbines and 4.2-MW turbines (Table 7; Appendix D).

Table 7. Truncated weighted maximum likelihood search area adjustment estimates for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (Bat n = 482).

Search Area Type	Search MW	Number of Bats*	Distribution	Parameter 1	Parameter 2	Search Area Adjustment
80-m full plot	3.6	85	Weibull	2.1965	36.5295	1.00
80-m full plot	4.2	305	Gompertz	0.0565	0.0036	1.00
100-m road and pad	3.6	26	Weibull	2.1965	36.5295	0.16
100-m road and pad	4.2	66	Gompertz	0.0565	0.0036	0.11

* Number of bats included in the area adjustment analysis by plot type.

Number of turbines searched by turbine type and sample sizes by turbine type are provided in Appendix D.

m = meter; MW = megawatt.

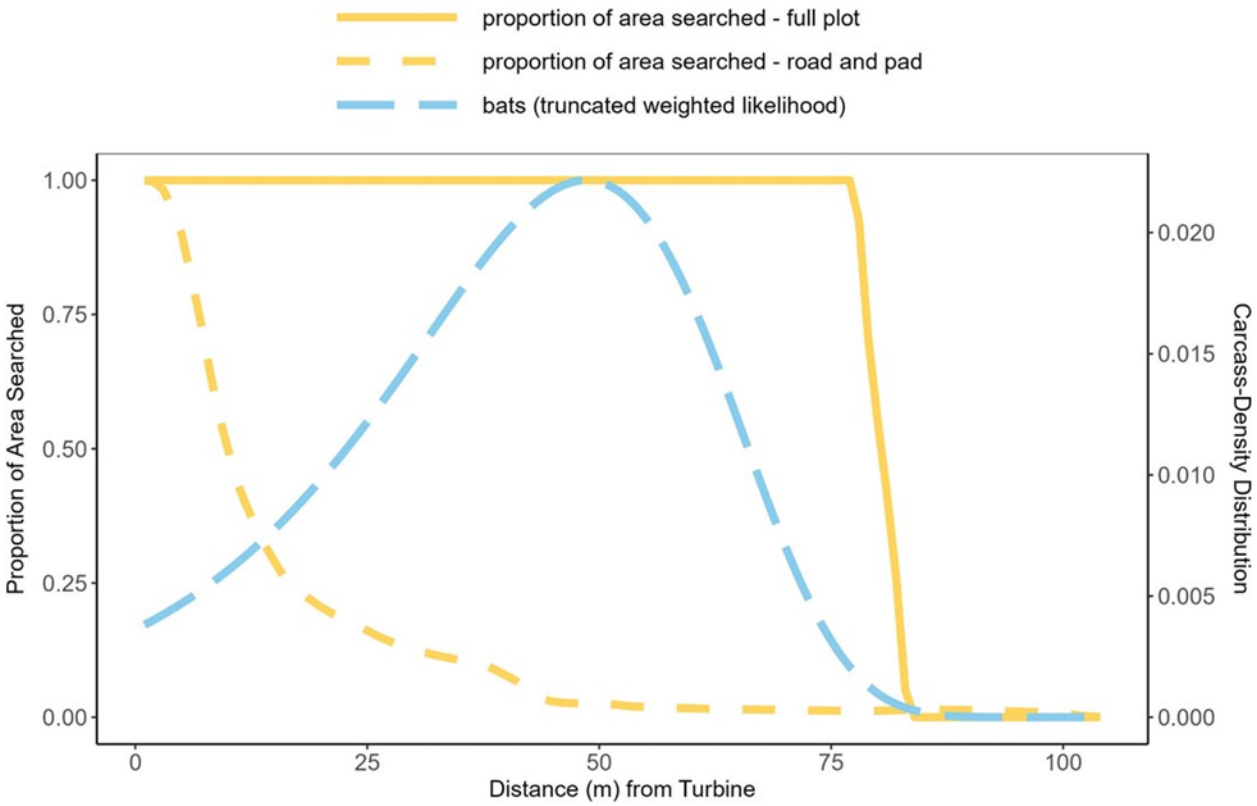


Figure 7a. Density of bat carcasses per area searched at all roads and pads and full plots (cleared and uncleared) for 4.2-MW turbines at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

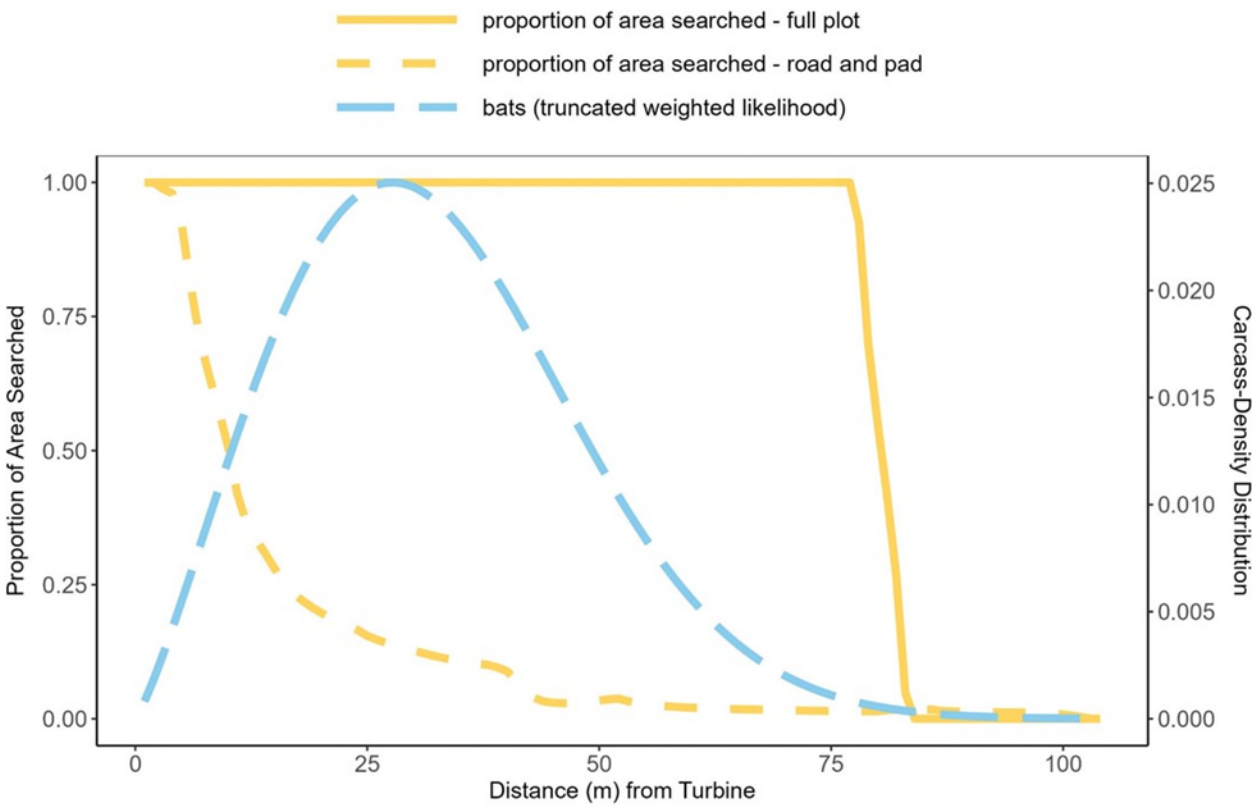


Figure 7b. Density of bat carcasses per area searched at all roads and pads and full plots (cleared and uncleared) for 3.6-MW turbines at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Covered Species Take Estimates

Six Indiana bat carcasses were found during the 2024 study. To date, 16 Indiana bats and zero northern long-eared bats have been found under the ITP. The annual probability of detection distribution achieved for the 2024 study period had a mean of 0.29 (90% CrI: 0.26–0.33; Table 8). Credible intervals are used with EoA since it is a Bayesian estimator, whereas confidence intervals provide a range of values based on sample data. 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 E.

Table 8. Inputs needed to run Evidence of Absence model to combine detection probability distributions across years: Multiple Years Module for the Headwaters II Wind Farm, Randolph County, Indiana, from 2022–2024.

					Carcass Count (X)	
Year[2]	Ba[1]	Bb[1]	*g* (90% CrI)[13]	ρ	INBA	NLBA
2022	293.12	660.05	0.31 (0.28–0.33)	0.92	4	0
2023	369.98	1155.91	0.24 (0.22–0.26)	1.00	6	0
2024	123.12	299.13	0.29 (0.26–0.33)	1.06	6	0
Short-term Trigger (Rolling Average)	584.83	1504.13	0.28 (0.26–0.30)	–	16	0
Long-term Trigger (Cumulative)	584.83	1504.13	0.28 (0.26–0.30)	–	16	0

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. For this study, data from the last three full study periods (spring 2022 – fall 2024) were used to evaluate the short-term trigger.
3. CrI = credible interval of *g*.

INBA = Indiana bat; NLBA = northern long-eared bat.

Mean annual take rates ($\lambda_{general}$) based on the combined 2022, 2023, and 2024 monitoring years were estimated to be 19.87 (90% CrI: 12.51–28.64) Indiana bats per year and 0.60 (90% CI: 0–2.31) northern long-eared bats per year (Table 9). The expected average annual take rates (τ) reported in the HCP were 11.96 Indiana bats per year and 3.11 northern long-eared bats per year.

Cumulative take under the ITP to date (2022, 2023, and 2024 monitoring years), *M*,* at α = 0.5 (50th credible bound), is estimated to be 57 Indiana bats and zero northern long-eared bats (Table 11). The total take permitted by the ITP is 359 Indiana bats and 93 northern long-eared bats over the 30-year permit term.

Adaptive Management Triggers

Evidence of Absence Short-term (general) Trigger

The short-term (general) trigger assesses the probability the estimated take rate, calculated from all monitoring years, to date, under the ITP, exceeded the expected take rate, $Pr(\lambda_{general} > \tau)$. At a 95% confidence level (α = 0.05), $Pr(\lambda_{general} > \tau)$ must be greater than or equal to 0.95 for the short-term (general) trigger to fire. For Indiana bat, $Pr(\lambda_{general} > \tau) = 0.96$, and northern long-eared bat, $Pr(\lambda_{general} > \tau) = 0.02$, the probability for Indiana bat exceeds 0.95, indicating the short-term (general) trigger was met for this species (Table 9, Figure 8).

Table 9. Probability the estimated take rates exceeded the expected take rates for studies conducted within the rolling average interval at the Headwaters II Wind Farm in Randolph County, Indiana, Incidental Take Permit Year 1 (2022), Year 2 (2023), and Year 3 (2024).

Species	Mean λ general (90% CrI[2])	Expected Take Rate (τ)	Pr(λ > τ)[1]	Short-Term (general) Trigger Fires at α = 0.05?
Indiana bat	19.87 (12.51–28.64)	11.96	0.96	Yes
northern long-eared bat	0.60 (0–2.31)	3.11	0.02	No

1. Pr($\lambda_{general} > \tau$) 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 (i.e., α = 0.05 for a 1-sided test), then no adaptive management is triggered because there is not sufficient evidence that the estimated annual take rate is greater than the expected annual take rate.
2. CrI = credible interval.

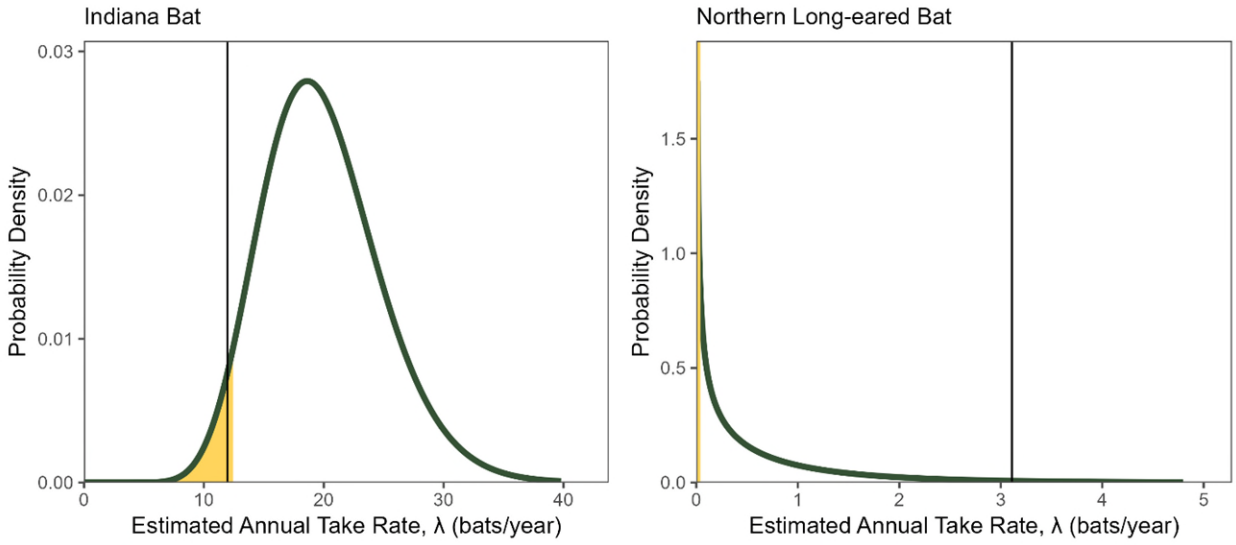


Figure 8. Estimated general take rates (λ), in bats per year at Headwaters II Wind Farm, Randolph County, Indiana, Incidental Take Permit Year 1 (2022), Year 2 (2023), and Year 3 (2024).

Note: The yellow region of the posterior distributions shows the region of the lower 5% quantile of the distributions (yellow region may not be visible when the posterior distribution is skewed heavily toward zero). The vertical line marks the expected take rate. The short-term (general) trigger evaluates whether the vertical line falls within or to the left of the yellow region of the posterior distributions. For Indiana bat, the short-term (general) trigger was met because the vertical line (expected take rate) was within or to the left of the yellow regions. In other words, the probability that estimated take rate was greater than the expected take rate exceeds 95%.

Evidence of Absence Short-term (summer)Trigger

The short-term (summer) trigger assesses the probability that the estimated summer take rate (λ_{summer}), calculated from all monitoring years to date under the ITP, exceeded the expected summer take rate, $Pr(\lambda_{summer} > \tau_{summer})$. At a 95% confidence level ($\alpha = 0.05$), $Pr(\lambda_{summer} > \tau_{summer})$ must be greater than or equal to 0.95 for the short-term (summer) trigger to fire. For Indiana bat, $Pr(\lambda_{summer} > \tau_{summer}) = 0.22$, and for northern long-eared bat, $Pr(\lambda_{summer} > \tau_{summer}) = 0.18$ (Table 10). Neither probability meets or exceeds 0.95, indicating the short-term (summer) trigger was not met and no adaptive management actions are required as described within the HCP (Table 10, Figure 9).

Table 10. Probability the estimated summer take rates exceeded the expected take rates for studies conducted within the rolling average interval at the Headwaters Wind II Farm, Randolph County, Indiana, Incidental Take Permit Year 1 (2022), Year 2 (2023), and Year 3 (2024).

Species	Mean λ (90% CrI)	Expected Take Rate (τ)	Pr (λ > τ)[1]	Short-Term Trigger Fires at α = 0.05?
Indiana bat	2.15 (0.49–4.77)	3.00	0.22	No
northern long-eared bat	0.43 (0–1.65)	0.78	0.18	No

[1] Pr ($\lambda_{summer} > \tau$) reads, "the probability that λ (the summer take rate) is greater than τ (the expected summer take rate based on the total permitted take, used as a threshold for adaptive management)." If this probability is less than 0.95 (i.e., α = 0.05 for a 1-sided test), then no adaptive management is triggered because there is not sufficient evidence that the estimated summer take rate is greater than the expected summer take rate.

CrI = credible interval.

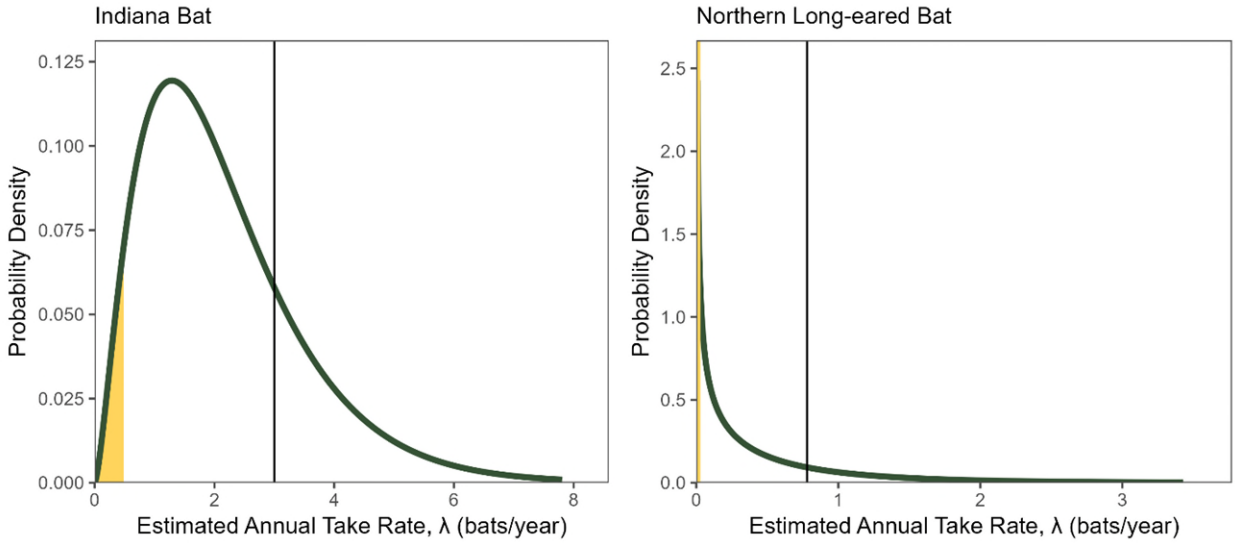


Figure 9. Estimated summer take rates (λ), in bats per year, at Headwaters II Wind Farm, Randolph County, Indiana, Incidental Take Permit Year 1 (2022), Year 2 (2023), and Year 3 (2024).

Note: The yellow region of the posterior distributions shows the region of the lower 5% quantile of the distributions (yellow region may not be visible when the posterior distribution is skewed heavily toward zero). The vertical line marks the expected take rate. The short-term (summer) trigger evaluates whether the vertical line falls within or to the left of the yellow region of the posterior distributions. For both species, the short-term (summer) trigger is not met because the vertical line (expected take rate) is not within or to the left of the yellow regions. In other words, the probability that estimated take rate is greater than the expected take rate does not exceed 95%.

Evidence of Absence Long-term Trigger

The estimated cumulative take to date, M^* at $\alpha = 0.5$ (50^{th} credible bound), is below the total permitted take for both Covered Species (Table 11). The long-term trigger was not met, and the Project is in compliance for both species because $M^* < T$ for both species. Therefore, an avoidance response is not required.

Table 11. Cumulative take estimates (*M) to date using Evidence of Absence for studies conducted within the Incidental Take Permit (ITP) term, to date, at Headwaters II Wind Farm, Randoph County, Indiana, from ITP Year 1 (2022), Year 2 (2023), and Year 3 (2024).**

Species	Cumulative Take (M*)	Permitted Take (T)	Long-term Trigger Fires at α = 0.5?
Indiana bat (50^{th} credible bound)	57	359	No
northern long-eared bat (50^{th} credible bound)	0	93	No

CONCLUSIONS

The post-construction monitoring effort completed in 2024 was consistent with the HCP's monitoring requirements and the Project's 2024 study plan. Six Covered Species carcasses were found. Estimates of potential take for the Covered Species for the short-term (summer) and long-term adaptive management triggers were below the levels authorized by the ITP. However, the short-term (general) trigger was met, indicating the estimated annual take rate exceeded the expected take rate. Due to the short-term (general) trigger being met, Headwaters II Wind Farm, LLC is planning to amend the HCP to increase the permitted take limit for Indiana bats as an adaptive management response.

REFERENCES

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78. doi: 10.2193/2007-221.

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. and M. Huso. 2015. A Framework for Decision Points to Trigger Adaptive Management Actions in Long-Term Incidental Take Permits. US Geological Survey Open-File Report 2015-1227. 88 pp. doi: 10.3133/ofr20151227. Available online: https://pubs.usgs.gov/of/2015/1227/ofr20151227.pdf

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., L. Madsen, M. M. Huso, P. Rabie, R. Wolpert, J. Studyvin, J. Simonis, and J. M. Mintz. 2018. GenEst Statistical Models—a Generalized Estimator of Mortality. US Geological Survey Techniques and Methods, Volume 7, Chapter A2. 13 pp. doi: 10.3133/tm7A2. Available online: https://pubs.usgs.gov/tm/7a2/tm7a2.pdf

Dalthorp, D. H, P. Rabie, M. M. Huso, and A. Tredennick. 2020. Some Approaches to Accounting for Incidental Carcass Discoveries in Non-Monitored Years using the Evidence of Absence Model. US Geological Survey Open-File Report 2020-1027, 24p. Available online: https://pubs.er.usgs.gov/publication/ofr20201027

Dalthorp, D. and M. Huso. 2023. DWP: Density-Weighted Proportion. R Package Version 1.1. R: A language and environment for statistical computing. Published July 1, 2023. Accessed December 2024. Available online: https://cran.r-project.org/package=dwp

Esri. 2024. World Imagery and Aerial Photographs (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California. Accessed December 2024. Available online: https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=10df2279f9684e4a9f6a7f08febac2a9

Headwaters II Wind Farm, LLC. 2022. Indiana Bat and Northern Long-Eared Bat Draft Habitat Conservation Plan for the Headwaters II Wind Farm Randolph County, Indiana. March 2022

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

Huso, M., D. Dalthorp, and F. Korner-Nievergelt. 2017. Statistical Principles of Post-Construction Fatality Monitoring Design. Pp. *In*: M. Perrow, ed. Wildlife and Wind Farms, Conflicts and Solutions. Pelagic Publishing, Exeter, United Kingdom. Vol. 2, Onshore: Monitoring and Mitigation.

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.

Lloyd, J. D., R. Butryn, S. Pearman-Gillman, and T. D. Allison. 2023. Seasonal Patterns of Bird and Bat Collision Fatalities at Wind Turbines. PLoS ONE 18(5): e0284778. doi: 10.1371/journal.pone.0284778.

McAlexander, A. and A. Byrd. 2023. 2024 Post-construction Monitoring Study Plan for the Headwaters II Wind Farm, Randolph County, Indiana. Prepared for EDP Renewables North America, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. December 28, 2023.

McAlexander, A., W. Felver, R. Knoedler, and F. Kulzer. 2024. Post-construction Monitoring Study for the Headwaters II Wind Farm, Randolph County, Indiana. Year 2 Final Report: April 3 – October 15, 2023. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 25, 2024.

National Land Cover Database (NLCD). 2024. Annual National Land Cover Database (NLCD) Collection 1. US Geological Survey (USGS) data release. USGS Earth Resources Observation and Science, Sioux Falls, South Dakota. Published October 24, 2024. doi: 10.5066/P94UXNTS. Available online: https://www.usgs.gov/centers/eros/science/annual-national-land-cover-database

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

US Fish and Wildlife Service (USFWS). 2016. Midwest Wind Energy Multi-Species Habitat Conservation Plan. Public Review Draft. USFWS Midwest Region in collaboration with the States of Iowa, Illinois, Indiana, Michigan, Minnesota, Missouri, and Wisconsin and the American Wind Energy Association. April 2016.

Yee, T. W. 2015. Vector Generalized Linear and Additive Models: With an Implementation in R. Springer, New York.

Appendix A. Turbines with Non-operational Periods or Missed Curtailment during the 2024 Post-construction Monitoring Surveys

Appendix A1. Turbines with extended (> 7 days), non-operational periods at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Turbine ID	Non-operational Date Period	Search Plot Type	Summer Risk Turbine
212	September 18 – September 24, 2024	Uncleared plot	NA
218	April 30 – May 6, 2024	Road and pad plot	NA
218	July 12 – July 18, 2024	Cleared plot	Yes
218	September 16 – September 22, 2024	Cleared plot	NA
221	July 17 – July 23, 2024	Road and pad plot	No
221	August 15 – August 22, 2024	Road and pad plot	NA
221	October 1 – October 9, 2024	Road and pad plot	NA
222	July 5 – July 11, 2024	Road and pad plot	Yes
223	April 2 – April 12, 2024	Road and pad plot	NA
223	May 21 – June 5, 2024	Uncleared plot	Yes
226	August 20 – September 12, 2024	Road and pad plot	NA
227	May 15 – May 15, 2024	Road and pad plot	NA
227	May 16 – May 21, 2024	Cleared plot	Yes
227	May 31 – June 6, 2024	Cleared plot	Yes
227	June 28 – July 4, 2024	Cleared plot	Yes
227	July 12 – July 31, 2024	Cleared plot	Yes
227	August 1 - August 3, 2024	Cleared plot	NA
227	August 28 – September 3, 2024	Cleared plot	NA
227	September 20 – September 26, 2024	Cleared plot	NA
227	October 5 – October 13, 2024	Cleared plot	NA
228	June 22 – July 2, 2024	Uncleared plot	Yes
228	July 5 – July 15, 2024	Uncleared plot	Yes
228	July 25 – July 31, 2024	Uncleared plot	Yes
228	August 10 – August 16, 2024	Uncleared plot	NA
228	August 21 – September 2, 2024	Uncleared plot	NA
228	September 7 – September 13, 2024	Uncleared plot	NA
228	October 5 – October 11, 2024	Uncleared plot	NA
232	May 18 – June 5, 2024	Uncleared plot	Yes
232	July 26 – July 31, 2024	Uncleared plot	Yes
232	August 1 – August 2, 2024	Uncleared plot	NA
232	August 11 – August 17, 2024	Uncleared plot	NA
232	September 2 – September 8, 2024	Uncleared plot	NA
232	September 16 – September 28, 2024	Uncleared plot	NA
232	September 30 – October 15, 2024	Uncleared plot	NA
234	August 24 – September 2, 2024	Uncleared plot	NA
235	May 29 – July 31, 2024	Road and pad plot	No
235	September 6 – September 13, 2024	Road and pad plot	NA
235	October 8 – October 14, 2024	Road and pad plot	NA
236	April 29 – May 5, 2024	Road and pad plot	NA
236	July 3 – July 31, 2024	Road and pad plot	No
236	August 1 – August 7, 2024	Road and pad plot	NA
238	May 13 – May 15, 2024	Road and pad plot	NA
238	May 16 – May 30, 2024	Road and pad plot	No
238	September 2 – September 8, 2024	Road and pad plot	NA
238	October 6 – October 12, 2024	Road and pad plot	NA
240	June 23 – July 5, 2024	Cleared plot	Yes
244	May 18 – July 4, 2024	Uncleared plot	Yes
244	July 9 – July 15, 2024	Uncleared plot	Yes
244	July 19 – July 30, 2024	Uncleared plot	Yes
244	August 7 – August 14, 2024	Uncleared plot	NA
244	August 17 – August 30, 2024	Uncleared plot	NA
244	September 3 – September 21, 2024	Uncleared plot	NA

Appendix A1. Turbines with extended (> 7 days), non-operational periods at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Turbine ID	Non-operational Date Period	Search Plot Type	Summer Risk Turbine
246	September 27 – October 15, 2024	Road and pad plot	NA
247	April 1 – April 19, 2024	Road and pad plot	NA
247	April 25 – May 12, 2024	Road and pad plot	NA
247	May 20 – May 26, 2024	Road and pad plot	No
248	April 4 – April 22, 2024	Road and pad plot	NA
248	May 5 – May 15, 2024	Road and pad plot	NA
248	July 3 – July 9, 2024	Uncleared plot	Yes
248	July 26 – July 31, 2024	Uncleared plot	Yes
248	August 1 – August 5, 2024	Uncleared plot	NA

ID = identification.

NA – not applicable since turbine was non-operational outside of the summer season.

Appendix B. Carcasses Found during the 2024 Post-construction Monitoring Surveys

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
04/09/2024	silver-haired bat	25	206	carcass search	road and pad	intact	no
04/15/2024	eastern red bat	10	226	carcass search	road and pad	scavenged	no
04/16/2024	silver-haired bat	4	242	carcass search	road and pad	scavenged	no
05/06/2024	big brown bat	11	205	carcass search	road and pad	scavenged	no
05/06/2024	big brown bat	12	205	carcass search	road and pad	scavenged	no
05/07/2024	silver-haired bat	17	219	carcass search[2]	road and pad	scavenged	no
05/08/2024	hoary bat	14	236	carcass search	road and pad	scavenged	no
05/08/2024	silver-haired bat	41	236	carcass search	road and pad	scavenged	no
05/08/2024	silver-haired bat	20	239	carcass search	road and pad	scavenged	no
05/08/2024	silver-haired bat	37	242	carcass search	road and pad	intact	no
05/14/2024	eastern red bat	18	231	carcass search	road and pad	scavenged	no
05/14/2024	eastern red bat	48	239	carcass search	road and pad	scavenged	no
05/14/2024	silver-haired bat	86	219	carcass search[2]	road and pad	scavenged	no
05/14/2024	silver-haired bat	21	245	carcass search	road and pad	scavenged	no
05/16/2024	big brown bat	59	214	incidental	cleared	scavenged	yes*
05/16/2024	big brown bat	23	225	incidental	uncleared	scavenged	yes*
05/16/2024	big brown bat	40	225	incidental	uncleared	intact	yes*
05/16/2024	eastern red bat	93	210	Incidental[2]	uncleared	scavenged	yes*
05/16/2024	eastern red bat	50	225	incidental	uncleared	scavenged	yes*
05/16/2024	hoary bat	33	215	incidental	cleared	scavenged	yes*
05/16/2024	silver-haired bat	36	214	incidental	cleared	scavenged	yes*
05/16/2024	silver-haired bat	52	214	incidental	cleared	intact	yes*
05/16/2024	silver-haired bat	38	215	incidental	cleared	scavenged	yes*
05/16/2024	silver-haired bat	38	224	incidental	cleared	scavenged	yes*
05/17/2024	eastern red bat	33	211	incidental	uncleared	scavenged	yes*
05/20/2024	evening bat	34	211	carcass search	uncleared	scavenged	yes*
05/20/2024	silver-haired bat	22	229	carcass search	road and pad	scavenged	no
05/23/2024	big brown bat	21	230	carcass search	cleared	scavenged	yes*
05/23/2024	hoary bat	23	224	carcass search	cleared	scavenged	yes*
05/23/2024	hoary bat	31	233	carcass search	cleared	scavenged	yes*
05/23/2024	silver-haired bat	12	224	carcass search	cleared	scavenged	yes*
05/23/2024	silver-haired bat	29	233	carcass search	cleared	scavenged	yes*
05/24/2024	big brown bat	28	249	carcass search	cleared	scavenged	yes*
05/24/2024	eastern red bat	28	240	carcass search	cleared	scavenged	yes*
05/24/2024	eastern red bat	27	248	carcass search	uncleared	scavenged	yes*
05/27/2024	eastern red bat	57	212	carcass search	uncleared	scavenged	yes*
05/27/2024	hoary bat	9	203	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
05/27/2024	silver-haired bat	34	201	carcass search	cleared	scavenged	yes*
05/27/2024	silver-haired bat	66	211	carcass search	uncleared	scavenged	yes*
05/27/2024	silver-haired bat	59	211	carcass search	uncleared	scavenged	yes*
05/27/2024	silver-haired bat	31	211	carcass search	uncleared	intact	yes*
05/27/2024	silver-haired bat	55	211	carcass search	uncleared	scavenged	yes*
05/27/2024	silver-haired bat	64	212	carcass search	uncleared	scavenged	yes*
05/27/2024	silver-haired bat	26	215	carcass search	cleared	scavenged	yes*
05/30/2024	eastern red bat	84	234	carcass search[2]	uncleared	scavenged	yes*
05/30/2024	silver-haired bat	68	224	carcass search	cleared	scavenged	yes*
05/30/2024	silver-haired bat	59	224	carcass search	cleared	scavenged	yes*
05/30/2024	silver-haired bat	55	231	carcass search	cleared	scavenged	yes*
05/30/2024	silver-haired bat	45	234	carcass search	uncleared	scavenged	yes*
05/30/2024	unidentified bat[3]	31	233	carcass search	cleared	scavenged	yes*
05/31/2024	eastern red bat	73	248	carcass search	uncleared	scavenged	yes*
05/31/2024	eastern red bat	38	248	carcass search	uncleared	scavenged	yes*
05/31/2024	eastern red bat	18	249	carcass search	cleared	scavenged	yes*
05/31/2024	silver-haired bat	65	240	carcass search	cleared	scavenged	yes*
05/31/2024	silver-haired bat	38	241	carcass search	cleared	scavenged	yes*
05/31/2024	silver-haired bat	28	245	carcass search	uncleared	scavenged	yes*
06/03/2024	eastern red bat	15	211	carcass search	uncleared	scavenged	yes*
06/03/2024	silver-haired bat	54	202	carcass search	cleared	intact	yes*
06/03/2024	silver-haired bat	43	212	carcass search	uncleared	scavenged	yes*
06/03/2024	silver-haired bat	48	225	carcass search	uncleared	scavenged	yes*
06/06/2024	silver-haired bat	74	224	carcass search	cleared	scavenged	yes*
06/06/2024	silver-haired bat	17	227	carcass search	cleared	intact	yes*
06/06/2024	silver-haired bat	44	228	carcass search	uncleared	scavenged	yes*
06/06/2024	silver-haired bat	49	233	carcass search	cleared	scavenged	yes*
06/07/2024	eastern red bat	45	230	carcass search	cleared	scavenged	yes*
06/07/2024	silver-haired bat	74	230	carcass search	cleared	scavenged	yes*
06/07/2024	silver-haired bat	66	244	carcass search	uncleared	scavenged	yes*
06/10/2024	eastern red bat	23	203	carcass search	cleared	scavenged	yes*
06/10/2024	eastern red bat	53	212	carcass search	uncleared	scavenged	yes*
06/10/2024	evening bat	7	203	carcass search	cleared	scavenged	yes*
06/10/2024	hoary bat	64	210	carcass search	uncleared	scavenged	yes*
06/10/2024	silver-haired bat	48	203	carcass search	cleared	scavenged	yes*
06/10/2024	silver-haired bat	34	224	carcass search	cleared	scavenged	yes*
06/14/2024	eastern red bat	73	241	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
06/14/2024	hoary bat	65	244	carcass search	uncleared	scavenged	yes*
06/14/2024	little brown bat	38	223	carcass search	uncleared	scavenged	yes*
06/16/2024	eastern red bat	9	225	carcass search	uncleared	scavenged	yes*
06/16/2024	eastern red bat	55	225	carcass search	uncleared	scavenged	yes*
06/16/2024	eastern red bat	7	225	carcass search	uncleared	scavenged	yes*
06/17/2024	eastern red bat	27	213	carcass search	road and pad	scavenged	no
06/17/2024	eastern red bat	69	222	carcass search	road and pad	intact	no
06/20/2024	eastern red bat	12	227	carcass search	cleared	scavenged	yes*
06/20/2024	hoary bat	55	227	carcass search	cleared	scavenged	yes*
06/20/2024	silver-haired bat	20	234	carcass search	uncleared	scavenged	yes*
06/21/2024	Indiana bat	20	218	carcass search	cleared	scavenged	yes*
06/21/2024	big brown bat	25	240	carcass search	cleared	scavenged	yes*
06/21/2024	eastern red bat	69	240	carcass search	cleared	scavenged	yes*
06/21/2024	eastern red bat	48	240	carcass search	cleared	scavenged	yes*
06/21/2024	eastern red bat	18	244	carcass search	uncleared	scavenged	yes*
06/21/2024	eastern red bat	62	249	carcass search	cleared	scavenged	yes*
06/24/2024	eastern red bat	55	210	carcass search	uncleared	scavenged	yes*
06/24/2024	eastern red bat	16	210	carcass search	uncleared	scavenged	yes*
06/24/2024	eastern red bat	42	210	carcass search	uncleared	scavenged	yes*
06/24/2024	eastern red bat	51	211	carcass search	uncleared	scavenged	yes*
06/24/2024	eastern red bat	43	214	carcass search	cleared	scavenged	yes*
06/24/2024	eastern red bat	7	222	carcass search	road and pad	scavenged	no
06/24/2024	evening bat	50	215	carcass search	cleared	scavenged	yes*
06/27/2024	eastern red bat	65	224	carcass search	cleared	scavenged	yes*
06/27/2024	eastern red bat	50	240	carcass search	cleared	scavenged	yes*
06/27/2024	hoary bat	29	240	carcass search	cleared	scavenged	yes*
06/27/2024	little brown bat	32	240	carcass search	cleared	scavenged	yes*
06/28/2024	eastern red bat	52	230	carcass search	cleared	scavenged	yes*
06/28/2024	eastern red bat	31	241	carcass search	cleared	scavenged	yes*
06/28/2024	eastern red bat	42	245	carcass search	uncleared	scavenged	yes*
06/28/2024	eastern red bat	26	248	carcass search	uncleared	scavenged	yes*
06/28/2024	eastern red bat	25	249	carcass search	cleared	scavenged	yes*
06/30/2024	hoary bat	22	226	carcass search	road and pad	scavenged	no
07/01/2024	eastern red bat	9	201	carcass search	cleared	scavenged	yes*
07/01/2024	eastern red bat	14	201	carcass search	cleared	intact	yes*
07/01/2024	eastern red bat	9	202	carcass search	cleared	scavenged	yes*
07/01/2024	eastern red bat	25	203	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
07/01/2024	eastern red bat	33	212	carcass search	uncleared	scavenged	yes*
07/01/2024	eastern red bat	43	215	carcass search	cleared	intact	yes*
07/01/2024	eastern red bat	70	215	carcass search	cleared	scavenged	yes*
07/04/2024	eastern red bat	11	232	carcass search	uncleared	scavenged	yes*
07/04/2024	eastern red bat	25	234	carcass search	uncleared	scavenged	yes*
07/04/2024	hoary bat	5	240	carcass search	cleared	scavenged	yes*
07/05/2024	eastern red bat	47	228	carcass search	uncleared	scavenged	yes*
07/05/2024	eastern red bat	30	245	carcass search	uncleared	scavenged	yes*
07/05/2024	eastern red bat	65	249	carcass search	cleared	scavenged	yes*
07/05/2024	hoary bat	5	244	carcass search	uncleared	scavenged	yes*
07/08/2024	eastern red bat	46	203	carcass search	cleared	scavenged	yes*
07/11/2024	eastern red bat	77	218	carcass search	cleared	scavenged	yes*
07/11/2024	eastern red bat	76	224	carcass search	cleared	scavenged	yes*
07/11/2024	eastern red bat	29	232	carcass search	uncleared	scavenged	yes*
07/11/2024	eastern red bat	26	240	carcass search	cleared	scavenged	yes*
07/12/2024	big brown bat	39	223	carcass search	uncleared	scavenged	yes*
07/18/2024	big brown bat	21	224	carcass search	cleared	scavenged	yes*
07/18/2024	eastern red bat	10	218	carcass search	cleared	scavenged	yes*
07/18/2024	eastern red bat	51	224	carcass search	cleared	scavenged	yes*
07/18/2024	eastern red bat	20	233	carcass search	cleared	scavenged	yes*
07/19/2024	big brown bat	22	230	carcass search	cleared	scavenged	yes*
07/19/2024	big brown bat	20	240	carcass search	cleared	scavenged	yes*
07/19/2024	big brown bat	67	240	carcass search	cleared	scavenged	yes*
07/19/2024	big brown bat	21	248	carcass search	uncleared	scavenged	yes*
07/19/2024	hoary bat	60	240	carcass search	cleared	scavenged	yes*
07/22/2024	eastern red bat	47	201	carcass search	cleared	scavenged	yes*
07/22/2024	eastern red bat	6	211	carcass search	uncleared	scavenged	yes*
07/22/2024	eastern red bat	52	234	carcass search	uncleared	scavenged	yes*
07/25/2024	eastern red bat	5	225	carcass search	uncleared	scavenged	yes*
07/25/2024	eastern red bat	34	232	carcass search	uncleared	scavenged	yes*
07/26/2024	eastern red bat	41	244	carcass search	uncleared	scavenged	yes*
07/26/2024	eastern red bat	38	248	carcass search	uncleared	scavenged	yes*
07/26/2024	eastern red bat	31	249	carcass search	cleared	scavenged	yes*
07/26/2024	hoary bat	22	240	carcass search	cleared	scavenged	yes*
07/26/2024	little brown bat	55	245	carcass search	uncleared	scavenged	yes*
07/26/2024	little brown bat	46	248	carcass search	uncleared	scavenged	yes*
07/29/2024	big brown bat	13	211	carcass search	uncleared	intact	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
07/29/2024	eastern red bat	47	201	carcass search	cleared	scavenged	yes*
07/29/2024	eastern red bat	52	210	carcass search	uncleared	scavenged	yes*
07/29/2024	eastern red bat	60	212	carcass search	uncleared	scavenged	yes*
07/29/2024	eastern red bat	3	222	carcass search	road and pad	intact	no
07/29/2024	hoary bat	16	202	carcass search	cleared	scavenged	yes*
08/01/2024	big brown bat	20	227	carcass search	cleared	intact	yes*
08/01/2024	eastern red bat	43	228	carcass search	uncleared	scavenged	yes*
08/01/2024	eastern red bat	23	248	carcass search	uncleared	scavenged	yes*
08/01/2024	hoary bat	60	224	carcass search	cleared	intact	yes*
08/01/2024	hoary bat	15	240	carcass search	cleared	scavenged	yes*
08/02/2024	big brown bat	56	245	carcass search	uncleared	scavenged	yes*
08/02/2024	eastern red bat	11	249	carcass search	cleared	scavenged	yes*
08/05/2024	big brown bat	3	219	carcass search	road and pad	scavenged	no
08/05/2024	big brown bat	15	246	carcass search	road and pad	scavenged	no
08/05/2024	eastern red bat	23	208	carcass search	road and pad	scavenged	no
08/05/2024	eastern red bat	17	217	carcass search	road and pad	scavenged	no
08/05/2024	eastern red bat	40	217	carcass search	road and pad	intact	no
08/05/2024	eastern red bat	17	219	carcass search	road and pad	intact	no
08/05/2024	eastern red bat	4	219	carcass search	road and pad	scavenged	no
08/05/2024	eastern red bat	30	238	carcass search	road and pad	scavenged	no
08/05/2024	eastern red bat	42	242	carcass search	road and pad	scavenged	no
08/08/2024	big brown bat	9	230	carcass search	cleared	scavenged	yes*
08/08/2024	big brown bat	69	245	carcass search	uncleared	scavenged	yes*
08/08/2024	big brown bat	33	249	carcass search	cleared	scavenged	yes*
08/08/2024	big brown bat	56	249	carcass search	cleared	intact	yes*
08/08/2024	eastern red bat	37	207	carcass search	road and pad	intact	no
08/08/2024	eastern red bat	20	208	carcass search	road and pad	scavenged	no
08/08/2024	eastern red bat	41	209	carcass search	road and pad	scavenged	no
08/08/2024	eastern red bat	32	213	carcass search	road and pad	scavenged	no
08/08/2024	eastern red bat	7	217	carcass search	road and pad	scavenged	no
08/08/2024	eastern red bat	46	230	carcass search	cleared	scavenged	yes*
08/08/2024	eastern red bat	30	230	carcass search	cleared	scavenged	yes*
08/08/2024	eastern red bat	37	238	carcass search	road and pad	intact	no
08/08/2024	eastern red bat	45	240	carcass search	cleared	scavenged	yes*
08/08/2024	eastern red bat	43	244	carcass search	uncleared	scavenged	yes*
08/08/2024	eastern red bat	24	246	carcass search	road and pad	scavenged	no
08/08/2024	eastern red bat	35	249	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
08/08/2024	hoary bat	25	230	carcass search	cleared	scavenged	yes*
08/08/2024	hoary bat	41	240	carcass search	cleared	scavenged	yes*
08/08/2024	hoary bat	5	246	carcass search	road and pad	scavenged	no
08/12/2024	big brown bat	58	202	carcass search	cleared	scavenged	yes*
08/12/2024	eastern red bat	18	202	carcass search	cleared	intact	yes*
08/12/2024	eastern red bat	22	203	carcass search	cleared	scavenged	yes*
08/12/2024	eastern red bat	26	211	carcass search	uncleared	scavenged	yes*
08/12/2024	eastern red bat	77	212	carcass search	uncleared	scavenged	yes*
08/12/2024	eastern red bat	62	215	carcass search	cleared	intact	yes*
08/12/2024	eastern red bat	38	231	carcass search	cleared	scavenged	yes*
08/12/2024	eastern red bat	16	238	carcass search	road and pad	scavenged	no
08/12/2024	eastern red bat	39	243	carcass search	road and pad	scavenged	no
08/12/2024	eastern red bat	3	246	carcass search	road and pad	scavenged	no
08/12/2024	hoary bat	33	210	carcass search	uncleared	scavenged	yes*
08/12/2024	hoary bat	17	243	carcass search	road and pad	scavenged	no
08/12/2024	tricolored bat	11	243	carcass search	road and pad	scavenged	no
08/14/2024	eastern red bat	18	227	carcass search	cleared	scavenged	yes*
08/14/2024	eastern red bat	60	234	carcass search	uncleared	scavenged	yes*
08/15/2024	big brown bat	37	240	carcass search	cleared	scavenged	yes*
08/15/2024	big brown bat	43	245	carcass search	uncleared	scavenged	yes*
08/15/2024	big brown bat	27	249	carcass search	cleared	scavenged	yes*
08/15/2024	eastern red bat	38	223	carcass search	uncleared	intact	yes*
08/15/2024	eastern red bat	22	229	carcass search	road and pad	scavenged	no
08/15/2024	eastern red bat	40	240	carcass search	cleared	scavenged	yes*
08/15/2024	eastern red bat	23	240	carcass search	cleared	scavenged	yes*
08/15/2024	eastern red bat	18	246	carcass search	road and pad	intact	no
08/15/2024	eastern red bat	13	246	carcass search	road and pad	scavenged	no
08/15/2024	eastern red bat	6	247	carcass search	road and pad	scavenged	no
08/15/2024	hoary bat	42	230	carcass search	cleared	intact	yes*
08/15/2024	hoary bat	43	249	carcass search	cleared	intact	yes*
08/15/2024	silver-haired bat	21	223	carcass search	uncleared	scavenged	yes*
08/18/2024	big brown bat	33	203	carcass search	cleared	scavenged	yes*
08/18/2024	big brown bat	62	210	carcass search	uncleared	scavenged	yes*
08/18/2024	big brown bat	40	212	carcass search	uncleared	scavenged	yes*
08/18/2024	eastern red bat	32	202	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	70	203	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	37	203	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
08/18/2024	eastern red bat	29	203	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	14	203	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	35	210	carcass search	uncleared	scavenged	yes*
08/18/2024	eastern red bat	17	211	carcass search	uncleared	scavenged	yes*
08/18/2024	eastern red bat	28	212	carcass search	uncleared	scavenged	yes*
08/18/2024	eastern red bat	9	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	48	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	33	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	63	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	17	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	68	230	carcass search	cleared	scavenged	yes*
08/18/2024	eastern red bat	46	230	carcass search	cleared	scavenged	yes*
08/18/2024	hoary bat	45	203	carcass search	cleared	scavenged	yes*
08/19/2024	Indiana bat	36	226	carcass search	road and pad	scavenged	no
08/19/2024	big brown bat	31	209	carcass search	road and pad	scavenged	no
08/19/2024	big brown bat	10	213	carcass search	road and pad	scavenged	no
08/19/2024	big brown bat	10	214	carcass search	cleared	scavenged	yes*
08/19/2024	big brown bat	20	219	carcass search	road and pad	scavenged	no
08/19/2024	big brown bat	29	227	carcass search	cleared	intact	yes*
08/19/2024	eastern red bat	9	206	carcass search	road and pad	intact	no
08/19/2024	eastern red bat	54	215	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	55	215	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	28	215	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	7	216	carcass search	road and pad	scavenged	no
08/19/2024	eastern red bat	7	219	carcass search	road and pad	scavenged	no
08/19/2024	eastern red bat	41	221	carcass search	road and pad	scavenged	no
08/19/2024	eastern red bat	40	224	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	12	224	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	44	224	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	36	225	carcass search	uncleared	scavenged	yes*
08/19/2024	eastern red bat	53	225	carcass search	uncleared	intact	yes*
08/19/2024	eastern red bat	26	227	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	79	227	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	67	233	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	57	233	carcass search	cleared	scavenged	yes*
08/19/2024	eastern red bat	54	234	carcass search	uncleared	scavenged	yes*
08/19/2024	eastern red bat	23	234	carcass search	uncleared	intact	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
08/19/2024	eastern red bat	21	234	carcass search	uncleared	intact	yes*
08/19/2024	eastern red bat	23	234	carcass search	uncleared	intact	yes*
08/20/2024	eastern red bat	43	243	carcass search[2]	road and pad	scavenged	no
08/22/2024	big brown bat	20	241	carcass search	cleared	scavenged	yes*
08/22/2024	big brown bat	29	244	carcass search	uncleared	scavenged	yes*
08/22/2024	big brown bat	2	245	carcass search	uncleared	scavenged	yes*
08/22/2024	big brown bat	11	249	carcass search	cleared	scavenged	yes*
08/22/2024	eastern red bat	21	240	carcass search	cleared	scavenged	yes*
08/22/2024	eastern red bat	55	245	carcass search	uncleared	scavenged	yes*
08/22/2024	eastern red bat	21	245	carcass search	uncleared	scavenged	yes*
08/22/2024	eastern red bat	65	245	carcass search	uncleared	scavenged	yes*
08/22/2024	eastern red bat	40	248	carcass search	uncleared	scavenged	yes*
08/22/2024	silver-haired bat	30	209	carcass search	road and pad	injured	no
08/25/2024	eastern red bat	41	203	carcass search	cleared	scavenged	yes*
08/25/2024	eastern red bat	23	203	carcass search	cleared	scavenged	yes*
08/25/2024	eastern red bat	73	203	carcass search	cleared	intact	yes*
08/25/2024	eastern red bat	29	231	carcass search	cleared	intact	yes*
08/25/2024	eastern red bat	39	231	carcass search	cleared	scavenged	yes*
08/25/2024	silver-haired bat	45	214	carcass search	cleared	scavenged	yes*
08/26/2024	big brown bat	20	224	carcass search	cleared	scavenged	yes*
08/26/2024	eastern red bat	29	205	carcass search	road and pad	scavenged	no
08/26/2024	eastern red bat	31	218	carcass search	cleared	scavenged	yes*
08/26/2024	eastern red bat	50	224	carcass search	cleared	scavenged	yes*
08/26/2024	eastern red bat	15	225	carcass search	uncleared	scavenged	yes*
08/26/2024	eastern red bat	46	233	carcass search	cleared	scavenged	yes*
08/26/2024	eastern red bat	7	234	carcass search	uncleared	scavenged	yes*
08/26/2024	eastern red bat	4	236	carcass search	road and pad	scavenged	no
08/26/2024	eastern red bat	14	238	carcass search	road and pad	scavenged	no
08/26/2024	hoary bat	9	217	carcass search	road and pad	scavenged	no
08/29/2024	big brown bat	30	213	carcass search	road and pad	scavenged	no
08/29/2024	big brown bat	68	232	carcass search	uncleared	intact	yes*
08/29/2024	eastern red bat	74	227	carcass search	cleared	scavenged	yes*
08/29/2024	eastern red bat	12	240	carcass search	cleared	scavenged	yes*
08/29/2024	eastern red bat	61	245	carcass search	uncleared	scavenged	yes*
08/29/2024	eastern red bat	21	249	carcass search	cleared	scavenged	yes*
08/29/2024	hoary bat	43	227	carcass search	cleared	intact	yes*
08/29/2024	hoary bat	43	244	carcass search	uncleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
08/29/2024	hoary bat	50	248	carcass search	uncleared	scavenged	yes*
08/29/2024	silver-haired bat	55	223	carcass search	uncleared	scavenged	yes*
09/01/2024	eastern red bat	42	202	carcass search	cleared	scavenged	yes*
09/01/2024	eastern red bat	56	202	carcass search	cleared	scavenged	yes*
09/01/2024	hoary bat	18	202	carcass search	cleared	scavenged	yes*
09/01/2024	hoary bat	60	202	carcass search	cleared	scavenged	yes*
09/01/2024	silver-haired bat	41	202	carcass search	cleared	scavenged	yes*
09/02/2024	big brown bat	48	211	carcass search	uncleared	scavenged	yes*
09/02/2024	eastern red bat	24	203	carcass search	cleared	scavenged	yes*
09/02/2024	eastern red bat	8	211	carcass search	uncleared	scavenged	yes*
09/02/2024	eastern red bat	33	211	carcass search	uncleared	scavenged	yes*
09/02/2024	eastern red bat	20	214	carcass search	cleared	scavenged	yes*
09/02/2024	eastern red bat	30	215	carcass search	cleared	intact	yes*
09/02/2024	eastern red bat	41	215	carcass search	cleared	intact	yes*
09/02/2024	eastern red bat	45	233	carcass search	cleared	scavenged	yes*
09/02/2024	eastern red bat	43	234	carcass search	uncleared	scavenged	yes*
09/02/2024	hoary bat	24	234	carcass search	uncleared	scavenged	yes*
09/02/2024	hoary bat	1	238	carcass search	road and pad	intact	no
09/02/2024	hoary bat	9	247	carcass search	road and pad	scavenged	no
09/02/2024	silver-haired bat	24	203	carcass search	cleared	intact	yes*
09/02/2024	silver-haired bat	18	204	carcass search	road and pad	intact	no
09/02/2024	silver-haired bat	38	214	carcass search	cleared	intact	yes*
09/02/2024	silver-haired bat	27	216	carcass search	road and pad	scavenged	no
09/02/2024	silver-haired bat	3	216	carcass search	road and pad	intact	no
09/02/2024	silver-haired bat	7	219	carcass search	road and pad	intact	no
09/02/2024	silver-haired bat	3	221	carcass search	road and pad	intact	no
09/02/2024	silver-haired bat	35	224	carcass search	cleared	scavenged	yes*
09/02/2024	silver-haired bat	29	225	carcass search	uncleared	intact	yes*
09/02/2024	silver-haired bat	18	233	carcass search	cleared	scavenged	yes*
09/02/2024	silver-haired bat	38	235	carcass search	road and pad	intact	no
09/02/2024	silver-haired bat	7	235	carcass search	road and pad	scavenged	no
09/02/2024	silver-haired bat	20	247	carcass search	road and pad	scavenged	no
09/02/2024	silver-haired bat	22	247	carcass search	road and pad	intact	no
09/04/2024	Indiana bat	47	227	carcass search	cleared	scavenged	yes*
09/04/2024	big brown bat	54	218	carcass search	cleared	intact	yes*
09/04/2024	big brown bat	17	218	carcass search	cleared	intact	yes*
09/04/2024	big brown bat	56	218	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
09/04/2024	big brown bat	35	230	carcass search	cleared	scavenged	yes*
09/04/2024	big brown bat	44	232	carcass search	uncleared	scavenged	yes*
09/04/2024	eastern red bat	33	227	carcass search	cleared	scavenged	yes*
09/04/2024	eastern red bat	61	240	carcass search	cleared	scavenged	yes*
09/04/2024	silver-haired bat	20	227	carcass search	cleared	scavenged	yes*
09/04/2024	silver-haired bat	45	227	carcass search	cleared	scavenged	yes*
09/04/2024	silver-haired bat	59	240	carcass search	cleared	scavenged	yes*
09/05/2024	eastern red bat	44	244	carcass search	uncleared	scavenged	yes*
09/05/2024	eastern red bat	69	249	carcass search	cleared	scavenged	yes*
09/05/2024	eastern red bat	74	249	carcass search	cleared	scavenged	yes*
09/05/2024	hoary bat	26	244	carcass search	uncleared	scavenged	yes*
09/05/2024	silver-haired bat	15	204	carcass search	road and pad	scavenged	no
09/05/2024	silver-haired bat	32	223	carcass search	uncleared	scavenged	yes*
09/05/2024	silver-haired bat	17	248	carcass search	uncleared	scavenged	yes*
09/05/2024	silver-haired bat	24	249	carcass search	cleared	scavenged	yes*
09/06/2024	eastern red bat	49	220	carcass search	road and pad	scavenged	no
09/06/2024	silver-haired bat	0	220	carcass search	road and pad	scavenged	no
09/06/2024	silver-haired bat	2	220	carcass search	road and pad	scavenged	no
09/07/2024	silver-haired bat	39	242	carcass search	road and pad	scavenged	no
09/08/2024	big brown bat	38	201	carcass search	cleared	scavenged	yes*
09/08/2024	big brown bat	40	203	carcass search	cleared	scavenged	yes*
09/08/2024	big brown bat	12	212	carcass search	uncleared	scavenged	yes*
09/08/2024	silver-haired bat	74	201	carcass search	cleared	intact	yes*
09/08/2024	silver-haired bat	6	202	carcass search	cleared	intact	yes*
09/08/2024	silver-haired bat	72	202	carcass search	cleared	scavenged	yes*
09/08/2024	silver-haired bat	71	202	carcass search	cleared	scavenged	yes*
09/08/2024	silver-haired bat	74	203	carcass search	cleared	scavenged	yes*
09/08/2024	silver-haired bat	29	211	carcass search	uncleared	scavenged	yes*
09/08/2024	silver-haired bat	33	212	carcass search	uncleared	intact	yes*
09/08/2024	silver-haired bat	24	231	carcass search	cleared	intact	yes*
09/09/2024	Indiana bat	60	227	carcass search	cleared	scavenged	yes*
09/09/2024	eastern red bat	33	227	carcass search	cleared	scavenged	yes*
09/09/2024	eastern red bat	49	234	carcass search	uncleared	scavenged	yes*
09/09/2024	eastern red bat	23	242	carcass search	road and pad	scavenged	no
09/09/2024	silver-haired bat	0	221	carcass search	road and pad	injured	no
09/09/2024	silver-haired bat	83	224	carcass search[2]	cleared	intact	yes*
09/09/2024	silver-haired bat	35	224	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
09/09/2024	silver-haired bat	60	224	carcass search	cleared	scavenged	yes*
09/09/2024	silver-haired bat	59	233	carcass search	cleared	scavenged	yes*
09/09/2024	silver-haired bat	39	234	carcass search	uncleared	scavenged	yes*
09/10/2024	silver-haired bat	32	216	carcass search	road and pad	scavenged	no
09/12/2024	big brown bat	56	240	carcass search	cleared	intact	yes*
09/12/2024	silver-haired bat	23	232	carcass search	uncleared	scavenged	yes*
09/12/2024	silver-haired bat	29	244	carcass search	uncleared	scavenged	yes*
09/12/2024	silver-haired bat	10	245	carcass search	uncleared	scavenged	yes*
09/12/2024	silver-haired bat	17	248	carcass search	uncleared	scavenged	yes*
09/12/2024	silver-haired bat	63	248	carcass search	uncleared	scavenged	yes*
09/12/2024	silver-haired bat	50	249	carcass search	cleared	scavenged	yes*
09/12/2024	silver-haired bat	71	249	carcass search	cleared	scavenged	yes*
09/15/2024	Indiana bat	68	231	carcass search	cleared	scavenged	yes*
09/15/2024	eastern red bat	35	211	carcass search	uncleared	scavenged	yes*
09/15/2024	eastern red bat	50	231	carcass search	cleared	intact	yes*
09/15/2024	hoary bat	71	212	carcass search	uncleared	scavenged	yes*
09/15/2024	silver-haired bat	0	202	carcass search	cleared	scavenged	yes*
09/15/2024	silver-haired bat	12	203	carcass search	cleared	scavenged	yes*
09/15/2024	silver-haired bat	56	203	carcass search	cleared	intact	yes*
09/15/2024	silver-haired bat	44	212	carcass search	uncleared	scavenged	yes*
09/15/2024	silver-haired bat	43	214	carcass search	cleared	intact	yes*
09/15/2024	silver-haired bat	26	231	carcass search	cleared	scavenged	yes*
09/15/2024	unidentified lasiurus bat	45	202	carcass search	cleared	scavenged	yes*
09/15/2024	unidentified lasiurus bat	24	202	carcass search	cleared	scavenged	yes*
09/16/2024	eastern red bat	8	206	carcass search	road and pad	intact	no
09/16/2024	eastern red bat	20	218	carcass search	cleared	scavenged	yes*
09/16/2024	eastern red bat	38	218	carcass search	cleared	scavenged	yes*
09/16/2024	hoary bat	38	204	carcass search	road and pad	scavenged	no
09/16/2024	hoary bat	18	204	carcass search	road and pad	scavenged	no
09/16/2024	hoary bat	9	237	carcass search	road and pad	scavenged	no
09/16/2024	hoary bat	18	247	carcass search	road and pad	scavenged	no
09/16/2024	silver-haired bat	8	209	carcass search	road and pad	scavenged	no
09/16/2024	silver-haired bat	60	215	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	20	218	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	0	224	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	62	224	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	53	224	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
09/16/2024	silver-haired bat	62	227	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	14	227	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	74	233	carcass search	cleared	scavenged	yes*
09/16/2024	silver-haired bat	26	236	carcass search	road and pad	scavenged	no
09/16/2024	silver-haired bat	47	237	carcass search	road and pad	scavenged	no
09/16/2024	silver-haired bat	5	239	carcass search	road and pad	intact	no
09/16/2024	silver-haired bat	65	241	carcass search	cleared	scavenged	yes*
09/19/2024	big brown bat	63	248	carcass search	uncleared	scavenged	yes*
09/19/2024	eastern red bat	44	228	carcass search	uncleared	scavenged	yes*
09/19/2024	eastern red bat	20	228	carcass search	uncleared	intact	yes*
09/19/2024	eastern red bat	37	244	carcass search	uncleared	scavenged	yes*
09/19/2024	eastern red bat	57	244	carcass search	uncleared	scavenged	yes*
09/19/2024	eastern red bat	30	245	carcass search	uncleared	scavenged	yes*
09/19/2024	evening bat	44	248	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	44	223	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	23	228	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	35	228	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	42	232	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	44	244	carcass search	uncleared	scavenged	yes*
09/19/2024	silver-haired bat	53	244	carcass search	uncleared	scavenged	yes*
09/22/2024	big brown bat	34	203	carcass search	cleared	intact	yes*
09/22/2024	big brown bat	57	211	carcass search	uncleared	scavenged	yes*
09/22/2024	eastern red bat	72	202	carcass search	cleared	scavenged	yes*
09/22/2024	eastern red bat	32	202	carcass search	cleared	scavenged	yes*
09/22/2024	eastern red bat	44	202	carcass search	cleared	scavenged	yes*
09/22/2024	hoary bat	20	202	carcass search	cleared	scavenged	yes*
09/22/2024	silver-haired bat	51	201	carcass search	cleared	intact	yes*
09/23/2024	big brown bat	59	234	carcass search	uncleared	scavenged	yes*
09/23/2024	eastern red bat	47	214	carcass search	cleared	scavenged	yes*
09/23/2024	eastern red bat	38	230	carcass search	cleared	scavenged	yes*
09/23/2024	eastern red bat	75	230	carcass search	cleared	scavenged	yes*
09/23/2024	eastern red bat	16	233	carcass search	cleared	intact	yes*
09/23/2024	hoary bat	32	211	incidental	uncleared	intact	yes*
09/23/2024	silver-haired bat	45	224	carcass search	cleared	scavenged	yes*
09/23/2024	silver-haired bat	38	224	carcass search	cleared	scavenged	yes*
09/23/2024	silver-haired bat	70	230	carcass search	cleared	intact	yes*
09/23/2024	silver-haired bat	35	230	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
09/23/2024	silver-haired bat	40	239	carcass search	road and pad	scavenged	no
09/26/2024	eastern red bat	60	245	carcass search	uncleared	intact	yes*
09/26/2024	hoary bat	6	216	carcass search	road and pad	scavenged	no
09/26/2024	silver-haired bat	21	209	carcass search	road and pad	scavenged	no
09/26/2024	silver-haired bat	4	220	carcass search	road and pad	intact	no
09/26/2024	silver-haired bat	16	223	carcass search	uncleared	scavenged	yes*
09/26/2024	silver-haired bat	44	228	carcass search	uncleared	scavenged	yes*
09/26/2024	silver-haired bat	59	248	carcass search	uncleared	scavenged	yes*
09/27/2024	silver-haired bat	73	232	carcass search	uncleared	scavenged	yes*
09/29/2024	big brown bat	43	203	carcass search	cleared	scavenged	yes*
09/29/2024	silver-haired bat	17	212	carcass search	uncleared	intact	yes*
09/29/2024	silver-haired bat	18	215	carcass search	cleared	intact	yes*
09/30/2024	Indiana bat	17	229	carcass search	road and pad	scavenged	no
09/30/2024	eastern red bat	56	235	carcass search	road and pad	scavenged	no
09/30/2024	eastern red bat	56	245	carcass search	uncleared	scavenged	yes*
09/30/2024	hoary bat	9	225	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	65	208	carcass search	road and pad	scavenged	no
09/30/2024	silver-haired bat	40	208	carcass search	road and pad	scavenged	no
09/30/2024	silver-haired bat	11	223	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	16	225	carcass search	uncleared	scavenged	yes*
09/30/2024	silver-haired bat	8	226	carcass search	road and pad	scavenged	no
09/30/2024	silver-haired bat	8	229	carcass search	road and pad	intact	no
09/30/2024	silver-haired bat	47	234	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	48	244	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	30	244	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	21	244	carcass search	uncleared	intact	yes*
09/30/2024	silver-haired bat	47	245	carcass search	uncleared	scavenged	yes*
09/30/2024	silver-haired bat	14	245	carcass search	uncleared	intact	yes*
10/03/2024	big brown bat	41	227	carcass search	cleared	scavenged	yes*
10/03/2024	big brown bat	48	228	carcass search	uncleared	scavenged	yes*
10/03/2024	evening bat	44	218	carcass search	cleared	intact	yes*
10/03/2024	little brown bat	44	249	carcass search	cleared	scavenged	yes*
10/03/2024	silver-haired bat	41	208	carcass search	road and pad	scavenged	no
10/03/2024	silver-haired bat	55	218	carcass search	cleared	scavenged	yes*
10/03/2024	silver-haired bat	30	218	carcass search	cleared	scavenged	yes*
10/03/2024	silver-haired bat	59	230	carcass search	cleared	intact	yes*
10/06/2024	big brown bat	47	210	carcass search	uncleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
10/06/2024	eastern red bat	58	202	carcass search	cleared	scavenged	yes*
10/06/2024	hoary bat	26	224	carcass search	cleared	scavenged	yes*
10/06/2024	silver-haired bat	54	201	carcass search	cleared	intact	yes*
10/06/2024	silver-haired bat	60	202	carcass search	cleared	scavenged	yes*
10/06/2024	silver-haired bat	54	203	carcass search	cleared	scavenged	yes*
10/06/2024	silver-haired bat	71	224	carcass search	cleared	scavenged	yes*
10/06/2024	silver-haired bat	47	224	carcass search	cleared	scavenged	yes*
10/07/2024	eastern red bat	30	241	carcass search	cleared	intact	yes*
10/07/2024	eastern red bat	45	243	carcass search	road and pad	intact	no
10/07/2024	evening bat	45	240	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	23	218	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	12	218	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	32	218	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	15	230	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	20	231	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	7	239	carcass search	road and pad	intact	no
10/07/2024	silver-haired bat	41	240	carcass search	cleared	scavenged	yes*
10/07/2024	silver-haired bat	35	240	carcass search	cleared	scavenged	yes*
10/10/2024	eastern red bat	34	243	carcass search	road and pad	scavenged	no
10/13/2024	eastern red bat	47	202	carcass search	cleared	scavenged	yes*
10/13/2024	eastern red bat	39	232	carcass search	uncleared	intact	yes*
10/13/2024	silver-haired bat	40	203	carcass search	cleared	scavenged	yes*
10/14/2024	big brown bat	68	218	carcass search	cleared	scavenged	yes*
10/14/2024	big brown bat	56	249	carcass search	cleared	scavenged	yes*
10/14/2024	hoary bat	18	245	carcass search	uncleared	scavenged	yes*
10/14/2024	silver-haired bat	11	243	carcass search	road and pad	scavenged	no
04/09/2024	European starling	33	207	carcass search	road and pad	scavenged	no
04/10/2024	golden-crowned kinglet	26	220	carcass search	road and pad	intact	no
04/16/2024	golden-crowned kinglet	39	222	carcass search	road and pad	scavenged	no
04/16/2024	golden-crowned kinglet	39	238	Incidental[2]	road and pad	scavenged	no
04/16/2024	horned lark	12	235	carcass search	road and pad	scavenged	no
04/16/2024	horned lark	0	235	carcass search	road and pad	scavenged	no
04/16/2024	red-tailed hawk	26	237	carcass search[2]	road and pad	scavenged	no
04/29/2024	chipping sparrow	81	224	carcass search	road and pad	scavenged	no
04/30/2024	red-winged blackbird	9	232	carcass search	road and pad	scavenged	no
05/06/2024	blue-gray gnatcatcher	8	225	carcass search	road and pad	scavenged	no
05/06/2024	indigo bunting	22	215	carcass search	road and pad	scavenged	no

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
05/13/2024	Nashville warbler	75	215	carcass search	road and pad	scavenged	no
05/14/2024	Tennessee warbler	47	249	carcass search	road and pad	scavenged	no
05/14/2024	gray catbird	78	220	carcass search	road and pad	scavenged	no
05/16/2024	gray catbird	87	224	Incidental[2]	cleared	scavenged	yes*
05/16/2024	killdeer	33	215	incidental	cleared	intact	yes*
05/16/2024	unidentified warbler	76	210	incidental	uncleared	scavenged	yes*
05/17/2024	turkey vulture	46	212	incidental	uncleared	injured	no
05/20/2024	unidentified warbler	67	210	carcass search	uncleared	scavenged	yes*
05/23/2024	black-billed cuckoo	44	232	carcass search	uncleared	scavenged	yes*
05/23/2024	unidentified small bird	67	233	carcass search	cleared	feather spot	yes*
05/24/2024	turkey vulture	54	228	carcass search	uncleared	scavenged	yes*
05/24/2024	unidentified small bird	55	249	carcass search	cleared	scavenged	yes*
05/27/2024	chimney swift	51	215	carcass search	cleared	scavenged	yes*
05/27/2024	unidentified passerine	78	211	carcass search	uncleared	scavenged	yes*
05/30/2024	unidentified accipiter	55	230	carcass search	cleared	scavenged	yes*
05/30/2024	unidentified passerine	52	230	carcass search	cleared	scavenged	yes*
05/31/2024	turkey vulture	76	249	carcass search	cleared	scavenged	yes*
05/31/2024	unidentified passerine	52	232	carcass search	uncleared	scavenged	yes*
05/31/2024	unidentified passerine	26	240	carcass search	cleared	scavenged	yes*
05/31/2024	unidentified passerine	68	241	carcass search	cleared	feather spot	yes*
06/06/2024	mourning dove	8	234	carcass search	uncleared	scavenged	yes*
06/07/2024	killdeer	54	249	carcass search	cleared	scavenged	yes*
06/07/2024	turkey vulture	59	249	carcass search	cleared	scavenged	yes*
06/10/2024	horned lark	5	202	carcass search	cleared	scavenged	yes*
06/13/2024	horned lark	74	228	carcass search	uncleared	scavenged	yes*
06/13/2024	mourning dove	6	234	carcass search	uncleared	scavenged	yes*
06/20/2024	turkey vulture	51	227	carcass search	cleared	scavenged	yes*
06/21/2024	unidentified passerine	28	240	carcass search	cleared	scavenged	yes*
07/04/2024	brown-headed cowbird	57	233	carcass search	cleared	scavenged	yes*
07/04/2024	turkey vulture	47	227	carcass search	cleared	scavenged	yes*
07/11/2024	killdeer	27	233	carcass search	cleared	scavenged	yes*
07/18/2024	European starling	49	231	carcass search	cleared	scavenged	yes*
07/18/2024	red-tailed hawk	61	233	carcass search	cleared	scavenged	yes*
07/19/2024	chimney swift	65	249	carcass search	cleared	scavenged	yes*
07/19/2024	killdeer	50	249	carcass search	cleared	feather spot	yes*
07/22/2024	horned lark	30	201	carcass search	cleared	scavenged	yes*
07/22/2024	indigo bunting	4	226	carcass search	road and pad	scavenged	no

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
07/22/2024	unidentified passerine	33	201	carcass search	cleared	scavenged	yes*
07/25/2024	chimney swift	61	228	carcass search	uncleared	scavenged	yes*
07/25/2024	horned lark	29	230	carcass search	cleared	scavenged	yes*
07/25/2024	killdeer	21	218	carcass search	cleared	scavenged	yes*
07/25/2024	killdeer	73	227	carcass search	cleared	feather spot	yes*
07/26/2024	brown-headed cowbird	1	245	carcass search	uncleared	scavenged	yes*
07/26/2024	chimney swift	25	249	carcass search	cleared	scavenged	yes*
07/26/2024	killdeer	19	241	carcass search	cleared	feather spot	yes*
07/29/2024	horned lark	41	201	carcass search	cleared	scavenged	yes*
07/29/2024	horned lark	79	202	carcass search	cleared	scavenged	yes*
08/01/2024	brown-headed cowbird	26	227	carcass search	cleared	scavenged	yes*
08/01/2024	brown-headed cowbird	35	231	carcass search	cleared	intact	yes*
08/01/2024	chimney swift	29	240	carcass search	cleared	scavenged	yes*
08/01/2024	red-tailed hawk	64	233	carcass search	cleared	scavenged	yes*
08/02/2024	chimney swift	67	241	carcass search	cleared	scavenged	yes*
08/02/2024	turkey vulture	67	249	carcass search	cleared	scavenged	yes*
08/04/2024	brown-headed cowbird	75	215	carcass search	cleared	feather spot	yes*
08/05/2024	killdeer	74	227	carcass search	cleared	injured	yes*
08/08/2024	chimney swift	71	240	carcass search	cleared	scavenged	yes*
08/08/2024	killdeer	29	223	carcass search	uncleared	scavenged	yes*
08/14/2024	indigo bunting	21	227	carcass search	cleared	scavenged	yes*
08/14/2024	killdeer	40	224	carcass search	cleared	feather spot	yes*
08/15/2024	indigo bunting	23	240	carcass search	cleared	scavenged	yes*
08/15/2024	purple martin	39	230	carcass search	cleared	intact	yes*
08/15/2024	purple martin	26	244	carcass search	uncleared	scavenged	yes*
08/15/2024	red-tailed hawk	70	240	carcass search	cleared	scavenged	yes*
08/15/2024	unidentified blackbird	43	244	carcass search	uncleared	feather spot	yes*
08/19/2024	turkey vulture	38	225	carcass search	uncleared	scavenged	yes*
08/19/2024	turkey vulture	44	225	carcass search	uncleared	scavenged	yes*
08/22/2024	Baltimore oriole	50	240	carcass search	cleared	scavenged	yes*
08/25/2024	killdeer	50	202	carcass search	cleared	feather spot	yes*
08/29/2024	unidentified warbler	5	207	carcass search	road and pad	scavenged	no
09/02/2024	pine warbler	64	219	carcass search	road and pad	intact	no
09/02/2024	turkey vulture	68	231	carcass search	cleared	scavenged	yes*
09/02/2024	turkey vulture	38	231	carcass search	cleared	scavenged	yes*
09/04/2024	Cape May warbler	43	240	carcass search	cleared	scavenged	yes*
09/08/2024	unidentified passerine	56	231	carcass search	cleared	scavenged	yes*

Appendix B1. Carcasses found at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Found Date	Species[1]	Distance from Turbine (m)	Turbine	Search Type	Plot Type	Condition	Aided Search Type
09/09/2024	horned lark	14	225	carcass search	uncleared	scavenged	yes*
09/09/2024	horned lark	7	229	carcass search	road and pad	scavenged	no
09/09/2024	turkey vulture	23	221	carcass search[2]	road and pad	scavenged	no
09/12/2024	mourning dove	40	240	carcass search	cleared	scavenged	yes*
09/15/2024	killdeer	48	203	carcass search	cleared	scavenged	yes*
09/16/2024	black-throated green warbler	15	243	carcass search	road and pad	scavenged	no
09/16/2024	horned lark	43	237	carcass search	road and pad	scavenged	no
09/16/2024	horned lark	17	241	carcass search	cleared	scavenged	yes*
09/16/2024	unidentified kinglet	51	227	carcass search	cleared	scavenged	yes*
09/19/2024	ruby-throated hummingbird	41	240	carcass search	cleared	scavenged	yes*
09/22/2024	chimney swift	35	201	carcass search	cleared	scavenged	yes*
09/22/2024	chimney swift	20	211	carcass search	uncleared	scavenged	yes*
09/23/2024	indigo bunting	1	247	carcass search	road and pad	scavenged	no
09/23/2024	turkey vulture	27	207	carcass search[2]	road and pad	scavenged	no
09/26/2024	chimney swift	20	245	carcass search	uncleared	scavenged	yes*
10/03/2024	European starling	43	230	carcass search	cleared	scavenged	yes*
10/03/2024	horned lark	15	219	carcass search	road and pad	intact	no
10/03/2024	northern parula	65	208	carcass search	road and pad	scavenged	no
10/06/2024	turkey vulture	46	233	carcass search	cleared	scavenged	yes*
10/07/2024	ruby-crowned kinglet	92	205	carcass search	road and pad	scavenged	no
10/10/2024	turkey vulture	10	226	carcass search	road and pad	scavenged	no
10/13/2024	golden-crowned kinglet	44	202	carcass search	cleared	scavenged	yes*
10/13/2024	golden-crowned kinglet	88	232	carcass search[2]	uncleared	scavenged	yes*
10/13/2024	horned lark	41	203	carcass search	cleared	scavenged	yes*
10/13/2024	ruby-crowned kinglet	64	232	carcass search	uncleared	scavenged	yes*
10/13/2024	ruby-crowned kinglet	77	232	carcass search	uncleared	scavenged	yes*
10/13/2024	turkey vulture	45	215	carcass search	cleared	intact	yes*
10/13/2024	turkey vulture	55	233	carcass search	cleared	scavenged	yes*
10/14/2024	turkey vulture	68	249	carcass search	cleared	scavenged	yes*

1. Birds found during the study period were not included in analysis.

2. Carcass was found outside the search area and was not included in analysis.

3. Carcass DNA analysis was inconclusive and species unable to be determined.

* Dog-aided search

Appendix B2. Summary of searches and bat fatalities recorded by season and search area type at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season	Search Area Type[1]	Indiana Bat Fatalities	Evening Bat Fatalities	Little Brown Bat Fatalities	Tricolored Bat Fatalities	Number of Searches[2]	Total Number of Bats Recorded[3]
Spring	100-m road and pad	0	0	0	0	326	12
Summer	100-m road and pad	0	0	0	0	80	6
	80-m cleared plot	1	2	1	0	145	68
	80-m uncleared plot	0	1	3	0	114	54
Fall	100-m road and pad	2	0	0	1	498	74
	80-m cleared plot	3	2	1	0	162	173
	80-m uncleared plot	0	1	0	0	125	95
Overall		**6**	**6**	**5**	**1**	**1,450**	**482**

1. All 80-meter (m) plots were searched by detection-dog teams, and road and pads were searched by technicians.
2. Thirty-one searches were missed due to turbine maintenance, weather constraints, and/or safety hazards. An additional nine searches were removed from analysis because they were partial searches.
3. Five hundred seven bats in total were found. Twenty-five bats were excluded from analysis.

Appendix C. Searcher Efficiency and Carcass Persistence Model Fitting Results

Appendix C1. Searcher efficiency results by plot type at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season	Plot Type	Carcass Type	Number Placed	Number Available	Number Found	% Found**
Spring	Road and pad	Frozen	17	14	14	100
Summer	Road and pad	Frozen	16	15	15	100
	Cleared plot*	Frozen	16*	16*	11*	69*
	Uncleared plot*	Frozen	15*	14*	13*	93*
Fall	Road and pad	Frozen & Fresh	19	16	13	81
	Cleared plot	Frozen	15	10	4	40
	Uncleared plot	Frozen	15	11	6	55
	Cleared plot	Fresh*	21	16	13	81
	Uncleared plot	Fresh*	16	14	11	79
Overall Full Plots (Cleared and Uncleared)		**Fresh***	**37**	**30**	**24**	**80**
Overall Road and Pads		**Frozen & Fresh**	**52**	**45**	**42**	**93**
Overall Used in Analysis		**–**	**89**	**75**	**66**	**88**

Uncleared and cleared plots were combined for analysis.

* Top model for detection-dog teams included only fresh searcher efficiency trials with plot type as a potential covariate. Only Fresh carcasses were used in analysis.

**Percentages are rounded to nearest whole number.

Appendix C2. Searcher efficiency models for detection-dog teams at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (n = 30).

Covariates	*k* Value	AICc	Delta AICc
No Covariates	0.67	32.17	0*
Plot Search Type	0.67	34.44	2.27

* Selected model.

k = detection reduction factor; AICc = corrected Akaike Information Criterion; Delta AICc = change in AICc.

Appendix C3. Searcher efficiency models for technicians at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (n = 45).

Covariates	*k* Value	AICc	Delta AICc
Season	0.67	24.06	0
No Covariates	0.67	24.14	0.08*

* Selected model.

k = detection reduction factor; AICc = corrected Akaike Information Criterion; Delta AICc = change in AICc.

Appendix C4. Number of carcass persistence trial carcasses placed by season and plot type at the Headwaters II Wind Farm, Randolph County, Indiana from April 1 – October 15, 2024.

Season	Search Area Type[1]	Number of Carcasses Placed
Spring	100-m road and pad	15
Summer	100-m road and pad	15
	80-m cleared plot	16
	80-m uncleared plot	14
Fall	100-m road and pad	10
	80-m cleared plot	10
	80-m uncleared plot	12
Overall 100-m Road and Pads		**40**
Overall 80-m Full Plots		**52**
Overall		**92**

[1.] Uncleared and cleared plots were combined for analysis.

m = meter.

Appendix C5. Carcass persistence models with covariates and distributions for bats at 80-meter full plots at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (n = 52).

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
Season	Season	Weibull	214.70	0*
Season	Season + Plot Search Type	Weibull	216.73	2.03
Season + Plot Search Type	Season	Weibull	216.83	2.13
No Covariates	Season	Weibull	217.38	2.68
Season * Plot Search Type	Season	Weibull	217.41	2.71
Season	Season	lognormal	217.43	2.73
Season	No Covariates	Weibull	217.59	2.89
Season	Season	loglogistic	217.77	3.07
No Covariates	Season + Plot Search Type	Weibull	218.03	3.33
Season	No Covariates	lognormal	218.55	3.85
No Covariates	No Covariates	Weibull	218.63	3.93
Season	Season * Plot Search Type	Weibull	219.08	4.38
Season + Plot Search Type	Season + Plot Search Type	Weibull	219.13	4.43
Season	No Covariates	loglogistic	219.13	4.43

* Selected model.

AICc = corrected Akaike Information Criterion; Delta AICc = change in AICc.

Appendix C6. Carcass persistence models with covariates and distributions for road and pads at the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (n = 40).

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
No Covariates	No Covariates	lognormal	173.26	0*
No Covariates	No Covariates	loglogistic	173.29	0.03
No Covariates	No Covariates	Weibull	173.96	0.70
Season	No Covariates	loglogistic	176.90	3.64
Season	No Covariates	lognormal	177.07	3.81
No Covariates	Season	loglogistic	177.53	4.27
No Covariates	Season	lognormal	177.61	4.35
Season	No Covariates	Weibull	177.65	4.39
No Covariates	Season	Weibull	178.69	5.43
No Covariates	–	exponential	181.61	8.35
Season	Season	loglogistic	181.73	8.47
Season	Season	lognormal	182.03	8.77
Season	Season	Weibull	183.00	9.74
Season	–	exponential	184.35	11.09

* Selected model.

AICc = corrected Akaike Information Criterion; Delta AICc = change in AICc.

Appendix C7. Carcass persistence top model with covariates, distributions, and model parameters for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Plot Search Type	Season	Distribution	Estimated Median Removal Times (days)	Parameter 1	Parameter 2
Full plot*	Fall	Weibull**	1.70	shape = 0.494	scale = 3.561
Full plot*	Summer	Weibull**	7.68	shape = 0.939	scale = 11.348
Road and pad	All	lognormal**	3.90	meanlog = 1.362	sdlog = 1.630

* Dog aided search.

** Parameterization follows the base R parameterization for this distribution.

Appendix D. Truncated Weighted Maximum Likelihood Search Area Adjustment Model Fitting Results

Appendix D1. Number and percent (%) of bat carcasses found and total included in the search area adjustment calculation for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

	Included in Search Area Adjustment		Outside Search Area[1]		Outside Study Period[1]		Total	
Species	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**
eastern red bat	203	42.1	3	50	10	52.6	216	42.6
silver-haired bat	156	32.4	3	50	3	15.8	162	32.0
big brown bat	59	12.2	0	0	3	15.8	62	12.2
hoary bat	44	9.1	0	0	2	10.5	46	9.1
Indiana bat	6	1.2	0	0	0	0	6	1.2
evening bat	5	1.0	0	0	1	5.3	6	1.2
little brown bat	5	1.0	0	0	0	0	5	1.0
unidentified *Lasiurus* bat	2	0.4	0	0	0	0	2	0.4
tricolored bat	1	0.2	0	0	0	0	1	0.2
unidentified bat	1	0.2	0	0	0	0	1	0.2
Overall Bats	**482**	**100**	**6**	**100**	**19**	**100**	**507**	**100**

[1.] Carcasses not included in analysis.

Sums of values may not equal totals shown due to rounding.

Appendix D2. Search area adjustment models for bats from the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

3.6-MW Distribution	4.2-MW Distribution	Pooled Distribution	AICc	Delta AICc
Weibull	Gompertz	–	18,814.27	0*
normal	Gompertz	–	18,825.70	11.42
gamma	Gompertz	–	18,825.97	11.69
Gompertz	Gompertz	–	18,856.38	42.10
Weibull	normal	–	18,931.87	117.59
normal	normal	–	18,943.29	129.02
gamma	normal	–	18,943.56	129.29
–	–	Gompertz	18,959.47	145.19
Gompertz	normal	–	18,973.97	159.70
Weibull	Weibull	–	19,042.62	228.34

* Selected model.

AICc = corrected Akaike Information Criterion; Delta AICc = change in AICc.

Appendix D3. Truncated weighted maximum (TWL) likelihood search area adjustment estimates by turbine and plot type for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024 (Bat n = 482).

Sample Size[1]	Turbine Size (MW)	Number of Searches	Area Adjustment	Search Area Type	Distribution	Parameter 1	Parameter 2
85	3.6	129	1.00	full plot	Weibull	2.1965	36.5295
305	4.2	417	1.00	full plot	Gompertz	0.0565	0.0036
26	3.6	259	0.16	road and pad	Weibull	2.1965	36.5295
66	4.2	645	0.11	road and pad	Gompertz	0.0565	0.0036

[1.] Bat carcasses input for the TWL.

MW = megawatt.

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

Appendix E1. Inputs needed to run Evidence of Absence (EoA): Single Class Module for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.[1]

Season	Plot Type[2]	Aided Search Type	MW	Search Interval (I; in days)	Number of Searches	Spatial Coverage (a)	Searcher Efficiency		Carcass Persistence			
							Carcasses Available	Carcasses Found	Distribution	Shape (α)	Scale (β)	β CI (95%)
Spring	road and pad	none	3.6	7.0	7	0.16	45	42	lognormal	2.66	1.36	0.83–1.89
	road and pad	none	4.2	7.0	7	0.11	45	42	lognormal	2.66	1.36	0.83–1.89
	unsearched	–	–	–	–	–	–	–	–	–	–	–
Summer 1	full plot	dog	3.6	7.0	2	1.00	30	24	Weibull	0.94	11.35	7.52–17.13
	full plot	dog	4.2	7.0	2	1.00	30	24	Weibull	0.94	11.35	7.52–17.13
	road and pad	none	3.6	3.5	4	0.16	45	42	lognormal	2.66	1.36	0.83–1.89
	road and pad	none	4.2	3.5	4	0.11	45	42	lognormal	2.66	1.36	0.83–1.89
Summer 2	full plot	dog	3.6	7.0	9	1.00	30	24	Weibull	0.94	11.35	7.52–17.13
	full plot	dog	4.2	7.0	9	1.00	30	24	Weibull	0.94	11.35	7.52–17.13
	road and pad	none	3.6	3.5	16	0.16	45	42	lognormal	2.66	1.36	0.83–1.89
	road and pad	none	4.2	3.5	16	0.11	45	42	lognormal	2.66	1.36	0.83–1.89
Fall	full plot	dog	3.6	7.0	11	1.00	30	24	Weibull	0.49	3.56	1.34–9.43
	full plot	dog	4.2	7.0	12	1.00	30	24	Weibull	0.49	3.56	1.34–9.43
	road and pad	none	3.6	3.5	21	0.16	45	42	lognormal	2.66	1.36	0.83–1.89
	road and pad	none	4.2	3.5	21	0.11	45	42	lognormal	2.66	1.36	0.83–1.89

1. The detection reduction factor k was assumed to equal 0.67 for all strata.

2. Temporal coverage (v) was set to 1 across all strata. Seasonality of risk is accounted for in the Multiple Class Module.

MW = megawatt; CI = confidence interval

Appendix E2. Weights used for the Evidence of Absence (EoA) model to combine across plot types within each subseason: Multiple Class Module for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season[1]	Plot Type	Aided Search Type	MW	Minimization Weight	Within-Season Sampling Fraction	Relative Operation of Turbines	Weight (DWP)[1]
Spring	road and pad	none	3.6	1.00	0.27	1.00	0.27
	road and pad	none	4.2	1.00	0.71	1.00	0.72
	unsearched	–	–	1.00	0.02	0.33	0.01
Summer 1	full plot	dog	3.6	1.27	0.21	1.00	0.20
	full plot	dog	4.2	1.32	0.66	1.00	0.66
	road and pad	none	3.6	1.27	0.03	1.00	0.03
	road and pad	none	4.2	1.31	0.10	1.00	0.10
Summer 2	full plot	dog	3.6	1.00	0.21	1.00	0.21
	full plot	dog	4.2	1.00	0.66	1.00	0.66
	road and pad	none	3.6	1.00	0.03	1.00	0.03
	road and pad	none	4.2	1.00	0.10	1.00	0.10
Fall	full plot	dog	3.6	1.00	0.12	1.00	0.12
	full plot	dog	4.2	1.00	0.39	1.00	0.39
	road and pad	none	3.6	1.00	0.14	1.00	0.14
	road and pad	none	4.2	1.00	0.35	1.00	0.35

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.

MW = megawatt.

Appendix E3. Data inputs for the Evidence of Absence (EoA) model to combine across plot types within each subseason: Multiple Class Module for the Headwaters II Wind Farm, Randolph County, Indiana, from April 1 – October 15, 2024.

Season[1]	Plot Type	Aided Search Type	MW	# of Turbines	Weight (DWP)[1]	Ba[2]	Bb[2]	*g* (90% CrI)[3]
Spring	road and pad	none	3.6	13	0.27	83.33	83.3	0.09 (0.07–0.10)
	road and pad	none	4.2	35	0.72	85.50	85.50	0.06 (0.05–0.07)
	unsearched	–	–	1	0.01	0.01	0.01	0 (0–0)
Summer 1	full plot	dog	3.6	6	0.20	126.41	126.41	0.59 (0.54–0.65)
	full plot	dog	4.2	19	0.66	126.31	126.31	0.60 (0.54–0.65)
	road and pad	none	3.6	1	0.03	136.02	136.02	0.11 (0.09–0.12)
	road and pad	none	4.2	3	0.10	140.53	140.53	0.08 (0.07–0.09)
Summer 2	full plot	dog	3.6	6	0.21	43.25	43.25	0.62 (0.52–0.71)
	full plot	dog	4.2	19	0.66	43.21	43.21	0.62 (0.52–0.71)
	road and pad	none	3.6	1	0.03	139.55	139.55	0.11 (0.09–0.12)
	road and pad	none	4.2	3	0.10	144.23	144.23	0.08 (0.07–0.09)
Fall	full plot	dog	3.6	6	0.12	13.07	13.07	0.35 (0.23–0.48)
	full plot	dog	4.2	19	0.39	13.05	13.05	0.35 (0.23–0.48)
	road and pad	none	3.6	7	0.14	139.80	139.80	0.11 (0.09–0.12)
	road and pad	none	4.2	17	0.35	144.50	144.50	0.08 (0.07–0.09)

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.

2. Ba and Bb are the α and β parameters of a beta distribution describing the detection probability distribution.

3. CrI = credible interval.

MW = megawatt.

Appendix E4. Weights used for the Evidence of Absence model to combine across subseasons: Multiple Class Module for the Headwaters II Wind Farm, Indiana, from April 1 – October 15, 2024.

Season	Seasonal Arrival Proportion	Relative Operation of Turbines	Minimization Weight	Weight (DWP)[1]
Summer 1	1.00	1.30	0.25	1.00
Summer 2	1.00	1.00	0.75	1.00

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.

Appendix E5. Data inputs for the Evidence of Absence model to combine across subseasons: Multiple Class Module for the Headwaters II Wind Farm, Indiana, from April 1 – October 15, 2024.

Season	Weight (DWP)[1]	Ba[2]	Bb[2]	*g* (90% CrI)[3]
Summer 1	0.25	241.50	218.69	0.52 (0.49–0.56)
Summer 2	0.75	85.57	70.76	0.55 (0.48–0.61)

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.
2. Ba and Bb are the α and β parameters of a beta distribution describing the detection probability distribution.
3. CrI = credible interval.

Appendix E6. Weights used for the Evidence of Absence model to combine across seasons: Multiple Class Module for the Headwaters II Wind Farm, Indiana, from April 1 – October 15, 2024.

Season	Seasonal Arrival Proportion	Relative Operation of Turbines	Risk Turbines Weight	Minimization Weight	Weight (DWP)[1]
Spring	0.07	1.00	1.00	1.00	0.08
Summer	0.36	1.00	0.59	1.06	0.26
Fall	0.57	1.00	1.00	1.00	0.66

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.

Appendix E7. Data inputs for the Evidence of Absence model to combine across seasons: Multiple Class Module for the Headwaters II Wind Farm, Indiana, from April 1 – October 15, 2024.

Season	Weight (DWP)[1]	Ba[2]	Bb[2]	*g* (90% CrI)[3]
Spring	0.08	154.37	2127.94	0.07 (0.06–0.08)
Summer	0.26	147.34	124.70	0.54 (0.49–0.59)
Fall	0.66	38.22	135.44	0.22 (0.17–0.27)

1. The density-weighted proportion (DWP) is the fraction of carcasses expected within the stratum.
2. Ba and Bb are the α and β parameters of a beta distribution describing the detection probability distribution.
3. CrI = credible interval.

Appendix E8. Inputs needed to run Evidence of Absence model to combine across years for the summer trigger: Multiple Years Module for the Headwaters II Wind Farm in Randolph County, Indiana, from 2022 – 2024.

Year[2]	Ba[1]	Bb[1]	*g* (90% CrI)[13]	ρ	Carcass Count (X)	
					INBA	NLBA
2022	359.28	769.36	0.32 (0.30–0.34)	0.92	0	0
2023	196.02	479.49	0.29 (0.26–0.32)	1.00	1	0
2024	147.34	124.70	0.54 (0.49–0.59)	1.06	1	0
Short-term (summer) Trigger (Rolling Average)	554.06	874.79	0.39 (0.37–0.41)	–	2	–
Long-term Trigger (Cumulative)	554.06	874.79	0.39 (0.37–0.41)	–	2	–

1. Ba and Bb are the α and β parameters of a beta distribution describing the detection probability distribution.

2. For this study, data from the last three summers (2022 – 2024) were used to evaluate the short-term trigger.

3. CrI = credible interval.

INBA = Indiana bat; NLBA = northern long-eared bat.

Appendix E9. Inputs needed to run Evidence of Absence model to combine detection probability distributions across years for the general trigger: Multiple Years Module for the Headwaters II Wind Farm, Randolph County, Indiana, from 2022-2024.

Year[2]	Ba[1]	Bb[1]	*g* (90% CrI)[13]	ρ	Carcass Count (X)	
					INBA	NLBA
2022	293.12	660.05	0.31 (0.28–0.33)	0.92	4	0
2023	369.98	1155.91	0.24 (0.22–0.26)	1.00	6	0
2024	123.12	299.13	0.29 (0.26–0.33)	1.06	6	0
Short-term Trigger (Rolling Average)	584.83	1504.13	0.28 (0.26–0.30)	–	16	0
Long-term Trigger (Cumulative)	584.83	1504.13	0.28 (0.26–0.30)	–	16	0

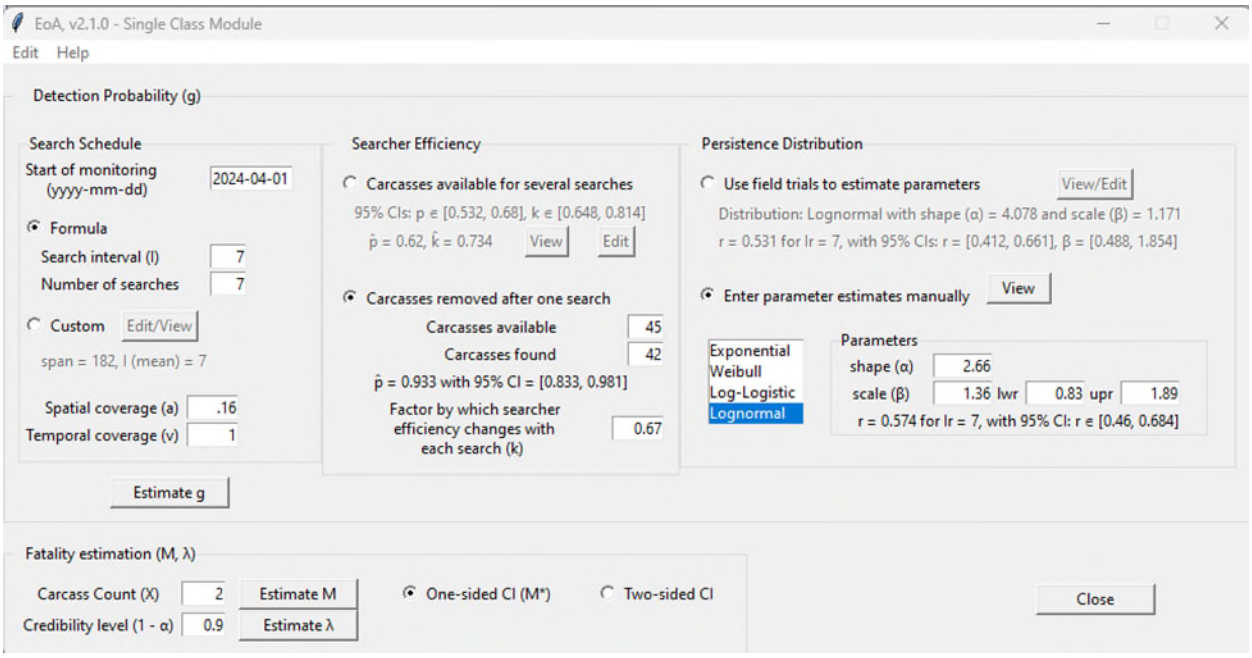
1. Ba and Bb are the parameters for the beta distribution used to characterize the distribution of the probability of detection. The *g*-value is the mean of that distribution.

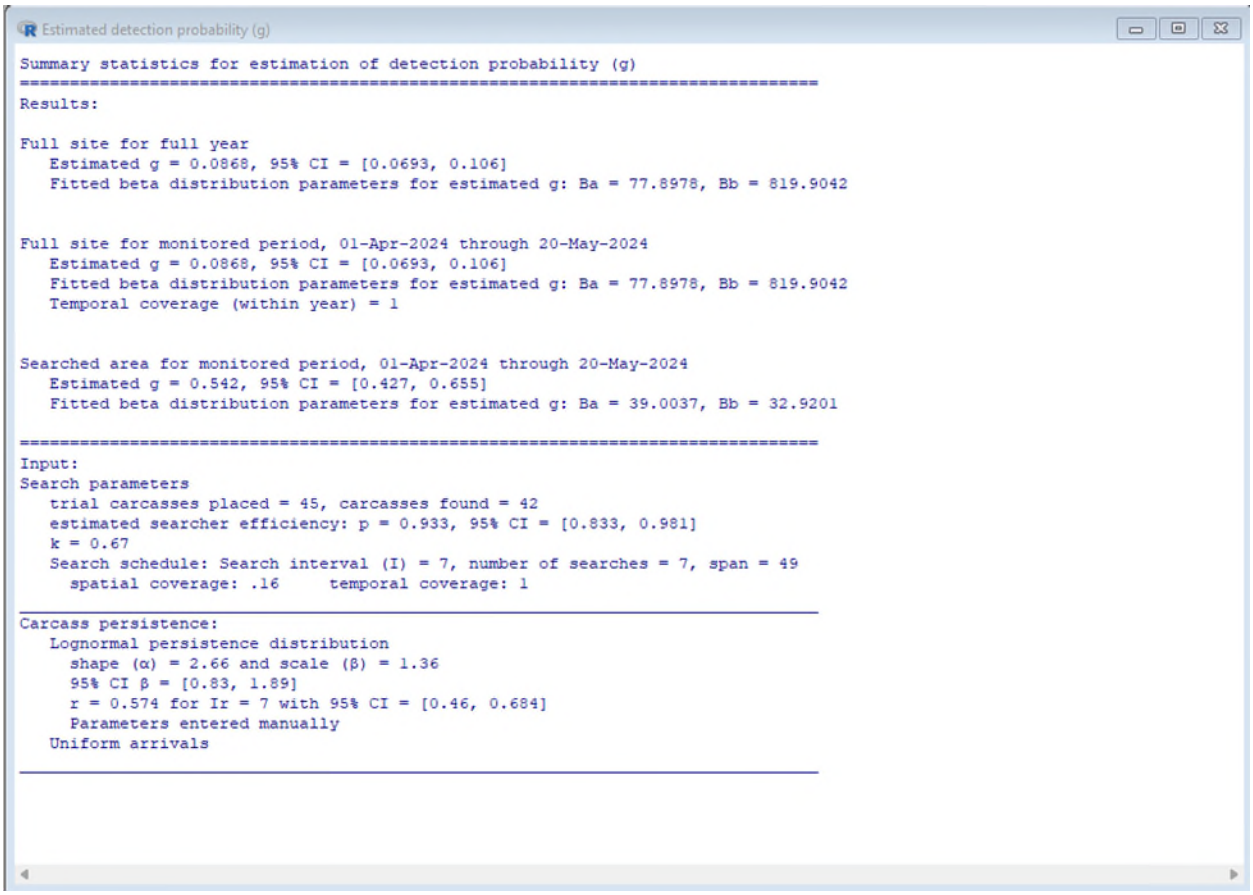
2. For this study, data from the last three full study periods (spring 2022 – fall 2024) were used to evaluate the short-term trigger.

3. CrI = credible interval of *g*.

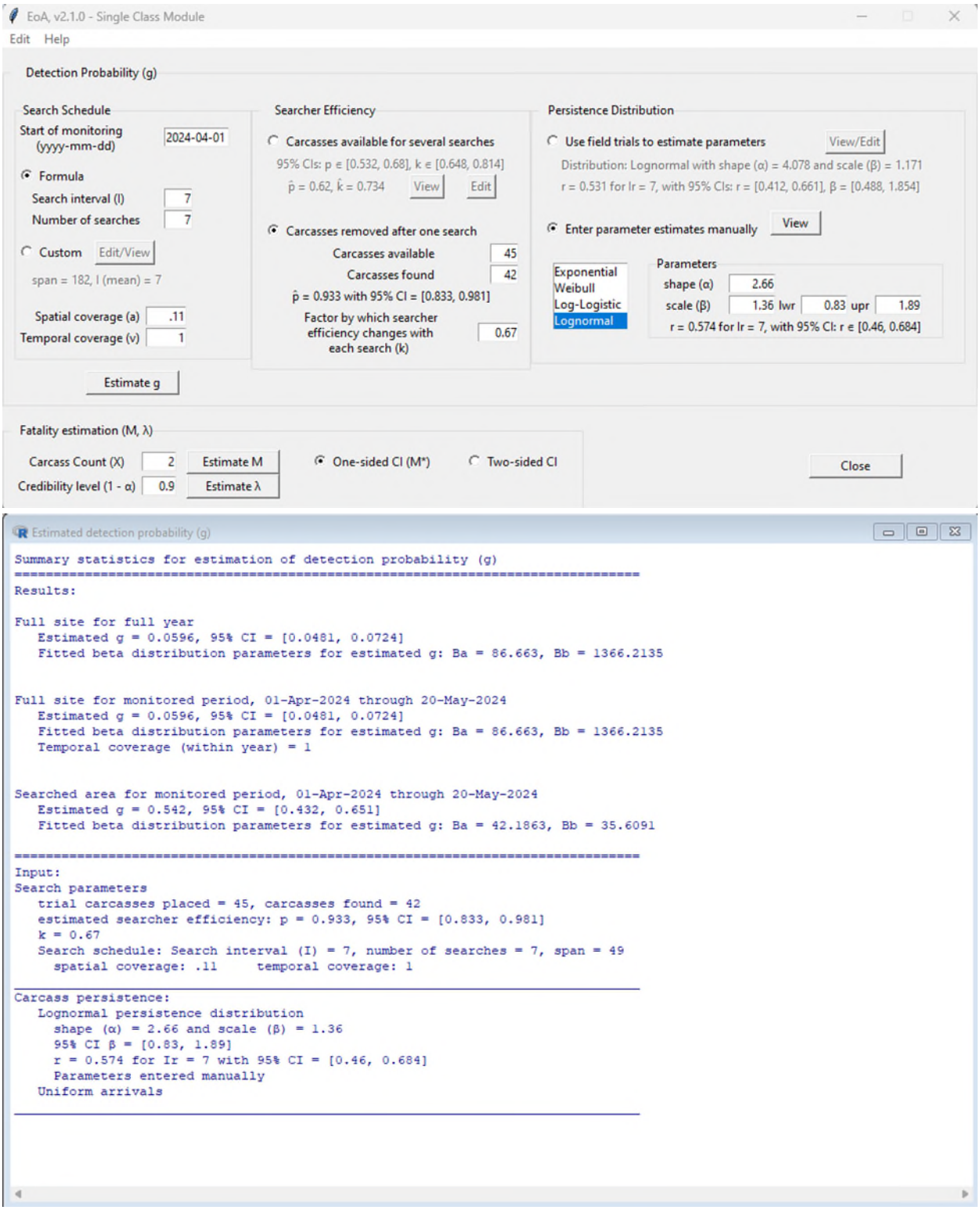
INBA = Indiana bat; NLBA = northern long-eared bat.

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

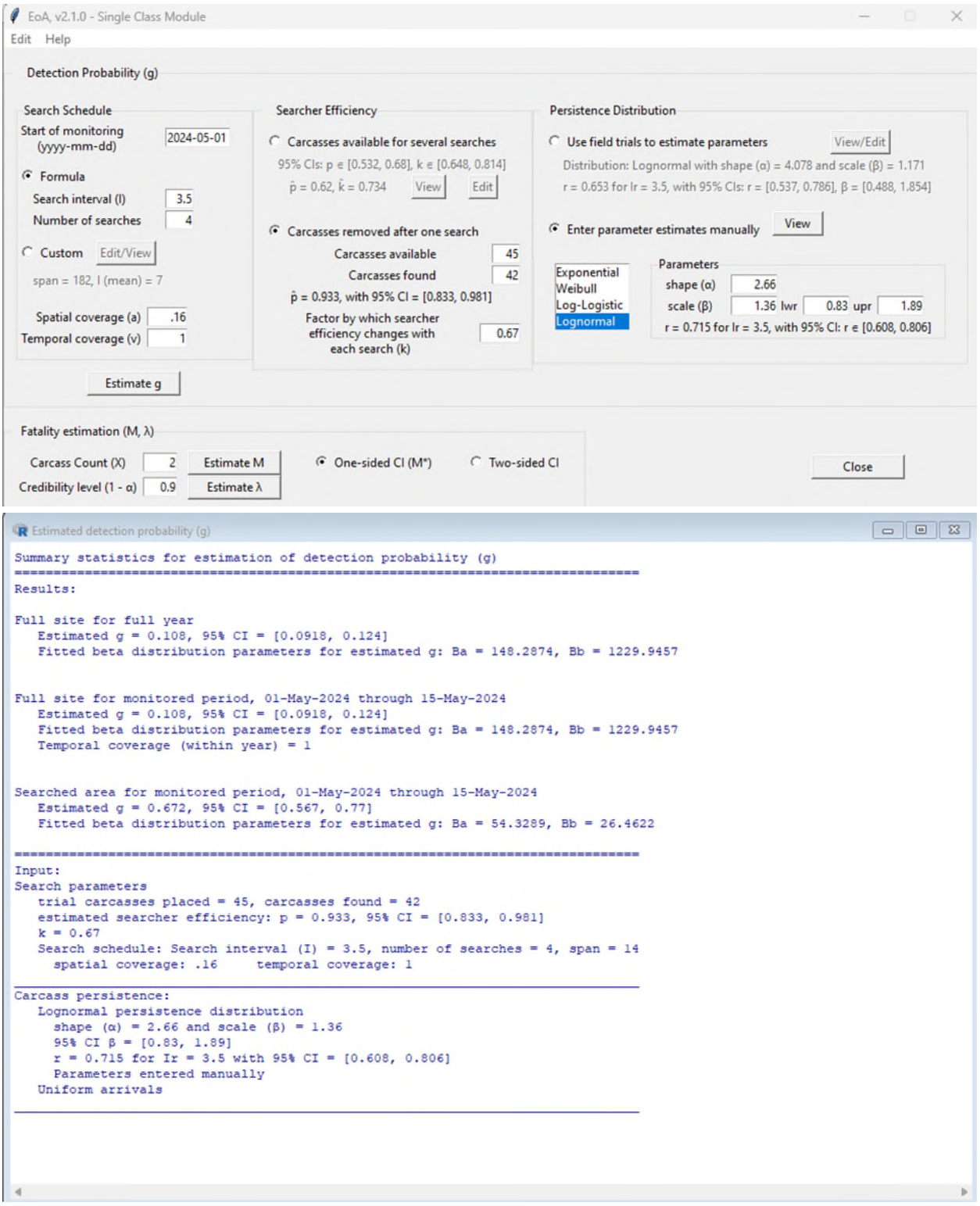




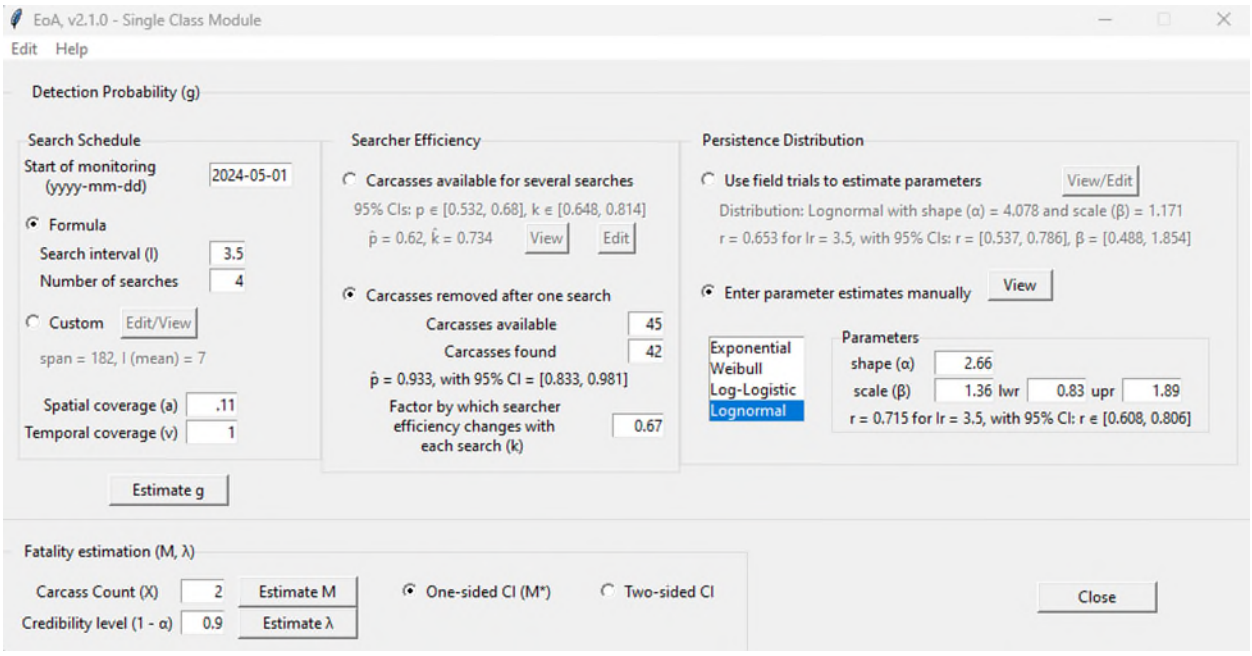
Appendix F1. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Spring 2024, 100-meter road and pad searches at 13 3.6-megawatt turbines with a blade length of 67 meters searched at a 7-day interval.

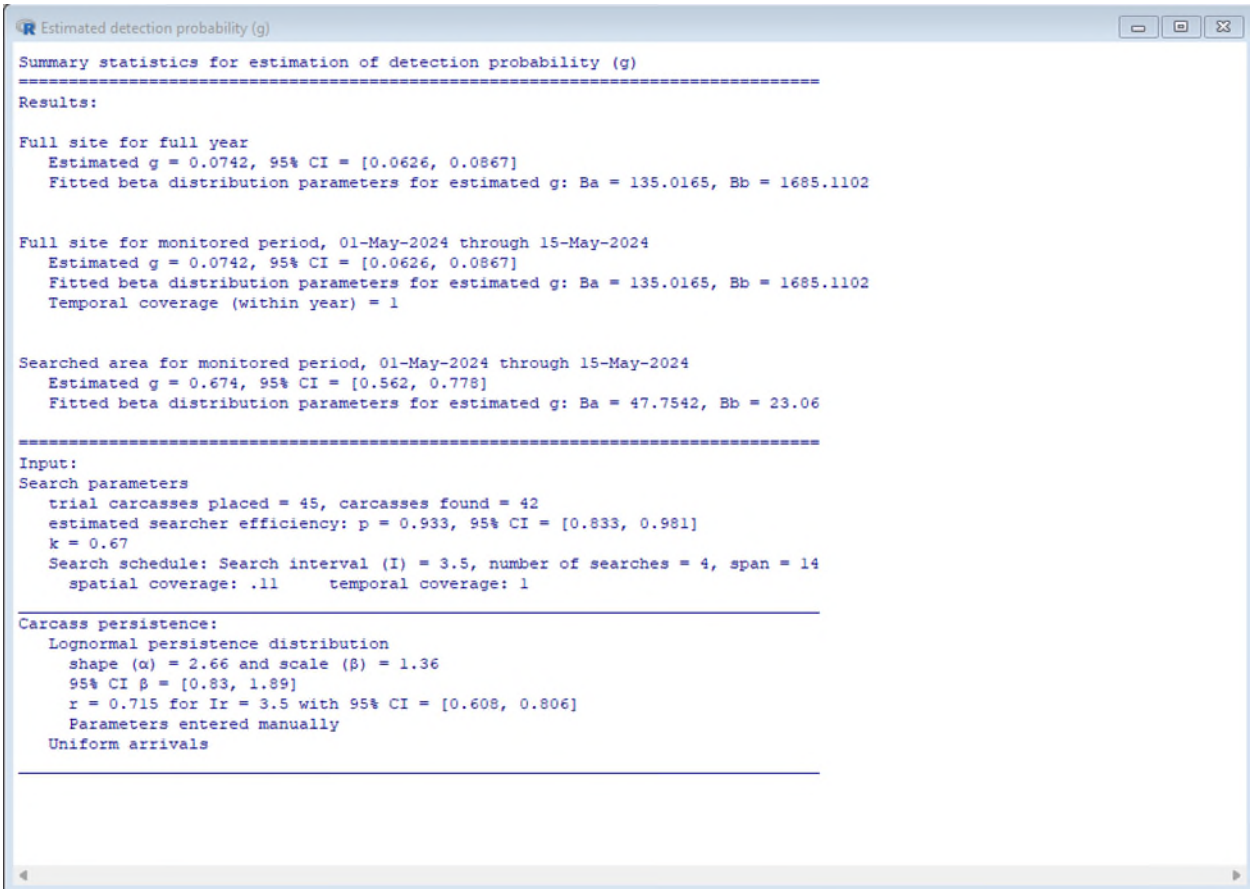


Appendix F2. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Spring 2024, 100-meter road and pad searches at 35 4.2-megawatt turbines with a blade length of 74 meters searched at a 7-day interval.

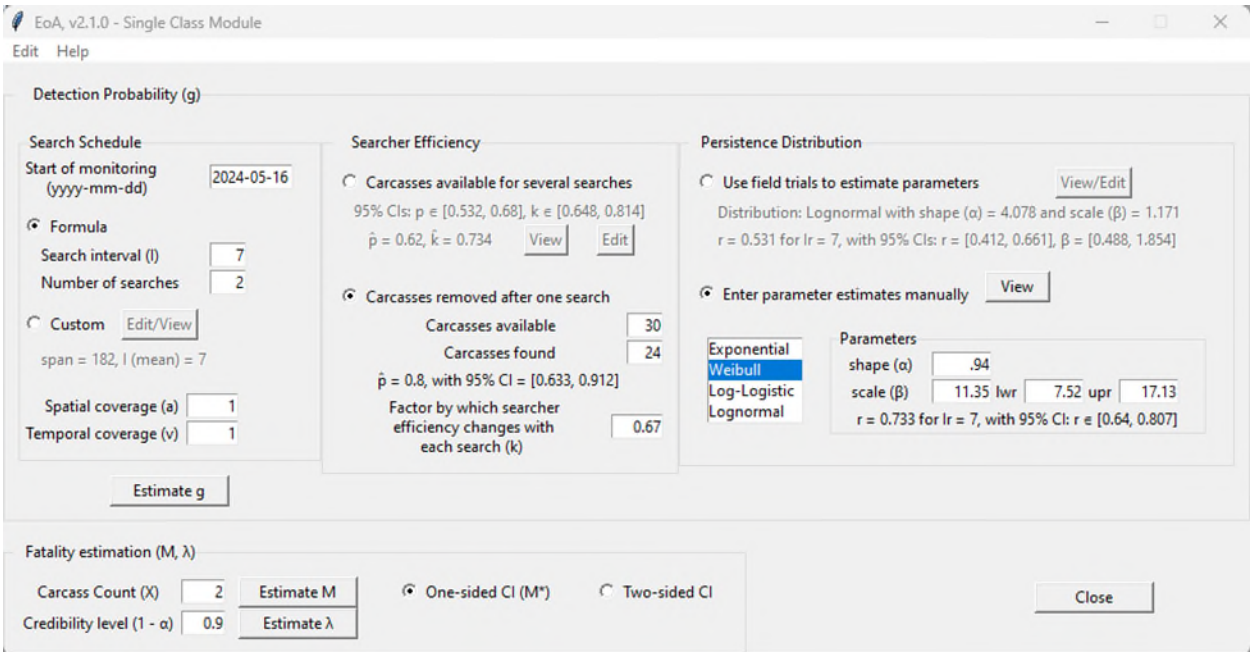


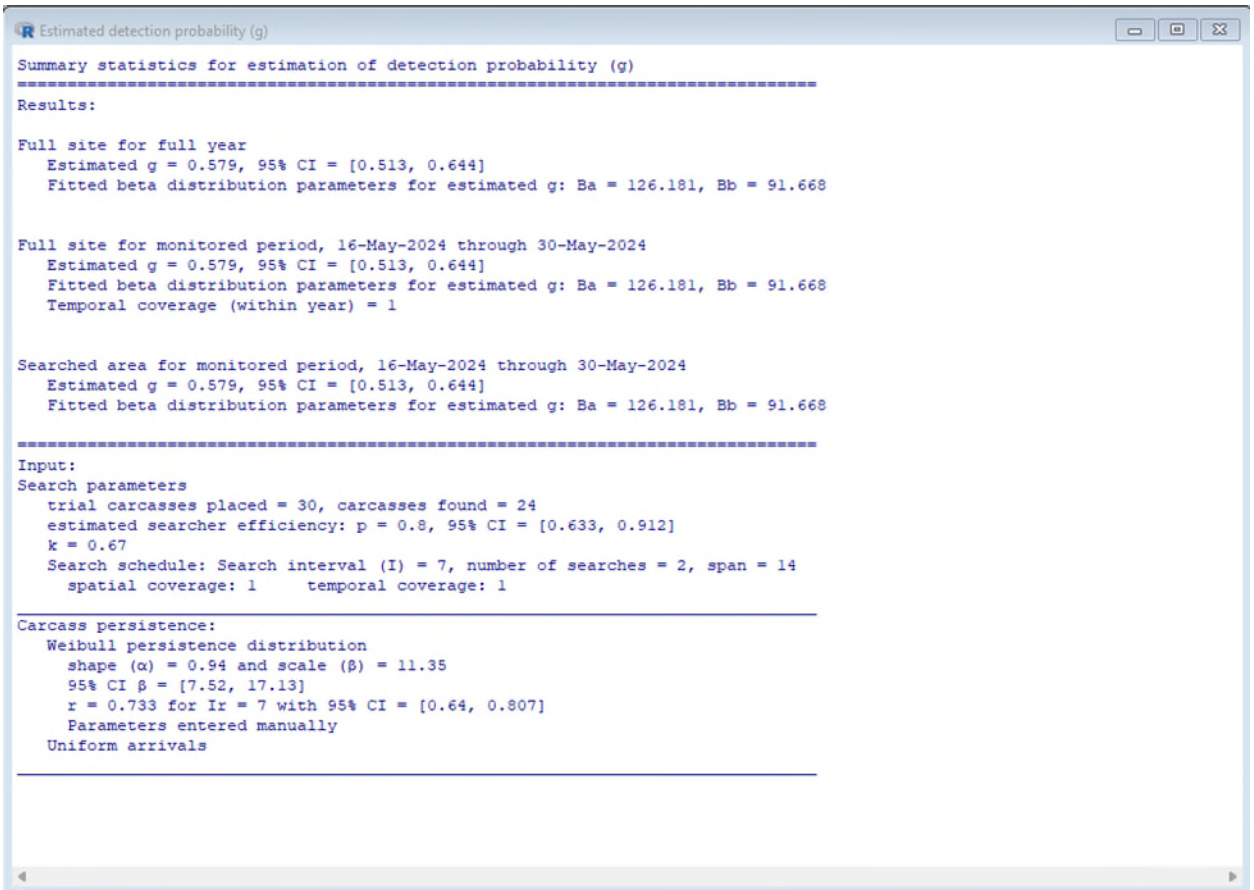
Appendix F3. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 1 2024, 100-meter road and pad searches at one 3.6-megawatt turbine with a blade length of 67 meters searched at a 3.5-day interval.



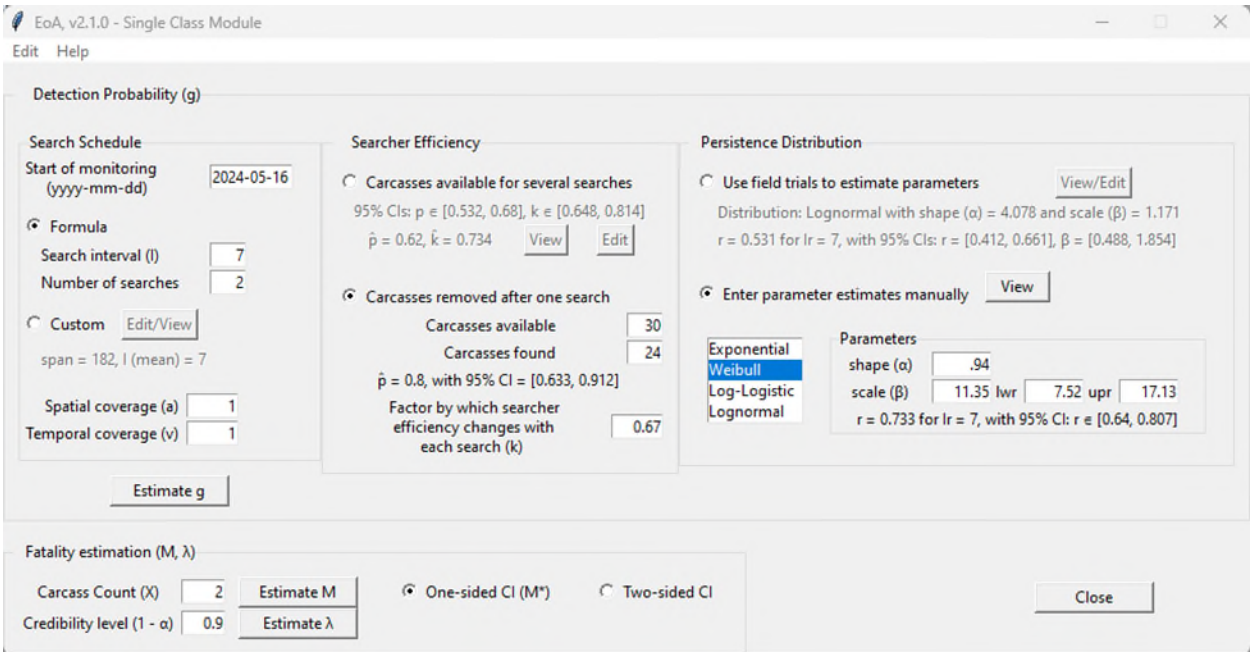


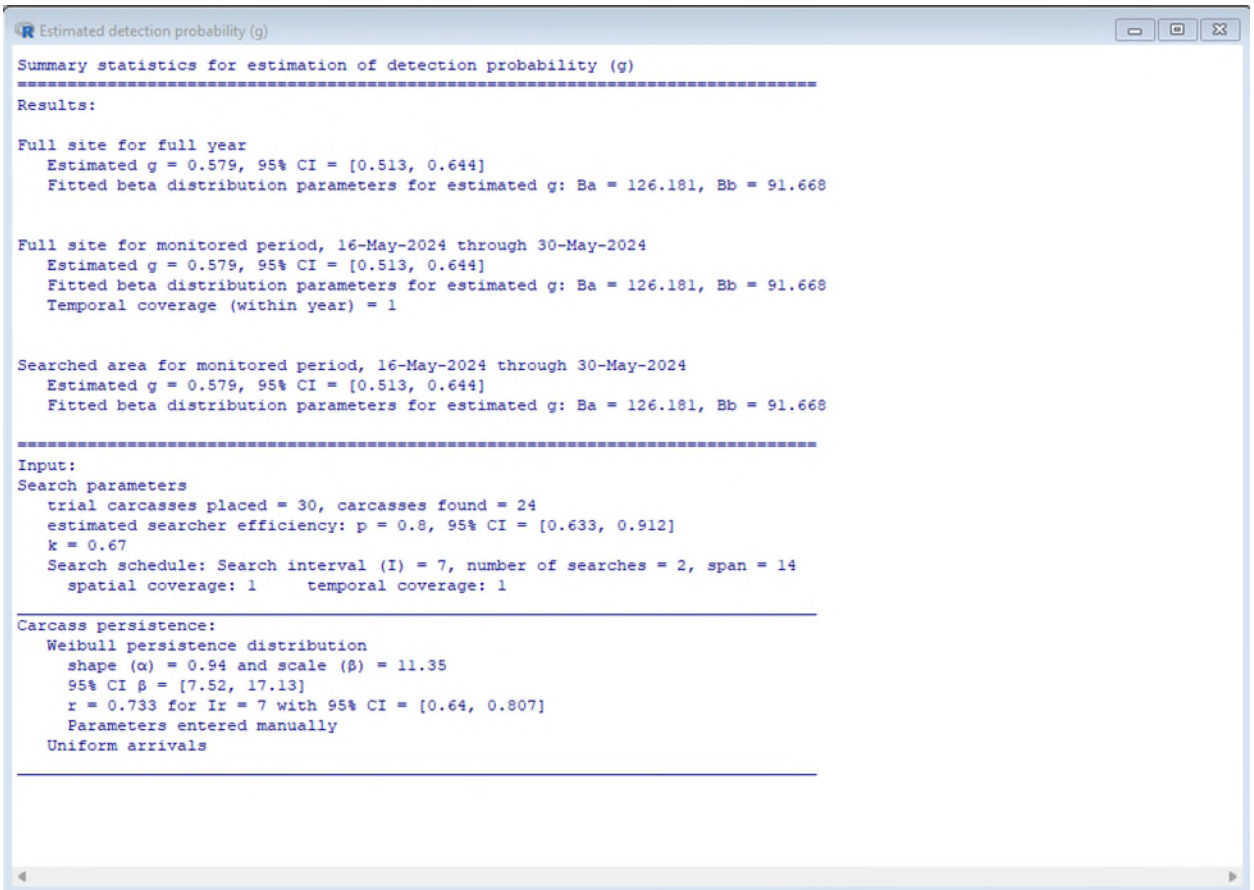
Appendix F4. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 1 2024, 100-meter road and pad searches at three 4.2-megawatt turbine with a blade length of 74 meters searched at a 3.5-day interval.



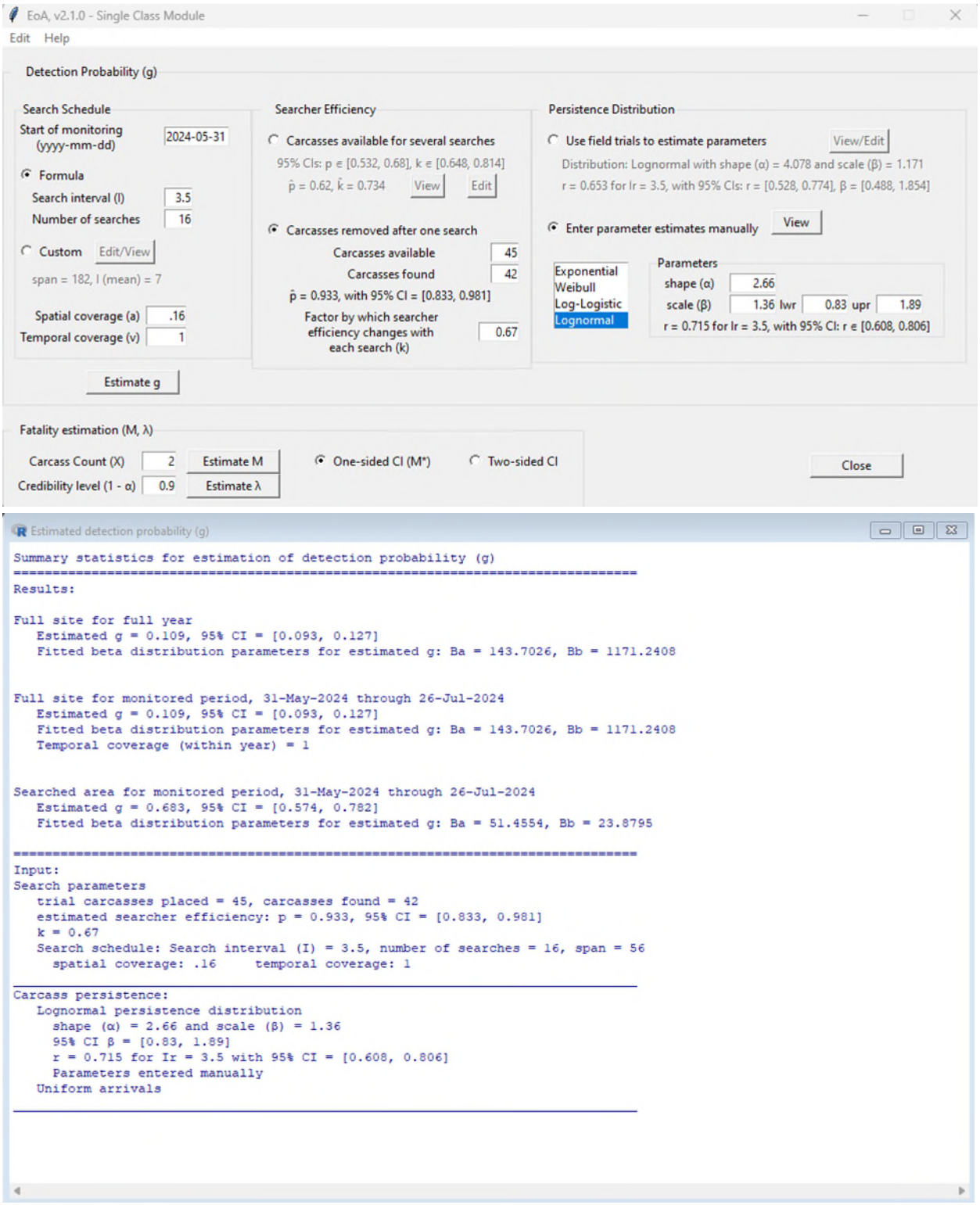


Appendix F5. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 1 2024, 80-meter full plot, dog-aided searches at six 3.6-megawatt turbines with a blade length of 67 meters searched at a 7-day interval.

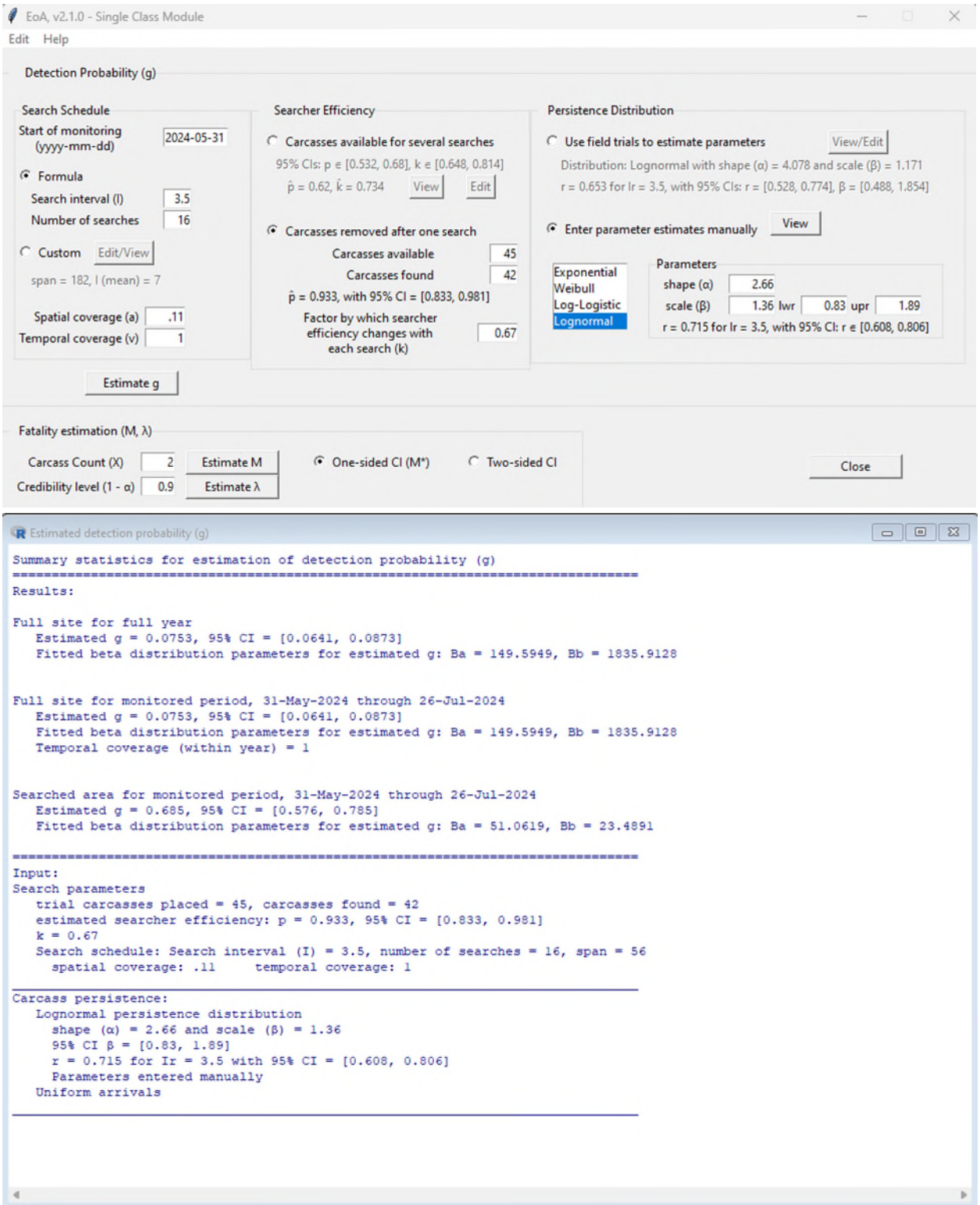




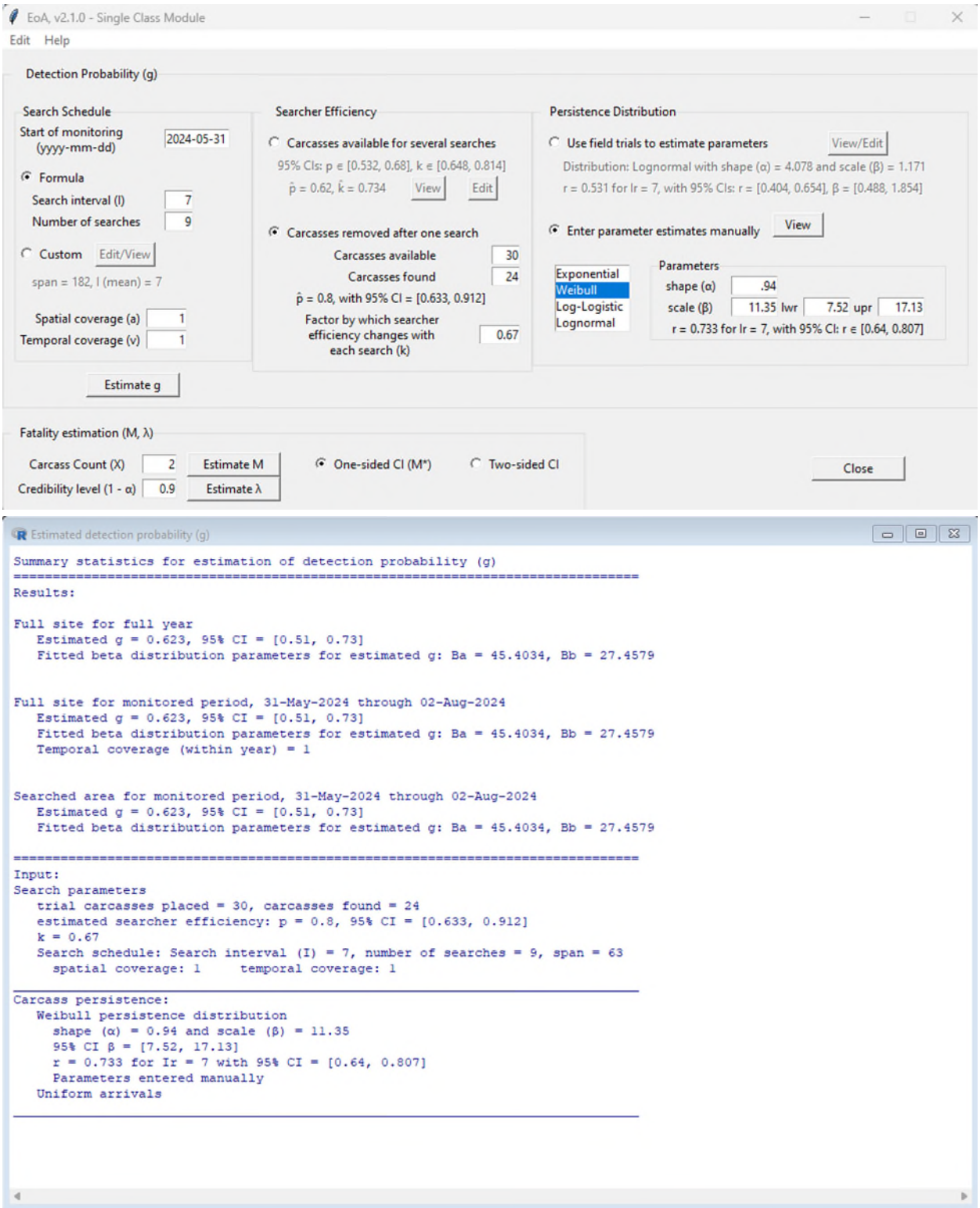
Appendix F6. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 1 2024, 80-meter full plot, dog-aided searches at 19 4.2-megawatt turbines with a blade length of 74 meters searched at a 7-day interval.



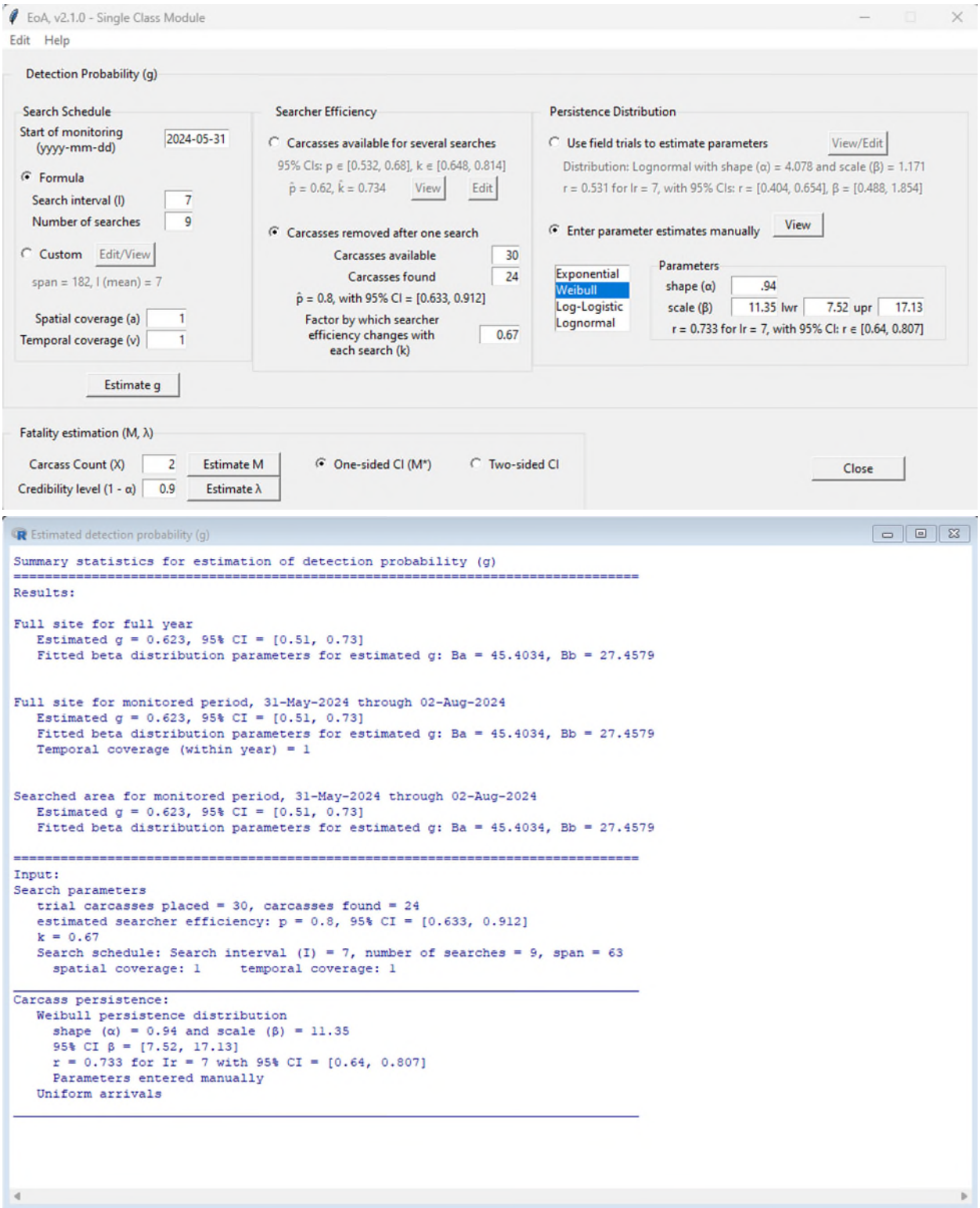
Appendix F7. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 2 2024, 100-meter road and pad searches at one 3.6-megawatt turbines with a blade length of 67 meters searched at a 3.5-day interval.



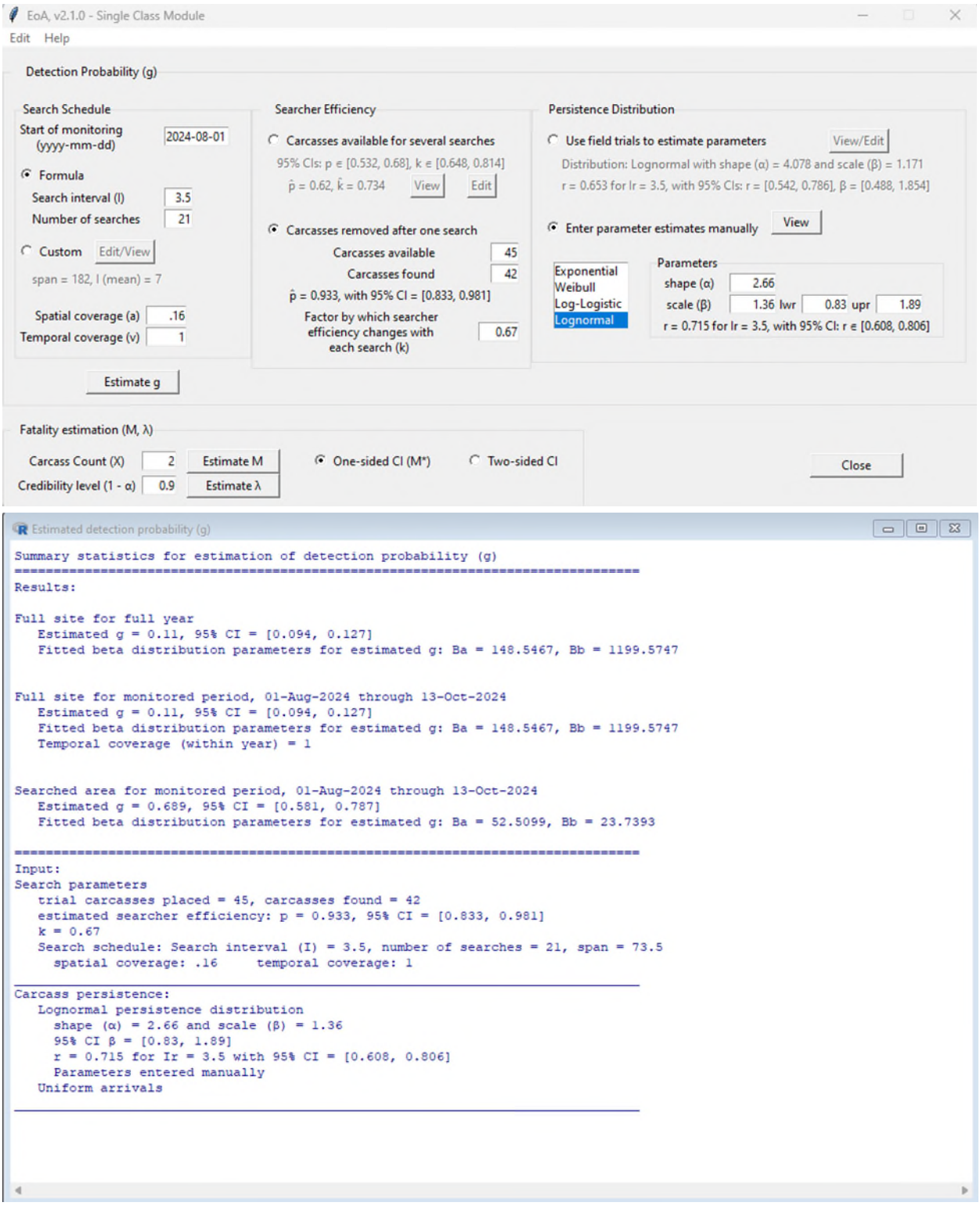
Appendix F8. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 2 2024, 100-meter road and pad searches at three 4.2-megawatt turbines with a blade length of 74 meters searched at a 3.5-day interval.



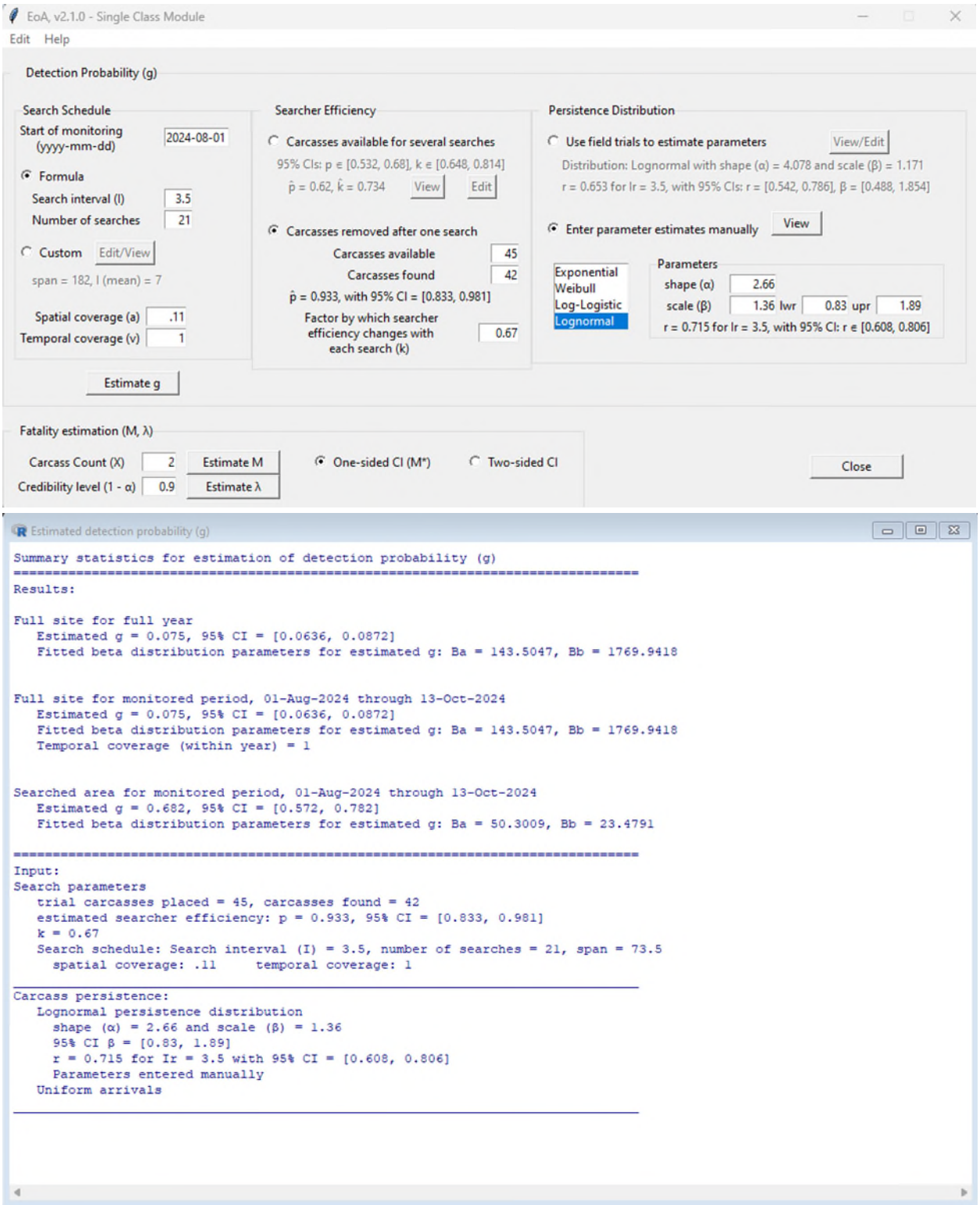
Appendix F9. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 2 2024, 80-meter full plot, dog-aided searches at six 3.6-megawatt turbines with a blade length of 67 meters searched at a 7-day interval.



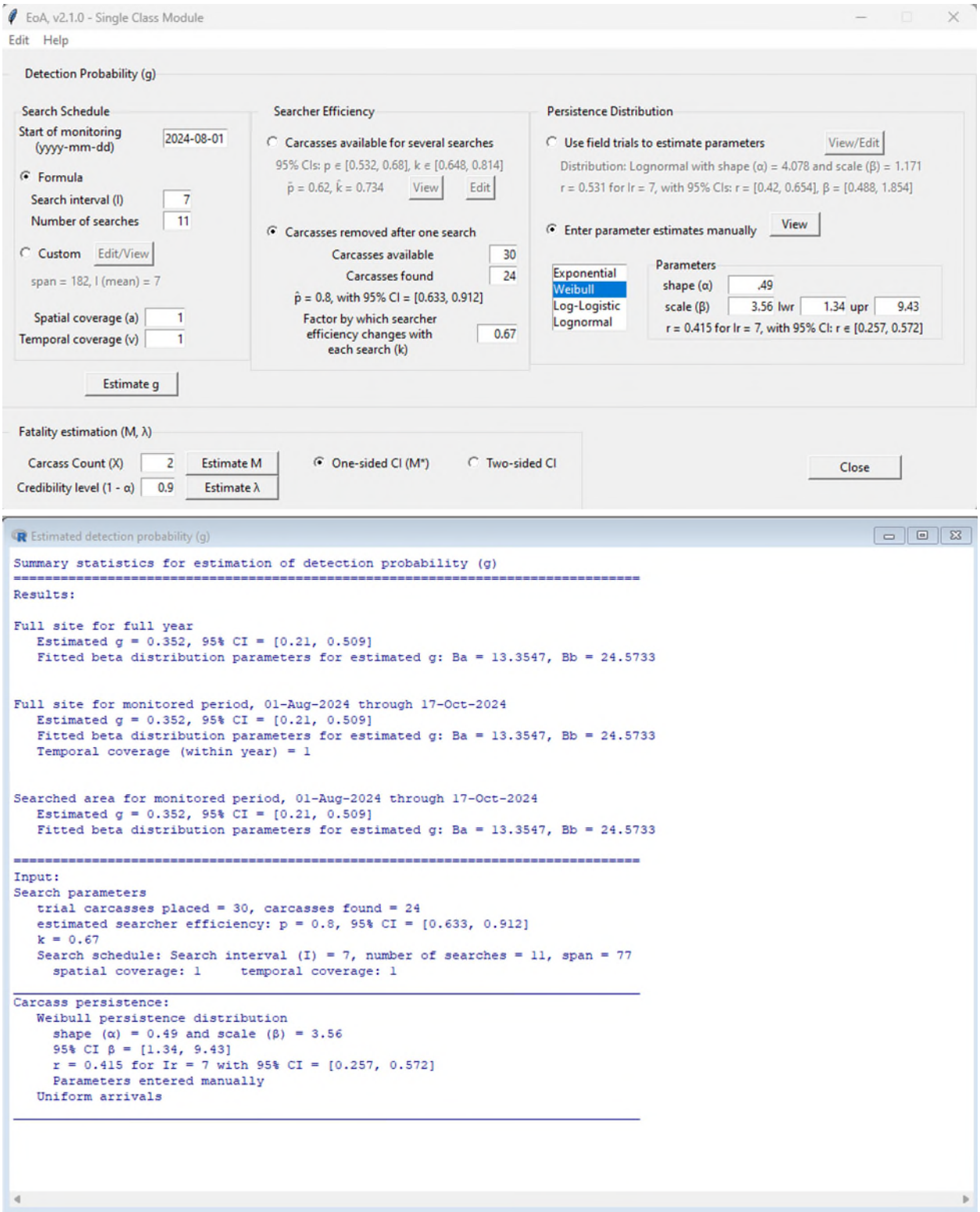
Appendix F10. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Summer 2 2024, 80-meter full plot, dog-aided searches at 19 4.2-megawatt turbines with a blade length of 74 meters searched at a 7-day interval.



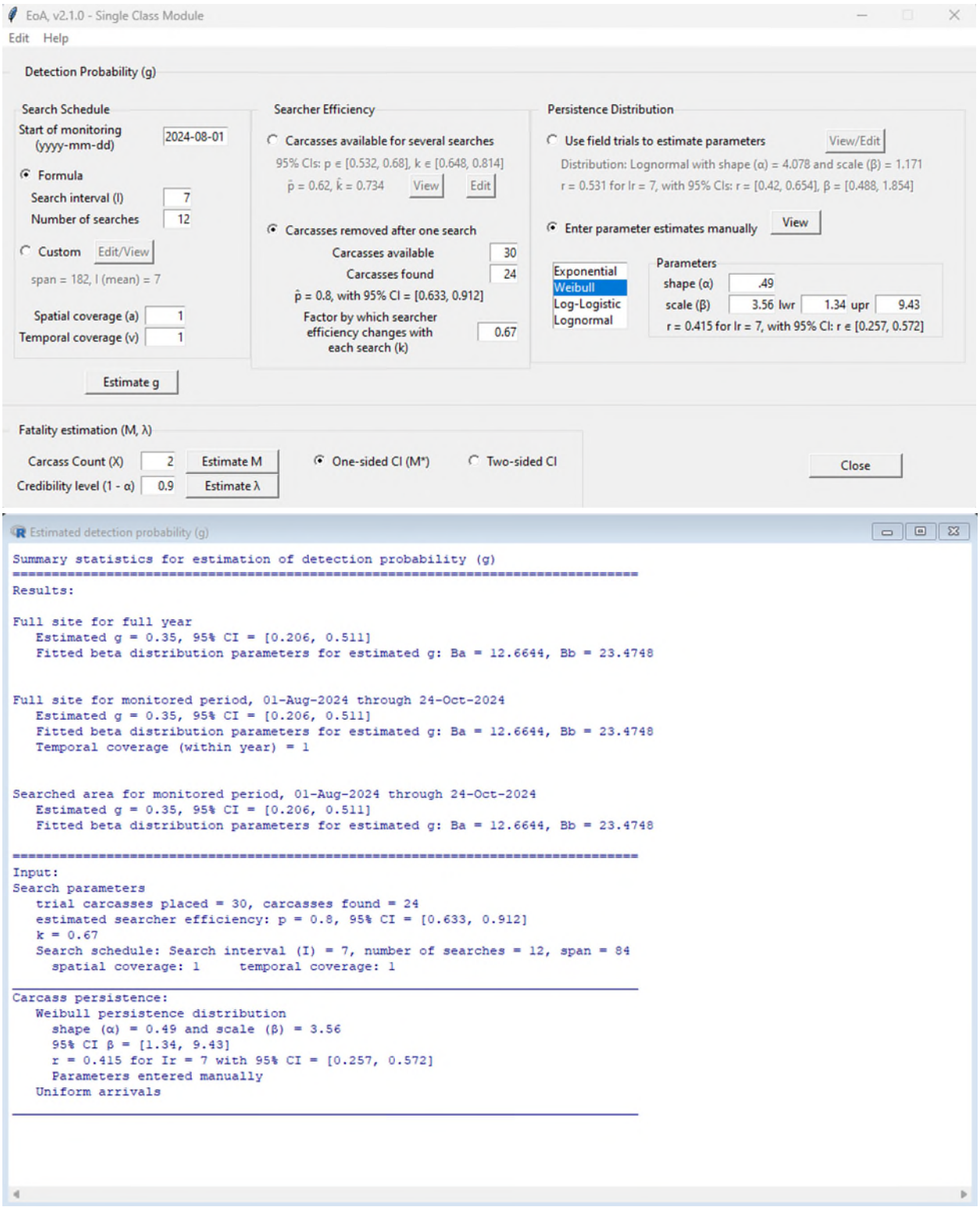
Appendix F11. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Fall 2024, 100-meter road and pad searches at seven 3.6-megawatt turbines with a blade length of 67 meters searched at a 3.5-day interval.



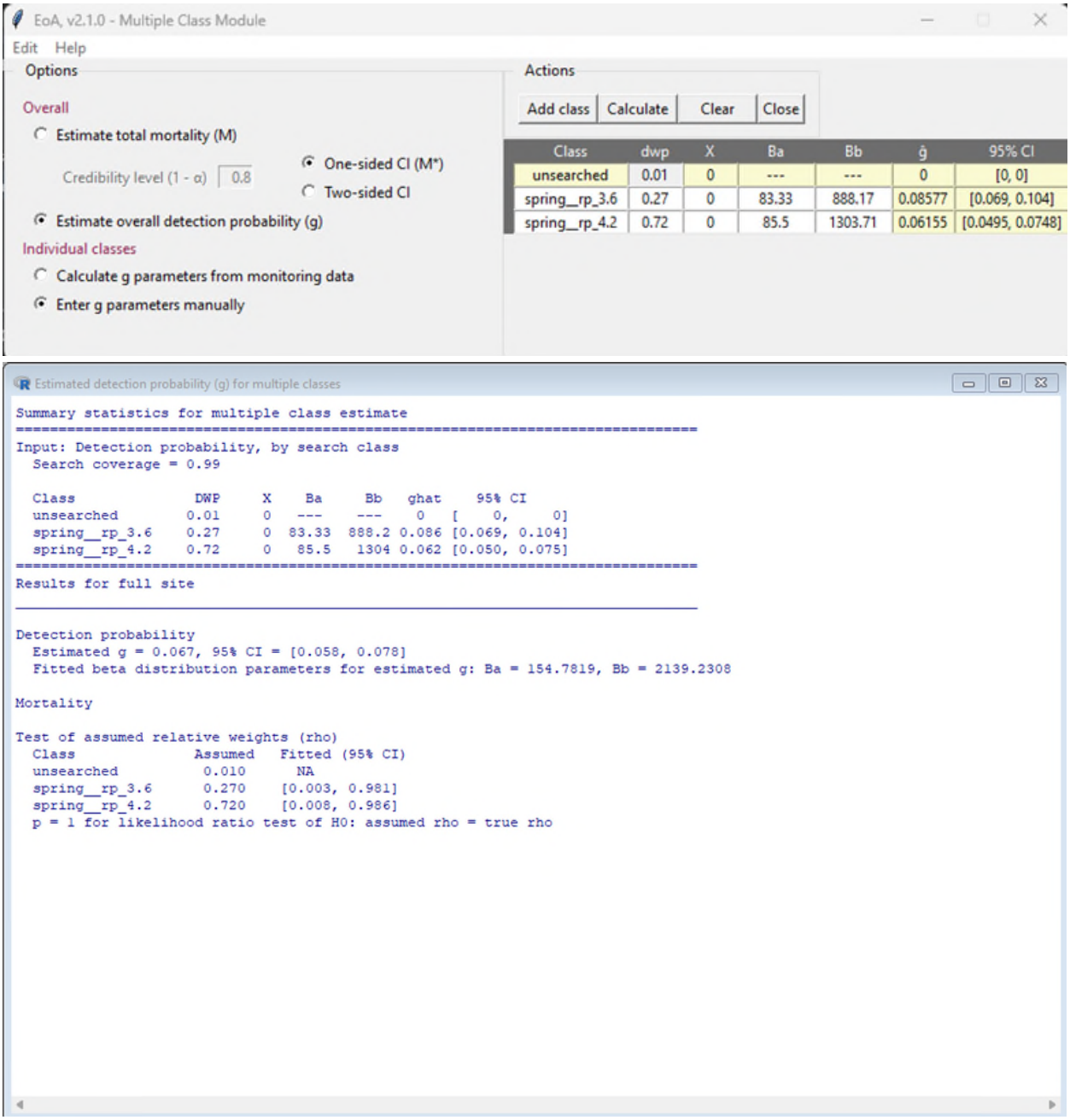
Appendix F12. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Fall 2024, 100-meter road and pad searches at 17 4.2-megawatt turbines with a blade length of 74 meters searched at a 3.5-day interval.



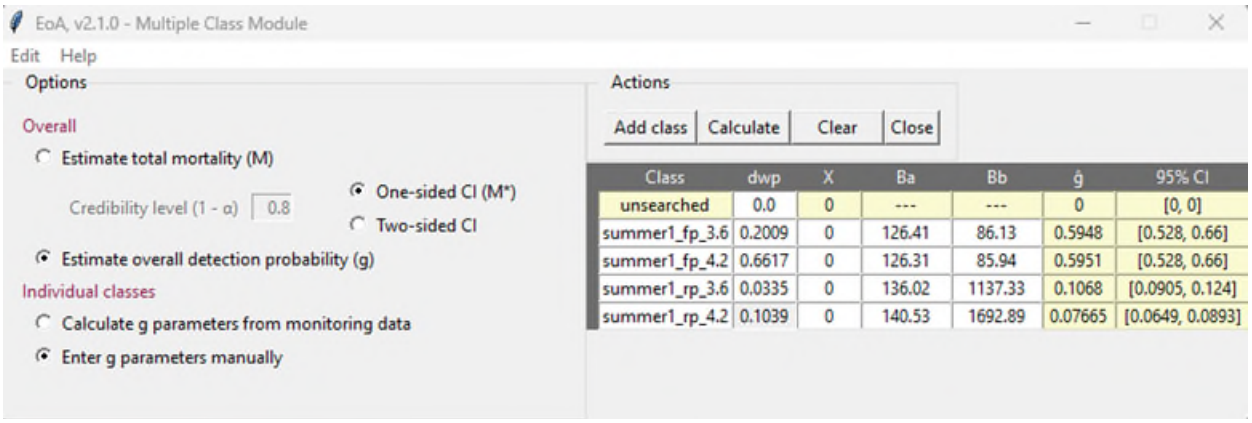
Appendix F13. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Fall 2024, 80-meter full plot, dog-aided searches at seven 3.6-megawatt turbines with a blade length of 67 meters searched at a 7-day interval.



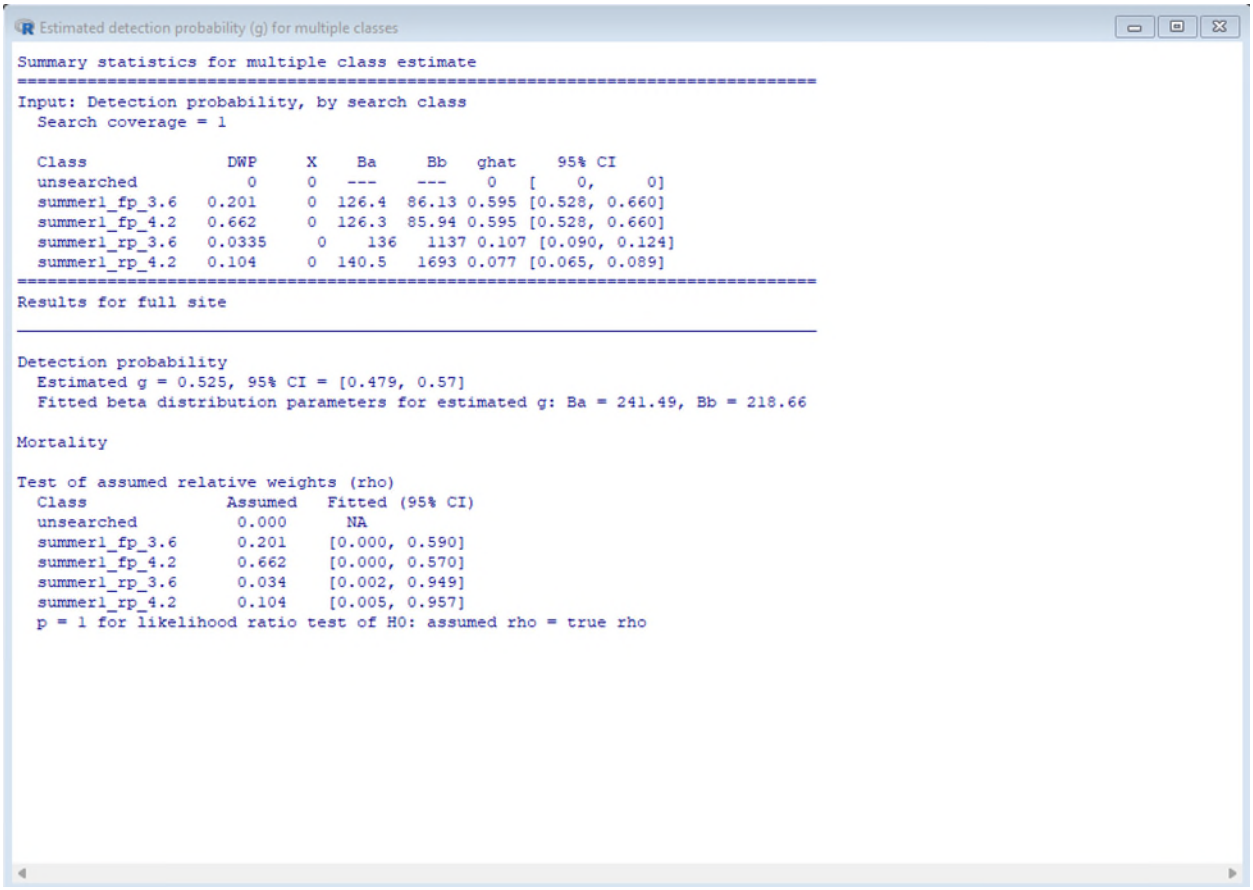
Appendix F14. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Single Class Module inputs for Fall 2024, 80-meter full plot, dog-aided searches at 19 4.2-megawatt turbines with a blade length of 74 meters searched at a 7-day interval.



Appendix F15. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Spring 2024, 48 turbines searched at a 7-day interval.

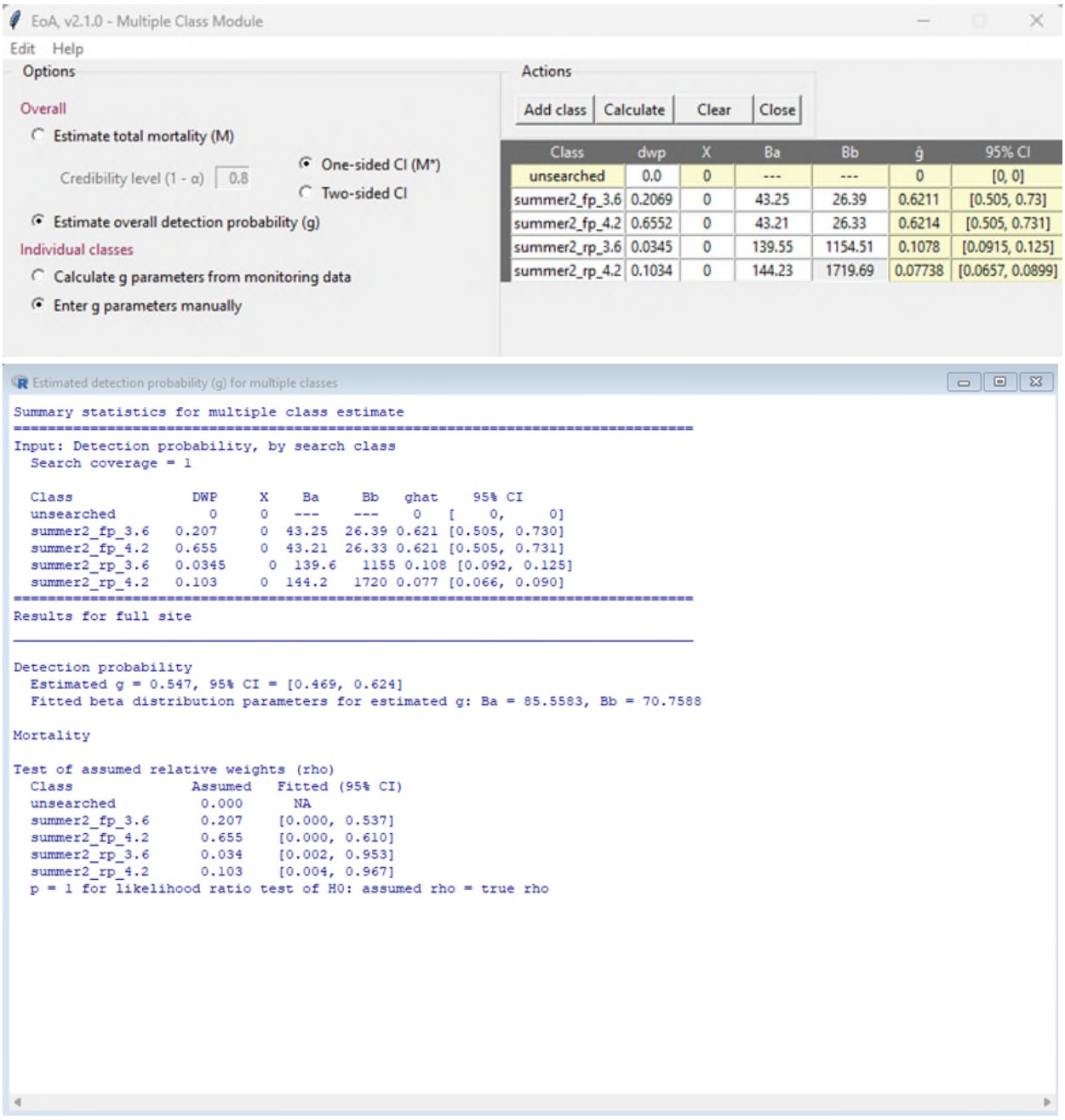


Class	dwp	X	Ba	Bb	ĝ	95% CI
unsearched	0.0	0	---	---	0	[0, 0]
summer1_fp_3.6	0.2009	0	126.41	86.13	0.5948	[0.528, 0.66]
summer1_fp_4.2	0.6617	0	126.31	85.94	0.5951	[0.528, 0.66]
summer1_rp_3.6	0.0335	0	136.02	1137.33	0.1068	[0.0905, 0.124]
summer1_rp_4.2	0.1039	0	140.53	1692.89	0.07665	[0.0649, 0.0893]

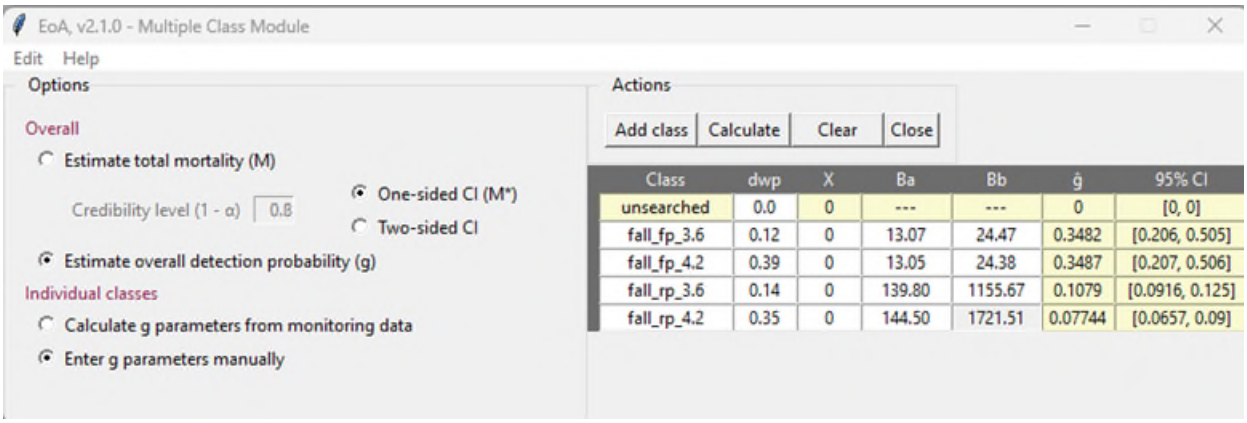


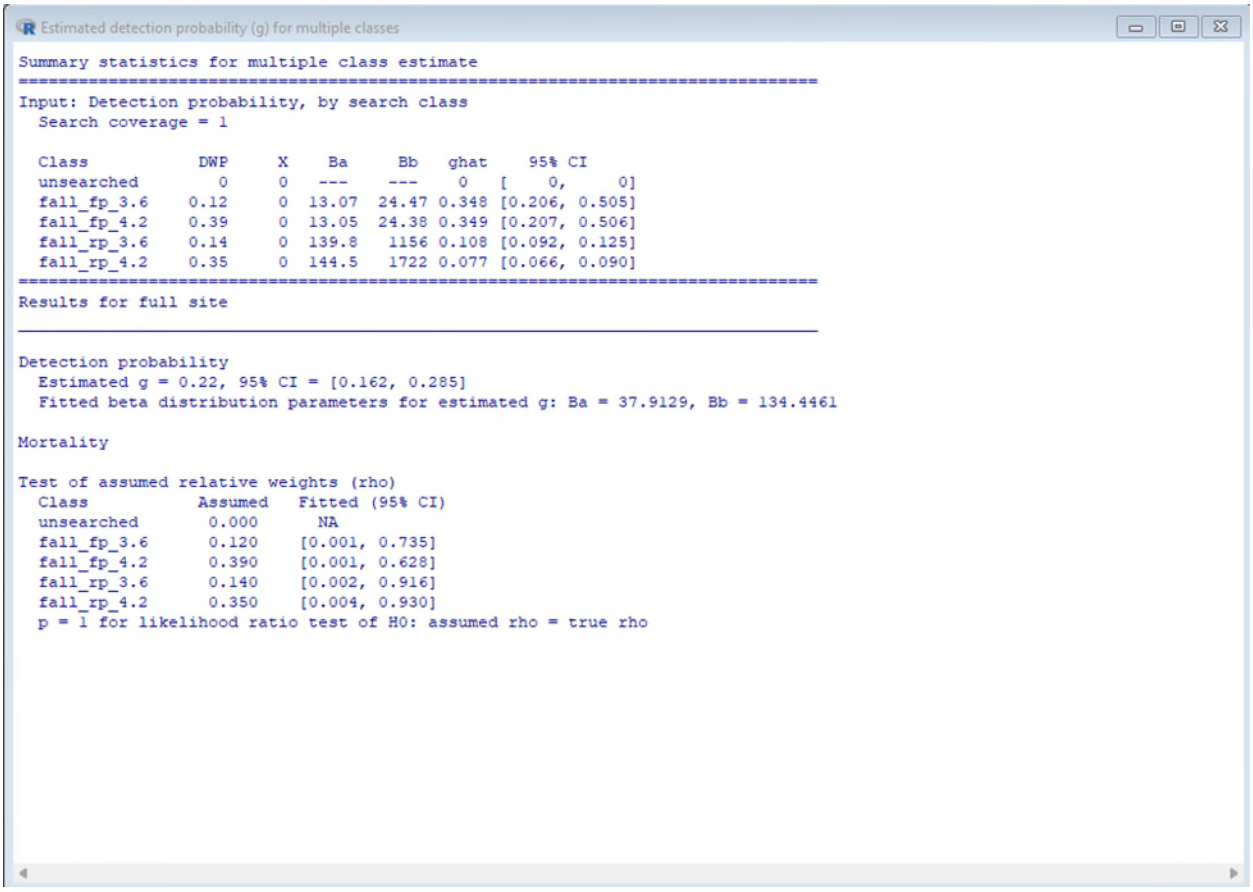
```
Estimated detection probability (g) for multiple classes

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

  Class              DWP     X    Ba     Bb   ghat    95% CI
  unsearched           0     0   ---    ---    0    [    0,     0]
  summer1_fp_3.6   0.201     0  126.4  86.13 0.595 [0.528, 0.660]
  summer1_fp_4.2   0.662     0  126.3  85.94 0.595 [0.528, 0.660]
  summer1_rp_3.6   0.0335     0    136   1137 0.107 [0.090, 0.124]
  summer1_rp_4.2   0.104     0  140.5   1693 0.077 [0.065, 0.089]
================================================================================
Results for full site
--------------------------------------------------------------------------------

Detection probability
  Estimated g = 0.525, 95% CI = [0.479, 0.57]
  Fitted beta distribution parameters for estimated g: Ba = 241.49, Bb = 218.66

Mortality

Test of assumed relative weights (rho)
  Class              Assumed   Fitted (95% CI)
  unsearched           0.000      NA
  summer1_fp_3.6       0.201    [0.000, 0.590]
  summer1_fp_4.2       0.662    [0.000, 0.570]
  summer1_rp_3.6       0.034    [0.002, 0.949]
  summer1_rp_4.2       0.104    [0.005, 0.957]
  p = 1 for likelihood ratio test of H0: assumed rho = true rho
```

Appendix F16. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Summer 1 2024, 29 turbines searched at a 3.5 and 7-day interval.

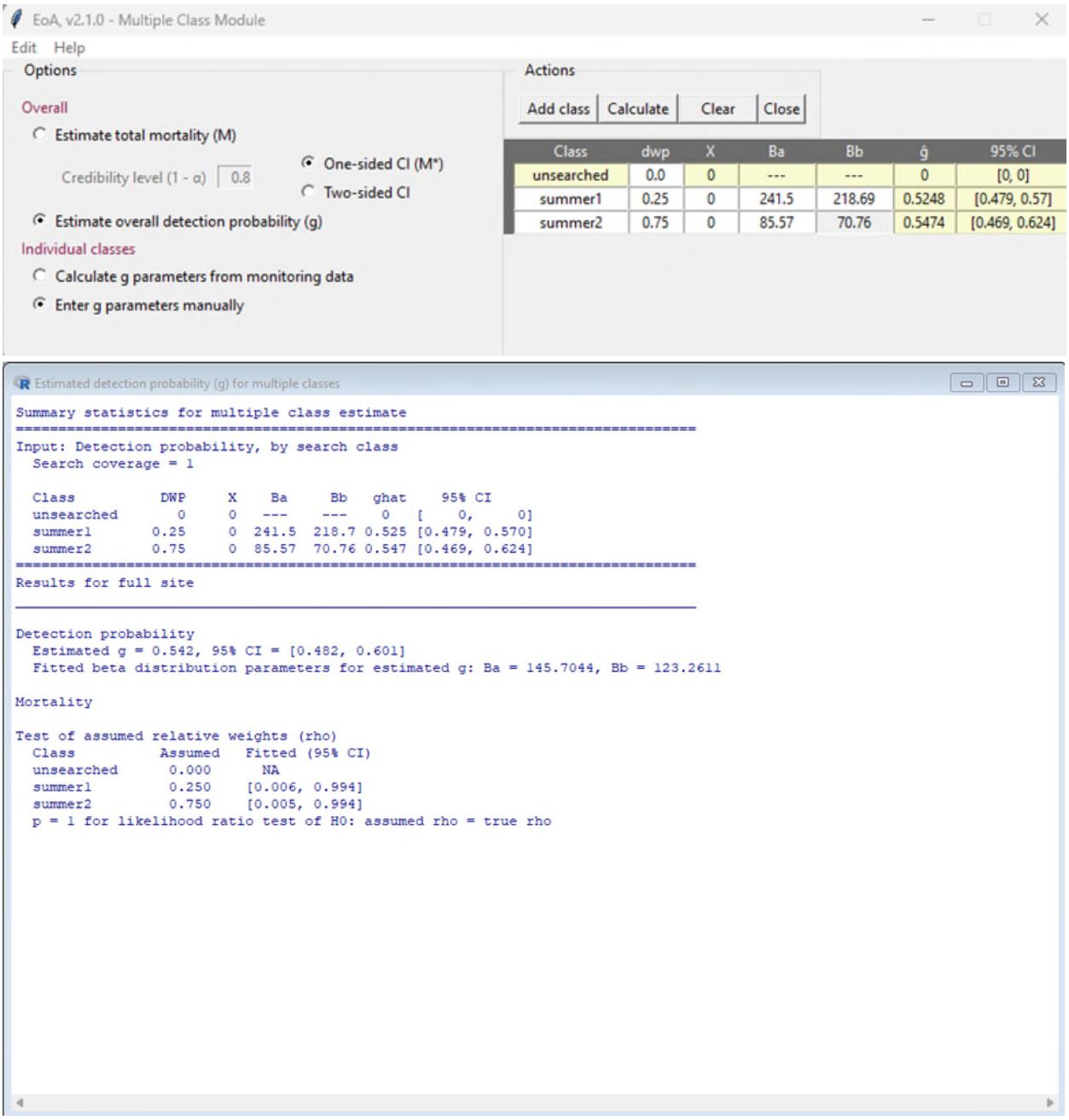


Appendix F17. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Summer 2 2024, 29 turbines searched at a 3.5 and 7-day interval.

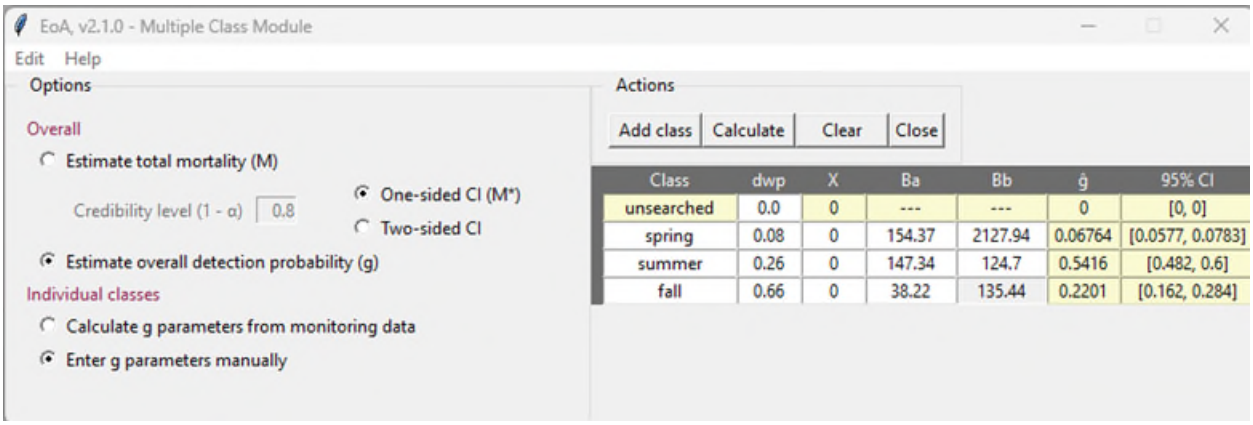


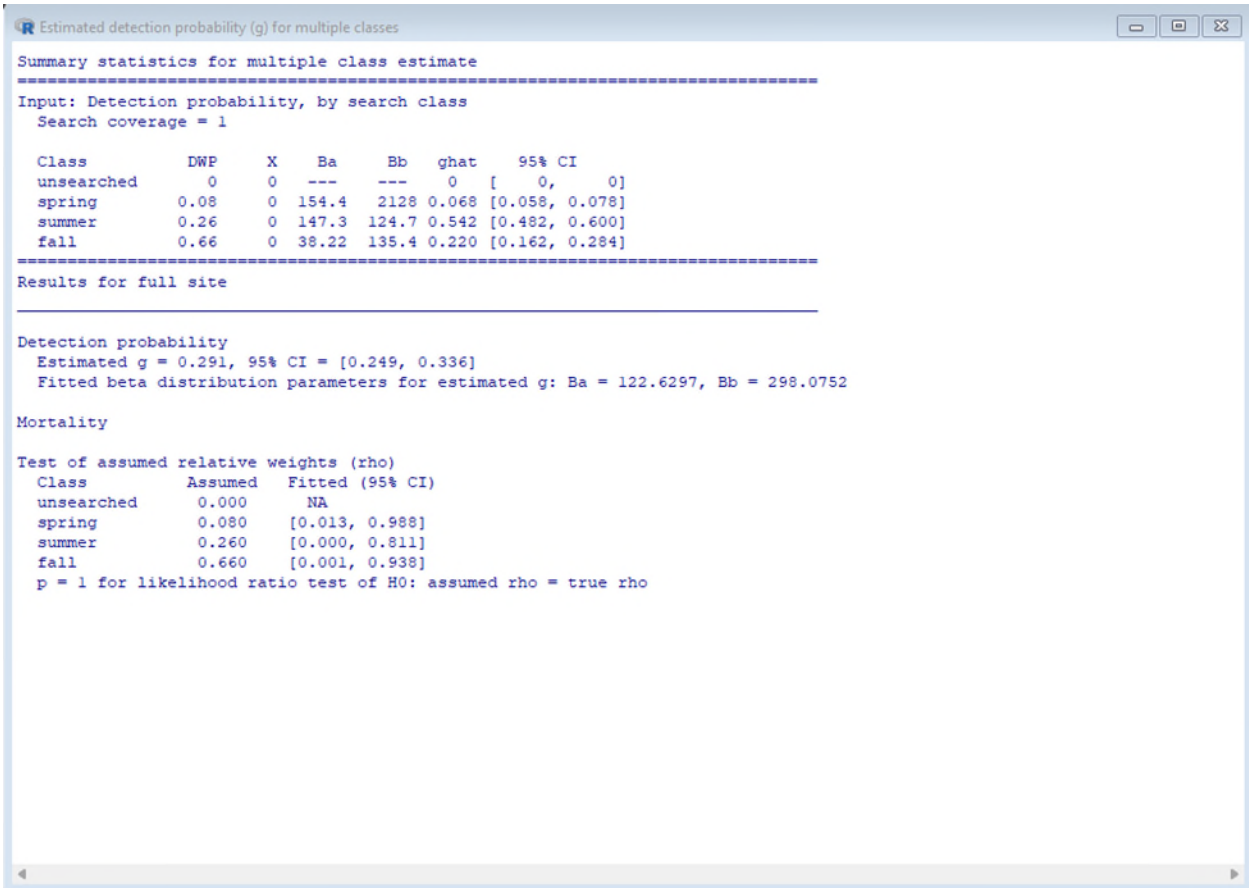


Appendix F18. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Fall 2024, 49 turbines searched at a 3.5 and 7-day interval.

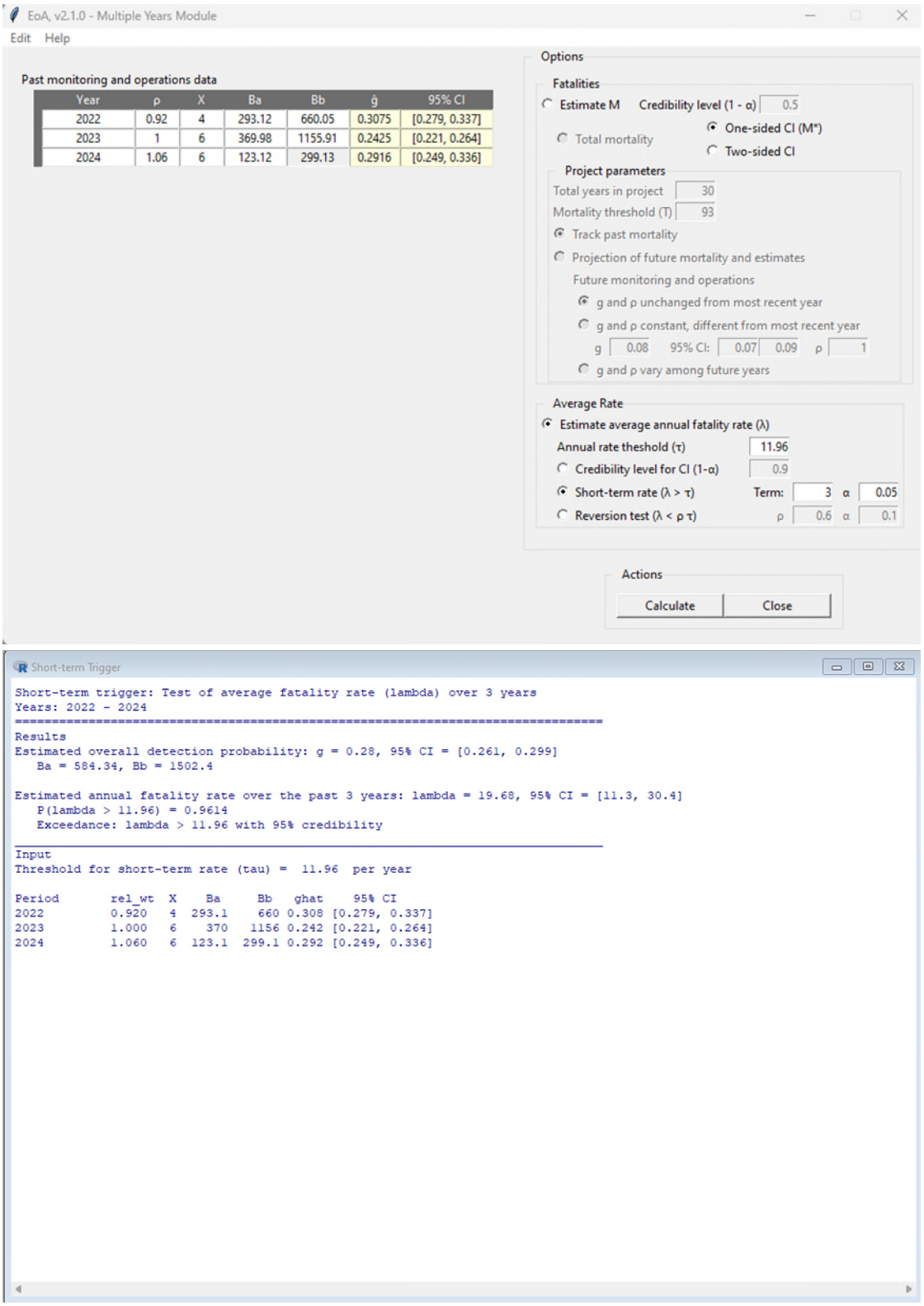


Appendix F19. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Summer 2024, 29 turbines searched at a 3.5 and 7-day interval.

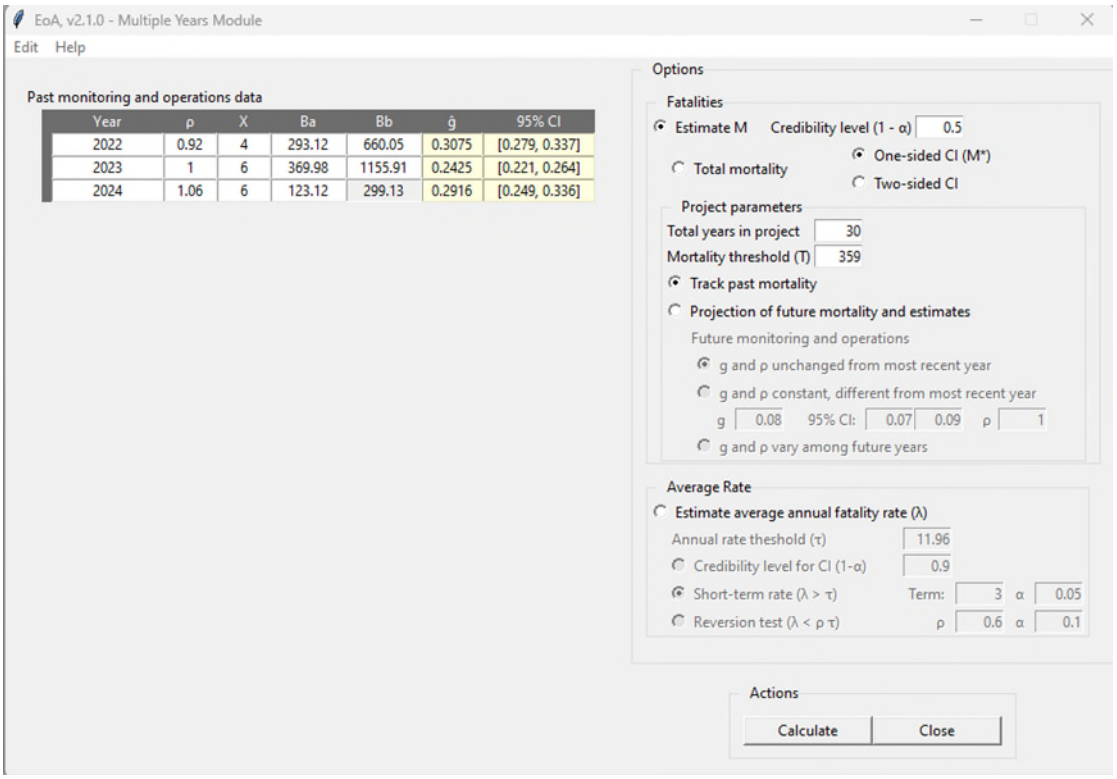


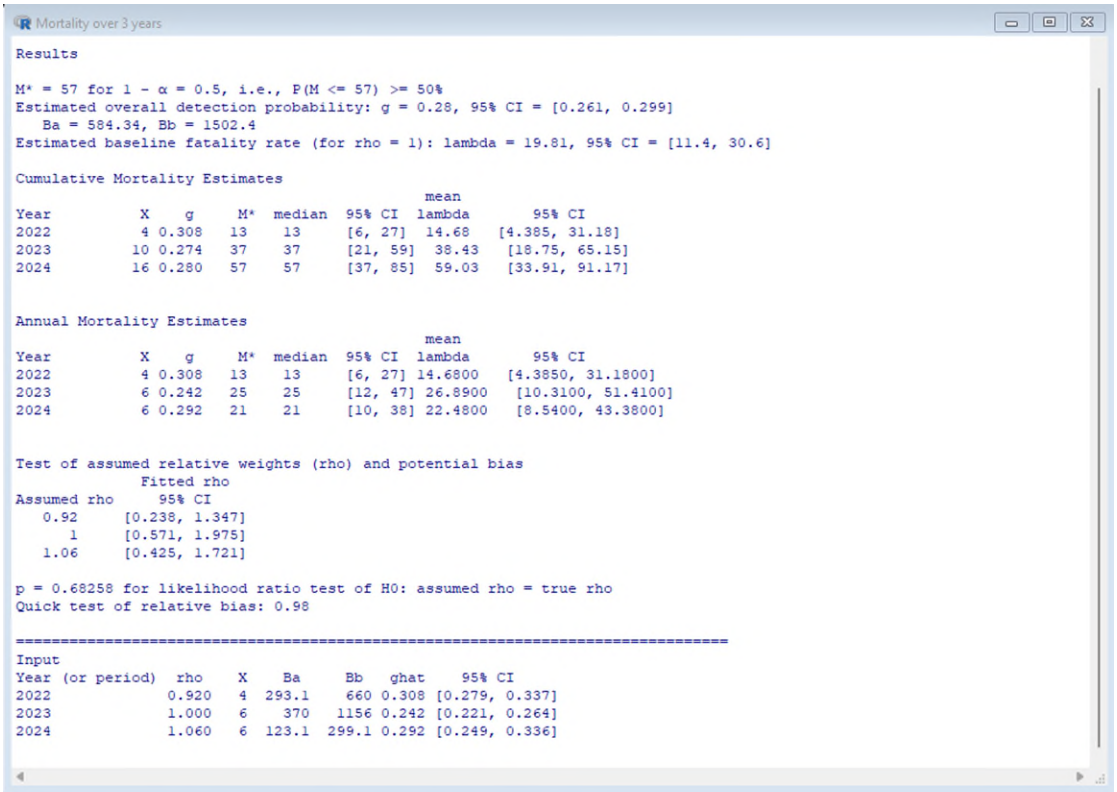


Appendix F20. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Class Module inputs and output for Spring, Summer and Fall 2024, (n = 48 in spring, n = 49 in fall, and n = 29 in summer), searched at a 7-day interval in the spring and a 7-day and 3.5-day interval in summer and fall.

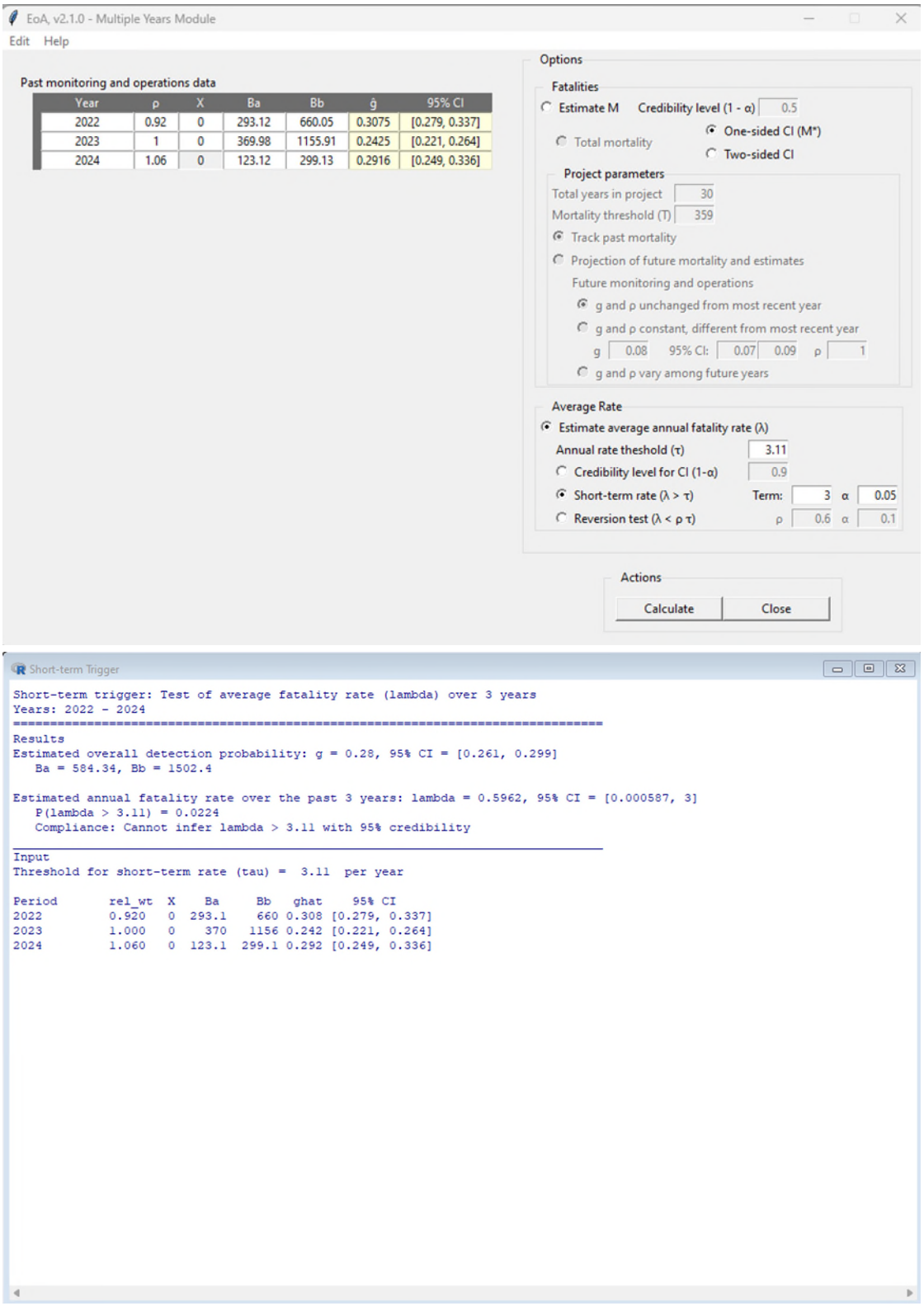


Appendix F21. Screen shot of Evidence of Absence (v2.1.0) graphical user interface (GUI), Multiple Year Module for Indiana bat rolling average detection probability and short-term adaptive management trigger test.

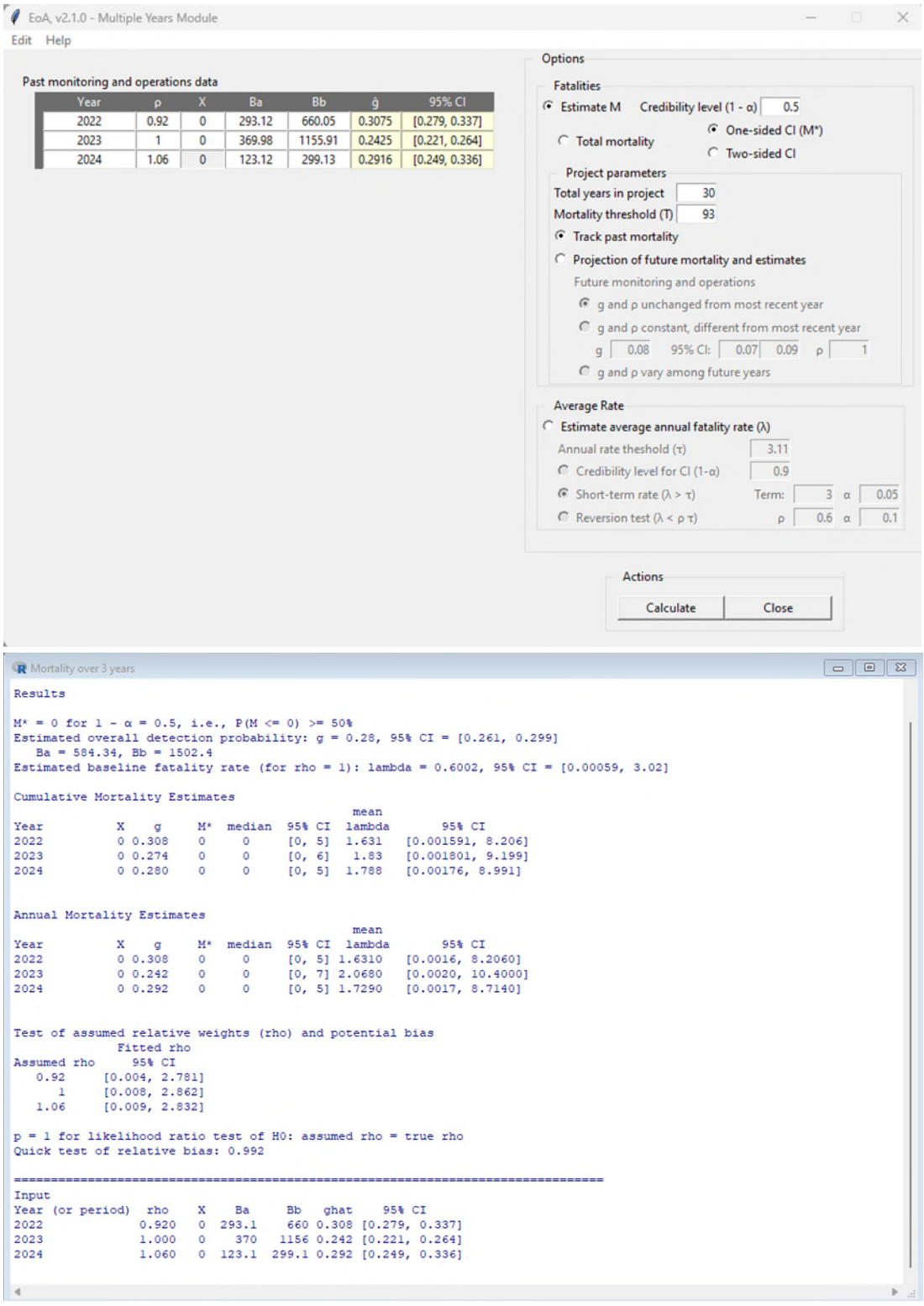




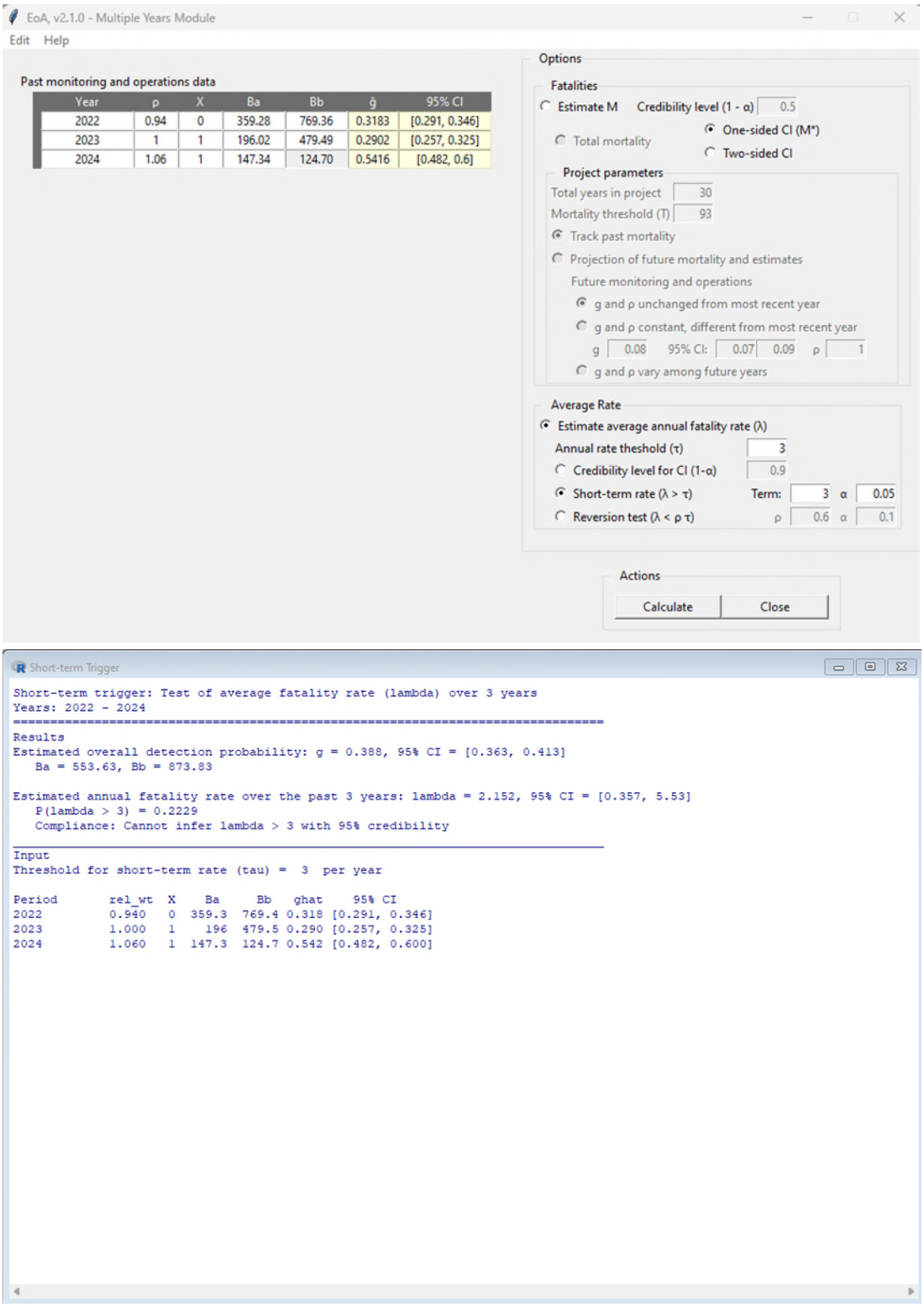
Appendix F22. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Year Module for Indiana bat Incidental Take Permit term-to-date detection probability and cumulative take estimate (M*). Inputs are based on values reported in the main text.



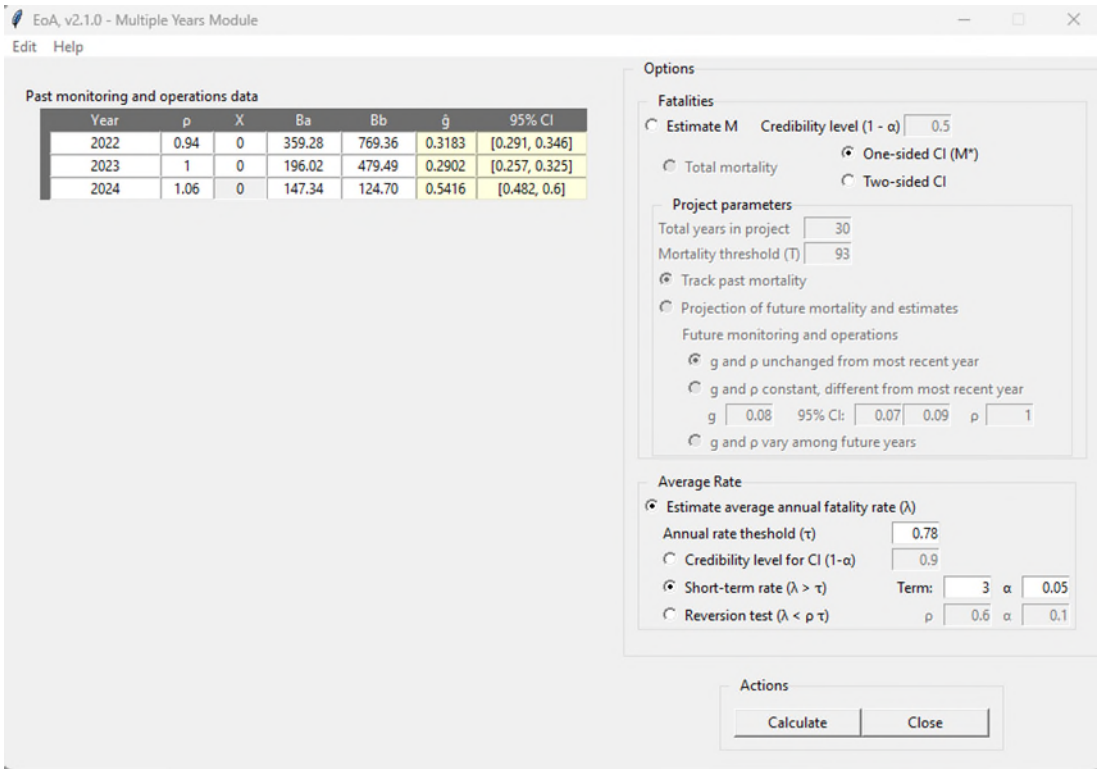
Appendix F23. Appendix E13. Screen shot of Evidence of Absence (v2.1.0) graphical user interface (GUI), Multiple Year Module for northern long-eared bat rolling average detection probability and short-term adaptive management trigger test.

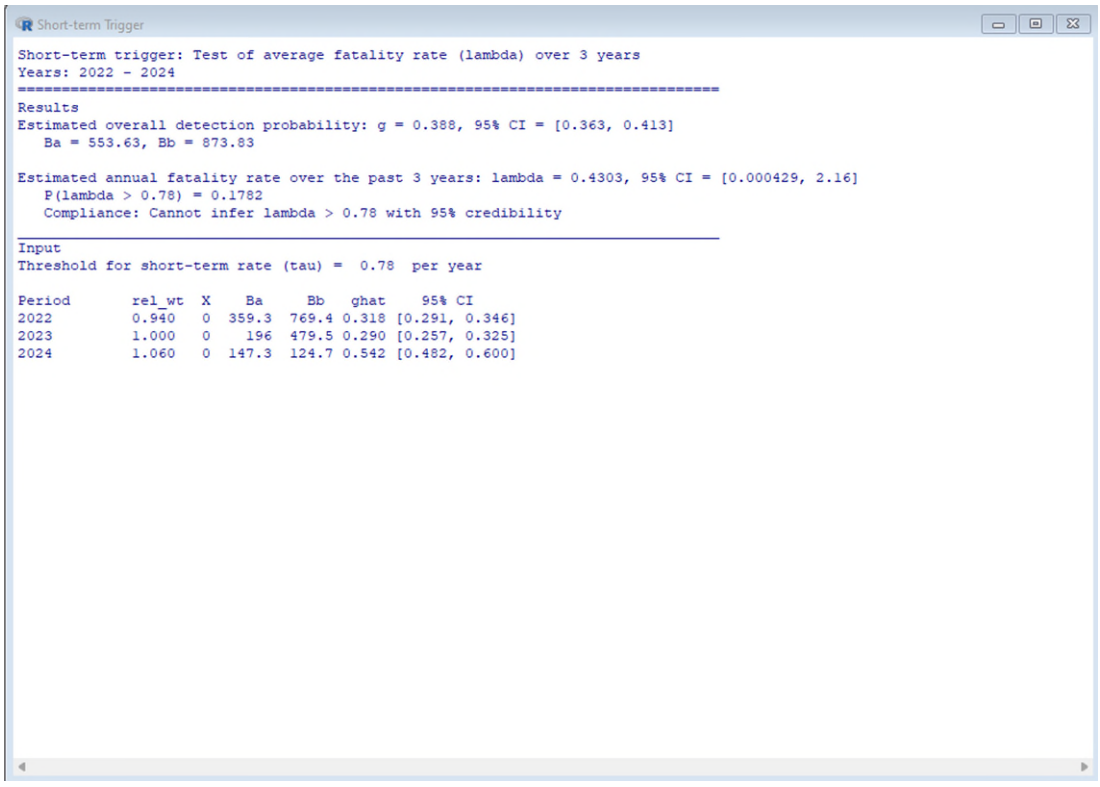


Appendix F24. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Year Module for northern long-eared bat Incidental Take Permit term-to-date detection probability and cumulative take estimate (M*). Inputs are based on values reported in the main text.



Appendix F25. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Year Module for Indiana bat summer detection probability and summer short-term adaptive management trigger test. Inputs are based on values reported in the main text.





Appendix F26. Screen shot of Evidence of Absence (v2.1.0) graphical user interface, Multiple Year Module for northern long-eared bat summer detection probability and summer short-term adaptive management trigger test. Inputs are based on values reported in the main text.