2024 Post-Construction Bat and Bird Mortality Monitoring Report California Ridge Wind Farm

Champaign and Vermilion Counties, Illinois

Project #193710720

Prepared for:
California Ridge Wind Energy LLC
200 Liberty Street, 14th Floor
New York, NY 10281

Prepared by:
Stantec Consulting Services Inc.
2300 Swan Lake Boulevard, Suite 202
Independence, Iowa 50644

November 25, 2024

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 Introduction

1.1 PROJECT DESCRIPTION AND HISTORY

1.1.1 Project Description

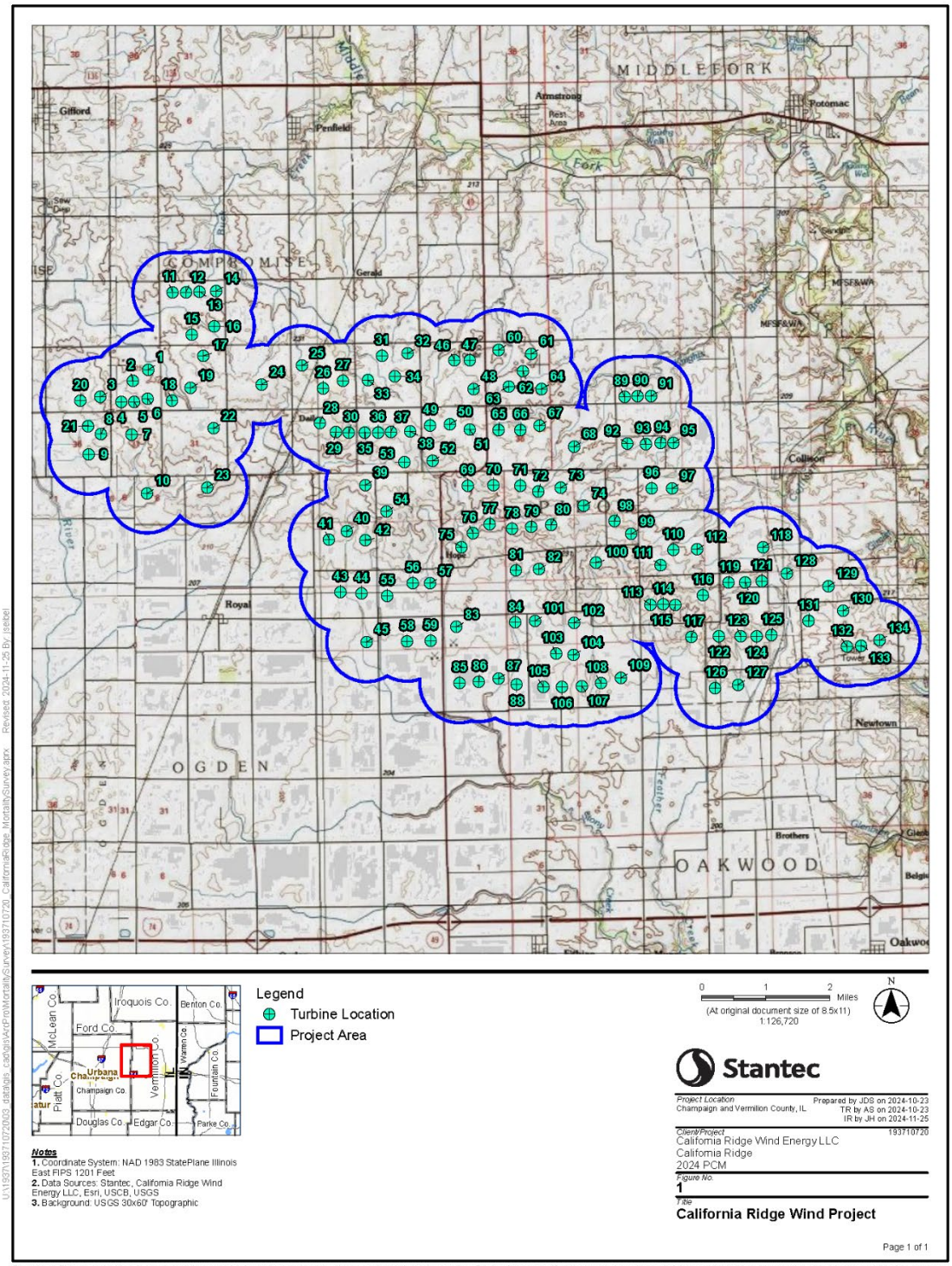
The California Ridge Wind Farm (Project), developed by California Ridge Wind Energy LLC, is located in Champaign and Vermilion counties, north of the town of Royal, Illinois. The Project consists of 134 GE 1.6-megawatt (MW) wind turbine generators, associated access roads, and collector line system for a total capacity of approximately 214.4 MW (Figure 1). The Project is located on lands leased from private landowners who continue their pre-wind farm use of the land. Land use in the area is predominantly agricultural.

1.1.2 Incidental Take Permit and Incidental Take Authorization - Bats

The Project is located within the range of both the federally endangered Indiana bat (*Myotis sodalis*) and federally endangered northern long-eared bat (*Myotis septentrionalis*). The Project is also located within the range of the little brown bat (*Myotis lucifugus*) and the tricolored bat (*Perimyotis subflavus*). The tricolored bat is currently proposed endangered with a listing decision expected in 2024. Additionally, the little brown bat is currently being reviewed for listing by the United States Fish and Wildlife Service (USFWS), with decisions anticipated in fiscal year 2024. On August 6, 2021, the Project obtained an Incidental Take Permit (ITP) from the USFWS, allowing operations under the terms of the Project's Habitat Conservation Plan (HCP), which covers the Indiana bat, northern long-eared bat, little brown bat, and tricolored bat (Covered Bat Species). The HCP requires curtailing of turbines to 5.0 meters/second (m/s) during the fall migration period (August 1 – October 15) and outlines the requirements for post-construction monitoring to ensure permit compliance. The ITP authorizes the take of 5 Indiana bats, 14 northern long-eared bats, 39 little brown bats, and 12 tricolored bats per year. This is the fourth year of monitoring at the Project under the HCP and ITP. Post-construction monitoring at the Project is also required as a condition of the Project's Incidental Take Authorization (ITA) from the Illinois Department of Natural Resources (IDNR) for Indiana bat and northern long-eared bat (ITA #222).

1.1.3 Incidental Take Authorization – Black-billed Cuckoo

Post-construction monitoring at the Project is also required as a condition of the Project's ITA for black-billed cuckoo (*Coccyzus erythropthalmus*) obtained from the IDNR on August 20, 2017 (ITA #140). Post-construction monitoring requirements were described in the ITA and the Project's associated Conservation Plan (CP). Post-construction monitoring for black-billed cuckoo is to occur during late summer and fall (July 15 to September 30) every three years. Monitoring last occurred in 2023.



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Figure 1. Turbine and Survey Locations

1.2 PURPOSE AND OBJECTIVES OF THE STUDY

Post-construction mortality monitoring was conducted as part of requirements stated in the federal ITP for Indiana bat, northern long-eared bat, little brown bat, and tricolored bat; the state ITA for Indiana bat and northern long-eared bat; and the state ITA for black-billed cuckoo. The purpose of the study was to:

1. Provide a means of monitoring and ensuring the Project's compliance with the take limits authorized in the federal ITP and the state ITAs.

2. Assess the effectiveness of the HCP and bat CP in meeting the biological objective of minimizing direct mortality of Indiana bats, northern long-eared bats, little brown bats, and tricolored bats.

2.0 Methods

2.1 FIELD METHODS

The post-construction monitoring included the following components:

1. Standardized carcass surveys to systematically search turbines for bat and bird casualties attributable to the turbines

2. Searcher efficiency trials to estimate the percentage of bat casualties that were found by the searchers

3. Carcass removal trials to estimate the persistence time of carcasses on-site before scavengers removed them

2.1.1 Standardized Carcass Searches

Standardized carcass surveys were conducted from August 12 through October 16, 2024, at 100% of the Project turbines (n=134). This study design provided full coverage of the facility. Surveys consisted of searching roads and pads out to 100 meters (m; 328 feet [ft]) at all 134 Project turbines. All turbines were searched weekly.

Standardized carcass surveys were conducted by searchers experienced and/or trained in fatality search methods, including proper handling and reporting of carcasses. Searchers were familiar with and able to accurately identify bat and bird species likely to be found in the Project area. Preliminary bat species identifications were made in the field by qualified staff. When carcass condition allowed, sex and age of the carcass were recorded. For bat carcasses, forearm length was recorded to facilitate species identification. In addition to the carcass, photographs and data collected for each carcass were used to verify the species identification. Photos of any

unknown bats discovered were sent to a Stantec USFWS permitted bat biologist for positive identification, and carcasses were stored on-site.

During searches, searchers walked at a rate of approximately 2 miles per hour (mph; 45 to 60 m per minute) while searching 10 ft (3 m) on either side. For each carcass found (for the purposes of this analysis, live or injured bats were considered a carcass), the following data were recorded digitally within Survey123 (ESRI, Redlands, CA):

- Date and time
- Initial species identification
- Sex, age, and reproductive condition (when possible)
- Global positioning system (GPS) location
- Distance and bearing to turbine
- Condition (intact, scavenged, decomposed)
- Any notes on presumed cause of death

A digital photograph of each carcass found was taken before the carcass was handled and removed. All bat carcasses were labeled with a unique number, bagged, and stored in a freezer at the Project operations and maintenance (O&M) building. Bat carcasses were collected and retained under IDNR Endangered and Threatened Species Permit (Permit No. 20439) and IDNR Permit NH24.5951. Bird carcasses were photographed and documented, but they were not collected and were left as found.

Bat and bird carcasses found in non-search areas were coded as incidental finds and documented in a similar fashion to those found in standardized carcass surveys when possible. These included carcasses found during non-search times and decomposed carcasses found during the first week of searches that were deemed to have been killed prior to the post-construction monitoring period based on the level of decomposition. Incidental bat carcasses were documented, collected, and stored in the freezer in the same manner as those carcasses found during standardized surveys. Incidental bird carcasses were photographed and documented in similar fashion as those found during standardized searches, and as in the standardized carcass searches, they were not collected and were left as found. Incidental finds were not included in the mortality estimates.

2.1.2 Searcher Efficiency Trials

A searcher efficiency trial was used to estimate the probability of bat carcass detection by the searcher. The searcher did not know at which turbines trial carcasses were placed or the location or number of trial carcasses placed in any given search plot. Commercially available brown mouse carcasses were used as trial carcasses to represent bats.

All searcher efficiency trial carcasses were randomly placed by the field lead within the search plots the morning of the planned standardized carcass searches for that day. The number of trial carcasses found by the searcher during the standardized carcass searches in each plot was

recorded and compared to the total number of trial carcasses placed in the plot and available to be found (i.e., not scavenged prior to the mortality search).

2.1.3 Carcass Persistence Trials

A carcass persistence trial was conducted to estimate the average length of time carcasses remained in the search plots (i.e., were available to find) before being removed by scavengers. The carcass persistence trial was conducted following the searcher efficiency trial during post-construction monitoring. Mouse carcasses used during the searcher efficiency trial were left in place, and their locations were discretely marked. Searchers monitored the trial carcasses over a period of up to 30 days. During the carcass removal trial, carcasses were checked, when possible, on days 1, 2, 3, 4, 5, 6, 7, 14, 20, and 30.

The condition of each carcass was recorded during each trial check. The conditions recorded were defined as follows:

- Intact – complete carcass with no body parts missing
- Scavenged – carcass with some evidence or signs of scavenging
- Fur spot – no carcass, but fur spot remaining
- Missing – no carcass or fur remaining

2.2 DATA ANALYSIS

Results include summaries of the raw data, including counts of species, the number of searches conducted, and the average search interval (calculated as the sum of the number of visits to a turbine divided by the number of days within a season).

The Generalized Estimator (GenEst; Dalthorp et al. 2018) was used for calculating bias correction factors (searcher efficiency and carcass persistence) and the overall bat fatality rate at the Project.

2.2.1 Searcher Efficiency (p)

Searcher efficiency (p) represents the average probability that a carcass was detected by the searcher. The searcher efficiency rate was calculated using the data collected during searcher efficiency trials (Section 2.1.2) by dividing the number of trial carcasses the observer found by the total number which remained available during the trial (i.e., non-scavenged). In GenEst when the searcher finds 100% of the trial carcasses, the program will double the number placed and assume the searcher misses one. Searcher efficiency decay (k) was fixed at 0.8 per the HCP. This value represents the decrease in searcher efficiency (p) on subsequent searches (i.e., if a carcass is missed the first time it is available, it is less likely to be found on subsequent searches than a "fresh" carcass).

GenEst returns numerous models depending on the number of variables included in the analysis, as well as Akaike information criterion (AIC) values for each model. The AIC value is a statistical score for the quality of a model fit, where smaller AIC values are considered better models.

However, models within 3-4 ΔAIC (the difference between each model's AIC and the AIC of the "best" model) are generally considered indistinguishable by this measure (Dalthorp et al. 2018). Therefore, the best model was chosen based on a manual review of models with the lowest AIC values, and a top model was chosen from the models within 3-4 ΔAIC of the top model based on AIC alone. Confidence intervals were generated using 1,000 bootstrapped iterations.

2.2.2 Carcass Persistence

Carcass persistence times modeled in GenEst include using censored exponential, Weibull, lognormal, and loglogistic survival models of the data collected as part of the carcass persistence trial (see Section 2.1.3). GenEst returns numerous models depending on the number of variables included in the analysis, as well as AIC values for each model. The best model was chosen based on a comparison of models with the lowest AIC values. Models were also graphically evaluated to ensure that they are logical, and the top model was chosen from the models within 3-4 ΔAIC of the top model based on AIC and visual analysis. Confidence intervals were generated using 1,000 bootstrapped iterations.

2.2.3 Density-weighted Proportion (DWP)

The DWP was calculated based on several parameters:

$$X_i = number\ of\ carcasses\ found\ within\ distance\ band\ i$$

$$a_i = fraction\ of\ ground\ searched\ within\ distance\ band\ i$$

$$\widehat{M}_i = relative\ mortality\ rate\ in\ each\ ring = \frac{X_i}{a_i}$$

$$\hat{p}(M_i) = fraction\ of\ total\ in\ each\ ring = \widehat{M}_i \,/\, \sum_i \widehat{M}_i$$

The number of carcasses found within each distance band (X_i) is simply a tally of the carcasses found at various distances. When each carcass is found, searchers measure the distance to the turbine using GIS and record that with the carcass information.

To determine the fraction of ground searched within each distance band (a_i), the turbine roads and pads were digitized, and the proportion of each distance band that included the road and pad was calculated for each of the 134 project turbines out to 100 m from the turbine base. These values were then averaged across all turbines to determine the percentage of each distance band that was searched on roads and pads. It was assumed that 100% of bat carcasses fall within 100 m of the turbine base based on USFWS data (USFWS 2016).

Using the turbine-specific GIS data from the digitized roads and pads (since the road and pad configuration can vary by turbine), a turbine-specific DWP was then calculated by multiplying the fraction of each distance band searched at a particular turbine by the fraction of the total for that distance band.

2.2.4 Adjusted Fatality Estimates (GenEst)

GenEst was used to calculate overall fatality rates for the Project (per turbine, per MW, and for all 134 turbines). All estimates include 90% confidence intervals. Per turbine estimates were calculated by dividing the GenEst estimate (and confidence intervals) by the number of turbines (134 turbines), and per MW estimates were calculated by dividing the per facility estimate by 214.4 MW.

2.3 DATA ANALYSIS – EVIDENCE OF ABSENCE

Evidence of Absence (EofA; Dalthorp et al. 2017) was used for estimating the overall detection probability (g). Adaptive management for the first five years of operations under the ITP is based on a bat-in-hand trigger, rather than analysis in EofA. The estimated take of the Covered Bat Species (M and λ) will be calculated after the first five years of monitoring.

2.3.1 Estimation of Detection Probability (g)

Site-specific monitoring data were used to calculate the g-value, including the following inputs:

- Search interval (I), calculated as the average time between searches
- Number of searches, calculated as the average number of times each turbine was visited
- Temporal coverage (v), which is set to 0.983 for the Indiana and northern long-eared bat, and set to 0.68 for the little brown bat and tricolored bat since monitoring occurred only during the fall period of risk[1]
- Searcher efficiency, which was calculated using the "carcasses removed after one search" option and inputting the total number of carcasses available and the number of carcasses found
- Factor by which searcher efficiency changes with each search (k) was fixed at 0.8
- Persistence distribution, which was calculated using field trials to estimate the parameters, and the top model was selected based on results from GenEst modeling

This analysis was done to calculate the detection probability (g) at the site for the 2024 monitoring for Indiana and northern long-eared bats and tricolored and little brown bats separately due to variation in the temporal coverage.

[1] Indiana and northern long-eared bats are only expected to have risk during the spring and fall migration periods and fall fatalities account for 98.3% of migratory fatalities (see Section 6.2.2 of the HCP); whereas, tricolored and little brown bats are also expected to have summer risk, so 68.0% of fatalities occur in the fall (USFWS 2016).

3.0 Results

3.1 BATS

A total of 1,294 carcass searches were conducted over 10 weeks (August 12 – October 16) (Table 1). The average time between searches was 6.83 days during the post-construction monitoring period (Table 1).

Table 1. Summary of standardized searches during the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Season	Date Range	Length (Weeks)	Road and Pad Turbines	Total number of searches conducted	Search Interval	Bat Carcasses Found[1]
Fall	August 12 – October 16	10	134	1,294	6.83	70

[1]This includes all carcasses found during standardized searches (within roads and pads on a scheduled search day).

3.1.1 Standardized Carcass Searches

A total of 70 individual bat carcasses were found during standardized carcass searches and used for calculating the DWP (see Section 3.1.4) and adjusted mortality estimates (see Section 3.1.5).

3.1.1.1 Species Composition

A total of 70 bat carcasses representing 4 species were found during standardized carcass searches. A summary of all bat carcasses found during the standardized carcass surveys during post-construction monitoring is shown in Table 2. Additionally, 12 bat carcasses were found incidentally.

Of the 70 bat carcasses found during standardized carcass searches at the site, the silver-haired bat (*Lasionycteris noctivagans*) was the most common species detected (n=34; 48.6% of all bat carcasses found during standardized searches) followed by eastern red bat (*Lasiurus borealis*; n=21; 30.0%), hoary bat (*Lasiurus cinereus*; n=10; 14.3%) and big brown bat (*Eptesicus fuscus*; n=5; 7.1%). All bat carcasses were identified to the species level. A fifth species, evening bat (*Nycticeius humeralis*), was only found incidental to standardized carcass searches. No covered species were found. No bat species federally listed as endangered or threatened under the Endangered Species Act of 1973 (ESA), as amended, were found. No bat species state-listed as endangered or threatened under the Illinois Endangered Species Protection Act of 1972 were found.

Table 2. Summary of all bat carcasses found incidentally and during standardized carcass searches during the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois. Percent of total shown in parenthesis.

Species	Number found during standardized searches	Number found incidentally	Total number found
Silver-haired Bat	34 (48.6%)	1 (8.3%)	35 (42.7%)
Eastern Red Bat	21 (30.0%)	2 (16.7%)	23 (28.0%)
Hoary bat	10 (14.3%)	5 (41.7%)	15 (18.3%)
Big Brown Bat	5 (7.1%)	3 (25.0%)	8 (9.8%)
Evening Bat	0 (0%)	1 (8.3%)	1 (1.2%)
Total	**70**	**12**	**82**

3.1.1.2 Age and Sex

A summary of the age and sex of all bat carcasses found during the standardized carcass searches is shown in Table 3 (incidental carcasses are not included). Of the 70 bat carcasses found, 3 were adult females (4.3%), 1 was a female of unknown age (1.4%), 10 were adult males (14.3%), 11 were males of unknown age (15.7%), 10 were adults of unknown sex (14.3%), 3 were juveniles of unknown sex (4.3%), and 32 were bats of unknown age and unknown sex (45.7%) (Table 3).

Table 3. Sex and age of bat carcasses found during standardized carcass searches during 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois. Ages include adults (A), juveniles (J), and unknown (U).

Species	Female			Male			Unknown		
	Adult	Juvenile	Unknown	Adult	Juvenile	Unknown	Adult	Juvenile	Unknown
Silver-haired Bat	1	0	1	5	0	5	6	2	14
Eastern Red Bat	2	0	0	2	0	5	2	1	9
Hoary Bat	0	0	0	2	0	1	1	0	6
Big Brown Bat	0	0	0	1	0	0	1	0	3
Total	**3**	**0**	**1**	**10**	**0**	**11**	**10**	**3**	**32**

3.1.1.3 Temporal Patterns

During standardized searches in the post-construction monitoring period, bats were found during every week of searches (Figure 2). The greatest number of bats found during a single week occurred the week of September 30 (week 8; n=13; 18.6%), followed by the week of September 23 (week 7; n=12; 17.1%). The fewest number of bats found during a single week occurred during week 9 (October 7) when only one bat was found (n=1; 1.4%).

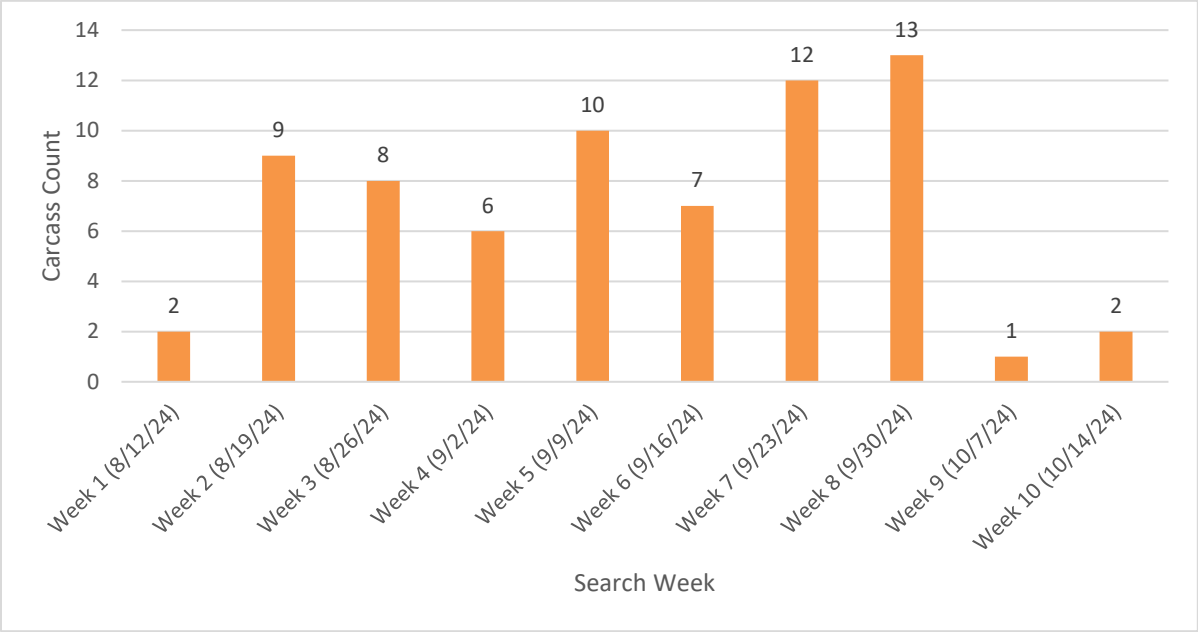


Figure 2. Bat carcasses found by week during the 2024 post-construction standardized searches (August 12 - October 16) at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

3.1.1.4 Spatial Patterns

During the standardized searches, bats were found at 50 of the 134 turbines (37.3%).

The number of carcasses found per turbine for the season varied from zero to five. The breakdown of carcasses per turbine is shown in Table 4.

Table 4. Summary of number of carcasses found per turbine during the 2024 standardized post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Number of Carcasses Found	Number of Turbines	Turbine ID(s)[1]
5 carcasses	1	23
4 carcasses	2	11, 14
2 carcasses	10	3, 6, 20, 46, 84, 85, 89, 91, 104, 107
1 carcass	37	5, 13, 17, 22, 24, 26, 27, 36, 38, 43, 45, 48, 50, 52, 54, 55, 57, 62, 64, 68, 69, 70, 71, 72, 80, 86, 96, 97, 98, 103, 106, 111, 113, 115, 119, 121, 122

Number of Carcasses Found	Number of Turbines	Turbine ID(s)[1]
0 carcasses	84	1, 2, 4, 7, 8, 9, 10, 12, 15, 16, 18, 19, 21, 25, 28, 29, 30, 31, 32, 33, 34, 35, 37, 39, 40, 41, 42, 44, 47, 49, 51, 53, 56, 58, 59, 60, 61, 63, 65, 66, 67, 73, 74, 75, 76, 77, 78, 79, 81, 82, 83, 87, 88, 90, 92, 93, 94, 95, 99, 100, 101, 102, 105, 108, 109, 110, 112, 114, 116, 117, 118, 120, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134

[1]See Figure 1

The most carcasses found at a single turbine was at Turbine 23 (5 carcasses; Table 4). Carcasses were found at turbines located throughout the Project area (Table 4 and Figure 1).

3.1.2 Searcher Efficiency Trials

Two searchers regularly completed surveys at the Project, therefore, two searcher efficiency trials were conducted during the post-construction monitoring period. A total of 20 mouse carcasses for one searcher and 10 for the second searcher were placed for the searcher efficiency trials during the post-construction monitoring period. Data were analyzed in GenEst with searcher as the only predictor variable. The top model did not include searcher as a predictor variable (constant model was chosen), with an estimated searcher efficiency of 98% (Table 5).

Table 5. Searcher efficiency for the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Trial Carcasses
Number of Carcasses Placed	30
Number of Carcasses Scavenged Prior	0
Number of Carcasses Available	30
Number of Carcasses Found	30
(p) Searcher Efficiency Mean (90% CI)	**0.98** (0.92, 1.00)

3.1.3 Carcass Persistence Trials

Twenty mouse carcasses were used for carcass persistence trials. They were left for up to 30 days and checked on days 1, 2, 3, 4, 5, 6, 7, 9, 14, 21, and 30 after which no carcasses remained. GenEst was run using exponential, Weibull, loglogistic and lognormal distributions, and the model with the best fit used a lognormal distribution. Results of each model are included in Table 6.

Table 6. Carcass persistence GenEst models for bats during the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

ΔAIC	Persistence Distribution	Probability of Persisting to Next Search (r)	a	b
0	Lognormal	0.7926	0.604	1.936
1.44	Loglogistic	0.764	2.165	6.315
3.91	Exponential	0.711	N/A	9.66
4.74	Weibull	0.778	1.259	10.444

This resulted in an estimated carcass persistence of 6.93 days for bats (Table 7).

Table 7. Carcass removal during the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Mouse
Number of Carcasses Placed	20
Number of Carcasses remaining after 30 days	0
Mean Carcass Persistence time in days (90% CI)	**6.93 (5.20, 9.24)**

3.1.4 Density-weighted Proportion (DWP)

The 70 bat carcasses found during standardized searches were used to calculate the DWP, with the assumption that 100% of bat carcasses fall within 100 m of the turbine base (Table 8).

Table 8. Calculation of the Density-weighted Proportion (DWP) at the California Ridge Wind Farm, Champaign and Vermilion counites, Illinois. See Section 2.2.3 for methods.

Distance Band (meters)	Number of Carcasses	Fraction of Area Searched	Relative Fatalities[1]	Fraction of Total Relative Fatalities
0-10	33	71.1%	46.4	3.0%
11-20	9	10.5%	85.7	5.8%
21-30	4	4.1%	97.6	6.6%
31-40	4	2.9%	137.9	9.3%
41-50	5	2.6%	192.3	12.6%
51-60	7	1.9%	368.4	24.8%
61-70	2	1.7%	117.6	7.9%
71-80	3	1.4%	214.3	14.4%
81-90	2	1.2%	166.7	11.2%
91-100	1	1.0%	100.0	6.7%

[1]Number of carcasses found divided by the fraction of area searched

Using the turbine-specific GIS data from the digitized roads and pads (since the road and pad configuration can vary by turbine), a turbine-specific DWP was then calculated by multiplying the fraction of each distance band searched at a particular turbine by the fraction of the total relative fatalities for that distance band. The turbine specific DWP ranges from 2.9% to 8.3% depending on the road and pad configuration and relative fatalities (Appendix A).

3.1.5 Adjusted Fatality Estimates

Mortality rate estimates were calculated based upon the carcasses found during the mortality surveys and did not include any incidental finds. Observed bat mortality estimates were adjusted to account for searcher efficiency, carcass persistence, and an area adjustment (DWP) using the methods described in Section 2.2.4.

The estimated bat mortality was 14.1 bats/turbine, or 1,890.0 bats over the entire facility (Table 9).

Table 9. Bat mortality estimates for the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Bat Estimate
(c) Observed bats/turbine	**0.5**
(m) Estimated bats/turbine (90% CI)	**14.1** (11.2, 17.8)
Estimated bats/MW (90% CI)	**8.8** (7.0, 11.1)
Estimated bats/facility (90% CI)	**1,890.0** (1,507.4, 2,382.0)

3.1.5.1 Bat Fatality Rates by Species

The estimated fatality rates by species are shown in Table 9. The silver-haired bat was the most commonly found species and was also the species with the highest fatality rate of 6.8 silver-haired bats/turbine, followed by the eastern red bat (4.2 bats/turbine), the hoary bat (2.0 bats/turbine), and the big brown bat (1.1 bats/turbine) (Table 10).

Table 10. Bat fatality rates by species from August 12 through October 16, 2024 post-construction monitoring at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Species	Total Found	Total Estimated Fatality (90% CI)	Per-turbine Estimated Fatalities (90% CI)	Per-MW Estimated Fatalities (90% CI)
Silver-haired Bat	34	908.0 (645.6– 1,215.3)	6.8 (4.8 – 9.1)	4.3 (3.0 – 5.7)
Eastern Red Bat	21	561.5 (378.0 – 800.7)	4.2 (2.8 – 6.0)	2.6 (1.8 – 3.8)
Hoary bat	10	267.9 (127.6 – 425.6)	2.0 (1.0 – 3.2)	1.3 (0.6 – 2.0)
Big Brown Bat	5	144.0 (52.4 – 269.8)	1.1 (0.4 – 2.0)	0.7 (0.3 – 1.3)

3.1.6 Incidental Finds

Twelve incidental bats were discovered during the 2024 standardized post-construction monitoring period, 11 during the first week of searches (week of August 12, which were deemed to have occurred prior to the post-construction monitoring period based on the level of decomposition), and 1 during week 8 (week of September 30, on road to turbine but outside 100 m). Of the incidental bat carcasses found, the hoary bat (n=5; 41.7% of all incidental bat

carcasses found) was the most common species detected, followed by the big brown bat (n=3; 25.0%), the eastern red bat (n=2; 16.7%), and the silver-haired and evening bat (n=1; 8.3%). The incidental bats are included in the summary in Table 2, and the sex and age of incidental bat carcasses is summarized in Table 11.

Table 11. Sex and age of incidental bat carcasses found during standardized carcass searches during 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois. Ages include adults (A), juveniles (J), and unknown (U).

Species	Female			Male			Unknown		
	Adult	Juvenile	Unknown	Adult	Juvenile	Unknown	Adult	Juvenile	Unknown
Hoary Bat	0	0	0	1	0	0	4	0	0
Big Brown Bat	0	0	0	0	0	0	3	0	0
Eastern Red Bat	0	0	0	0	1	0	0	1	0
Silver-haired Bat	0	0	0	1	0	0	0	0	0
Evening Bat	0	0	0	0	0	0	0	0	1
Total	**0**	**0**	**0**	**2**	**1**	**0**	**7**	**1**	**1**

3.2 BIRD CARCASSES

A total of seven individual bird carcasses representing three identified species were found during standardized carcass searches.

3.2.1 Species Composition

A summary of all bird carcasses found during standardized carcass searches is shown in Table 12. Of the seven bird carcasses found at the site during standardized carcass searches, mourning dove (*Zenaida macroura*) was the most common species detected (n=4; 57.1% of all bird carcasses found). The three remaining bird carcasses included one of each of the following species, killdeer (*Charadrius vociferous*), horned lark (*Eremophila alpestris*), and one unknown species. The one unknown passerine (i.e., songbird) carcass was too decomposed to be identified to species. No birds were found incidentally. No bird species federally listed as threatened or endangered under the ESA, as amended, were found. No bird species state listed as threatened or endangered under the Illinois Endangered Species Protection Act of 1972 were found, including no black-billed cuckoos.

Table 12. Summary of all bird carcasses found during standardized carcass searches or incidentally during the 2024 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois. Percent of total shown in parenthesis.

Species	Number found during standardized searches	Number found incidentally	Total number found
Mourning Dove	4 (57.1%)	0 (0%)	4 (57.1%)
Killdeer	1 (14.3%)	0 (0%)	1 (14.3%)
Horned Lark	1 (14.3%)	0 (0%)	1 (14.3%)
Unknown Passerine	1 (14.3%)	0 (0%)	1 (14.3%)
Total	7	0	7

3.2.2 Temporal Patterns

During standardized searches in the post-construction monitoring period, birds were found during 40% of weeks (4 of 10). The greatest number of birds found during a single week occurred the week of August 26 (week 3; n=4; 57.1%). Additionally, one bird (14.3%) was found each week during weeks 4, 9, and 10 (Figure 3). No birds were found during the remaining weeks (Figure 3).

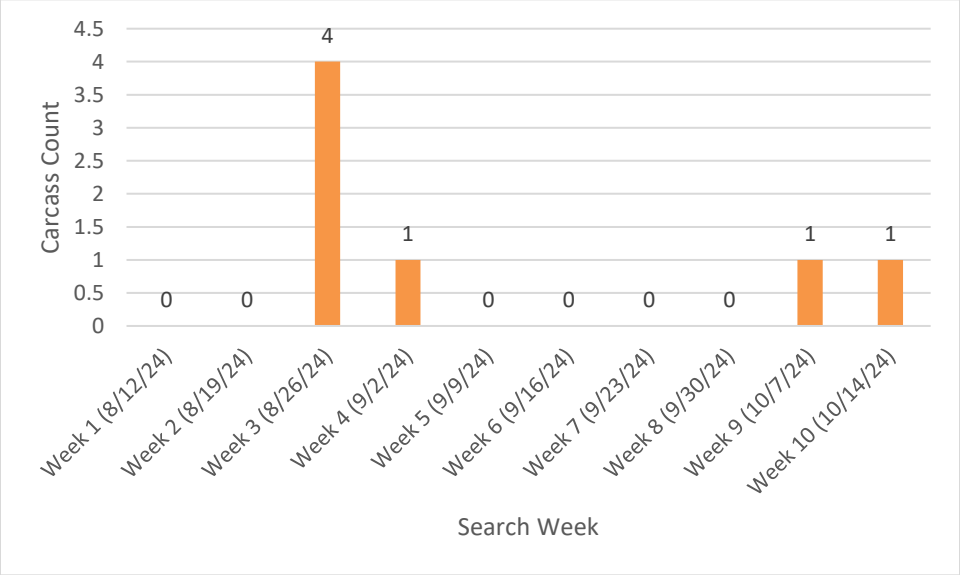


Figure 3. Bird carcasses found by week during the 2024 post-construction standardized searches (August 12 - October 16) at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

3.2.3 Spatial Patterns

During the standardized searches, birds were found at 7 of the 134 turbines (5.2%).

The number of carcasses found per turbine for the season varied from zero to one. The breakdown of carcasses per turbine is shown in Table 13.

Table 13. Summary of number of bird carcasses found per turbine during the 2024 standardized post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Number of Carcasses Found	Number of Turbines	Turbine ID(s)[1]
1 carcass	7	44, 54, 69, 76, 97, 115, 122
0 carcasses	127	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134

[1]See Figure 1

One carcass was found at each of the seven turbines that had bird fatalities during the standardized carcass searches (Table 13). Carcasses were found at turbines located throughout the eastern two-thirds of the Project area (Table 13 and Figure 1).

3.3 DETECTION PROBABILITY (G) FOR BAT MONITORING

The following inputs were used to calculate the probability of detection (g) for the 2024 post-construction monitoring using the EofA software:

- Search interval: 7 days (closest number to 6.83 that would allow EOA to run)
- Number of searches: 10
- Spatial coverage (a): 0.046 (average of the turbine-specific DWPs)
- Temporal coverage (a): 0.983 for Indiana and northern long-eared bats, 0.68 for little brown and tricolored bats
- Searcher efficiency: found 30 of 30 carcasses
- Factor by which searcher efficiency changes with each search (k): 0.8 (per the HCP)
- Persistence Distribution: Lognormal distribution using the site-specific data (shape=0.6044, scale=1.936)

This resulted in an estimated detection probability (g) of:

- 0.0352 for Indiana bats and northern long-eared bats (95% CI: 0.0303 – 0.0404), (Ba=179.2954, Bb=4918.8726)
- 0.0243 for little brown bats and tricolored bats (95% CI: 0.021 – 0.028) (Ba=181.66, Bb=7278.868)

Screenshots of the inputs and outputs from EofA are provided in Appendix B.

3.4 COVERED SPECIES

3.4.1 Bats

There were no Indiana bats, northern long-eared bats, little brown bats, or tricolored bats found during the 2024 post-construction monitoring surveys. Therefore, no adaptive management was triggered.

3.4.2 Black-billed Cuckoo

There were no black-billed cuckoos found during the 2024 post-construction monitoring surveys. Therefore, no adaptive management was triggered.

4.0 Summary and Conclusions

4.1 SUMMARY

- A total of 1,294 carcass searches were conducted over 10 weeks from August 12 through October 16, 2024.
- A total of 70 bat carcasses of 4 species and 7 bird carcasses of 3 species were found during standardized carcass searches. Additionally, 12 bat carcasses were found incidentally and included one additional species not found during standardized searches. No bird carcasses were found incidentally.
- No bat or bird species listed as federally threatened or endangered under the ESA or listed as state-threatened or endangered under the Illinois Endangered Species Protection Act of 1972 were found during this study.
- Bat species found during standardized searches included silver-haired bat (34), eastern red bat (21), hoary bat (10), and big brown bat (5). One evening bat was found incidentally.
- Bird species found during standardized searches included mourning dove (4), killdeer (1), horned lark (1), and unknown species (1).

4.2 CONCLUSIONS

The bat fatality rate of 8.8 bats/MW falls within the range previously reported for the Midwest of 1.42 to 38.22 bats/MW and below the average of 17.59 bats/MW (USFWS 2016). More recent studies show an even broader range reported for the Midwest of 0.4 to 51 bats/MW; however, they report a lower average of 10.87 bats/MW (REWI 2020).

No Indiana bat, northern long-eared bat, little brown bat, or tricolored bat fatalities were detected during 2024, and no adaptive management was triggered. No black-billed cuckoo fatalities were detected during 2024 and adaptive management was not triggered. Thus, no adaptive management actions will be implemented.

5.0 Literature Cited

Dalthorp, D., M. Huso, and D. Dail. 2017. Evidence of Absence (v2.0) Software User Guide: U.S. Geological Survey Data Series 1055, 109 pp. https://doi.org/10.3133/ds1055.

Dalthorp, D., L. Madsen, M.M. Huso, P.A. Rabie, R. Wolpert, J. Studyvin, J. Simonis, and J. Mintz. 2018. GenEst statistical models – A generalized estimator of mortality. No. 7-A2. U.S. Geological Survey, 2018.

Renewable Energy Wildlife Institute (REWI). 2020. Summary of Bat Fatality Monitoring Data Contained in AWWIC (2nd Edition). Washington, DC. Available at Available at https://rewi.org/. © 2022 Renewable Energy Wildlife Institute.

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. U.S. Department of the Interior, Fish and Wildlife Service. April 2016.

Appendix A Turbine-specific Density-Weighted Proportions (DWP)

Turbine ID	DWP
1	0.039408
2	0.042335
3	0.061763
4	0.05738
5	0.045955
6	0.066293
7	0.054723
8	0.040049
9	0.034197
10	0.044641
11	0.051868
12	0.076211
13	0.064429
14	0.056918
15	0.046762
16	0.045114
17	0.041758
18	0.039354
19	0.028796
20	0.051381
21	0.040024
22	0.059651
23	0.052559
24	0.056846
25	0.029722
26	0.033147
27	0.039507
28	0.038711
29	0.038546
30	0.036934
31	0.0364
32	0.045467
33	0.040672
34	0.035823
35	0.075963
36	0.06596
37	0.058604

Turbine ID	DWP
38	0.047716
39	0.037933
40	0.042
41	0.060188
42	0.044638
43	0.045205
44	0.052505
45	0.039988
46	0.047963
47	0.060229
48	0.042145
49	0.036894
50	0.038931
51	0.04328
52	0.046146
53	0.044036
54	0.034954
55	0.037248
56	0.048698
57	0.043735
58	0.041434
59	0.035342
60	0.029748
61	0.052149
62	0.068987
63	0.044939
64	0.045076
65	0.033419
66	0.034704
67	0.051715
68	0.041138
69	0.04977
70	0.035635
71	0.03709
72	0.048761
73	0.039989
74	0.043097
75	0.04728
76	0.066836
77	0.054055

Turbine ID	DWP
78	0.037883
79	0.056858
80	0.049378
81	0.039288
82	0.039032
83	0.046172
84	0.038502
85	0.071536
86	0.061044
87	0.037205
88	0.034985
89	0.043127
90	0.035759
91	0.044812
92	0.04545
93	0.061661
94	0.044397
95	0.040973
96	0.062495
97	0.044627
98	0.036028
99	0.046265
100	0.034445
101	0.040412
102	0.042281
103	0.042972
104	0.042437
105	0.045734
106	0.040132
107	0.041542
108	0.051628
109	0.035419
110	0.046144
111	0.044339
112	0.04708
113	0.040415
114	0.043698
115	0.04956
116	0.047379
117	0.045513

Turbine ID	DWP
118	0.034077
119	0.046058
120	0.038407
121	0.040701
122	0.058841
123	0.051406
124	0.051727
125	0.083335
126	0.046481
127	0.04002
128	0.041848
129	0.037708
130	0.035823
131	0.03963
132	0.042932
133	0.040277
134	0.037319

Appendix B Evidence of Absence Screenshots

Screenshots of inputs for estimation of detection probability (g) and the related outputs are provided on the following pages.

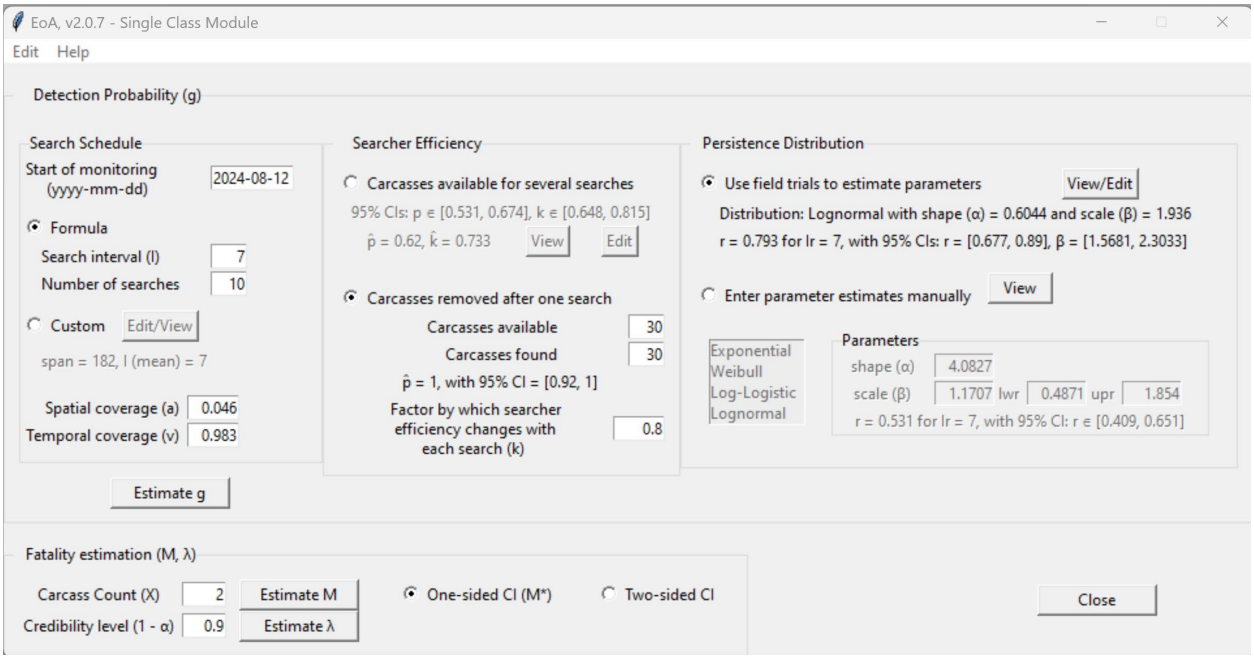


Figure B.1. Screenshot of EofA inputs for the Indiana and northern long-eared bat in the "Single Class" module.

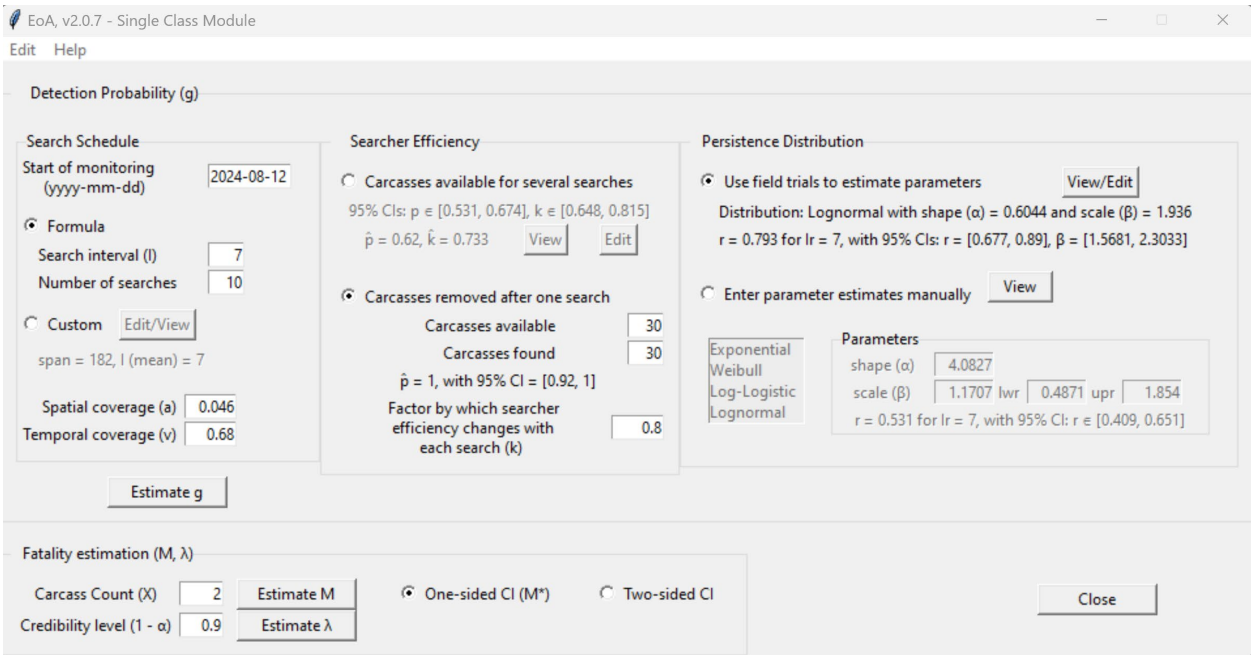


Figure B.2. Screenshot of EofA inputs for the little brown bat and tricolored bat in the "Single Class" module.

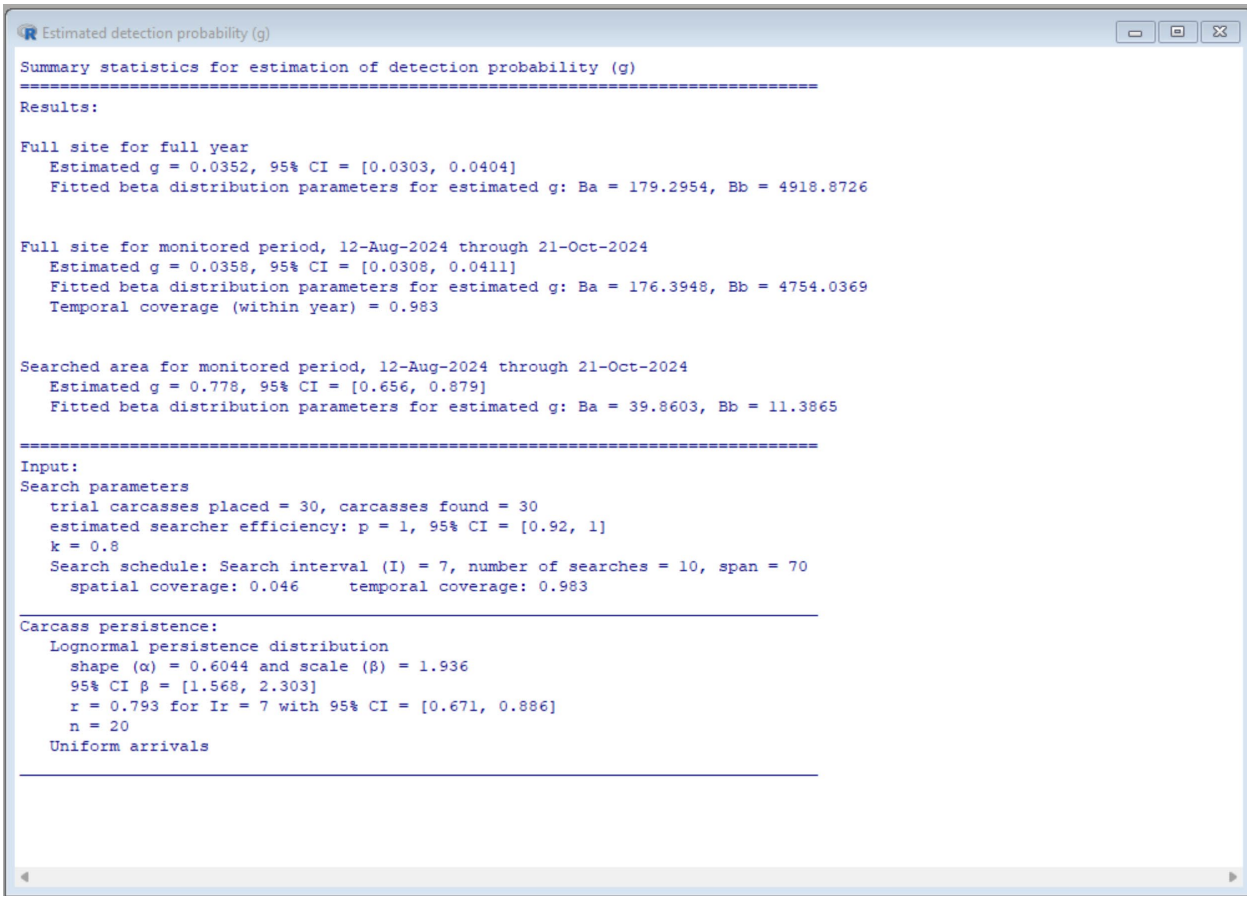


Figure B.3. Screenshot of EofA output for the Indiana and northern long-eared bat from the "Single Class" module.

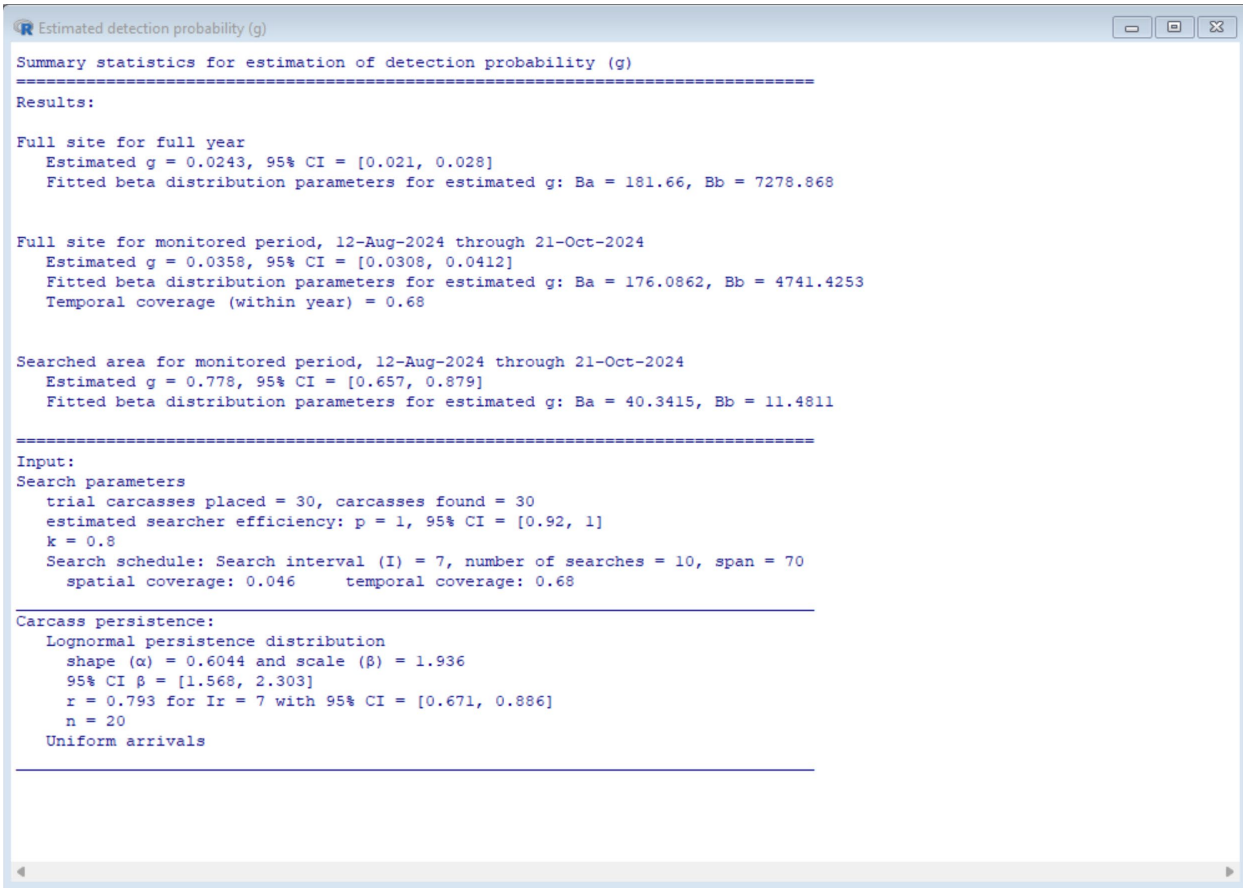


Figure B.4. Screenshot of EofA output for the little brown bat and tricolored bat from the "Single Class" module.