2021 Post-Construction Bat and Bird Mortality Monitoring Report California Ridge Wind Farm

Champaign and Vermilion Counties, Illinois

Project #193705145

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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 threatened northern long-eared bat (*Myotis septentrionalis*). The Project is also located within the range of the little brown bat (*Myotis lucifugus*) and the tri-colored bat (*Perimyotis subflavus*), both of which are currently being reviewed for listing by the United States Fish and Wildlife Service (USFWS), with decisions anticipated in 2022. 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 tri-colored bat (covered bat species), 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 first year of monitoring at the Project under the HCP and ITP.

Post-construction monitoring at the Project will also be 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. This ITA is pending and once finalized will be available under 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.

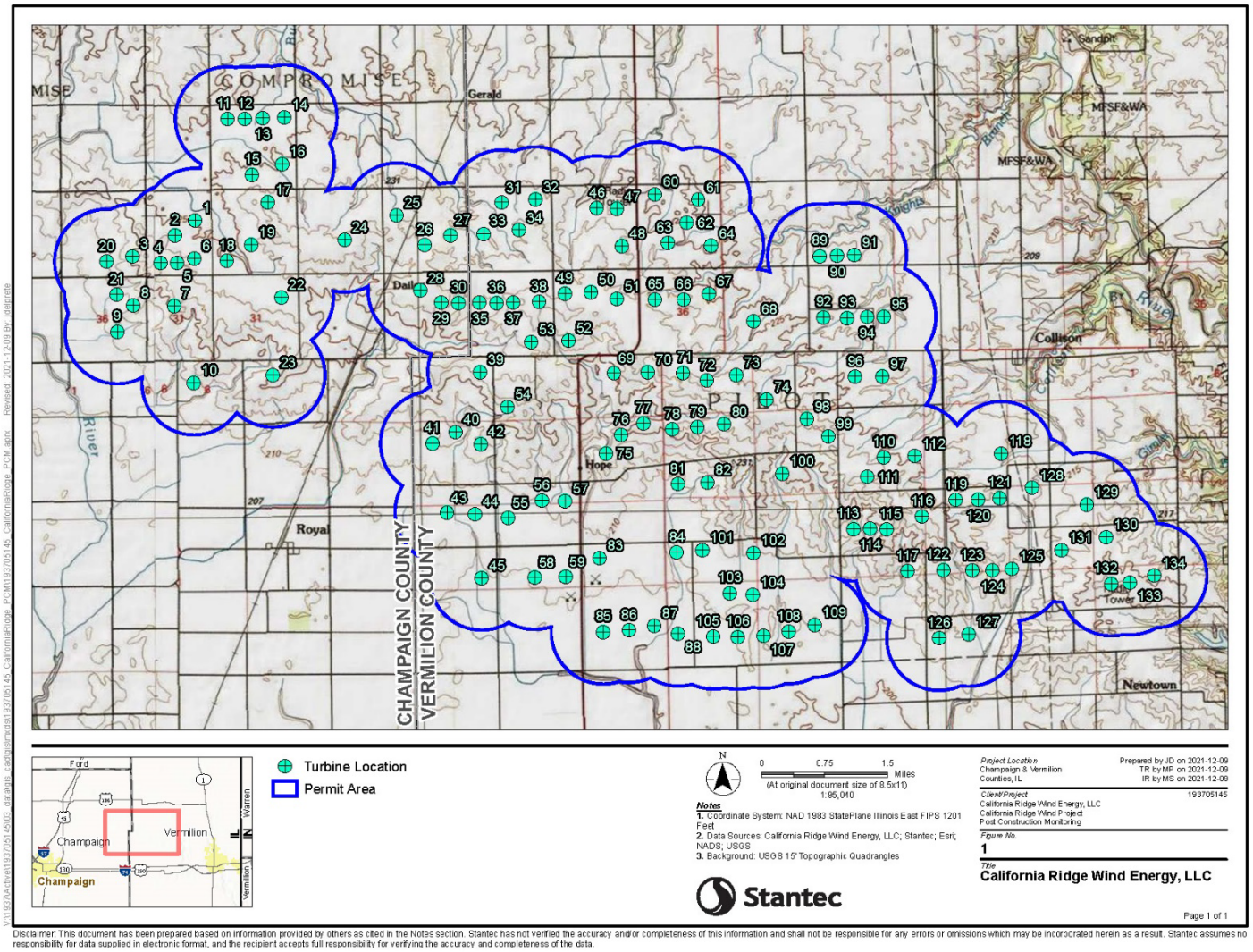

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Figure 1. Turbine and Survey Locations

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 tri-colored bat; the pending state ITA for Indiana bat and northern long-eared bat; and the state ITA for black-billed cuckoo:

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 tri-colored bats.

3. Assess the effectiveness of the black-billed cuckoo CP in meeting the biological objective of minimizing direct mortality of black-billed cuckoo.

2.0 Methods

2.1 FIELD METHODS

The post-construction monitoring included the following components:

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

2. Searcher efficiency trial to estimate the percentage of bat and bird casualties that were found by the searcher

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

2.1.1 Standardized Carcass Searches

Standardized carcass searches were conducted from July 19 through October 14, 2021, at 100% of the Project turbines (n=134). Searches consisted of searching roads and pads out to 95 meters (m; 312 feet [ft]) at all 134 Project turbines.

All turbines were searched weekly. An individual turbine was searched on the same day each week when conditions allowed. A weekly search interval for fatality monitoring was deemed adequate by Kunz et al. (2007), and other studies have demonstrated that a weekly search interval provides effective mortality monitoring and adequately estimates impacts from wind energy facilities (Gruver et al. 2009, Young et al. 2009), such that the added effort associated with more frequent intervals is not warranted.

Standardized carcass searches 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 permitted bat biologist for positive identification, and carcasses were kept 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 (this information was updated as needed based on photos or dentition)
- 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 (with a copy of the original data sheet) at the Project O&M Building. Bat carcasses were collected and retained under IDNR Endangered and Threatened Species Permit (Permit No. 13254) and IDNR Permit NH21.6588A. 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 searches 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 collected and stored in the freezer with the carcasses found during standardized surveys. As per industry standard, incidental finds were not included in the fatality estimates.

2.1.2 Searcher Efficiency Trials

A searcher efficiency trial was used to estimate the probability of bat and bird carcass detection by the searcher. The searcher did not know when during the monitoring periods the trials were being conducted, 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 and quail carcasses were used as trial carcasses to represent birds.

All searcher efficiency trial carcasses were randomly placed by the field lead within the search plots. These were placed in the morning prior to 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 not scavenged prior to the mortality search.

2.1.3 Carcass Removal Trials

A carcass removal 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 removal trial was conducted following the searcher efficiency trials during post-construction monitoring. Mouse and quail carcasses used during the searcher efficiency trials were left in place, and their locations were discretely marked. Searchers monitored the trial carcasses over a period of up to 15 days. During the carcass removal trial, carcasses were checked on days 1, 2, 3, 4, 7, and 15.

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, carcass persistence, and area adjustment) and the overall mortality rate and fatality estimates for all bats and birds at the Project.

2.2.1 Searcher Efficiency (p)

Searcher efficiency (p) represents the average probability that a carcass was detected by the surveyor. 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). Searcher efficiency decay (k) was fixed at 0.8. 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 models 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 removal trial (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, though similar to searcher efficiency, 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 alone. 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 95 meters 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.

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 Mortality Estimates (GenEst)

GenEst was used to calculate overall mortality 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 turbine estimates by 1.6 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
- 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 input was done to calculate the detection probability (g) at the site for the 2022 monitoring.

3.0 Results

3.1 SUMMARY OF STANDARDIZED CARCASS SEARCHES

A total of 1,697 carcass searches were conducted over 13 weeks (July 19 – October 14) (Table 1). Due to weather conditions and maintenance at turbines, the average time between searches was 7.07 days during the post-construction monitoring period (Table 1).

Table 1. Summary of standardized searches during the 2021 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]	Bird Carcasses Found[1]
Fall	July 19 – October 14	13	134	1,697	7.07	42	8

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

3.1.1 Bat Carcasses

A total of 42 individual bat carcasses were found during standardized carcass searches and used for calculating the adjusted mortality estimates (see Section 3.5). No federal or state-listed bat species were found.

3.1.1.1 Species Composition

A summary of all bat carcasses found during post-construction monitoring is shown in Table 2. No bat carcasses were found incidentally. Of the 42 bat carcasses found during standardized monitoring at the site, the eastern red bat (*Lasiurus borealis*) was the most common species detected (n=21; 50.0% of all bat carcasses found). Hoary bat (*Lasiurus cinereus*) was the next most common species (n=11; 26.2%), followed by silver-haired bat (*Lasionycteris noctivagans*; n=6; 14.3%), big brown bat (*Eptesicus fuscus*; n=3; 7.1%), and evening bat (*Nycticeius humeralis*; n=1; 2.4%). All bat carcasses were identified to the species level. 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 2021 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Species	Number Found (percent of total)
Eastern Red Bat	21 (50.0%)
Hoary bat	11 (26.2%)
Silver-haired Bat	6 (14.3%)
Big Brown Bat	3 (7.1%)
Evening Bat	1 (2.4%)
Total	**42**

3.1.1.2 Temporal Patterns

During 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 August 15 (week 5; n=8; 19.0%), followed by week 3 (August 1; n=7; 16.7%). The fewest number of bats found during a single week occurred during weeks 8, 9, 10, 12, and 13 (September 5, September 13, September 19, October 3, and October 10, respectively) when only one bat was found (n=1; 2.4%).

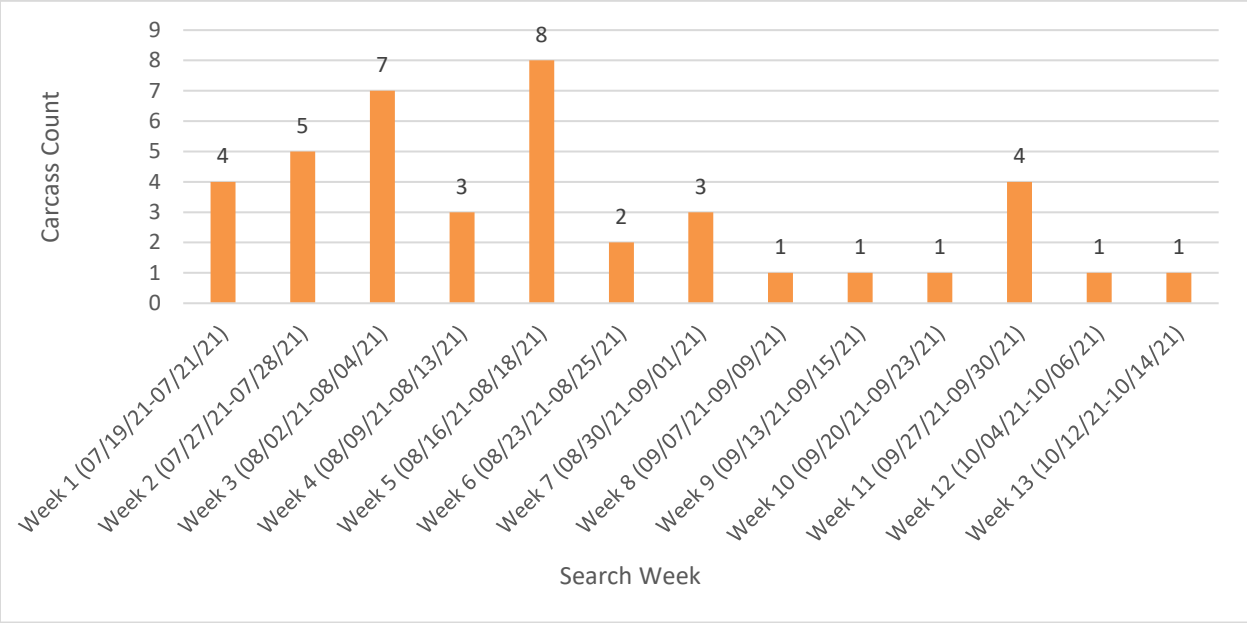

Figure 2. Bat carcasses found by week during the 2021 post-construction standardized searches (July 19 - October 14) at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

3.1.1.3 Spatial Patterns

During the standardized searches, bats were found at 32 of the 134 turbines (23.9%).

The number of carcasses found per turbine for the season varied from zero to five, with the following breakdown:

- 5 carcasses – 1 turbine
- 4 carcasses – 0 turbines
- 3 carcasses – 1 turbine
- 2 carcasses – 4 turbines
- 1 carcass – 26 turbines
- 0 carcasses – 102 turbines

The most carcasses found at a single turbine was at Turbine 38 (5 carcasses) followed by Turbine 73 (3 carcasses). Carcasses were found at turbines located throughout the project area.

3.1.2 Bird Carcasses

A total of eight individual bird carcasses were found during standardized carcass searches.

3.1.2.1 Species Composition

A summary of all bird carcasses found during standardized carcass searches is shown in Table 3. Of the eight bird carcasses found at the site during standardized carcass searches, mourning dove (*Zenaida macroura*) was the most common species detected (n=3; 37.5% of all bird carcasses found) followed by killdeer (*Charadrius vociferous*; n=2; 25.0%). The three remaining bird carcasses included one of each of the following species, golden-crowned kinglet (*Regulus satrapa*), Tennessee warbler (*Leiothlypis peregrina*), and turkey vulture (*Cathartes aura*). 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.

Table 3. Summary of all bird carcasses found during standardized carcass searches or incidentally during the 2021 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Species	Total (percent of total)
Mourning Dove	3 (37.5%)
Killdeer	2 (25.0%)
Golden-crowned Kinglet	1 (12.5%)
Tennessee Warbler	1 (12.5%)
Turkey Vulture	1 (12.5%)
Total	8

3.1.2.2 Temporal Patterns

During the post-construction monitoring period, two birds were found during week 7 (25.0%). Additionally, one bird (12.5%) was found each week during weeks 1, 3, 5, 6, 8, and 12 (Figure 3). No birds were found during the remaining weeks (Figure 3).

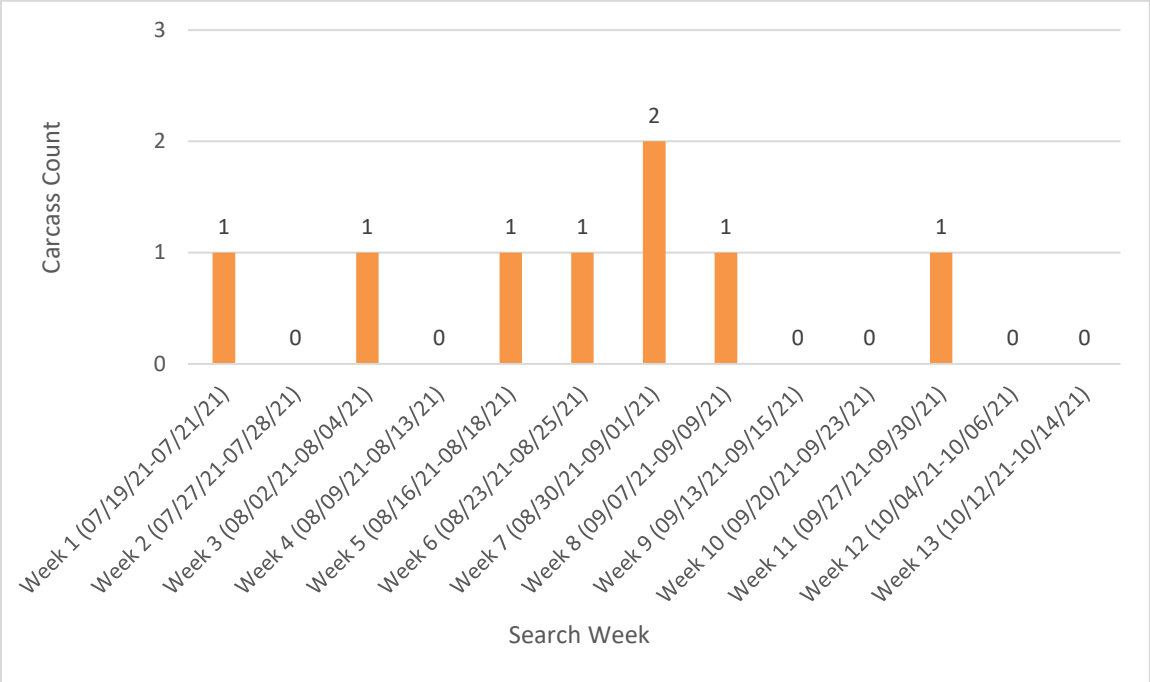

Figure 3. Bird carcasses found by week during the 2021 post-construction standardized searches (July 19 - October 14) at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

3.1.2.3 Spatial Patterns

Of the 134 turbines at which roads and pads were searched, carcasses were found at 7 different turbines (5.2% of the 134 turbines) during the standardized searches, with no carcasses found at each of the remaining 127 turbines. No birds were found incidentally.

The number of carcasses found per turbine during the standardized search for the entire season varied from zero to two, with the following breakdown:

- 2 carcasses – 1 turbine
- 1 carcass – 6 turbines
- 0 carcasses – 127 turbines

Carcasses were found at turbines located throughout the project area.

3.2 SEARCHER EFFICIENCY TRIALS

One searcher efficiency trial was conducted during the post-construction monitoring period for one searcher.

A total of 12 mouse carcasses and 10 quail carcasses were placed for the searcher efficiency trial during the post-construction monitoring period. Data were analyzed in GenEst with carcass type (bird vs bat) as the only predictor variable. The selected model included carcass type as a

predictor variable, with an estimated searcher efficiency of 92% for bats and 95% for birds (Table 4).

Table 4. Searcher efficiency for the 2021 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Mouse	Quail
Number of Carcasses Placed	12	10
Number of Carcasses Scavenged Prior	0	0
Number of Carcasses Available	12	10
Number of Carcasses Found	11	10
(p) Searcher Efficiency Mean (90% CI)	**0.92** (0.66, 0.98)	**0.95** (0.78, 0.99)

3.3 CARCASS REMOVAL TRIALS

Mouse and quail carcasses used in the searcher efficiency trials were left for up to 15 days and checked on days 1, 2, 3, 4, 7, and 15 of the trial. Fifteen mouse carcasses and 11 quail carcasses were used during the post-construction monitoring period. Fourteen mouse carcasses and all 11 quail carcasses were scavenged by the end of the 15-day trial. One mouse carcass remained intact after 15 days. GenEst was run using exponential, Weibull, loglogistic and lognormal distributions for carcass persistence, with carcass type as the predictor variable. The selected model was a Weibull distribution with the scale varying by carcass type. This resulted in an estimated carcass persistence of 2.79 days for bats and an average of 3.55 days for birds (Table 5).

Table 5. Carcass removal during the 2021 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Mouse	Quail
Number of Carcasses Placed	15	11
Number of Carcasses Scavenged within 15 days	14	11
Mean Carcass Persistence time in days (90% CI)	**2.79 (1.89, 3.92)**	**3.55 (2.66, 4.69)**

3.4 DENSITY-WEIGHTED PROPORTION (DWP)

The 42 bat carcasses found during standardized searches were used to calculate the DWP, with the assumption that 100% of bat carcasses fall within 95 meters of the turbine base (Table 6).

Table 6. 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 Fatality Rate[1]	Fraction of Total Relative Fatalities
0-10	8	61.6%	13.0	0.8%
11-20	5	5.3%	94.3	5.9%
21-30	6	3.4%	174.9	11.0%
31-40	4	2.5%	160.0	10.1%
41-50	4	2.3%	177.8	11.2%
51-60	10	1.7%	588.2	37.0%
61-70	2	1.6%	129.0	8.1%
71-80	1	1.3%	77.5	4.9%
81-90	2	1.1%	177.0	11.1%
91-95	0	1.0%	0.0	0.0%

[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 for that distance band (Appendix A). Therefore, the turbine specific DWP ranges from 2.2% to 5.2% (Appendix A).

3.5 ADJUSTED FATALITY ESTIMATES

Fatality rate estimates were calculated based upon the carcasses found during the standardized carcass searches and did not include any incidental finds. Observed bat mortality estimates were adjusted to account for searcher efficiency, carcass removal, the search schedule, and the turbine-specific DWPs.

The estimated bat mortality was 28.5 bats/turbine, or 3,816.0 bats over the entire facility (Table 7). The estimated bird mortality was 4.9 birds/turbine, or 661.6 birds over the entire facility (Table 7).

Table 7. Bat and bird fatality estimates for the 2021 post-construction monitoring study at the California Ridge Wind Farm, Champaign and Vermilion counties, Illinois.

Parameter	Bat Estimate	Bird Estimate
(c) Observed fatalities/turbine	**0.3**	**0.1**
(m) Estimated fatalities/turbine (90% CI)	**28.5** (12.6, 27.1)	**4.9** (2.2, 8.9)
Estimated fatalities/MW (90% CI)	**17.8** (12.6, 27.1)	**3.1** (1.4, 5.6)
Estimated fatalities/facility (90% CI)	**3,816.0** (2,710.9, 5,803.7)	**661.6** (298.8, 1,193.9)

3.5.1 Bat Fatality Rates by Species

The estimated fatality rates by species are shown in Table 8. The eastern red bat was the most commonly found species and was also the species with the highest fatality rate of 13.9 eastern red bats/turbine, followed by the hoary bat (7.7 hoary red bats/turbine), silver-haired bat (4.4 silver-haired bats/turbine), big brown bat (1.6 big brown bats/turbine), and evening bat (0.8 evening bat/turbine) (Table 8).

Table 8. Bat fatality rates by species from July 19 through October 14, 2021 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)
Eastern Red Bat	21	1,861.4 (1,134.4 – 2,977.7)	13.9 (8.5 – 22.2)	8.7 (5.3 – 13.9)
Hoary bat	11	1,033.1 (515.1 – 1,804.9)	7.7 (3.8 – 13.5)	4.8 (2.4 – 8.4)
Silver-haired Bat	6	592.6 (198.3 – 1,164.6)	4.4 (1.5 – 8.7)	2.8 (0.9 – 5.4)
Big Brown Bat	3	210.2 (3.0 – 482.7)	1.6 (0.0 – 3.6)	1.0 (0.0 – 2.3)
Evening Bat	1	104.7 (1.0 – 332.9)	0.8 (0.0 – 2.5)	0.5 (0.0 – 1.6)

3.6 INCIDENTAL FINDS

No bat or bird carcasses were found incidentally.

3.7 DETECTION PROBABILITY (G) FOR BAT MONITORING

The following inputs were used to calculate the probability of detection (g) for the 2021 post-construction monitoring using the EofA software:

- Search interval: 7 days
- Number of searches: 13
- Spatial coverage (a): 0.026 (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 11 of 12 carcasses
- Factor by which searcher efficiency changes with each search (k): 0.8 (EofA default)
- Persistence Distribution: Weibull distribution using the site-specific data (shape=1.049, scale=4.439)

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

- 0.0126 for Indiana bats and northern long-eared bats (95% CI: 0.00848 – 0.0175), (Ba=29.2948, Bb=2295.992)

- 0.00872 for little brown bats and tricolored bats (95% CI: 0.0058 – 0.0122) (Ba=27.7818, Bb=3157.1403)

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

3.8 COVERED SPECIES

3.8.1 Bats

There were no Indiana bats, northern long-eared bats, little brown bats, or tri-colored bats found during the 2021 post-construction monitoring surveys. Therefore, no adaptive management was triggered.

3.8.2 Black-billed Cuckoo

There were no black-billed cuckoos found during the 2021 post-construction monitoring surveys. Therefore, no adaptive management was triggered.

4.0 Summary and Conclusions

4.1 SUMMARY

- A total of 1,697 carcass searches were conducted over 13 weeks from July 19 through October 14, 2021.
- A total of 42 bat carcasses and 8 bird carcasses were found during standardized carcass searches. No bat or bird carcasses were found incidentally.
- No bird or bat 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 eastern red bat (21), hoary bat (11), silver-haired bat (6), big brown bat (3), and evening bat (1).
- Bird species found during standardized searches included mourning dove (3), killdeer (2), golden-crowned kinglet (1), Tennessee warbler (1), and turkey vulture (1).

4.2 CONCLUSIONS

The bat fatality rate of 17.8 bats/MW falls within the range previously reported for the Midwest of 1.42 to 38.22 bats/MW (USFWS 2016). More recent studies show an even broader range reported for the Midwest of 0.4 to 73 bats/MW (AWWI 2020a). The bird fatality rate of 3.1 birds/MW falls within the range previously reported for the Midwest of 0.37 to 5.15 birds/MW (USFWS 2016). More recent studies show an even broader range reported for the Midwest of 0.07 to 12.5 birds/MW (AWWI 2020b).

No Indiana bat, northern long-eared bat, little brown bat, or tri-colored bat fatalities were detected during 2021, and no adaptive management was triggered. No black-billed cuckoo fatalities were detected during 2021 and adaptive management was not triggered. Thus, no adaptive management actions will be implemented.

4.2.1 2022 Post-construction Monitoring

The post-construction monitoring plan for 2022 is outlined in the HCP, and includes twice weekly searches at 30% full plots (60-meter radius) and 70% roads and pads from April 1 through October 15. The bias correction results from 2022 will be used to inform subsequent monitoring, but monitoring for 2022 was not revised based on 2021 monitoring since no data on full plots or the spring/summer seasons were available.

5.0 Literature Cited

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

Turbine ID	DWP
1	0.022
2	0.022
3	0.022
4	0.025
5	0.022
6	0.030
7	0.028
8	0.022
9	0.022
10	0.027
11	0.029
12	0.044
13	0.047
14	0.036
15	0.029
16	0.022
17	0.022
18	0.022
19	0.027
20	0.022
21	0.022
22	0.029
23	0.025
24	0.025
25	0.022
26	0.028
27	0.022
28	0.022
29	0.028
30	0.044
31	0.022
32	0.022
33	0.022
34	0.022
35	0.044
36	0.044
37	0.028

Turbine ID	DWP
38	0.022
39	0.022
40	0.028
41	0.045
42	0.022
43	0.022
44	0.028
45	0.025
46	0.022
47	0.037
48	0.022
49	0.022
50	0.022
51	0.026
52	0.022
53	0.022
54	0.022
55	0.022
56	0.029
57	0.022
58	0.022
59	0.022
60	0.022
61	0.022
62	0.048
63	0.022
64	0.024
65	0.022
66	0.022
67	0.033
68	0.022
69	0.022
70	0.022
71	0.022
72	0.024
73	0.022
74	0.022
75	0.022
76	0.045
77	0.027

Turbine ID	DWP
78	0.026
79	0.045
80	0.024
81	0.022
82	0.022
83	0.022
84	0.022
85	0.022
86	0.044
87	0.022
88	0.022
89	0.022
90	0.022
91	0.022
92	0.022
93	0.047
94	0.022
95	0.022
96	0.046
97	0.022
98	0.022
99	0.022
100	0.025
101	0.022
102	0.022
103	0.022
104	0.025
105	0.022
106	0.022
107	0.022
108	0.052
109	0.022
110	0.028
111	0.022
112	0.022
113	0.022
114	0.022
115	0.026
116	0.022
117	0.024

Turbine ID	DWP
118	0.026
119	0.022
120	0.022
121	0.022
122	0.037
123	0.046
124	0.045
125	0.028
126	0.029
127	0.023
128	0.029
129	0.022
130	0.022
131	0.022
132	0.022
133	0.022
134	0.022

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.

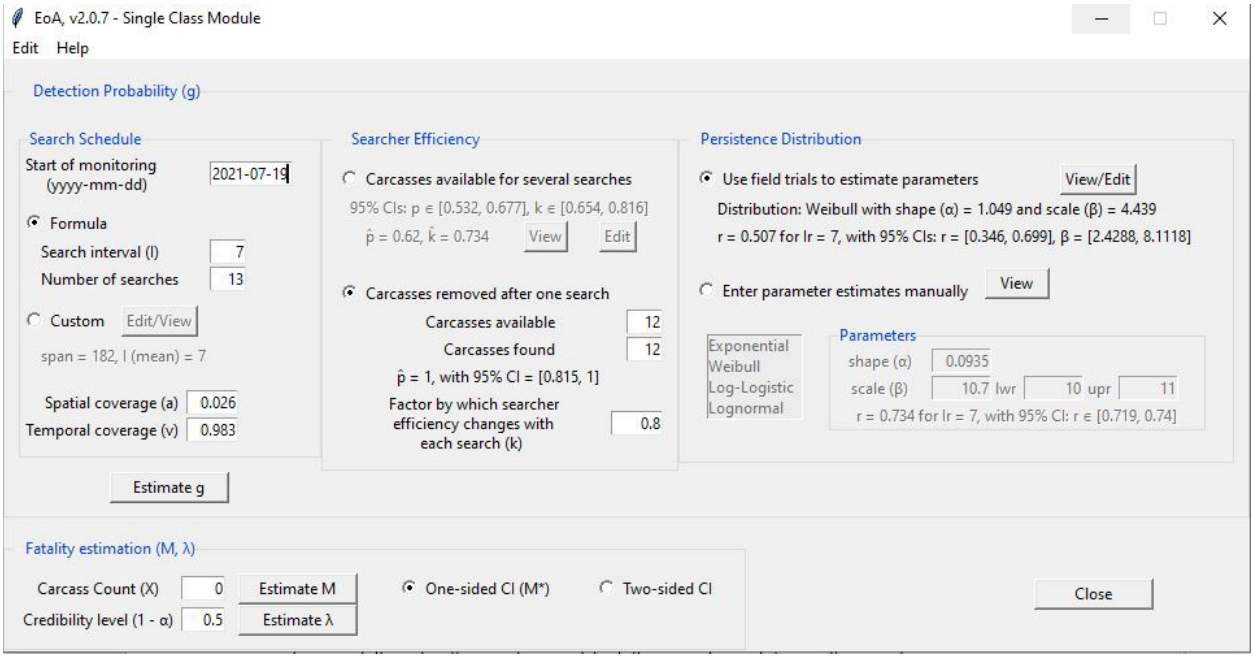

Figure B.2. Screenshot of EofA inputs for the little brown bat and tricolored bat in the "Single Class" module.

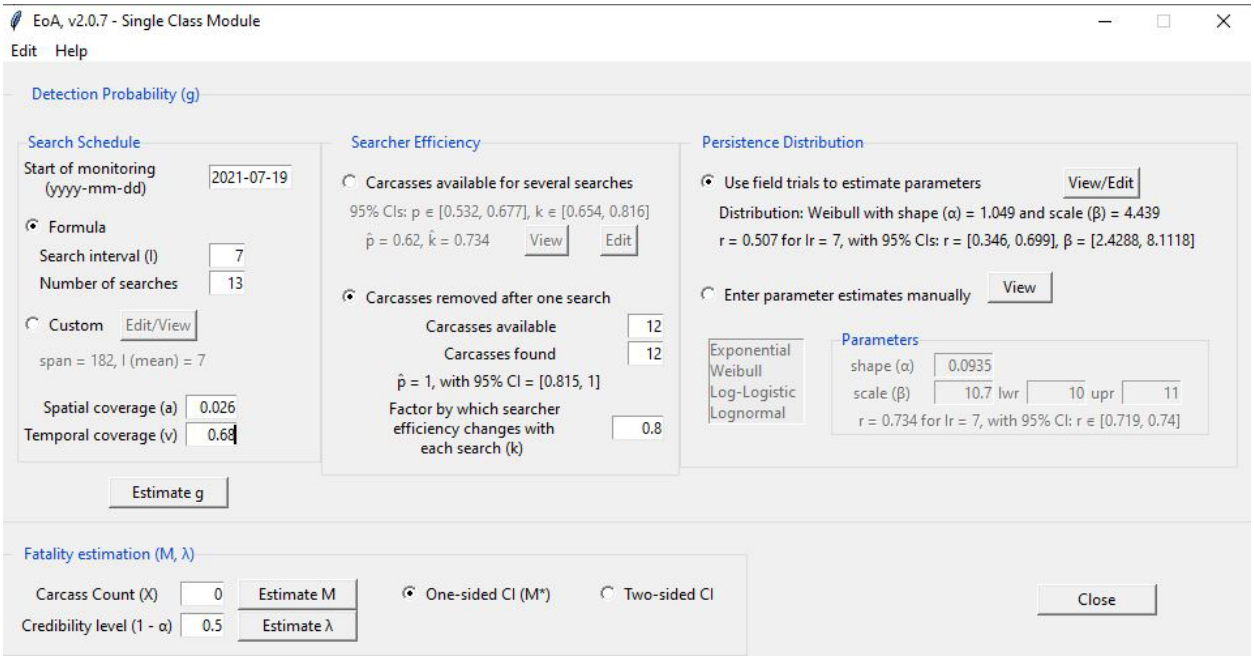

Figure B.3. Screenshot of EofA output for the Indiana and northern long-eared bat from the "Single Class" module.

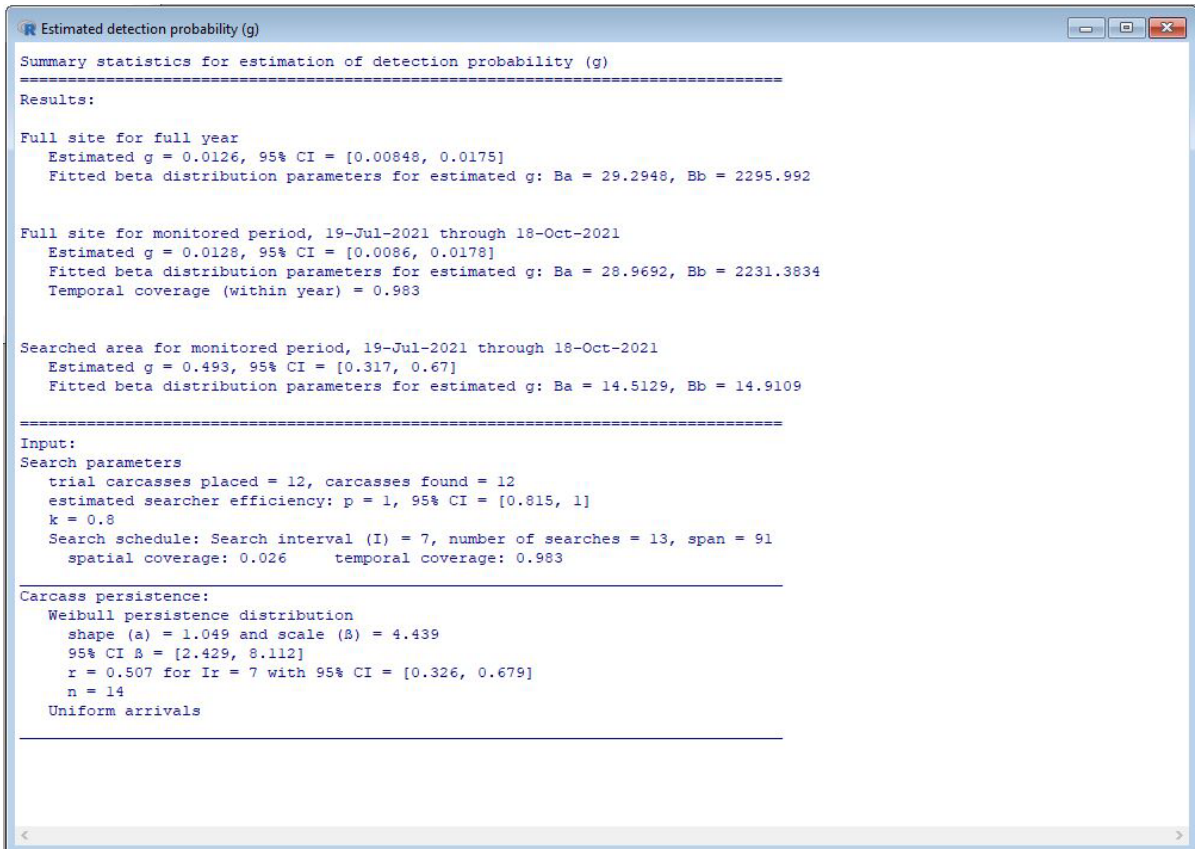

Figure B.4. Screenshot of EofA output for the little brown bat and tricolored bat from the "Single Class" module.