Bat Evaluation Monitoring Studies at the Fowler Ridge Wind Farm Benton County, Indiana

August 1 – October 15, 2024

Prepared for:

Fowler Ridge Wind Farm

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WEST

EXECUTIVE SUMMARY

The Fowler Ridge Wind Farm (FRWF or Project) collectively includes Fowler Ridge Wind Farm LLC, Fowler Ridge II Wind Farm LLC, Fowler Ridge III Wind Farm LLC, and Fowler Ridge IV Wind Farm LLC. The FRWF consists of 420 wind turbines in four phases in Benton County, Indiana. Western EcoSystems Technology, Inc., conducted post-construction fatality studies of bats within Phases I, II, and III in the fall of 2009 and 2010, when two Indiana bat carcasses were found. The FRWF worked with the US Fish and Wildlife Service and developed a Habitat Conservation Plan (HCP) for the Indiana bat, designed to minimize Indiana bat fatalities during the fall migration period. The FRWF received an Incidental Take Permit (ITP) for Indiana bats in August 2014 and an amendment to cover northern long-eared bats was signed in 2023.

Standardized carcass searches were completed twice weekly at 114 turbines in the fall (August 1 – October 15) of 2024, corresponding with migration periods of Indiana and northern long-eared bats as required by the ITP. Carcass searches were not required in the spring per the HCP. The search area was restricted to the gravel roads and pads within 80 meters (262 feet) of each turbine included in the study. Searcher efficiency and carcass persistence trials were also conducted to correct for detection and removal bias.

No Indiana bats or northern long-eared bats were found. One unidentified *Myotis* bat carcass was found but could not be identified to species. One hundred sixteen bat carcasses of six known species were found during searches and incidentally. The most commonly found bat species were eastern red bat and silver-haired bat, followed by hoary bat, big brown bat, evening bat, and Seminole bat. One bat carcass reported incidentally by turbine workers could not be collected or identified to species.

Estimated bat fatality rates were calculated based on the number of carcasses found, the results of bias trials, and adjustments for bats that did not fall on roads and pads. The bat fatality rate in 2024 was estimated to be 13.15 bat fatalities/turbine/study period (90% confidence interval: 8.68, 16.83). The results of monitoring during 2024 provide evidence that operational strategies exceeded the objective of reducing bat fatality rates by 50%, compared to fatality estimates from turbines operating normally in 2010 and 2011 (31.71 bats per turbine per year). Within-season and end-of-season adjustments of minimization strategies were not required in 2024 because bat fatality rates were below adaptive management thresholds.

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INTRODUCTION

The Fowler Ridge Wind Farm (FRWF or Project) collectively includes Fowler Ridge Wind Farm LLC, Fowler Ridge II Wind Farm LLC, Fowler Ridge III Wind Farm LLC, and Fowler Ridge IV Wind Farm LLC. The FRWF consists of 420 wind turbines in four phases in Benton County, Indiana. A post-construction fatality monitoring study for bats was conducted by Western EcoSystems Technology, Inc. (WEST), within Phases I, II, and III in 2009 (Johnson et al. 2010a, 2010b), when an Indiana bat (*Myotis sodalis*) and a northern long-eared bat (*Myotis septentrionalis*) carcass were found. Subsequent studies were conducted in 2010, 2011, 2012 and 2013 (Good et al. 2011, 2012, 2013, and 2014) under Scientific Research and Recovery Permits (TE15075A in 2010, TE15075A-2 in 2011, and TE73598A-0 in 2012 and 2013) within Phases I, II, and III. A second Indiana bat carcass was found in 2010 (Good et al. 2011). The results of this research were used by FRWF to design a strategy for reducing Indiana bat fatality rates and to develop a Habitat Conservation Plan (HCP).

The first two years of evaluation phase monitoring were completed at Phases I, II, and III per the Incidental Take Permit (ITP) during the fall migration season for Indiana bats in 2014 and 2015 (Good et al. 2015, 2016). Construction of Phase IV was completed in December 2015, and the required two years of evaluation phase monitoring were conducted during the fall migration season for Indiana bats in 2016 and 2017 (Good et al. 2017, 2018). Because the estimated Indiana bat fatality rate was below adaptive management thresholds for all phases during their respective evaluation years, as outlined in the HCP, implementation phase monitoring began in the fall of 2016 at Phases I, II, and III, and in the fall of 2018 at Phase IV, and will continue unless adaptive management thresholds are exceeded in the future (Good et al. 2018, 2019, 2020).

Indiana bats were not believed to be at risk during the spring migration period (April 1 – May 15) when the original HCP was prepared and the ITP was issued. Since that time, new evidence indicates Indiana bats may be at risk of take during the spring migration period as well (Pruitt and Reed 2018). The HCP was amended to account for spring take of Indiana bats and an amendment to the ITP was granted on March 22, 2018 (TE95012A-1). To minimize take of Indiana bats during the spring migration period, turbine blades are feathered below a cut-in speed of 3.5 meters per second (m/s; 11.5 feet per second [ft/s]) on a nightly basis from sunset to sunrise from April 1 – May 15. As per the amended HCP and ITP, two years of spring evaluation phase monitoring were conducted in 2018 (Good et al. 2019) and 2019 (Good et al. 2020) at the FRWF. Because the estimated Indiana bat fatality rate was estimated to be below adaptive management thresholds during the spring of 2018 and 2019, implementation phase monitoring began in 2020 and continued through 2023. Per the HCP, monitoring will be conducted every other year during the spring unless operational changes occur.

The FRWF worked with the US Fish and Wildlife Service (USFWS) and developed an HCP for the Indiana bat designed to minimize Indiana bat fatalities by feathering turbine blades when winds are at 5.0 m/s (16.4 ft/s) or lower, on a nightly basis from sunset to sunrise during the fall migration period from August 1 – October 15. The FRWF received an ITP for Indiana bats in

August 2014 (TE95012A-0) based on the HCP and an amendment to cover northern long-eared bats was received in 2022 and signed in 2023. The HCP and ITP include requirements for monitoring the effectiveness of minimization measures. This report describes the results of the 2024 fall fatality monitoring required under the HCP and ITP.

STUDY AREA

The FRWF has a total energy capacity of 738 megawatts (MW). Phase I consists of 122, Vestas V82 1.65-MW turbines and 40, Vestas V120 2.20-MW turbines with a combined 289 MW of energy capacity. Phase II consists of 133, 1.50-MW General Electric (GE) SLE turbines with a capacity of 199.5 MW. Phase III consists of 60, Vestas V82 1.65-MW turbines with a total 99 MW of capacity. Phase IV consists of 65, Siemens SWT-2.3-108 2.30-MW turbines with a capacity of 150 MW. Turbine characteristics are listed in Table 1.

Table 1. Turbine characteristics at the Fowler Ridge Wind Farm, Benton County, Indiana.

Turbine Model	Megawatts	Turbine Height (meters)	Rotor Diameter (meters)	Standard Cut-in Speed (meters/second)
General Electric SLE	1.50	80	77	3.5
Vestas V82	1.65	80	82	3.5
Siemens SWT-2.3-108	2.30	80	108	3.5
Vestas V120	2.20	90	120	3.0

Phases I and III were constructed in 2008 and became operational during January 2009. Forty turbines in Phase I received upgraded nacelles and blades, transitioning from Clipper C96 to Vestas V120 models during the summer of 2023. Phase II was constructed in 2009 and became operational by December 31, 2009. Phase IV was constructed in 2015 and became operational in December 2015.

The Project area is dominated by cultivated crops, consisting primarily of corn (*Zea mays*) and soybeans (*Glycine max*; Figure 1). Within 0.8 kilometers (0.5 miles) of turbine locations, cultivated crops compose 92.5% of the land use in the 61,075-acre (24,716-hectare) study area (Table 2). After cultivated crops, the next most common land uses within the FRWF are developed areas (e.g., houses, buildings, and open space), which compose 5.9% of the total. Forested areas, grasslands (herbaceous), and wetlands are rare within the study area (National Land Cover Database 2019).

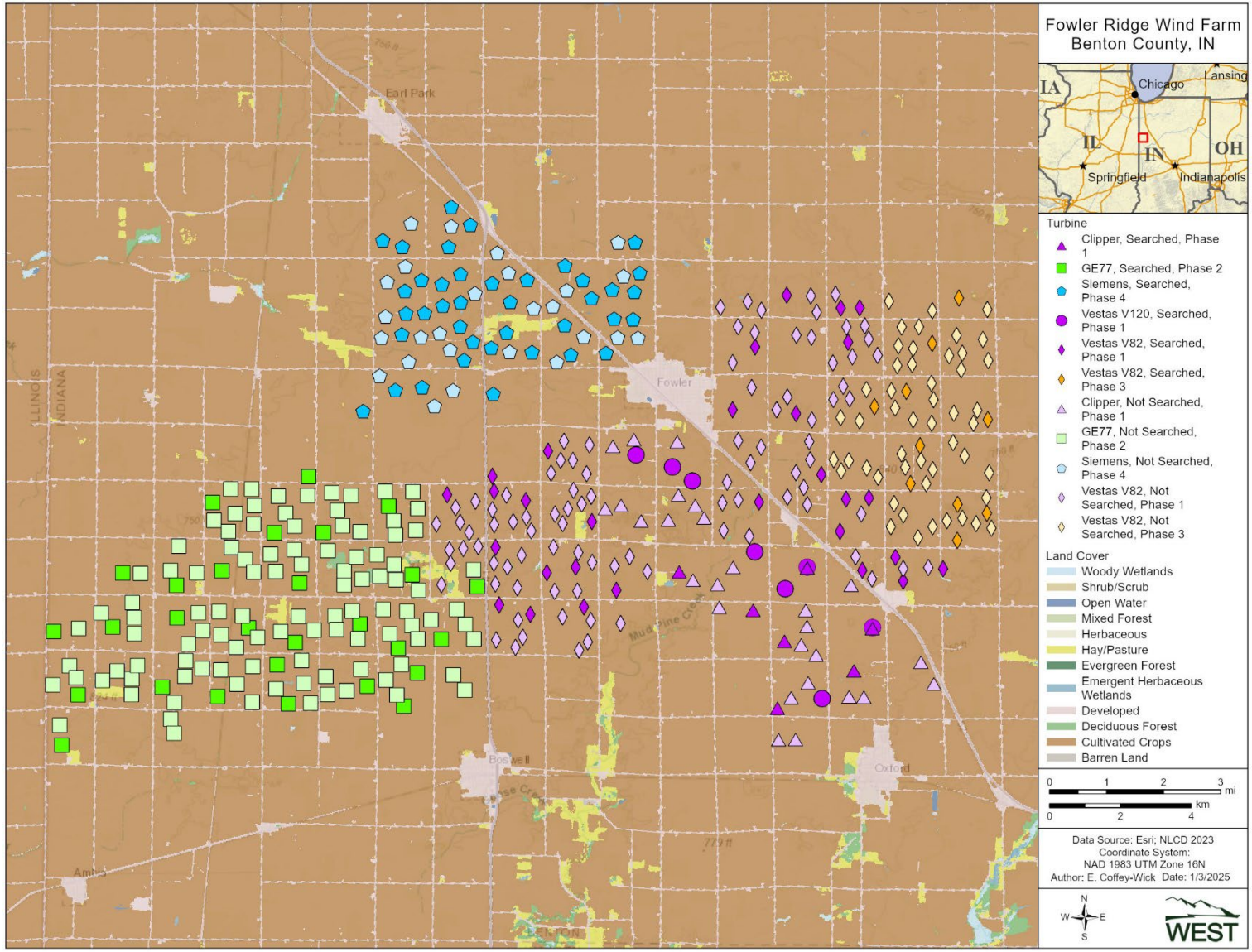

Figure 1. Land cover types and locations of Phase I–IV turbines searched from August 1 – October 15, 2024, at the Fowler Ridge Wind Farm, Benton County, Indiana.

Table 2. Land cover types, coverage, and percent composition within 0.5 miles of turbine locations within the Fowler Ridge Wind Farm, Benton County, Indiana.

Land Cover Types	Coverage (acres)	Percent Composition
Cultivated Crops	56,514.7	92.5
Developed, Low Intensity	1,817.2	3.0
Developed, Open Space	1,055.7	1.7
Hay/Pasture	695.0	1.1
Developed, Medium Intensity	610.0	1.0
Deciduous Forest	173.1	0.3
Developed, High Intensity	113.8	0.2
Open Water	29.1	<0.1
Mixed Forest	21.8	<0.1
Herbaceous	14.0	<0.1
Barren Land	12.4	<0.1
Emergent Herbaceous Wetlands	12.0	<0.1
Woody Wetlands	5.6	<0.1
Evergreen Forest	0.4	<0.1
Total[1]	**61,074.9**	**100**

1. Sums may not equal totals shown due to rounding.

Source: National Land Cover Database 2019.

METHODS

Standardized Carcass Searches

All phases of the FRWF are in the implementation phase of HCP monitoring for the fall monitoring period. The HCP did not require spring monitoring in 2024. At Phases I, II, and III, 75 turbines were searched from August 1 – October 15, along with an additional 39 turbines at Phase IV (Figure 1).

Carcass searches were conducted along access roads and on turbine pads within 80 m (262 ft) of the selected turbines twice per week. The HCP recommends monitoring be conducted every 3.5 days if the prior year carcass persistence rates are less than seven days and weekly if the prior year carcass persistence rates are greater than seven days. Carcass persistence time was 6.7 days in the fall of 2023 (Good et al. 2024) and, therefore, the fall search interval in 2024 was twice per week.

Technicians trained in proper search techniques conducted the carcass searches. Searches occurred along transects on the roads and pads of a sampled turbine within 80 m of the tower. Searchers walked at a rate of approximately 45–60 m (148–197 ft) per minute along each transect, looking for bat and bird carcasses. Transects were spaced at approximately 3-m (10-ft) intervals, and searchers scanned the area on both sides of a transect, out to 1.5 m (5.0 ft), for carcasses as they walked. All bat carcasses were recorded and collected. Bird carcasses were recorded but left in the field. Searches began after 0700 hours each morning and were completed before sunset.

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

- Intact – a carcass that is complete, shows little to no decomposition, and no sign of being fed upon by a predator or scavenger
- Scavenged – an entire carcass that shows signs of scavenging or is heavily infested by insects, or portion(s) of a carcass in one location (e.g., wings, skeletal remains)
- Dismembered – an entire carcass, but found in more than one piece, where the pieces are separated by more than 5.0 m (16.4 ft)
- Injured – a live bird or bat that is harmed, damaged, or impaired in some way
- Feather Spot (for bird carcasses only) – 10 or more feathers (or two or more primary feathers) at one location indicating predation or scavenging

Data recorded for each carcass included date and time collected, turbine number, species, sex and age when identifiable, carcass location as latitude and longitude, distance and azimuth from turbine, condition (live, intact, scavenged, dismembered, feather spot), and any comments regarding possible cause of death or scavenging. Digital photographs were taken of the carcass, any visible injuries, and surrounding habitat. Time since death for all carcasses was also estimated and recorded (e.g., last night, two to three days). Criteria used to determine time since death are listed in Appendix A.

Bat carcasses were collected under the Project's ITP (ES95012A), WEST's Federal Native Endangered and Threatened Species Recovery permit (ES234121), and WEST's State Endangered Species ITP Amendment for evening bat and Special Purpose Salvage Permit from the Indiana Department of Natural Resources (IDNR; 2263). Each bat carcass and any collected tissue and fur samples were identified with a unique casualty identification number. Any carcass with the potential to be a state- or federally listed endangered or threatened species was reported to the appropriate agency within 48 hours. A federally permitted bat biologist verified the species identification of all bat carcasses. In the event a bat carcass could not be identified to species by a permitted bat biologist and had the potential to be a listed species (i.e., no fur was present on the wing, forearm measured less than 40 millimeters [1.6 inches]), a tissue sample was taken and sent to the Dr. Jane Huffman Wildlife Genetics Institute at East Stroudsburg University for genetic identification. A subset of carcasses will be delivered to the Illinois Natural Heritage Database repository in January 2025, along with any tissue and fur samples taken from carcasses not submitted in their entirety.

Carcasses found in non-search areas (e.g., near a turbine not selected for standardized carcass searches or outside of the search area for a selected turbine) were recorded as incidental discoveries and documented in a similar fashion as those found during standard searches. In addition to carcasses, all injured bats and birds were recorded and treated as a fatality for the purpose of the analyses but left in place.

Turbine Operation Schedule

Turbines were feathered below cut-in speed (3.5 m/s) during the spring and 5.0 m/s during the fall. Increasing cut-in speed and feathering turbine blades below cut-in speed were both implemented on a nightly basis from sunset to sunrise and adjusted for sunset/sunrise times weekly. Turbines were monitored and controlled based on wind speed on an individual basis (i.e., the entire facility did not alter cut-in speed at the same time; rather, operational changes were based on wind speed conditions specific to each turbine). Turbines began operating under normal conditions when the 5- to 10-minute rolling average wind speed was above 3.5 m/s during the spring and 5.0 m/s during the fall; turbines were feathered again if the 5- to 10-minute rolling average wind speed dropped below the specified cut-in speed during the night.

Bias Trials

Searcher Efficiency Trials

The objective of searcher efficiency trials was to estimate the probability that a carcass was found by searchers, to account for detection bias in the bat fatality estimates. When possible, freshly killed bats conclusively identified as non-*Myotis* or non-evening bat (*Nycticeius humeralis*) were used for searcher efficiency and carcass persistence trials.

Searcher efficiency trials were conducted across multiple days during the study to measure potential changes in plot conditions and other factors on searcher efficiency over time. Fifty-five bats were placed on seven separate days, from zero to three days prior to carcass searches to estimate the overall probability that a bat carcass was available and detected (empirical pi). We conducted two sets of trials, including one set placed the day of the search to estimate day of search efficiency rates; carcasses not found during the day of search trial were checked for availability and collected at the end of the day. A second set of trials were completed, where carcasses were placed from one to three days ahead of the search. These carcasses were left in the field if missed on the first search until found on subsequent searches or removed by scavengers. The first day a searcher discovered a carcass was recorded to estimate the overall probability that a carcass was available and detected. Bat carcasses were placed by a technician not involved in the carcass search effort and were randomly placed within a turbine's searchable area using distances derived from a random number generator. Searchers had no knowledge of the number, location, or timing of carcasses placed at turbines. Data recorded for each trial carcass included date of placement, species, turbine number, the distance and azimuth from the turbine, and date the carcass was found. Carcasses were identified as bias trial carcasses through the placement of a small, indistinct black zip tie on the bat's forearm and were collected when found.

Carcass Persistence Trials

The objective of carcass persistence trials was to estimate the average length of time (in days) a carcass persisted in the field (i.e., before a carcass was no longer available for detection). Carcasses could be removed by scavenging or rendered undetectable by typical farming or wind farm maintenance activities. Two carcass persistence trials were conducted when carcass searches occurred, to incorporate the effects of varying weather conditions and scavenger

densities. Technicians monitored 20 trial carcasses over a 24-day period according to the following schedule as closely as possible. Carcasses were checked on days 1, 2, 4, 6, 8, 10, 12, 18, and 24 after placement, where Day 1 was defined as the day after a carcass was placed. Trial carcasses were left at the placement location until they were removed by scavenging or other means, completely decomposed, or the end of the carcass persistence trial, whichever occurred first. Any evidence of carcasses that remained at the end of the 24-day period was removed.

Quality Assurance and Quality Control

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the study, including in the field, during data entry and analysis, and report writing. All WEST field staff were trained in proper survey techniques and all data were recorded electronically on a tablet. Data were reviewed before they were submitted for data entry. If errors or anomalies were found, follow-up measures were implemented including discussions and review of field data with searchers and/or Project managers.

System controls were implemented to ensure correct data were entered; however, if any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data where appropriate changes and measures were implemented. Data were entered into a MS SQL database and were QA/QC'd throughout the course of the study. Statisticians provided an extra level of QA/QC to ensure proper protocols were followed and data collected were congruent with the objectives of the study.

Statistical Analysis

Bat Fatality Rate Estimation

Fatality estimates for bats were calculated based on:

- Observed number of bat carcasses found in search areas estimated to have been killed during the monitoring period
- Persistence rates combined with searcher efficiency, expressed as the estimated average probability a bat carcass is expected to be available for detection and was detected by the searchers during combined bias trials
- The search area adjustment factor for bat carcasses landing outside of searched roads and pads

Carcasses found in a search area were included in the fatality estimate if the fatality was estimated to occur during the monitoring period (i.e., on or after the evening of July 31), regardless of whether they were found during a scheduled search or incidentally at some other time. We assumed that all carcasses found incidentally in a search area would be found during the next scheduled search. Carcasses found outside of search areas were not included in fatality estimates.

Some turbine searches could not be completed due to hazardous weather or turbine maintenance activities.

The probability of carcass availability and detection ($\hat{\pi}$) was calculated based on the results of combined bias trials measuring searcher efficiency and carcass persistence. Trial carcasses were placed in search areas throughout the monitoring period and left until they were either found by searchers or removed by some other means, such as scavenging. The ratio of the number found to the number placed was calculated for each number of days prior to the search for which the trial carcass was placed. The average of the ratios was used as an empirical pi estimate of the probability of availability and detection.

An adjustment factor (*r*) of 6.56 was used to adjust for carcasses estimated to occur outside of searched roads and pads for Fowler Ridge I–III Wind Farms (Fowler I–III), to determine total estimated bat fatality during fall migration periods. This area adjustment factor was an average of the road and pad adjustment factors from 2011 and 2012 at Phases I, II, and III of the FRWF (Good et al. 2011, 2012).

The road and pad area of each turbine at Phase IV is smaller compared to Phases I, II, and III, and required a different adjustment factor to accurately estimate bat fatality rates. An adjustment factor (*r*) of 26.38 was used to adjust for carcasses that likely occurred outside the searched road and pad area for Fowler Ridge IV Wind Farm (Fowler IV) to determine the total estimated bat fatality rate during the fall migration periods (Good et al. 2018).

The adjusted estimate for the number of fatalities per turbine was calculated as follows:

$$m = \frac{(observed\ fatalities)}{(number\ of\ search\ plots) * \hat{\pi}} * r$$

Due to the differences in MW ratings for each turbine type, bat fatality rates were calculated for each type of turbine present, and a weighted average was used to calculate the facility-wide bat fatality rate (bats/turbine/study period and bats/MW/study period). The proportion of each turbine type at the FRWF were used as weights for calculating the overall bat fatality rate for the Project.

Carcass Persistence Rates

Definition of Variables

The following variables were used to calculate carcass persistence rates:

- s the number of carcasses used in persistence trials
- s_c the number of carcasses in persistence trials that remain in the study area after 24 days
- t_j the time (in days) carcass *j* remains in the study area before it is removed, as determined by the persistence trials
- $\bar{t}$ the average time (in days) a carcass remains in the study area before it is removed, as determined by the persistence trials

Mean carcass persistence time ($\bar{t}$) was calculated as the average length of time, in days, a carcass remained in the study area before it was removed:

$$\bar{t} = \frac{\sum_{j=1}^{s} t_j}{s - s_c}$$

Between Years Comparisons

Percent change in fatality rates between 2024 (spring and fall combined) and the baseline years (2010 and 2011) was calculated as the percent difference between estimates and compared to the anticipated 50% reduction in fatality rates due to applied minimization measures. In 2024, spring monitoring was not conducted and the average spring bat fatality rate (bats/turbine/study period) from 2019 to 2023 of 0.78 was assumed to estimate the overall bat fatality rate per the HCP.

RESULTS

The following sections contain the results of studies conducted under ITP permit ES95012A. Per the requirements of this permit, information regarding the date, locations, and species of bats (and birds) encountered can be found in Appendix B.

Bat and Bird Carcass Surveys

There were 2,396 surveys conducted on roads and pads at 114 turbines from August 1 – October 15, 2024. Due to regular turbine maintenance, accessibility, or severe weather, 110 surveys (4.6%) were missed. The average search interval was 3.65 days in the fall. Overall, 116 bat carcasses and 30 bird carcasses were found during the study (Table 3; Appendix B).

Species Composition

No Indiana or northern long-eared bats were found during the study. One bat carcass could only be identified to the *Myotis* genus level after unsuccessful genetic testing. One additional bat carcass reported incidentally by turbine workers was not available to be collected after reporting and remains unidentified. The most commonly found bat species were eastern red bat (*Lasiurus borealis*; 56 carcasses; 48.3%), silver-haired bat (*Lasionycteris noctivagans*; 32 carcasses; 27.6%), and hoary bat (*Lasiurus cinereus*; 17 carcasses; 14.7%). Six big brown bat carcasses (*Eptesicus fuscus*; 5.2%), two evening bat carcasses (1.7%), and one Seminole bat carcass (*Lasiurus seminolus*; 0.9%) were also found (Table 3).

Thirty bird carcasses were found during the survey period representing 20 known bird species or bird groups (Table 4). No bird species listed as threatened or endangered by IDNR (2024), or the federal Endangered Species Act of 1973 were found (USFWS 2024).

Table 3. Total number and percent composition of bat carcasses found at the Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Species	Number Included in Fatality Estimate	Percent Composition Included in Fatality Estimate[1]	Number Found Outside Plot	Percent Composition Found Outside Plot	Number with Estimated Time of Death Outside Study Period	Percent Composition with Estimated Time of Death Outside Study Period	Number of All Carcasses Found	Percent Composition of All Carcasses Found
eastern red bat	36	45.6	18	58.1	2	33.3	56	48.3
silver-haired bat	25	31.6	7	22.6	0	0	32	27.6
hoary bat	13	16.5	2	6.5	2	33.3	17	14.7
big brown bat	2	2.5	2	6.5	2	33.3	6	5.2
evening bat	2	2.5	0	0	0	0	2	1.7
unidentified *Myotis*	1	1.3	0	0	0	0	1	0.9
Seminole bat	0	0	1	3.2	0	0	1	0.9
unidentified bat	0	0	1	3.2	0	0	1	0.9
Totals[1]	**79**	**100**	**31**	**100**	**6**	**100**	**116**	**100**

[1.] Totals may not add to 100% due to rounding.

Table 4. Total number and percent composition of bird carcasses found at the Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Species	Number	Percent Composition[1]
horned lark	4	13.3
killdeer	3	10.0
American crow	2	6.7
chimney swift	2	6.7
European starling	2	6.7
mourning dove	2	6.7
ring-necked pheasant	2	6.7
American redstart	1	3.3
barn swallow	1	3.3
Cape May warbler	1	3.3
cedar waxwing	1	3.3
cliff swallow	1	3.3
eastern kingbird	1	3.3
northern parula	1	3.3
palm warbler	1	3.3
sora	1	3.3
Tennessee warbler	1	3.3
unidentified passerine	1	3.3
unidentified small bird	1	3.3
yellow-throated vireo	1	3.3
Totals	**30**	**100**

[1.] Totals may not add to 100% due to rounding.

Bias Trials

Searcher Efficiency Trials

During the fall season, 30 of 55 bias trial carcasses placed were found during the first scheduled search, with three additional trial carcasses found after multiple searches. The overall probability of a carcass being available and detected was 54.0% (Table 5).

Table 5. Searcher efficiency based on empirical pi methodology for post-construction fatality monitoring at the Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Number of Days Prior to Search	Number Placed	Number Found on First Search	Total Found	Percent Found
0	27	18	19	70.0
1	11	7	7	64.0
2	8	1	2	25.0
3	9	4	5	56.0
Total	**55**	**30**	**33**	**54.0**[1]

1. The percent found was calculated as an average across the number of days prior to search values.

Carcass Persistence Trials

Twenty bat carcasses were used to measure carcass persistence rates. The average length of persistence for bat carcasses in 2024 was 10.1 days in the fall. Fall carcass persistence in 2024 was greater than persistence in the fall of 2023 (6.7 days) and similar to rates recorded in 2020 and 2021 at the Project. A summary of carcass persistence at FRWF over the past 15 years shows year-to-year variation (Table 6).

Table 6. Carcass persistence rates reported at the Fowler Ridge Wind Farm from April 1 – May 15 (spring) and August 1 – October 15 (fall) from 2010–2024.

Year	Spring (days)	Fall (days)
2010	–	10.3
2011	–	15.1
2012	–	–
2013	–	5.8
2014	–	19.4
2015	–	13.9
2016	–	20.8
2017	–	10.7
2018	13.4	6.8
2019	8.5	4.1
2020	4.2	11.5
2021	12.8	10.6
2022	11.8	5.4
2023	5.2	6.7
2024	–	10.1

Estimated Fatality Rates

Seventy-nine bat carcasses were included in the analyses and 37 bat carcasses were excluded because they were either incidental finds at non-searched turbines (n = 27), found outside the search area at a normally searched turbine (n = 4) or were estimated to have died prior to the night of August 1 (n = 6; Appendix B).

The average of past spring fatality estimates from 2019 to 2023 was 0.78 bat fatalities per turbine (Table 7).

The observed fatality rate was 0.69 bat per turbine in the fall (Table 8). The observed fatality rate was then divided by the empirical probability of availability and detection (0.54). This value was multiplied by the road and pad area adjustment factor (6.56 for Fowler I–III, 26.38 for Fowler IV) to obtain the per turbine adjusted fatality estimate for each turbine type.

Table 7. Number of bat fatalities per turbine calculated during spring (April 1 – May 15) monitoring studies at the Fowler Ridge Wind Farm from 2019–2023.

Monitoring Year	Point Estimate	Standard Deviation[1]	90% Confidence Interval[1]	
			Lower Limit	Upper Limit
2019	1.14	0.38	0.56	1.82
2020	1.24	–	–	–
2021	0.73	–	–	–
2022	0.68	0.31	0.24	1.25
2023	0.12	–	–	–
Average Fatality Rate[2]	**0.78**	**–**	**–**	**–**

1. Standard deviation and confidence intervals not calculated due to the small number of carcasses found.
2. Standard deviation and confidence intervals not calculated for the 2019 to 2023 average.

Table 8. Number of bat fatalities per turbine per study period for the Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Estimator		Point Estimate	Standard Deviation	90% Confidence Interval	
				Lower Limit	Upper Limit
Area Adjustment	Fowler I–III	6.56	–	–	–
	Fowler IV	26.38	–	–	–
Observed fatalities per turbine		0.69	0.12	0.51	0.89
Empirical pi		0.54	0.07	0.42	0.65
Adjusted Number of Fatalities per Turbine		**12.37**	**2.66**	**8.68**	**16.83**

The adjusted fatality estimate for the facility was weighted by the number of each turbine type present in the FRWF. The adjusted fatality estimate for the fall was 12.37 bat fatalities/turbine/ study period or 6.23 bat fatalities/MW/study period (Table 9).

The facility-wide fatality rate was calculated using a weighted average across turbine types due to differences in MW ratings between the four types of turbines. Past studies at FRWF have suggested that bat fatality rates may vary by MW ratings, how they operate, rotor swept area, or a combination of factors (Good et al. 2012). The reasons for why fatality rates may vary between

turbine types are unclear. Previous research at the Project, and the current monitoring study, were not designed to conclusively determine if certain brands of turbines, or other potential causal factors, result in higher or lower mortality. Survey methodology may also explain the differences observed. For example, two different methods were used to calculate area corrections at Phases I, II and III (which contain three turbine types), compared to the area correction method used to estimate Phase IV mortality rates (contains one turbine type). All turbines operate under the same basic principles, and it is inappropriate to conclude that certain turbine brands have higher or lower mortality rates based on the results of monitoring at FRWF.

Table 9. Bat fatality estimates (adjusted for empirical pi) for different turbine types within the Fowler Ridge Wind Farm from August 1 – October 15, 2024.[1]

Turbine Type	Mean	90% Confidence Interval
Number of Fatalities/Turbine/Study Period		
Vestas (2.20 MW)	39.75	16.50–68.92
Siemens (2.30 MW)	29.00	16.87–45.70
Vestas (1.65 MW)	6.59	4.03–9.75
GE (1.50 MW)	3.93	1.70–6.90
All Turbines	**12.37**	**8.68–16.83**
Number of Fatalities/MW/Study Period[2]		
Vestas (2.20 MW)	18.07	7.50–31.33
Siemens (2.30 MW)	12.61	7.33–19.87
Vestas (1.65 MW)	3.99	2.44–5.91
GE (1.50 MW)	2.62	1.14–4.60
All Turbines	**6.23**	**4.42–8.41**

1. This study was not designed to determine if bat fatality rates differ between turbine models, and this table should not be used to inform management actions or assessments at other wind-energy facilities.
2. Estimates are calculated by turbine type due to differences in megawatt (MW) ratings by turbine type.

End-of-year Adaptive Management Threshold

The end-of-year adaptive management threshold, as described within the HCP, is 19.64 bat fatalities/turbine/year, which is based on the upper 90% confidence interval (CI) of the average of 2010 and 2011 spring and fall bat mortality estimates, reduced by 50% (39.28 bat fatalities/ turbine/year ÷ 2). The 2024 fatality estimate assuming the 2019 to 2023 average for the spring bat fatality rate and with turbines feathered until wind speeds reached 5.0 m/s in the fall was 13.15 bat fatalities/turbine/study period (90% CI: 8.68, 16.83). The 2024 fatality estimate was 33% lower than the end-of-year adaptive management threshold, and 67% lower than the mean spring and fall fatality estimate from 2010 and 2011 with turbines that operated at manufacturer cut-in speed. The end-of-year threshold for triggering adaptive management was not met in 2024 (Figure 2).

Within-season Adaptive Management

The HCP includes an active adaptive management approach that facilitates responsiveness in management actions based on results from annual take compliance monitoring to ensure permit compliance. Within-season adaptive management thresholds were calculated to serve as an early indicator if adjustments to minimization efforts were necessary before the conclusion of the monitoring year. Per the HCP, within-season adaptive management thresholds were based on the predicted number of bat carcasses that would be found that would equal the upper quartile

(i.e., 75th percentile) of estimated spring and fall bat mortality in 2010 and 2011 at control turbines with minimization measures in place, which equals 11.8 Indiana bats per year for the entire facility.

The HCP prescribes a sampling approach utilizing roads and pads to calculate fatality estimates. Per the HCP, to determine the number of bat carcasses of all species found that would equate to the adaptive management threshold for within-season Indiana bat fatality, bias correction factors from the previous year's monitoring results were applied (Table 10). The within-season adaptive management threshold for 2024 was 142 bat carcasses in the fall. There were 79 bat carcasses found on search plots that were estimated to have been killed during the study's monitoring period. Figure 3 illustrates the within-season tracking tool that was used to determine if a fatality was approaching within-season adaptive management thresholds. The weekly 2024 estimated bat fatality rate shown in Figure 3 was a prediction calculated using the 2023 bias trial data. The final 2024 bat fatality estimate was based on 2024 bias trial results. Adaptive management thresholds were not exceeded at any time during the study, and no changes to minimization efforts were required during 2024.

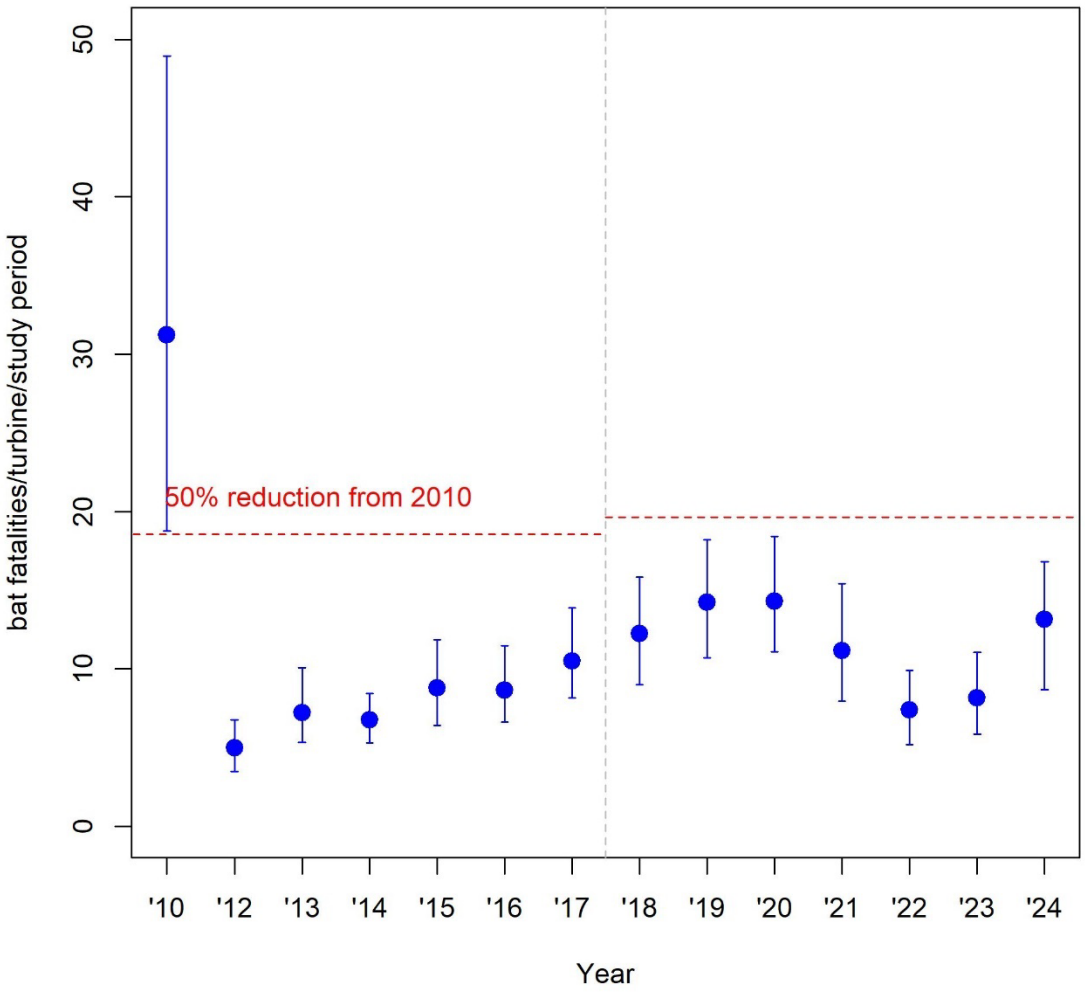

Figure 2. A comparison of estimated bat fatality rates and 90% confidence intervals for the Fowler Ridge Wind Farm.

Note: The 2010 and 2011 combined spring and fall estimate represents turbines operating at manufacturer cut-in speeds. The 2012–2017 estimates represent data collected at turbines feathered below 5.0 meters/second (m/s) in the fall only. The 2018–2024 estimates represent turbines feathered below 5.0 m/s in the fall and 3.5 m/s in the spring. The red dotted line represents the end-of-year adaptive management thresholds, which is a 50% reduction of the upper 90% confidence interval of bat fatality rates compared to the 2010 and 2011 combined fatality estimates.

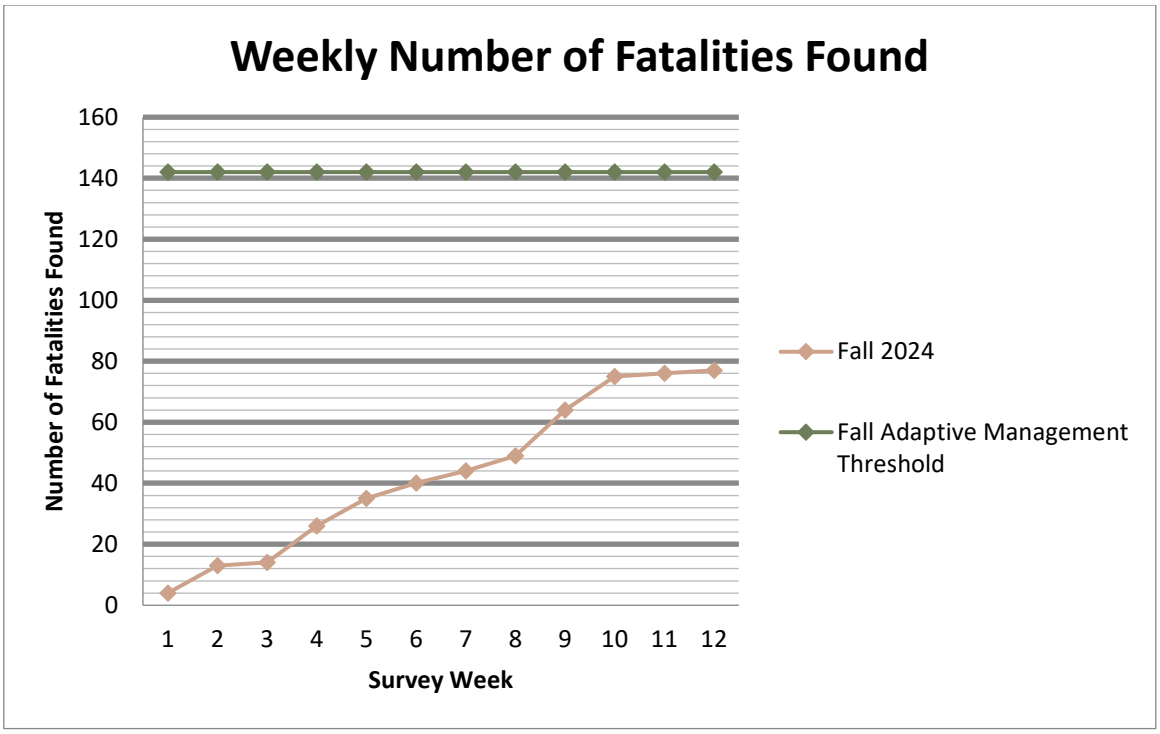

Figure 3. Weekly per-turbine fatality rates (number of bat carcasses found per turbine) at the Fowler Ridge Wind Farm in 2024. This graph was used to determine if weekly fatality rates were approaching the 50% adaptive management threshold. Fatality rates for 2024 shown in this figure were based on 2023 bias trial results.

Table 10. Variables used to calculate the within-season adaptive management threshold for 420 operational turbines in fall 2024 (Phases I, II, III, and IV).

Parameter	Fowler I–III	Fowler IV	Descriptions of Data Sources
Adaptive management threshold for Indiana bats	11.22		Upper quartile (i.e., 75th percentile) of estimated fall bat mortality in 2010 and 2011 at control turbines with minimization measures in place.
Percent of all Indiana bat fatalities	0.16		Percentage based on total number of Indiana bats found during searches over total bats found, as described within the Habitat Conservation Plan.
Estimated upper quartile of total fatalities during the period for which adaptive management thresholds are based	7,016		Calculated—11.22/0.0016
Number of turbines	355	65	Fowler Phases I, II, III, and IV.
Estimated upper quartile of all bat fatality rates per turbine during the period for which adaptive management thresholds are based	16.70		Estimated by dividing the bat mortality count (7,016) by the number of operational turbines (420).
Empirical pi estimate	0.66		Estimated probability of carcasses being available and detected based on Fowler 2023 empirical bias trials from road and pad searches every 3.5 days; will be adjusted annually for subsequent years.
Road and pad correction factor	6.56	26.38	Phases I, II, and III based on number of bats found on road and pads of cleared plots in relation to the total number of bats found at cleared plots in 2010 and 2011. Phase IV based on road and pad area searched measured at Phase IV and modeled carcass density distribution based on carcass distance data collected at Fowler from 2012–2016 on roads and pads.
Predicted upper quartile of number of bats found per searched turbine during the period for which adaptive management thresholds are based	1.68	0.42	Predicted based on estimated fatality rate per turbine (16.70), multiplied by empirical pi (0.66), and divided by road and pad correction factor (6.56 or 26.38).
Total bats found in one fall season based on turbines searched	126.04	16.30	Predicted based on estimated number of bats found per turbine (1.68 or 0.42) multiplied by the number of turbines searched (75 or 39). Calculated value represents adaptive management threshold for 2023.
Total Bats Found Threshold	**142.34**		**Sum of expected bat mortality from Phases I, II, III, and IV.**

Fowler I–III = Fowler Ridge I–III Wind Farms; Fowler IV = Fowler Ridge IV Wind Farm.

End-of-season Covered Species Take Estimate

The estimated number of Indiana bat fatalities that occurred during 2024 was calculated based on the overall estimated bat fatality rate during 2024, and the relative percent of Indiana (0.16%) and northern long-eared bat (0.08%) carcasses compared to all bat carcasses found during the fall of 2009, 2010, and 2011. The spring estimate of 0.53 Indiana bat fatalities was based on the average spring bat fatality estimate from 2019 to 2023 and an estimated 8.31 Indiana bat fatalities in the fall for a combined total of 8.84 (90% CI: 5.83, 11.31; Table 11). The spring estimate of 0.26 northern long-eared bat fatalities was based on the average spring bat fatality estimate from 2019 to 2023 and an estimated 4.16 northern long-eared bat fatalities in the fall for a combined total of 4.42 (90% CI: 2.92, 5.65; Table 11).

The total estimated number of Indiana and northern long-eared bat fatalities were lower than the number that was predicted to occur as fatalities within the HCP after minimization. The end-of-year adaptive management threshold is equal to the upper bound of the 90% CI of Indiana bat mortality predicted within the HCP. This adaptive management threshold also applies to northern long-eared bats. Per the terms of the HCP, no changes to minimization efforts are required for 2025.

Table 11. The number of estimated Indiana and northern long-eared bat fatalities, compared to the number predicted to occur within the Habitat Conservation Plan.

Year	Number of Operating Turbines	Estimated Number of Indiana Bat Fatalities	Predicted Number of Indiana Bat Fatalities	Estimated Number of Northern Long-eared Bat Fatalities	Predicted Number of Northern Long-eared Bat Fatalities
2014 – Annual	355	4.10	8.6	–	–
2015 – Annual	355	5.20	8.6	–	–
2016 – Annual	420	5.80	10.9	–	–
2017 – Annual	420	7.10	10.9	–	–
2018 – Spring	420	0.70	0.7	–	–
2018 – Fall	420	7.60	10.9	–	–
2019 – Spring	420	0.80	0.7	–	–
2019 – Fall	420	9.00	10.9	–	–
2020 – Spring	420	0.80	0.7	–	–
2020 – Fall	420	8.80	10.9	–	–
2021 – Spring	420	0.49	0.7	–	–
2021 – Fall	420	7.50	10.9	–	–
2022 – Spring	420	0.46	0.7	–	–
2022 – Fall	420	4.53	10.9	–	–
2023 – Spring	420	0.08	0.7	0.04	0.36
2023 – Fall	420	5.51	10.9	2.74	6.24
2024 – Fall	420	8.31	10.9	4.16	6.24

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Appendix A. Estimated Time of Death Information Sheet for Fowler Ridge Wind Farm, Benton County, Indiana

Estimated Time of Death Information Sheet

Last Night

- **Eyes will be round and fluid filled, or slightly dehydrated**
  - Bat eyes dry much slower than bird eyes
  - Bird eyelids usually closed, open to check eyes
- **No decomposition, no smell**
- **No infestation beyond flies and eggs**
  - Possible to have very small maggots if carcass found after noon
- **Joints of body flexible**
  - Bat wing membranes flexible

2–3 Days

- **Eyes sunken or missing**
  - Bat eyes may still be intact
- **May be infested with small–medium sized maggots, beetles, flies, and ants**
- **Strong smell of decomposition**
- **Small holes in skin or body from insects (if no infestation noticed)**

4–7 Days

- **Eyes missing**
- **Internal scavenging evident**
  - Carcass may be full of large maggots (days 4–5) or only a shell with a few large maggots remaining (days 6–7) (during warm days)
- **Carcass may be hollow**
- **Fur may have begun to fall off and appear as "fluff" around bat**
  - Typically if carcass was rained on and then dried

7–14 Days

- **Mostly skin, feathers, and bones**
- **Skin tightened to skeletal system**
- **Mostly devoid of insects**
  - Possibly a beetle, no maggots

Greater than 2 Weeks

- **Body desiccated (mummified in appearance)**

Appendix B. Bat and Bird Casualties Found at the Fowler Ridge Wind Farm, Benton County, Indiana, between August 1 – October 15, 2024

Appendix B. Bat and bird casualties found at Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Date	Common Name	Location	Turbine Type	Outside of Search Plot?	Estimated to have Died Outside of Study Period?	Included in Fatality Estimate?
8/1/2024	eastern red bat	622	Vestas V120	No	No	Yes
8/1/2024	eastern red bat	611	Vestas V120	No	Yes	No
8/1/2024	eastern red bat	268	Vestas V82	No	Yes	No
8/1/2024	big brown bat	611	Vestas V120	No	Yes	No
8/1/2024	eastern red bat	622	Vestas V120	No	No	Yes
8/1/2024	hoary bat	611	Vestas V120	No	No	Yes
8/1/2024	eastern red bat	156	Vestas V82	No	No	Yes
8/1/2024	big brown bat	611	Vestas V120	No	Yes	No
8/1/2024	eastern red bat	309	Vestas V82	No	No	Yes
8/2/2024	hoary bat	S59	Siemens	No	Yes	No
8/2/2024	hoary bat	S56	Siemens	Yes	No	No
8/2/2024	unidentified small bird	230	Vestas V82	No	No	Yes
8/2/2024	hoary bat	193	Vestas V82	No	Yes	No
8/3/2024	killdeer	87	GE	No	No	Yes
8/5/2024	eastern red bat	641	Vestas V120	No	No	Yes
8/5/2024	eastern red bat	641	Vestas V120	No	No	Yes
8/5/2024	killdeer	423	Vestas V82	No	No	Yes
8/5/2024	eastern red bat	371	Vestas V82	Yes	No	No
8/5/2024	European starling	641	Vestas V120	No	No	Yes
8/5/2024	big brown bat	425	Vestas V82	No	No	Yes
8/5/2024	eastern red bat	378	Vestas V82	No	No	Yes
8/6/2024	hoary bat	285	Vestas V82	No	No	Yes
8/6/2024	eastern red bat	625	Vestas V120	Yes	No	No
8/6/2024	unidentified passerine	156	Vestas V82	No	No	Yes
8/6/2024	hoary bat	121	GE	No	No	Yes
8/6/2024	killdeer	14	GE	No	No	Yes
8/6/2024	eastern red bat	625	Vestas V120	Yes	No	No
8/6/2024	big brown bat	168	Vestas V82	Yes	No	No
8/6/2024	eastern red bat	609	Vestas V120	Yes	No	No
8/6/2024	eastern red bat	128	GE	Yes	No	No
8/7/2024	eastern red bat	S43	Siemens	No	No	Yes
8/7/2024	hoary bat	S59	Siemens	No	No	Yes
8/7/2024	hoary bat	S52	Siemens	No	No	Yes
8/7/2024	eastern red bat	S45	Siemens	No	No	Yes
8/7/2024	eastern red bat	S60	Siemens	No	No	Yes
8/7/2024	eastern red bat	S23	Siemens	No	No	Yes
8/7/2024	eastern red bat	624	Vestas V120	No	No	Yes
8/8/2024	eastern red bat	249	Vestas V82	Yes	No	No
8/8/2024	hoary bat	249	Vestas V82	Yes	No	No
8/9/2024	eastern red bat	642	Vestas V120	Yes	No	No
8/9/2024	American crow	642	Vestas V120	Yes	No	No
8/9/2024	eastern red bat	642	Vestas V120	Yes	No	No
8/12/2024	eastern kingbird	448	Vestas V82	No	No	Yes
8/12/2024	hoary bat	622	Vestas V120	No	No	Yes
8/12/2024	cedar waxwing	611	Vestas V120	No	No	Yes
8/13/2024	ring-necked pheasant	52	GE	No	No	Yes
8/15/2024	cliff swallow	635	Vestas V120	Yes	No	No
8/15/2024	eastern red bat	605	Vestas V120	No	No	Yes
8/19/2024	hoary bat	425	Vestas V82	No	No	Yes
8/19/2024	horned lark	260	Vestas V82	No	No	Yes

Appendix B. Bat and bird casualties found at Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Date	Common Name	Location	Turbine Type	Outside of Search Plot?	Estimated to have Died Outside of Study Period?	Included in Fatality Estimate?
8/19/2024	eastern red bat	348	Vestas V82	No	No	Yes
8/19/2024	Seminole bat	608	Vestas V120	Yes	No	No
8/20/2024	unidentified myotis	203	Vestas V82	No	No	Yes
8/20/2024	silver-haired bat	230	Vestas V82	No	No	Yes
8/21/2024	silver-haired bat	S41	Siemens	No	No	Yes
8/21/2024	eastern red bat	S31	Siemens	No	No	Yes
8/21/2024	hoary bat	631	Vestas V120	No	No	Yes
8/21/2024	eastern red bat	322	Vestas V82	No	No	Yes
8/22/2024	silver-haired bat	28	GE	No	No	Yes
8/22/2024	silver-haired bat	87	GE	Yes	No	No
8/22/2024	eastern red bat	612	Vestas V120	Yes	No	No
8/22/2024	eastern red bat	612	Vestas V120	Yes	No	No
8/22/2024	eastern red bat	438	Vestas V82	Yes	No	No
8/23/2024	eastern red bat	S42	Siemens	No	No	Yes
8/23/2024	eastern red bat	13	GE	Yes	No	No
8/26/2024	eastern red bat	639	Vestas V120	No	No	Yes
8/26/2024	American crow	622	Vestas V120	No	No	Yes
8/26/2024	eastern red bat	624	Vestas V120	No	No	Yes
8/26/2024	eastern red bat	448	Vestas V82	No	No	Yes
8/26/2024	eastern red bat	448	Vestas V82	No	No	Yes
8/26/2024	eastern red bat	457	Vestas V82	No	No	Yes
8/26/2024	barn swallow	417	Vestas V82	Yes	No	No
8/26/2024	eastern red bat	375	Vestas V82	No	No	Yes
8/26/2024	eastern red bat	371	Vestas V82	No	No	Yes
8/26/2024	eastern red bat	612	Vestas V120	Yes	No	No
8/27/2024	eastern red bat	S25	Siemens	No	No	Yes
8/27/2024	big brown bat	642	Vestas V120	Yes	No	No
8/27/2024	eastern red bat	643	Vestas V120	Yes	No	No
8/28/2024	eastern red bat	S23	Siemens	No	No	Yes
8/28/2024	chimney swift	S52	Siemens	No	No	Yes
8/30/2024	silver-haired bat	379	Vestas V82	Yes	No	No
9/1/2024	eastern red bat	461	Vestas V82	Yes	No	No
9/2/2024	silver-haired bat	639	Vestas V120	No	No	Yes
9/2/2024	silver-haired bat	627	Vestas V120	No	No	Yes
9/2/2024	eastern red bat	268	Vestas V82	No	No	Yes
9/3/2024	Cape May warbler	129	GE	No	No	Yes
9/4/2024	sora	S40	Siemens	No	No	Yes
9/4/2024	American redstart	S30	Siemens	No	No	Yes
9/4/2024	horned lark	S1	Siemens	No	No	Yes
9/6/2024	eastern red bat	634	Vestas V120	Yes	No	No
9/6/2024	horned lark	635	Vestas V120	No	No	No
9/6/2024	horned lark	635	Vestas V120	No	No	No
9/6/2024	eastern red bat	640	Vestas V120	Yes	No	No
9/9/2024	silver-haired bat	285	Vestas V82	No	No	Yes
9/9/2024	eastern red bat	624	Vestas V120	No	No	Yes
9/9/2024	mourning dove	398	Vestas V82	No	No	Yes
9/11/2024	silver-haired bat	S48	Siemens	Yes	No	No
9/12/2024	silver-haired bat	628	Vestas V120	Yes	No	No
9/13/2024	silver-haired bat	S33	Siemens	No	No	Yes
9/13/2024	silver-haired bat	S52	Siemens	No	No	Yes

Appendix B. Bat and bird casualties found at Fowler Ridge Wind Farm from August 1 – October 15, 2024.

Date	Common Name	Location	Turbine Type	Outside of Search Plot?	Estimated to have Died Outside of Study Period?	Included in Fatality Estimate?
9/13/2024	European starling	S32	Siemens	No	No	Yes
9/13/2024	silver-haired bat	187	Vestas V82	Yes	No	No
9/15/2024	silver-haired bat	235	Vestas V82	Yes	No	No
9/17/2024	silver-haired bat	605	Vestas V120	No	No	Yes
9/17/2024	silver-haired bat	605	Vestas V120	No	No	Yes
9/17/2024	unidentified bat	435	Vestas V82	Yes	No	No
9/18/2024	silver-haired bat	229	Vestas V82	No	No	Yes
9/18/2024	eastern red bat	641	Vestas V120	No	No	Yes
9/18/2024	silver-haired bat	S52	Siemens	No	No	Yes
9/23/2024	hoary bat	622	Vestas V120	No	No	Yes
9/23/2024	silver-haired bat	641	Vestas V120	No	No	Yes
9/23/2024	silver-haired bat	309	Vestas V82	No	No	Yes
9/23/2024	hoary bat	639	Vestas V120	No	No	Yes
9/23/2024	silver-haired bat	398	Vestas V82	No	No	Yes
9/24/2024	eastern red bat	110	GE	No	No	Yes
9/24/2024	hoary bat	52	GE	No	No	Yes
9/24/2024	hoary bat	110	GE	No	No	Yes
9/24/2024	silver-haired bat	52	GE	No	No	Yes
9/24/2024	silver-haired bat	605	Vestas V120	No	No	Yes
9/24/2024	hoary bat	56	GE	No	No	Yes
9/25/2024	silver-haired bat	631	Vestas V120	No	No	Yes
9/25/2024	evening bat	S1	Siemens	No	No	Yes
9/26/2024	silver-haired bat	61	GE	No	No	Yes
9/26/2024	silver-haired bat	118	GE	No	No	Yes
9/30/2024	silver-haired bat	611	Vestas V120	No	No	Yes
9/30/2024	silver-haired bat	611	Vestas V120	No	No	Yes
9/30/2024	eastern red bat	641	Vestas V120	No	No	Yes
10/1/2024	eastern red bat	224	Vestas V82	No	No	Yes
10/1/2024	eastern red bat	230	Vestas V82	Yes	No	No
10/1/2024	northern parula	52	GE	Yes	No	No
10/2/2024	silver-haired bat	S27	Siemens	No	No	Yes
10/2/2024	silver-haired bat	S54	Siemens	No	No	Yes
10/2/2024	eastern red bat	S60	Siemens	No	No	Yes
10/2/2024	eastern red bat	S3	Siemens	No	No	Yes
10/2/2024	silver-haired bat	S60	Siemens	No	No	Yes
10/2/2024	eastern red bat	S49	Siemens	No	No	Yes
10/2/2024	eastern red bat	S33	Siemens	No	No	Yes
10/2/2024	palm warbler	S41	Siemens	No	No	Yes
10/2/2024	chimney swift	S4	Siemens	No	No	Yes
10/7/2024	ring-necked pheasant	52	GE	No	No	Yes
10/7/2024	Tennessee warbler	639	Vestas V120	No	No	Yes
10/7/2024	mourning dove	627	Vestas V120	No	No	Yes
10/7/2024	silver-haired bat	629	Vestas V120	Yes	No	No
10/9/2024	yellow-throated vireo	S48	Siemens	No	No	Yes
10/9/2024	evening bat	S46	Siemens	No	No	Yes
10/14/2024	big brown bat	639	Vestas V120	No	No	Yes

GE = General Electric.