

2021 Spring Post-Construction Bat Mortality Monitoring Report

High Prairie Renewable Energy Center

Schuyler and Adair Counties, Missouri

Technical Assistance Letter (TAL) Level Monitoring

Project #193708256



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**2021 POST-CONSTRUCTION BAT MORTALITY MONITORING REPORT
HIGH PRAIRIE RENEWABLE ENERGY CENTER
SCHUYLER AND ADAIR COUNTIES, MISSOURI**

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1.0 Introduction

1.1 PROJECT DESCRIPTION AND HISTORY

The High Prairie Renewable Energy Center (Project or High Prairie) is operated by Ameren Missouri (Ameren), and consists of 175 turbines with an approximate 400-megawatt (MW) operating capacity in Schuyler and Adair counties, Missouri.

Due to the potential risk of take of the federally-endangered Indiana bat (*Myotis sodalis*) and federally-threatened northern long-eared bat (*Myotis septentrionalis*) during operations, Ameren applied for an Incidental Take Permit (ITP) for these species, as well as for the little brown bat (*Myotis lucifugus*). In the interim, the Project operated under a Technical Assistance Letter (TAL) from the U.S. Fish and Wildlife Service (USFWS).

To avoid potential effects to the Indiana bat and northern long-eared bat, the TAL required feathering of all turbines below 6.9 meters-per-second (m/s) for 0.5 hour before sunset to 0.5 hour after sunrise when air temperatures were above 50°F from March 15 through October 31 based on the 10-minute rolling average at each individual turbine. Due to the fatality of a male Indiana bat at the Project in September 2020, Ameren voluntarily increased the avoidance measures to involve no operation of the turbines when temperatures were above 50°F starting on March 15, 2021. Another fatality was discovered on April 15, 2021; Ameren voluntarily stopped all night time operations starting on April 19, 2021, but continued post-construction monitoring under the TAL until the ITP was issued on May 14, 2021.

The post-construction monitoring followed the protocols outlined in the TAL. This included a weekly search interval at 100% of Project turbines. At 10% of turbines, a 60-meter (m) full plot was searched, while at the remaining turbines the roads and pads were searched out to 95-m.

1.2 PURPOSE AND OBJECTIVES OF THE MONITORING

Post-construction mortality monitoring activities adhered to the post-construction monitoring requirements outlined in the Project's TAL, specifically to document overall bat fatality rates and confirm avoidance of Indiana bat and northern long-eared bat fatalities.

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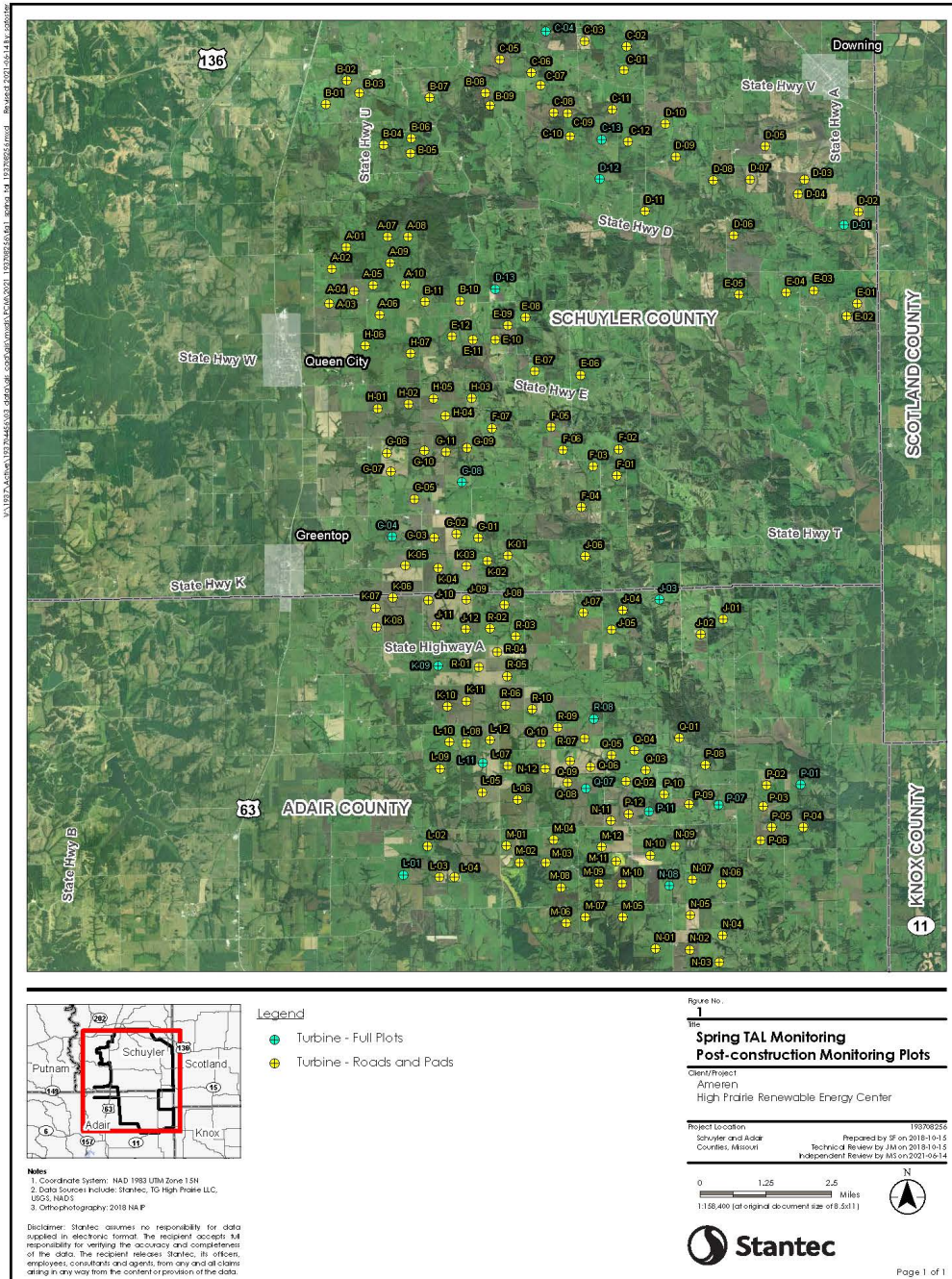


Figure 1. Project Location and Turbine Locations

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2.0 Methods

Post-construction monitoring included the following components:

1. Standardized carcass searches to systematically search plots at all 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 searcher(s)
3. Carcass removal trials to estimate the persistence time of carcasses on-site before scavengers removed them

2.1 FIELD METHODS

Standardized carcass searches were conducted from March 15 – May 14, 2021.

2.1.1 Sample Size

Post-construction monitoring was conducted at 100% of the turbines. This study design provides full coverage of the facility and will serve as a control to which subsequent monitoring results can be compared.

2.1.2 Search Plot Size

Searches consisted of searching pads and roads out to 328 feet (ft; 100 meters [m]) at 90% of the turbines (n=158) and full plots out to 197 ft (60 m) at 10% of the turbines (n=17).

2.1.3 Search Schedule

All turbines were searched once weekly per the TAL.

2.1.4 Standardized Carcass Searches

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. 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, the following data were recorded:

- Date and time
- Initial species identification
- Sex, age, and reproductive condition (when possible)

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- 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 Building¹. Bat carcasses were collected and retained under Missouri Department of Conservation Wildlife Collector's Permits #19170 and #19158.

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

2.1.5 Species Identification

Preliminary bat and bird 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. Any unknown bat was identified by a Stantec permitted bat biologist. In addition to the carcass, photographs and data collected for each carcass were used to verify the species identification.

2.1.6 Searcher Efficiency Trials

Searcher efficiency trials were used to estimate the probability of bat carcass detection by the searchers. The searchers 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.

All searcher efficiency trial carcasses were randomly placed by the field lead within the search plots. These were placed either the evening before monitoring, or in the morning prior to the planned carcass surveys for that day. The number of trial carcasses found by the searcher during the mortality surveys 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.

¹ The first bat found of the season, on 16 March, was not collected, as a salvage permit from the state had not yet been received. The Indiana bat found on 15 April was sent to the Wildlife Health Lab in Madison, Wisconsin per the USFWS for necropsy and genetic testing. All other bat carcasses are in the O&M building freezer.

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2.1.7 Carcass Removal Trials

Following the searcher efficiency 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. Mouse 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 30 days. During the carcass removal trial, carcasses were checked every day for the first week, and then on days 10, 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

Any carcasses remaining at the end of the 30-day trial period were removed from the field.

2.2 DATA ANALYSIS

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 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 2.1.6) by dividing the number of trial carcasses the observer found by the total number which remained available during the trial (i.e., non-scavenged). Analysis includes an evaluation of whether searcher efficiency differed by searcher or plot type (roads and pads vs full plots). 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 best model was chosen based on a comparison of models with the lowest AIC values, though models are also graphically evaluated to ensure that they are logical.

We assumed that searcher efficiency decay (k) was fixed at 0.67. 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).

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

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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 models are also graphically evaluated to ensure that they are logical.

2.2.3 Density-weighted Proportion (DWP)

The density-weighted proportion (DWP) was calculated based on publicly available data on carcass distribution and known information about the plots and roads and pads at High Prairie, since only four carcasses were found during monitoring, and a site-specific density-weighted-proportion could not be calculated.

Specifically, based on data provided by USFWS for turbines operating uncurtailed, it is assumed that 100% of carcasses fall within 322 ft (98 m) of a turbine (Table 2-1, USFWS, personal communication). For the 60-m full plots, this means that 80% of carcasses are falling within the plots. For the roads and pads, we calculated what percent of each distance band was being searched, and were then able to calculate what percent of carcasses were falling within searched areas (by multiplying the percent of carcasses within a band by the percent of that band being searched). The sum of these values is 4.0%, which would indicate that 4.0% of the fatalities at the project will fall within the road and pad search plots.

Table 2-1. Summary of USFWS data on carcass distribution, and calculation of area adjustment for roads and pads.

Distance from turbine	Percent of Carcasses (USFWS, personal communication)	% of area included in standardized searches	% of carcasses falling within searched areas on roads and pads
0-10 meters	6%	24.7%	1.5%
10 – 20 meters	10%	4.7%	0.5%
20 – 30 meters	15%	3.7%	0.6%
30 – 40 meters	20%	3.0%	0.6%
40 – 50 meters	16%	2.2%	0.4%
50 – 60 meters	13%	1.8%	0.2%
60 – 70 meters	10%	1.6%	0.2%
70 – 80 meters	5%	1.3%	0.1%
80 – 90 meters	3%	1.2%	0.0%

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Distance from turbine	Percent of Carcasses (USFWS, personal communication)	% of area included in standardized searches	% of carcasses falling within searched areas on roads and pads
90 – 98 meters	2%	1.1%	0.0%
TOTAL	100%	n/a	4.0%

The proportion of the area that was searched (i.e., within the road and pad) within each of these distance bands was determined via GIS analysis. Each turbine was then assigned a DWP based on whether a full plot or road and pad search was conducted at that turbine.

The DWP analysis provided a turbine-specific adjustment for the total number of bat carcasses that would have been found within 100-m of the turbine, had the entire plots been searched.

2.2.4 Detection Probability (g)

The detection probability (g) is the probability that a carcass is found if it arrives within a searched area. This value is not used within GenEst to calculate mortality (which uses a sophisticated, carcass-specific detection probability). Nonetheless, rough summaries of detection probabilities are provided for planning purposes. These values are calculated based on the searcher efficiency, carcass persistence, and search schedule.

2.2.5 Adjusted Mortality Estimates (GenEst)

GenEst was used to calculate overall mortality rates for the Project (per turbine, per MW, and for all 175 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 (175 turbines), and per MW estimates were calculated by dividing the GenEst estimate (and confidence intervals) by the total MW (400 MW).

2.2.6 Design Protocols – Future Monitoring

To determine the probability of detection (g) of future monitoring (i.e., summer monitoring under the Habitat Conservation Plan [HCP]), the “Single Class Module” in Evidence of Absence (Dalthorp et al. 2017) was used. This analysis included utilizing the bias correction factors calculated in GenEst (e.g., searcher efficiency, carcass persistence) and the proposed protocols to determine whether the detection probability (g) of the summer monitoring would achieve the desired detection probability (g) of at least 0.2 (per the Project’s HCP).

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3.0 Results

3.1 BATS

3.1.1 Standardized Carcass Searches

A total of 152 full plot searches and 1,412 road and pad searches were conducted over 9 weeks (15 March–14 May), in the post-construction monitoring period.

A total of three (3) individual bat carcasses were found during standardized carcass searches, and one (1) bat was found incidentally.

3.1.1.1 Species Composition

A summary of all bat carcasses found during the standardized carcass searches and incidentally during post-construction monitoring is shown in Table 3-1.

A total of four bat carcasses were found, three of which were identified to the species level, including one eastern red bat (*Lasiurus borealis*), one silver-haired bat (*Lasionycteris noctivagans*; species of conservation concern in Missouri) and one Indiana bat. The fourth bat was determined to be either a hoary bat (*Lasiurus cinereus*; species of conservation concern in Missouri) or big brown bat (*Eptesicus fuscus*) based on forearm length. Based on the condition of this bat when found on 16 March 2021, it is assumed this bat died prior to winter, and is thus considered an incidental find.

The Indiana bat is federally listed as endangered under the Endangered Species Act of 1973 (ESA), as amended. No other federally-listed bat species were found during the spring TAL monitoring. The Indiana bat is also state-listed as endangered, and was the only state-listed bat species found as well. USFWS and MDC were notified of this fatality via phone within 24 hours, with follow-up email correspondence (Appendix A), and the Project voluntarily suspended night operations regardless of temperature (down to -20°F) to avoid any additional unpermitted take. A necropsy from this bat is provided in Appendix B.

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Table 3-1. Summary of all bat carcasses found incidentally and during standardized carcass searches during spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Species	Total (percent of total)
Eastern Red Bat	1 (25%)
Silver-haired Bat	1 (25%)
Indiana Bat	1 (25%)
Unknown (Big Brown bat or Hoary Bat)	1 (25%)
Total	4

3.1.2 Searcher Efficiency

Three searcher efficiency trials were conducted during the carcass searches, and a total of 37 mouse carcasses were placed for the searcher efficiency trials.

GenEst models indicated that searcher efficiency was best modeled using a constant searcher efficiency and did not vary by searcher or plot type. Searcher efficiency was estimated at 94.6% (90% CI: 84.1% - 98.3%).

Table 3-2. Searcher efficiency during spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Parameter	Value
Number of Carcasses Placed	37
Number of Carcasses Found	35
(p) Searcher Efficiency Mean (90% CI)	0.946 (0.841 – 0.983)

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3.1.3 Carcass Persistence

Twenty-six of the mouse carcasses used in the searcher efficiency trials were left in place and monitored for up to 42 days. Carcasses were checked daily for the first 8 days, and then checked during the regular weekly search.

GenEst models indicated that carcass persistence was best modeled using a Weibull distribution with the location parameter varying by plot type (road and pad versus full plots) and a constant scale parameter. Carcass persistence averaged 9.3 days on full plots (90% CI: 6.0 to 14.1 days) and 5.3 days on roads and pads (90% CI: 3.6 to 7.6 days).

Table 3-3. Carcass persistence during spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Parameter	Full Plots	Roads and Pads
Number of Carcasses Placed	12	14
Number of Carcasses Scavenged within 7 days	7	5
Mean Carcass Persistence time in days (90% CI)	9.3 (6.0, 14.1)	5.3 (3.6, 7.6)

3.1.4 Detection Probability (g)

The detection probability within searched areas was estimated to be 77.6% for full plots and 63.4% for roads and pads (Table 3-4).

Table 3-4. Detection probability (g) during spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Parameter	Full plots	Roads and Pads
(p) Mean Searcher Efficiency	0.946	0.946
(t) Mean Carcass Persistence time in days	9.3	5.3

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Parameter	Full plots	Roads and Pads
Search Interval (in days)	7	7
(g) Mean Detection Probability	77.6%	63.4%

3.1.5 Adjusted Mortality Estimates

Mortality 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, and an area adjustment using the methods described in Section 2.2.

Over the entire spring migratory period (15 March–14 May), the estimated bat mortality (90% CI) was between 0.02 to 0.69 bat per turbine, with a mean of 0.24 bat per turbine, or approximately 43 bats across the entire facility during the search period (Table 3-5).

Table 3-5. Bat mortality estimates from GenEst for the spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Parameter	Estimate
(c) Observed bats/turbine	0.02
(m) Estimated bats/facility (90% CI)	42.6 (3.0, 120.5)
Estimated bats/turbine (90% CI)	0.24 (0.02, 0.69)
Estimated bats/MW (90% CI)	0.11 (0.01, 0.30)

3.2 BIRDS

A total of 52 bird carcasses representing 20 species were found during the 2021 spring TAL post-construction monitoring (Table 3-6). The most common species found (n>1) were the red-tailed hawk (*Buteo jamaicensis*; n=10), European starling (*Sturnus vulgaris*; n=7), turkey vulture (*Cathartes aura*; n=6), golden-crowned kinglet (*Regulus satrapa*; n=3), rough legged hawk (*Buteo lagopus*; n=3), horned lark (*Eremophila alpestris*; n=3), ruby-crowned kinglet (*Regulus calendula*; n=2), and killdeer (*Charadrius vociferus*; n=2). Four carcasses could not be identified to the species level.

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Table 3-6. Summary of bird carcasses found during the spring 2021 TAL post-construction monitoring at the High Prairie Renewable Energy Center, Schuyler and Adair counties, Missouri.

Date	Species	Turbine
3/15/2021	Red-tailed Hawk (<i>Buteo jamaicensis</i>)	B-02
3/15/2021	Rough legged Hawk (<i>Buteo lagopus</i>)	A-10
3/16/2021	Red-tailed Hawk	H-03
3/19/2021	European Starling (<i>Sturnus vulgaris</i>)	C-13
3/22/2021	European Starling	L-10
3/22/2021	Green-winged Teal (<i>Anas carolinensis</i>)	L-08
3/22/2021	Golden Crowned Kinglet (<i>Regulus satrapa</i>)	R-08
3/22/2021	Red-tailed Hawk	L-10
3/22/2021	Rough legged Hawk	Q-09
3/22/2021	Red-tailed Hawk	Q-07
3/24/2021	European Starling	N-03
3/25/2021	European Starling	A-07
3/25/2021	Red-tailed Hawk	B-04
3/26/2021	Killdeer (<i>Charadrius vociferus</i>)	D-04
3/30/2021	Downy Woodpecker (<i>Picoides pubescens</i>)	P-04
3/31/2021	Rough legged Hawk	K-03
4/1/2021	Killdeer	H-04
4/2/2021	Ring-necked Pheasant (<i>Phasianus colchicus</i>)	R-08
4/12/2021	Mourning dove (<i>Zenaida macroura</i>)	A-04
4/14/2021	Turkey vulture (<i>Cathartes aura</i>)	R-08
4/15/2021	Horned Lark (<i>Eremophila alpestris</i>)	P-03
4/15/2021	Turkey Vulture	P-11
4/16/2021	European Starling	M-05
4/19/2021	Yellow-rumped Warbler (<i>Setophaga coronata</i>)	P-06
4/19/2021	Unknown passerine	P-11
4/19/2021	Dark-eyed Junco (<i>Junco hyemalis</i>)	M-12
4/21/2021	European Starling	N-06
4/21/2021	Red-tailed Hawk	Q-03
4/22/2021	Golden-crowned Kinglet	J-10
4/22/2021	Ruby-crowned Kinglet (<i>Regulus calendula</i>)	J-10
4/22/2021	Golden-crowned Kinglet	J-10
4/26/2021	Turkey vulture	J-02
4/27/2021	European Starling	N-03
4/27/2021	Blue-gray Gnatcatcher (<i>Poliophtila caerulea</i>)	K-11
4/27/2021	Red-tailed Hawk	P-04

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Date	Species	Turbine
4/30/2021	Yellow-throated Vireo (<i>Vireo flavifrons</i>)	E-05
5/3/2021	Unknown flycatcher	B-05
5/3/2021	Bald Eagle (<i>Haliaeetus leucocephalus</i>)	H-06
5/4/2021	Turkey vulture	D-01
5/5/2021	Red-tailed Hawk	R-02
5/6/2021	Ruby-crowned kinglet	L-01
5/6/2021	Horned lark	N-08
5/6/2021	Tree Swallow (<i>Tachycineta bicolor</i>)	F-07
5/6/2021	Turkey vulture	L-11
5/11/2021	Unknown (suspected duck spp.)	J-06
5/11/2021	Virginia Rail (<i>Rallus limicola</i>)	F-03
5/11/2021	Red-tailed Hawk	G-01
5/12/2021	Unknown passerine	A-04
5/13/2021	Horned Lark	L-05
5/13/2021	Turkey Vulture	P-10
5/13/2021	Red-tailed Hawk	J-07
5/14/2021	Palm warbler (<i>Setophaga palmarum</i>)	Q-06

Of the 52 birds found, one federally-protected bald eagle (*Haliaeetus leucocephalus*) was found. Ameren notified the USFWS and MDC of the bald eagle fatality, and had previously applied for an eagle take permit under the Bald and Golden Eagle Protection Act (BGEPA) in August 2020. The Project continues to work with the USFWS to obtain an eagle take permit. The bald eagle and one additional species, the Virginia rail (*Rallus limicola*), are also species of conservation concern in Missouri, and MDC was notified of these fatalities (Appendix A).

3.3 DESIGN PROTOCOLS – FUTURE MONITORING

Due to the issuance of the Incidental Take Permit on May 14, 2021, the Project will be conducting HCP-level monitoring during the summer bat season (May 15 – August 15), which includes twice weekly searches at 40% full plots and 60% roads and pads. This was designed to achieve a detection probability (g) of at least 0.2, but will be evaluated seasonally based on the site-specific bias correction factors, and altered as needed to achieve at least the desired detection probability.

Inputs into the “Single Class Module” in EofA included the following (see Appendix C for screenshots):

- Searcher efficiency: 37 trial carcasses placed, of which 35 were found; k=067

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- Carcass persistence: Weibull distribution with shape=1.171 and scale=9.128 (this was modeled using the actual carcass persistence data collected, through EofA)
- Area adjustment of 0.344²
- Search interval of 3.5 days (twice weekly) for 26 searches

This results in an estimated detection probability (g) of 0.287 (95% CI: 0.253 – 0.321), which is above the goal of 0.2. Therefore, no changes to the proposed protocols are proposed at this time. Additional carcass persistence and searcher efficiency trials will be conducted during summer monitoring.

4.0 Summary and Conclusion

- A total of 152 full plot searches and 1,412 road and pad searches were conducted over 9 weeks between 15 March and 14 May 2021.
- A total of 4 bat carcasses and 52 bird carcasses were found during post-construction monitoring. One of the four bat carcasses was incidental (determined to have died prior to the start of the spring monitoring period), and was not included in mortality estimation.
- One federally-listed bat species, the Indiana bat, was found during the monitoring period on 15 April 2021 when operating under what had previously been considered avoidance protocols. A necropsy of this bat determined that the bat was positive for white nose syndrome (WNS), and tentatively attributed the death to that disease. Please see Appendix B for additional details of the necropsy results and Appendix A for e-mail correspondence.
- One federally-protected bald eagle was found during the monitoring period on 3 May 2021. Please see Appendix A for e-mail correspondence.
- The estimated mean bat fatality rate during the spring monitoring period (15 March – 14 May) was calculated at 0.24 bat/turbine (90% CI: 0.02, 0.69) or 0.11 bat/MW (90% CI: 0.01, 0.30), resulting in a facility-wide bat mortality of 42.6 bats (90% CI: 3.0, 120.5) during the monitoring period. This monitoring period included approximately five weeks of curtailing at night when temperatures were above 50°F (March 15 – April 18), and four weeks of no operation at night regardless of temperature (April 19 - May 14).

² 4.0% of carcasses fall within the road and pad, and 80% fall within full plots; using 40% full plots and 60% roads and pads

**2021 POST-CONSTRUCTION BAT MORTALITY MONITORING REPORT
HIGH PRAIRIE RENEWABLE ENERGY CENTER
SCHUYLER AND ADAIR COUNTIES, MISSOURI**

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 p.. <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.

APPENDIX A

Correspondence with USFWS and MDC

From: [Stephenson, Molly](#)
To: [Jordan Meyer](#)
Cc: [Epplin, Julianne](#); [Atkins, Kevin D](#); [Terry VanDeWalle \(Terry.Vandewalle@stantec.com\)](#)
Subject: Indiana Bat - High Prairie - 4/15/2021
Date: Wednesday, April 21, 2021 4:30:00 PM
Attachments: [193708256 High Prairie Mortality Survey 2021_04162021_MYSO.pdf](#)

Jordan,

As Kevin notified you of last week via voicemail, an Indiana bat was found last Thursday, 4/15/2021 at the High Prairie Renewable Energy Center in Adair County, MO. Attached is the datasheet from the fatality with photos and additional info.

Please let us know if you have any questions or need anything else. The bat is currently in route to the Wildlife Health Lab in Madison, WI for necropsy and genetic testing.

Molly

Molly Gillespie Stephenson

Wildlife Biologist

Office: (612) 712-2134

Mobile: (319) 327-0881

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733 Marquette Ave., Suite 1000

Minneapolis, MN 55402

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193708256 High Prairie Mortality Survey 2021

Submitted by: Tyler.Scherbring@stantec.com_stantec

Submitted time: Apr 15, 2021, 3:32:59 PM

General Info

Survey Date

Apr 15, 2021, 2:31:00 PM

Biologist Name

Tyler scherbring

Turbine ID

M-03

Plot Type

Roads

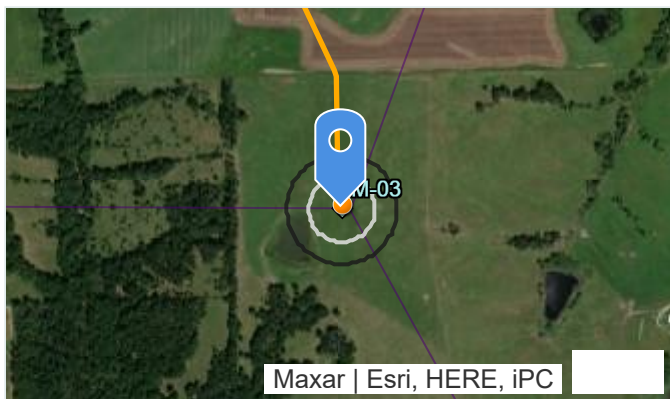
Carcass Present?

Yes

Location

Location

Lat: 40.2707 Lon: -92.47187



speed

0

Carcasses

Carcass Number

1

Incidental

No

Carcass Type

Bat

Bat Species

Indiana Bat

Forearm Length of Bat (mm)

35

Distance from Turbine (m)

1

Azimuth from Turbine (Degrees)

30

Age

Adult

Sex

Female

Cause of Death

Unknown

Condition

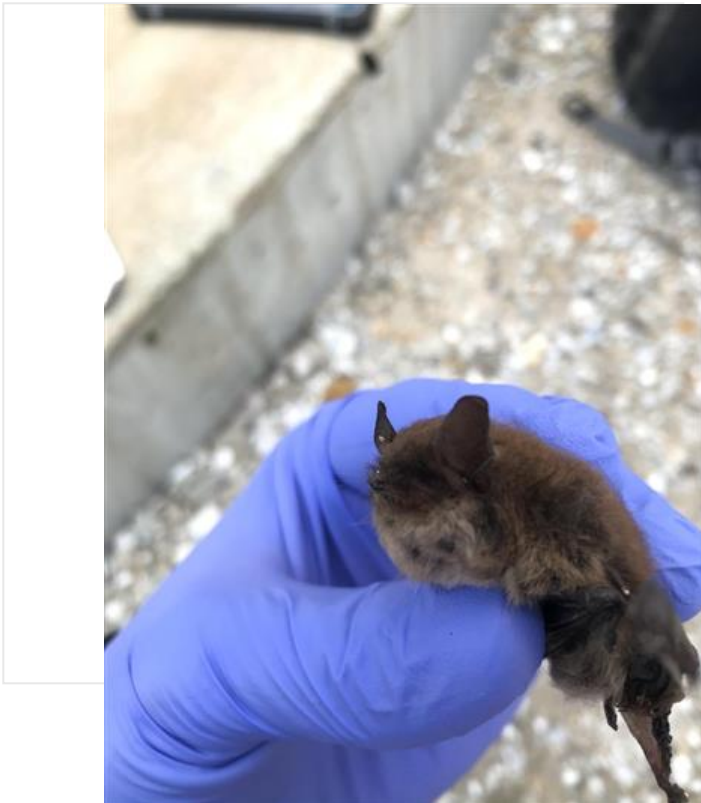
Fresh/Whole

Additional Comments

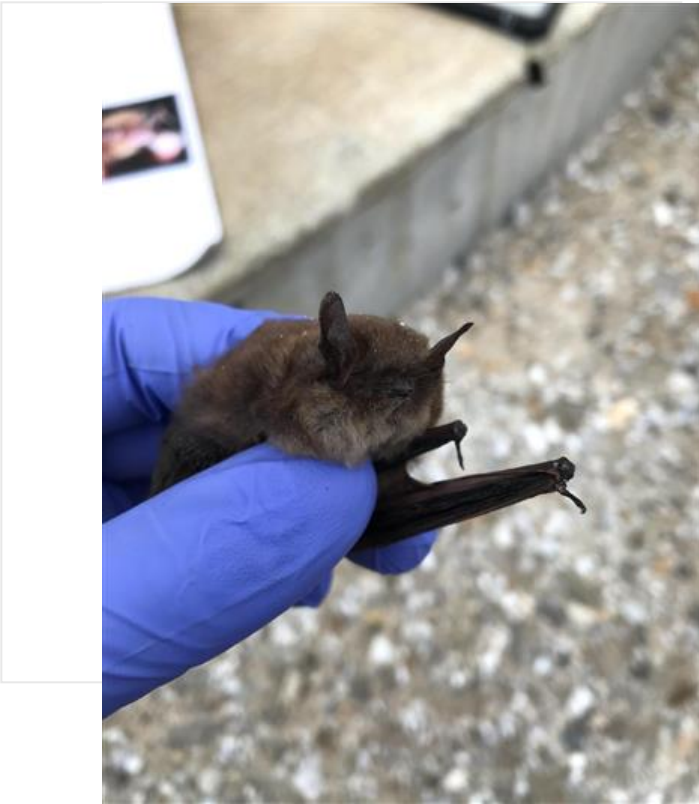
Unable to get teeth pictures. Toe hairs don't pass nails. Keeled/ slight keel

Photos

Carcass Photo



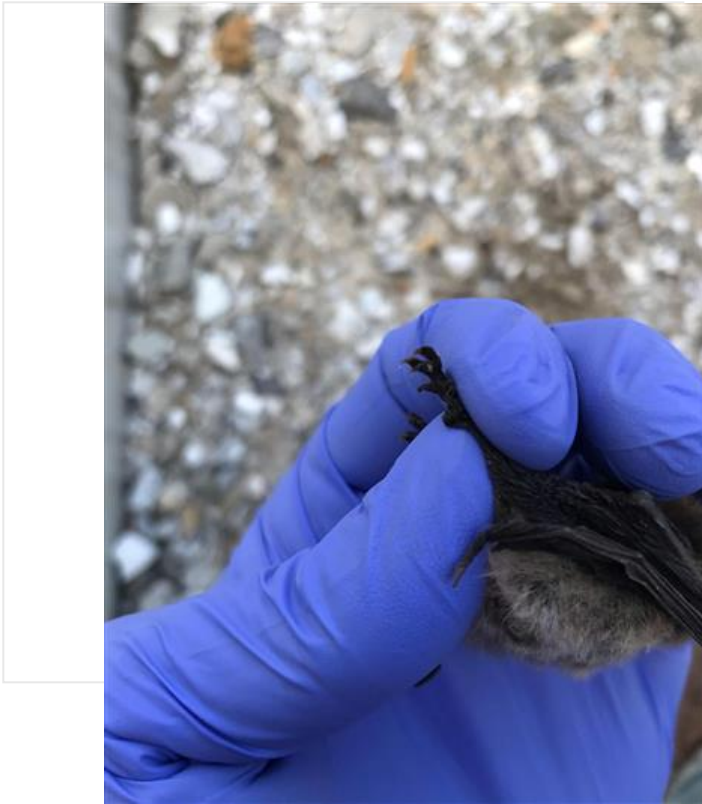
Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



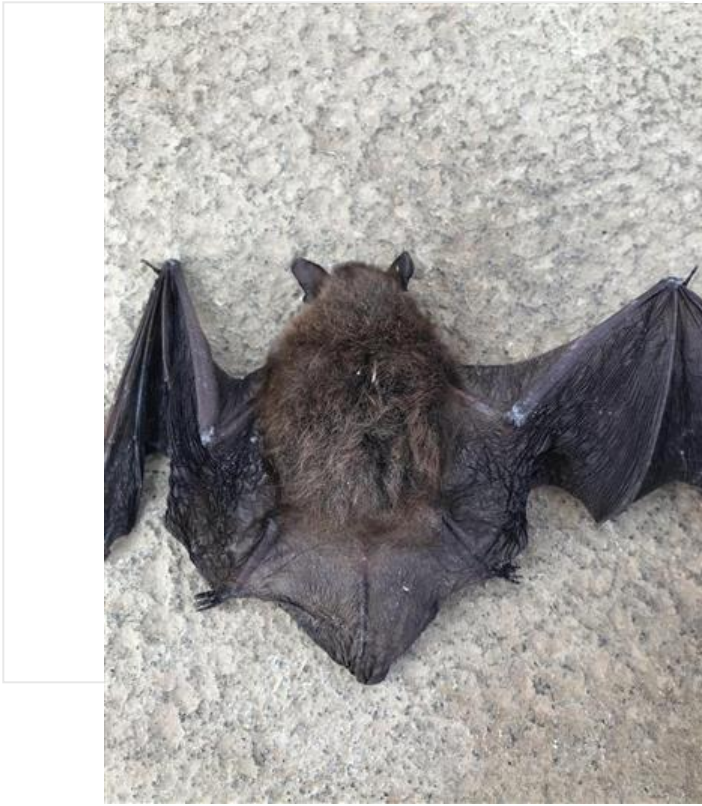
Carcass Photo



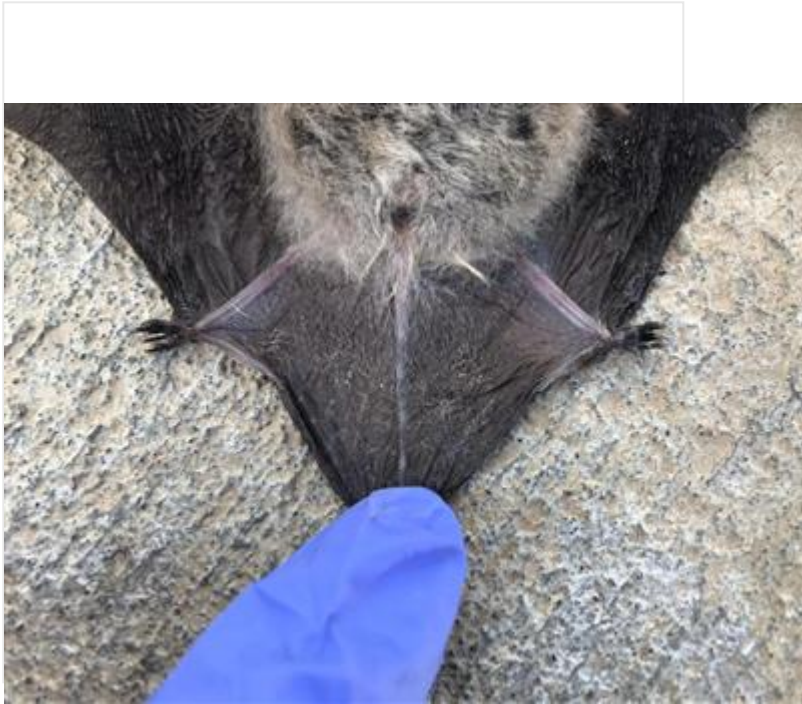
Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



From: [Stephenson, Molly](#)
To: [Jordan Meyer](#)
Cc: [Epplin, Julianne](#); [Terry VanDeWalle \(Terry.Vandewalle@stantec.com\)](#); [Giesmann, Craig J](#)
Subject: High Prairie SOCC Reporting - March 2021
Date: Monday, April 5, 2021 5:17:00 PM

Hi Jordan,

We've been conducting monitoring at the High Prairie Renewable Energy Center since March 15th. During that time, we have found a single potential SOCC carcass. A bat carcass was found on 3/16/2021 that based on forearm length was either a hoary bat or big brown bat, but the carcass was very decayed so a positive species identification could not be made. It is believed the carcass is likely from fall 2020. This carcass was not collected, as we did not yet have our MDC collector permit. We have now received our permits and will be keeping all carcasses found.

Otherwise no SOCC-species have been found. We will keep you posted on any other SOCC fatalities, and we will be sending emails on a weekly basis from here on out (if there is anything to report).

Please let us know if you have any questions, or if there is anyone else we should be notifying (I figured I would start the email chain small, and grow it as needed).

Thanks,

Molly

Molly Gillespie Stephenson

Wildlife Biologist

Office: (612) 712-2134

Mobile: (319) 327-0881

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Minneapolis, MN 55402

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From: [Stephenson, Molly](#)
To: [Jordan Meyer](#)
Cc: [Giesmann, Craig J](#); [Terry VanDeWalle \(Terry.Vandewalle@stantec.com\)](mailto:Terry.Vandewalle@stantec.com); [Epplin, Julianne](#)
Subject: High Prairie SOCC Reporting
Date: Monday, April 26, 2021 3:43:00 PM

Jordan,

One additional SOCC species has been found, a silver-haired bat found on 4/19/2021 at Turbine D-01. The bat is currently stored in the freezer at the O&M building.

Please let us know if you have any questions or need any other information.

Thank you,

Molly

Molly Gillespie Stephenson

Wildlife Biologist

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From: [Stephenson, Molly](#)
To: [Jennifer Campbell](#)
Cc: [Epplin, Julianne](#)
Subject: SOCC Species - High Prairie
Date: Monday, May 17, 2021 4:50:00 PM

Hi Jennifer,

We had our first SOCC bird found, a Virginia Rail found on 5/11/2021 and identified today via photograph.

Is there someone other than you that I should notify of bird SOCC found? I have been notifying Jordan Meyer as needed about bat fatalities on a weekly basis, but I assume he doesn't want to know about birds?

Thanks,

Molly

Molly Gillespie Stephenson

Wildlife Biologist

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From: [Stephenson, Molly](#)
To: ["jennifer.campbell@mdc.mo.gov"](mailto:jennifer.campbell@mdc.mo.gov); ["Janet.Haslerig@mdc.mo.gov"](mailto:Janet.Haslerig@mdc.mo.gov); karen_herrington@fws.gov; ["Hill, Laurel A"](#); ["Rigby, Elizabeth A"](#); ["Rheude, Margaret G"](#); ["KAtkins@ameren.com"](mailto:KAtkins@ameren.com); ["Epplin, Julianne"](#); [Mark Casper](#); [Terry VanDeWalle \(Terry.Vandewalle@stantec.com\)](mailto:Terry.Vandewalle@stantec.com)
Subject: RE: Eagle carcass found near High Prairie
Date: Thursday, May 6, 2021 2:41:00 PM
Attachments: [BAEA H-06_05032021.pdf](#)

MDC and USFWS,

Attached is the data sheet from the bald eagle fatality. The carcass is currently being stored in the freezer at the O&M building. I am coordinating with Greg Jeffers of USFWS to pick up the carcass.

The turbine had last been visited on 4/29/2021, and our field biologists do not believe there is any way the carcass was there at that time based on how visible it was from the turbine road. The field had been freshly plowed and they did not see any evidence that the carcass had been dragged there by scavengers, though as noted on the data form the carcass was missing the lower half. They searched the area surrounding the turbine to try to locate additional pieces but did not find any.

Let us know if you have any additional questions.

Molly

Molly Gillespie Stephenson
Wildlife Biologist

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Mobile: (319) 327-0881

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Please consider the environment before printing this email.

-----Original Message-----

From: Stephenson, Molly
Sent: Monday, May 3, 2021 6:56 PM
To: jennifer.campbell@mdc.mo.gov; Janet.Haslerig@mdc.mo.gov
Cc: karen_herrington@fws.gov; [Hill, Laurel A <laurel_hill@fws.gov>](mailto:Hill,LaurelA@fws.gov); [Rigby, Elizabeth A <elizabeth_rigby@fws.gov>](mailto:ElizabethA.Rigby@fws.gov); [Rheude, Margaret G <margaret_rheude@fws.gov>](mailto:margaret_rheude@fws.gov); KAtkins@ameren.com; [Epplin, Julianne <JEpplin2@ameren.com>](mailto:Epplin,Julianne@ameren.com); [Mark Casper <mcasper@terra-gen.com>](mailto:MarkCasper@terra-gen.com); [Terry VanDeWalle \(Terry.Vandewalle@stantec.com\) <Terry.Vandewalle@stantec.com>](mailto:Terry.Vandewalle@stantec.com)
Subject: FW: Eagle carcass found near High Prairie

Jennifer and Janet,

An adult bald eagle carcass of unknown sex was found near High Prairie this evening. Per the email below from USFWS, we will be storing the carcass overnight in the freezer at the O&M building while we await further

instructions. We will follow up with additional details tomorrow.

Thank you,

Molly

Molly Gillespie Stephenson
Wildlife Biologist

Office: (612) 712-2134
Mobile: (319) 327-0881

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Please consider the environment before printing this email.

-----Original Message-----

From: Herrington, Karen <karen_herrington@fws.gov>

Sent: Monday, May 3, 2021 6:40 PM

To: Kevin D Atkins <KAtkins@ameren.com>; Julianne Epplin <jepplin2@ameren.com>; Mark Casper <mcasper@terra-gen.com>; Stephenson, Molly <Molly.Stephenson@stantec.com>

Cc: Rheude, Margaret G <margaret_rheude@fws.gov>; Rigby, Elizabeth A <elizabeth_rigby@fws.gov>; Hill, Laurel A <laurel_hill@fws.gov>

Subject: Eagle carcass found near High Prairie

Kevin,

Thank you for notifying me that Stantec found a dead eagle this afternoon near the High Prairie Renewable Energy Center. As we discussed, I'm asking you to have Stantec collect it and put it in the freezer as soon as possible this evening. I understand that the carcass is partially scavenged and that you do not have a permit to possess the bird. I'm temporarily authorizing this possession until we can give you more direction tomorrow morning. I or someone from the Migratory Birds Division will be in touch as soon as possible tomorrow. Please notify MDC, and let me know if you have questions that need immediate attention.

Karen

Sent from my iPhone

193708256 High Prairie Mortality Survey 2021

Submitted by: Michaela.White@stantec.com_stantec

Submitted time: May 3, 2021, 8:22:09 PM

General Info

Survey Date

May 3, 2021, 5:46:00 PM

Biologist Name

Michaela White

Turbine ID

H-06

Plot Type

Roads

Carcass Present?

Yes

Location

Location



speed

0.0626615658402443

Carcasses

Carcass Number

1

Incidental

No

Carcass Type

Bird

Bird Species

Bald Eagle

Distance from Turbine (m)

31

Azimuth from Turbine (Degrees)

170

Age

Adult

Sex

Unknown

Cause of Death

Unknown

Condition

Decomposed/Most of Body, Some Missing

Additional Comments

Lower half missing, small maggots present. Been dead for some days. Might have been predated on or possibly cut in half.

Photos

Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



Carcass Photo



APPENDIX B

Necropsy Report



NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

DIAGNOSTIC SERVICES CASE REPORT

Case: 30207
Epi/WID # 201247

Supplemental Report

5/10/2021

Legal Declassified INV#:

Submitter:

Laurel Hill
USFWS Ecological Services/Columbia MO
101 Park De Ville Drive, Suite A
Columbia, MO 65203

Date Submitted: 4/22/2021

Specimen description/Identification/Location:

AC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Bat, Indiana	CARCASS			Adair	MO

Diagnosis:

1. White-nose syndrome positive

Event History:

One suspected Indiana Bat was found dead on 4/15/21 at an industrial wind turbine facility (turbine M-03). Site is surveyed weekly; last survey prior to bat detection was on 4/8/21. There had been a rainstorm event in the area on 4/11/21 (evening). At the time of collection, the carcass appeared relatively fresh and not covered in mud/wet, wings pliable but jaws were shut tight and couldn't be pried open. Carcass is being submitted for cause of death determination and WNS surveillance.

5/7/21: Host genetics was completed and species was identified as *Myotis sodalis*.

Legal Declassified INV#:

Comment:

Final report 5/4/21

Death of this adult female Indiana bat is tentatively attributed to white-nose syndrome (WNS) due to the bat's positive WNS status and lack of other clear cause of death. [Note 5/10/21: Species ID was changed from *Myotis* sp. to Indiana bat after genetic confirmation of species].

There were no clear signs of impact trauma, such as bruising, laceration, skeletal or visceral fractures, or herniation. While lungs were dark red, wet, and heavy, this finding can be seen in bats that die from various causes and is not specific to pulmonary hemorrhage. Microscopically, there are increased numbers of macrophages in the lung suggestive of edema, but additional assessment is not possible due to extensive freeze-thaw artifact and autolysis. Barotrauma can neither be confirmed nor excluded; barotrauma can be very difficult to assess on frozen specimens and may have been overdiagnosed on initial reports (Rollins et al., 2012). See Gross, Microscopic, and Diagnostic Findings section below for more detail.

A wing skin swab was positive for *Pseudogymnoascus destructans* by PCR and histopathology of the muzzle and ear revealed lesions of WNS. The brain was negative for rabies by direct fluorescent antibody assay at the Wisconsin State Laboratory of Hygiene.

Several samples were saved frozen and can be returned to the submitter at your request; these include brain, liver, kidney, skin (in 95% EtOH), and gastrointestinal tract with contents. Please contact us if you would like to receive these samples.

Genetic species identification is pending and those results will be reported in a Supplemental Report when available.

Reference:

Rollins KE, Meyerholz DK, Johnson GD, Capparella AP, Loew SS. A Forensic Investigation Into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? *Veterinary Pathology*. 2012;49(2):362-371. doi:10.1177/0300985812436745

Wildlife and Domestic Animal Significance: This case represents the first confirmation of white-nose syndrome (WNS) in a bat from Adair County although WNS has been recognized in Missouri since 2012. White-nose syndrome is an often fatal disease of hibernating bats and is cumulatively estimated to have caused the deaths of millions of North American bats since its emergence in 2007. The USFWS National and Regional WNS Coordinators are being notified in confidence of this expansion of confirmed WNS in this state. There is no evidence that WNS poses a health risk to other wildlife or domestic animals.

Human Health Considerations: None known.

Disease Control and Biosecurity: Bats are most commonly exposed to *P. destructans* while over-wintering in a contaminated hibernaculum. Although this bat was not found in direct association with a hibernaculum, additional monitoring for disease at potential hibernacula in the area may be appropriate. Adherence to the most current National WNS Decontamination Guidelines (<<<<<http://whitenosesyndrome.org/topics/decontamination>>>>>) is recommended to avoid contamination of uncontaminated sites.

The NWHC and the USFWS are conducting surveillance and research on this emerging disease. Please contact Anne Ballmann (aballmann@usgs.gov, 608-270-2445) to discuss options for additional surveillance of hibernacula in your area to further assess the extent of *Pd* dispersal and WNS progression in the U.S.

GROSS, MICROSCOPIC AND DIAGNOSTIC FINDINGS:

ACCESSION 001

GROSS FINDINGS:

External examination: A 6.89 g adult female *Myotis* sp. in poor body condition and fair postmortem condition is examined at necropsy. Forearm length is 37.92 mm.

There are scattered pinpoint white foci on the wings and tail. Within the left plagiopatagium just ventral to the mid-humerus near the body is an ~2 mm diameter slightly raised white area ventrally and slightly sunken white area dorsally (suspect erosion). In the first phalanx of the left fifth digit approximately 1 cm above the first interphalangeal joint is an area of mild enlargement with ventral displacement of the distal portion (suspect healed fracture site). At this site, the digit is enlarged to 1 mm diameter (vs. ~0.5 mm diameter for normal digit) and there is a sunken area on the ventral aspect that is ~0.5 mm wide by 1 mm long. The nose contains dark red fluid and the fur on the top of the muzzle is matted with light red fluid. The ventral abdomen is damp (suspect stained by fluid from nose). On examination under ultraviolet light, there are two small (4-5 mm diameter) areas of dull white-orange fluorescence on the right ventral wing between digits 4 and 5 last 2 digits and on the left dorsal tail.

Internal examination: There are subcutaneous fat pads on the dorsal shoulders bilaterally (~5x5x10 mm); no other fat stores remain. Pectoral muscle is within normal limits. The trachea contains dark red fluid along its length. Lungs are diffusely dark red and sink in formalin. The inner sternum and epicardium is stained dark red. There is a suspect small thymus. Liver, kidneys, and spleen are moderately pale tan and soft (autolysis). Uterus and ovaries are small. The stomach is distended with abundant (~2 ml) thick dark brown fluid (did not open - saved frozen intact). The small intestine contains a moderate amount of tan pasty material. The large intestine contains a moderate amount of dark brown to black pasty material. The brain and middle ear are not examined (submitted for rabies testing). All tissues not described are within normal limits.

MICROSCOPIC FINDINGS:

Muzzle: Epidermal erosions with intralesional fungal hyphae, multifocal, moderate

Pinnae: Otitis externa, neutrophilic and erosive, with intralesional fungal hyphae, multifocal, moderate to marked

Wing: Dermatitis, neutrophilic, erosive, multifocal, minimal, with focal fungal hyphae

Wing: Dermatitis, neutrophilic, erosive, focal, subacute, moderate, with suspect fibrosis

Lung: Edema, suspect

Tissues, multiple: Autolysis and freeze artifact, marked

Case: 30207
Epi/WID # 201247

Supplemental Report

5/10/2021

Legal Declassified INV#:

DIAGNOSTIC TEST RESULTS:

Microbiology: Skin swab, *Pseudogymnoascus destructans* PCR: Positive

Parasitology: N/A

Chemistry: N/A

Virology: Brain, rabies virus, direct fluorescent antibody testing: Negative (Wisconsin State Laboratory of Hygiene)

Supplemental report 5/10/21

Species was confirmed as Indiana bat (*Myotis sodalis*) by mitochondrial DNA analysis (cytochrome b gene) of skeletal muscle.

Julia S. Lankton

Julia S. Lankton DVM, DACVP

Staff Pathologist

Phone: 608-270-2459 Email: jlankton@usgs.gov

The USGS-National Wildlife Health Center conducts wildlife disease investigations with state, federal and tribal partners, and we welcome collaborative dissemination of this information (e.g., publication, press release, technical report, etc.). Please contact the pathologist or wildlife disease epidemiologist assigned to this case to ensure that information is accurately interpreted and appropriately credited.

Copies To:

ANTHONY ELLIOTT

Missouri Dept of Conservation/Kirksville, 3500 S. Baltimore, Kirksville, MO 63501

DR. JEREMY COLEMAN

USFWS Hadley MA (RO5), 300 Westgate Center Drive, Hadley, MA 01035-9589

RICHARD GEBOY

USFWS Environmental Contaminants/Bloomington IN, 620 S. Walker Street, Bloomington, IN 47403-2121

LORI PRUITT

USFWS Environmental Contaminants/Bloomington IN, 620 S. Walker Street, Bloomington, IN 47403-2121

This is a Report for your submission to the National Wildlife Health Center.

For consultation regarding diagnostic findings or laboratory testing and results, please contact the pathologist. Contact information can be found underneath the signature line on this report.

For consultation on the significance of this disease to wildlife populations in your area, assistance with disease control and response, or to report field updates (numbers and species affected, geographical distribution, end date, etc.), please contact an NWHC epidemiologist at NWHC-epi@usgs.gov or 608-270-2480.

APPENDIX C

Screenshots from Evidence of Absence

Screenshot of EofA Inputs:

EoA, v2.0.7 - Single Class Module

Edit Help

Detection Probability (g)

Search Schedule

Start of monitoring (yyyy-mm-dd)

Formula

Search interval (I)

Number of searches

Custom [Edit/View](#)

span = 182, l (mean) = 7

Spatial coverage (a)

Temporal coverage (v)

Searcher Efficiency

Carcasses available for several searches

95% CI: $p \in [0.535, 0.674]$, $k \in [0.656, 0.815]$

$\hat{p} = 0.62$, $\hat{k} = 0.735$ [View](#) [Edit](#)

Carcasses removed after one search

Carcasses available

Carcasses found

$\hat{p} = 0.946$, with 95% CI = [0.838, 0.989]

Factor by which searcher efficiency changes with each search (k)

Persistence Distribution

Use field trials to estimate parameters [View/Edit](#)

Distribution: Weibull with shape (α) = 1.171 and scale (β) = 9.128

$r = 0.865$ for $l_r = 3.5$, with 95% CI: $r \in [0.766, 0.947]$, $\beta \in [6.3202, 13.183]$

Enter parameter estimates manually [View](#)

Parameters

shape (α)

scale (β) lwr upr

$r = 0.719$ for $l_r = 3.5$, with 95% CI: $r \in [0.632, 0.773]$

[Estimate g](#)

Fatality estimation (M, λ)

Carcass Count (X) [Estimate M](#)

Credibility level (1 - α) [Estimate \$\lambda\$](#)

One-sided CI (M*) Two-sided CI

[Close](#)

Screenshot of EofA Outputs:

```

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

Full site for full year
  Estimated g = 0.287, 95% CI = [0.253, 0.321]
  Fitted beta distribution parameters for estimated g: Ba = 193.6419, Bb = 481.9743

Full site for monitored period, 15-May-2021 through 14-Aug-2021
  Estimated g = 0.287, 95% CI = [0.253, 0.321]
  Fitted beta distribution parameters for estimated g: Ba = 193.6419, Bb = 481.9743
  Temporal coverage (within year) = 1

Searched area for monitored period, 15-May-2021 through 14-Aug-2021
  Estimated g = 0.833, 95% CI = [0.721, 0.921]
  Fitted beta distribution parameters for estimated g: Ba = 42.5519, Bb = 8.5127

=====
Input:
Search parameters
  trial carcasses placed = 37, carcasses found = 35
  estimated searcher efficiency: p = 0.946, 95% CI = [0.838, 0.989]
  k = 0.67
Search schedule: Search interval (I) = 3.5, number of searches = 26, span = 91
  spatial coverage: 0.344   temporal coverage: 1

-----
Carcass persistence:
Weibull persistence distribution
  shape (a) = 1.171 and scale (b) = 9.128
  95% CI b = [6.32, 13.183]
  r = 0.865 for l_r = 3.5 with 95% CI = [0.803, 0.909]
  n = 26
Uniform arrivals
  
```