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Memorandum

To: Endangered Species Chief, Division of Ecological Services, Great Lakes Region, U.S. Fish and Wildlife Service, Bloomington, MN

From: Field Office Supervisor, Missouri Ecological Services Field Office, Division of Ecological Services, Great Lakes Region, U.S. Fish and Wildlife Service, Columbia, MO KAREN HERRINGTON Digitally signed by KAREN HERRINGTON Date: 2021.08.05 16:57:52 -05'00'

Subject: Biological Opinion on the issuance of an ESA Section 10(a)(1)(A) recovery permit to Empire District Electric Company

This document transmits the U.S. Fish and Wildlife Service's (USFWS) Biological Opinion for the proposed issuance of an Endangered Species Act (ESA) section 10(a)(1)(A) recovery permit (permit) to Empire District Electric Company (applicant) and effects to the Federally endangered gray bat (*Myotis grisescens*). The USFWS worked collaboratively with the applicant to develop the study plan submitted as part of the application for the permit. The purpose of the study plan is to evaluate the effectiveness of Activity-Based Informed Curtailment (ABIC) at reducing bat fatalities at wind energy facilities. The USFWS recognizes the value of the research objectives outlined in the study plan, and the results of this study are expected to provide information on the efficacy of the ABIC method, such that, if demonstrated successful, it could be used as a conservation strategy at other wind facilities. Specifically, the results are expected to answer the question of whether 1) exposed bat activity (that is, bat activity recorded when turbine rotors are spinning) at the turbine nacelle is a reliable predictor of bat fatalities, and if so, 2) can ABIC be designed to successfully reduce bat fatalities by a pre-determined rate.

The proposed study plan and permit terms describe how turbines at Kings Point Wind Project and North Fork Wind Project will operate in assigned treatment groups and methods of data collection and analyses. All treatment groups are expected to minimize impacts to bat species by a certain amount (when compared to fully operating turbines) and provide an adequate sample size such that a significant difference between treatment groups would be detected, should it exist. To date, no gray bat fatalities have been detected at wind facilities (due to little overlap of wind development and gray bat range); therefore, we estimated potential impacts using fatality data of other bat species at wind facilities across the Midwest. We calculated the level of proposed authorized take based on the operating parameters of each treatment group, USFWS compiled data on bat fatalities across the Service's Midwest Region, and fatality studies published in the literature.

The proposed authorized take is allocated by study phase and permittee. The proposed take authorization is higher at Kings Point Wind Project than North Fork Wind Project because of the higher level of gray bat activity detected in that study area. The resulting cumulative proposed take authorization is 795 gray bats over the course of the proposed study. The proposed authorized take is approximately 0.14% of the associated hibernaculum population, and results of population analyses indicate the proposed action will not cause an appreciable difference in the fitness of any population level, including maternity colonies. In determining whether the action is appropriate for categorical exclusion from NEPA (516 OM9, 8.5(C)(I)), we reviewed the extraordinary circumstances and determined that none applied. Extraordinary circumstance #8 calls for a determination of whether adverse effects are significant to federally listed or proposed species or critical habitats. We determined the proposed level of take does not have significant adverse effects on the gray bat because the result of our population analyses indicate the proposed take will not result in appreciable differences in the fitness of local hibernaculum or maternity colony populations.

The proposed action occurs on the periphery of the range of the endangered Indiana bat (*M. sodalis*) and the threatened northern long-eared bat (*M. septentrionalis*); however, the permit is not likely to adversely affect these species. No Indiana bats or northern long-eared bats were found during extensive surveys, no hibernacula occur past the project boundaries that could result in migratory risk, and consultation would be reinitiated if these species are found in the project area in the future.

The realized take of gray bats may not reach the authorized take level impacts. However, potential impacts are limited by the bounds of the authorized take the permit and the permit term. Should the impacts of the action meet the authorized level of take, the study would cease, and turbines would operate in a manner to avoid further impacts to gray bats. The proposed study plan and terms and conditions of the permit will ensure the consequences caused by the proposed action are not likely to jeopardize the continued existence of any endangered, threatened, or proposed species and will not destroy or adversely modify proposed or designated habitat.

We base this Biological Opinion on the permit application that the USFWS received from the applicant on February 2, 2021; the proposed permit terms and conditions; reports and scientific literature related to gray bats and similar bat species, and meetings, phone calls, and written correspondence with the applicants and their consultants.

Biological Opinion for the Issuance of a Scientific Research Permit for the Endangered Gray Bat

Associated with the Study Plan for Empire District Electric Company at Kings Point Wind Project and North Fork Ridge Wind Project in Jasper, Dade, Lawrence, and Barton Counties, Missouri

August 5, 2021
U.S. Fish and Wildlife Service Missouri Ecological Services Field Office

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INTRODUCTION

Empire District Electric Company (the applicant) applied for a recovery permit under Section 10(a)(1)(A) of the ESA on February 2, 2021 to carry out a research study at two commercially operating wind facilities, Kings Point Wind Project and North Fork Wind Project in Jasper, Dade, Lawrence, and Barton Counties, Missouri. The projects began operating commercially in May 2021 and January 2021, respectively. The proposed study plan would alter turbine operations at night based on assigned study treatment groups between April 1st and October 31st each year. The requested permit would authorize take of gray bats (*Myotis grisescens*) that may occur as a result of implementing the study plan. Receipt of the permit application was published in the Federal Register (FR) on June 28, 2021. No public comments were received on the FR notice. In accordance with 50 CFR 402.14(h)(3), we incorporated background information on the species biology, project description, and study plans directly from the materials submitted with the permit application into this Biological Opinion.

Prior to submitting the application, USFWS worked collaboratively with the applicant to develop the study plan ("10(a)(1)(A) Permit Application Study Plan") to evaluate the effectiveness of Activity-Based Informed Curtailment (ABIC) at reducing bat fatality at wind energy facilities. The USFWS recognizes the value of the research objectives outlined in the study plan, and the results of this study are expected to provide information on the efficacy of the ABIC method, such that, if demonstrated successful, it could be used as a conservation strategy at other wind facilities. Specifically, the results are expected to answer the question of whether 1) exposed bat activity (that is, bat activity recorded when turbine rotors are spinning) at the turbine nacelle is a reliable predictor of bat fatalities, and if so, 2) can ABIC be designed to successfully reduce bat fatalities by a pre-determined rate.

In coordinating on the study design, USFWS conducted a power analysis using programming software code developed to analyze similar wind energy research projects. Study treatments at Kings Point Wind Project and North Fork Wind Project were considered independently (that is, not a pooled sample) and analyses included a 69- turbine, 149.4-megawatt (MW), four-year (2-treatment groups first two years, 3-treatment groups the following two years) study design. Three potential fatality scenarios were analyzed including low, mean, and high scenarios. Fatality estimates were derived from all-bat fatality rates from wind facilities in the Service's Midwest region compiled by USFWS (USFWS 2020). In addition to fatality scenarios, the analysis also included three scenarios spanning a range in monitoring success (i.e., probability of detection; the probability of a carcasses recovered and counted by searchers). The results of the power analysis suggest the proposed study design has sufficient power to detect an effect with the treatment groups, as proposed (Section 1.3.1).

Currently, there are no published studies comparing the effectiveness of ABIC methods to blanket curtailment methods (Whitby et al. 2021). Turbine "curtailment" is one strategy for reducing bat fatalities at wind turbines. Curtailment is when turbine operations are altered, that is, blades are "feathered", during periods of high risk for bats. "Feathered" blades are rotated to reduce the blade angle to the wind, such that the turbine blades cease spinning or rotate very minimally [<1 rpm], thus eliminating or greatly reducing risk of bat fatalities until the designated operating conditions are met. The term "blanket curtailment" refers to a minimization strategy

where turbines are programmed to feather below the same specified "cut-in" speed (the wind speed in which turbines 'cut-in' to the wind and begin generating power), thereby reducing or avoiding bat fatalities during specified periods of risk. The ABIC strategy is a kind of "smart" curtailment where periods of turbine curtailment are informed by other variables (e.g., weather, bat activity, etc.) in addition to wind speed.

Recent research has demonstrated the amount of bat activity recorded at the turbine nacelle when turbines are operating (i.e., exposed bat activity) directly correlates with bat fatality rates, and patterns of exposed bat activity can be used to develop predictive models for which to inform turbine curtailment (Peterson 2020). Specifically, Peterson (2020) developed software to map the distribution of exposed bat activity seasonally as a function of temperature and wind speed; simulate reduction in exposed bat activity; and determine how effective ABIC strategies could be in reducing exposed bat activity. As a result of these simulations, researchers found that ABIC strategies can be designed to reduce bat activity exposure by specified amounts.

Data are not available on the impacts of wind to gray bats, and the documented presence of gray bats at Kings Point Wind Project and North Fork Wind Project offers a unique opportunity to research the effectiveness of ABIC technology during the summer roosting and migratory periods. This study is expected to provide valuable insights on gray bat interactions with wind turbines and contribute to advancing wind energy technology and reducing associated environmental impacts.

1. Description of the Proposed Action

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

1.1. USFWS Issuance of a Recovery Permit

The USFWS Midwest Region proposes to issue a scientific recovery permit (permit) under section 10(a)(1)(A) of the Endangered Species Act (ESA) to Empire District Electric Company (applicant). The permit would allow the applicant to take up to 795 Federally endangered gray bats at Kings Point Wind Project and North Fork Ridge Wind Project, over the permit term of four years, while carrying out the study plan and researching the effectiveness of Activity-Based-Informed Curtailment (ABIC) technology in Jasper, Dade, Lawrence, and Barton Counties, Missouri.

To determine whether to issue a recovery permit, the USFWS must consider the following (Issuance Criteria, 50 CFR 17.22(a)(2) and 50 CFR 17.32(a)(2)):

> (i) Whether the purpose for which the permit is required is adequate to justify removing from the wild or otherwise changing the status of the wildlife sought to be covered by the permit;
> (ii) The probable direct and indirect effect which issuing the permit would have on the wild populations of the wildlife sought to be covered by the permit;
> (iii) Whether the permit, if issued, would in any way, directly or indirectly, conflict with any known program intended to enhance the survival probabilities of the population from which the wildlife sought to be covered by the permit was or would be removed;

(iv) Whether the purpose for which the permit is required would be likely to reduce the threat of extinction facing the species of wildlife sought to be covered by the permit;
(v) The opinions or views of scientists or other persons or organizations having expertise concerning the wildlife or other matters germane to the application; and
(vi) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application.

1.2. Action Area

The "action area" is defined (50 CFR 402.02) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." We consider the action area to be the boundaries of Kings Point Wind Project and North Fork Wind Project, and Stinson Cave, where the study and population counts will take place (*Figure 1*). Specifically, the action area includes all turbine pads, access roads and the points of bat emergence at Stinson

Cave (location of population counts).

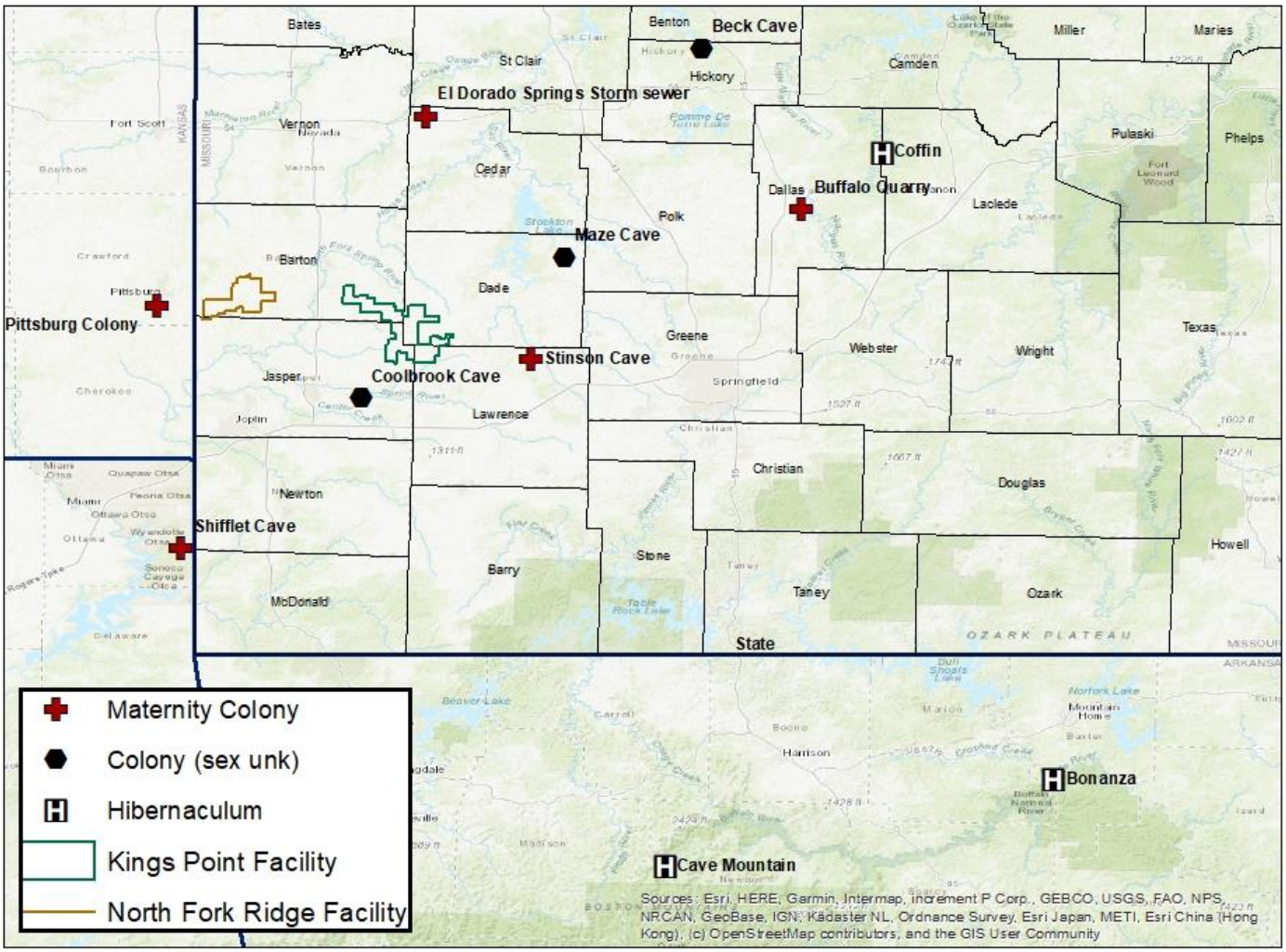

Figure 1 Action Area: Boundaries of Kings Point and North Fork Ridge Wind Projects, and Stinson Cave.

1.3. Study Design: Activity-Based Informed Smart Curtailment

The permit would allow Empire District Electric Company to operate Kings Point Wind Project and North Fork Ridge Wind Project in accordance with the study design. Each wind project consists of 69 turbines with a total generating capacity of 149.4 megawatts (MW), and each turbine is assigned to a treatment group which will be studied during the course of this research. The study design is fully explained in 10(a)(1)(A) Permit Application Study Plan and summarized below. The design consists of two, two-year phases:

Phase I (first two years):

- Turbines equally divided among two treatment groups, and turbines assigned to treatment

groups using a spatially balanced design (Robertson et al. 2017)
- Treatments include a control group, where turbines will feather below manufacturer's cut-in speed (3.0 m/s); and a blanket curtailment group, where turbines will feather below wind speeds of 5.0 m/s
- 15 of the 69 turbines at each wind project will be equipped with acoustic detectors
- Turbine treatments are in affect from April 1- October 31st

Phase II (second two years):
- Turbines equally divided into three treatment groups that will be assigned using a spatially balanced design (Robertson et al. 2017)
- Treatments include a control group, where turbines feather below manufacturer's cut-in speed (3.0 m/s); a blanket curtailment group, where turbines will feather below wind speeds of 5.0 m/s; and a ABIC group, where strategic curtailment will be programmed to curtail at certain periods of risk identified during Phase I
- 15 of the 69 turbines at each wind project will be equipped with acoustic detectors
- Turbine treatments are in affect from April 1- October 31st

Data Collection and Monitoring:
- Turbine operations and weather data: During the course of the study turbine operation parameters (e.g., turbine rotations per minute) and weather data (e.g., ambient air temperature, wind speeds at nacelle height) will be recorded at each turbine and summarized for each 10-minute interval. These data will be used to determine conditions in which bats are most active at nacelle height over the course of the bat active season.
- Acoustic bat detectors and activity data: During the course of the study acoustic bat detectors will be deployed at the turbine nacelle and operate from March first through November. Bat passes will be identified to the species level, and where passes cannot be identified by species, passes will be assigned to species groups.
- Standardized carcass searches: Carcass searches are designed to achieve a sample size such that we would detect a significant difference between treatment groups, if present (Section 1.3.1 below). Searches were also designed to ensure compliance with permitted take levels, and limit impacts to gray bats to the level analyzed in this Opinion (Section 4.1.1, below). During the course of the study, from April 1 through October 31, systematic carcass searches will be conducted at each site as follows:
    - During the first year of the study, large cleared plot searches (2 per treatment group, 4 total per wind project, cleared to 100m) will be searched and results will be used to correct detections at other turbines for searched area. Also, during the first year of the study, cleared plots out to 60m will be searched (5 per treatment group, 20 per wind project, cleared to 60m). The remaining 45 turbines at each wind project will be searched using a road and pad protocol out to a radius of 100m from the base.
    - For year 2 and beyond, 24 plots at each wind project will be cleared out to 60m (or the radius around the turbine expected to encompass where 80% of the fatalities are found, whichever is greater) will be searched, and the remaining 45 turbines at each wind project will be searched using a road and pad protocol out to a radius of 100m from the base of each turbine. Fatality detections will be corrected for unsearched areas, based on the results of the large cleared plots in

the first study year (explained above).
    - Each year, standardized carcass searches will be designed such that the probability of detection (g), as calculated using Evidence of Absence software (EoA)[1], is expected to be a minimum point estimate of 0.2 for each year this permit is in effect. In addition, the average resulting g for each study phase should be a minimum of 0.2.
    - Search efficiency and carcass removal trials (bias trials) will be used to estimate the number of bat fatalities that may be overlooked or removed by scavengers. Bias trials will be conducted each season (defined as: Spring, April 1-May 31; Summer, June 1-August 31; and fall, September 1-October 31) and the results will be incorporated into the mortality estimator to determine the calculated take of gray bats. The results of bias trials will also be used to modify the level of search effort the following year.
- The results of carcass searches will be used to evaluate fatality rates by treatment group, along with the recorded exposed bat activity.

Equipment maintenance and monitoring:

- Turbine functionality will be evaluated quarterly in both study phases to verify correct implementation of curtailment strategies. In addition, every acoustic detector will be checked once at least once each season (defined above) to ensure they are functioning properly.

1.3.1. Expected Power of the Study Design

The ability to determine whether fatality rates between treatment groups are statistically significant depends on the number of the turbines in each group, the magnitude of the baseline fatality rate, and precision of fatality estimates. The USFWS worked with the applicant to ensure treatment groups were designed such that statistically significant results could be expected, given the information available about potential fatality rates.

The USFWS conducted a power analysis using programming software code developed to analyze similar wind energy research projects. Three potential fatality scenarios were analyzed including low, mean, and high scenarios. Fatality estimates were derived from all-bat fatality rates from wind facilities in the Service's Midwest region. In addition to fatality scenarios, the analysis also included three scenarios spanning a range in monitoring success (i.e., probability of detection; the probability of a carcasses recovered and counted by searchers). Every modeled scenario demonstrated that a significant difference between treatment groups would be detected, should it exist. Specifically, the probability of detecting a difference between control groups was 1, where $p \leq 0.05$, and $n=10,000$. The results of the power analysis suggest the proposed study design has sufficient power to detect an effect with the treatment groups, as proposed.

1.4. Conservation Measures

Turbine Operations All treatment groups are expected to reduce bat fatalities by varying magnitudes. Operational curtailment is an effective strategy for reducing bat fatalities at wind

[1] Evidence of absence software (Dalthorp et al. 2014) is an application used for estimating bird and bat fatalities at wind farms and designing search protocols.

energy facilities and studies have shown all-bat fatality reductions of over 50%, associated with raising turbine cut-in speeds by 1.5-3.0 m above manufacturer's rate (typically 3.0-3.5 m/s) (Whitby et al 2021, Arnett and Baerwald 2013, USFWS 2020). In addition, feathering (i.e., adjusting the angle of the turbine blade parallel to the wind, to slow or stop the blade rotation) below manufacturer's rate is expected to reduce bat fatalities by over 30% (Whitby et al 2021, Arnett et al. 2011, Good et al. 2016, ACP 2015). In addition, in study phase II the ABIC treatment group will be designed such that turbine operating parameters are expected to reduce bat fatalities at the same or greater level than the 5.0 m/s treatment group. Therefore, we anticipate all treatment groups will minimize gray bat fatalities during the study.

Population Monitoring Each year the applicants will passively census the gray bat maternity colony population at Stinson Cave using a combination of thermal or infra-red recording. Results of this monitoring will be used to establish a baseline population trend and identify whether trends change, potentially because of operating turbines.

Gray bat fatality monitoring As explained above in Section 1.3, standardized carcass searches are designed to achieve study goals, and also to determine accurately if and when impacts to gray bats approach or exceed the permitted level of take analyzed in this Opinion (Section 4.1.1, below). The results of fatality monitoring are evaluated in real time to ensure the bat-in-hand level (*Table 6*) is not exceeded, and annually to ensure the calculated take level is not exceeded (4.3.6). The Service finds the monitoring program sufficient to provide the data the Service needs to ensure compliance with permitted take levels because:

- Fatality monitoring protocols are consistent with those used at other wind facilities and approved by the Service
- Detected fatalities will be corrected with results of seasonal bias trials (i.e., searcher efficiency, and carcass persistence) and unsearched areas
- Fatality monitoring effort (e.g., search interval) will be informed by the results of the previous year's bias trials
- Fatality monitoring shall be designed annually such that the average probability of detection (g), as calculated using EoA, is expected to be a minimum point estimate of 0.2 for each study phase (i.e., monitoring will be sufficiently robust to detect at least 20% of the bats killed by the turbines).

Limiting impacts to gray bats If the level of authorized take is met or exceeded at Kings Point Wind Project or North Fork Ridge Wind Project (either by meeting or exceeding the 'bat-in-hand' limit or the estimated amount of take based on outputs of the GenEst and EoA Software, Table 6) implementing the study plan and return to operations covered in their Technical Assistance Letter (TAL). Specifically, if Kings Point Wind Project meets or exceeds the authorized take limit they will operate according to the Kings Point TAL dated May 10, 2019 (Appendix A). Similarly, if North Fork Ridge Wind Project meets or exceeds the authorized take limit they will operate according to the North Fork Ridge TAL dated June 6th, 2019 (Appendix B). The TALs outline how turbines may operate such that take of Federally listed bat species is unlikely. USFWS may revise the TALs if new information regarding the effectiveness of operating parameters in avoiding impacts to Federally listed bats becomes available. If take limits are met, notification shall be provided to the U.S. Fish and Wildlife Service Missouri Ecological Services Field Office and the Regional Office within 48 hours of determining take

limits have been reached.

Bird and Bat Conservation Plan The applicants will implement the bird and bat conservation plan during the study. The plan includes monitoring and reporting requirements for bird fatalities at King's Point Wind Project and North Fork Wind Project.

2. Status of the Gray Bat

This section presents the biological and ecological information relevant to formulating this BO. Appropriate information on the species' life history, habitat and distribution, and other data on factors necessary to survival are included to provide background for analysis in later sections. Portions of this information are also presented in listing documents, the recovery plan (USFWS 1982) and the draft 2021 5-year review (USFWS 2021) and available literature.

The gray bat was originally listed as an endangered species by the Service in 1976. The main historical threats to the gray bat include human disturbance to roosting bats, environmental contamination, impoundment of waterways, roost modification or destruction (i.e., cave entrance or mine sealing, modification of the internal environment and entrances), cave commercialization, improper gating, and natural calamities such as cave-ins and flood events. Emerging threats, such as interactions with wind turbines, climate change, and white-nose syndrome have been added as potential threats since gray bats were first federally listed in 1976. A more detailed description of historical threats is provided in the Recovery Plan, 2009 5-Year Review, and the draft 2021 5-year review (USFWS 1982; USFWS 2009; USFWS 2021).

2.1. Range and Distribution

Gray bats are found throughout karst areas of the southeastern United States where they primarily roosts in caves, and occasionally in human-made structures such as concrete box culverts, dams, abandoned mines, and bridges (Gerdes et al. 2016; Sasse et al. 2019). Gray bats migrate to and from hibernaculum locations and summer colonies each year, and are considered regional migrants, with average migrations of 200 km (124 mi) (Gerdes et al. 2016). However, some bats have been known to migrate as far as 775 km (481 mi). In the spring, gray bats migrate to caves used as separate bachelor and maternity colonies (Decher and Choate 1995). Hibernating populations are concentrated in caves throughout Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. The summer range extends eastward from eastern Oklahoma and very southeastern Kansas, across Illinois and Indiana and out to southwestern Virginia, western North Carolina, and northwest section of Georgia (Figure 2). Historically, some populations occurred in northwestern Florida which are now considered locally extirpated, and there have been rare cases of foraging gray bats observed in the very northeastern county in Mississippi. There is only one record of a single gray bat hibernating in Pendelton County, West Virginia.

The overall geographic range and distribution has changed relatively little since the gray bat was first listed as endangered in 1976. In particular, the number of occupied hibernacula has changed relatively little. Missouri, Arkansas, Tennessee, Alabama, and Kentucky historically had the highest estimated numbers of hibernating bats and continue to support the largest number of bats in hibernacula. Of the 5,306,905 bats counted during 2019 hibernacula surveys, approximately 28% were found to hibernate in Tennessee, 25% in Alabama, 22% in Arkansas, 15% in

Missouri, and 10% in Kentucky. Given the small number of preferred occupied sites, gray bats are particularly vulnerable to impacts from natural and anthropogenic stressors.

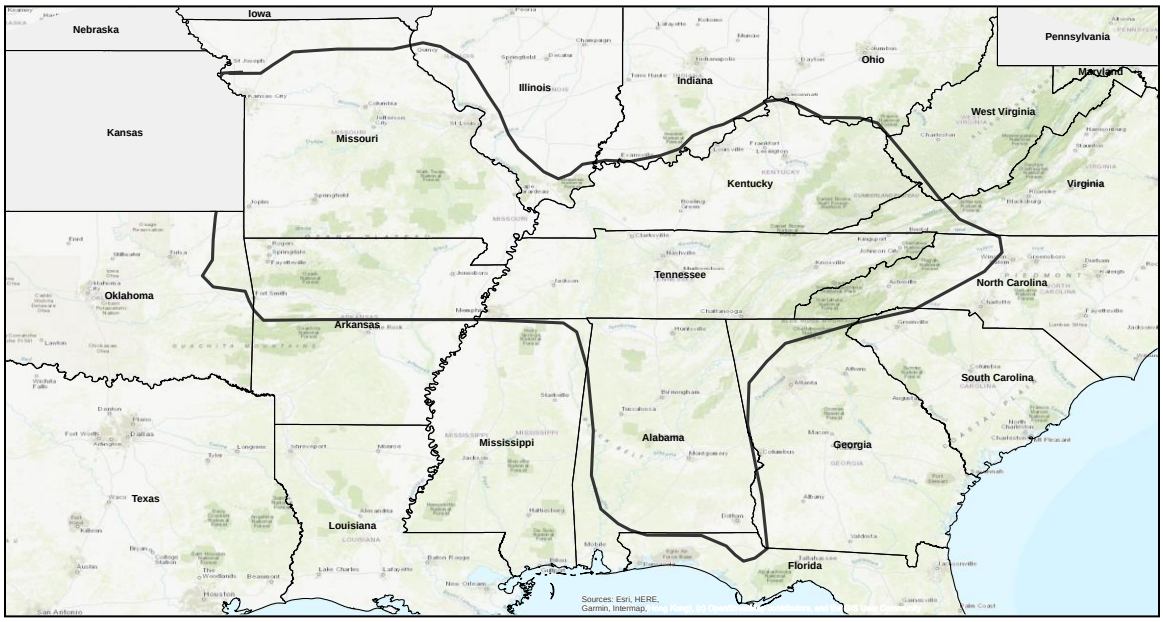

Figure 2 Gray Bat Range: The approximate range of the gray bat, based on cave and mist net captures, visually confirmed records, and assumed movements between roosts. Many acoustic recordings fall outside the estimated range provided here, especially in southern Illinois and southern Indiana, but the presence of gray bats in these areas has not been verified with physical captures (USFWS 2021)

2.2. Life History and Habitat Use

The timing of the annual cycle of gray bats are relevant to the periods of risk at the project. Gray bats are exposed to risk at the project during the following key stages: spring staging and migration, summer roosting and foraging (maternity season), and fall migration and swarming (Table 1).

2.2.1. Spring Staging and Migration

Spring migration typically takes place between mid-March to late May, which may vary based on latitudinal gradients and annual weather patterns (Tuttle 1976). Adult females are thought to emerge and migrate from their winter hibernacula first, followed by first-summer juveniles of both sexes and adult males, and begin migrating to their summer roosts. However, few studies have attempted to document when gray bats emerge from hibernacula in the spring. Migration and stop-over site ecology remain largely unstudied for the gray bat.

During migration, gray bats use transient stop over sites which include caves, trees (Samoray et al. 2020), dams, and artificial structures such as concrete bridges (Sasse 2019). In spring, when fat reserves and food supplies are low and females are pregnant, migration is hazardous (Tuttle 1976). Consequently, mortality may be higher in the early spring, immediately following emergence (Tuttle 1976).

2.2.2. Summer Roosting and Foraging (maternity season)

Male and female gray bats appear to have high site fidelity to their summer and winter roost sites, which is evidenced by the buildup of guano piles in caves over many years or decades and through banding studies which documented female bats returning to the same site year after year (Elder and Gunier 1978).

Early in the spring, males and females may share a common roost. However, pregnant females tend to congregate in a single maternity cave as they come closer to parturition and separate from non-reproductive females and males (USFWS 1982). In larger cave systems which contain multiple rooms, males may also occupy the same site as female maternity colonies (USFWS 2021). The extent of shared roost use is unknown. Maternity colonies are typically large, often with thousands to individuals per colony, with some colonies estimated to have more than 100,000 individuals. Summer caves, especially those used by maternity colonies, are nearly always located within a kilometer of rivers or reservoirs (rarely more than 4 km) over which the bats feed (Tuttle, 1976b).

Birth of a single pup occurs between late May and early June (Tuttle 1975). Growth rates of non-volant young are positively correlated with colony size (Tuttle 1975), because increasing numbers of bats clustering together reduce the thermoregulatory cost per individual (Herreid 1963). Growth rates are also affected positively by higher ambient cave temperatures and porous or domed ceilings at roosts. Though growth rates vary, most young begin to fly (volancy) within 20-25 days after birth. The volancy period may be delayed if colonies are reduced (for example, because of disturbances; Tuttle 1975), and in severely reduced colonies, the young may die before learning to fly. The young are typically seen flying by early to mid-July (USFWS 1982).

Gray bats have a propensity for hunting over large areas in the summer (362.2 ± 24.9 [SE] km2; Moore et al. 2017), given their ability for strong, fast flight (an average wing load of 8.0g/m2). First of year young often feed and take shelter in forested areas close to the roost (USFWS 1982). Also, whenever possible, gray bats of all ages fly in the protection of forest canopy between caves and feeding areas. Such behavior provides increased protection from predators such as screech owls. Forested areas surrounding and connecting roosts and over-water feeding habitat clearly are advantageous to gray bat survival (Tuttle 1979). Additionally, gray bat feeding areas have not been found along sections of river or reservoir where adjacent forest has been cleared (LaVal et al. 1977).

2.2.3. Fall Migration and Swarming

After the summer maternity period, gray bats migrate to their winter hibernacula. Fall migration usually occurs from early August to mid-November (Tuttle, 1976; Gerdes, 2016) (Table 1). As during spring migration bats use transient roosts (e.g., ‘stop-over’ caves) when migrating long distances, while bats migrating short distances may make direct movements to hibernacula. Very few studies have attempted to document spring and fall migratory pathways, and little is known about bat movements between summer and winter caves (but see LaVal et al. 1977; Thomas and Best, 2000; Moore et al. 2016). The duration spent at transient locations by individual gray bats is unknown. However, in Missouri, recordings from bat detectors placed at transient caves during the migratory period show that transient caves are used over several weeks each spring and fall (USFWS unpublished data).

Once bats have arrived at winter roosts (i.e., hibernaculum) in the fall, during a several week swarming period, bats fly in and out of cave entrances from dusk to dawn and mate. Females delay fertilization by storing the sperm and become pregnant once they ovulate in the spring (Tuttle 1976).

2.2.4. Winter Hibernation

Females immediately enter hibernation after copulation (Tuttle 1976). Generally, female bats mate and begin winter torpor during mid-September to mid-October (USFWS 1982). Juveniles and adult males tend to enter hibernation several weeks later than adult females, but most are in hibernation by mid-November. Hibernation lasts six to seven months (Tuttle 1976).

Gray bats hibernate in caves and mines with cold, stable microclimates. Most winter caves are deep and vertical and provide large volume below the lowest entrance and act as cold air traps. There are few vertical caves within the range of the gray bat that meet these specifications, which likely contributes to the gray bat's use of a very limited number of hibernacula (Tuttle 1976). It is estimated that 98% of gray bats hibernate in just 15 caves (USFWS 2021). Hibernating individuals form large, dense clusters, ranging in size from a few hundred to over a million per cave.

A study in Missouri has demonstrated gray bats are generally philopatric to a hibernaculum (i.e., they return annually to the same hibernaculum each year; Colatskie et al. 2018, but see Elder and Gunier 1978).

Table 1 Generalized Annual Cycle: Overview of timing for gray bat hibernation, spring migration, breeding, and fall migration (Tuttle 1976, LeVal 1977, Decher and Choate 1995, USFWS)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hibernation												
Spring Migration												
Summer Roosting and Foraging												
Fall Migration												

2.3. Population Status and Threats

2.3.1. Species Population Status

The population of the gray bat has increased significantly in hibernacula since they were listed in 1976, and population trend analyses indicate gray bats range-wide are stable and increasing (Figure 3; USFWS 2021). The current range-wide population estimate for the gray bat based on winter surveys of hibernacula is 5,306,905 individuals.

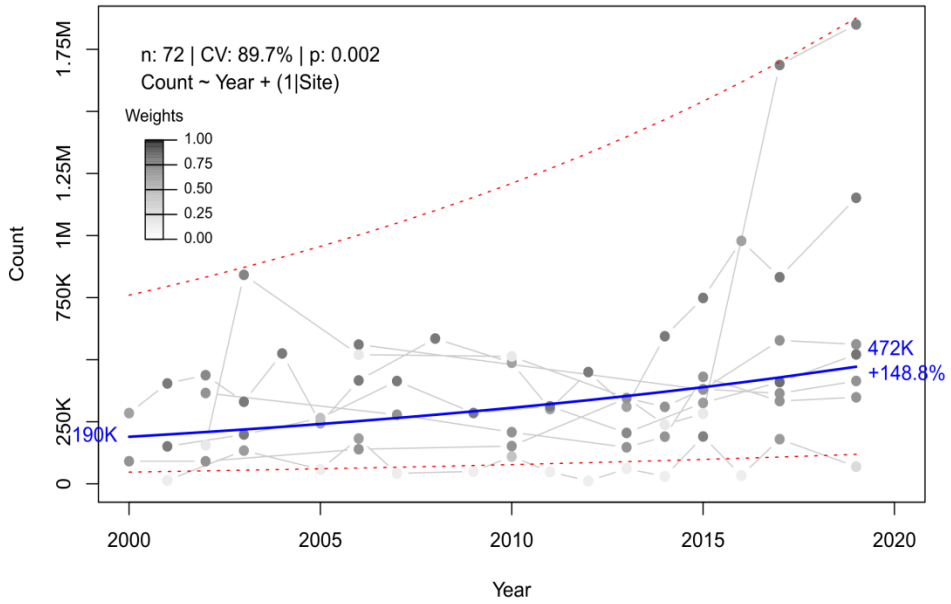

Figure 3. Hibernacula Populations: The regression line represents count data from 13 hibernation sites included in the analysis. Counts are shaded by assigned survey method confidence weights, with darker shade indicating greater weight. The blue line depicts the predicted regression line from the linear mixed model, and blue text represents predicted starting and ending population sizes and percent change in population size over the modeled period. Red dashed lines represent 95% confidence intervals of predicted values. Source: USFWS 2021

2.3.2. Status within Missouri

Based on survey data from 2000 to 2019, Missouri is home to approximately 14 gray bat maternity colonies that each support at least 10,000 bats. There are likely at least 10 more colonies that support 5,000 or more bats in the summertime, but the populations are not counted regularly, and the colonies may have more or fewer than 5,000 individuals (MDC 2020). Of these 24 maternal colonies, one is known to use the action area during summer maternity season (Stinson Cave maternity colony; Section 3.1.3), although the action area may also be used by other populations from unknown caves and structures.

Based on the most recent population counts at gray bat hibernacula, the Missouri population is approximately 768,731 individuals (USFWS 2021). Coffin cave hosts the largest hibernaculum population in the State, approximately 561,936 individuals, or 0.73% of the Missouri population. Gray bats in the Action Area are presumed to be primarily part of the Coffin Cave hibernaculum population because this is the largest and closest hibernaculum to the action area. However, individuals of the same summer colony are known to use multiple hibernacula and may travel further distances other hibernating populations (Elder and Gunier 1978).

It is currently unknown if summer and winter colonies in Missouri are increasing, decreasing, or stable. However, the Missouri Department of Conservation (MDC) has not noted any obvious or apparent declines during the last ten years at the four major hibernacula which occur within Missouri (Shelly Colatskie, Missouri Department of Conservation, pers. comm. 1/7/2021).

3. Environmental Baseline

In accordance with 50 CFR 402.02, the environmental baseline refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Below, we describe the baseline condition of the gray bat's environment within the Action Area, including the study area at Kings Point Wind Facility, North Fork Wind Facility, and Stinson Cave (location of ongoing maternity colony population monitoring).

3.1. Habitat Characteristics in the Action Area

3.1.1. Kings Point Wind Project

The Kings Point Wind Project encompasses approximately 8,515 acres (ac; 3,446 hectares [ha]) in Barton, Dade, Lawrence, and Jasper Counties, south-west Missouri (Figure 1). Not every acre within the boundary will be directly or indirectly affected by the operation of the wind turbines. However, assessing the habitat characteristics within the Project's boundary provides some context for the habitat types that are likely to occur in areas directly or indirectly affected by the operation of turbines and helps us characterize the baseline conditions.

Most of this area is currently used for agriculture. According to the U.S. Geological Survey (USGS) National Land Cover Dataset, lands within the boundary of Kings Point Wind Project is primarily hay/pasture (51%), cultivated crop (38%), deciduous forest (7%), and developed open space (4%). Other minor land use categories cover less than 1% of the project area (Yang et al. 2018). Cultivated row crops occur throughout the Project and include soybeans, corn, and wheat. The land cover within the boundary of the Project is summarized in Table 2.

The Project supports gray bat foraging habitat, and habitat use has been observed throughout the bat active season (Section 3.2.1, below). The Project does not support wintering habitat for gray bats; there are no caves or mines suitable for use as hibernacula. Gray bats using habitat within the Kings Point Wind Project boundary are most likely part of the Coffin cave wintering population of gray bats.

In summary, the Kings Point Wind Project includes suitable summer and migratory habitat for gray bats, no known hibernacula are present within the boundary of the project.

Table 2 Land cover types within the boundary of Kings Point Wind Project. Sources: Yang et al. 2018.

Habitat	Approximate Proportion of Project Area
Pasture/Hay	50.5%
Cultivated Crops	37.8%
Deciduous Forest	6.8%
Mixed Forest	0.1%
Evergreen Forest	0.0%
Barren Land	0.0%
Developed, Open Space	3.6%
Developed, Low Intensity	0.3%
Developed, Medium Intensity	0.1%
Developed, High Intensity	0.0%
Open Water	0.3%
Shrub/Scrub	0.2%
Grassland/Herbaceous	0.3%
Woody Wetlands	0.2%
Emergent Herbaceous Wetlands	0.0%

3.1.2. North Fork Wind Project

The North Fork Ridge Wind Project encompasses approximately 10,145 ac (4105.5 ha) in Barton, Dade, Lawrence, and Jasper Counties, south-west Missouri (Figure 2). Most of this area is currently used for agriculture. We recognize that not every acre within the boundary will be directly or indirectly affected by the operation of the wind turbines. However, assessing the habitat characteristics within the Project's boundary provides some context for the habitat types that are likely to occur in areas directly or indirectly affected by the operation of turbines and helps us characterize the baseline conditions.

According to the U.S. Geological Survey (USGS) National Land Cover Dataset, the habitat within the North Fork Ridge Wind Project boundary is primarily cultivated crop (52%), hay/pasture (35%) deciduous forest (7%), and developed open space (3%). Other minor land use categories cover 1% or less of the Project (Yang et al. 2018). Cultivated row crops occur throughout the Project and include soybeans, corn, and wheat. The land cover within the boundary of North Fork Ridge Wind Project is summarized in Table 3.

The Project supports gray bat foraging habitat, and habitat use has been observed throughout the bat active season (Section 3.1.2). The Project does not support wintering habitat for gray bats; there are no caves or mines suitable for use as hibernacula. Gray bats using habitat within the North Fork Ridge Wind Project boundary are most likely part of the Coffin cave wintering population of gray bats (explained further in Section 3.1.2).

In summary, the North Fork Ridge Wind Project includes suitable summer and migratory habitat for gray bats, no known hibernacula are present within the boundary of the project.

Table 3 Land cover types within the boundary of North Fork Ridge Wind Project. Sources: Yang et al. 2018.

Habitat	Approximate Proportion of Project Area
Cultivated Crops	51.5%
Pasture/Hay	34.7%
Deciduous Forest	6.9%
Barren Land	0.3%
Developed, Open Space	3.1%
Developed, Low Intensity	0.6%
Developed, Medium Intensity	0.1%
Developed, High Intesity	0.0%
Open Water	1.1%
Grassland/Herbaceous	0.3%
Woody Wetlands	1.1%
Shrub/Scrub	0.0%
Emergent Herbaceous Wetlands	0.2%
Mixed Forest	0.1%

3.1.3. Stinson Cave

Stinson Cave is located in the unincorporated town of Stinson, Missouri, approximately 14.5 km (9.0 mi) from the boundary of Kings Point Wind Project (Figure 1). The area is within the Mississippian Burlington Limestone geology, with historical records of caves occurring throughout. The entrance to Stinson Cave, where population monitoring will take place, is in a forested valley that lies within the riparian zone of an ephemeral stream which flows into the mouth of the cave. The cave entrance is approximately 0.5 mi south of Turnback Creek. The main cave opening is approximately 40 feet (ft) wide and 15 ft tall, forming a rounded chamber that extends back to a smaller cave entrance, which is approximately 6 ft wide and 3 ft high.

3.2. Gray Bat Populations in the Action Area

3.2.1. Kings Point Wind Project

Pre-construction studies were conducted in 2017, 2018, and 2019. The results of these studies are summarized in Table 4, below. Detailed methods and results are available in the referenced reports. The results of these studies demonstrate suitable foraging habitat is present within the boundary of Kings Point Wind Project and bats use the area during the spring migration, summer maternity, and fall migration seasons. The Project does not support winter roost habitat. However, migrating individuals are presumed primarily to be part of the Coffin Cave hibernaculum population. Coffin Cave supports the closest known hibernaculum population to the Action Area, and this is the largest hibernaculum population in Missouri. Study results also indicate Stinson Cave is the source maternity colony population foraging at the Project during the summer maternity season. However, bats at Stinson Cave have also been documented foraging in areas southeast of the cave (outside of the Project boundary), and likely take advantage of available resources closer to the cave than the Project (ESI 2019).

In summary, gray bats use habitat within the boundary of Kings Point Wind Project throughout the bat active season including spring migration, summer maternity season, and fall migration. The source population during summer maternity season is presumed to be the primarily the Stinson Cave maternity colony (Section 3.1.3). Although other summer populations (male or female) in unknown caves and structures may also use habitat within the project boundary. All gray bats at Kings Point Wind Project are also presumed to be part of the Coffin Cave hibernaculum population.

Table 4 Summary of Pre-construction Studies and Results at Kings Point Wind Project

Survey	Summary	References
MET tower acoustic studies (2017-2018)	• Two detectors deployed on one MET towers in 2017 from July 10-November 22, and in 2018 from March 8- November 8 • Majority of bat activity occurred when temperatures were above 15°C (59˚ F) • All gray bat detections occurred when wind speeds were below 8.0 m/s • Gray bat detections occurred from April through November 10	Stantec 2019 Stantec. 2019b
Acoustic surveys (2018)	• Acoustic detectors deployed May 31-June 4, and June 13-15 • Eastern red bats made up 66.6% of all bat passes, followed by evening bat (19.1%). • Gray bat made up 1.9% of bat passes, tri-colored bat made up 4.6% and little brown bat made up 2.3%	Stantec 2019c
Mist-net and telemetry (2018)	• Study effort was focused on capturing gray bats to track to maternity roosts • Mist-netting conducted at three sites July 24-26, 2018; 30 eastern red bats, and 4 gray bats were captured. • Gray bats were tracked to Stinson Cave approximately 14.5 km (9.0 mi) from the eastern edge of Kings Point boundary.	Stantec 2019c
Mist-net and aerial radio-tracking (2019)	• Mist-netting conducted at two sites within boundary, and on site near Stinson Cave. • Tracked gray bats included 5 adult females, two juvenile females, and one juvenile male. • Gray bats were tracked from an airplane	Stantec 2019d ESI 2019

	and locations indicated females foraging within the Kings Point boundary on a nightly basis. • None of the juvenile gray bats were detected within the boundary, but were observed gradually foraging a greater distance from the cave	

3.2.2. North Fork Wind Project

Pre-construction studies were conducted in 2017, 2018, and 2019. The results of these studies are summarized in Table 5, below. Detailed methods and results are available in the referenced reports. Despite appropriate level of survey effort, no gray bats were captured during these studies, and presence was determined by acoustic detections demonstrating that bats pass through and may forage within the boundary of North Fork Ridge Project. Therefore, gray bats make use of the area during the spring migration, summer maternity, and fall migration seasons. The Project does not support winter roost habitat. However, migrating individuals are presumed to be of the Coffin Cave hibernaculum population. Coffin Cave is the closest known hibernaculum population to the Action Area, and the largest hibernaculum population in Missouri. Study results also indicate that individuals from the nearest known maternity colony population, Pittsburg colony (approximately 6.8 miles west of the Project), are not likely to use habitat within the North Fork Wind Project boundary for foraging during the summer maternity season (ESI 2019b).

In summary, gray bats use habitat within the boundary of North Fork Wind Project during the bat active season during spring migration, summer maternity season, and fall migration. All gray bats at Kings Point Wind Project are presumed to be part of the Coffin Cave hibernaculum population.

Table 5 Summary of Pre-construction Studies and Results at North Fork Ridge Wind Project

Survey	Summary	References
MET tower acoustic studies (2017-2019)	• Two detectors deployed on one MET tower in 2018 from July 7-November 22, in 2018 from March 8- November 8; and on three MET towers in 2019 from February 28-December 4th • All bat activity was generally highest when temperatures were above 15° C (59˚ F) and wind speeds were between 3 and 8 m/s (6.7 and 17.9 mph) • 20 gray bat passes were detected in 2019 • The earliest gray bat detection was May 8th, and the latest detection was October 25th	Stantec 2019e Stantec 2020f

Presence/Absence Acoustic surveys (2018)	• Acoustic detectors deployed June 3-6, and June 11-13 and included two detectors at each site • Eastern red bat made up 54.4% of all bat passes, followed by evening bat (20.6%), and tri-colored bat (16.6%). • Gray bat made up 2.0% of bat passes and little brown bat made up 2.3%	Stantec 2018
Mist-net and telemetry (2018-2019)	• Study effort was focused on capturing gray bats to track to maternity roosts • Mist-netting conducted at two locations August 6-9, 2018; 54 eastern red bats, 3 big brown bats, and 1 tri-colored bat were captured. • No gray bats were captured	Stantec 2018
Mist-net and aerial radio-tracking (2019)	• Mist-netting conducted at Pittsburg roost and bats were tracked to assess habitat use around within boundary of North Fork Ridge Wind Project • Tracked gray bats included 10 adult females and 1 juvenile female • Gray bats were tracked from a fixed-wing plane and locations indicated females traveling along creeks, overland, and rarely over land through developed areas. Foraging areas primarily consisted of streams and woody wetlands. Wetlands are abundantly available around Pittsburg due to the presence of inundated historic strip-mining sites. • Results indicate Pittsburg colony gray bats have relatively small home ranges and do not forage within the boundary of North Fork Ridge Wind Project	Stantec 2019f ESI 2019a

3.2.3. Stinson Cave

The Stinson Cave hosts a gray bat maternity colony population. Thermal infrared population counts conducted in June of 2020 indicate a population size of 8,008 adult females (average of three counts). The Missouri Department of Conservation estimated the population size to be 16,973.5 based on spring emergence counts in 2011 and 2012 (pers. Comm. Shelly Colatskie, sited in ESI 2019). However, 2020 studies used thermal video to census bats and these estimates are used as the baseline population size for the purpose of this analysis and Opinion.

3.3. Factors Affecting Gray Bats in the Action Area

This section describes factors affecting the environment of the species in the Action Area. The environmental baseline includes state, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress. Related and unrelated Federal actions affecting the same species that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the Action Area that may benefit listed species or critical habitat.

A Missouri Department of Transportation and Federal Highway Administration (FHWA) project to improve Bagnell Dam in Miller County, Missouri is also expected to impact gray bats populations affected by the Action (i.e. Coffin Cave hibernaculum population). In addition, factors affecting the gray bat environment within the Action Area are a subset of potential threats, affecting the species' range-wide. These factors include climate change and wind turbine-related fatalities.

3.3.1. Bridge Rehabilitation at Bagnell Dam

The Service concluded formal consultation with the FHWA's project to repair the bridge over Bagnell Dam in Miller County, Missouri in February 2021. The repair work, anticipated to start September 1, 2021, will affect a cavernous understructure below the bridge that is used by summer and fall roosting gray bats. These bats are also presumed to be part of the Coffin Cave hibernaculum population. Prior to repair work beginning, bats will be excluded from the structure, and any bats occupying the structure prior to work beginning will be manually relocated. As part of this project, Missouri Department of Transportation is also providing funding to protect a priority gray bat cave. No net loss to gray bats is expected as a result of these conservation commitments and therefore no appreciable difference is expected as a result of the aggregated impacts of the FHWA's project and the Service's Action in authorizing take resulting from the study plan.

3.3.2. Climate Change

Average global temperatures are increasing and likely will continue to do so into the future. This changing climate has had and will likely continue to have a multitude of impacts on bat species throughout North America. There is growing concern about impacts to bat populations in response to climate change (Jones et al. 2009, Jones and Rebelo 2013, O'Shea et al. 2016, p. 9). Jones et al. (2009, p. 94) identified several climate change factors that may impact bats, including changes in hibernation, mortality from extreme drought, cold, or rainfall, cyclones, loss of roosts from sea level rise, and impacts from human responses to climate change (e.g., wind turbines). Sherwin et al. (2012) reviewed potential impacts of climate change on foraging, roosting, reproduction, and biogeography of bats and also discussed extreme weather events and indirect effects of climate change. However, the impact of climate change is unknown for most species.

During winter, only a small proportion of caves provide the right conditions for hibernating gray bats because of the species' very specific temperature requirements. Surface temperature is directly related to cave temperature, so climate change will inevitably affect the suitability of hibernacula. Cave temperatures respond to changes in ambient climate(unpublished data,

Missouri Field Office, March 2021) although the magnitude of the response likely varies from cave to cave due to the physical layout and location of the cave (cave length, size of cave opening, the number of openings, and multiple other factors). Impacts on the availability or timing of emergence of insect prey are also likely.

In the spring and summer, large scale precipitation events that result in major floods remain a threat to some gray bat caves and may become a more serious threat in the future due to climate change. During the summer, gray bats tend to occupy and rear young in caves directly adjacent to or close to rivers and large bodies of water. Some of the caves occur at similar altitudes as the waterbodies and are therefore prone to flooding during major flood events.

Among available energy sources, wind turbines have some of the lowest life-cycle greenhouse gas emissions and global warming potential. Currently, only blanket curtailment has demonstrated broad-scale reduction of bat fatalities at wind energy facilities. However, blanket curtailment is associated with some loss in energy production, which can jeopardize the profitability of a renewable energy project.

Activity-based smart curtailment is one of several recent technologies that aims to reduce the environmental impact of wind energy while minimizing lost power and revenue. Efforts to better understand and reduce the environmental impacts of wind power without compromising energy production will reduce burdens on the industry and improve the effectiveness of wind as a low-carbon, renewable energy source. In turn, a growing global reliance on wind energy is expected to ease the negative effects of climate change on wildlife, including bats.

3.3.3. Wind Turbine-related Fatalities

Bat mortality has been documented at wind energy facilities worldwide (Arnett et al. 2008). Two types of bat mortality have been reported at wind facilities: direct impact with a spinning turbine blade or from barotrauma (Baerwald et al. 2008). However, more recent studies have concluded that traumatic injury from direct impact is still the leading cause of death (Rollins et al. 2012, Grodsky et al. 2011). The primary bat species affected by wind facilities are migratory, foliage- and tree-roosting lasiurine species that undergo long distance migrations and do not hibernate in caves (i.e., Eastern red bat, Silver-haired bat, and Hoary bat [Lasiurus cinereus]). Arnett et al. (2016) compiled data from publicly available sources in the U.S. and Canada and found that mortality has been reported for 21 of the 47 bat species known to occur north of Mexico. Of the 21 species, the Hoary bat, Eastern red bat, and Silver-haired bat have the highest mortality rates, with the Hoary bat making up 78.4% of all fatalities (Arnett et al. 2016).

As of July 2021, no gray bat fatalities have been reported at wind energy facilities. However, present wind energy distribution overlaps with only a small portion of the gray bat's range, and wind-generating capacity is relatively low in the southeastern U.S. (USFWS 2021). Because so few wind energy facilities exist within the range of the gray bat there is limited information on the potential impact wind power could have on gray bats. To understand the potential impact of turbine related fatalities as a result of the Action (Section 4, below) we 1) determined an average all-bat fatality rate using post construction monitoring data at wind facilities in the Service's Midwest Region and used little brown bat fatality rates (pre-WNS period) as a surrogate for which to estimate impacts to gray bats. We then analyzed the impact of the estimated take to

local gray bat populations.

4. Effects of the Action

In accordance with 50 CFR 402.02, effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (See § 402.17).

We evaluated the effects of the Action (i.e. implementation of the permit and associated study plan) to the gray bat. In doing so, we followed a hierarchal framework, which is consistent with the manner that we analyze the impacts of wind power projects. This approach consists of analyzing: 1) effects to individuals; 2) effects to maternity colonies and hibernating populations; 3) effects to relevant Recovery Units; and, 4) effects to the species. There are not recovery units established for gray bat, therefore we analyzed the effect to the Missouri population.

Both the ABIC strategy and blanket curtailment at wind speeds (i.e., <3.0 m/s and <5.0 m/s) are hypothesized to reduce the number of bats killed by wind turbines (Section 1.4). As previously stated, the Study is expected to provide valuable insights on bat interactions with wind turbines, add to a growing body of knowledge on the relative effectiveness of ABIC, and contribute to advancing wind energy technology and reducing associated environmental impacts. However, as we do not yet know the likely magnitude of effect of each treatment to gray bats, we used fatality data available for little brown bats and all bat species to estimate potential fatalities, determine an appropriate authorized take level for the permit, and to analyze the effect of the authorized take to gray bats (explained in sections below). The impacts to gray bats are confined by the amount of take authorized, and the timeframe of the permit (Sections 1.4 and 4.3.6).

4.1. Effects of the Study Plan (turbine operations)

The study plan necessitates the operation of turbines as explained in Section 1.4. Results of pre-construction studies demonstrated gray bats are present within the Action Area and are likely to be affected by turbine operations throughout the bat active season (the Action Area does not support winter habitat).

Implementation of the study plan (i.e. operating turbines) is likely to have negative effects to gray bats during migration and the summer maternity season. Gray bats have the potential to collide with spinning turbine blades, which usually causes injury or death. Additionally, flying in very close proximity to spinning turbine blades may cause barotrauma, which may also be lethal. The implementation of the permit and association study plan includes spinning of wind turbine blades, this is expected to cause lethal take of gray bats. Populations affected by these fatalities include the Stinson Cave maternity colony population, and migratory maternity colonies that are part of the Coffin Cave hibernaculum population. The impacts to these populations are analyzed in the Sections below.

4.1.1. Proposed Take Authorization

The impact of wind turbine related fatalities to gray bats is unknown. However, interactions with turbines are a well-documented source for fatality for bats and we used these data, and little brown bat as a surrogate species, to estimate gray bat fatalities, and determine take authorization that will occur as a result of the Action.

Little brown bat was used as a surrogate species for which to estimate the magnitude of potential impacts to gray bats, because the two species share similar life history traits and because there is little information on the effects of turbines on gray bats. These life history traits may influence the magnitude of exposure of both species to operating turbines. Like gray bats, little brown bats are strong fliers that migrate between summer and winter grounds, forage near and over water bodies, and hibernate in caves in large numbers. Both gray bats and little brown bats are often documented hunting in open conditions, typically over and adjacent to large waterbodies (LaVal et al. 1977; Moore et al. 2016; Nelson and Gillam 2017). Both little brown and gray bats are considered among the most open-air hunting species of the Myotis genus (Chris Corben, pers. comm, 2020). Both species are relatively powerful flyers; gray bat wing loads are similar to that of the little brown bat (gray bat: 8.0 g/m 2; little brown bat: 7.5 g/m2).

Little brown bats also form large nurseries during the summer, which can consist of several hundred individuals (Olsen and Barclay 2013), although these colonies are typically smaller than summer gray bat maternity colonies. In the winter, little brown bats congregate by the thousands in hibernacula, although this is increasingly rare because of reductions in populations due to white-nose syndrome. Little brown bat seasonal movements are also comparable in length to that of gray bat (USFWS 2021).

Gray bats may be more vulnerable to wind turbine collisions than little brown bats because they congregate in larger numbers during the spring, summer and fall, and may travel over longer distances to foraging grounds within their summer home range. However, because of the species similarities and the lack of gray bat specific fatality data (due to the current limited overlap of wind facilities with gray bat range), we assume the impacts of wind turbines to the little brown bat (prior to WNS) are comparable to what we would observe for gray bats. Therefore, we used the reported little brown bat composition of wind fatalities from within the Service's Midwest Region (USFWS 2020; 11.13% of the all-bat fatality rate, pre-WNS) to estimate potential fatalities of gray bats and analyze affects to the species.

We reviewed Service data from compiled post-construction monitoring at wind facilities within the Service's Midwest Region (USFWS 2020) and derived estimated fatality rates for gray bats. The Service compiled data from studies where turbines did not use cut-in speeds, and further filtered studies that included a minimum weekly search interval. These compiled data were adjusted for seasonal distributions in fatality, survey period, and area of plot searched. We further filtered available studies to only include data prior to white-nose syndrome disease arrival. As WNS-affected bat populations decline it appears that fatality rates at wind facilities also decline. Gray bats do not appear to be affected by WNS, so it is important to consider pre-WNS fatality rates in estimating impacts to the species. Post construction monitoring data from wind facilities across the region were available for compilation and standardization, and studies included data from pre-WNS time periods.

As a result, 38 studies were used estimate potential impacts to gray bats. The resulting estimated impact associated with the study plan at King's Point Wind Project is 1.58 gray bats/MW/y and was determined using the mean all-bat fatality rate and little brown bat fatality composition. The resulting estimated impact associated with North Fork Wind Project is 1.03 gray bats/MW/y and was determined using the median all-bat fatality rate and little brown bat fatality composition. We used a higher all-bat fatality rate to estimate impacts at King's Point Wind Project because results of pre-construction studies have demonstrated more frequent gray bat use of that area.

The estimated impacts, explained above, were used to define take authorized by the action of issuing a permit. The effects of the action to gray bats are limited by the bounds of the authorized take (Table 6) in the permit, and the permit term. Should the impacts of the action meet the authorized level of take, the study would cease, and turbines would operate in a manner to avoid further impacts to gray bats. The authorized take as a result of the action is presented in Table 6 below. In the following sections we analyze how this take could impact individuals and populations of gray bats.

Table 6 Proposed take Authorization

	Study Phase I (two years) *Calculated/bat-in-hand*	Study Phase II (two years) *Calculated/bat-in-hand*
Kings Point Wind Project	251/46	230/43
North Fork Wind Project	164/30	150/28

4.2. Effects of Population Monitoring

Population counts at Stinson Cave will occur annually. Counts will be passive and use a combination of thermal or infra-red recording devices to record bats as they emerge from the cave. There may be minor, temporary adverse effects from presence of two biologists using recording devices at the cave entrance, but effects are not anticipated to rise to cause harm. Population counts are not anticipated to impair breeding, feeding, or sheltering of gray bats at Stinson Cave.

4.3. Framework of Analyses and Assumptions

Our analyses below evaluate the response of gray bats to the proposed action. Results of these analyses are used to determine whether the proposed action could reduce likelihood of survival and recovery of the species.

We considered effects to gray bats in a stepwise approach beginning with impacts to individuals, then populations, and concluding with impacts at the species-level. If there are no impacts at a population level, then it is not necessary to evaluate impacts at the species-level.

4.3.1. Demographic Model

Impacts to gray bat populations were analyzed using the Bat Tool (Erickson et al. 2014). The Bat

Tool uses the Thogmartin et al. 2013 population model in R. Thogmartin et al. (2013) developed a stochastic, stage-based population model to forecast the population dynamics of the Indiana bat, subject to WNS. This model was developed in coordination with (and funding from) the Service as a tool for the Service to use in evaluating how the take of species of Myotis from various types of projects will affect their populations. This model is regularly used by the Service to evaluate impact scenarios on listed bat populations and explicitly incorporates environmental and demographic stochasticity. The Bat Tool was originally developed to model Indiana bat hibernacula populations; however, we modified parameters (with the inputs and assumptions explained below) to specifically model the impact of the study plan to populations affected by the Action (the Stinson maternity colony and the Coffin Cave hibernaculum population) and determine whether populations would continue to persist into the future.

To understand if take associated with the Action appreciably changes the probability of persistence of populations, we analyzed the impact of the take of gray bats at two population levels 1) maternity colony level; and, 2) winter hibernaculum level.

4.3.2. Model Parameters and Relevant Outputs

For each analyzed scenario (below), we ran 10,000 simulations and summarized the simulation results for the following metrics: probability of extinction in 50 years (of the modeled population), median time to extinction (of the modeled population), and median ending lambda after 50 years (Table 3). We compared the results of each baseline scenario to the corresponding expected take scenario, and determined whether the Action could result in an appreciable difference to the modeled population. An "appreciable difference" is defined as a reduction of more than 5% in 1 or more metric (probability of extinction, median time to extinction, and median ending lambda after 50 years. "Appreciable difference" was not defined using biologically relevant data on population dynamics but used as a conservative threshold to determine if additional population analyses are warranted.

4.3.3. Impacts to Females

The demographic model used in this analysis (Bat Tool) only considers female bats. Typically, when we analyze the impact of wind to bats, we do not directly input the total take number (which includes both male and female bats); and instead estimate the number of female bats taken. However, we expect the impact of this Action to disproportionately effect female gray bats (i.e., the Stinson cave maternity colony population), and insufficient information is available to estimate a proportion of impact expected to females. Therefore, to be conservative in our assumptions, we directly input the total take into the model such that the model considers all impacts only to females. This approach errors on the side of over estimating impacts to the species because it is likely a proportion of the fatalities will be male gray bats.

4.3.4. Impacts to Migratory Maternity Colonies

We assume individuals who are part of the Stinson Cave maternity colony are at higher risk of impact than migratory colonies because results of pre-construction studies demonstrate this maternity colony as a source population for bats using habitat at Kings Point Wind Project (therefore we analyze impacts to this population separately in Section 4.4.1, below). However, we do not have information about migratory pathways, or any evidence to support that that one migratory maternity colony will be disproportionately impacted compared to other migratory

colonies. Therefore, we analyzed the impact of the take to the Coffin Cave hibernaculum population, of which we assume all migratory bats affected by the action are part of.

4.3.5. Distribution of Impacts

Take of gray bats (Table 6) was distributed (as explained below), to determine impact inputs into the Bat Tool.

Seasonally-We assume the seasonal distribution of impacts to gray bats are similar to the proportion of total bat mortality reported in each season (USFWS 2016). Seasonal distribution of impact is expected as follows: 6.63% fatalities in spring, 25.63% fatalities in summer, 68.13% fatalities in the fall.

Resident maternity colonies- We analyzed impacts to the Stinson cave maternity colony population, as individuals at this cave have been determined to forage within the Action Area during the summer maternity season.

4.3.6. Impacts defined by Take Limits

The modeled impacts of the action are limited by the bounds of the take authorization and the permit term (Sections 1.3 and 1.4). Actual impacts could be lower, however, for this analysis we model the maximum impact possible, within the bounds of the Service's permit.

4.3.7. Starting Population Sizes

Estimates of current population size were compiled from pre-construction studies, and census data collected from the Missouri Department of Conservation (Table 7). We assume that half of the estimated population size at Coffin Cave Hibernaculum is female. We also assume the female population at the Stinson Cave maternity colony is the average of three counts performed before the estimated volancy period (counts were conducted in early June 2020). It's possible that some individuals that use Stinson Cave are also males (Elder and Gunier 1978), however only females and young of the year have been captured at this location and we assume the Cave is primarily a maternity colony during the early maternity season.

Table 7 Starting population sizes

	Stinson Cave Maternity Colony	Coffin Cave Hibernaculum
Starting female population	8,008	280,968
Starting adult proportion of the	1	.8

population		

4.4. Step-1 Effects to Individuals

The Proposed Action is likely to result in the death of individuals over the four-year proposed permit term (Table 6. Individual gray bats are expected to die due to collision with wind turbines during migration, and collision with wind turbines while foraging in the summer months in the Action Area. In the sections below, we assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong.

There is also potential for sublethal or delayed-lethal effects to individuals from interactions with turbines at the Project. Particularly, potential impairment of hearing from damage to the ear has been noted, but there are no data to help quantify how many bats may suffer such damage and die later.

4.5. Step-2 Effects to Populations

We evaluated the likely consequences of the anticipated gray bat fatality to the relevant populations (Table 7). Specifically, we analyzed how the impacts to individuals are likely to affect the Stinson Cave maternity colony and the hibernating population at Coffin Cave. Note that there is no designated critical habitat for the gray bat in or near the Action Area, and, thus, no potential for the Action to affect critical habitat.

4.5.1. Step-2a Effects to Stinson Cave Maternity Colony

The Action is likely to impact the maternity colony population in Stinson cave (Stinson *Cave* 3.2.3). For the purpose of this analysis, we assume all take at Kings Point Wind Project will occur to individuals of the Stinson Cave maternity colony. We used the Bat Tool to determine the effects the loss those individuals would have to the colony. The results do not demonstrate appreciable reductions relative to the baseline in any of the metrics (Table 8). Based on these results, we conclude that take from the proposed Action will not cause an appreciable difference in the fitness of the Stinson Cave maternity colony.

Table 8 Expected impacts to Stinson Cave maternity colony

Stinson Cave Maternity Colony		Extinction Probability in 50 Years	Median Time to Extinction	Median Ending Lambda at 50 years
	Baseline	0.00	N/A	0.99
	Effects of the take	0.00	N/A	0.99

4.5.2. Step-2b Effects to the Hibernaculum Population

Analyses in step 2a indicate that impacts of the proposed action will not affect the fitness of the Stinson maternity colony. We expect the proposed action to kill gray bats during the spring and fall migratory periods when moving between summer and winter habitat. Because we do not

have enough information about migratory maternity colonies that could be affected by the action, we evaluated the aggregated consequences of the Action to the Coffin Cave hibernaculum population, where individuals affected by the Action are most likely to hibernate in the winter. We assume all maternity colony populations affected by the proposed Action are part of the Coffin Cave hibernaculum population, because this is the closest and largest hibernaculum to the action area.

We used the Bat Tool to determine how the hibernaculum population could be affected by the cumulative effects to associated maternity colonies. We modeled the impact of taking at Kings Point and North Fork Wind Projects (Table 6) from the Coffin Cave hibernaculum over the permit term. For model inputs, we used complex-level lambda values (see Thogmartin et al. 2013) and 2019 gray bat population numbers from visual counts at the hibernaculum (Table 7).

Resulting metrics did not show appreciable reductions relative to the Baseline Scenario (Table *9*). Based on the result of these analyses we concluded that take from the proposed Action will not cause an appreciable difference in the fitness of the hibernaculum population.

Table 9 Expected impacts to Coffin Cave Hibernaculum Population

Coffin Cave Hibernaculum Population		Extinction Probability in 50 Years	Median Time to Extinction	Median Ending Lambda at 50 years
	Baseline	0	NA	0.99
	Effects of the take	0	NA	0.99

4.6. Step-3 Effects to the Missouri Population

Based on our conclusion that impacts of take from Project will not have hibernaculum population-level effects to the gray bat, we further concluded that take will not have State-level impacts. We conclude that any reduction in the likelihood that survival and recovery of gray bat within Missouri are unlikely to result from the proposed Action.

4.7. Step-4 Effects to the Species

Based on our conclusion that impacts of take from the Project will not have State-level effects to the gray bat, we further concluded that take will not have species-level impacts.

5. Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the Action Area (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is aware of at least two wind development companies scoping new wind facilities within the migrating distance of Coffin Cave. All these companies would work with the Service

to avoid impacts or pursue HCPs that would require separate consultation under the Act.

The Service is unaware of any future state, tribal, local, or private actions, other than the proposed project, which would cause significant effects on gray bats within the Action Area. In addition, there is no designated critical habitat for the bat in or near the Action Area. Thus, cumulative effects to critical habitat, from the proposed action in concert with any future state, tribal, local, or private actions in the Action Area, are not anticipated.

6. Conclusion

After reviewing the current status of gray bats, the environmental baseline for the Action Area, the effects of the proposed actions of the study plan, and the cumulative effects, it is Services' opinion that the implementation of the study plan and permit, as proposed, is not likely to jeopardize[2] the continued existence of gray bats.

Briefly, the basis for this conclusion (as detailed in the Biological Opinion) is as follows:

- *Standardized Fatality Monitoring*: The Service finds the monitoring program (Sections 1.3 and 1.4) sufficient to provide the data the Service needs to ensure compliance with permitted take levels. Standardized fatality monitoring is anticipated to detect at least 20% percent of all bat carcasses. Detected carcass quantities will be corrected with EoA software to estimate take. Estimated take, and associated bat-in-hand numbers will inform whether the authorized level of take has been met. If the authorized take is met or exceeded at Kings Point Wind Project or North Fork Ridge Wind Project, then the relevant Project will cease implementing the study plan at the facility where authorized take was met and operate such that no additional impacts to gray bats are likely to occur (Section 1.4).
- *Analysis of Impacts*: The impact of the take was analyzed using a hierarchal framework including the following steps: 1) effects to individuals; 2) effects to maternity colonies and the hibernating population; 3) effects on the number of gray bats in Missouri and, 4) effects to the species. We concluded that the number of gray bats likely to be killed as a result of the proposed study is not likely to cause an appreciable difference in the fitness of the affected maternity colony and hibernating population of gray bats. Therefore, we concluded it is unlikely the project will cause reductions in the likelihood of survival and recovery of gray bats within the State of Missouri, or range-wide .

7. Incidental Take

The intent of the proposed Action is to permit the take of a specified number of gray bats. We do not expect any additional take of this species because of the proposed action. Therefore, there is no incidental take statement attached to this Biological Opinion.

The ES program has the responsibility to monitor implementation of the study plan and compliance with the permit.

[2] 'Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

8. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The federal Action Agency in the case of this Biological Opinion is the U.S. Fish and Wildlife Service, Ecological Services Program (ES); the federal action considered is the issuance of a 10(a)(1)(A) Scientific Research Permit. In furtherance of section 7(a)(1) of the Act, the following activities may be conducted at the discretion of ES as time and funding allow:

- Support sustainable development of wind facilities in Missouri while considering the cumulative effects of wind build out within the range of influence of major hibernacula including Sodalis Nature Preserve and Coffin Cave. As described in the Cumulative Effects section, the Service is aware of two new wind facilities being considered for development within the gray bat migratory distance of Coffin Cave. We recommend that the Service develop a General Conservation Plan for wind projects that addresses impacts to Endangered and Threatened bat species and includes biological monitoring and appropriate population levels (within and beyond the Action Area).
- Work with partners to support research focused on better understanding exposure of bats to wind turbines, measures to minimize collision risk, and monitoring methods.
- Incorporate new findings from research and post-construction monitoring programs into guidance documents, including the Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (USFWS 2011).
- Continue and expand efforts within the Service to ensure that all offices working on wind energy projects have access to the best scientific and commercial data available on bat/wind interactions and methods to avoid and minimize bat mortality at wind facilities.
- Continue to develop tools for the Service to use that promote consistent, efficient, and effective methods for addressing wind impacts to federally listed species.

9. Reinitiation Notice

This concludes formal consultation on the proposed issuance of a section 10(a)(1)(A) Scientific Recovery Permit to the Applicant. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiating.

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APPENDIX A. KINGS POINT WIND PROJECT TECHNICAL ASSISTANCE LETTER

Kings Point Wind, LLC
14302 FNB Parkway
Omaha, Nebraska 68154

March 4, 2019

Attention: Karen Herrington

Field Supervisor, Missouri Ecological Services Office
101 Park DeVille Drive, Suite A
Columbia, MO 65203
karen_herrington@fws.gov

Reference: Request for a Technical Assistance Letter for the Kings Point Wind Project in Barton, Dade, Jasper, and Lawrence Counties, Missouri

Dear Ms. Herrington,

Kings Point Wind, LLC (the "Project Company") is the owner of the proposed Kings Point Wind Project (the "Project") located in Barton, Dade, Jasper, and Lawrence counties, Missouri. The Project will produce up to 250 MW of renewable energy.

Empire Electric – Liberty Utilities Central ("Empire") has been coordinating with the U.S. Fish and Wildlife Service ("USFWS") on behalf of the Project Company pertaining to threatened and endangered species at the Project site. The Project Company is requesting the USFWS provide a Technical Assistance Letter ("TAL") documenting the Project Company's compliance with the Endangered Species Act ("ESA") of 1973, as amended. Specifically, the Project Company is requesting a TAL regarding its prescribed avoidance measures during construction activities for potential impacts to the ESA protected wildlife species.

Please note that preconstruction bat surveys were completed in 2017 and 2018 at the Project for the presence of protected bat species. Indiana Bat (*Myotis sodalis*; Endangered), Ozark Big-eared Bat (*Corynorhinus townsendii ingens*; Endangered), and Northern Long-eared Bat (*Myotis septentrionalis*; Threatened) were presumed absent based on acoustic and mist-netting surveys as per the USFWS 2017 Indiana Bat Summer Survey Guidelines and the Project's Bird and Bat Work Plan (Stantec 2018). In addition, the take of the Northern Long-eared Bat by wind turbines is exempt through the 4(d) rule. Therefore, a TAL is not requested for these three protected bat species.

The Project Company is committed to avoiding impacts to ESA protected wildlife species and is requesting the TAL to cover construction and turbine commissioning activities where non-purposeful take might occur. The Project Company requests the TAL to be issued as soon as possible, but not later than early June 2019, in order to ensure the construction schedule (commencement Q3 2019 with Commercial Operation Date in Q4 2020) can be achieved. Avoidance measures to be utilized during construction and commissioning to avoid take of ESA protected wildlife species are provided in Table 1 below.

TABLE 1: CONSTRUCTION AVOIDANCE MEASURES FOR ESA-PROTECTED SPECIES

Species	Avoidance Measures
Bats	
Gray Bat	1. All turbines will be tested (commissioned) with an operational cut-in speed of 8.0 meters per second (m/s) or higher. The cut-in speed will be in effect during the Gray Bat active season (March 1 through November 15) from 30 minutes before sunset to 30 minutes after sunrise. The cut-in speed of 8.0 m/s will not be in affect during the active season when the air temperature is < 50° F. 2. All impacts to known caves and/or known roosts will be avoided.
Fish	
Neosho Madtom	1. Horizontal directional drilling will occur at all perennial streams for all below ground infrastructure (i.e., electrical collection lines). 2. Aquatic life passage via a culvert (or similar device) will be maintained at all times during construction for all perennial stream crossings for all above ground infrastructure (e.g., access roads, temporary crane paths). 3. All impacts to known caves will be avoided. 4. Erosion control and soil stabilization measures will be implemented as per the Project's Storm Water Pollution Prevention Plan. 5. Impacts within the Spring River will be avoided.
Ozark Cavefish	
Freshwater Mussels	
Neosho Mucket	1. Impacts within designated critical habitat (i.e., Spring River) will be avoided. This includes all areas within the ordinary high-water mark as designated by a qualified wetland scientist. No equipment will be allowed to operate, and materials will not be directly or indirectly placed within in the Spring River. The Project transmission line will span over the Spring River. 2. Horizontal directional drilling will occur at all perennial streams for all below ground infrastructure (i.e., electrical collection lines). 3. Aquatic life passage via a culvert (or similar device) will be maintained at all times during construction for all perennial stream crossings for all above ground infrastructure (e.g., access roads, temporary crane paths). 4. Erosion control and soil stabilization measures will be implemented as per the Project's Storm Water Pollution Prevention Plan.
Rabbitsfoot	

Monitoring	
	1. During commissioning of turbines, post-construction monitoring using Evidence of Absence methods for Gray Bats will be conducted at operating turbines, until the HCP has been approved. 2. Unauthorized take of a listed species will be reported to the USFWS within 24 hours of the documented mortality.

Potential impacts to Gray Bats during operations will be addressed in the Project's Habitat Conservation Plan ("HCP") and Incidental Take Permit ("ITP") currently being developed. The conditions specified in the TAL pertaining to Gray Bats will be implemented until an ITP has been issued, which the Project Company acknowledges may not occur until after the Commercial Operation Date. The HCP will supercede the measures in the TAL upon the issuance of the ITP.

Additionally, the Project Company requests that USFWS include the following language in the TAL document confirming that the measures described will adequately avoid the take of ESA protected species:

> This office is not authorized to provide guidance in regards to the USFWS Office of Law Enforcement ("OLE") investigative priorities involving federally listed species. However, we understand that OLE carries out its mission to protect ESA-listed species through investigation and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of listed species; and by encouraging others to implement measure to avoid take of listed species. It is not possible to absolve individuals or companies from liability for unpermitted take of listed species, even if such take occurs despite the implementation of appropriate take avoidance measures. However, the OLE focuses its enforcement resources on individuals and companies that take listed species without identifying and implementing all reasonable, prudent and effective measures to avoid such take. This office concludes that, if Kings Point Wind, LLC follows the measures above, the Kings Point Wind Project is unlikely to result in prohibited take of ESA listed species.

Thank you for your consideration.

Sincerely,

Kings Point Wind, LLC
By: Kings Point Wind Holdings, LLC, its Manager

By: Joel Link
Title: Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
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Phone: (573) 234-2132 Fax: (573) 234-2181

May 10, 2019

Mr. Joel Link
Kings Point Wind Holdings, LLC
14302 FNB Parkway
Omaha, Nebraska 68154

Dear Mr. Link:

The U.S. Fish and Wildlife Service (Service) has been coordinating with Empire Electric – Liberty Utilities Central (Empire) on behalf of the Kings Point Wind, LLC (Project Company) regarding their development of the Kings Point Wind energy project, an approximately 150 MW wind energy facility in Barton, Dade, Jasper, and Lawrence Counties, Missouri. In their March 4, 2019, letter, the Project Company requested the Service provide them with a technical assistance letter (TAL) documenting their compliance with the Endangered Species Act of 1973 (as amended).

Empire's 2017 and 2018 pre-construction surveys of the project area conducted according to the Service's Indiana bat guidelines indicated no summer presence of the federally listed Indiana bat or northern long-eared bat. Based on recent tracking of an Indiana bat from Arkansas to Missouri just east of the project area, there is potential for Indiana bats to migrate through the project site. Nonetheless, given the proposed operating protocols of curtailment until 8 m/s during the active bat season as detailed in your March 4, letter, take of Indiana or northern long-eared bats is unlikely. We consider Ozark big-eared bat extirpated from the state. Both acoustic and mist net preconstruction surveys detected presence of gray bats across much of the project area. In addition, radiotelemetry tracked three gray bats captured at the project area to a cave approximately 10 miles east of the project area.

To avoid potential effects to federally listed species pending HCP/ITP completion and issuance, the Project Company will implement all measures listed in Table 1: Construction Avoidance Measures for ESA-Protected Species in the Project Company's March 4, 2019, TAL request. In addition, the Project Company commits to the following as they develop an HCP for their Kings Point Wind energy project.

1. The Project Company will prepare and implement a voluntary Bird and Bat Conservation Strategy plan pursuant to the USFWS's Wind Energy Guidelines that describes: (a) risks to wildlife associated with the Kings Point Wind energy project,

(ii) avoidance and minimization techniques incorporated into the design and operation of the Kings Point Wind energy project, and (iii) post-construction mortality monitoring and reporting. That plan, including post-construction monitoring, will be in place at the start of operations. The Service recommends that the post construction monitoring plan follow Evidence of Absence protocols with an overall probability of detection (g) of 0.2. The Project Company should retain all bat carcasses and send tissue samples (protocol forthcoming) to the Missouri Ecological Services Field Office.

2. To reduce effects to all bat species in the area, the Project Company will limit tree clearing to between August 1 and March 31, with the possible exception of supplemental tree-clearing necessary to accommodate any final layout design changes.

3. The measures outlined in this TAL will be superseded by the avoidance, minimization, and mitigation measures established in the HCP and the ITP, pending Service evaluation and determination of permit issuance.

This office is not authorized to provide guidance in regards to the USFWS Office of Law Enforcement (OLE) investigative priorities involving federally listed species. However, we understand that OLE carries out its mission to protect ESA-listed species through investigation and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of listed species; and by encouraging others to implement measures to avoid take of listed species. It is not possible to absolve individuals or companies from liability for unpermitted take of listed species, even if such take occurs despite the implementation of appropriate take avoidance measures. However, the OLE focuses its enforcement resources on individuals and companies that take listed species without identifying and implementing all reasonable, prudent and effective measures to avoid such take. This office concludes that, if the Project Company follows the measures above, the Kings Point Wind energy project is unlikely to result in prohibited take of ESA listed species.

Thank you for your continuing coordination on project development. Should you have questions regarding this TAL, please contact Shauna Marquardt, 573/234-2132, x 174, of my office.

Sincerely,

for Karen Herrington
Field Supervisor

cc: MDC, Jefferson City, MO (J. Campbell)

APPENDIX B. NORTH FORK RIDGE WIND PROJECT TECHNICAL ASSISTANCE LETTER

North Fork Ridge Wind, LLC
14302 FNB Parkway
Omaha, Nebraska 68154

May 13, 2019

Attention: Karen Herrington

Field Supervisor, Missouri Ecological Services Office
101 Park DeVille Drive, Suite A
Columbia, MO 65203
karen_herrington@fws.gov

Reference: Request for a Technical Assistance Letter for the North Fork Ridge Wind Project in Barton and Jasper Counties, Missouri

Dear Ms. Herrington,

North Fork Ridge Wind, LLC (the "Project Company") is the owner of the proposed North Fork Ridge Wind Project (the "Project") located in Barton and Jasper counties, Missouri. The Project will produce up to 150 MW of renewable energy.

Empire Electric – Liberty Utilities Central ("Empire") has been coordinating with the U.S. Fish and Wildlife Service ("USFWS") on behalf of the Project Company pertaining to threatened and endangered species at the Project site. The Project Company is requesting the USFWS provide a Technical Assistance Letter ("TAL") documenting the Project Company's compliance with the Endangered Species Act ("ESA") of 1973, as amended. Specifically, the Project Company is requesting a TAL regarding its prescribed avoidance measures during construction activities for potential impacts to the ESA protected wildlife species.

Please note that preconstruction bat surveys were completed in 2017 and 2018 at the Project for the presence of protected bat species. Indiana Bat (*Myotis sodalis*; Endangered), Ozark Big-eared Bat (*Corynorhinus townsendii ingens*; Endangered), and Northern Long-eared Bat (*Myotis septentrionalis*; Threatened) were presumed absent based on acoustic and mist-netting surveys as per the USFWS 2017 Indiana Bat Summer Survey Guidelines and the Project's Bird and Bat Work Plan (Stantec 2018). In addition, the take of the Northern Long-eared Bat by wind turbines is exempt through the 4(d) rule. Therefore, a TAL is not requested for these three protected bat species.

The Project Company is committed to avoiding impacts to ESA protected wildlife species and is requesting the TAL to cover construction and turbine commissioning activities where non-purposeful take might occur. The Project Company requests the TAL to be issued as soon as possible, but not later than early June 2019, in order to ensure the construction schedule (commencement Q3 2019 with Commercial Operation Date in Q4 2020) can be achieved. Avoidance measures to be utilized during construction and commissioning to avoid take of ESA protected wildlife species are provided in Table 1 below.

TABLE 1: CONSTRUCTION AVOIDANCE MEASURES FOR ESA-PROTECTED SPECIES

Species	Avoidance Measures
Bats	
Gray Bat	1. All turbines will be tested (commissioned) with an operational cut-in speed of 8.0 meters per second (m/s) or higher. The cut-in speed will be in effect during the Gray Bat active season (March 1 through November 15) from 30 minutes before sunset to 30 minutes after sunrise. The cut-in speed of 8.0 m/s will not be in affect during the active season when the air temperature is < 50° F. 2. All impacts to known caves and/or known roosts will be avoided.
Fish	
Neosho Madtom	1. Horizontal directional drilling will occur at all perennial streams for all below ground infrastructure (i.e., electrical collection lines). 2. Aquatic life passage via a culvert (or similar device) will be maintained at all times during construction for all perennial stream crossings for all above ground infrastructure (e.g., access roads, temporary crane paths). 3. All impacts to known caves will be avoided. 4. Erosion control and soil stabilization measures will be implemented as per the Project's Storm Water Pollution Prevention Plan.
Ozark Cavefish	
Freshwater Mussels	
Neosho Mucket	1. Horizontal directional drilling will occur at all perennial streams for all below ground infrastructure (i.e., electrical collection lines). 2. Aquatic life passage via a culvert (or similar device) will be maintained at all times during construction for all perennial stream crossings for all above ground infrastructure (e.g., access roads, temporary crane paths). 3. Erosion control and soil stabilization measures will be implemented as per the Project's Storm Water Pollution Prevention Plan.
Rabbitsfoot	

Monitoring	
	1. During commissioning of turbines, post-construction monitoring using Evidence of Absence methods for Gray Bats will be conducted at operating turbines, until the HCP has been approved. 2. Unauthorized take of a listed species will be reported to the USFWS within 24 hours of the documented mortality.

Potential impacts to Gray Bats during operations will be addressed in the Project's Habitat Conservation Plan ("HCP") and Incidental Take Permit ("ITP") currently being developed. The conditions specified in the TAL pertaining to Gray Bats will be implemented until an ITP has been issued, which the Project Company acknowledges may not occur until after the Commercial Operation Date. The HCP will supercede the measures in the TAL upon the issuance of the ITP.

Additionally, the Project Company requests that USFWS include the following language in the TAL document confirming that the measures described will adequately avoid the take of ESA protected species:

> This office is not authorized to provide guidance in regards to the USFWS Office of Law Enforcement ("OLE") investigative priorities involving federally listed species. However, we understand that OLE carries out its mission to protect ESA-listed species through investigation and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of listed species; and by encouraging others to implement measure to avoid take of listed species. It is not possible to absolve individuals or companies from liability for unpermitted take of listed species, even if such take occurs despite the implementation of appropriate take avoidance measures. However, the OLE focuses its enforcement resources on individuals and companies that take listed species without identifying and implementing all reasonable, prudent and effective measures to avoid such take. This office concludes that, if Kings Point Wind, LLC follows the measures above, the Kings Point Wind Project is unlikely to result in prohibited take of ESA listed species.

Thank you for your consideration.

Sincerely,

North Fork Ridge Wind, LLC
By: North Fork Ridge Wind Holdings, LLC, its Manager

By: Joel Link
Title: Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

June 6, 2019

Mr. Joel Link
North Fork Ridge Wind, LLC
14302 FNB Parkway
Omaha, Nebraska 68154

Dear Mr. Link:

The U.S. Fish and Wildlife Service (Service) has been coordinating with Empire Electric – Liberty Utilities Central (Empire) on behalf of the North Fork Ridge Wind, LLC (Project Company) regarding their development of the North Fork Ridge Wind energy project, an approximately 150 MW wind energy facility in Barton and Jasper Counties, Missouri. In your May 13, 2019, letter, the Project Company requested the Service provide a technical assistance letter (TAL) documenting the Project Company's compliance with the Endangered Species Act of 1973 (as amended).

Empire's 2017 and 2018 pre-construction surveys of the project area conducted according to the Service's Indiana bat guidelines indicated no summer presence of the federally listed Indiana bat or northern long-eared bat. Given the proposed operating protocols of curtailment until 8 m/s during the active bat season as detailed in your May 13, 2019 letter, take of Indiana or northern long-eared bats is unlikely. We consider Ozark big-eared bat extirpated from the state. Acoustic preconstruction surveys detected presence of gray bats across much of the project area.

To avoid potential effects to federally listed species pending HCP/ITP completion and issuance, the Project Company will implement all measures listed in Table 1: Construction Avoidance Measures for ESA-Protected Species in the Project Company's May 13, 2019, TAL request. In addition, the Project Company commits to the following as they develop an HCP for their North Fork Ridge Wind energy project.

1. The Project Company will prepare and implement a voluntary Bird and Bat Conservation Strategy plan pursuant to the USFWS's Wind Energy Guidelines that describes: (a) risks to wildlife associated with the North Fork Ridge Wind energy project, (ii) avoidance and minimization techniques incorporated into the design and operation of the North Fork Ridge Wind energy project, and (iii) post-construction mortality monitoring and reporting. That plan, including post-construction monitoring, will be in place at the start of operations. The Service recommends that the post construction monitoring plan follow Evidence of Absence protocols with an overall probability of detection (g) of 0.2. The Project Company should retain all bat

carcasses and send tissue samples (protocol forthcoming) to the Missouri Ecological Services Field Office.

2. To reduce effects to all bat species in the area, the Project Company will limit tree clearing to between August 1 and March 31, with the possible exception of supplemental tree-clearing necessary to accommodate any final layout design changes.

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Thank you for your continuing coordination on project development. Should you have questions regarding this TAL, please contact Shauna Marquardt, 573/234-2132, x 174, of my office.

Sincerely,

Shauna R Marquardt

acting for
Karen Herrington
Field Supervisor

cc: MDC, Jefferson City, MO (J. Campbell)