Indiana Bat and Northern Long-Eared Bat

Habitat Conservation Plan

For the Wildhorse Mountain Wind Facility

Pushmataha County, Oklahoma

Prepared by:

Wildhorse Wind Energy, LLC

3535 Colonnade Parkway
Birmingham, Alabama 35243

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ACRONYMS AND ABBREVIATIONS

Term	Definition
Applicant	Wildhorse Wind Energy Project, LLC
BO	Biological Opinion
C	Celsius
CBD	Center for Biological Diversity
EoA	Evidence of Absence
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
ft	feet
g	grams
GLM	Generalized Linear Model
ha	Hectare
HCP	Habitat Conservation Plan
HCP Handbook	Habitat Conservation Planning and Incidental Take Permit Processing Handbook
HUC	Hydrologic Unit Code
IDNR	Illinois Department of Natural Resources
INBA	Indiana bat, *Myotis sodalis*t
ITP or Permit	Incidental Take Permit
k	factor by which searcher efficiency changes as undetected carcasses age
km	kilometers
m	meters
Magnolia	Magnolia Land Partners LLC
MOU	Memorandum of Understanding
MW	Megawatts
NEPA	National Environmental Policy Act
NLCD	National Land Cover Database
NLEB	Northern long-eared bat, *Myotis septentrionalis*
NMFS	National Marine Fisheries Service
NREL	National Renewable Energy Laboratory
O&M	Operations and Maintenance
OCRU	Ozark-Central Recovery Unit
ODWC	Oklahoma Department of Wildlife Conservation
oz	ounces
Pd	*Pseudogymnoascus destructans* (fungus which causes the disease known as white-nose syndrome)
PPA	Power purchase agreement
Project	Wildhorse Mountain Wind Energy Project
REA	Resource Equivalency Analysis
ROC	Remote Operations Center
SCADA	Supervisory, control and data acquisition
Secretary	Secretary of the Interior

ACRONYMS AND ABBREVIATIONS

Term	Definition
Southern	Southern Power Company
TNC	The Nature Conservancy
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Services
UTM	Universal Transverse Mercator
WEG	Wind Energy Guidelines
WNS	White-nose syndrome

1 INTRODUCTION

1.1 Overview and Background

Wildhorse Wind Energy, LLC (Applicant) owns and operates the Wildhorse Mountain Wind Energy Project (Project), located within Pushmataha County, Oklahoma (Figure 1.1). The Project consists of 29 wind turbines, with a total nameplate generating capacity of 100 megawatts (MW). The Project began commercial operation in November 2019.

The Applicant has prepared this Habitat Conservation Plan (HCP) as a bat conservation program for the Project in support of an application for an Incidental Take Permit (ITP or Permit) under Section 10(a)(1)(B) of the Endangered Species Act (ESA 1973; 16 U.S. Code [U.S.C.] Sections [§§] 1531-1544) for potential take of two listed bat species resulting from Project operation. This HCP was developed in accordance with the ESA (Section 10(a)(2)(A)) and Federal Regulation (50 Code of Federal Regulations [CFR] §§ 17.22(b)(1), 17.32(b)(1)).

1.2 Purpose and Need

The purpose of the Project is to generate renewable electricity to meet energy demand in the South Central region of the U.S. The Applicant's objective for the Project is to operate an economically viable commercial wind energy facility of 100 MW in southeast Oklahoma that contributes to meeting the energy needs of the region. The Applicant has entered into a power purchase agreement (PPA) to sell electricity and other renewable energy attributes generated by the Project to the Arkansas Electric Cooperative Corporation for sale to retail electric customers. Furthermore, the Project aids utilities in meeting energy policy objectives by obtaining electricity from renewable energy sources and reducing greenhouse gas emissions. The Project also provides significant economic benefits to the surrounding community in the form of local spending and annual community investment. The development and construction of the Project also generated as many as 150 jobs at the peak of construction and created approximately 6-8 full-time, permanent jobs at the Project.

During Project development and early coordination with the U.S. Fish and Wildlife Service (USFWS), the Applicant determined that the operation of Project turbines could pose a risk to Indiana bats (*Myotis sodalis*; INBA) and northern long-eared bats (*Myotis septentrionalis*; NLEB), hereafter referred to collectively as "Covered Species," that are protected under the ESA. Therefore, the Applicant has developed this HCP as part of their Section 10 permit application package for an ITP for the Covered Species.

The Applicant's need for the HCP includes achieving regulatory certainty under the ESA by obtaining incidental take authorization for Covered Species. Accordingly, the purposes of this HCP are to: (1) provide measures to minimize and mitigate to the maximum extent practicable the impacts of the taking of the Covered Species, (2) assess the minimized impacts of the Project on the Covered Species, and (3) ensure that incidental take from the Project will not appreciably reduce the likelihood that the Covered Species will survive and recover in the wild. In addition, this HCP describes the monitoring that will be used to confirm the effectiveness of the bat

conservation program (see Chapter 4) and evaluate compliance with the ITP, and identifies funding assurances to ensure implementation of monitoring, mitigation, and to address any changed circumstances. This HCP includes all elements necessary to meet the criteria for ITP issuance according to ESA § 10(a)(2)(B) and 50 CFR §§ 17.22(b)(2) and 17.32(b)(2).

1.3 Permit Duration

The Applicant entered into a PPA to generate electricity to wholesale energy providers for sale to retail electric customers for 25 years; however, the Applicant is seeking a 30-year ITP from the date of issuance. This requested Permit term is necessary to cover the entire operational life of the Project. If, at the end of the 30-year term of the ITP, the Applicant decides to continue to operate the Project, the Applicant will apply for a new ITP or for an ITP renewal (Section 8.5).

1.4 Covered Lands

The lands covered by this HCP include the Plan Area and the Permit Area (together, the Covered Lands).

1.4.1 *Plan Area*

The Plan Area is the geographic area where all activities covered by the HCP will occur and that will be analyzed in the NEPA analysis (Figure 1.1). It includes any and all areas that are necessary for the HCP to be fully implemented, whether or not take is likely to occur in those areas. The Plan Area for the HCP includes the Permit Area (defined below), as well as all areas influenced by the HCP's biological goals and objectives, including areas where the mitigation, monitoring, and adaptive management measures associated with this HCP will occur (Chapter 4). The Plan Area includes lands involved in the off-site mitigation project associated with this HCP, which are not likely to overlap with the Permit Area lands (Section 4.3). For the purposes of this HCP, the boundary of the Plan Area is defined as the Permit Area (5,520.6 ha [13,641.6 ac]) plus the off-site mitigation project (36.4 ha [90.0 ac]), which includes all areas where the HCP applies (*Habitat Conservation Planning and Incidental Take Permit Processing Handbook* [HCP Handbook]; USFWS and National Marine Fisheries Service [NMFS] 2016).

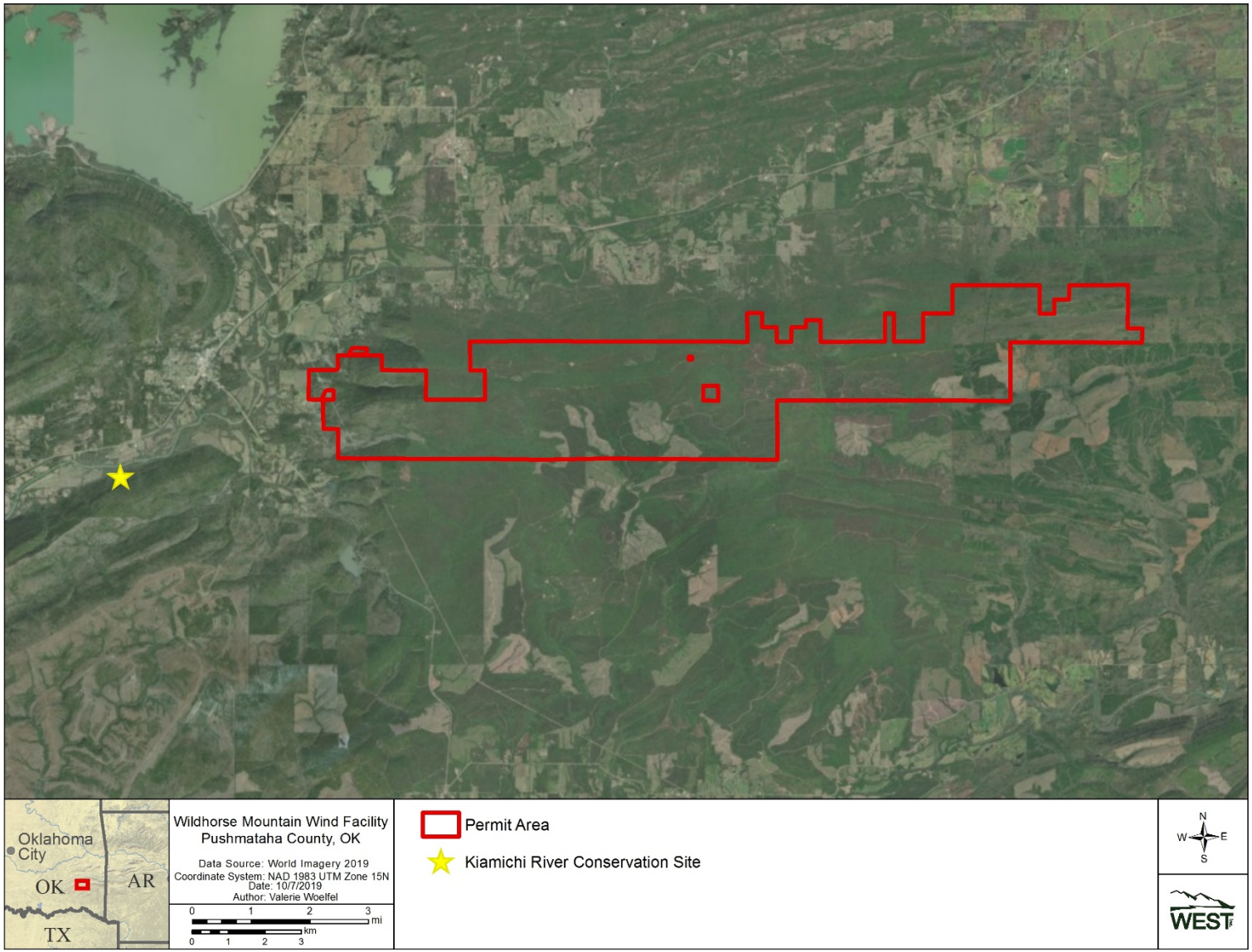

Figure 1.1. Plan Area of the Wildhorse Mountain Wind Facility Habitat Conservation Plan.

1.4.2 *Permit Area*

The Permit Area is a subsection of the Plan Area and consists of all areas where incidental take of the Covered Species is requested to be authorized by the ITP. Operation of Project wind turbines is the only activity that is likely to cause take of the Covered Species; therefore, the Permit Area includes all lands leased for the Project on which the 29 turbines will be located (Chapter 2, Figure 1.2). Additionally, the Permit Area includes all Project components, i.e. underground electrical collection system, overhead generation-tie line, substation, operations and maintenance (O&M) facilities, and access roads that are located within the Permit Area. The total Permit Area is 5,520.6 hectares (ha; 13,641.6 acres) and includes parcels owned by 18 landowners. More detailed descriptions of the Project and the Permit Area can be found in Sections 2.2 and 2.1, respectively.

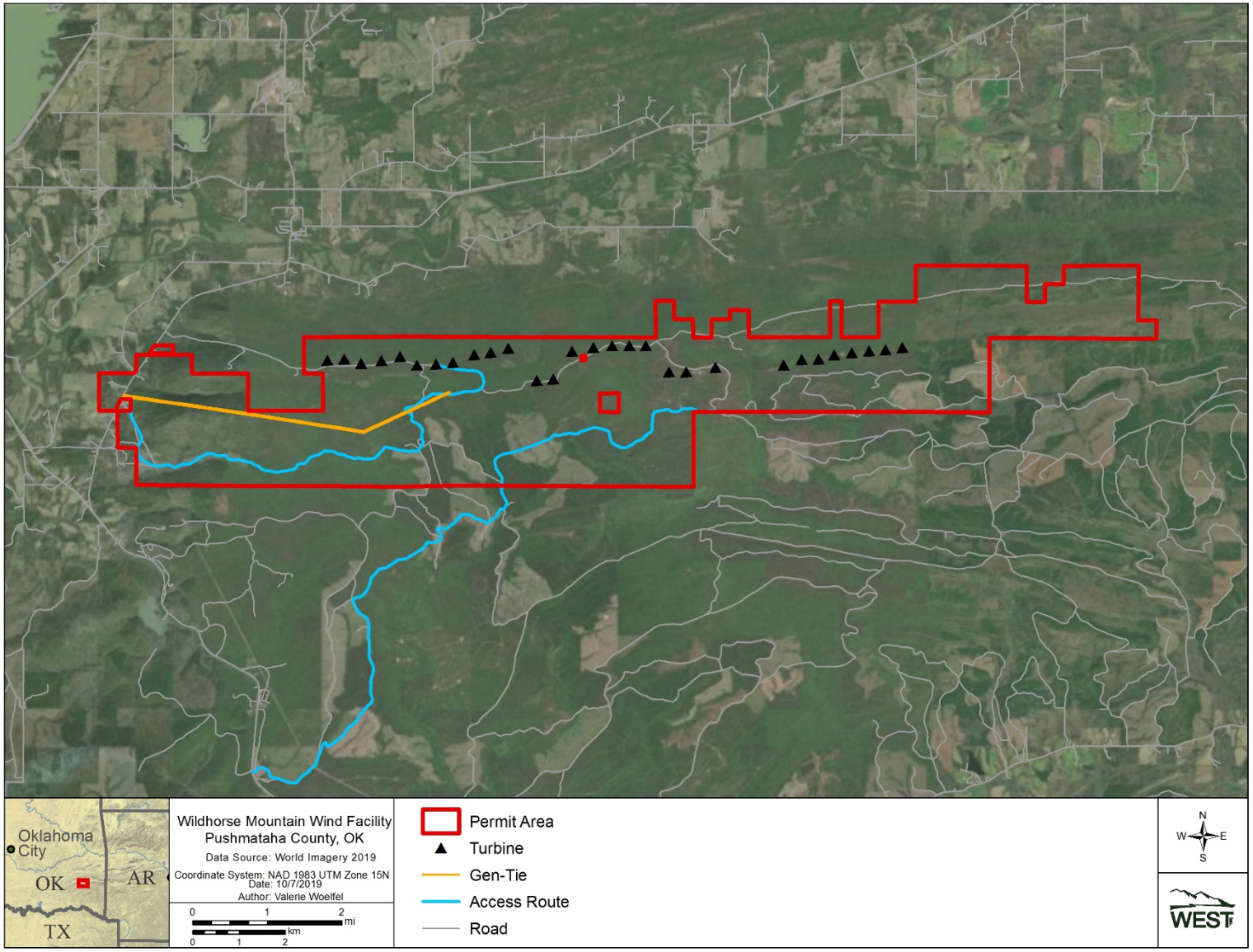

Figure 1.2. Wildhorse Mountain Wind Facility Permit Area and Project Components.

1.5 Covered Species

The Applicant has developed a bat conservation program for INBA and NLEB for the Project (see Chapter 4) and is applying for an ITP for these species to cover incidental take resulting from the Covered Activities (see Section 2.2). The INBA is listed as endangered under the ESA (USFWS 2018c). Although the NLEB is currently listed as threatened under the ESA (USFWS 2015a), the final 4(d) Rule[1] for the species (81 Fed. Reg. 1900 [2016]; USFWS 2016d) exempts from ESA Section 9 take prohibitions the incidental take of NLEB resulting from most otherwise lawful activities, including the operation of wind turbines. NLEB is included in this HCP as a Covered Species so that the species is addressed in the event the 4(d) Rule is reversed or the species is up-listed to endangered (in which case the 4(d) rule would no longer apply) during the term of the Permit.

The future listing of any additional wildlife species that are reasonably certain to be taken by the Covered Activities is considered a changed circumstance and is addressed in Section 8.2.2.

1.6 Regulatory Framework

1.6.1 *Endangered Species Act*

The purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[2] It also prohibits the "take" of endangered species of fish and wildlife.[3] The term take means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[4] The take prohibition also applies to threatened species, unless the USFWS promulgates a species-specific rule that removes the prohibition in full or in part.[5]

The ESA further provides that the Secretary of the Interior (Secretary)[6] may authorize, under certain terms and conditions, any take otherwise prohibited if such take is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."[7] To obtain this incidental take

[1] The final 4(d) rule published January 14, 2016 (81 FR 1900), exempts all incidental take of northern long-eared bats caused by otherwise lawful activities from take prohibition under Section 9 of the ESA, except: take of northern long-eared bats in their hibernacula in areas affected by WNS; take resulting from tree removal within 0.4 km (0.25 mi) of a known northern long-eared bat hibernaculum; and take resulting from removal of a known northern long-eared bat maternity roost tree or tree removal within a 45-m (150-ft) radius of a known northern long-eared bat maternity roost tree during the pup season (June 1 through July 31). Incidental take resulting from hazard tree removal for protection of human life and property is exempt from the take prohibition regardless of where and when it occurs.

[2] ESA § 2(b) [16 USC 1531(b)]

[3] ESA § 9(a)(1)(B) [16 USC 1538(a)(1)(B)]

[4] ESA § 3(19) [16 USC 1532(19)]

[5] 50 CFR 17.31(a)

[6] As the species covered by this HCP are within the jurisdiction of the Secretary of the Interior and the USFWS, hereafter all references to "Secretary" refer to the Secretary of the Interior and no references will be made to the Secretary of Commerce or the National Marine Fisheries Service.

[7] ESA § 10(a)(1)(B) [16 USC 1539(a)(1)(B)]

authorization, a non-federal entity must apply to the USFWS for an ITP. In order to receive the ITP, the entity must develop, fund, and implement a USFWS-approved HCP. The HCP describes how "the applicant will, to the maximum extent practicable, minimize and mitigate the impact" of the proposed taking.

To obtain an ITP, the applicant must submit:[8]

1) A complete description of the activity sought to be authorized;
2) The common and scientific names of the species sought to be covered by the permit, as well as the number, age, and sex of such species, if known;
3) A conservation plan that specifies:
    a. The impact that will likely result from such taking;
    b. What steps the applicant will take to monitor, minimize, and mitigate such impacts, the funding that will be available to implement such steps, and the procedures to be used to deal with unforeseen circumstances;
    c. What alternative actions to such taking the applicant considered and the reasons why such alternatives are not proposed to be utilized; and
    d. Such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan.

An ITP will be issued following a public comment period if the USFWS finds that the application and the associated HCP meet the following issuance criteria:[9]

1) The taking will be incidental;
2) The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings;
3) The applicant will ensure that adequate funding for the conservation plan and procedures to deal with unforeseen circumstances will be provided;
4) The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;
5) Any other measures that the USFWS may require as being necessary or appropriate will be met; and
6) The USFWS has received such other assurances as the USFWS may require that the plan will be implemented.

In addition to these requirements, the USFWS has indicated that the following components should be addressed in an HCP (USFWS and NMFS 2016): 1) biological goals and objectives, 2) adaptive management, 3) monitoring, 4) ITP duration, and 5) public participation.

[8] As outlined in ESA § 10(a)(2)(A) [16 USC 1539(a)(2)(A)] and its implementing regulations at 50 CFR §§ 17.22(b)(1) and 17.32(b)(1)

[9] ESA § 10(a)(2)(B) and 50 CFR §§ 17.22 (b)(2) and 17.32 (b)(2)

Any actions that federal agencies implement, authorize, or fund (including the issuance of an ITP) require consultation with the USFWS if they potentially impact ESA-listed species.[10] The USFWS must conduct an internal, formal consultation for issuance of an ITP.[11] Formal consultation terminates with preparation of a Biological Opinion (BO). The BO provides the USFWS's determination as to whether the proposed action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. This intra-Service consultation ensures that issuance of the ITP is consistent with ESA Section 7.

1.6.2 *National Environmental Policy Act*

The National Environmental Policy Act (NEPA) requires federal agencies to examine environmental impacts of their actions and provide for public participation.[12] Issuing an ITP is a federal action subject to compliance with NEPA. The USFWS must conduct and publish an environmental impact statement or environmental assessment that includes detailed analyses of all direct, indirect, and cumulative impacts to the human environment resulting from issuance of the ITP.

2 PROJECT DESCRIPTION AND COVERED ACTIVITIES

2.1 Project Description

The Project is an existing renewable energy generation facility that consists of 29 3.45-MW wind turbines and associated facilities required for Project operations. The total generating capacity is approximately 100 MW. The Project is located on private land in southeastern Oklahoma in Pushmataha County. Commercial operation began in November 2019.

The Project is operated locally from the control room in the O&M buildings and remotely from a remote operations center (ROC). A permanent staff of 6-8 on-site personnel provides all O&M support at the Project. Each turbine has a supervisory, control and data acquisition (SCADA) operations and communications system which provides automated independent and remote operation of the turbine. The SCADA data provides detailed information for each turbine's operation and performance, allowing real-time control and continuous monitoring to ensure optimal operation and identification of potential problems. In the event of emergency notification or critical outage, a local wind technician is either onsite or available on-call to respond.

Auxiliary facilities associated with the Project include access roads, collection and communication lines, a meteorological (met) tower, and an O&M facility. Access roads at the Project include upgraded existing roads and new roads constructed in accordance with local building requirements and industry standards to accommodate the operation, and maintenance of the Project. Turbine sites include pads that are designed to accommodate heavy construction and maintenance cranes. Electrical power generated by the wind turbines is transformed and collected

[10] ESA § 7: Interagency Cooperation (16 USC 1536)

[11] Under the authority of Section 7 and implementing regulations, where, as here, the federal agency action is the USFWS's issuance of an ITP under ESA § 10

[12] 42 USC § 4321, et. seq.

through a network of collection circuits that are buried underground. An overhead generation tie-line connects the Project substation to the existing transmission grid. The O&M facility consists of space for offices, the control room and SCADA system, equipment storage, bathroom and kitchenette. The O&M facility has exterior lighting on the building. As required by the Federal Aviation Administration (FAA), lighting (see FAA 2000) was installed on the nacelle of all 29 wind turbines.

A preventative maintenance and inspection schedule is employed at the Project. Wind turbines are inspected to determine the need for component repair and maintenance. In addition to wind turbine inspections, site maintenance activities include periodic mowing around O&M facilities or, in limited cases, other areas adjacent to the leased corridor that are not otherwise maintained by the landowner; periodic herbicide treatment of access roads and turbine pads; building inspection and repairs, as needed; grading of roads to restore or repair road surface and drainage, as needed; and monthly security inspection and removal of hazards (e.g., downed trees or encroaching branches), as needed on Project components.

The operating life of the Project is projected to be a minimum of 30 years and at the end of the 25-year PPA, the Applicant will assess the viability of continuing to operate the existing turbines, repowering the Project by installing new or refurbished turbines, or completely decommissioning the Project. If the Project is to be decommissioned, the turbines, infrastructure, and facilities will be removed according to Project permit requirements and landowner specifications and will be removed, recycled, or disposed of at a licensed waste management facility. To avoid the potential for collision of Covered Species with spinning turbines during decommissioning, the turbines will be locked so the blades do not spin. Additionally, all decommissioning activities will occur during the daylight hours to prevent incidental take of Covered Species during the decommissioning period.

2.1.1 *Wind Turbines*

The Project consists of 29 Vestas V110 3.45-MW turbines. The turbine towers are approximately 105 meters (m; 344 feet [ft]) in height and the rotor blade diameter is 136 m (413 ft). Therefore, the maximum height of the turbines from tower base to highest blade tip is 173 m (568 ft) above ground level.

2.1.2 *Meteorological Towers*

One permanent, un-guyed 105-m (344-ft) met tower is located within the Permit Area. All temporary met towers associated with the Project that were constructed during the planning/design phase were decommissioned prior to construction. However, two temporary met towers were constructed on concrete pads at the location of Turbines 20 and 21 for site calibration. The permanent met tower and associated electrical components is situated on a concrete pad.

2.1.3 *Roads and Pads*

Roads associated with the Project include upgraded existing roads and new roads, both constructed in accordance with industry standards for wind facility roads and local building requirements. The roads accommodate all-weather access and long-term use for O&M.

The permanent width of access roads is approximately 5 m (16 ft). All roads include road base, surface materials, appropriate drainage, and culverts where necessary. The Project utilized 39 kilometers (km; 24 miles) of existing access roads which were improved and upgraded to handle construction traffic and delivery of wind turbine components. All 39 km required horizontal curves larger than 5-m to handle delivery of wind turbine components to turbine pads.

The gravel pad around each turbine has an approximate 10-m (33-ft) radius. The crane pad at each turbine site consists of an approximately 0.6-ha (1.6-acre) permanent gravel pad extending from the roadway to the turbine foundation. Some pads extend to include up to 0.8 ha (2.0 acres) of gravel pad depending on terrain and topography at the individual pad location.

2.1.4 *Underground Electrical and Communications Cables*

Electrical power generated by the wind turbines is transformed and collected through a network of underground collection cables. The underground collection cables total approximately 34 km (21 miles) in length. The Project includes 12 km (7 miles) of overhead communication lines, of which 5 km (3 miles) of cables previously existed on overhead power poles.

2.1.5 *Generation-Tie Line*

The 7.3-km (4.5-mile) 138-kV generation-tie line extends from the Project substation in the south to the switchyard with the connection to the existing transmission grid and is owned by the Applicant.

2.1.6 *Substation and Switchyard*

The substation is connected to the interconnection point, an existing 345-kilovolt electrical line, by the generation-tie line. The substation is located on 0.6 ha (1.5 acres) and consists of transformation and switching equipment that collects the energy from the Project where voltage is transformed from low to high using transformers for delivery into the bulk power system. The interconnect switchyard is located on 0.8 ha (1.9 acres) and consists of an electrical station with switching and protection equipment that acts as a hub between the bulk power system and the Project.

2.1.7 *Operations and Maintenance Facility*

The O&M facility is located on approximately 0.8 ha (2.1 acres) and consists of a building containing office space, storage space, bathrooms and a kitchenette, and a staff parking area.

2.2 Covered Activities

The HCP Handbook (USFWS and NMFS 2016) states that an applicant should “include in the HCP a description of all actions within the planning area that: (1) are likely to result in incidental

take; (2) are reasonably certain to occur over the life of the permit; and (3) for which the applicant or landowner has some form of control" ("Covered Activity").

As a result, the Covered Activities of this HCP are limited to actions in the Permit Area that are reasonably certain to result in the incidental take of the Covered Species and over which the Applicant has direct control. No incidental take is expected to occur from maintenance of the wind facility, decommissioning, or any other similar activities because potential impacts to the Covered Species from these activities will be avoided (Section 4.2).

The Applicant has determined that operation of Project turbines during the 30-year ITP term is likely to result in incidental take of the Covered Species, is reasonably certain to occur, and is an activity over which the Applicant has control; therefore, operation of the Project turbines is a Covered Activity under the HCP. Additionally, implementation of mitigation under the HCP is a Covered Activity; however, no incidental take of the Covered Species is anticipated to occur from the implementation of mitigation. No incidental take is expected to occur as a result of activities at the remaining auxiliary facilities or structures. The Applicant will implement avoidance measures as necessary during maintenance activities within the wind facility (Section 4.2). In the event that the Project is decommissioned at the end of the ITP term, take is not expected to result from the decommissioning activities within the wind facility.

2.2.1 *Operation of the Project*

Commercial operation of the Project began in November 2019 and is expected to continue for a minimum of 25 years. Collisions[13] with spinning rotor blades are known to cause injury to and mortality of bats and birds, including the Covered Species (Horn et al. 2008, National Renewable Energy Laboratory [NREL] 2013). Incidental take of the Covered Species could potentially occur from operation of Project turbines; therefore, operation of all the turbines at the Project is included as a Covered Activity in this HCP.

2.2.2 *Mitigation Measures*

This HCP's bat conservation program includes measures to minimize and mitigate the impacts of the take of the Covered Species to the maximum extent practicable. These measures are described in detail in the conservation program (Chapter 4). Mitigation measures will be implemented in a manner that is not expected to result in take but are expected to result in conservation benefits to the Covered Species. However, because the authority to implement mitigation measures within occupied habitat of the Covered Species is granted as a condition of

[13] Bat deaths and injuries were initially thought to also result from decompression sickness, or barotrauma, which is a phenomenon in which bats flying in close proximity to rotating turbine blades are thought to experience rapid or excessive pressure change, resulting in pulmonary trauma, or lung damage due to expansion of air in the lungs that is not accommodated by exhalation (Baerwald et al. 2008). However, a recent NREL study found that the pressure changes around operating wind turbine blades were not large enough to cause fatal barotrauma in bats (NREL 2013). Simulation results showed that the pressure drop around wind turbine blades was an order of magnitude less than the amount needed to cause mortality in mice (*Mus musculus*; used as a surrogate species for bats), which in turn was significantly higher than the pressure changes experienced by bats around wind turbine blades. The authors of the study concluded that since the pressure changes around wind turbine blades at low wind speeds were insignificant, it seemed unlikely that barotrauma was a significant cause of bat fatalities around wind turbines, and that the vast majority of bat fatalities were the result of blade strikes.

implementing the HCP in accordance with the ITP, mitigation measures are included as a Covered Activity in this HCP.

3 ENVIRONMENTAL BASELINE AND COVERED SPECIES ECOLOGY

The following sections describe the environmental setting of the Permit Area and the Covered Species' ecology and natural history. Information in these sections draws upon the best available scientific literature and publicly available data. Pre-construction data specifically collected at the Project site are used and referenced as appropriate throughout this HCP. This chapter provides the basis for development of the Project's bat conservation program and the assessment of the Project's impact on the Covered Species.

3.1 Environmental Setting

The Project is located within the Ouachita Mountains Ecoregion that encompasses portions of southeastern Oklahoma and extends into west-central Arkansas (U.S. Environmental Protection Agency [USEPA] 2015). The ecoregion is characterized by rugged mountain ridges and broad valleys with complex geological formations and soils that create diverse forested habitats (The Nature Conservancy [TNC] 2018b). In Pushmataha County, where the Project is located, the Ouachita mountain range is comprised of oak/pine forests and oak/pine savannahs with steep slopes and shallow soils (Oklahoma Department of Wildlife Conservation [ODWC] 2018). The structure and composition of forest communities in the Pushmataha area are primarily threatened by altered fire regimes (e.g., fire suppression) and incompatible wildlife and timber management practices (TNC 2018a). Elevations in the Permit Area range from approximately 171 to 588 m (561 to 1,929 ft) above sea level. Topography consists of a ridgetop with predominantly forested land cover (84.5%; Table 3.1, Figure 3.1). Very little open water (<0.1%), cultivated crops (<0.1%), or developed area (1.8%) exist within the Permit Area (Table 3.1, Figure 3.1).

Table 3.1. Land cover types, coverage, and composition within the Wildhorse Mountain Wind Facility Permit Area.

Habitat	Hectares	Acres	% Composition
Evergreen Forest	2,416.3	5,970.8	44.0%
Deciduous Forest	1,681.1	4,154.0	30.6%
Mixed Forest	546.1	1,349.5	9.9%
Herbaceous	403.6	997.3	7.3%
Shrub/Scrub	334.0	825.3	6.1%
Developed	98.6	243.6	1.8%
Hay/Pasture	13.3	32.9	0.2%
Woody Wetlands	1.9	4.7	<0.1%
Open Water	0.6	1.6	<0.1%
Cultivated Crops	0.2	0.5	<0.1%
Total[a]	**5,495.6**	**13,580.0**	**100%**

[a] Totals may not equal values shown due to rounding.

Data from the National Land Cover Database (USGS NLCD 2011, Homer et al. 2015).

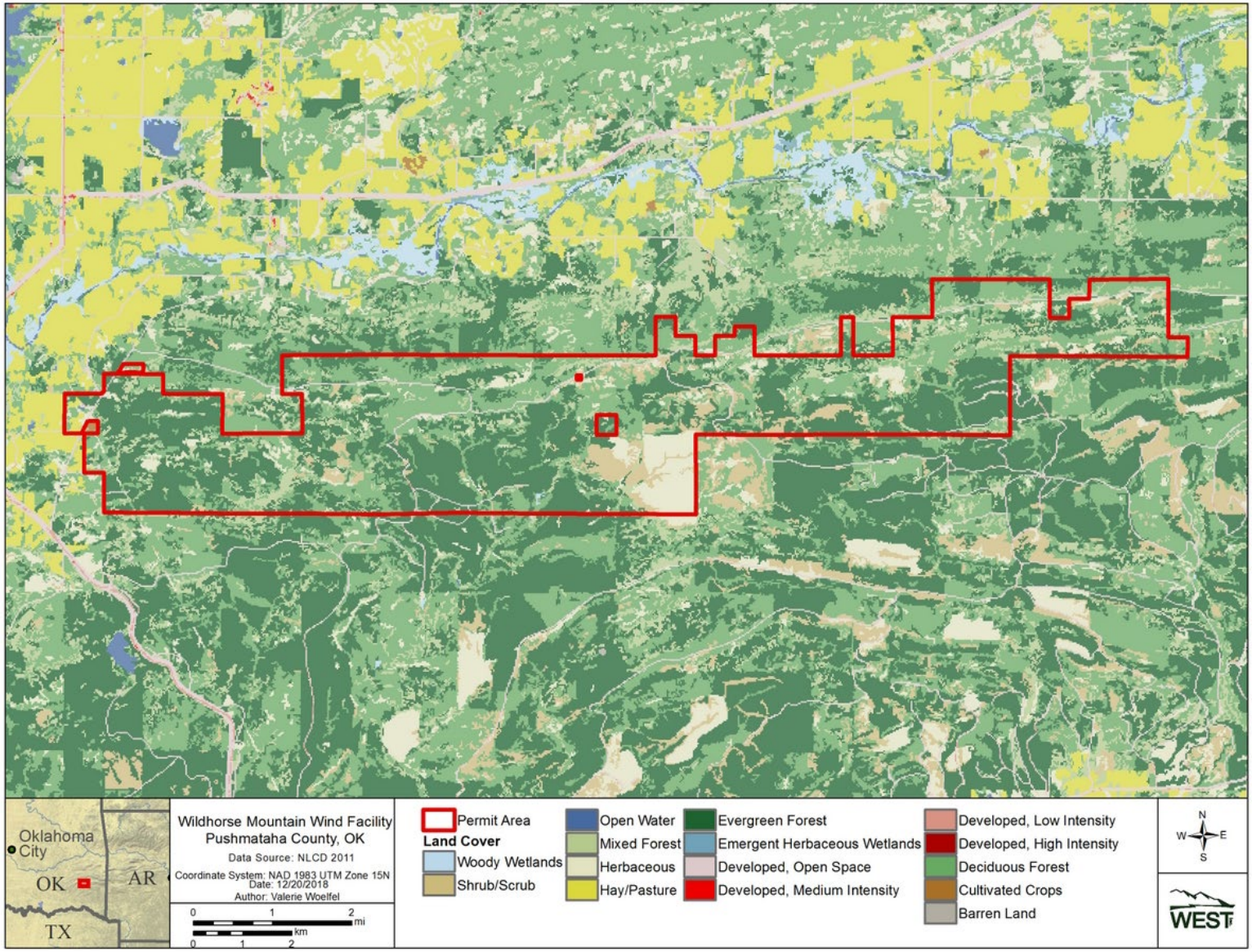

Figure 3.1. Land Cover within the Wildhorse Mountain Wind Facility Permit Area (U.S. Geological Survey National Land Cover Database 2011, Homer et al. 2015).

3.2 Indiana Bat

The INBA is a relatively long-lived, medium-sized (0.25 ounce [7 g]), insectivorous, migratory bat (Barclay and Harder 2003). While similar in appearance to other Myotis species (e.g., little brown bat [*Myotis lucifugus*]; NLEB), INBA can be distinguished by their pink nose, keeled calcar, and long toe hairs (Illinois Department of Natural Resources [IDNR] 2017).

3.2.1 *Life History and Habitat Requirements*

INBAs typically hibernate within caves, mines, or similar structures between October and April in large, dense groups that range in size from 3,300 to nearly 5,400 bats per square meter (300-500 bats per square foot; USFWS 2007, Boyles et al. 2008). The species requires low, stable temperatures (3 to 8 degrees [°] Celsius [C; 37° to 46° Fahrenheit (F)]) to successfully hibernate (Brack 2004, Tuttle and Kennedy 2002). Caves with the largest populations of INBAs are usually large, complex systems that allow for airflow, yet buffer or slow changes in temperature due to cave volume and complexity (Brack 2004).

INBAs usually emerge from hibernacula in the spring between mid-April and the end of May (Winhold and Kurta 2006), with spring emergence occurring earlier in more southern portions of the species' range (USFWS 2007). In Oklahoma, the observed INBA active season is from April 1 to November 15 (pers. comm., Brian Fuller, USFWS, August 27, 2019). The timing of spring migration depends on weather conditions and varies by latitude, but is broadly defined as the end of March to late May (USFWS 2007). While some male and non-reproductive female INBAs remain in the vicinity of hibernacula during summer (Gardner and Cook 2002, Whitaker and Brack 2002), reproductive females can travel up to 563 km (350 miles) to summer habitat (Winhold and Kurta 2006).

INBA summer habitat typically consists of low to moderate deciduous forest cover, with wooded corridors (e.g., riparian areas or tree lines) connecting forest patches in fragmented landscapes (IDNR 2017). The species often utilizes forest edges and semi-open areas within the forest to forage (Menzel et al. 2005). Reproductive females roost communally in maternity colonies of approximately 50 to 80 females (Whitaker and Brack 2002), although maternity colonies can vary greatly in size with respect to number of individuals and number of roost trees used (Kurta 2004). The majority of INBA maternity colonies have been found in fragmented forests near agricultural areas (USFWS 2007). Maternity colonies form under slabs of exfoliating bark, or occasionally within narrow cracks in trees, though they tend not to use tree cavities, such as those created by rot or woodpeckers (Kurta 2004, Lacki et al. 2009, Timpone et al. 2010). Typically, roosts are found in dead trees (i.e., snags), though partly dead or live trees (e.g., shagbark hickory [*Carya ovata*]) may also be used (USFWS 2007). Maternity colonies may use multiple roost trees during a single breeding season, and INBAs appear to be highly philopatric, using the same locations and same roosts in successive years (Barclay and Kurta 2007, Callahan et al. 1997, Humphrey et al. 1977). Female bats likely switch roosts throughout the breeding season based upon factors such as reproductive condition, roost type, roost condition, time of year, and predation (Kurta et al. 2002, USFWS 2007).

Female INBAs give birth to one young per year (Humphrey et al. 1977, Kurta and Rice 2002) and parturition (i.e., birth of pups) is completed by mid-July (Easterla and Watkins 1969, Humphrey et al. 1977, Kurta and Rice 2002). Young bats are volant (i.e., capable of flight) within three to five weeks of birth, at which time the maternity colony begins to disperse and adults and juveniles begin fall migration to return to the vicinity of hibernacula (USFWS 2007). Fall migration may begin as early as mid-July and last until mid-October (USFWS 2007). The timing of fall migration is dependent on weather conditions and varies by latitude, with INBAs in the southern portion of the species' range migrating later than those in the northern portions (USFWS 2007).

Prior to hibernation, during the swarming period, both sexes roost in wooded habitat around hibernacula and build fat stores vital to winter survival. In addition, mating occurs during the swarming period, but fertilization is delayed until the following spring (Guthrie 1933). Female bats enter hibernation soon after they arrive at hibernacula, while males remain active for a longer period and may also travel between hibernacula (USFWS 2007). Most INBAs roost within approximately 2.4 km (1.5 miles) of a hibernaculum during this time, suggesting that the forests around hibernacula provide important habitat before hibernation (USFWS 2007).

3.2.2 *Species Status and Occurrence*

3.2.2.1 Range-Wide

The species range for INBA includes all or parts of 22 states in the eastern U.S. (Gardner and Cook 2002, USFWS 2007; Figure 3.2). The INBA was one of the first species listed as endangered under the Endangered Species Preservation Act of 1966, prior to the enactment of the ESA of 1973. Near this time, in 1965, the overall population was estimated to be over 880,000 individuals. In general, there has been a long-term population decline in the species. As of 2019, the total range-wide population was estimated to be approximately 537,297 individuals (USFWS 2019).

A majority of the population decline since 2007 (more than 50%) is likely due to the effects of white-nose syndrome (WNS), such as those documented by Turner et al. (2011), where, in 2010, INBA mortality rates averaged 72% in WNS-infected hibernacula studied in the northeastern U.S. WNS is caused by the fungus *Pseudogymnoascus destructans* (Pd), which is frequently found on the muzzles, ears, feet, or patagium of infected bats (Blehert et al. 2009, Lorch et al. 2011). WNS was first discovered during the winter of 2006/2007 in four caves in Schoharie County, New York, and has since spread steadily in all directions (IDNR 2013, White-Nose Syndrome.org 2020), causing large and prolonged population declines at hibernacula and also reducing bat abundance in summer habitat (Brooks 2010, Dzal et al. 2011, USFWS 2012b).

Additional causes of INBA winter mortality may include natural predation, natural disasters that impact hibernacula, disturbance or modifications at hibernacula and surrounding areas that physically disturb the bats or change the microclimate within hibernacula, and direct human disturbance during hibernation that leads to disruption of normal hibernation patterns (USFWS 2007). Possible causes of summer mortality include loss of occupied forested habitat, predation, human disturbance, and other man-made disturbances (Kurta et al. 2002, USFWS 2007). General identified threats to the species include: destruction/degradation of hibernation habitat;

loss/degradation of summer, migration, and swarming habitat; disturbance of hibernating bats; disturbance of summering bats; disease (including WNS) and parasites; and natural factors and anthropogenic factors, as identified in The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (2007 Draft Recovery Plan; USFWS 2007). Currently, the most severe range-wide threat to populations of INBA is WNS (USFWS 2012b).

In 2019, there were 344 known extant INBA hibernacula in 16 of the 22 states within the species' range (USFWS 2019). Of these, 98% of the population hibernated in five states: Missouri (36.3%), Indiana (34.4%), Illinois (14.6%), Kentucky (10.4%), and New York (2.5%; USFWS 2019). In addition, 269 maternity colonies across 16 states have been identified since 2006, but it is assumed that this represents <10% of all maternity colonies range-wide, based on population size and an average maternity colony size (USFWS 2007).

The general distribution of the INBA within its range is shifting, likely in response to multiple factors. Pre-WNS population estimates indicated decreasing trends through the core range of the species in the Midwest and an increasing trend in the periphery and northern states (USFWS 2007), although WNS has now caused declining trends in the northern and central parts of the species' range (USFWS 2019). While the causes of the pre-WNS distribution changes are unknown, climate change may be playing a role by adversely affecting hibernacula temperature (USFWS 2007). The 2007 Indiana Bat Draft Recovery Plan divides the species' range into four Recovery Units (Ozark-Central, Midwest, Appalachian Mountains, and Northeast) intended to protect both core and peripheral populations (Figure 3.2). Delineation of Recovery Units was based on preliminary evidence of "population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macrohabitats and land use" (USFWS 2007). The Project lies within the Ozark-Central Recovery Unit (OCRU) described in the following section.

3.2.2.2 Ozark-Central Recovery Unit

The OCRU includes the state of Missouri and portions of Arkansas, Illinois, Iowa, and Oklahoma (USFWS 2007). The most recent population estimate for INBAs within the OCRU was 276,317 individuals in 2019; 51.4% of the range-wide population (USFWS 2019). The population within the OCRU decreased 8.1% from the population high recorded in 2017 (300,757 individuals; USFWS 2019). There are 126 known INBA hibernacula[14] within the OCRU, of which 72 are classified as extant (i.e., having at least one recorded INBA during census counts since 1995; USFWS 2007). Of these, seven are classified as Priority 1 hibernacula, having a current or historically observed winter population of 10,000 or more individuals and considered essential to the recovery and long-term conservation of the species; one in Illinois and six in Missouri.

[14] This value excludes the previously unknown Indiana bat hibernaculum discovered in Missouri in 2012 (USFWS 2017a).

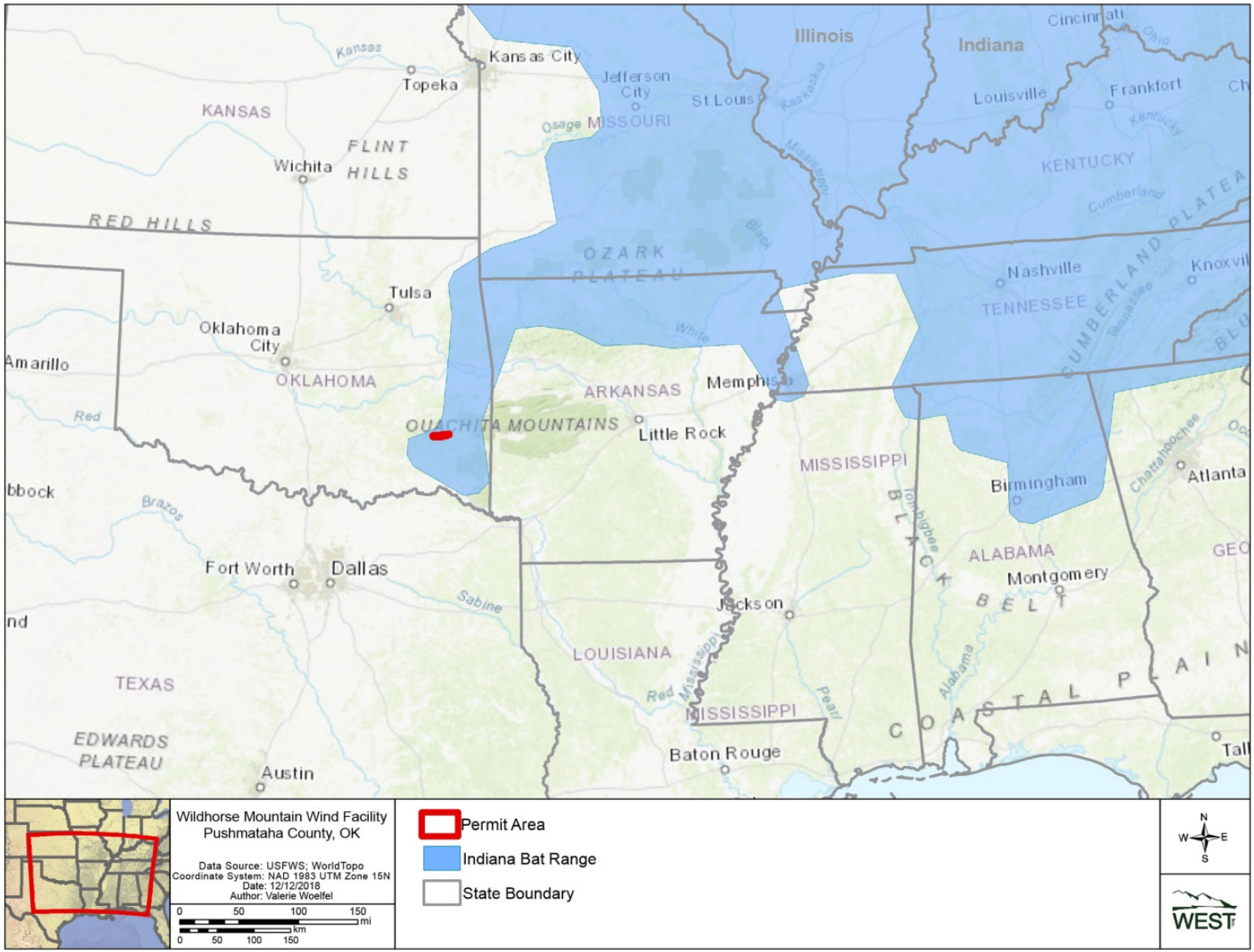

Figure 3.2. Approximate Range of the Indiana Bat and the Location of the Wildhorse Mountain Wind Facility.

3.2.2.3 Oklahoma

The INBA range in Oklahoma includes the counties of Adair, Delaware, Le Flore, Pushmataha, and Sequoyah (Figure 3.2). These counties compose the southwestern edge of the species range. Within the state, there are two known hibernacula with extant populations since 1995, of which only one, Bear Den in Le Flore County, has been occupied by INBAs after 2000 (USFWS 2007). Bear Den is located approximately 26 km (16 miles) from the Project. Prior to 2003 there were no INBAs estimated to occur in Oklahoma (USFWS 2007). Beginning in 2003, the state-wide hibernating population estimate was five INBAs. This increased to an all-time high of 13 bats in 2011 but has since been reduced and has remained at eight individuals since 2017 (USFWS 2019). During the winter 2019 survey season, a total of eight hibernating INBAs were recorded at Bear Den (pers. comm, Laurence Levesque, USFWS, July 18, 2019). To date, no INBA maternity roosts have been documented to occur in the state. Species occurrence within the Permit Area is discussed in Section 3.4.

In Oklahoma, the fungus associated with WNS (Pd) was first detected at a privately owned cave in Delaware County (eastern Oklahoma) during the winter of 2015 and infection was confirmed in 2017 (ODWC 2018b). Hibernating bats infected with WNS have also been confirmed in Adair County (eastern Oklahoma) during the 2017–2018 winter, and WNS is suspected in six other counties, including Le Flore, Sequoyah, Cherokee, and Ottawa in eastern Oklahoma (ODWC 2018b) and Woods and Woodward counties in north-central Oklahoma (White-Nose Syndrome.org 2020).

3.3 Northern Long-Eared Bat

The NLEB is a medium-sized (0.17–0.23 oz [5–6.4 g]), migratory, insectivorous bat. For most of the 20th century, the NLEB was considered a subspecies of Keen's bat (*Myotis keenii*), but the two are now considered genetically distinct species (Caceres and Pybus 1997, Center for Biological Diversity [CBD] 2010). The NLEB can be distinguished from other Myotis species by their long ears which extend past the snout and longer, more pointed tragus projecting from the inner ear (Feldhamer et al. 2015, IDNR 2017).

3.3.1 *Life History and Characteristics*

NLEBs hibernate as individuals or in small groups in caves, sinkholes, fissures in cliffs, quarries, or abandoned mines (Caceres and Barclay 2000) along with other bat species, such as INBAs, little brown bats, big brown bats (*Eptesicus fuscus*), and tri-colored bats (*Perimyotis subflavus*; Mills 1971, Caire et al. 1979, Boyles et al. 2009). Generally, NLEBs make up a small proportion of the total known hibernating population within a hibernaculum (less than 1%-15%; Griffin 1940, Hitchcock 1949, Pearson 1962, Caire et al. 1979, Stones 1981), and it is rare to find more than 100 NLEBs per hibernation colony (Barbour and Davis 1969, Caire et al. 1979). However, NLEBs favor deep crevices, unlike the large aggregations or clusters usually formed by other Myotis species (Caceres and Barclay 2000) and may therefore be difficult to accurately census during hibernaculum counts (Whitaker et al. 2002).

NLEBs typically emerge from hibernation between March and May (Caire et al. 1979, Fenton 1969, Nagorsen and Brigham 1993, Whitaker and Rissler 1992), depending on region,

and most commonly migrate distances up to 55 miles (89 km) to summer forested habitat (USFWS 2014a). Some males may migrate relatively shorter distances or stay in the vicinity of their hibernacula (Davis and Hitchcock 1965). The timing of spring migration depends on weather conditions and varies by region but is broadly defined as the beginning of April to mid-May (USFWS 2014a).

NLEB summer habitat typically consists of moderate to dense deciduous forest cover (>80% cover regionally; Pauli et al. 2015). The species often forages in intact forest under the canopy at small ponds or streams, along paths and roads, or at the forest edge (Caire et al. 1979). Roost selection varies by gender. Solitary male bats typically roost in the cavities of live trees (Caceres and Barclay 2000, Lacki and Schwierjohann 2001, Broders and Forbes 2004), while reproductive females roost communally in small maternity colonies of approximately 30–60 individuals (USFWS 2014a). Maternity colony roosts may be established in cracks, crevices, or under the peeling bark of live, dying or snag trees (USFWS 2014a) and occur more often in shade-tolerant stands of deciduous trees in species that are susceptible to cavity formation (Broders and Forbes 2004). Females give birth to one offspring per year (Barclay et al. 2004; Barbour and Davis 1969 as cited by USFWS 2016d). Regional conditions likely dictate parturition dates and subsequent weaning schedules (Foster and Kurta 1999), which have been reported to range from mid-May and June in the southeastern U.S. (Caire et al. 1979, Cope and Humphrey 1972) to late July in Canada (Broders et al. 2006).

Generally, NLEB fall migration occurs between mid-August and October (USFWS 2014a). NLEBs begin arriving at hibernacula in August, and by mid-September large numbers can be seen flying near the openings of certain caves and mines (Boyles et al. 2009). Similar to INBAs, mating occurs near hibernacula during the fall swarming period and fertilization is delayed until the following spring (Caceres and Barclay 2000).

3.3.2 *Species Status and Occurrence*

3.3.2.1 Range-Wide

The NLEB was listed as a threatened species under the ESA in 2015 (80 Fed. Reg. 17973 (2015); USFWS 2015a). Recently, the global status of the NLEB was changed to G1, indicating it is now considered a critically imperiled species (NatureServe 2016). NLEBs are widely distributed throughout 39 states in the U.S. and across eastern and central Canada (Figure 3.3; USFWS 2014b). While the distribution of NLEBs is widespread, individuals are present in an irregular, patchy distribution, rarely occurring in large numbers (Barbour and Davis 1969) and, prior to WNS, were considered more common in the northern part of their overall range (Harvey 1992, CBD 2010).

Little information exists describing the overall population size or trends of NLEB. Although low numbers are characteristic of hibernacula counts (Schmidt 2001, CBD 2010), mist-netting surveys suggest that NLEBs are more numerous than hibernacula counts indicate (Whitaker et al. 2002). While population trends for the NLEB were not historically monitored across the species' range, some surveys documented stable populations within portions of the species' range prior to the onset of WNS (e.g., Trombulak et al. 2001, CBD 2010). The most recent USFWS range-

wide population estimate for NLEBs was 6,546,718 adults (USFWS 2016d). The USFWS also reported that were 1,508 known NLEB hibernacula across 31 U.S. states and 1,744 known maternity roost trees (USFWS 2016d).

As described in Section 3.2.2.1 for INBAs, WNS is the most severe threat facing populations of NLEBs across the species' entire range and is the primary reason the species was listed under the ESA (USFWS 2015b). Populations of the NLEB in the northeastern U.S. and eastern Canada are estimated to have declined by up to 99% since the discovery of WNS in 2007 (as determined from hibernacula counts before and after WNS; USFWS 2015b). Specific to the U.S., Turner et al. (2011) reported a 98% decline in the number of hibernating NLEBs at 42 hibernacula in New York, Pennsylvania, Vermont, Virginia, and West Virginia since the onset of WNS. Climate change has also been identified as a threat to NLEBs, potentially influencing the species' phenology, range and distribution, and food availability (USFWS 2015b, 80 FR 17974 [April 2, 2015]). Other sources of mortality may further diminish the species' ability to persist in areas where populations have been significantly reduced by WNS.

3.3.2.2 Oklahoma

The NLEB range includes 23 counties in Oklahoma, which are located along the western edge of the species range (USFWS 2017c, Figure 3.3). As of 2015, there were nine known hibernacula within the state and no documented maternity colonies (USFWS 2016d; but see Section 3.4.2). Active hibernacula for the species have been reported in Adair, Cherokee, Delaware, and Sequoyah counties (USFWS 2018b). These hibernacula are all located more than 80 km (50 miles) from the Project.

Less than 50% of the state of Oklahoma falls within the NLEB range. The state was excluded from the most recent USFWS NLEB population estimates (USFWS 2016d); however, estimates were provided for Arkansas which is the located at the same latitude as Oklahoma. Assuming Oklahoma has a similar ratio of estimated adult NLEBs to forested acres (within the state-wide NLEB range) as Arkansas, the estimated NLEB population in Oklahoma is approximately 449,081 adults. As reported in Section 3.3.2.1 for INBAs, WNS has recently spread to hibernacula in Oklahoma and NLEB population declines in the state are likely to follow. Species occurrence within the Permit Area is discussed in Section 3.4.

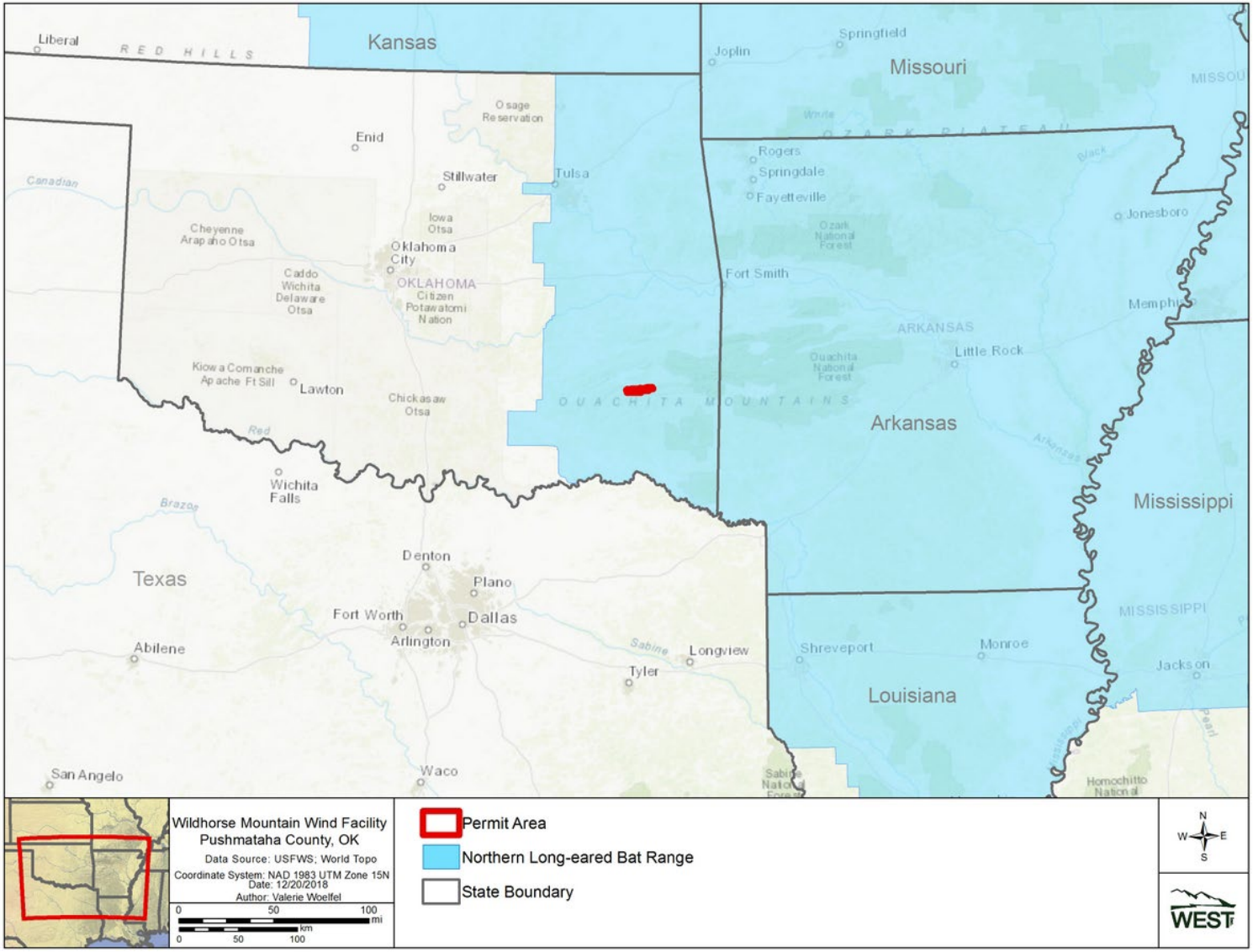

Figure 3.3. Approximate Range of the Northern Long-Eared Bat and the Location of the Wildhorse Mountain Wind Facility.

3.4 Occurrence of the Covered Species in the Permit Area

The following sections summarize the pre-construction studies conducted in the Permit Area that aided in the development of the Project's bat conservation program as well as the Applicant's understanding of the magnitude and seasonality of potential impacts to the Covered Species.

3.4.1 *Project-Specific Acoustic Bat Monitoring Surveys*

Two rounds of acoustic monitoring were conducted in the Permit Area during the summer and fall of 2016. The first round of monitoring (Murray et al. 2016), conducted June 6 to July 7, was designed to determine the presence or probable absence of INBA and NLEB at the Project during the summer and to identify locations where follow-up mist-netting (Section 3.4.2) should be conducted. The study design followed the 2016 Range-wide Indiana Bat Summer Survey Guidelines (USFWS 2016a). In consultation with the USFWS, 61 sites were surveyed for a total of 205 detector-nights. Recordings were taken from elevated detectors placed at least 3.0 m (9.8 ft) above ground level and Kaleidoscope Pro software was used to identify recorded calls to species. All calls identified as probable INBA or NLEB were qualitatively examined and verified by a qualified biologist with extensive acoustic identification experience (Dr. K.L. Murray).

The second round of acoustic monitoring (Pickle et al. 2017a), conducted July 21 to November 9, was designed to estimate levels of bat activity at the Project during the fall. Recordings were taken from two detectors paired at a met tower located in a clearing within a forested ridgetop. One detector was stationed approximately 3.0 m (9.8 ft) above ground level and the other was raised 45 m (148 ft) above ground level within the anticipated rotor-swept zone of the Project turbines.

3.4.1.1 First-Round Results

A total of 19,466 bat calls were recorded on 205 detector-nights during the first round of acoustic monitoring (Murray et al. 2016). Of those calls, approximately 88% could be identified to species. The most frequent of the Kaleidoscope-identified calls were eastern red bat (*Lasiurus borealis*) calls (32.5%). INBA and NLEB calls composed 2.3% and 3.8%, respectively. Of the INBA and NLEB calls identified by Kaleidoscope, NLEB calls were qualitatively confirmed at 14 of the 61 survey sites. No INBA calls were confirmed by qualitative review at any site. A follow-up mist-net survey was conducted at two of the 61 monitoring sites with potential INBA and NLEB calls that could not reliably be reviewed due to clutter (i.e., these were bat calls produced near vegetative clutter). The results of this follow-up survey are presented in Section 3.4.2.

3.4.1.2 Second-Round Results

A total of 4,211 bat passes were recorded over 171 detector-nights during the second round of acoustic monitoring (Pickle et al. 2017a). The two detectors recorded a combined mean (± standard error) of 25.34 ± 2.94 bat passes per detector-night. The ground unit recorded more bat passes per detector night (38.95 ± 5.42) than the raised unit (11.73 ± 1.2). High-frequency bat species, such as evening bats (*Nycticeius humeralis*), tri-colored bats, eastern red bats, and Myotis species, composed 83.4% of bat passes. High-frequency bats were the most commonly

recorded species at both the ground detector (92.6%) and the raised detector (56.0%). Weekly acoustic activity peaked from August 21 – 27 (95.0 bat passes per detector-night).

3.4.2 *Project-Specific Mist-Net, Telemetry and Emergence Surveys*

Mist-net surveys were conducted at the Project in 2016 and 2017. In 2016, surveys were conducted at two locations within the Permit Area from August 5 – 8 (Pickle et al. 2016b) as a follow-up to presence/absence acoustic monitoring conducted in June and July of 2016 (Pickle et al 2016a, Section 3.4.1). The purpose of 2016 mist-net surveys were to determine summer presence or probable absence of INBA and NLEB at two sites where previous acoustic survey data were unreliable and to conduct follow-up telemetry surveys and emergence counts of any captured female or juvenile INBA or NLEB for the purposes of locating maternity roosts.

In 2017, mist-net surveys were conducted at 36 sites, for four net-nights each, throughout the Project from May 16 through June 12 (Hyzy et al. 2017). The purpose of 2017 mist-net surveys were to determine summer presence or probable absence of INBA at sites recommended by the USFWS (to provide additional information on the site beyond 2016 surveys) and to conduct follow-up telemetry surveys and emergence counts of any captured female or juvenile INBA or NLEB for the purposes of locating maternity roosts. Mist-net surveys were conducted following guidelines for linear projects in the 2017 Range-wide Indiana Bat Summer Survey Guidelines (USFWS 2017b), which is also used for NLEB presence/probable absence surveys per the Northern Long-Eared Bat Interim Conference and Planning Guidance (USFWS 2014a).

3.4.2.1 2016 Results

A total of 27 bats were captured across both mist-netting sites, including 13 eastern red bats, nine evening bats (included one recapture), three NLEB, and two tri-colored bats. NLEB were captured at both mist-net locations and included two post-lactating adult females and one adult non-reproductive male. No INBA were captured.

Two of the NLEB captured (both post-lactating adult females) were radio-tracked between August 6 and August 12, 2016. Telemetry surveys documented two roost trees on accessible land tracts. Emergence counts at these roost trees documented one and zero bats emerging from each roost. Four additional roost sites located on land tracts that were not accessible were triangulated. Emergence counts were not conducted for triangulated roosts.

Results of the 2016 surveys indicated NLEB were present in the Permit Area during summer and used roost trees in the Permit Area. No INBA were captured during the 2016 study period; combined with the acoustic survey results this indicated probable absence of INBA in the Permit Area during summer.

3.4.2.2 2017 Results

A total of 205 bats were captured at 29 of the 36 sites. In total, eight big brown bats, 86 eastern red bats, three hoary bats, 10 silver-haired bats (*Lasionycteris noctivagans*), 32 evening bats, 51 NLEB, and 15 tri-colored bats were captured. NLEB were captured at 21 mist-net locations and

included 21 lactating females, 11 pregnant females, and 19 non-reproductive males. No INBA were captured, indicating probable absence of INBA in the Permit Area.

Eight of the NLEB (four pregnant females and four lactating females) were affixed with radio-trackers, of which five were unable to be located after searching for a minimum of seven days after release. Tracking the other three bats, telemetry surveys documented a total of four roost trees on accessible land tracts. Emergence counts at these roost trees documented zero, one, five, and 29 exiting bats.

Results of the 2017 surveys indicated NLEB were present in the Permit Area during summer and used roost trees in the Permit Area. No INBA were captured during the 2017 study period, indicating probable absence of INBA in the Permit Area during summer.

3.4.3 *Summary*

The results of acoustic monitoring and mist-net surveys (Table 3.2) indicate probable absence of INBA in the Permit Area during the summer; therefore, maternity colonies are unlikely to occur within the Permit Area. However, based on guidance from USFWS, INBA could utilize the Permit Area for foraging. The nearest known historic INBA hibernaculum, Bear Den, which had eight hibernating INBAs during the winter 2019 survey period, is located approximately 26 km from the Project (Section 3.2.2.3). INBA are therefore not expected to occur within the Permit Area during the fall swarming or winter hibernation seasons.

The results of acoustic monitoring and mist-net surveys indicate the presence of NLEB in the Permit Area during summer, including the presence of maternity colonies in the Permit Area. Because the nearest known hibernacula are located over 80 km from the Project (Section 3.3.2.2), NLEB are not expected to occur within the Permit Area during the fall swarming or winter hibernation seasons.

Table 3.2. Pre-construction bat surveys conducted at the Wildhorse Mountain Wind Facility.

Survey	Purpose	Dates	Results	Citation
Acoustic monitoring	Determine presence/probable absence of the Covered Species and identify locations for mist-netting	June 6 – July 7, 2016	NLEB calls confirmed at 14 of 61 survey locations, no INBA calls confirmed	Murray et al. 2016
Acoustic monitoring	Estimate levels of bat activity at the Project during fall	July 21 – November 9, 2016	Combined bat activity: 25.34 $\pm$ 2.94 bat passes per detector-night Ground unit: 38.95 $\pm$ 5.42 Raised unit: 11.71 $\pm$ 1.2	Pickle et al. 2017a

Table 3.2. Pre-construction bat surveys conducted at the Wildhorse Mountain Wind Facility.

Survey	Purpose	Dates	Results	Citation
Mist-net survey	Determine presence/probable absence of the Covered Species at two sites where acoustic data were unreliable and locate maternity roosts	August 5 – 8, 2016	NLEBs captured at both locations (two post-lactating adult females and one adult non-reproductive male), no INBAs captured Six roost trees located, emergence counts of one and zero bats at the two accessible roosts	Pickle et al. 2016b
Mist-net survey	Determine presence/probable absence of INBA at sites recommended by the USFWS and locate maternity roosts	May 16 – June 12, 2017	NLEBs captured at 21 locations (21 lactating females, 11 pregnant females, 19 non-reproductive males), no INBAs captured Four roost trees located, emergence counts of zero, one, five, and 29 bats	Hyzy et al. 2017

4 CONSERVATION PROGRAM

As described in the HCP Handbook (USFWS and NMFS 2016) and USFWS regulations, conservation actions within an HCP usually take one or more of the following forms: (1) avoiding potential impacts to the Covered Species (to the extent practicable), (2) minimizing potential impacts, (3) rectifying potential impacts, (4) reducing or eliminating potential impacts over time, or (5) compensating for potential impacts. Potential impacts to Covered Species can be avoided or minimized through timing restrictions and buffer zones; rectified by restoration and revegetation of disturbed Project areas; reduced or eliminated over time by proper management, monitoring, and adaptive management; and compensated by habitat restoration or protection at an on-site or off-site location(s). Typically, HCPs use several of these strategies simultaneously or consecutively. Ultimately, the conservation program provided in an HCP must be reasonably capable of being undertaken, and both commensurate with and rationally related to the impact of take under the plan[15].

The Applicant's bat conservation program focuses on avoiding and minimizing potential impacts to the Covered Species on Covered Lands, and on compensating for the minimized impacts on the Covered Species through the protection and enhancement of high-quality bat habitat in Oklahoma. Monitoring will be used to verify the effectiveness of these measures in meeting the biological goals and objectives of this HCP, provide information necessary to assess ITP compliance, and determine if adaptive management actions may be needed to maintain Permit compliance.

[15] See National Wildlife Federation v. Norton, 306 F.Supp.2d 920 (E.D. CA, February 4, 2004).

4.1 Biological Goals and Objectives

Biological goals and objectives are an inherent part of the HCP process and define the expected outcome of the conservation plan (HCP Handbook [USFWS and NMFS 2016]). The goals represent the guiding principles for operation of the conservation program described in the HCP and form the basis for the minimization and mitigation strategies employed. The biological objectives represent the steps through which the biological goals will be achieved and provide a basis for measuring progress towards achieving the goals. The biological goals and objectives of the Applicant's bat conservation program are to:

Biological Goal 1: Minimize potential impacts to the Covered Species in the Permit Area.

> Objective 1: The objective to achieve this goal is to implement a turbine operational strategy that will reduce mortality of the Covered Species at the Project over the entire bat active season during the 30-year ITP term.

Biological Goal 2: Fully offset impacts to the Covered Species in the Plan Area.

> Objective 2: The objective to achieve this goal is to implement a mitigation project that will protect and enhance high-quality habitat for the Covered Species. The conservation benefits of the mitigation will be at least equal to the impacts on the Covered Species.

Biological Goal 3: Increase scientific understanding of the benefits of bat conservation program measures for the Covered Species.

> Objective 3: The objective to achieve this goal is to conduct a monitoring program with three purposes: (a) establish a robust evaluation of the minimized take of the Covered Species under the bat conservation program, (b) ensure compliance with the requested ITP, and (c) contribute to the scientific knowledge base for management of the Covered Species and all bats in general.

Measures that will be used to meet these goals and objectives and the criteria used to evaluate their success are described in detail in the following sections.

4.2 Measures to Avoid and Minimize Impacts to the Covered Species

4.2.1 *Avoidance through Project Design and Planning*

The Applicant followed the tiered evaluation process outlined in the Wind Energy Guidelines (WEG; USFWS 2012a) to assess potential impacts of the Project. The Applicant implemented the following practices during Project design and construction and continues to implement best management practices during operation to avoid and minimize potential impacts to wildlife, including bats.

4.2.1.1 Operations and Maintenance and Substation Lighting

The Applicant has kept lighting at turbines, the O&M building, and the substation to the minimum necessary to safely and securely operate its facilities, consistent with facility security requirements. O&M personnel are directed through annual environmental training to extinguish nighttime exterior lights at the O&M building and substation (consistent with facility security requirements) when not in use and the importance of minimizing nighttime light use. Exterior lights are hooded downward-directed lights to minimize horizontal and skyward illumination, and, whenever possible and consistent with physical security requirements, lights with motion or heat sensors and switches are used to keep lights off when not required. These measures reduce potential attraction of bats and their insect prey to the Project's facilities.

4.2.1.2 Wind Turbine Lighting

Aviation hazard lighting of the Project has been minimized to that which is required by the FAA. The FAA typically requires every structure taller than 61 m (200 ft) above ground level to be lit to improve visibility to aviation traffic. In the case of wind power developments, the FAA allows a strategic lighting plan that provides complete visibility to aviators but does not require lighting every turbine. The Applicant's lighting plan uses the minimal level of lighting acceptable to the FAA and employs medium-intensity red synchronously flashing lights for nighttime use and for daytime use, if needed, as recommended by the FAA and in the WEG. These measures also reduce potential attraction of bats and their insect prey to the Project's facilities.

4.2.1.3 Repowering/Decommissioning

Following the useful life of the Project facilities and infrastructure, the Applicant has the option to repower or decommission the Project. In the case of repowering, the Applicant would seek an ITP renewal or amendment. Actions associated with repowering and decommissioning (i.e., replacement of turbines or the removal of turbines and other facilities) will be conducted during daylight hours and any necessary tree clearing will be conducted in the bat winter hibernation season (November 1 – March 31) to avoid potential take of the Covered Species.

4.2.2 *Minimization Measures during Project Operations*

The Applicant has developed measures to minimize the impacts to Covered Species, including operational adjustments to minimize the impacts of INBA and NLEB. Several operational adjustment experiments and comparisons have documented significant reductions in bat mortality through reducing or eliminating the rotation of turbine blades below cut-in wind speed by turning turbine blades parallel to the prevailing wind direction to reduce rotation of the turbine rotors to less than two revolutions per minute at pre-defined wind speeds (feathering) or increasing the wind speed at which turbines become operational (cut-in; Appendix A). Bat mortality in the Eastern and Midwestern U.S. is inversely related to wind speed (Arnett et al. 2005). Raising the cut-in speed and feathering turbine blades below cut-in speed at night, during periods of low wind,

and in the late-summer through early-fall can substantially reduce bat mortality (Appendix A)[16]. While operational strategies and turbine types varied somewhat among studies, the results from these curtailment effectiveness studies can be used to predict what can be expected from minimization measures that will be implemented as part of this HCP.

Based on landscape similarity, research conducted in USFWS Region 5 is the most relevant for understanding reductions in bat mortality that are likely to be achieved under the proposed minimization strategy. Only studies that have strong study designs were considered for bat mortality reductions. At the Pinnacle Project in West Virginia, curtailment trials were rotated among all turbines so that results of the treatment groups were directly comparable. All bat fatalities were reduced by 47% (95% confidence interval = 52 – 93%) when cut-in speed was increased from 3.0 m/s to 5.0 m/s in 2013 and by 54% (95% confidence interval = 44% - 86%) in 2014 (Hein et al. 2013, 2014). At the Casselman Project, Pennsylvania, a similar study design was applied at a subset of turbines. All bat fatalities were reduced by 82% when cut-in speed was increased from 3.5 m/s to 5.0 m/s (95% confidence interval = 12 – 78%) in 2008 and by 72% (95% confidence interval = 18% - 75%) in 2009 (Arnett et al. 2010). At the NedPower Mount Storm Projects in West Virginia, researchers evaluated the effect of curtailing turbines during different times of night. Feathering was conducted under a normal cut-in speed of 4.0 m/s (Young et al. 2011). Feathering during the first half of the night reduced bat mortality by 72% and feathering during the second half of the night reduced mortality by 50% during the period when curtailment was in place. When reviewing the reduction over the entire study period from July to October (i.e., including nights of normal operation), feathering during the first half of the night reduced bat mortality by 47% and feathering during the second half of the night reduced mortality by 22%. Based on the results of post-construction monitoring at these three projects, it is reasonable to expect at least a 50% reduction in mortality when increasing cut-in speed to 5.0 m/s with feathering.

It is unclear if operational adjustments are equally effective at reducing mortality for all species or species groups. Three species of long-distance migratory bats account for the majority of fatalities at wind energy facilities in North America: the foliage-roosting hoary bat (*Lasiurus cinereus*) and eastern red bat, and the cavity-roosting silver-haired bat (Kunz et al. 2007, Arnett et al. 2008). Collectively, these species composed 75% of all documented bat fatalities in a review of studies from 19 wind energy facilities (Arnett et al. 2008). Consequently, these species constitute the bulk of the all-bat fatality data analyzed in curtailment studies to date.

The Applicant will minimize potential impacts to the Covered Species from the Project by implementing turbine operational adjustments (Table 4.1). These turbine operational adjustments are designed, based on the best available science, to substantially reduce take of the Covered Species, thereby reducing the impact on the Covered Species' populations potentially affected by take from the Project and supporting the conservation of these populations. Minimization

[16] Confidence intervals around the mean percent reductions in some studies overlapped. In those cases, the reported effect of curtailment was not significantly different from normally operating turbines or those curtailed at lower wind speeds. However, because fewer bat fatalities are generally found at turbines curtailed at higher wind speeds, there may have been insufficient power to detect a difference had there been one.

measures will be implemented from April 1 to October 31 to cover the majority of the bat active season and will be increased to more intensive measures during important conservation periods for the Covered Species (May 15 to July 31 and August 1 to October 31) at all turbines, except for Turbines 20 and 21 during the power performance testing in Year 1. Existing information on the effectiveness of operational adjustments at reducing bat mortality indicates that the minimization plan will reduce take of the Covered Species by at least 50%. This plan is described below.

The Applicant will feather all turbines below the manufacturer's cut-in speed nightly from April 1 through May 14 each year, except for Turbines 20 and 21 during the power performance testing in Year 1. The manufacturer's cut-in speed for Project turbines is 3.0 m per second (m/s; 9.8 ft/s). Research suggests that feathering below the manufacturer's cut-in speed can reduce fatalities by approximately 35% to 57.5% (Baerwald et al. 2009, Young et al. 2011, Good et al. 2012). Project turbines will be monitored and controlled based on wind speed on an individual basis (i.e., the entire Project will not alter cut-in wind speed of all turbines at the same time, but cut-in speeds will be altered based on wind speed conditions specific to each turbine). Turbine blades will be feathered when wind speed, as monitored at individual turbines, is below the cut-in wind speed during the course of the night. Turbines will be released to run normally when the wind speed rises above the cut-in wind speed.

The Applicant will implement more intensive minimization measures from May 15 to July 31 each year as this period overlaps with the Covered Species' maternity season and take during this period is more likely to affect reproductive females from maternity colonies in or near the Permit Area. Additionally, the Applicant will implement more intensive minimization measures from August 1 to October 31 each year as this period constitutes the end of the Covered Species' maternity season and their fall migration season, when most mortality of the Covered Species at wind energy facilities has occurred and when bats in general experience the highest mortality at wind energy facilities. To substantially reduce potential impacts during these important conservation periods for the Covered Species, turbines will be feathered below a raised nighttime cut-in speed of 4.0 m/s (13.1 ft/s) from May 15 to July 31 each year and turbines will be feathered below a further raised nighttime cut-in speed of 5.0 m/s (16.4 ft/s) from August 1 to October 31 each year, except for Turbines 20 and 21 during the power performance testing in Year 1. Research suggests that feathering below a cut-in speed of 4.0 m/s can reduce fatalities by 50% to 72% (Young et al. 2011) and feathering below 5.0 m/s (16.4 ft/s) can reduce fatalities by approximately 47% to 82% (Arnett et al. 2010, Good et al. 2011, Hein et al. 2013 and 2014). The only exception to feathering turbines below these raised cut-in speeds would occur when

temperatures are below 10 °C (50 °F)[17], as activity of the Covered Species, and consequently the potential for take of the Covered Species, is minimal below this temperature threshold (Fowler Ridge Wind Farm LLC 2013). However, turbines will still be feathered below the manufacturer's cut-in speed (3.0 m/s) below this temperature. As with wind speed, turbines will be monitored and controlled based on temperature on an individual basis. Turbines will be feathered under raised cut-in speeds when the temperature is above 10 °C (50 °F) during the course of the night. Turbines will be feathered under the manufacturer's rated cut-in speed when the temperature drops below 10 °C (50 °F).

Table 4.1. Operational minimization plan for the Wildhorse Mountain Wind Facility Habitat Conservation Plan.

Dates	Time of Day	Cut-in Speed	Feathering Below Cut-in[1]?	Temperature Threshold[2]
April 1 – May 14	Sunset to sunrise	3.0 m/s (9.8 ft/s)	Yes	None
May 15 – July 31	Sunset to sunrise	4.0 m/s (13.1 ft/s)	Yes	10 °C (50 °F)
August 1 – October 31	Sunset to sunrise	5.0 m/s (16.4 ft/s)	Yes	10 °C (50 °F)
November 1 – March 31	Sunset to sunrise	3.0 m/s (9.8 ft/s)	No	None

[1] Feathering means that turbine blades will be pitched into the wind such that they spin at less than one rotation per minute.

[2] Turbines will be feathered below cut-in when temperatures are above the threshold.

4.3 Measures to Mitigate Impacts to the Covered Species

As described above, the Applicant will implement measures that are expected to reduce take of the Covered Species, particularly during important conservation periods, and thereby minimize the impact of take on the Covered Species populations. However, some incidental take of the Covered Species is still expected to occur. To provide conservation benefits to the Covered Species that are at least equal to the minimized impact of take, the Applicant has collaborated with the USFWS and Magnolia Land Partners LLC (Magnolia), the Applicant's contracted conservation entity, to design a mitigation program that provides protection of high-quality habitat for the Covered Species. This mitigation will fully offset the impact of predicted take of the Covered Species, including lost reproductive capacity, based on the USFWS Resource Equivalency Analysis (REA) model (described in Section 5.2.6.1). The mitigation will provide 90 acres of summer habitat protection in a location occupied by both Covered Species. The REA model calculations resulted in 27 acres of summer habitat protection necessary to offset the impacts of Indiana bat take and 84 acres of summer habitat protection required to offset the impacts of northern long-eared bat take (see Appendix C for REA calculations). Because suitable habitat for

[17] The 10 °C (50 °F) temperature threshold is based on results from post-construction mortality monitoring at the Fowler Ridge Wind Farm, Benton County, Indiana, and nightly temperatures measured at 10-minute increments derived from turbine SCADA data between the hours of 20:00 and 08:00 from August 1 to October 15, 2010-2012. These data show that the proportion of fresh bat fatalities that occurred when average nightly temperatures were above 10 °C (50 °F) was 99.7% (285 fatalities out of 286; range in nightly temperatures in this group of fatalities was 42.8 °F to 88.9 °F [6.0 °C to 31.6 °C]) in 2010, 99.0% (307 fatalities out of 310; range in nightly temperatures in this group of fatalities was 44.4 °F to 85.6 °F [6.9 °C to 29.8 °C]) in 2011, and 98.2% (55 fatalities out of 56; range in nightly temperatures in this group of fatalities was 44.1 °F to 100.4 °F [6.7 ˚C to 38.0 °C]) in 2012. Average nightly temperatures that were below 10 ˚C (50 °F) occurred about 4.1%, 2.7%, and 9.5% of the time in 2010, 2011, and 2012, respectively.

and occurrence of the two Covered Species overlap at the mitigation project (Martin 2019), the 90-acre parcel exceeds the mitigation requirements for both Covered Species. The conservation benefits to the Covered Species and implementation of this mitigation program are described below.

4.3.1 *Conservation Benefits for the Covered Species*

The 2007 Draft Indiana Bat Recovery Plan includes proposed recovery actions based on four broad categories: 1) population monitoring actions; 2) conservation and management of habitat (hibernacula, swarming, summer); 3) further research essential for the species' recovery; and 4) public education and outreach. The 2007 Draft Indiana Bat Recovery Plan identifies Priority 1 actions that are most important and effective for recovery or reclassification of the INBA, namely, hibernacula- and summer habitat-related recovery actions as well as those "that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future" (USFWS 2007). Because a recovery plan has not yet been developed for NLEBs, and based on the similarity in habitat requirements of, and threats to, the two Covered Species, the Applicant referred to the above recovery action priorities in identifying a mitigation project that will advance conservation of both of the Covered Species.

In collaboration with the USFWS and Magnolia, the Applicant determined that the highest priority, achievable recovery action for the Covered Species in eastern Oklahoma is the conservation and management of habitat, specifically summer and/or swarming habitat. Therefore, as a key component of the Project's bat conservation program, the Applicant will provide funding to Magnolia to implement a summer habitat protection project that is expected to reduce threats to the Covered Species and is expected to result in an increase in the populations of the Covered Species that use eastern Oklahoma (the impacts from WNS, over which the Applicant and the USFWS have no control, notwithstanding).

The impact of the predicted take will be fully offset by one upfront mitigation project which will entail the protection of the Kiamichi River Conservation Site. The Kiamichi River Conservation Site consists of a single parcel located in Pushmataha County. The site provides 90 acres of contiguous forested habitat that is likely to be utilized by Covered Species for roosting and/or foraging habitat and is located immediately adjacent to the Kiamichi River. The site contains numerous large live trees and snags with cracks, crevices, and sloughing bark characteristic of the preferred roosting habitat for the Covered Species, with an average canopy cover of approximately 68%, less than 1% woody invasive species coverage, and an average of 9 snags per acre that are greater than 11 inches diameter-at-breast-height. The forest community includes a mix of large, mature trees and younger trees and saplings in the understory. The dominant canopy trees are oaks (*Quercus* spp.) and hickory species (*Carya* spp.). The site also contains approximately 17 acres of wetlands, primarily floodplains of the Kiamichi River, which forms the northern boundary of the site. The site is mostly flat where it consists of floodplains along the river, then slopes steeply away from the river to the south. Some of the slopes contain boulder fields and rocky outcroppings (Magnolia 2019), features that may be used as roosts or hibernacula by the Covered Species, particularly northern long-eared bats. The summer presence of both Covered Species has been confirmed at the site (Martin 2019).

Mitigation will confer important conservation benefits to both of the Covered Species because the protection of summer habitat from threats is essential to the reproductive success of maternity colonies, which is critical to the recovery of the Covered Species due to their life histories characterized by long-lived individuals and low reproductive rates. By protecting Covered Species summer habitat and removing threats that affect survivorship, the long-term survival and reproductive success of local bat populations should remain stable or increase as a result of the mitigation. Protection of such local populations will increase the likelihood that bats in the population survive over time, continue contributing to the recovery of the species, and offset the impacts of the potential take from operation of the Project.

4.3.2 *Mitigation Implementation*

The mitigation component of this bat conservation program will be implemented upfront and was designed to fully offset the impact of the take predicted to occur over the 30-year ITP term (see Sections 5.2.5 and 5.3.5 for the take predictions). The Applicant has entered into a contract with Magnolia to implement the full amount of mitigation under this bat conservation program within one calendar year from the date of ITP issuance. The Applicant collaborated with the USFWS and Magnolia to select and implement a mitigation project to fully offset the impact of the predicted take of the Covered Species. The mitigation project was agreed upon by the Applicant and the USFWS and will be approved by the USFWS before a Memorandum of Understanding (MOU) or similar agreement is executed between the USFWS, Magnolia and Applicant. Once the MOU is executed and the Applicant provides payment to Magnolia, Magnolia will implement the mitigation project. Thereafter, Magnolia shall be responsible for completion of the mitigation project using the funds provided by the Applicant. In the event that Magnolia is unable to perform its duties, the Applicant and the USFWS may jointly select an alternative conservation entity to assist in the implementation of the mitigation project.

4.3.3 *Mitigation Management and Effectiveness Monitoring*

As a requirement of the mitigation contract, Magnolia is in the process of developing a bat habitat conservation plan for approval by the USFWS (Appendix E). The bat habitat conservation plan will include but not be limited to background information on the habitat, a threats analysis, the mitigation project's objectives, the action and implementation strategy for the project, a description of the project monitoring, an adaptive management strategy, and the reporting process. The plan will describe: the entity responsible for periodic evaluation of the mitigation project, the frequency of the periodic evaluation, and adaptive management actions to be taken if the periodic evaluation indicates that the habitat quality of the project has been impacted by natural disaster. Generally, the plan will include the following sections:

- Purpose of Mitigation Plan
- Goals of Mitigation Plan

- Species Information
    - Life History
    - Existing Threats
- Site Information
- Management Actions
- Adaptive Management
- Exhibit A: Mitigation Site Location Maps
    - A-1: General Vicinity Map
    - A-2: Map of Conservation Area
- Exhibit B: Development Plan
    - B-1: Development Security Analysis and Schedule
    - B-2: Development Plan
- Exhibit C: Management and Monitoring Documents
    - C-1: Interim Management Security Analysis and Schedule
    - C-2: Long-term Management Security Analysis and Schedule
    - C-3: Endowment Agreement
    - C-4: Interim Management Plan
    - C-5 Long-term Management Plan
- Exhibit D: Real Estate Records
    - D-1: Title Review
    - D-2: Approved-as-to-form Conservation Easement Deed
- Exhibit E: Resource Equivalency Analysis
- Exhibit F: Phase I Environmental Site Assessment
- Exhibit G: Biological Resources Survey
- Exhibit H: Other Documentation, Permits, Amendments, or Revisions

Mitigation effectiveness monitoring will be conducted by Magnolia and will examine the mitigation project to evaluate its performance relative to the criteria established in the project's bat habitat conservation plan and to recommend project-specific adjustments as needed. Monitoring will be conducted to ensure that the habitat conditions are maintained and that protections are adequate. Details of the monitoring methods will be included in the management plans. The monitoring will include an assessment of the functionality of the habitat protection measures, the need for any maintenance measures, and an assessment of threat abatement due to the project. Monitoring,

likely through site visits, will be conducted on an annual basis to ensure the criteria established in the project's bat habitat conservation plan are being met.

The results of mitigation effectiveness monitoring (as compiled in the compliance and effectiveness monitoring reports, Section 4.6) will be provided to the USFWS for review. In addition to the reports, Magnolia will make recommendations for modifications or discontinuance of certain measures if any are warranted, the Applicant and USFWS will then confer and adjust implementation of the mitigation plan if appropriate.

4.4 Compliance Monitoring Plan

The Applicant will conduct compliance monitoring at the Project to ensure compliance with the ITP and to support management for the Covered Species and bats in general. The compliance monitoring program was designed based on available information, USFWS HCP guidance, and the ITP compliance needs with the following objectives in mind:

- A cost-effective strategy that will provide the metrics necessary to establish a robust evaluation of the minimized take of the Covered Species under the bat conservation program;
- A monitoring approach designed to facilitate evaluation of take thresholds to determine if an adaptive management response may be needed to maintain ITP compliance;
- Contribution to the scientific knowledge base for management of the Covered Species and all bats in general.

The compliance monitoring plan developed by the Applicant, in coordination with the USFWS, takes a two-tiered approach: 1) mortality monitoring at the Project for the first three years, then 2) annual participation in the North American Bat Monitoring Program (NABat) for the remainder of the ITP term **OR** interval mortality monitoring at the Project every seventh year for the remainder of the ITP term. The second-tier monitoring approach will be determined based on the results of the first-tier mortality monitoring. The process for this determination is set forth in the adaptive management protocol in Section 4.5.

Methods for mortality monitoring and NABat monitoring are described below. If new information becomes available to suggest improved, cost-effective, and logistically feasible methods for either approach, the Applicant may consult with the USFWS regarding changes to the protocol and implementation of applicable new methods (see Changed Circumstances, Section 8.2.3).

4.4.1 *Mortality Monitoring*

The Applicant designed the mortality monitoring approach to collect robust, useful data that provide high confidence in the resulting evaluation of Covered Species take. In order to provide a robust take evaluation, a representative sample of the Project needs to be achieved through a logistically successful and cost-efficient monitoring study design. The monitoring will include searching the roads and pads of every turbine daily during the mortality monitoring period as described below in detail (Section 4.4.1.2). Conducting road and pad searches at each turbine

will ensure the monitoring is logistically successful and cost-efficient. The gravel roads and pads provide safe and reliable search areas in which the ability of searchers to find bat carcasses is typically high. Although not all bat carcasses are expected to fall on the gravel roads and pads, the take estimation methods (Section 4.4.1.1) will adjust the raw carcass data to account for bats that may have fallen outside of searched areas. The ability of searchers to find bat carcasses off the road and pad areas in anything but mowed grass fields is typically extremely low. Forested habitat surrounding each Project turbine creates poor searching conditions and clearing and maintaining a larger search area around the turbines would be counterproductive to conservation as clearing additional vegetation would entail unnecessary habitat removal. Woody vegetation will be allowed to regenerate in the non-gravel areas that were cleared for construction at each turbine site. Additionally, the ridgetop location of the Project presents challenges due to the potential safety issues that can arise when attempting to search steep slopes. For these reasons, a road and pad monitoring design best achieves a representative sample of the Project to support robust take estimates for the Covered Species.

4.4.1.1 Take Estimation

The Applicant will conduct mortality monitoring for the purpose of achieving a robust evaluation of take of the Covered Species at the Project under this bat conservation program. The take evaluation for NLEB will be conducted using the Evidence of Absence model (EoA) to calculate a take estimate for the species. Evidence of Absence is a statistical framework and software package developed by the USGS to estimate the occurrence of rare events (Huso et al. 2015, Dalthorp and Huso 2015). Of the available analytical methods for estimating the occurrence of rare events, EoA provides the most precise estimates and is the most appropriate method for establishing take estimates for NLEB. EoA requires the following inputs:

- Total number of carcasses found in searches
- Estimated probability of discovering a carcass, which comprises the following:
    - Searcher efficiency
    - Carcass persistence
    - Area correction
    - Arrival distribution
    - Search schedule

The monitoring study design, described below in detail (Sections 4.4.1.2 and 4.4.1.3), will provide all of the data necessary for these EoA inputs. If new information becomes available to suggest improved methods for estimating bat mortality, the Applicant may consult with the USFWS regarding cost effective and logistically feasible changes to the protocol and implementation of applicable new methods, per the New Technology and Information changed circumstance (Section 8.2.3).

For INBA, EoA is not an appropriate method for evaluating take at the Project due to the extremely low amount of take that is expected to occur and is requested to be authorized on the ITP. Few INBA fatalities have been recorded at US wind facilities and the number of INBA expected to occur within the Permit Area and in Oklahoma in general is extremely low. The total known hibernating population for the entire state of Oklahoma is only eight individuals (USFWS 2019) and the Project is located along the western-most boundary of the INBA range, limiting the likelihood of the occurrence of migrating individuals in the Permit Area. Furthermore, the results of site-specific pre-construction surveys (Section 3.4) and the lack of hibernacula near the Permit Area indicate probable absence of INBA in the Permit Area during the summer and winter seasons. The EoA method assumes that some level of mortality is occurring in every year for which a take estimate is generated from the monitoring data, and is therefore inaccurate at estimating take when the rate of take is less than one bat per year, such as the predicted take of INBA at the Project (Section 5.2.5). EoA, like most of statistics, operates on the principle of the average. In reality, rare events usually do not occur at evenly spaced intervals, thereby not meeting the average every year, or occur too infrequently to be accurately represented by an annual average. This is particularly true when the permitted level of take (i.e. 8 INBA) is substantially less than the permit term (i.e. 30 years). The average principle here would state that on average a fraction (8/30 ~ 0.25) of a bat would be killed every year. Because it is impossible to only kill a fraction of a bat, the on average principle breaks down in this situation. Conceptually, EoA operating on the average principle is comparing the average (8/30 ~ 0.25) to a found carcass (0.25 compared to 1) and because only whole bats can be killed the difference appears bigger than it is.

To avoid the potential bias and overestimated take associated with using the EoA model when take is not expected to occur each year (and in fact only once every four years or so), INBA take compliance will be evaluated based on the unadjusted counts of carcasses collected during mortality monitoring.

4.4.1.2 Data Collection and Processing

Road and pad searches will be conducted at all 29 Project turbines daily from April 1 through October 31. Searches will cover the gravel pad around each turbine and the roads up to 100 m (328 ft) from each turbine. This search design provides full spatial coverage of the Project and avoids the assumption that a subset of search turbines is representative of the entire Project. This design also provides full temporal coverage of the bat active season, ensuring that events or trends in time will be captured in the dataset and improving the ability to establish the date of mortality for most carcasses.

All bat carcasses located within the search areas (i.e., roads and pads) will be recorded. The following information will be recorded for each carcass: a unique identification code, sex and age when possible, date and time collected, observer, carcass condition (i.e., intact, scavenged, dismembered, or injured), injuries, scavenging, estimated time of death, Universal Transverse Mercator (UTM) location, distance and bearing from the turbine, and any relevant comments. All carcasses will be photographed as found and plotted on a map of the search area. Bat carcasses will be collected and species identification will be verified by bat biologists permitted by the

USFWS to survey for INBA and NLEB. Skin and tissue samples from bat carcasses too decomposed to be identified by permitted bat biologists will be sent to a qualified lab for identification via DNA sampling. Carcasses found outside of the standardized search area or within the search area will be recorded following the above protocol, and labeled as incidental finds.

4.4.1.3 Bias Correction

Searcher Efficiency

The objective of searcher efficiency trials is to estimate the proportion of available carcasses found by searchers. Searcher efficiency trials will be conducted in the same areas as carcass searches and will be estimated by season. The most appropriate searcher efficiency model will be selected based on Akaike's Information Criterion, adjusted for sample size. The selected searcher efficiency model will be used to adjust the total number of bat carcasses found for those missed by searchers, thereby correcting for detection bias.

Twenty bias trial carcasses will be placed per season (spring, summer, and fall). The person placing the carcasses will not inform the personnel conducting the searches when the trial is being conducted, where trial carcasses are placed, or how many trial carcasses have been placed. Carcasses of non-listed bat species found on-site, and carcasses of non-listed bat species that are available from labs or other sources, will be used in the trials. If an insufficient number of bat carcasses are available, brown or black mice (*Mus musculus*) carcasses may be used as surrogate bat carcasses.

All searcher efficiency trial carcasses will be placed at random locations within the search area prior to scheduled carcass survey. Each trial carcass will be discreetly marked so that it can be identified as a study carcass after it is found. The number and location of the searcher efficiency carcasses found will be recorded. The number of carcasses available for detection during each trial (i.e., that were not removed by scavengers before searchers could search for them) will be determined immediately after the trial by the person responsible for placing the carcasses.

The factor by which searcher efficiency changes as undetected carcasses age (k) is difficult to estimate in the field because it requires a large number of carcasses to be tracked through multiple searches. However, a recent analysis indicated that 0.67 is a reasonable value to use for k for bats (Huso et al. 2017). Unless a better estimate becomes available, k will be assumed to be 0.67.

Carcass Persistence

The objective of carcass persistence trials is to estimate the average probability a carcass is available to be found after an interval of time. The probability is determined by the length of time a carcass remains in the search area before being removed by scavengers or by other means. Possible means of carcass removal include removal by scavengers or insects. Estimates of carcass persistence will be used to adjust mortality estimates for removal bias.

Carcasses will be placed within search area boundaries. Carcass persistence trials will be conducted throughout the monitoring period to incorporate the effects of varying weather, climatic conditions, and scavenger densities. Species used for carcass persistence trials will be the same as used for searcher efficiency trials. Approximately 20 bat carcasses or bat surrogate carcasses will be placed during the carcass persistence trials each season (spring, summer, and fall). Persistence trial carcasses will be marked discreetly (e.g., with zip ties) for recognition by searchers and other personnel.

Field personnel will monitor carcass persistence trials for 30 days. Trial carcasses will be checked every day for the first four days, and then on day seven, day 10, and day 14 after placement. At the end of the 14-day period, any remaining evidence of the carcass will be removed.

4.4.2 *NABat Monitoring*

NABat is a continent-wide effort led by the US Geologic Survey to monitor bat activity at local and landscape scales to inform effective conservation decision-making and assist in tracking the long-term viability of bat populations (Loeb et al. 2015). One method for participating in NABat is to gather data by conducting mobile (i.e., driving transect) acoustic surveys. If participation in NABat is triggered by the HCP's adaptive management protocol (Section 4.5), the Applicant will conduct annual mobile surveys within four grids surrounding the Project, chosen in coordination with the USFWS. The Applicant will follow all NABat protocol guidelines for conducting mobile surveys as defined in the NABat program guidance (Lobe et al. 2015). Monitoring will begin during the first summer following the initial three years of post-construction mortality monitoring and will be repeated annually for remainder of the ITP term. Participation in the NABat program would allow the Applicant to contribute valuable data for an area within the Covered Species ranges that is currently unrepresented in the NABat program, and thus provide information that could be key to supporting bat conservation in eastern Oklahoma. Data collected by the Applicant would support coordinated efforts to monitor bat populations and contribute to the body of knowledge used to draw inferences about local, regional and rangewide population abundances and changes in species distributions (Loeb et al. 2015).

4.5 Adaptive Management for Take Compliance

Adaptive management is a method to address uncertainty in natural resources management. Broadly defined, it means to examine strategies for meeting biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned. Adaptive management will be utilized to ensure that the Project's bat conservation program is effective in meeting the goals and objectives of this HCP and that the take of Covered Species at the Project does not exceed the permitted level of take. Therefore, the adaptive management protocol is designed to adjust the bat conservation program's minimization and mitigation components accordingly to offset the impacts to the Covered Species occurring under the HCP.

The Applicant will interpret the results of the compliance monitoring and in March of each year of the ITP following a mortality monitoring event, the Applicant and USFWS will coordinate (either in-person or via webinar or conference call) to review and discuss the compliance monitoring

results from the previous year. Additionally, the Applicant will evaluate which adaptive management triggers have been met (per the Adaptive Management strategies in Table 4.2, Table 4.3, and Table 4.4), and notify the USFWS prior to implementing an adaptive management response. Adaptive management in response to the mitigation effectiveness monitoring will be implemented according to the bat habitat conservation plan developed for the mitigation project (see Section 4.3.3).

The Applicant's adaptive management protocol is species-specific and consists of three frameworks:

1. Framework to determine the long-term monitoring approach based on the first three years of compliance monitoring (Table 4.2),
2. Framework to adjust minimization measures if necessary based on interval monitoring (Table 4.3), and
3. Framework to respond to incidental discoveries of Covered Species carcasses, applicable under both the interval monitoring and the NABat monitoring approaches (Table 4.4).

4.5.1 *Definition of Terms*

In the adaptive management protocol, "significantly" is defined statistically as the take level requested on the ITP (48 NLEBs, see Section 5.3.5) being outside of the 90% confidence interval for the NLEB take estimate calculated from the mortality monitoring data and projected for the ITP term. In other words, if the authorized level of take on the ITP is greater than the upper bound of the 90% confidence interval for the NLEB take estimate, then the projected estimated take for the ITP term will be significantly lower than the authorized take. Conversely, if the authorized level of take on the ITP is less than the lower bound of the 90% confidence interval for the NLEB take estimate, the projected estimated take for the ITP term is significantly higher than the authorized take. If the authorized level of take on the ITP is within the 90% confidence interval for the NLEB take estimate, the projected estimated take for the ITP term is equivalent to the authorized take.

Practical significance also needs to be considered but it is difficult if not impossible to describe an algorithm for making a conclusion. For example, if the take level authorized on the requested ITP is twice as much as the projected estimated take but still within the 90% confidence interval, then it would not be statistically significant, but an argument could be made that it is practically or meaningfully different. This could occur if there is a great deal of uncertainty (large variance) in the data collected during the three years of monitoring that lead to a large confidence interval. The monitoring is designed to address this scenario at the end of the third year monitoring event, but without any current monitoring data it is hard to predict how much variance will be observed at the Project and whether this may be an important consideration for adaptive management decisions. The Applicant will coordinate with the USFWS to discuss this consideration based on the mortality monitoring results.

4.5.2 *Framework to Determine the Long-Term Monitoring Approach*

During the first three years of the ITP, the Applicant's compliance monitoring plan is designed to collect robust mortality monitoring data to evaluate Project-specific take of Covered Species

(Section 4.4) and determine the appropriate long-term monitoring approach based on this evaluation (Table 4.2). Based on the first three years of mortality monitoring data and the adaptive management protocol specific to the first three years of mortality monitoring, the Applicant will implement one of two potential approaches to compliance monitoring for years 4-30 of the ITP: 1) collection of annual data to support the NABat Monitoring Program for the remainder of the ITP term, or 2) interval mortality monitoring every seventh year for the remainder of the ITP term.

The approach implemented by the Applicant beginning with year 4 of the ITP will be dependent on species-specific adaptive management triggers (Table 4.2). For participation in the NABat Monitoring Program, the projected estimated take of NLEB over the ITP term must be significantly lower than the authorized take on the ITP and no INBA carcasses can be found during years 1-3 of mortality monitoring. If the projected estimated take of NLEB over the ITP term is equivalent to the authorized take on the ITP or one INBA carcass is found during the years 1-3 of mortality monitoring, continued mortality monitoring over the ITP term may be necessary to ensure ITP compliance; thus the Applicant will conduct mortality monitoring on a seven-year interval for the remainder of the ITP term. The Applicant has designed this monitoring approach to use an initial 3-year monitoring event to collect robust, useful data that provide confidence in the take estimates throughout the ITP term. The ongoing interval scale then accounts for the gradual pace at which the Covered Species populations, given the species' life histories, would reasonably be expected to experience any population increase that could cause take estimates at the Project to increase. If the projected estimated take of NLEB is significantly higher than the authorized take on the ITP or two or more INBA have been found during years 1-3 of mortality monitoring, the Applicant will adjust the minimization measures to reduce take to level that is sustainable for ITP compliance over the ITP term and conduct mortality monitoring in year 4 of the ITP to assess the action's effectiveness at reducing Covered Species mortality. The Applicant will then conduct mortality monitoring on a seven-year interval for the remainder of the ITP term. Alternatively to the minimization adjustment and monitoring in year 4, the Applicant may seek an ITP amendment to increase the permitted level of take for one or both Covered Species and conduct mortality monitoring on a seven-year interval.

Table 4.2. Adaptive management framework to determine the long-term monitoring approach based on the first three years of compliance monitoring at the Wildhorse Mountain Wind Facility.

Trigger	Response
Re-evaluation of the take assessment after Year 3 indicates that the projected estimated take of NLEB over the ITP term is significantly[a] lower than the ITP-authorized take level (48 NLEBs). **AND** No INBA carcasses are found during Years 1-3 of mortality monitoring.	The Applicant will discontinue mortality monitoring and begin annual NABat monitoring the following summer for the remainder of the ITP term.
Re-evaluation of the take assessment after Year 3 indicates that the projected estimated take of NLEB over the ITP term is equivalent to the ITP-authorized take level (48 NLEBs). **OR** One INBA carcass is found during Years 1-3 of mortality monitoring.	The Applicant will conduct mortality monitoring (per Section 4.4.1) on a 7-year interval for the remainder of the ITP term.
Re-evaluation of the take assessment after Year 3 indicates that the projected estimated take of NLEB over the ITP term is significantly[1] higher than the ITP-authorized take level (48 NLEBs). **OR** Two or more INBA carcasses are found during Years 1-3 of mortality monitoring	**Option 1:** The Applicant will determine the amount of additional minimization necessary to reduce the estimated take to a level that is sustainable for ITP compliance over the permit term and then implement the appropriate minimization adjustment(s). Minimization adjustments may include but are not limited to: extending the seasonal period within which the turbine operational adjustments are applied, raising the wind speed under which turbine blades are feathered, increasing curtailment at specific turbines if evidence shows that some turbines result in higher bat mortality, and/or implementing a technological solution to reduce bat mortality. The measure(s) chosen will be based on the least impactful option (operational and economic) that provides the appropriate minimization to address the additional estimated take. The Applicant will conduct mortality monitoring (per Section 4.4.1) in year 4 of the ITP, subject to the adaptive management framework to adjust the minimization measures if necessary (Section 4.5.3). If adaptive management is triggered, the response will be implemented once year 4 monitoring has concluded. If adaptive management is not triggered, mortality monitoring (per Section 4.4.1) will then continue on a 7-year interval for the remaining ITP term. **Option 2:** The Applicant may alternatively submit a request for an ITP amendment to increase the level of authorized take for one or both of the Covered Species, which would require an increased mitigation commitment from the Applicant and acknowledgement that increased authorization is not guaranteed and at the discretion of the USFWS.

[1] Authorized take level (requested on the ITP) being outside of the 90% confidence interval for the projected estimated take calculated from the first three years of mortality monitoring.

ITP = Incidental Take Permit; USFWS = US Fish and Wildlife Service; NLEB = northern long-eared bat; INBA = Indiana bat

4.5.3 *Framework to Adjust the Minimization Measures if Necessary*

Beginning in year 4, if the Applicant conducts mortality monitoring on a seven-year interval, the results of this monitoring will be used to determine whether and when adjustments to the minimization measures may be necessary to maintain compliance with the ITP (Table 4.3). The decision to adjust minimization measures will be species-specific and based on re-evaluation of the NLEB take estimate after each monitoring event and the total number of INBA carcasses collected during each monitoring event. If the projected estimated take of NLEB is equivalent to or lower than the authorized take on the ITP and no more than one INBA was found during the monitoring event, no adjustment of the minimization will be required and the Applicant will continue to conduct interval mortality monitoring every seven years. If the projected estimated take of NLEB is significantly higher than the authorized take on the ITP or two or more INBA carcasses are found during a monitoring event, the Applicant will adjust the minimization measures to reduce take to a level that is sustainable for ITP compliance over the ITP term and conduct mortality monitoring during the year immediately following the adjustment to assess the action's effectiveness at reducing Covered Species mortality. The Applicant will coordinate with the USFWS on the proposed minimization measure adjustments, and the proposed approach will be based on the data gathered during monitoring. For instance, if there is unusually high take of NLEB during the summer maternity season, the Applicant may increase the minimization measures implemented during the summer season, and make no adjustments in spring or fall. Similarly, if certain turbines or turbine strings appear to present higher risk to the Covered Species, the Applicant may increase the minimization measures implemented at those turbines during the documented period of higher risk, and make no adjustments for the remainder of the turbines. The interval mortality monitoring schedule will then resume such that the next mortality monitoring event is conducted seven years after the previous (i.e., most recent) mortality monitoring event. Alternatively, to the minimization adjustment and monitoring, the Applicant may seek an ITP amendment to increase the permitted level of take for one or both Covered Species.

In addition to the adaptive management triggers designed to adjust the minimization measures if and when necessary such that ITP compliance is maintained (Table 4.3), the Applicant will evaluate whether the ITP take limit has been met after each monitoring event. It is unlikely that the ITP take limit would be met before the adaptive management triggers indicated that the minimization measures required adjustment, but compliance with the ITP take limit nevertheless warrants evaluation after each monitoring event. If the 90% lower bound of the cumulative NLEB take estimate or the cumulative count of INBA carcasses is higher than the permitted level of take, then the Applicant will implement measures recommended by USFWS to avoid further take of the Covered Species and consider whether to seek an ITP amendment.

Table 4.3. Adaptive management framework to adjust minimization measures if necessary based on interval monitoring at the Wildhorse Mountain Wind Facility.

Trigger	Response
Re-evaluation of the take assessment after an interval mortality monitoring event indicates that the projected estimated take of NLEB over the ITP term is equivalent to or significantly[a] lower than the ITP-authorized take level. **AND** No more than one INBA carcass is found during a single interval mortality monitoring event.	The Applicant will continue mortality monitoring (per Section 4.4.1) on a 7-year interval.
Re-evaluation of the take assessment after an interval mortality monitoring event indicates that the projected estimated take of NLEB over the ITP term is significantly[1] higher than the ITP-authorized take level. **OR** Two or more INBA carcasses are found during a single interval mortality monitoring event.	**Option 1:** The Applicant will determine the amount of additional minimization necessary to reduce the estimated take to a level that is sustainable for ITP compliance over the permit term and then implement the appropriate minimization adjustment(s). Additional minimization measures may include but are not limited to: extending the seasonal period within which the turbine operational adjustments are applied, raising the wind speed under which turbine blades are feathered, increasing curtailment at specific turbines if evidence shows that some turbines result in higher bat mortality, and/or implementing a technological solution to reduce bat mortality. The measure(s) chosen will be based on the least impactful option (operational and economic) that provides the appropriate minimization to address the additional estimated take. The Applicant will conduct mortality monitoring (per Section 4.4.1) in the year immediately following implementation of the adjustment, subject to the adaptive management framework to adjust the minimization measures. If adaptive management is triggered, the response will be repeated. If adaptive management is not triggered, the interval mortality monitoring schedule will resume such that the next mortality monitoring event (per Section 4.4.1) is conducted seven years after the previous mortality monitoring event. **Option 2:** The Applicant may alternatively submit a request for an ITP amendment to increase the level of authorized take for one or both of the Covered Species, which would require an increased mitigation commitment from the Applicant and acknowledgement that increased authorization is not guaranteed and at the discretion of the USFWS.

[1] Authorized take level (requested on the ITP) being outside of the 90% confidence interval for the projected estimated take calculated from the interval mortality monitoring results.

ITP = Incidental Take Permit; USFWS = US Fish and Wildlife Service; NLEB = northern long-eared bat; INBA = Indiana bat

4.5.4 *Framework to Respond to Incidental Discoveries of Covered Species Carcasses*

The Applicant's adaptive management protocol is also designed to address Covered Species carcasses found incidentally at the Project, regardless of the monitoring approach implemented (i.e., NABat monitoring or interval mortality monitoring) in years 4-30 of the ITP term (Table 4.4). Any NLEB carcasses found incidentally at the Project will be added to the cumulative NLEB take estimate used to evaluate ITP compliance. Similarly, any INBA carcasses found incidentally at the Project will be added to the cumulative count of INBA carcasses used to evaluate ITP compliance. However, the low predicted take of INBA at the Project indicates that, although possible, incidental discoveries of INBA carcasses should not be very probable. Therefore, if, at any time during the ITP term, two or more INBA carcasses have been found incidentally at the Project, the Applicant will conduct one year of mortality monitoring in the year immediately following the incidental discovery of the second INBA carcass to re-evaluate INBA take at the Project (Table 4.4). The results of this monitoring will be subject the adaptive management framework presented in Section 4.5.3 to adjust minimization measures if necessary (Table 4.3). The Applicant will then resume interval mortality monitoring (or begin interval mortality monitoring if NABat surveys were being conducted), such that the next year of mortality monitoring is conducted seven years after the previous (i.e., most recent) mortality monitoring event.

Table 4.4. Adaptive management framework to respond to incidental discoveries of Covered Species carcasses at the Wildhorse Mountain Wind Facility; applicable under both the interval monitoring and the NABat monitoring approaches.

Trigger	Response
A NLEB carcass is found incidentally at the Project.	The incidental carcass will be added to the cumulative NLEB take estimate used to evaluate ITP compliance.
Two or more INBA carcasses are found incidentally at the Project (cumulative over the ITP term).	The Applicant will conduct one year of mortality monitoring (per Section 4.4.1) in the year immediately following the incidental discovery of a second (cumulative) INBA carcass, subject to the adaptive management framework to adjust the minimization measures if necessary (Section 4.5.3). If adaptive management is triggered, the response will be implemented once the monitoring has concluded. If adaptive management is not triggered, the interval mortality monitoring schedule will resume (or begin if NABat survey were being conducted), such that the next mortality monitoring event is conducted seven years after the previous mortality monitoring event.

ITP = Incidental Take Permit; HCP = Habitat Conservation Plan; USFWS = US Fish and Wildlife Service; NLEB = northern long-eared bat; INBA = Indiana bat

4.6 Habitat Conservation Plan Reporting

The Applicant will provide USFWS with annual compliance and effectiveness monitoring report by February 15 of each year of the ITP. The annual report will include, but will not be limited to, the following:

- Results of compliance monitoring (NABat and/or mortality) conducted in the previous year (including carcass counts for all bat species observed during mortality monitoring);

- Take estimates of the Covered Species and the methods used to calculate the estimates (if applicable);
- Review of the adaptive management triggers and whether or not any were met;
- Responses to any adaptive management triggers implemented;
- Results of any mitigation effectiveness monitoring conducted in the previous year, as prepared by the conservation entity; and
- Description of adaptive management implemented at the mitigation project, if applicable, as prepared by the conservation entity.

Although permitted, in the event that a mortality of a Covered Species is discovered at the Project, the Applicant will notify USFWS Oklahoma Field Office within 24 hours of positive species identification. Positive identification will be obtained through typical species identification procedures.

5 TAKE ASSESSMENT

The Applicant's bat conservation program has been designed to avoid and minimize to the maximum extent practicable impacts to the Covered Species from the Project. Even with these conservation measures, Project operation may still result in a reduced level of take of the Covered Species from collision with spinning turbine blades. The number of Covered Species carcasses documented in publicly available data on wind turbine searches throughout North America indicates the number of fatalities of the two Covered Species at wind energy facilities is small (Table 5.1). The Project's anticipated incidental take of the Covered Species is quantified in this chapter to ensure the bat conservation program will fully offset the impacts of the take and to support a request for an ITP for the Project.

Table 5.1. Publicly available records of Covered Species fatalities at North American wind energy facilities.

Species	Regional Fatalities	All Documented Fatalities	Reference
Indiana bat	Ozark-Central Recovery Unit: 2	13 in 6 states from 2009 - 2017	Pruitt and Reed 2018
Northern long-eared bat	USFWS Southeast Region: none	43 in 9 states and 1 Canadian province from 1998 - 2014	Gruver and Bishop-Boros 2015

The term "predicted" take refers to the amount of incidental take that is projected to occur at the Project under implementation of the HCP; this is done to establish the amount of take requested to be authorized by the ITP. The term "estimated" take refers to the amount of take that is statistically estimated to have occurred during a given monitoring period at a reference wind facility or at the Project once monitoring data have been collected (Chapter 4). Take is estimated for the purpose of evaluating compliance with the ITP (as described in Section 4.4.1.1). In other words, take prediction refers to quantification of projected future take while take estimation refers to quantification of take that has already occurred.

5.1 General Methodology

5.1.1 *Dataset*

Mortality monitoring data from representative operational wind energy facilities were compiled and used to evaluate collision risk and predict the future likelihood of bat fatalities at the Project. There are no wind facilities within the Covered Species' ranges in USFWS Region 2 with publicly available data; therefore, in coordination with USFWS, the geographic scope of representative facilities was broadened to include those in USFWS Regions 4 and 5 within forested habitat and hilly topography that most closely resemble the Permit Area (Section 3.1). Among the data available from representative wind facilities, studies in which turbines were operating under an avoidance strategy (i.e., curtailing up to wind speeds of 6.9 m/s) were excluded to ensure the amount of bat mortality predicted for normal operation of the Project was not biased towards fewer fatalities. Under the avoidance strategy, no take of Covered Species was expected to occur (USFWS 2014a), so these datasets were not considered predictive of potential risk to the Covered Species from the Project. Although these studies did not provide a control group to quantify the overall bat fatality reduction from curtailment, the lack of Covered Species fatalities in these datasets supports the expectation that the curtailment strategy avoided take.

5.1.2 *Species Composition Approach*

5.1.2.1 Incorporating and Quantifying Uncertainty

Covered Species' mortality at wind energy facilities is a rare event; therefore, the accuracy of take predictions is constrained by a lack of data regardless of the statistical tool utilized. The Project recently began operation, and the lack of site-specific fatality monitoring data and use of data from surrogate projects outside of USFWS Region 2 has created uncertainty in the take prediction. Additionally, fatality events are somewhat stochastic (i.e., there is an element of randomness to them), resulting in uncertainty (variance) in the estimate of take. Uncertainty in these estimates could arise from a number of sources, including but not limited to annual variation in bat densities, long-term population trends, and differences in study design. Quantification of this uncertainty acknowledges that an estimate or prediction is a reasonable approximation of the actual take and provides a range of values within which the actual take number will fall[18].

Data limitations have been accounted for and sources of uncertainty in that the method utilized represents the best available model for predicting take of the Covered Species at the Project while also allowing for quantification of the uncertainty in the take predictions produced.

Quantifying the uncertainty in take predictions is important because it reduces the likelihood of underestimating the take that may occur at the Project. When developing predicted take numbers for ITPs it is important to use take rates that are high enough so that the take that actually occurs remains below the permitted number. Therefore, quantifying uncertainty in take predictions not only limits the likelihood that the ITP's authorized take limit will be exceeded, but also helps ensure

[18] If this range or interval is calculated using frequentist statistics it is called a confidence interval, if Bayesian statistics is used it is called a credible interval. The species composition approach used here employs both types of statistics. As credible and confidence intervals are functionally the same, we refer to both as "confidence intervals" throughout.

that the bat conservation program will fully offset the impacts of the take. Based on an evaluation of the uncertainties involved in the take prediction and with a goal of successful ITP compliance, the 80th quantile was utilized for deriving a take authorization request.

5.1.2.2 Take Prediction Model

The take prediction method here is commonly called the "species composition" approach. This approach was developed for wind energy HCPs and was first used in the Fowler Ridge Wind Farm Indiana Bat HCP (Fowler Ridge LLC 2013). The species composition calculation requires two components: 1) an all-bat fatality estimate (i.e., expected number of total bat fatalities that will occur at the Project) and 2) a species ratio (i.e., expected proportion of all fatalities that is attributable to the species of interest). The final species composition estimate is the product of these two components. Conceptually, if the average all-bat fatality rate were 10 bats per year at a wind facility and a particular Covered Species accounted for 1% of those fatalities, then over the course of a 30-year ITP term it would be reasonably expected that turbine operation would result in 3 fatalities of the Covered Species in question ([1 Covered Species fatality per 100 bat fatalities × 10 bat fatalities per year] × 30 years = 3 predicted fatalities). The actual calculation, which relies on probability distributions and cannot be reproduced through simple arithmetic, is discussed in more detail below.

The first step in predicting Covered Species take at the Project was to determine the expected number of total bat fatalities (i.e., all-bat estimate) at the Project. All-bat mortality was estimated using a subset of the dataset described in Section 5.2.1. In total, six studies were selected as surrogates for the Project based on their relative similarity to the Project's biogeography and the availability of reported confidence intervals for each study's fatality estimate. These studies were associated with three wind facilities from Tennessee and West Virginia (Figure 5.1). Annual fatality estimates and confidence intervals from the six studies were combined using a weighted average, accounting for the number of turbines and number of years included in each study, to produce an estimate of the average number of bat fatalities per turbine per year (Table 5.2). Based on the average all-bat fatality estimate from these surrogate studies, the Project is expected to result in the fatality of approximately 29.49 ([variance = 11.66]) bats/turbine/year, or approximately 855.21 ([variance = 9810.02]) total bats per year across the Project's 29 turbines; variance was calculated using properties of the variance (Casella and Berger 2002). This value represents the estimated number of total fatalities expected in the absence of minimization measures at the Project. The actual number of bat fatalities resulting from operation of the Project is expected to be substantially smaller as a result of the bat conservation program implemented under this HCP (i.e., reduced by approximately 54%; see Sections 5.2.4 and 5.3.4).

The second step in predicting Covered Species take at the Project was to determine what proportion of the all-bat fatality rate may be attributable to each Covered Species (i.e., the species ratio) based on publicly available fatality monitoring data collected at representative wind facilities (see Section 5.2.1) and refined for each Covered Species (see Sections 5.2.1 and 5.3.1). The Bayesian beta-binomial model (Gelman et al. 2004) and a beta distribution prior with parameter values of 0.5 and 0.5, were used to calculate the species ratio for each Covered Species.

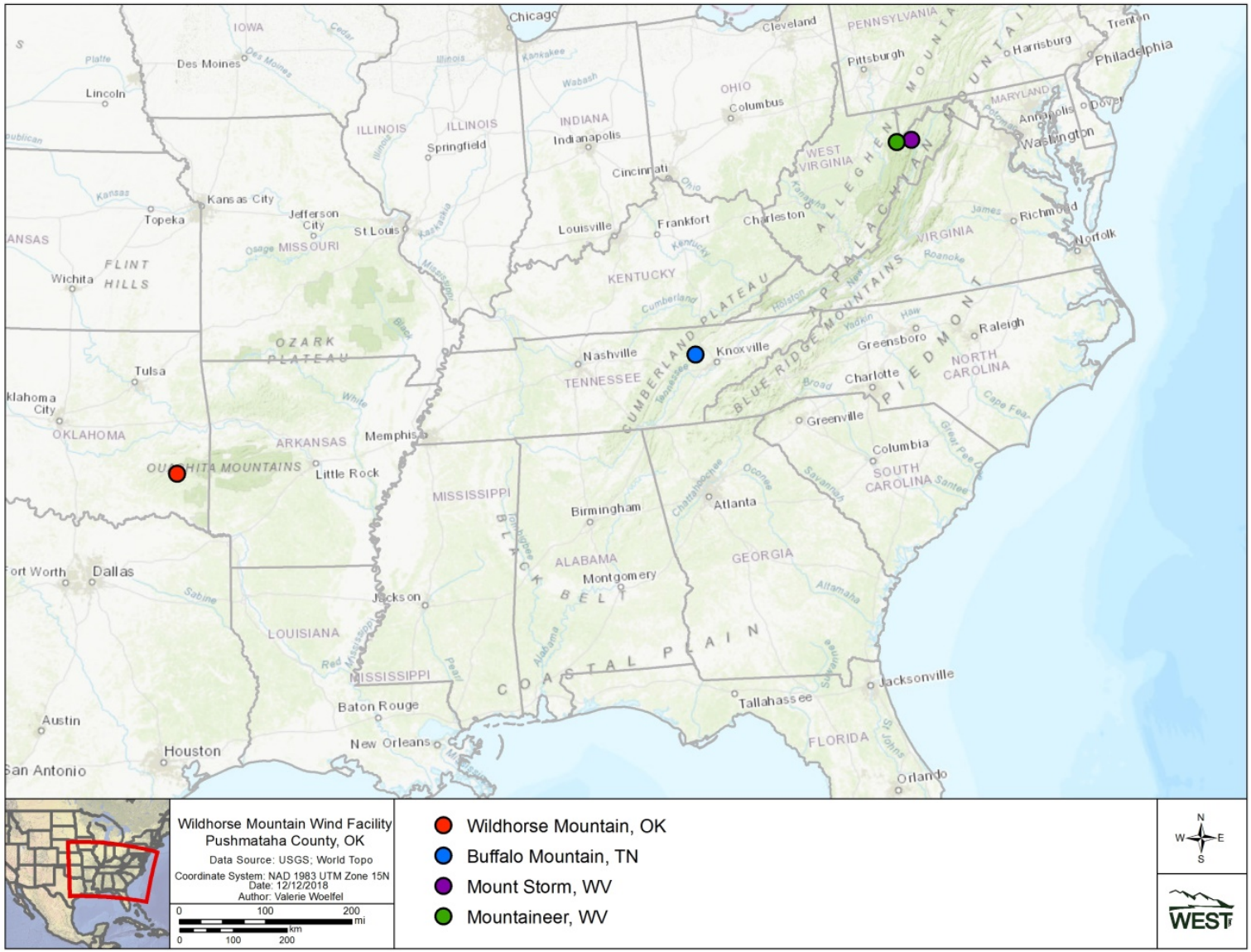

Figure 5.1. The Proposed Location of Wildhorse Mountain Wind Facility and the Locations of Wind Facilities Providing the Reference Bat Fatality Dataset.

Table 5.2. Surrogate wind facilities and associated data used in the species composition calculation of overall bat fatality estimates for the Covered Species at the Wildhorse Mountain Wind Facility.

Project	State (USFWS Region)	Year(s) Monitored	Number of Turbines	All-Bat Annual[1] Fatality Estimate
Buffalo Mountain	TN (Region 4)	2000 – 2003	3	20.82 (19.53 – 22.11)
Mountaineer	WV (Region 5)	2003	44	47.53 (31.78 – 91.62)
		2004	44	37.76 (31.20 – 45.09)
Mount Storm	WV (Region 5)	2009	132	35.05 (24.97 – 48.61)
		2010	132	30.36 (25.34 – 35.07)
		2011	132	14.87 (13.47 – 17.90)
Weighted Average				**29.49 fatalities/turbine/year**

[1] The 90% confidence interval provided in parenthesis was reported in all studies.

The final step in the species composition approach was to combine the all-bat fatality estimate and the species ratio. Variance of the species composition estimate was determined by the variance of the product of independent random variables (Casella and Berger 2002). Quantiles for the take limit were derived assuming the species composition estimate is normally distributed.

5.2 Indiana Bat

5.2.1 *Dataset*

The following criteria were used to select representative mortality monitoring data for use in developing INBA take predictions for the Project:

- Wind facility is located within the INBA range;
- Wind facility is located in a predominately forested area (based on a desktop analysis of satellite imagery); and
- Turbine operations were not curtailed for avoidance during fatality monitoring.

After applying these selection criteria to all publicly available data, mortality monitoring data were available for 40 studies (Appendix B). There were no fatalities of INBA in this selection of data; however, two known fatalities reported by Pruitt and Reed (2018) in forested areas at wind facilities in Pennsylvania and West Virginia (USFWS Region 5) were included. These fatalities were not associated with an all-bat fatality estimate from the facility where the bats were found.

5.2.2 *Method – Species Composition*

Based on the average all-bat fatality estimate from the six (6) surrogate studies described in Section 5.1.2.2, the estimated all-bat fatality estimate at the Project was 29.49 bats/turbine/year. Among the 40 post-construction studies used in the analysis, no INBA fatalities were observed out of the 6,452 total bat fatalities reported. However, there are two known fatalities of INBA associated with wind facilities in forested landscapes in USFWS Region 5 (Pruitt and Reed 2018): one from the North Allegheny Project in Pennsylvania and the other from the Laurel Mountain Project in West Virginia. Because an associated all-bat fatality estimate is not available for either of these fatalities, as a conservative approach, these two fatalities were added to both the

numerator and denominator of the species ratio (i.e., 2 INBA/6,454 total bats). While the addition of these two fatalities may produce an overestimate of the number of INBA, this approach was preferable to underestimating potential INBA fatalities. The calculated species ratio for INBA was 0.000387.

5.2.3 *Take Prediction Prior to Minimization Measures*

INBA are expected to occur in the Permit Area only in the spring and fall but not in the summer based on summer surveys (Section 3.4). The publicly available data (Section 5.2.1) only has annual all bat estimates, meaning summer fatality estimates are included in the take calculations for INBA. This is a conservative approach since INBA are assumed to not occur in the summer in the Permit Area. The term "annual take" used throughout the rest of this section and the HCP refers to the amount of take predicted to occur in a given year.

Based on an evaluation of the uncertainties involved in the take prediction and the likelihood of ITP compliance at different confidence levels, the 80th quantile (q80) was used as the appropriate level of confidence for deriving the take predictions. Based on q80 of the species composition approach, the annual INBA fatality estimate for the Project is 0.51 INBA per year or 15.3 INBA over the 30-year ITP term in the absence of minimization measures (0.51 INBA per year × 30 years = 15.3 INBA). Although this value may overestimate the amount of take that could occur, it represents a level of predicted take that is reasonably certain not to be exceeded once Project operation commences.

5.2.4 *Take Prediction Adjusted for Minimization Measures*

The analysis presented in Section 5.2.3 represents the amount of INBA mortality that can be expected under normal operation of the Project. However, the bat conservation program's operational adjustments to minimize take of the Covered Species at the Project will be implemented as a condition of this HCP and the ITP. Specifically, all turbine blades will be feathered below the manufacturer's cut-in wind speed of 3.0 m/s (11.5 ft/s) in the spring, below a raised cut-in of 4.0 m/s (13.1 ft/s) in the summer, and below a raised cut-in of 5.0 m/s (16.4 ft/s) in the fall (see discussion of minimization measures in Section 4.2.2). These measures are expected to substantially reduce INBA mortality at the Project. Although there is uncertainty in the take prediction, the effectiveness of the proposed minimization measures at reducing take is supported by a substantial amount of research throughout North America (Section 4.2.2). The only exception to these minimization measures is that Turbines 20 and 21 will operate normally during the power performance testing in Year 1; this exception is expected to have a negligible effect on the total minimized take of the Covered Species, given the limited turbines affected (two of 29) and the limited duration (one of 30 years).

To quantify the impacts of curtailment on the take predictions, it was necessary to estimate reductions in all-bat fatalities by cut-in speed and then correct these reductions based on the proportion of Covered Species fatalities expected to occur in each season. As noted above, feathering turbines below 4.0 m/s at the Mount Storm Projects in West Virginia resulted in a reduction of mortality between 50% - 72%. On average, feathering turbines below 5.0 m/s in Region 5 reduces bat mortality by approximately 63% (using data from Criterion, MD, Casselman,

PA, and Pinnacle, WV; Appendix A). There is no publicly available information on the effectiveness of feathering below a cut-in of 3.0 m/s, although an Indiana study showed that feathering turbines below 3.5 m/s reduced bat mortality by approximately 35% (Good et al. 2012). While it is expected that some amount of reduction would occur at the lower cut-in speed of 3.0 m/s, the actual percentage is not known.

In the draft Midwest Multi-species HCP, the seasonal distribution of Myotis fatalities was examined as part of the take assessment (USFWS 2016c) and this broad dataset is considered generally representative of the seasonal distribution of Covered Species fatalities that may be expected at the Project. USFWS calculated the expected proportion of take that is likely to occur during each season of the bat active period, which they defined as: spring (April 1 to May 31), summer (June 1 to July 31), and fall (August 1 to October 31). Using data from monitoring conducted during the full INBA active period, the USFWS examined the seasonal distribution of Myotis fatalities from 41 fatality studies conducted in the eastern and Midwestern U.S. Of the total 4,284 bat fatalities documented, there were 237 Myotis fatalities, of which 7%, 36%, and 57% percent occurred during the spring, summer, and fall, respectively (USFWS 2016c).

If these anticipated reductions are combined with the expected seasonal distribution of Covered Species fatalities, a conservative estimate[19] of the potential reduction in fatalities of the Covered Species as a result of the implementation of minimization measures at the Project would be 54% (0.07 × 0% spring + 0.36 × 50% summer + 0.57 × 63% fall = 53.91% reduction in the take). Even though it is assumed that INBA will not occur in the Permit Area during the summer (Section 3.4), the estimates of reduction associated with the proposed minimization includes summer because the take calculation is based on an annual all bat estimate that included summer. To account for the variability among studies in the estimated reductions in bat mortality (Appendix A), and potential year-to-year variation at the Project, it is estimated that feathering turbine blades below a cut-in wind speed of 3.0 m/s during the spring, 4.0 m/s during the summer, and 5.0 m/s during fall migration season will reduce bat mortality, and the associated predicted INBA mortality, by at least 50% annually.

5.2.5 *Incidental Take Authorization Request*

After adjusting the take prediction to reflect the benefits (take reduction) from the bat conservation program's minimization measures, it is anticipated that the Project will take about 0.26 INBA per year (0.51 INBA per year pre-minimization × 50% reduction). The predicted amount of take over the 30-year ITP term under the HCP's bat conservation program is approximately eight (8) INBA. By taking a conservative approach to arrive at the species composition estimate and then using the 80th quantile, this take prediction is unlikely to underestimate take at the Project, and the bat conservation program will account for uncertainty in the prediction in offsetting the impact of take. The Applicant requests a take authorization of eight (8) INBA for the 30-year term of the ITP.

[19] The estimate of reduction is conservative because it assumes no reduction in the spring from feathering below 3.0 m/s, although some benefit is actually expected; additionally, the reduction expected in the summer from the proposed 4.0 m/s cut-in during this season assumes the lower end of the percentage reduction range (50% - 72%) documented at the Mount Storm Project.

As described in Section 4.4, the Applicant will conduct compliance monitoring and implement adaptive management if necessary to ensure that the Project is in compliance with the requested ITP take limit.

5.2.6 *Impact of the Take*

5.2.6.1 Resource Equivalency Analysis Framework

Determining the significance of potential take on a species or population requires an understanding of population demographics, and in particular annual survival and reproduction rates. Seeking a common framework for comparing resources lost through wind energy activities with resources gained through compensatory mitigation, the USFWS Region 3 Office developed a "resource equivalency analysis" (REA) for INBA (Szymanski et al. 2013). The REA is comprised of two parts: 1) a species-specific demographic model that reflects the best scientific understanding of INBA biology and 2) a resource equivalency model to calculate the amount of mitigation needed to offset the projected loss of female bats. The demographic model, which is predefined for the user, is used to calculate losses in reproductive potential from project impacts. The user provides information on permit duration, projected take, and the direction of population trends to calculate the number of female bats that will not be recruited into future generations as a result of the take of female bats at a project. Although the conservation priorities and habitat values in the REA model component are specific to Region 3 and could likely benefit from adjustment for use in other USFWS regions, the demographic model is based on parameter values derived from studies across the species' range and was utilized to estimate the impacts of take from the Project as it is a more broadly applicable model.

One key assumption of the REA's predefined demographic model is that female INBA are the reproductive units of the species and therefore the loss of a female INBA has a greater impact on the overall population than the loss of a male. The model requires the user to provide the number of "injured adult females annually" at a project but does not provide guidance on how to generate this number. The INBA take authorization request (see Section 5.2.5) is for all INBA, including males. To understand the biological impact of the Project take on INBA populations, it is necessary to estimate what proportion of the INBA affected by take is likely to be females.

5.2.6.2 Estimated Sex Ratio of Indiana Bat Take

It is unclear based on available scientific information if there are sex-related factors that might influence turbine collision risk for bats. Few empirical datasets are available on the sex ratios of bats found in mortality monitoring studies, partly because many carcasses cannot be identified to age or sex due to decomposition and scavenging by insects. The sex of bat carcasses was reported in 50 publicly available mortality monitoring studies in the eastern and Midwestern US and Canada (Appendix D). Among 5,860 carcasses of all bat species, 22%, 41%, and 37% were identified as females, males, and unknown sex, respectively. For Myotis species specifically, among 460 carcasses, 18%, 40%, and 42% were identified as females, males, and unknown sex, respectively. More recent genetic analysis of bat carcasses has indicated that using morphology exclusively resulted in a male bias sex ratio that was not present when molecular methods were used (Korstian et al. 2013). Therefore, the empirical fatality data based exclusively on morphometric sexing may over-represent the actual percentage of male fatalities.

However, since such a large percentage of Myotis in the 50-study dataset could not be identified to either sex (42%), it was unclear whether or not males made up the majority of fatalities. If unidentified bats were divided equally among the two sexes, the ratio of females to males would have been skewed towards males (39% females and 61% males). Fatality data for INBA suggest that females may be more likely to be killed by turbines, but the small sample size makes it difficult to draw conclusions. Five of the seven INBA fatalities identified to sex to date have been females (five females, two males, and six unknown sex; Pruitt and Reed 2018).

The location of the Project indicates that the INBA migrating through the Permit Area in the spring and fall may include more females than males. Female INBA disperse from hibernacula to join summer maternity colonies, while male INBA typically remain closer to hibernacula throughout the summer (Gardner and Cook 2002, Whitaker et al. 2002). The Project's location more than 26 km from the nearest known historic INBA hibernaculum, and farther from any extant INBA hibernacula, suggests that most INBA occurring in the Permit Area would be females. However, some males have been documented migrating over 400 km (249 mi) from hibernacula in southern Indiana and Kentucky (Kurta and Murray 2002). Therefore, it is anticipated that most, but not necessarily all, of the INBA take at the Project may affect female bats. A sex ratio of 3 female INBA to 1 male INBA was used to approximately quantify this conclusion.

5.2.6.3 Project-Level Impacts

A total of 0.26 INBA is predicted to be taken each year during the 30-year ITP term. Approximately 75% of the incidental take is anticipated to affect female INBA, which would result in an annual take of 0.19 female INBA. Using the REA and assuming a declining population due to the effects of WNS, the total predicted loss in reproductive capacity during the ITP term is nine (9) female pups, resulting in a total predicted impact of take of 15 female INBA over the 30-year ITP term (Appendix C). The bat conservation program's mitigation project will fully offset the impact of take under this HCP (Section 4.3), and thereby compensate for any reproductive impacts on INBA populations.

5.2.6.4 Population-Level Impacts

INBA occurring within the Permit Area would be part of the OCRU population (USFWS 2007). The impacts of the taking are evaluated as they pertain to the OCRU population as well as to the range-wide population. The loss of bats and reproductive capacity from maternity colonies may reduce the productivity of the colony as a reproductive unit and, if losses are great enough, could potentially threaten the persistence of the colony on the landscape. The loss of bats from hibernacula may reduce the abundance of the population and, if losses are great enough, could potentially affect the growth rate of the hibernating population. However, because take from the Project is expected to consist of individual bats migrating from various hibernacula and maternity colonies and is anticipated to be less than one individual a year, take is not likely to have a concentrated or frequent impact on any single maternity colony or hibernaculum.

The average annual loss of 0.26 INBA equates to a negligible reduction of the 2019 population of 276,317 INBA in the OCRU (USFWS 2019), the INBA population most likely to be impacted. The

occurrence of WNS in the OCRU is newer and the geographic extent of the disease has not yet been as great as in the northeast or Appalachian regions (White-Nose Syndrome.org 2020). To take an extreme case, even if the OCRU population of INBA were reduced by 90% as a result of WNS, the loss of 0.26 INBA per year would still represent much less than one percent of the WNS-reduced population of 27,632 INBA. The loss to the range-wide population would be less than one hundredth of one percent, based on the 2019 estimated range-wide population of 537,297 INBAs (USFWS 2019).

These losses represent small fractions of the OCRU and range-wide INBA populations. Given the expected minimal impact of Project take on overall population levels, and because mitigation actions are designed to fully offset the impacts of Project take, the Project is not expected to have a significant impact on the OCRU or range-wide populations of INBA at their current levels or under the effects of WNS.

5.3 Northern Long-Eared Bat

5.3.1 *Dataset*

The same general approach to selecting monitoring data from relevant wind facilities was used for both Covered Species (Section 5.2.1). The following criteria were used to select representative mortality monitoring data for use in developing NLEB take predictions for the Project:

- Wind facility is located within the NLEB range;
- Wind facility is located in a predominately forested area (based on a desktop analysis of satellite imagery); and
- Turbine operations were not curtailed for avoidance during fatality monitoring.

After applying these selection criteria to all publicly available data, mortality monitoring data were available for 54 post-construction monitoring studies (Appendix B). There are 18 fatalities of NLEB in this dataset and two additional public records of NLEB fatalities reported at unnamed sites in Pennsylvania (J. Taucher, PGC, pers. comm.).

5.3.2 *Method – Species Composition*

Based on the average all-bat fatality estimate from the six (6) surrogate studies described in Section 5.2.2, the estimated all-bat fatality estimate at the Project was 29.49 bats/turbine/year. To calculate the NLEB species ratio, 18 fatalities were observed out of 6,608 total bat fatalities reported among the 54 studies included in the analysis. An additional two (2) NLEB fatalities associated with unnamed wind facilities in Pennsylvania were also included in the species ratio calculation. The calculated species ratio for NLEB was 0.0031.

5.3.3 *Take Prediction Prior to Minimization Measures*

NLEB are expected to occur in the Permit Area throughout the bat active period and are potentially at risk of take from spring through fall (Section 3.4.3). Again, based on the q80 of the species composition model, the annual NLEB fatality estimate for the Project is 3.2 NLEB per year or 96.3

NLEB over the 30-year ITP Permit term (3.2 NLEB per year × 30 years = 96.3 NLEB). As with INBA, this value represents a level of predicted take that is reasonably certain not to be exceeded once Project operation commences.

5.3.4 *Take Prediction Adjusted for Minimization Measures*

The analysis presented in Section 5.3.3 represents the amount of NLEB mortality that can be expected under normal operation of the Project. As with INBA, it is estimated that the bat conservation program's minimization measures will reduce bat mortality, including NLEB mortality, by at least 50% annually (Section 5.2.4).

5.3.5 *Incidental Take Authorization Request*

After adjusting the take prediction to reflect the take reduction from minimization measures, it is anticipated that the Project will take about 1.6 NLEB per year (3.2 NLEB per year pre-minimization × 50% reduction). The predicted amount of take over the 30-year ITP term under the HCP's bat conservation program is approximately 48 NLEB. By taking a conservative approach to arrive at the species composition estimate and then using the 80th quantile, the take estimate is unlikely to be exceeded during the ITP term, and the conservation program will account for uncertainty in the prediction. The Applicant requests a take authorization of 48 NLEB for the 30-year term of the ITP.

As described in Section 4.4, the Applicant will conduct compliance monitoring and implement adaptive management if necessary to ensure that the cumulative take estimated is less than the ITP take limit.

5.3.6 *Impact of the Take*

5.3.6.1 Resource Equivalency Analysis Framework

For background information on the REA approach used to assess the impacts of take, see Section 5.2.6.1. In addition to the INBA REA, the USFWS has developed a REA specifically for NLEB (Szymanski et al. 2016). As with INBA, one key assumption of the REA's predefined demographic model is that female NLEB are the reproductive units of the species and therefore the loss of a female NLEB has a greater impact on the overall population than the loss of a male. Thus, it was necessary to estimate what proportion of the NLEB affected by take are likely to be reproductive females.

5.3.6.2 Estimated Sex Ratio of Northern Long-Eared Bat Take

As explained in Section 5.2.6, the sex ratio of bat carcasses reported in 50 publicly available mortality-monitoring studies in the eastern and Midwestern US and Canada (Appendix D) is inconclusive. Information on the sex of NLEB carcasses specifically has not been collected in most cases.

The location of the Project indicates little about the expected sex ratio of NLEB migrating through the Permit Area, as the locations of most NLEB hibernacula remain undocumented and the species is known to hibernate singly or in small groups in features such as cliffs and rock crevices

that are broadly distributed on the landscape. Much of the take during the summer season may affect female NLEB, although male NLEB may also forage and roost within the Permit Area during summer. During the spring and, in particular the fall (when most take is likely to occur) migration seasons, both sexes may occur equally within the Permit Area. Therefore, it is anticipated that approximately half of the NLEB take at the Project may affect female bats. A sex ratio of 1 female NLEB to 1 male NLEB was used to approximately quantify this conclusion.

5.3.6.3 Project-Level Impacts

Approximately 1.6 NLEB are predicted to be taken each year during the 30-year ITP term (see Section 5.3.5). Approximately 50% of the incidental take is anticipated to affect female NLEB, which would result in an annual take of 0.8 female NLEB. Using the REA and assuming a declining population, the total predicted loss in reproductive capacity during the ITP term is 38 female pups, resulting in a total predicted impact of take 62 female NLEB over the 30-year ITP term (Appendix C). The bat conservation program's mitigation project will fully offset the impact of take under this HCP (Section 4.3), and thereby compensate for any reproductive impacts on NLEB populations.

5.3.6.4 Population-Level Impacts

As discussed for INBA in Section 5.2.6, because take from the Project is expected to primarily consist of individual bats from various hibernacula and maternity colonies, and is anticipated to be less than two individuals a year, take is not likely to have a concentrated or frequent impact on any single maternity colony or hibernaculum.

The Oklahoma and Arkansas populations of NLEB are most likely to be affected by take from the Project, given the NLEB's relatively short migration distances (Section 3.3.1). The loss of 1.6 NLEB per year is much less than one percent of the Arkansas adult population of 863,850 NLEB (USFWS 2016d). Even if the Arkansas population were reduced by 98% as a result of WNS (the population loss reported in the northeast by Turner et al. 2011), the loss of 1.6 NLEB per year represents much less than one percent of a reduced adult population of 17,277 bats. Because the most recent NLEB population estimates do not include population numbers for Oklahoma, it is estimated that the Oklahoma population is approximately 449,081 adults by assuming a similar density of bats in Oklahoma and Arkansas, as based off the amount of forested acres in each state within the species' range (Section 3.3.2.2). It is, therefore, expected that the loss of 1.6 NLEB per year will also not affect the NLEB population in Oklahoma, even after accounting for potential effects of WNS on the population. The annual loss of 1.6 NLEB equates to much less than one percent of the estimated range-wide NLEB population of 6,546,718 individuals (USFWS 2016d).

These losses represent small fractions of the Arkansas, Oklahoma, and range-wide NLEB populations. Given the expected minimal impact of Project take on overall population levels, and because mitigation actions are designed to fully offset the impacts of Project take, it is not expected that the Project would have a significant impact on the Arkansas, Oklahoma, or range-wide populations of NLEB at their current levels or under the effects of WNS.

6 ALTERNATIVES

HCPs must describe "what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized[20]." USFWS guidance for developing HCPs suggests detailing, among other things, "alternative actions the applicant considered that would not result in take and the reasons why such alternatives are not being utilized," as well as actions that would reduce the take (USFWS and NMFS 2016).

The only alternative that may fully avoid take would be long-term operation of the Project under turbine operational adjustments recommended by the USFWS for avoiding take of the Covered Species.

6.1 No Curtailment

The Applicant evaluated an alternative that would involve no curtailment of turbine operations. Under this alternative, the Project would have an increase in the amount of power generated by the proposed facility; however, the increase in operating hours when wind speeds are lower and the Covered Species are more active would increase the amount of take of the INBA and NLEB. This alternative would result in a predicted annual take of 0.51 INBA and 3.2 NLEB for the 30-year ITP term. Based on this alternative there would be no lost energy production from INBA or NLEB curtailment, therefore, the Project would meet the purpose and need to generate sufficient renewable energy for the region and provide economic opportunities to the local community. While the No Curtailment alternative meets the advancement of the national renewable energy policy objectives and improves the local economic opportunities, this alternative does not meet the biological objective in minimizing take of the Covered Species. This alternative was not considered further since this alternative does not meet all of the Project's objectives.

6.2 Take Avoidance

Under the take avoidance alternative, the Applicant evaluated the Project not seeking or obtaining an ITP. Under this alternative, the Applicant would curtail its turbines in a manner that would reduce the risk of take of the Covered Species such that potential take of Covered Species would be unlikely to occur. To reduce risk of take the Project turbines would be fully feathered at wind speeds below 6.9 m/s (22.6 ft/s) from sunset to sunrise during the bat active season (April 1 through November 15). By implementing these turbine operational adjustments, there is a reasonable expectation that take of INBA and NLEB would be avoided or unlikely to occur. Based on the take modeling that has been conducted, achieving a "take is unlikely to occur" or "avoidance" threshold for the Covered Species would require curtailment of the Project turbines to a degree that the Project would not be able to meet its power production obligations. The lost energy production from curtailing the turbines under this alternative would render the Project financially unviable and would not meet the purpose and need to generate ample clean and renewable energy. Moreover, the local economic opportunities associated with the Project would be foregone. The Project will minimize short and long-term environmental impacts associated with greenhouse gas emissions and carbon output emitted by non-renewable energy producers thus

[20] Section 10(a)(2)(A)(iii) of the ESA and its regulations (50 CFR §§ 17.22(b)(1), 17.32(b)(1), and 22.2)

contributing to the advancement of the national renewable energy policy objectives. Furthermore, the Project will improve local economic opportunities in the form of payments to landowners and local spending. Since the environmental benefits of meeting the region's renewable energy needs and the economic opportunities of supporting the local community would be renounced if the Project is deemed economically unfeasible, the take avoidance alternative was not considered further.

7 FUNDING ASSURANCES

ESA § 10(a)(2)(B)(iii) provides that the USFWS shall issue an ITP if, among other things, it finds that "the applicant will ensure that adequate funding for the [HCP] will be provided." Measures requiring funding in this HCP include recurring costs (e.g., HCP implementation, compliance monitoring, and adaptive management) and non-recurring costs (e.g., mitigation contracts). The Applicant and its parent company, Southern Power Company (Southern), have a number of sources of liquidity that are available to support the costs of the HCP, both internal and external, including net cash flows from operating activities, public and private debt offerings, the issuance of commercial paper, the use of unsecured revolving credit facilities, and other sources. For example, Southern currently maintains credit facilities totaling $600 million, and as of March 31, 2019, $595 million is available. Southern will maintain credit facilities throughout the Permit term. These credit facilities and other sources of liquidity are more than sufficient to provide adequate funds for all costs associated with the HCP, as laid out in Table 7.1. The Applicant will ensure that adequate funding for the HCP will be provided using three financial assurance mechanisms: the Project's annual budget/operating revenue, a corporate guarantee, and an endowment fund.

The Applicant will fund recurring costs associated with implementation of the HCP through operating revenues generated by the Project. These recurring costs (Table 7.1) will be built into the Project's operating budget. The Project has secured a power purchase agreement with a utility that guarantees the Project will be paid for each MW-hour of energy produced, thus ensuring that adequate revenue will be generated and funds will be available for the required activities. The only situation in which the Project would not earn revenue would be if the Project were to not operate and generate energy. In that situation, the Applicant would lock the Project's turbines and no take of the Covered Species would occur. Therefore, the recurring costs in Table 7.1 would cease to be incurred. Recurring costs include:

- Compliance Monitoring – The Applicant will fund compliance monitoring, both the mortality monitoring and the bat activity monitoring, through the Project's annual operation and maintenance budget. It is important to note that because take is a direct result of turbine operation (i.e., Covered Activity), if turbine operation stops, take will also stop and there will be no reason for compliance monitoring. The Applicant will obtain a proposal from an independent consultant for compliance monitoring in each year of the ITP.
    - The compliance monitoring cost estimates assume that mortality monitoring will be conducted during the first three years of the ITP and that thereafter, either bat activity monitoring will be conducted annually for the ITP term or mortality monitoring will be conducted on a seven-year interval for the duration of the ITP

term. The Year 1 cost estimates were based on current monitoring costs provided by a contractor with experience conducting both types of monitoring studies, and the costs for future years were escalated by 3% per year to account for inflation.

  - The monitoring costs include bias trials (for mortality monitoring) and development of an annual monitoring report and an agency coordination meeting in March of each year of the ITP. The meeting costs are primarily associated with report preparation and logistics for the actual meeting.

- HCP Overhead and Administration – General overhead and administrative costs are the Applicant's internal expenditures for travel to USFWS meetings and other expenses related to general administrative tasks, such as on-site logistics for monitoring studies, submitting reports, scheduling meetings, and coordinating implementation of the HCP. These costs have been accounted for and will be funded through the Project's annual operation and maintenance budget.

The Applicant also has accounted for non-recurring costs of the HCP in the Project's operation and maintenance budget, and will fund these costs from Project revenues. The Applicant will provide financial assurance for these non-recurring costs as described below. Non-recurring costs of plan implementation are also identified in Table 7.1, and include:

- Mitigation Measures – The Applicant will enter into a contract with Magnolia for the mitigation project and will establish an endowment to fund the costs associated with the contract as financial assurance. The contract for the mitigation will be executed within 90 days of ITP issuance and prior to take occurring. The mitigation costs will be sufficient to fully offset the impact of take for the full ITP term, and are covered under the mitigation contract.

- Contingencies – In addition to the funding assurances for the planned components of the HCP, the Applicant will provide financial assurance for contingencies to cover adaptive management and changed circumstance responses, should they be necessary over the ITP term. The amount of expected contingency funding needed was estimated based on the cost of one adaptive management response and one changed circumstance response. For both situations, the most expensive responses were used to estimate cost. The cost of an adaptive management response was based on the implementation of an additional year of mortality monitoring and analysis of the results. The cost of a changed circumstance was based on the restoration or replacement of mitigation habitat in response to a natural disaster, calculated as 5% of the total mitigation cost because it is unlikely that an entire mitigation project would need replacement or restoration. The location of mitigation in eastern Oklahoma or western Arkansas means there is a low likelihood of natural disasters such as wildfire that would cause large-scale destruction of forested habitat. The Applicant will fund responses to adaptive management by drawing upon other available funds, backed by a corporate guarantee. With regard to changed circumstances, the only changed circumstance – other than voluntary changed circumstances such as a new species listing – that would require the expenditure of additional funds is the need for additional mitigation lands in

response to the destruction of mitigation lands due to a natural disaster, which will be included in the endowment fund established in conjunction with Magnolia at the time the ITP is issued.

Other costs incurred by the Project include:

- Minimization Measures – The Applicant will adjust operation of the Project turbines to reduce potential impacts to the Covered Species; this entails limiting turbine rotation during periods when the Covered Species are considered at risk (Section 4.2.2). The lost revenue associated with these operational adjustments will be absorbed in the annual operation and maintenance budgeting process and is therefore not included as a recurring cost of the HCP.
- Other Measures – As described in Section 4.2.1, other measures to avoid and minimize take were implemented during Project design and planning. Costs associated with these measures were included, and paid for, as part of the Project development budget prior to the commercial operation of the Project. These costs are not included as non-recurring costs of the HCP because no further funding requirements for Project design and planning measures are anticipated.

Table 7.1. Estimated costs for implementing the Wildhorse Mountain Wind Facility Habitat Conservation Plan.

Budget Item	First Year Cost	Permit Term Total	Cost Basis and Assumptions
Recurring Costs			
Initial Compliance Monitoring, Years 1-3	$200,000	$618,200	Monitoring in ITP years one through three for estimating take of the Covered Species; includes monitoring logistics, bias trials, reporting, and agency meetings, with 3% inflation over three years. **Funding mechanism:** Project's annual budget/operating revenue
Interval Compliance Monitoring, Years 4-30	$218,500	$976,600	Seven-year interval monitoring in ITP years 10, 17 and 24, if this approach is taken at Year 4 (see Section 4.5.2) or if an adaptive management trigger results in adopting interval monitoring after Year 10 (see Section 4.5.4) with 3% annual inflation over the ITP term. **Funding mechanism:** Project's annual budget/operating revenue
NABat Compliance Monitoring, Years 4-30	$24,500	$997,400	Annual NABat monitoring, if this approach is taken at Year 4 (see Section 4.5.2), with 3% inflation for Years 4-30. **Funding mechanism:** Project's annual budget/operating revenue

Table 7.1. Estimated costs for implementing the Wildhorse Mountain Wind Facility Habitat Conservation Plan.

Budget Item	First Year Cost	Permit Term Total	Cost Basis and Assumptions
Non-Recurring Costs			
Mitigation	n/a	Per contract	Summer and/or swarming habitat protection and enhancement project to offset impact of requested take under the HCP; includes mitigation project management, monitoring, and reporting and funding to respond to one changed circumstance (natural disaster event). **Funding mechanism:** Contract with Magnolia; **Financial assurance:** Endowment Fund
Contingency Fund	n/a	$218,500	Funds necessary for one adaptive management response. **Funding mechanism:** Project's annual budget/operating revenue; **Financial assurance:** Corporate guarantee

n/a = not applicable

USFWS = US Fish and Wildlife Service; HCP = Habitat Conservation Plan; ITP = Incidental Take Permit

8 HABITAT CONSERVATION PLAN ADMINISTRATION

The HCP will be implemented by the Applicant, in coordination with the USFWS, upon issuance of the ITP. The Applicant is solely responsible for meeting the terms and conditions of the ITP and will allocate sufficient personnel and resources to ensure effective implementation of the terms and conditions of the HCP. In order to effectively implement the terms and conditions of the HCP, the Applicant will plan and coordinate meetings with the USFWS; organize training of management and O&M staff; oversee allocation of funding for mitigation, monitoring, adaptive management, and changed circumstances, if necessary; and ensure delivery of monitoring reports to the USFWS. While the Applicant will oversee the HCP implementation, the Applicant expects that management and monitoring (mitigation effectiveness monitoring) of mitigation lands will be conducted by the conservation entity(ies). Compliance monitoring at the Project is expected to be conducted by a contractor experienced in conducting bat fatality searches at wind facilities (for mortality monitoring) and bat acoustics (for NABat monitoring). Additionally, the Applicant will meet with the USFWS annually throughout the ITP term to discuss the results of the annual compliance monitoring reports and if any changed or unforeseen circumstances occurred during that monitoring event. Additional meetings or conferences may be initiated by the Applicant and/or the USFWS to address other concerns, as necessary, including implementation and results of conservation measures.

8.1 No Surprises Assurances

This HCP is subject to the federal "No Surprises" assurances rule[21]. As detailed in the rule and Federal Register notice adopting the rule, as long as the Applicant is properly implementing the HCP and the ITP, no additional commitment of land, water, or financial compensation will be required with respect to Covered Species, and no restrictions on the use of land, water, or other

[21] Codified at 50 CFR §§ 17.22(b)(5), 17.32(b)(5)

natural resources will be imposed beyond those specified in the HCP without the consent of the Applicant.

The "No Surprises" Rule has two major components: changed circumstances and unforeseen circumstances[22]. The former term includes changes affecting a species or geographic area covered by an HCP that can reasonably be anticipated and that can be planned for (e.g., the listing of a new species, or a fire or other natural catastrophic event in areas prone to such an event). In contrast, the latter term is defined as changes that could not reasonably have been anticipated by plan developers and the USFWS at the time of the negotiation and development of the HCP, and that result in a substantial, adverse change in the status of a covered species.

8.2 Changed Circumstances

As described in the HCP Handbook, with respect to foreseeable changed circumstances, the HCP should discuss measures developed by the applicant to address such changes over time, possibly by incorporating adaptive management measures as necessary for the covered species in the HCP. To the extent practicable, the applicant should identify potential problems in advance and identify specific strategies or responses in the HCP for addressing them, so that adjustments can be made as necessary without the need to amend the HCP. The Applicant has identified potential changes in risk of take of the Covered Species due changes in Covered Species' migration dates, the listing of new species, new technologies and information, and change in mitigation project viability as changed circumstances warranting consideration and planning in this HCP.

8.2.1 *Change in Covered Bat Species Migration Dates*

The ongoing effects of climate change make it reasonably foreseeable that the phenology of the Covered Species may change. This could result in changes in the timing of spring and fall migration of the Covered Species. For example, warmer temperatures may allow INBA and NLEB to leave hibernacula earlier and remain in summer habitat longer, pushing the dates of spring migration earlier in the year and the dates of fall migration later in the year.

In the event that the timing of Covered Species' spring and/or fall migration changes due to increased seasonal temperatures, the timing of Covered Species' mortality at the Project could change, warranting a response by the Applicant.

8.2.1.1 Trigger: Shift in Migration Patterns

1. USFWS notifies the Applicant of the documented shift in the timing of Covered Species' spring or fall migration in Oklahoma, either in peer-reviewed literature or recorded by the USFWS; or
2. The carcass of a Covered Species is discovered incidentally at the Project and a determination is made that the fatality occurred outside of the minimization period (April 1 to October 31).

[22] 50 CFR § 17.3

8.2.1.2 Response to Shifts in Migration Patterns

1. If USFWS notifies the Applicant of a documented shift in the timing of Covered Species' spring or fall migration in Oklahoma, the Applicant will shift the timing of the minimization and monitoring period in response to the changed circumstance. This shift will be a movement of the entire minimization and monitoring period to earlier or later in the season, rather than an expansion of the period, unless the USFWS indicates the migration period has expanded or contracted (i.e., the temporal distribution of bat activity is broader or narrower) – in this case, the minimization and monitoring period would be expanded or contracted accordingly. The Applicant will then implement the HCP's minimization measures during the redefined season of spring or fall migratory risk from sunset to sunrise. If the minimization protocols have been modified as the result of adaptive management, the modified protocol(s) will be implemented.

2. If a Covered Species fatality is discovered outside of the minimization period (April 1 to October 31), the Applicant will notify the USFWS within 24 hours of positive identification. The Applicant will shift the timing of the minimization and monitoring period to encompass the date(s) of the estimated time of death of the carcass in response to the changed circumstance. This shift will be a movement of the entire minimization and monitoring period to earlier or later in the season, rather than an expansion of the period, unless the analysis of the bat activity data indicates the migration period has expanded or contracted rather than shifted (i.e., the temporal distribution of bat activity is broader or narrower). In this case, the minimization and monitoring period would be expanded or contracted accordingly. The Applicant will then implement the HCP's minimization measures during the redefined season of spring or fall migratory risk from sunset to sunrise. If the minimization protocols have been modified as the result of adaptive management, the modified protocol(s) will be implemented.

8.2.2 *Additional Species Listings, Status Changes, Take Prohibitions or Critical Habitat Designations*

As a result of current population declines due primarily to WNS, other bat species (such as little brown bat) may become listed under the ESA as threatened or endangered during the term of the requested ITP. Additionally, other wildlife species may become federally listed as threatened or endangered during the term of the ITP due to the impacts of climate change, habitat loss, or other factors. Therefore, the Applicant believes that these circumstances constitute a foreseeable changed circumstance thus warranting consideration in this HCP.

8.2.2.1 Trigger: Additional Species Listing

The USFWS notifies the Applicant of either a proposed rule to list a species under the ESA, or to designate a candidate for listing under the ESA, that may occur in the Permit Area for which take is reasonably certain to occur as a result of the Covered Activities but is not a Covered Species.

8.2.2.2 Response to Additional Species Listing

The Applicant will evaluate data from all monitoring years up to the time of the proposed rule, and additional scientific information related to the impacts of wind turbines on the species proposed for listing, to determine if take of the species has occurred, or is reasonably certain to occur, and determine if the Covered Activities may result in future take of the species proposed for listing. In the event that a take has been documented, or it is reasonably certain to occur, the Applicant will coordinate with the USFWS. If the species is listed in the final rule, an amendment to the HCP (see Section 8.4) will be prepared that includes an assessment of take and impacts of the take evaluation and any additional conservation measures provided for the newly listed species. In the interim, the Applicant will take measures to ensure prohibited take of the newly listed species is not reasonably certain to occur.

Upon notice from the USFWS of such listing(s), the Applicant will coordinate with the USFWS to determine, using the best available data and information at the time, if additional avoidance, minimization, or mitigation strategies beyond those implemented for the Covered Species are advisable.

8.2.3 *New Technology and Information*

Over the ITP term, new information on the Covered Species and bat/wind-power interactions is likely to become available, new methods for monitoring and/or estimating mortality are likely to be developed, and new technology may become available to minimize bat mortality from wind turbines. The Applicant may wish to incorporate new information, methods, and/or technology into this HCP. For example, it is expected that over time, results of post-construction monitoring (both at the Project and from other publicly available sources) and research related to bat/wind-power interactions will be useful for identifying changes that would improve the on-site minimization measures. New methods, procedures, or analyses for monitoring studies are likely to be developed during the course of the ITP that provide more accurate results for determining the appropriate management actions for the Project (e.g., adjusting the turbine operations) to minimize impacts.

Ongoing and future studies on the Covered Species are likely to provide useful information on location, timing, and characteristics of migration or other periods of elevated risk. Such information could inform optimization of the bat conservation program's measures for minimizing take. Deterrent technologies (e.g., acoustic deterrents, visual deterrents) are also being investigated and new advances may make these technologies effective at minimizing take while also improving output at the Project. Ideally, these types of technological advances and new information will be utilized to improve mortality estimates and maximize the effectiveness of the minimization and monitoring measures associated with the Project and this HCP.

8.2.3.1 Trigger: New Methods

The Applicant notifies the USFWS of the intent to utilize alternative monitoring, mortality estimation, or minimization methods. Any new method, information, or technology will only be considered if it has been demonstrated to be as effective or more effective than the methods described in the HCP, has been approved in writing by the USFWS field office administering the

HCP as the best available science, is cost-effective and logistically practicable, and will not require an increase in the amount of take authorized by the ITP.

8.2.3.2 Response to New Methods

Prior to implementing any new measures for monitoring, estimating mortality, or minimizing take, the Applicant will meet with the USFWS to discuss the new methods, how they will be implemented, and any special conditions that may be needed. The Applicant will work with the USFWS to ensure that any new information or techniques that are used are compatible with the biological goals and objectives of this HCP. Any changes to the minimization measures will be accompanied by at least one year of mortality monitoring to confirm their effectiveness. The monitoring plan will be determined in consultation with the USFWS.

8.2.4 *Natural Disasters Affecting Mitigation Lands*

One or more of a range of natural phenomena, such as tornadoes, drought, wildfire, floods, or newly invasive species, are reasonably expected to occur during the ITP term and may impact mitigation lands.

8.2.4.1 Trigger: Natural Disaster

The Applicant will notify the USFWS and provide information of the natural disaster that has impacted the mitigation land, in which one or more of the mitigation objectives can no longer be met, within 30 days of discovery.

8.2.4.2 Response to Natural Disaster

The Applicant will work with the conservation entity and the USFWS to identify prescriptions for management of the affected area. If the USFWS concludes that the affected area is no longer suitable habitat for the INBA and NLEB, then the USFWS will work with the Applicant to identify portions that may be salvaged. For the areas that cannot be salvaged, the Applicant may sell the affected land area and revenue from the land sale will be utilized to acquire a replacement mitigation parcel. For areas that can be salvaged, the affected area will be restored. These changes will be implemented using the contingency fund under the criteria and prioritization guidelines for the HCP's mitigation (Section 4.3.1).

8.3 Unforeseen Circumstances

Unforeseen circumstances are defined as those affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the negotiation and development of the plan and that result in a substantial and adverse change in the status of the Covered Species (50 CFR § 17.3).

The USFWS bears the burden of demonstrating that unforeseen circumstances exist using the best available scientific and commercial data available. In deciding whether unforeseen circumstances exist, the USFWS will consider, but not be limited to, the following factors[23]:

1. The size of the current range of the affected species,
2. The percentage of the range adversely affected by the covered activities,
3. The percentage of the range that has been conserved by the HCP,
4. The ecological significance of that portion of the range affected by the HCP,
5. The level of knowledge about the affected species and the degree of specificity of the conservation program for that species under the HCP, and
6. Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the species in the wild.

When negotiating unforeseen circumstances, the USFWS will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the HCP without the consent of the permittee[24]. If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the USFWS may require additional measures of the permittee where the HCP is being properly implemented. This will happen only if such measures are limited to modifications within conserved habitat areas, if any, or to the HCP's operating conservation program for the affected species, and maintain the original terms of the plan to the maximum extent possible[25].

Notwithstanding these assurances, nothing in the No Surprises Rule will be construed to limit or constrain the USFWS, any federal agency, or a private entity, from taking additional actions, at its own expense, to protect or conserve a species included in a conservation plan.

8.4 Amendments

The HCP Handbook indicates that an ITP should be amended when the permittee significantly modifies the covered activities, the project, or the minimization or mitigation measures from the description in the original HCP. Such modifications may include changes in the Permit Area, changes in funding, addition of species to the ITP that were not addressed in the original HCP, or adjustments to the HCP due to strategies developed to address unforeseen circumstances. Depending on the circumstances, these could be made without a formal amendment request, or may require a formal amendment accompanied by public notice and analyses to varying extents, as described below. Any permit amendment must satisfy ESA § 10 review requirements; as the scale and scope of an amendment increases, other responsibilities, such as additional NEPA or ESA § 7 review, may be triggered (USFWS and NMFS 2016, page 17-7).

[23] 50 CFR §§ 17.22(b)(5)(iii)(C)) and 17.32(b)(5)(iii)(C)

[24] 50 CFR §§ 17.22(b)(5)(iii)(A)

[25] 50 CFR § 17.22(b)(5)(iii)(B)

8.4.1 *Changes Made Without a Formal Request*

Some changes or corrections to this HCP or the ITP may be agreed upon between the Applicant and the USFWS without a formal amendment request. These changes are primarily corrective revisions where the amount of take authorized by the ITP and the Covered Activities are not substantively altered. Examples include: correcting insignificant mapping errors, modifying avoidance and minimization measures to a small degree, modifying annual reporting protocols, making small changes to monitoring protocols, making changes to funding sources, and changing the names or addresses of responsible officials (USFWS and NMFS 2016). These changes may be made through an exchange of written correspondence between the Applicant and the USFWS. For example, the Applicant may submit a letter to the USFWS explaining a proposed change, and the USFWS may respond with a letter approving of the change. USFWS approved changes will be documented in a note to the HCP file.

8.4.2 *Formal Amendments*

Amendments may constitute an exchange of formal correspondence between the USFWS and the Applicant, addenda to this HCP, revisions to this HCP, or ITP amendments. The extent of NEPA and ESA Section 7 analyses and public notice processes accompanying an amendment is determined by the USFWS and depends on the scale and scope of the amendment. Amendments that do not increase the levels of incidental take and do not change the covered activity in ways that were not analyzed in the original NEPA or ESA Section 7 documents do not usually require advertising for public notice or additional analysis under NEPA or ESA Section 7. Amendments that require ITP amendment and publication in the Federal Register include: addition of new species, either listed or unlisted; increased level or different form of take for Covered Species; changes to funding that affect the ability of the permittee to implement the HCP; changes to covered activities not previously addressed; changes to covered lands; and significant changes to the conservation strategy, including changes to the mitigation measures (USFWS and NMFS 2016).

8.4.3 *Changes Due to Adaptive Management or Changed Circumstances*

Unless explicitly provided in Section 4.5 and Section 8.2 of this HCP, the need for and type of amendment to deal with adaptive management measures or Changed Circumstances will be determined by the USFWS, in coordination with the Applicant, at the time such responses are triggered. Changes provided in Section 4.5 and Section 8.2 to this HCP or the ITP needed to implement an adaptive management or Changed Circumstances response may be made without a formal request. However, a substantial change to the adaptive management or Changed Circumstances sections of this HCP would require a formal amendment.

8.5 Permit Renewal

The Applicant requests that the ITP associated with this HCP be renewable pursuant to 50 CFR § 13.22. In the event that the Applicant plans to continue to operate the Project after the ITP term and the cumulative take estimated for the Project is less than the take level authorized by the ITP, the Applicant will file in writing a renewal request at least 30 days prior to the permit expiration. Per the HCP Handbook, the USFWS will honor the No Surprises assurances as much as

practicable, but a renewed permit must satisfy applicable statutory and regulatory requirements in force as of the date of the approval of the renewal request. Permit renewals must be published in the Federal Register before the USFWS issues a decision, even if there are no revisions (USFWS and NMFS 2016, page 17-8).

9 REFERENCES

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9.2 List of Preparers

Wildhorse Wind Energy, LLC:
Kristin Mohon
Steve Glickauf

Western EcoSystems Technology, Inc.:
Brandi Welch-Acosta
Quintana Hayden
Joyce Pickle
Jared Studyvin
Kevin Murray

Troutman Pepper LLP:
Angela Levin

Appendix A. Operational Curtailment Studies and References

Appendix A. Publicly available operational curtailment studies from wind energy facilities in North America.

Wind Energy Facility	Location	Year	Normal Cut-in Speed (m/s)	Treatment Cut-in Speed (m/s)	Estimated Percent Reduction in Mortality	Study Design	Source
Fowler Ridge	IN	2011	3.5	3.5	36	Control-treatment	Good et al. 2012
Anonymous Project (AN02)	USFWS Region 8	2012	3	4	20	Randomized block	Arnett et al. 2013
Summerview	AB	2007	4	4	57	Before-after-control-impact	Baerwald et al. 2009
Mount Storm	WV	2010	4	4	35	Control-treatment; 1st half vs 2nd half of night	Young et al. 2011
Mount Storm	WV	2011	4	4	No significant reduction	Control-treatment	Young et al. 2012
Anonymous Project (AN01)	USFWS Region 3	2010	3.5	4.5	47	Control-treatment	Arnett et al. 2013
Fowler Ridge	IN	2011	3.5	4.5	57	Control-treatment	Good et al. 2012
Wolfe Island	ON	2011	4	4.5	48	Control-treatment	Stantec Consulting 2012
Anonymous Project (AN02)	USFWS Region 8	2012	3	5	35	Randomized block	Arnett et al. 2013
Anonymous Project (AN02)	USFWS Region 8	2012	3	5	33	Randomized block	Arnett et al. 2013
Pinnacle	WV	2012	3	5	47	Control-treatment	Hein et al. 2013
Pinnacle	WV	2013	3	5	54	Control-treatment; randomized design	Hein et al. 2014
Casselman	PA	2008	3.5	5	82	Control-treatment; randomized block	Arnett et al. 2011
Casselman	PA	2009	3.5	5	72	Control-treatment; randomized block	Arnett et al. 2011
Fowler Ridge	IN	2010	3.5	5	50	Control-treatment	Good et al. 2011
Fowler Ridge	IN	2012	3.5	5	84	Before-after (between years)	Good et al. 2013
Fowler Ridge	IN	2013	3.5	5	77	Before-after (between years)	Good et al. 2014
Fowler Ridge	IN	2014	3.5	5	78	Before-after (between years)	Good et al. 2015
Fowler Ridge	IN	2015	3.5	5	72	Before-after (between years)	Good et al. 2016

Appendix A. Publicly available operational curtailment studies from wind energy facilities in North America.

Wind Energy Facility	Location	Year	Normal Cut-in Speed (m/s)	Treatment Cut-in Speed (m/s)	Estimated Percent Reduction in Mortality	Study Design	Source
Fowler Ridge	IN	2016	3.5	5	72	Before-after (between years)	Good et al. 2017
Fowler Ridge	IN	2017	3.5	5	66	Before-after (between years)	Good et al. 2018
Wildcat	IN	2017	3.5	5	74	Before-after/before	Stantec Consulting 2018
Criterion	MD	2012	4	5	62	Before-after	Young et al. 2013
Anonymous Project (AN01)	USFWS Region 3	2010	3.5	5.5	72	Control-treatment	Arnett et al. 2013
Summerview	AB	2007	4	5.5	60	BACI	Baerwald et al. 2009
Fowler Ridge	IN	2011	4	5.5	73	Control-treatment	Good et al. 2012
Wolfe Island	ON	2011	4	5.5	60	Control-treatment	Stantec Consulting 2012
Anonymous Project (AN02)	USFWS Region 8	2012	3	6	38	Randomized block	Arnett et al. 2013
Sheffield	VT	2009	4	6	60	Control-treatment; randomized block	Arnett et al. 2013
Pinnacle	WV	2013	3	6.5	76	Control-treatment; randomized design	Hein et al. 2014
Casselman	PA	2008	3.5	6.5	82	Control-treatment; randomized block	Arnett et al. 2011
Casselman	PA	2009	3.5	6.5	72	Control-treatment; randomized block	Arnett et al. 2011
Fowler Ridge	IN	2010	3.5	6.5	78	Control-treatment	Good et al. 2011
Beech Ridge	WV	2012	3.5	6.9	89	Qualitative comparison to fatality rates of other wind facilities at three spatial scales	Tidhar et al. 2013
Beech Ridge	WV	2013	3.5	6.9	97	Qualitative comparison to fatality rates of other wind facilities at three spatial scales	Young et al. 2014
Wildcat	IN	2017	5	6.9	51	Before-after	Stantec Consulting 2018

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Appendix B. Post-Construction Monitoring Studies and References used to Calculate Take Predictions for the Wildhorse Mountain Wind Facility

Appendix B. Wind energy facilities located in forested areas with publicly available bat carcass data (n = 54) used to calculate take predictions for the Wildhorse Mountain Wind Facility. All 54 studies were used for northern long-eared bat (NLEB) take prediction because all studies are located in the NLEB range; 40 of the studies are located in the Indiana bat (INBA) range and are therefore were used in INBA take prediction.

		Number of Carcasses			
Project (Year)	State	INBA	NLEB	Total Bats	Reference
Buffalo Mountain (2000-2003)*	TN	0	0	119	Nicholson et al. 2005
Buffalo Mountain (2005)	TN	0	0	238	Fiedler et al. 2007
Casselman (2008)	PA	0	0	148	Arnett et al. 2009
Casselman (2009)	PA	0	0	124	Arnett et al. 2010
Cohocton/Dutch Hill (2009)	NY	0	0	69	Stantec 2010
Cohocton/Dutch Hills (2010)	NY	0	1	63	Stantec 2011
Criterion (2011)	MD	0	1	706	Young et al. 2012a
Criterion (2012)	MD	0	0	82	Young et al. 2013
Criterion (2013)	MD	0	0	40	Young et al. 2014
Kibby (2011)	ME	NA	0	9	Stantec 2012a
Lempster 2009	NH	NA	0	12	Tidhar et al. 2010
Lempster 2010	NH	NA	0	19	Tidhar et al. 2011
Locust Ridge II (2009)	PA	0	0	255	Arnett et al. 2011
Locust Ridge II (2010)	PA	0	0	221	Arnett et al. 2011
Maple Ridge (2006)	NY	0	0	220	Jain et al. 2007
Maple Ridge (2007)	NY	0	0	283	Jain et al. 2009a
Maple Ridge (2008)	NY	0	0	216	Jain et al. 2009d
Maple Ridge (2012)	NY	0	0	85	Tidhar et al. 2013
Mars Hill (2007)	ME	NA	0	24	Stantec 2008
Mars Hill (2008)	ME	NA	0	5	Stantec 2009a
Meyersdale (2004)	PA	0	2	299	Arnett et al. 2005
Mount Storm (2009)*	WV	0	0	265	Young et al. 2009a, 2010b
Mount Storm (2010)*	WV	0	0	460	Young et al. 2010a, 2011b
Mount Storm (2011)*	WV	0	0	183	Young et al. 2011a, 2012b
Mount Storm (Fall 2008)	WV	0	1	209	Young et al. 2009b
Mountaineer (2003)*	WV	0	6	475	Kerns and Kerlinger
Mountaineer (2004)*	WV	0	0	468	Arnett et al. 2005
Munnsville (2008)	NY	0	0	10	Stantec 2009b
Noble Altona (2010)	NY	0	0	31	Jain et al. 2011b
Noble Altona (2011)	NY	0	0	25	Kerlinger et al. 2011b
Noble Bliss (2008)	NY	0	0	89	Jain et al.2009e
Noble Bliss (2009)	NY	0	0	36	Jain et al. 2010a
Noble Bliss/Wethersfield (2010)	NY	0	1	75	Jain et al. 2011a

Appendix B. Wind energy facilities located in forested areas with publicly available bat carcass data (n = 54) used to calculate take predictions for the Wildhorse Mountain Wind Facility. All 54 studies were used for northern long-eared bat (NLEB) take prediction because all studies are located in the NLEB range; 40 of the studies are located in the Indiana bat (INBA) range and are therefore were used in INBA take prediction.

		Number of Carcasses			
Project (Year)	**State**	**INBA**	**NLEB**	**Total Bats**	**Reference**
Noble Bliss/Wethersfield (2011)	NY	0	5	64	Kerlinger et al. 2011a
Noble Chateaugay (2010)	NY	0	0	29	Jain et al. 2011c
Noble Clinton (2008)	NY	0	0	53	Jain et al. 2009c
Noble Clinton (2009)	NY	0	0	42	Jain et al. 2010b
Noble Ellenburg (2008)	NY	0	1	59	Jain et al. 2009b
Noble Ellenburg (2009)	NY	0	0	32	Jain et al. 2010c
Pinnacle (2012)	WV	0	0	227	Hein et al. 2013a
Pinnacle Operational (2012)	WV	0	0	186	Hein et al. 2013b
Record Hill (2012)	ME	NA	0	44	Stantec 2013b
Record Hill (2014)	ME	NA	0	7	Stantec 2015
Rollins (2012)	ME	NA	0	2	Stantec 2013c
Roth Rock (2011)	MD	0	0	88	Atwell 2012
Sheffield (2012)	VT	0	0	87	Martin et al. 2013
Sheldon (2010)	NY	0	0	53	Tidhar et al. 2012a
Sheldon (2011)	NY	0	0	38	Tidhar et al. 2012b
Spruce Mountain (2012)	ME	NA	0	6	Tetra Tech 2013
Stetson Mountain I (2009)	ME	NA	0	5	Stantec 2009c
Stetson Mountain I (2011)	ME	NA	0	4	Normandeau Associates 2011
Stetson Mountain I (2013)	ME	NA	0	1	Stantec 2014
Stetson Mountain II (2010)	ME	NA	0	14	Normandeau Associates 2010
Stetson Mountain II (2012)	ME	NA	0	4	Stantec 2013d

*Indicates a study conducted at a wind energy facility with topography and geographic location most similar to the Wildhorse Mountain Wind Facility that was used as a surrogate to estimate the overall bat fatality rate.

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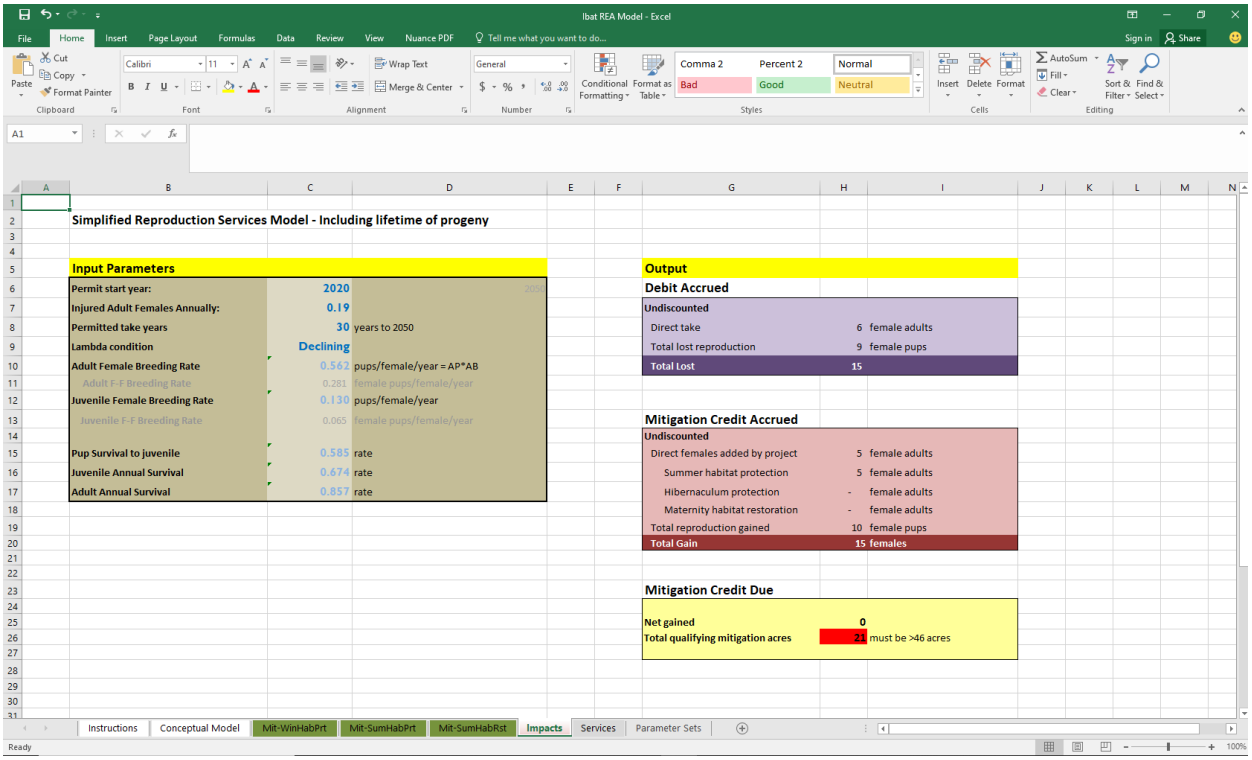
Appendix C. Resource Equivalency Analysis Model Calculations

Calculations from the R3 Ibat REA Model v7.user (Szymanski et al. 2013) for Summer Habitat Protection for Habitat Suitable for Both Indiana Bat and Northern Long-Eared Bat



Ibat REA Model - Excel

Simplified Reproduction Services Model - Including lifetime of progeny

Input Parameters		
Permit start year:	2020	
Injured Adult Females Annually:	0.19	
Permitted take years	30	years to 2050
Lambda condition	Declining	
Adult Female Breeding Rate	0.562	pups/female/year = AP*AB
Adult F-F Breeding Rate	0.281	female pups/female/year
Juvenile Female Breeding Rate	0.130	pups/female/year
Juvenile F-F Breeding Rate	0.065	female pups/female/year
Pup Survival to juvenile	0.585	rate
Juvenile Annual Survival	0.674	rate
Adult Annual Survival	0.857	rate

Output

Debit Accrued

Undiscounted		
Direct take	6	female adults
Total lost reproduction	9	female pups
Total Lost	15	

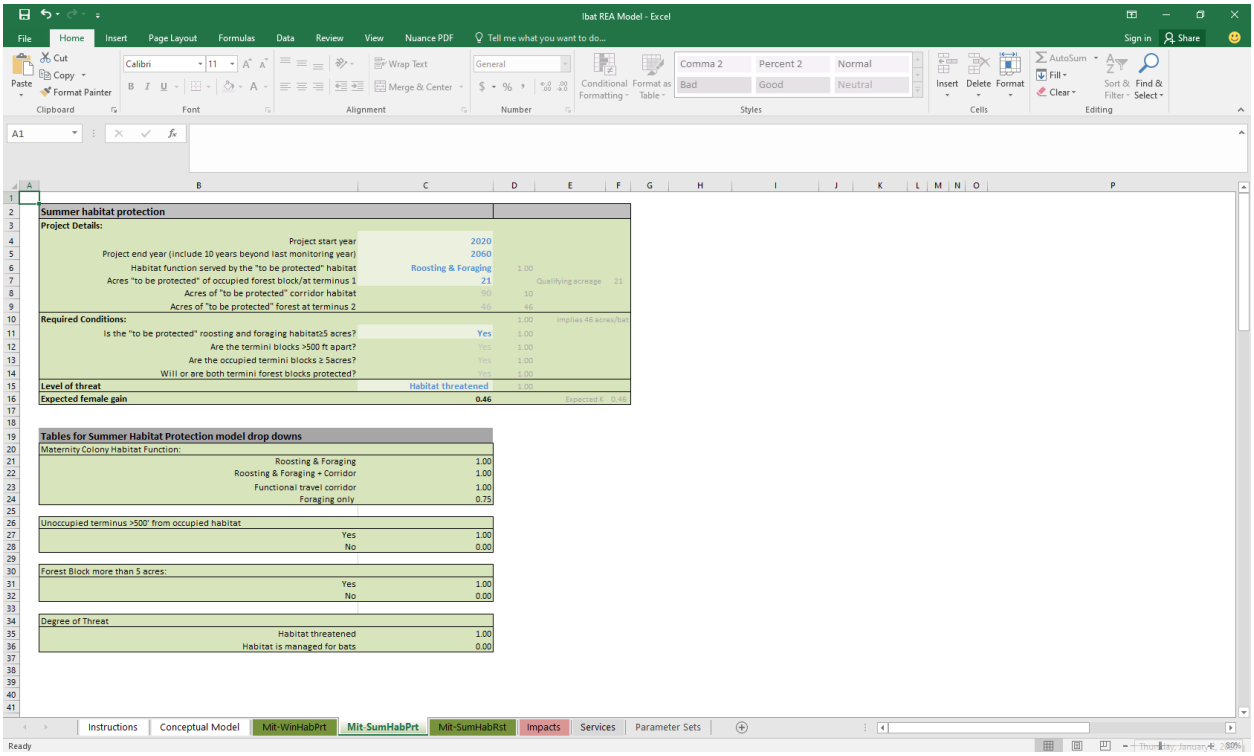
Mitigation Credit Accrued

Undiscounted		
Direct females added by project	5	female adults
Summer habitat protection	5	female adults
Hibernaculum protection	-	female adults
Maternity habitat restoration	-	female adults
Total reproduction gained	10	female pups
Total Gain	15	females

Mitigation Credit Due

Net gained	0	
Total qualifying mitigation acres	21	must be >46 acres

Instructions | Conceptual Model | Mit-WinHabPrt | Mit-SumHabPrt | Mit-SumHabRst | Impacts | Services | Parameter Sets



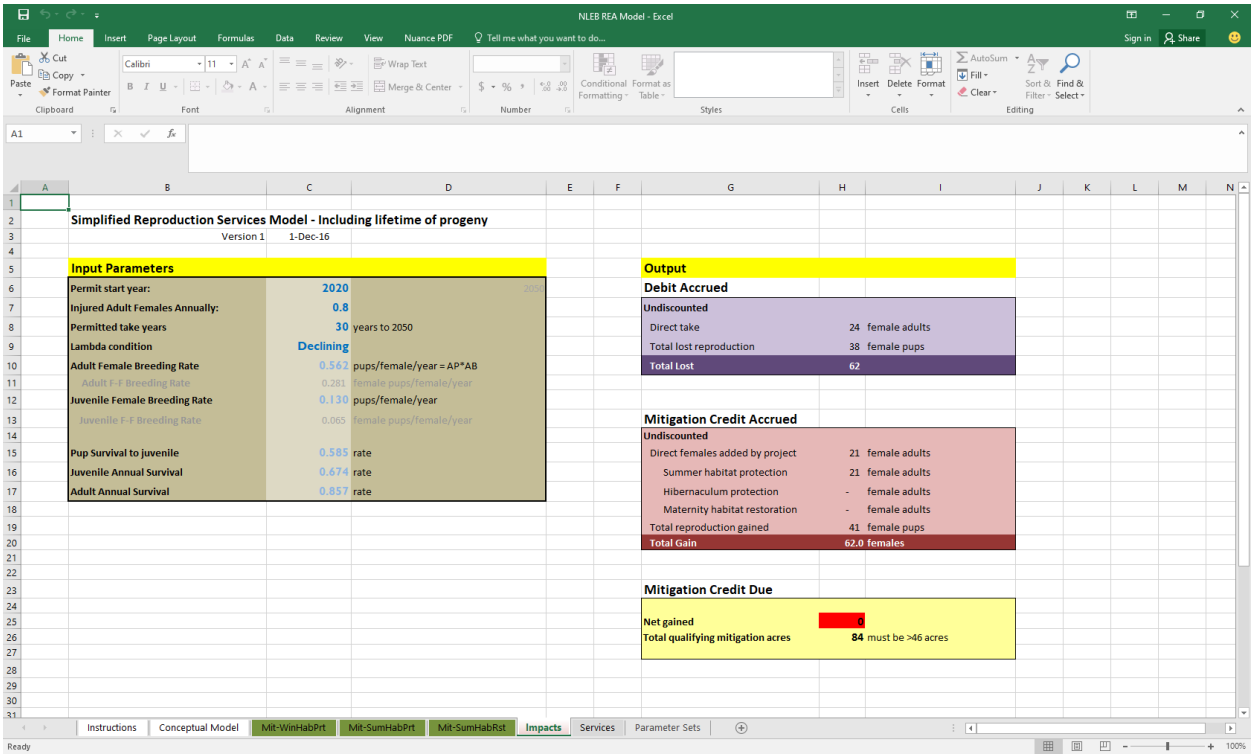
Ibat REA Model - Excel

Summer habitat protection		
Project Details:		
Project start year	2020	
Project end year (include 10 years beyond last monitoring year)	2060	
Habitat function served by the "to be protected" habitat	Roosting & Foraging	1.00
Acres "to be protected" of occupied forest block/at terminus 1	21	Qualifying acreage 21
Acres of "to be protected" corridor habitat	90	10
Acres of "to be protected" forest at terminus 2	46	46
Required Conditions:		1.00 implies 46 acres/bat
Is the "to be protected" roosting and foraging habitat≥5 acres?	Yes	1.00
Are the termini blocks >500 ft apart?	Yes	1.00
Are the occupied termini blocks ≥ 5acres?	Yes	1.00
Will or are both termini forest blocks protected?	Yes	1.00
Level of threat	Habitat threatened	1.00
Expected female gain	0.46	Expected K 0.46

Tables for Summer Habitat Protection model drop downs	
Maternity Colony Habitat Function:	
Roosting & Foraging	1.00
Roosting & Foraging + Corridor	1.00
Functional travel corridor	1.00
Foraging only	0.75
Unoccupied terminus >500' from occupied habitat	
Yes	1.00
No	0.00
Forest Block more than 5 acres:	
Yes	1.00
No	0.00
Degree of Threat	
Habitat threatened	1.00
Habitat is managed for bats	0.00

Instructions | Conceptual Model | Mit-WinHabPrt | Mit-SumHabPrt | Mit-SumHabRst | Impacts | Services | Parameter Sets

Calculations from the R3 NLEB REA Model v1.user (Szymanski et al. 2016) for Summer Habitat Protection for Habitat Suitable for Both Indiana Bat and Northern Long-Eared Bat



Simplified Reproduction Services Model - Including lifetime of progeny

Version 1 1-Dec-16

Input Parameters		
Permit start year:	2020	2050
Injured Adult Females Annually:	0.8	
Permitted take years	30	years to 2050
Lambda condition	Declining	
Adult Female Breeding Rate	0.562	pups/female/year = AP*AB
Adult F-F Breeding Rate	0.281	female pups/female/year
Juvenile Female Breeding Rate	0.130	pups/female/year
Juvenile F-F Breeding Rate	0.065	female pups/female/year
Pup Survival to juvenile	0.585	rate
Juvenile Annual Survival	0.674	rate
Adult Annual Survival	0.857	rate

Output

Debit Accrued

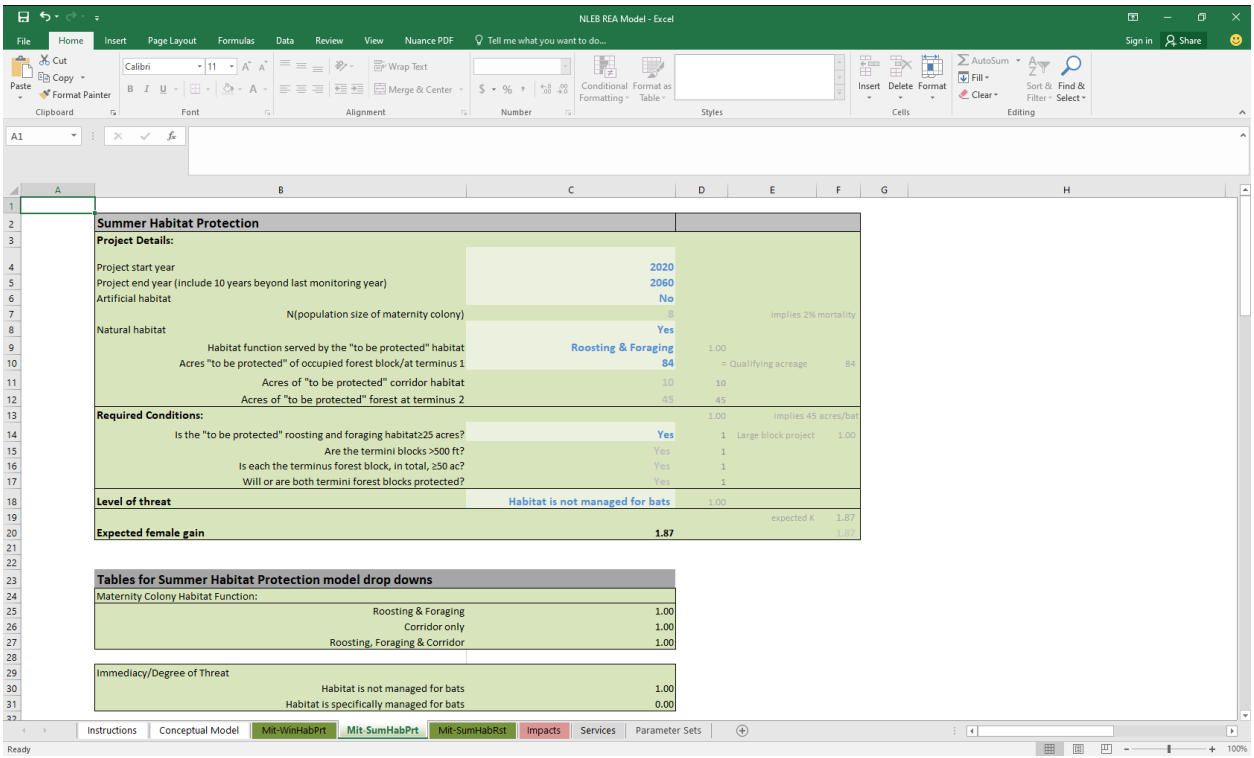
Undiscounted		
Direct take	24	female adults
Total lost reproduction	38	female pups
Total Lost	62	

Mitigation Credit Accrued

Undiscounted		
Direct females added by project	21	female adults
Summer habitat protection	21	female adults
Hibernaculum protection	-	female adults
Maternity habitat restoration	-	female adults
Total reproduction gained	41	female pups
Total Gain	62.0	females

Mitigation Credit Due

Net gained	0	
Total qualifying mitigation acres	84	must be >46 acres



Summer Habitat Protection				
Project Details:				
Project start year	2020			
Project end year (include 10 years beyond last monitoring year)	2060			
Artificial habitat	No			
N(population size of maternity colony)	8		implies 2% mortality	
Natural habitat	Yes			
Habitat function served by the "to be protected" habitat	Roosting & Foraging	1.00		
Acres "to be protected" of occupied forest block/at terminus 1	84		= Qualifying acreage	84
Acres of "to be protected" corridor habitat	10	10		
Acres of "to be protected" forest at terminus 2	45	45		
Required Conditions:		1.00	implies 45 acres/bat	
Is the "to be protected" roosting and foraging habitat≥25 acres?	Yes	1	Large block project	1.00
Are the termini blocks >500 ft?	Yes	1		
Is each the terminus forest block, in total, ≥50 ac?	Yes	1		
Will or are both termini forest blocks protected?	Yes	1		
Level of threat	Habitat is not managed for bats	1.00		
			expected K	1.87
Expected female gain	**1.87**			1.87

Tables for Summer Habitat Protection model drop downs	
Maternity Colony Habitat Function:	
Roosting & Foraging	1.00
Corridor only	1.00
Roosting, Foraging & Corridor	1.00
Immediacy/Degree of Threat	
Habitat is not managed for bats	1.00
Habitat is specifically managed for bats	0.00

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Appendix D. Project Location and References for the 50 Publicly Available Mortality Monitoring Studies in the Eastern and Midwestern United States and Canada Reporting the Sex of Bat Carcasses Found

Appendix D. Project location and references for the 50 publicly available mortality monitoring studies in the eastern and Midwestern United States and Canada reporting the sex of bat carcasses found.

Project	Reference
Barton I and II	Derby et al. 2011b
Blue Sky Green Field	Gruver et al. 2009
Buffalo Mountain (2000-2003)	Nicholson et al. 2005
Buffalo Mountain (2005)	Fiedler et al. 2007
Buffalo Ridge (2000)	Krenz and McMillan 2000
Buffalo Ridge (Phase II; 2001/Lake Benton I)	Johnson et al. 2004
Buffalo Ridge (Phase III; 2001/Lake Benton II)	Johnson et al. 2004
Buffalo Ridge I (2010)	Derby et al. 2010d
Buffalo Ridge II (2011)	Derby et al. 2012a
Casselman (2008)	Arnett et al. 2009
Casselman (2009)	Arnett et al. 2010
Cohocton/Dutch Hill (2009)	Stantec 2010
Cohocton/Dutch Hills (2010)	Stantec 2011
Criterion (2011)	Young et al. 2012b
Crystal Lake II	Derby et al. 2010b
Elm Creek	Derby et al. 2010e
Elm Creek II	Derby et al. 2012b
Fowler I, II, III (2010)	Good et al. 2011
Fowler I, II, III (2011)	Good et al. 2012
Grand Ridge I	Derby et al. 2010a
Lakefield Wind	Minnesota Public Utilities Commission (MPUC) 2012
Lempster (2009)	Tidhar et al. 2010
Lempster (2010)	Tidhar et al. 2011
Locust Ridge II (2009)	Arnett et al. 2011
Locust Ridge II (2010)	Arnett et al. 2011
Mars Hill (2008)	Stantec 2009a
Moraine II	Derby et al. 2010f
Mount Storm (Fall 2008)	Young et al. 2009b
Mount Storm (2009)	Young et al. 2009a, 2010b
Mount Storm (2010)	Young et al. 2010a, 2011b
Mount Storm (2011)	Young et al. 2011a, 2012a
Munnsville (2008)	Stantec 2009b
Noble Bliss (2009)	Jain et al. 2010c
Noble Clinton (2009)	Jain et al. 2010a
Noble Ellenburg (2009)	Jain et al. 2010b
NPPD Ainsworth	Derby et al. 2007
Pioneer Prairie I (Phase II)	Chodachek et al. 2012
Prairie Winds ND1 (Minot)	Derby et al. 2011d
Prairie Winds ND1 (Minot) (2011)	Derby et al. 2012d
Prairie Winds SD1 (Crow Lake)	Derby et al. 2012c
Prince Wind Farm (2006)	Natural Resource Solutions Inc. (NRSI) 2008
Rugby	Derby et al. 2011c
Sheldon (2010)	Tidhar et al. 2012a
Sheldon (2011)	Tidhar et al. 2012b
Stetson Mountain I (2011)	Normandeau Associates 2011
Stetson Mountain II (2010)	Normandeau Associates 2010
Wessington Springs (2009)	Derby et al. 2010c
Wessington Springs (2010)	Derby et al. 2011a
Winnebago	Derby et al. 2010g
Wolfe Island Report 2 (July-December 2009)	Stantec Ltd. 2010

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Appendix E. Bat Habitat Conservation Plan for the Wildhorse Mountain Habitat Conservation Plan

Bat Habitat Conservation Plan

for the

Wildhorse Mountain HCP

Pushmataha County, Oklahoma

PREPARED BY

Magnolia Land Partners LLC

166 West Washington Street, Suite 700

Chicago, IL 60602

SUBMITTED June 25, 2020

Table of Contents

Exhibits

I. Introduction

Magnolia Land Partners LLC ("Magnolia") has prepared this Bat Habitat Conservation Plan ("Conservation Plan") for the Wildhorse Mountain Wind Project ("Project") on behalf of Wildhorse Wind Energy LLC ("Applicant"). The purpose of this plan is to satisfy the mitigation component of the Project's Incidental Take Permit and associated Habitat Conservation Plan ("HCP") through the preservation and enhancement of the Kiamichi River Mitigation Site ("Mitigation Site"). Upon approval of the HCP and this bat habitat conservation plan, the Conservation Plan will be implemented in accordance with the schedule set forth in the HCP.

This document addresses mitigation that will be provided at the Mitigation Site. The proposed mitigation at the Mitigation Site will offset possible take of the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*), (collectively, the "Target Species") by enhancing and permanently protecting threatened high value summer habitat for the Target Species.

The 90-acre Mitigation Site sits adjacent to the Pushmataha Wildlife Management Area in the town of Clayton, Pushmataha County, Oklahoma. The Mitigation Site is located approximately four miles southwest of the Project. The Mitigation Site is generally bound by the Kiamichi River to the north, and private forested land to the east and private forested and agricultural land to the west.

Mitigation Site figures are included as **Exhibit A**. A vicinity map is included as **Exhibit A-1** and shows the location of the Mitigation Site in relation to the Project. **Exhibit A-2** provides a view of the Mitigation Site on aerial background.

The Mitigation Site is located off of Oklahoma State Route 2 in the NE corner of Section 14, Township 1 North, Range 18 East. The approximate center point of the Mitigation Site is provided below.

Coordinates:

34°33'39.6"N, 95°22'44.4"W (WGS84)

Driving directions from Wilburton, OK are as follows:

1. Head west on E Main St for 1 mile.
2. Turn left onto OK-2 S and continue for 31.5 miles.
3. The property will be on the left, at the GPS coordinates 34.569, -95.374. Follow the dirt road to cross the Kiamichi River.
4. Continue on the dirt road for approximately .25 miles to arrive at the Mitigation Site.

II. Purpose of Management Plan

Loss and fragmentation of roosting and foraging habitat has been identified as a major contributor to the loss in population of Indiana bats and northern long-eared bats. The Ouachita Mountains region is heavily forested; however much of the native forest has been replaced with pine plantations for silviculture. The purpose of this plan is to provide protection for Indiana bat and northern long-eared bat roosting and foraging habitat by placing a conservation easement on a tract of mature native hardwood forest habitat and managing it for the benefit of the Target Species.

III. Goal of Management Plan

The goal of the management plan is to facilitate an increase in Target Species populations via:

- Preventing removal of potential roost trees;
- Selectively cutting trees to promote growth of future potential roost trees;
- Promoting healthy forest growth by controlling non-native invasive species growth; and
- Periodically monitoring habitat conditions to ensure the Mitigation Site continues to provide high quality roosting and foraging habitat for the Target Species.

IV. Species Information

A. Target Species Life History

1. Indiana Bat Life History

The Indiana bat was listed as endangered in 1967 due to episodes of people disturbing hibernating bats in caves during winter, resulting in the death of large numbers of bats. Indiana bats are vulnerable to disturbance because they hibernate in large numbers in only a few caves. (The largest hibernacula support from 20,000 to 50,000 bats.) Other threats that have contributed to the Indiana bat's decline include commercialization of caves, loss of summer habitat due to deforestation for logging and development, pesticides and other contaminants, and most recently, white-nose syndrome. Indiana bats are quite small, weighing only one-quarter of an ounce, although in flight they have a wingspan of 9 to 11 inches. Their fur is dark brown to black. They hibernate during winter in caves or abandoned mines with high levels of humidity and stable temperatures between 32° F and 50° F. During summer, they roost under the peeling bark and in crevices of live trees and standing dead trees, known as snags. In addition to living trees and snags of any species with sloughing bark, cracks, or crevices, the following tree species are considered to be high-value potential roost trees: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa),* bitternut hickory (*Carya cordiformis*), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), black locust (*Robinia pseudoacacia*), sugar maple (*Acer saccharum*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), eastern cottonwood (*Populus deltoides*), northern red oak (*Quercus rubra*), scarlet oak (*Quercus coccinea*), black oak (*Quercus velutina*), chestnut oak (*Quercus montana*), and white oak (*Quercus alba*). Males tend to roost solitarily, while females may roost in groups of over 100, known as maternity colonies. Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands.

2. Northern Long-Eared Bat Life History

The northern long-eared bat is one of the species most vulnerable to white-nose syndrome and was listed as federally threatened in 2015 due to population declines attributed to white-nose syndrome and habitat loss. They are slightly smaller than Indiana bats, with average wingspans of 9 to 10 inches. Their fur is typically medium to dark brown on the back, and a lighter pale brown on the underside. As their name suggests, they can be distinguished from other bats in the genus *Myotis* by their relatively long ears. They utilize similar habitat to Indiana bats, hibernating in caves and mines and roosting in the summer under the bark and

in crevices of live trees and snags. They also have diets similar to those of Indiana bats, consisting of various flying insects. Both Indiana and northern long-eared bats have been recognized as being valuable controls on the populations of disease spreading insects such as mosquitos and agricultural pests such as moths.

B. Existing Threats

Mitigation Site assessments led to the identification of the following conditions as possible threats to the Target Species population and the habitat they occupy:

1. Loss of Forest Habitat

The Mitigation Site is located in an area that has been largely deforested and replaced with pine plantations. Any native forested habitat in the region is at risk of deforestation for logging and silvicultural use.

2. Invasive Species Growth

Non-native invasive species growth was noted within and adjacent to the Mitigation Site These species can outcompete native plant growth and can negatively alter the composition of the ecosystem by preventing regenerative growth. Excessive invasive species growth in the understory of forest habitat may reduce utilization as foraging habitat by the Target Species.

V. Mitigation Site Information

Magnolia will serve as the mitigation agent and land manager for the Kiamichi River Mitigation Site and will be responsible for implementation of this Conservation Plan in addition to achieving performance standards, monitoring, and management of the Mitigation Site. The Mitigation Site management and monitoring documents are included as **Exhibit B**. Land Legacy will serve as the easement holder and long-term steward for the Mitigation Site.

The Mitigation Site parcel is currently owned by Dale Jackson and Justin Jackson. The Mitigation Site is free and clear of any easements or encumbrances that would interfere with the ability to protect and conserve the Mitigation Site. A title review for the property is included as **Exhibit C-1: Title Review**. Contact information for each party is provided below.

Mitigation Agent / Land Manager	**Easement Holder**	**Property Owners**
Magnolia Land Partners LLC	Land Legacy	Dale Jackson & Justin Jackson
(847) 287-6025	(918) 587-2190	(970) 902-3006
166 West Washington St, Suite 700	822 E 6th St, Suite 200	PO Box 100
Chicago, IL 60602	Tulsa, OK 74120	Clayton, OK 76436

VI. Mitigation Site Selection & Baseline Status

The parcel included in the Mitigation Site was selected due to the ecological benefits its management and permanent protection would provide to the Target Species. The Mitigation Site contains 90 acres of contiguous mature, deciduous broadleaf forest habitat. A Phase I Environmental Site Assessment was

performed on the Mitigation Site property and no recognized environmental conditions were identified. The results of this survey are included as **Exhibit E**.

Acoustic surveys were performed on the Mitigation Site in August of 2019. Calls of both Target Species were recorded during the surveys, confirming the Mitigation Site is utilized by the Target Species. The locations of the acoustic monitors that recorded activity from the Target Species are shown on the Mitigation Site map included as **Exhibit A-2**, and a report of the acoustic survey results is included as **Exhibit F-1**.

Despite the high levels of forest coverage in the vicinity of the Mitigation Site, the habitat for the Target Species in the area is highly fragmented by agricultural activities, primarily grazing, and conversion to pine plantations. Within five miles of the Mitigation Site, approximately 43% of land is mapped as hardwood forest by the National Land Cover Database. A map showing the hardwood forest cover in the vicinity of the Mitigation Site can be found in **Exhibit A-3.** Clearing for agricultural and forestry use is an ever-present threat to the forested habitat in this area. The owner of the property has been contacted by logging companies who expressed interest in extracting timber from the Mitigation Site property, which would result in the replacement of a diverse hardwood forest habitat with plantation trees with less value to wildlife. The combination of development pressures, documented use by the Target Species, and fragmented habitat in the area make the Mitigation Site a valuable conservation area for the Target Species.

A forested habitat assessment performed by Magnolia on the Mitigation Site indicated that the forest within the Mitigation Site presents as high-quality summer habitat for the Target Species, due to the age and species composition of the forest and snag density. The forested habitat assessment report is included as **Exhibit F-2**. Historical aerial photography and conversations with the landowners indicate that the forest included in the Mitigation Site has not been cut or logged since earlier than 1955. Aquatic features such as streams and apparent wetland habitat were found within the Mitigation Site boundaries. The Kiamichi River is adjacent to the northern border of the Mitigation Site, and several unnamed tributaries run through the Mitigation Site. Additionally, approximately 17 acres of bottomland hardwood wetland habitat are mapped by the National Wetlands Inventory within the Mitigation Site. These aquatic features provide excellent foraging habitat for the Target Species.

VII. Management Plan

The goal of this management plan is to benefit the Target Species by permanently protecting the forested habitat on the Mitigation Site which currently contains high-quality foraging habitat for the Target Species. It is expected that the habitat will persist without any direct management actions. To ensure the continued value of the Mitigation Site to the Target Species, the Mitigation Site will be periodically monitored to ensure it meets the performance standards set forth in **Exhibit B-3.**

VIII.Adaptive Management

Should one of the monitoring visits indicate that the Mitigation Site's performance standards are not being met, the Land Manager shall take action to correct any deficiencies. Specific events that would trigger either adaptive management or a changed circumstance event and the appropriate responses are listed in **Exhibit B-3.**

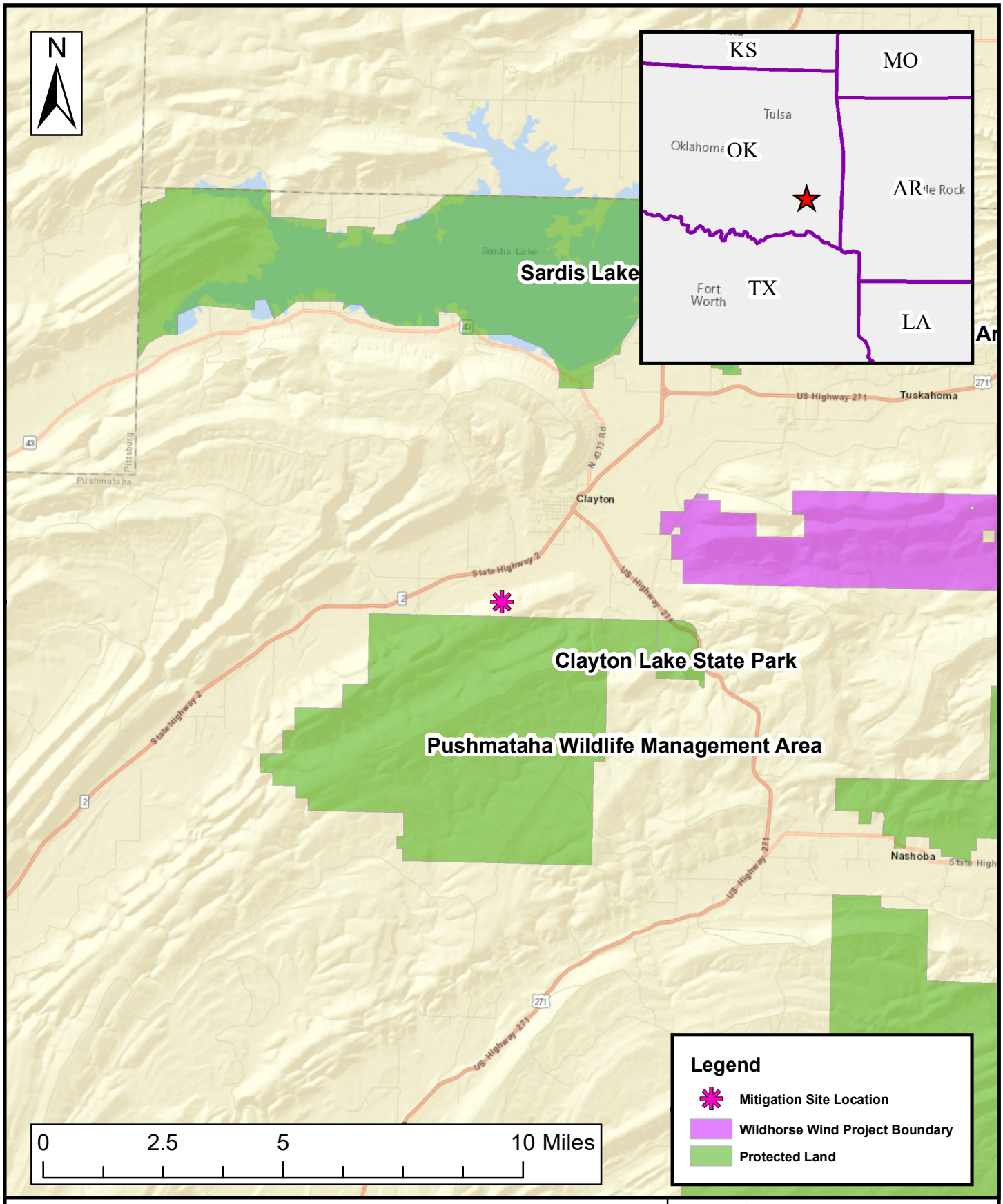
EXHIBIT A

MITIGATION SITE MAPS

Contents

EXHIBIT A-1

GENERAL VICINITY MAP



Vicinity Map

Kiamichi River Conservation Area
Pushmataha County, OK

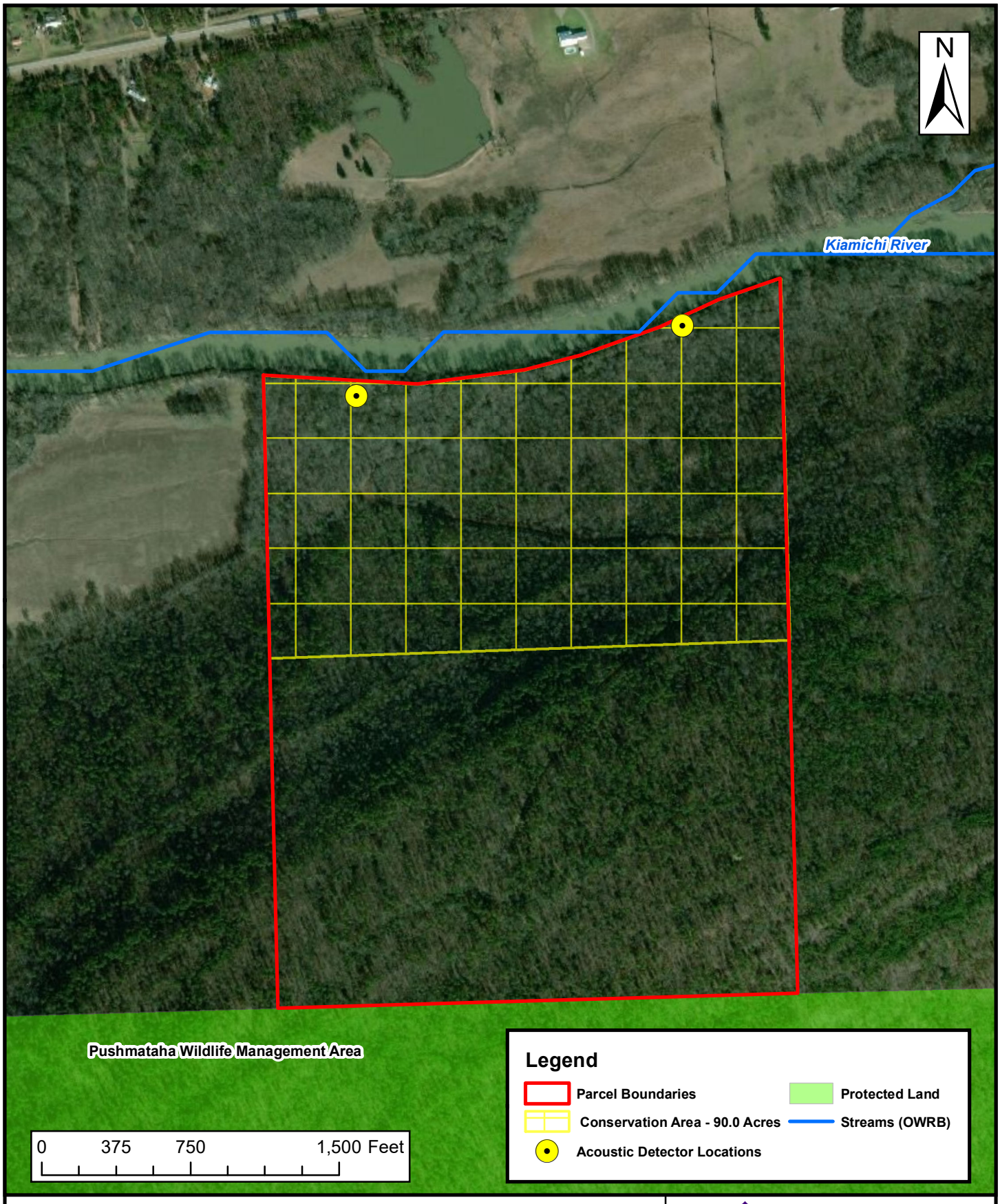
Magnolia

Date: November 2019

Source: USGS, Esri

EXHIBIT A-2

MAP OF MITIGATION SITE



Conservation Area

Kiamichi River Mitigation Site
Pushmataha County, OK

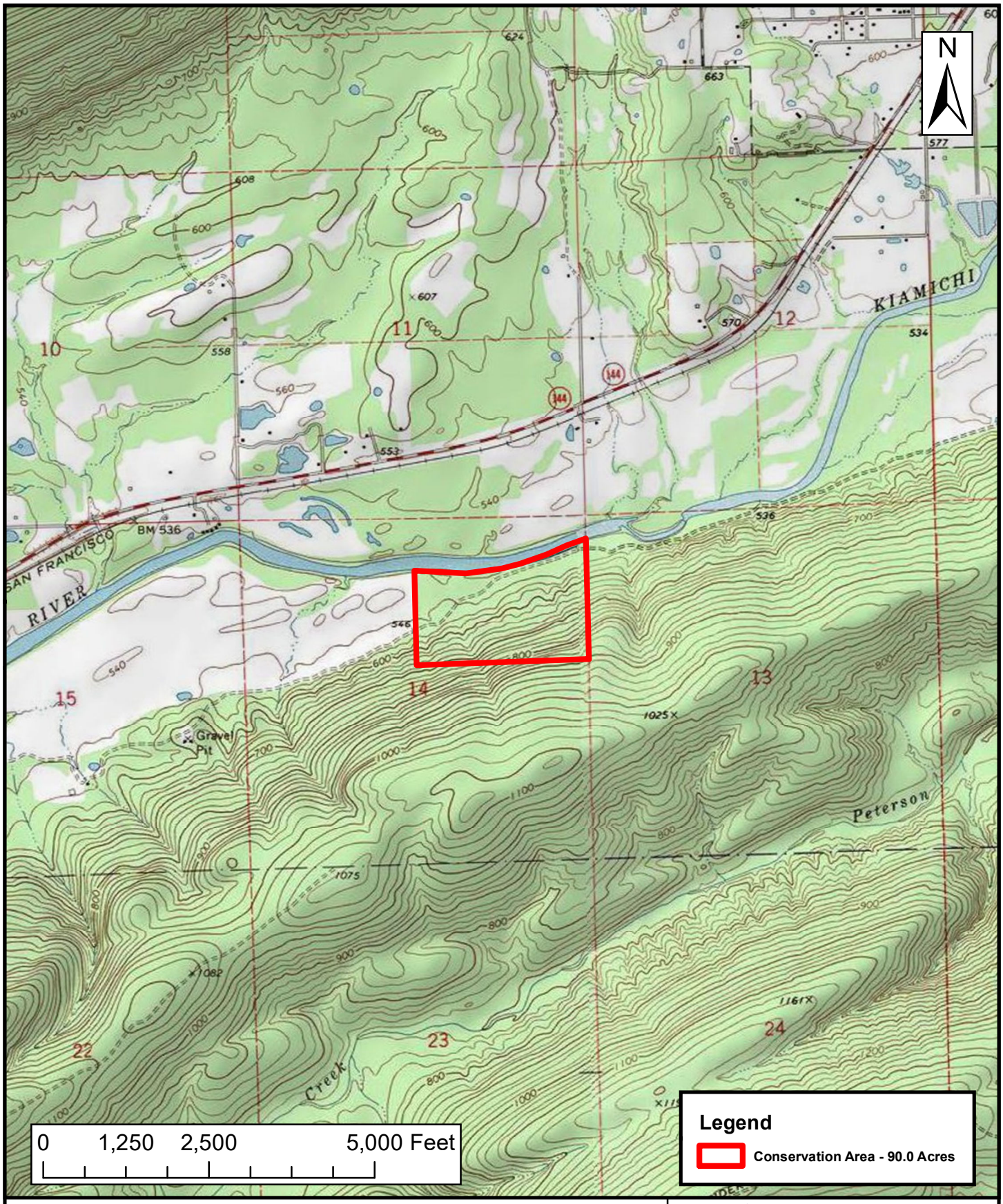
Magnolia

Date: November 2019

Source: USGS, Esri, OWRB

EXHIBIT A-3

USGS TOPOGRAPGIC MAP



USGS Quadrangle Map

Kiamichi River Mitigation Site
Pushmataha County, OK

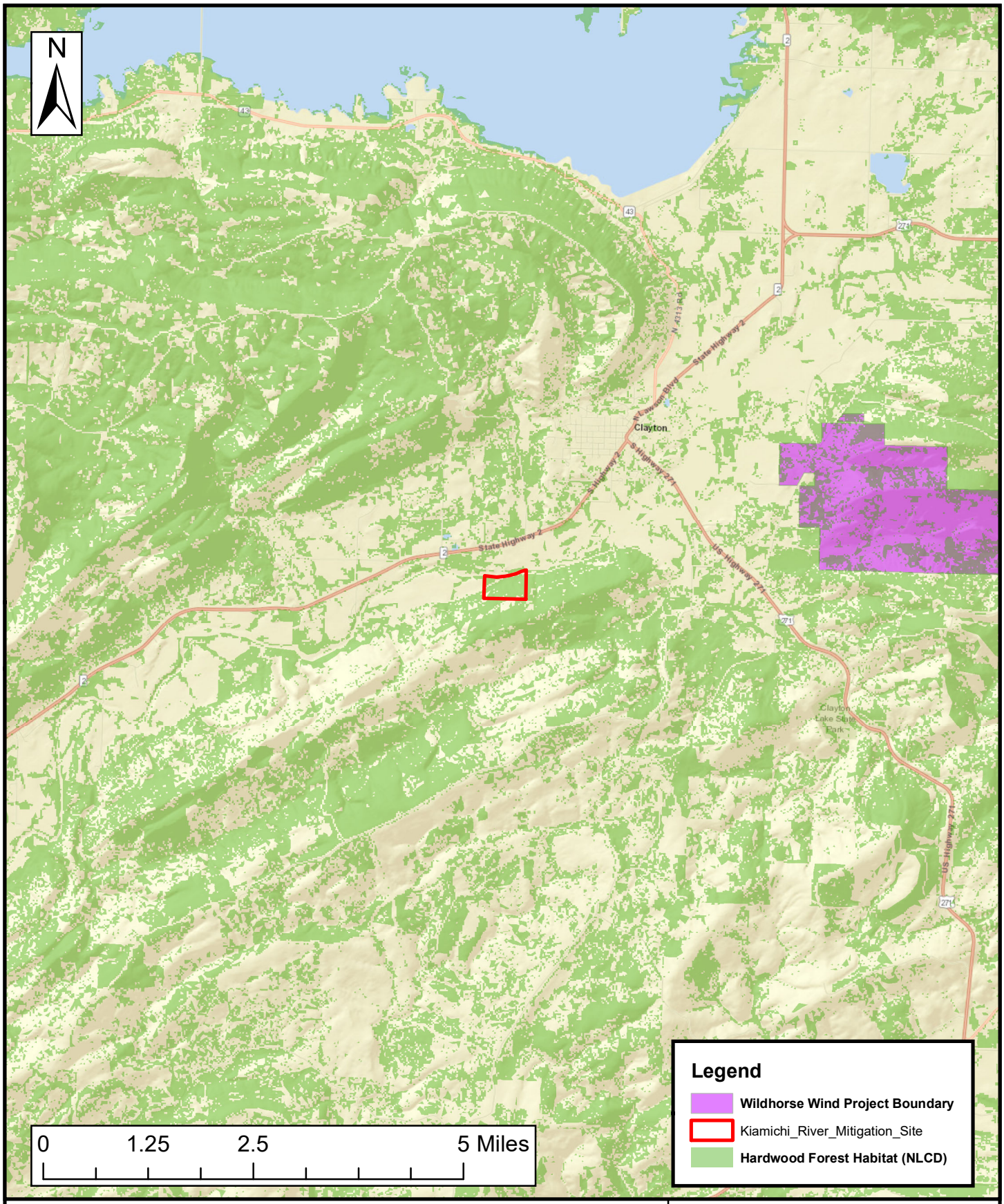
Magnolia

Date: November 2019

Source: USGS, Esri, OWRB

EXHIBIT A-4

HARDWOOD FOREST COVER



Hardwood Forest Cover

Kiamichi River Conservation Area
Pushmataha County, OK

Magnolia

Date: December 2019

Source: USGS, Esri

EXHIBIT B

MANAGEMENT AND OPERATION DOCUMENTS

Contents

EXHIBIT B-1

MANAGEMENT SECURITY ANALYSIS AND SCHEDULE

Description: The annual cost of monitoring and habitat restoration and management described in the Management Plan (**Exhibit B-3**) will be funded through the interest generated by the principal constituting the Endowment Fund. The anticipated costs of management for the Kiamichi River Mitigation Site were calculated using the attached Stewardship Cost Calculator. A copy of the Mitigation Site's Stewardship Cost Calculator is incorporated as part of this exhibit. These costs include estimates of time, equipment and funding necessary to conduct the basic monitoring site visits, management and reporting. The Endowment Fund will be provided to a USFWS-approved third-party upon Mitigation Site Establishment.

Schedule: The Endowment Fund will be funded via a cash deposit upon Mitigation Site establishment.

EXHIBIT B-2

ENDOWMENT AGREEMENT

UNIQUE PLACES TO SAVE

AND

MAGNOLIA LAND PARTNERS LLC

PUSHMATAHA MITIGATION SITE
LONG-TERM FUNDING AGREEMENT

This Pushmataha Mitigation Site Long-Term Funding Agreement ("Agreement") is entered by and between Unique Places to Save ("Foundation"), and Magnolia Land Partners LLC ("Magnolia" or "Recipient"), (together, the "Parties," and individually, a "Party"), as of the date of the signature of the last Party to sign (such date, the "Effective Date") .

WHEREAS, the U.S. Fish and Wildlife Service ("USFWS"), an agency within the U.S. Department of the Interior, has jurisdiction over the conservation and protection of fish, wildlife, and native plants pursuant to the Endangered Species Act, 16 U.S.C. § 1531 et seq. and the Fish and Wildlife Coordination Act, 16 U.S.C. § 661 et seq. USFWS oversees the establishment, use, operation, and maintenance of the Pushmataha Mitigation Site ("Mitigation Site"), located in Pushmataha County, Oklahoma.

WHEREAS, the Bat Habitat Conservation Plan for the Wildhorse Mountain HCP ("Mitigation Plan") sponsored by Magnolia, that was submitted for approval to USFWS on June 25, 2020, requires Magnolia to establish a long-term financing or funding mechanism to provide ongoing payment for specified land management, maintenance, and monitoring of the real property comprising the Mitigation Site ("Mitigation Property") in accordance with the Mitigation Plan and associated long-term management plan that identifies the specific land management activities that are required to be performed on the Bank Property to improve, conserve, and/or protect the habitat and other ecological values of the Mitigation Property ("Management Plan"). The Mitigation Property, comprised of ninety (90) acres, including Indiana bat and northern long-eared bat roosting and foraging habitat will be managed in accordance with the Mitigation Plan and associated Management Plan.

WHEREAS, Magnolia is the Recipient under this Agreement and is responsible to protect and manage for conservation purposes the Mitigation Property in accordance with the Mitigation Plan.

WHEREAS, the Foundation is a charitable not-for-profit corporation and is a tax exempt organization under Section 501(c)(3) of the Internal Revenue Code, and is authorized to hold and administer funds for the long-term management and maintenance of mitigation lands and mitigation and conservation bank properties.

WHEREAS, the Mitigation Plan provides for the establishment of a fund to pay the costs of the management and maintenance of the Mitigation Property ("Endowment Fund") to be held and managed by the Foundation in trust as a neutral fiduciary.

WHEREAS, the Mitigation Plan incorporates by reference and attaches this Agreement and the USFWS's approval of the Mitigation Plan constitutes its approval of this Agreement as the document governing the intent, uses, benefits, purposes, and duration of the Endowment Fund, and the terms and conditions under which it will be established, held, and administered by the Foundation.

NOW, THEREFORE, in consideration of the mutual promises made herein, and for other and further consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

I. PURPOSES

A. The purposes of this Agreement are to establish an Endowment Fund for the Mitigation Site to be held by the Foundation in trust for the benefit of the Mitigation Property, and to set forth the Parties' respective responsibilities with respect to the funds to be held in and administered from the Endowment Fund.

B. If and to the extent the funds are subject to the Uniform Prudent Management of Institutional Funds Act ("UPMIFA"), this Agreement is the record under which the funds are transferred to, and held by, the Foundation, and as such shall be considered the "gift instrument" for purposes of UPMIFA. As reflected by its incorporation into the Mitigation Agreement, this Agreement shall be deemed in all respects to set forth the USFWS's approval as to the intent, uses, benefits, purposes, and duration of the Endowment Fund.

II. ACCOUNT ESTABLISHMENT, INVESTMENT, AND ADMINISTRATION

A. This Agreement, through its approval under the Mitigation Agreement, authorizes the Foundation to hold the Endowment Fund as requested by and received from Magnolia, in the amount of ninety-seven thousand two hundred ninety-six dollars and ninety-seven cents ($97,296.97) (including $45,000.00 to address catastrophic events and unforeseen circumstances), to be deposited in one lump sum, to be held in trust for the management, maintenance, and monitoring of the Mitigation Property, in accordance with the Mitigation Plan, including this Agreement, the Management Plan, and the associated analysis of the costs of long-term management, maintenance, and monitoring of the Mitigation Property ("Endowment Assessment"), dated June 25, 2020, all of which have been approved by the USFWS as part of the Mitigation Plan.

B. Magnolia shall pay (or cause to be paid) to the Foundation a single, one-time payment of Three Thousand Four Hundred dollars ($3,400) ("Account Establishment Fee") for the Foundation's establishment of a uniquely identifiable financial account constituting the Endowment Fund. The Foundation's receipt of the Account Establishment Fee is an express condition precedent to the effectiveness of the Foundation's obligations under this Agreement. The Account Establishment Fee is in addition to the Endowment Fund amount as set forth in Section II.A. above and the "Annual Fee" as set forth in Section II.C. below. The Parties agree, as soon as practicable after the Foundation's receipt of both the Account Establishment Fee and funds for deposit into the Endowment Fund, to invest the funds comprising the Endowment Fund in accordance with the Foundation's Investment Policy for Long-Term and Endowment Fund Accounts held by the

Foundation, the current version of which is attached hereto as Attachment A and as the same may be modified from time to time in accordance with its terms. The Recipient shall have no right or responsibility with respect to the investment or financial management of the Endowment Fund under this Agreement or otherwise.

C. The Endowment Fund shall be subject to an annual fee of one percent (1%) ("Annual Fee") of the Endowment Fund's balance for the Foundation's annual administration, operation, reporting, and accounting of the Endowment Fund. The Foundation shall assess and collect the Annual Fee either quarterly or annually, in either case at the Foundation's election, during each year in which the account is in existence. The Foundation shall collect the Annual Fee by deducting it from the balance of the Endowment Fund.

D. The Foundation shall submit to the Recipient (and, if requested, to the USFWS) an activity report for the Endowment Fund by March 15 of each calendar year the Endowment Fund is in existence. In each activity report, the Foundation shall report on the balance of the Endowment Fund at the beginning of the calendar year; deposits; disbursements; fees; earnings, gains, losses and other investment activity accruing to the Endowment Fund during the previous calendar year; administrative expenses; the balance of the Endowment Fund at the end of the calendar year; and the specific asset allocation percentages of the portfolio in which the Endowment Fund funds is invested. If requested, the Foundation shall also provide to the USFWS a copy of its most recent financial statement as prepared by an independent auditor.

E. Disbursements from the Endowment Fund shall be made in accordance with Section IV of this Agreement, entitled Recipient Land Management. The Parties to this Agreement expressly agree and acknowledge that the USFWS may, at any time after providing prior written notice to the Foundation and the Recipient, direct or approve in writing a different form or mechanism for disbursements from the Endowment Fund or specify an increase or decrease in the amount to be disbursed from the Endowment Fund to the Recipient. The Recipient and the Foundation further agree and acknowledge that the Foundation shall be obligated to follow such written direction or approval of the USFWS and shall, upon receipt of any such written notice from the USFWS, make disbursements in accordance with the USFWS's direction or approval.

III. FOUNDATION'S FIDUCIARY OBLIGATIONS AND LIMITATIONS ON LIABILITY

A. The Foundation shall have a duty of loyalty to the Mitigation Property with respect to the Endowment Fund, and shall not use or borrow against funds in the Endowment Fund for its own benefit, except for assessment and collection of the fees due to the Foundation or its financial institutions, or as otherwise approved, permitted or directed by the USFWS pursuant to this Agreement.

B. The Foundation shall not be liable to the USFWS, the Bank Sponsor, the Recipient, or any other entities or persons for losses arising from investment of funds in the Endowment Fund that is consistent with this Agreement.

IV. RECIPIENT LAND MANAGEMENT

A. Performance of Land Management Activities. The Recipient has agreed to perform the specific land management activities set forth in the Management Plan that are required to be performed on the Mitigation Property to improve, conserve, and/or protect the habitat and other ecological values of the Mitigation Property ("Land Management Activities") on the Mitigation Property as part of its obligations under the Mitigation Plan. Funding to pay the costs of the Land Management Activities shall be provided in accordance with the terms and conditions set forth below. If, at any time, the Management Plan, the Land Management Activities, the Endowment Assessment, or Endowment Payment Schedule (as such term is defined below) is amended or otherwise modified as permitted by the Mitigation Plan, then:

1. The Recipient shall immediately notify the Foundation in writing of such amendment or modification;

2. The Recipient shall transmit to the Foundation as soon as practicable the amended Management Plan, Land Management Activities, Endowment Assessment, or Endowment Payment Schedule, as applicable, along with the corresponding written approval by the USFWS of each such amended document; and

3. Any amended Management Plan, Land Management Activities (and associated costs), Endowment Assessment, and Endowment Payment Schedule, as approved by the USFWS, shall upon receipt by the Foundation supersede and replace their original counterparts, and shall thereafter govern as the "Management Plan," "Land Management Activities," "Endowment Assessment," and "Endowment Payment Schedule" under this Agreement.

B. Funding for Land Management Activities. The Foundation hereby agrees to disburse funds from the Endowment Fund to the Recipient to pay the costs of Recipient's performance of the Land Management Activities on the Mitigation Property, upon the terms and conditions set forth below.

C. Scope of Services to be Performed. The Recipient will perform the Land Management Activities as set forth in the Management Plan and the Endowment Assessment. The Recipient will pay for the costs of such Land Management Activities using the funds disbursed to it under this Agreement. The Parties agree and acknowledge that the Management Plan and the Endowment Assessment were created by or on behalf of Magnolia and approved by the USFWS. The Foundation is expressly entitled to rely on the validity of the USFWS approval and the accuracy and validity of the Management Plan and the Endowment Assessment without independent verification. The Foundation shall not be liable in any respect to the USFWS, the Recipient, or to any other entities or persons, for errors, omissions, inaccuracies, or other elements of the Management Plan or the Endowment Assessment, whether contained therein or omitted therefrom, including but not limited to the sufficiency or adequacy of the Endowment Fund calculated pursuant to the Endowment Assessment. The Parties agree and acknowledge that the Recipient is required to perform Land Management Activities on the Mitigation Property under the Mitigation only to the extent funds are made available to the Recipient under this Agreement to pay for performance of such Land Management Activities. In addition, in the event an amendment is made to the Management Plan that changes the Land Management Activities identified in the Endowment Assessment or Endowment Payment Schedule, thereby requiring an amendment to the Endowment Assessment, the Foundation shall not be liable to USFWS, the Recipient, or to any other entities or persons for

any decision by USFWS to approve the amendment to the Endowment Assessment or the Endowment Payment Schedule in any way that impairs the viability of the Endowment Fund as a source of funding for the Land Management Activities on the Mitigation Property.

D. Payment.

1. *Payment in the Ordinary Course*.

a. In consideration of the Land Management Activities to be performed by the Recipient, the Foundation shall disburse to the Recipient from the Endowment Fund annual, advance payments (each such payment, an "Endowment Payment") which the Recipient shall use to pay the costs of Land Management Activities to be performed by the Recipient throughout the forthcoming calendar year. Unless the USFWS directs or approves otherwise in a written instrument delivered to the Foundation, each Endowment Payment will be made for the amount requested by the Recipient in a written payment request (hereinafter, a "Payment Request") submitted to the Foundation pursuant to this Section D (as adjusted by a measure of inflation as described below in this subsection). Each Payment Request is subject to a maximum annual dollar limit calculated as the total dollar value of Land Management Activities, exclusive of any contingency amount, catastrophic event amount, or any incremental amount for non-annual work items (the funds for such non-annual work items such as the 5-year quantitative vegetation monitoring to be paid in full in the calendar year immediately preceding the calendar year in which the applicable work item is to be performed), for the applicable calendar year as set forth in the Endowment Assessment. An Endowment Payment Schedule (as hereinafter defined) created and/or approved by the Recipient and approved by the USFWS reflecting the foregoing, i.e., the total dollar value of Land Management Activities for each calendar year, including annual and applicable non-annual occurrence expenses, exclusive of any contingency amount or catastrophic event amount, set forth in the Endowment Assessment ("Endowment Payment Schedule"), is attached to this Agreement as Attachment B, and incorporated herein by reference. Payment Requests shall be made in accordance with the Endowment Payment Schedule except as otherwise provided in this Agreement. Each Endowment Payment shall be adjusted by a measure of inflation over the period of time since the Endowment Assessment was completed. The measure of inflation shall be calculated using the United States Department of Labor's Bureau of Labor Statistics' Consumer Price Index South Region, or the successor of such index over the same period of time.

b. The Recipient must submit to the Foundation the written confirmation specified in Section IV.D.1.a. (or the Foundation must have received another applicable written approval from the USFWS) on or before the date of its first Payment Request. The Recipient must submit to the Foundation a Payment Request between July 1 and November 15 of a calendar year in order to receive an Endowment Payment to fund Land Management Activities in the immediately following calendar year. Absent the

express written approval of the USFWS, the Recipient will not be eligible to receive an Endowment Payment for the immediately forthcoming calendar year if the Recipient has failed to submit to the Foundation a Payment Request between July 1 and November 15 of the then-current calendar year. The Foundation will disburse Endowment Payments in December for Payment Requests properly submitted to the Foundation in the period from the immediately prior July 1 through November 15.

c. The Recipient shall submit all Payment Requests via email, fax, or mail to the Foundation. In the event an alternate method of requesting payment becomes available in the future, such as an online payment request system, the Foundation will notify the Recipient and provide appropriate instructions. All Payment Requests must include a written statement by the Recipient that (i) the Endowment Payment will be used exclusively for payment of expenses of Recipient for Land Management Activities and (ii) the Recipient reasonably expects the Land Management Activities specified in the Endowment Assessment for the applicable calendar year to be actually necessary in that year.

2. *USFWS Suspension or Reduction of Payments for Performance Reasons*. In accordance with the terms of the Mitigation Plan, the USFWS may conduct periodic site visits and/or other evaluations of the Mitigation Property in order to monitor the progress and effectiveness of Land Management Activities performed by the Recipient. If at any time the USFWS determines that the Land Management Activities are not being performed in a satisfactory manner (including, without limitation, that the Land Management Activities are not being performed in accordance with the Management Plan or applicable laws or regulations), the USFWS may issue a written stop-payment notice (hereinafter a "Stop Payment Notice") to the Foundation. A Stop Payment Notice will instruct the Foundation either to suspend or reduce Endowment Payments to the Recipient until the Foundation is otherwise notified in writing by the USFWS. The Foundation shall be entitled to rely on any Stop Payment Notice received from the USFWS and shall be obligated to follow the instructions contained therein. The Foundation shall not be liable in any manner to the Recipient or to any other entities or persons by virtue of following the instruction of the USFWS contained in any Stop Payment Notice.

3. *USFWS Suspension or Reduction of Payments for Financial Reasons.* From time to time the Foundation's financial advisors may advise that the Management Fund has decreased to levels that may threaten its continued existence as a source of funding for Land Management Activities, whether due to unexpected investment performance or otherwise. The Foundation shall notify the USFWS and Recipient of any such appraisal and upon receipt of such notice, the Recipient shall propose appropriate modifications to continued Endowment Payments and associated Land Management Activities, if any, in order to protect the long-term viability of the Management Fund. The USFWS will approve or disapprove such proposal and shall so notify the Recipient and Foundation in writing. The Foundation will be obligated to follow the written response of the USFWS with respect to any such modifications. Neither the Foundation nor the Recipient shall be liable in any

manner to the USFWS or any other entities or persons by virtue of following the approval of the USFWS contained in any notice issued under this Subsection 3.

4. *One-time Payments.* Whether upon request by the Recipient or otherwise, the USFWS may give approval to the Foundation in writing to disburse a specific amount of funding from the Endowment Fund not contemplated by the Management Plan or Endowment Assessment to the Recipient so that the Recipient may perform an activity, or activities, which the USFWS determines to be consistent with the management of the Mitigation Property. The Foundation will disburse any such one-time payment within thirty (30) business days of receipt of the USFWS's approval. A one-time payment may fund, but is not necessarily restricted to, activities in response to a catastrophic event (e.g., recovery after a fire), an unforeseen circumstance, and/or a specific amount of funding from the contingency amount in the Endowment Fund. Upon receipt of such one-time payment, the Recipient shall, as soon as practicable, perform whatever activity, or activities, the one-time payment is intended to fund as directed or approved by the USFWS. The Recipient and the Foundation hereby acknowledge that any approval by the USFWS under this Subsection 4 for the Foundation to disburse a one-time payment not contemplated by the Management Plan or Endowment Assessment may impair or preclude the viability of the Endowment Fund as a source of long-term funding for the Land Management Activities on the Mitigation Property. Neither the Foundation nor the Recipient shall be liable to the USFWS or to any other entities or persons for any decision by the USFWS to direct a one-time payment under this Subsection 4 that impairs the viability of the Endowment Fund as a source of long-term funding for the Land Management Activities on the Mitigation Property.

5. *Overages in Payments.* Any portion of an Endowment Payment that remains unspent by the Recipient as of the end of the calendar year in which such amount was expected to be spent in accordance with the Endowment Assessment shall be deemed an "overage" for purposes of this subsection. Any overage shall be (i) retained and accounted for by the Recipient; (ii) used by the Recipient exclusively for payment of costs of the immediately following year's Land Management Activities; (iii) reflected as a deduction from the amount of the Payment Request submitted by the Recipient for the immediately following year; and (iv) deducted from the amount of the Endowment Payment made by the Foundation for such following year.

6. *USFWS Assignment of Replacement Recipient.* The USFWS may, at the request of Magnolia or Recipient, as applicable, approve the appointment of a replacement Recipient ("Replacement Recipient") proposed by Magnolia or Recipient, as applicable. The Replacement Recipient approved by the USFWS shall assume the rights and responsibilities of the "Recipient" hereunder, including but not limited to the right to receive Endowment Payments and other payments under this Agreement and the obligation to perform the Land Management Activities. In the event the USFWS approves the appointment of a Replacement Recipient, written notification of the Replacement Recipient and the USFWS approval will be provided by Magnolia or Recipient, as applicable, to the Foundation, the Replacement Recipient, and any Conservation Easement Grantee. The Foundation shall have no obligation to make disbursements from the Endowment Fund to the Replacement

Recipient unless and until: 1) Replacement Recipient executes an assignment and assumption agreement with the Recipient that is acceptable to the Foundation whereby: a) the Recipient assigns and otherwise transfers in all respects to Replacement Recipient all rights, obligations, title and interest held by the Recipient in this Agreement; and b) the Replacement Recipient agrees to accept such Assignment and assume all rights, obligations, title, and interest of the Recipient; or 2) this Recipient Agreement is terminated and Replacement Recipient enters into a substitute Recipient Agreement with the Foundation.

E. Review and Reporting Requirements. The Recipient shall submit to the Foundation and the USFWS an annual funding report ("Annual Funding Report") for each calendar year this Agreement is in effect. Each Annual Funding Report shall be submitted by the Recipient between January 1 and January 31, or at least thirty (30) days prior to the effective date of termination of this Agreement. The Annual Funding Report shall (i) describe in reasonable detail the Land Management Activities performed by the Recipient during the immediately preceding calendar year or in the event of termination the then-current calendar year (in either case, the "Reporting Period"); (ii) detail all expenses incurred by or on behalf of the Recipient for Land Management Activities performed during the Reporting Period; (iii) describe any discrepancy between the Land Management Activities expected to be performed during the Reporting Period in accordance with the Management Plan and the Endowment Assessment and the Land Management Activities actually performed during the Reporting Period; and (iv) describe any discrepancy between the costs of Land Management Activities as modeled in the Endowment Assessment and the costs of Land Management Activities actually performed during the Reporting Period.

The Parties expressly agree and acknowledge that the Foundation is entitled to rely on the accuracy and validity of the Annual Funding Reports submitted by the Recipient and shall have no duty to independently verify the information set forth therein. The Parties further agree and acknowledge that, except as otherwise expressly permitted or required by this Agreement, the Foundation shall have neither the right nor the obligation to reduce, suspend, or otherwise modify Endowment Payments based on the contents of any Annual Funding Report, and that any remedial action under this Agreement or otherwise with respect to Endowment Payments based on the contents of any Annual Funding Report shall be the exclusive right and/or obligation of the USFWS.

F. Compliance with Laws; Indemnification.

1. In conducting the Land Management Activities and performing its obligations under this Agreement, the Recipient agrees to conduct all such activities in compliance with all applicable Federal, State, and local laws, regulations, and ordinances; and to secure all appropriate and necessary public or private permits, approvals, and consents.

2. The Foundation and Recipient shall indemnify and hold harmless each other, and their respective officers, directors, agents, representatives, and employees in respect of any and all claims, injuries, losses, diminution in value, damages, liabilities, whether or not currently due, and related expenses (including without limitation, settlement costs and any legal or other expenses for investigating or defending any actions or threatened actions) arising from or in connection with any breach by the indemnifying Party of its obligations under this

Agreement (including, in the case of the Recipient, of its obligation to perform the Land Management Activities).

3. The terms of this Section IV.F. will survive termination of this Agreement.

V. TERM, TERMINATION, AND TRANSFER

A. This Agreement shall continue in full force and effect unless and until terminated by either party, which termination shall be effective on the date specified by either party in a written notice delivered to the other party not less than one hundred eighty (180) days prior to the intended date of termination. Notwithstanding the immediately preceding sentence, regardless of the date that notice of termination is provided and the passage of the intervening minimum one hundred eighty (180) day notice period, termination is not effective unless and until the Foundation has transferred in an orderly fashion the custody, control or other power necessary for the investment, management, and administration of all the funds in the Endowment Fund (other than funds in an amount equal to any fees due and owing to the Foundation or its financial institutions) to an entity identified or approved in writing by the USFWS.

B. Prior to the effective date of termination of this Agreement, the Foundation shall transfer all funds remaining in the Endowment Fund, other than fees due and owing to the Foundation or its financial institutions, to an entity designated by the USFWS to serve as a successor. Upon USFWS approval of the final monitoring report as set forth in the Mitigation Plan, USFWS will direct the Foundation to release any remaining funds to Magnolia.

C. Within ninety (90) days following final disbursement of the funds in the Endowment Fund to any successor, the Foundation shall provide to the Recipient (and, if requested, the USFWS) a final financial activity report on the Account.

VI. CONTACT INFORMATION AND COMMUNICATIONS

A. All approvals, notices, reports, and other communications required or permitted under this agreement shall be in writing and delivered by first-class mail, overnight mail, receipt-confirmed facsimile, electronic mail, or electronic PDF format. Each party agrees to notify the other promptly after any change in name representative, address, telephone, or other contact information.

B. If any notice or communication is required or permitted to be delivered to the USFWS hereunder, such notice or communication shall be delivered to the USFWS lead contact identified in Section VI.C. below.

C. The individuals named below shall be the representatives of Magnolia and the Foundation for purposes of this Agreement:

Foundation Primary:	name title address city, state, zipcode Phone: Facsimile: Email:
Foundation Alternate:	name title address city, state, zipcode Phone: Facsimile: Email:
Magnolia:	name title address city, state, zipcode Phone: Facsimile: Email:
USFWS Lead:	name title address city, state, zipcode Phone: Facsimile: Email:

D. The Parties agree and acknowledge that any change to their respective Representatives as set forth in Section VI.C. above shall not constitute an amendment to this Agreement and may be effected through written notice to the other Party.

VII. MISCELLANEOUS PROVISIONS

A. If any provision of this Agreement is held to be unlawful or invalid by any court of law with duly established jurisdiction over this Agreement, the parties intend that the remainder of this Agreement shall remain in full force and effect notwithstanding the severance of the unlawful or invalid provision(s).

B. Except as otherwise provided in this Agreement, this Agreement may be amended only by a written

amendment, signed by the Parties, and approved by the USFWS. Counterpart originals, facsimile copies, and/or portable document format (pdf) versions of signed amendments are acceptable and will be treated as binding originals, but this Agreement may not be amended via electronic mail.

C. Each of the Parties is acting in its independent capacity in entering into and carrying out this Agreement and not as an agent, employee, or representative of the other Party.

D. The Parties will cooperate in good faith to achieve the objectives of this Agreement and to avoid disputes. The Parties will use good faith efforts to resolve disputes at the lowest organizational level and, if a dispute cannot be so resolved, the Parties will then elevate the dispute to the appropriate officials within their respective organizations.

E. Nothing contained in this Agreement is intended to unlawfully delegate the USFWS's duties or to limit the authority of the USFWS to fulfill its statutory or regulatory responsibilities.

F. This Agreement shall not be the basis of any claims, rights, causes of action, challenges, or appeals by any person not a Party to this Agreement, except that the Parties acknowledge that the USFWS shall have the rights expressly assigned to it hereunder.

G. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Oklahoma, disregarding principles of conflicts of law. Venue for any action arising out of this Agreement shall be in the Tulsa County District Court.

H. Any waiver by either Party of any term or provision of this Agreement shall be given in writing. No waiver shall be construed as a waiver of any other provision of this Agreement, nor shall such waiver be construed as a waiver of such provision respecting any other event or circumstance.

I. The headings used in this Agreement are for convenience only and shall not determine or limit the interpretation, construction or meaning of this Agreement.

J. This Agreement may be executed in one or more counterparts, each of which shall be considered an original, but all of which together shall constitute one and the same instrument.

K. This Agreement represents the entire agreement of the Parties with respect to the subject matter hereof and may not be amended, except in writing signed by each Party hereto.

L. Each Party to this Agreement warrants to the other that its respective signatory has full right and authority to enter into and consummate this Agreement and the transactions contemplated hereby.

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their respective authorized representatives, intending to be bound legally.

UNIQUE PLACES TO SAVE

By: _____ Date: _____

MAGNOLIA LAND PARTNERS LLC

By: _____ Date: _____

[name, title]

ACKNOWLEDGED:

U.S. FISH AND WILDLIFE SERVICE

By: _____ Date: _____

ATTACHMENT A

Investment Policy for Long-Term and Endowment Funds

Investment Policy for Long-Term and Endowment Funds

October 2019

Purpose

This policy establishes investment objectives, policies, guidelines and eligible securities related to conservation easement stewardship and long-term land management cash assets held by Unique Places to Save ("UP2S") primarily for investment purposes ("Investment Funds"). In doing so the policy:

- Clarifies the delegation of duties and responsibilities concerning the management of Investment Funds.
- Identifies the criteria against which the investment performance of the organization's investments will be measured.
- Communicates the objectives to the Board of Directors ("Board"), staff, investment managers, brokers, donors and funding sources that may have involvement.
- Confirms policies and procedures relative to the expenditure of Investment Funds.
- Serves as a review document to guide the ongoing oversight of the management of the organizations' investments.

Delegation of Responsibilities

The Board has a direct oversight role regarding all decisions that impact UP2S Investment Funds. The Board has delegated supervisory responsibility for the management of our Investment Funds to the Mitigation Program Manager ("Manager"). Specific responsibilities of the various bodies and individuals responsible for the management of our Investment Funds are set forth below:

Responsibilities of the Board

The Board shall ensure that its fiduciary responsibilities concerning the proper management of UP2S Investment Funds are fulfilled through appropriate investment structure, internal and external management, and portfolio performance consistent with all policies and procedures. The Board shall approve investment policies and objectives that reflect the long-term investment-risk orientation of the endowment.

Responsibilities of the Manager

The Manager is not held accountable for less than desirable outcomes, rather for adherence to procedural prudence, or the process by which decisions are made in respect to endowment assets. In consideration of the foregoing, the Manager is responsible for the development, recommendation, implementation and maintenance of all policies relative to UP2S Investment Funds an shall:

- Develop and/or propose policy recommendations to the Board with regard to the

management of all Investment Funds.

- Recommend long-term and short-term investment policies and objectives for our Investment Funds, including the study and selection of asset classes, determining asset allocation ranges, and setting performance objectives.
- Determine that Investment Funds are prudently and effectively managed and any necessary investment consultants and/or other outside professionals, if any.
- Monitor and evaluate the performance of all those responsible for the management of Investment Funds.
- Recommend the retention and/or dismissal of investment consultants and/or other outside professionals.
- Receive and review reports from investment consultants and/or other outside professionals, if any.
- Periodically meet with investment consultants and/or other outside professionals management, investment consultants and/or other outside professionals.
- Convene regularly to evaluate whether this policy, investment activities, risk management controls and processes continue to be consistent with meeting the goals and objectives set for the management of Investment Funds.
- Oversee the day-to-day operational investment activities of all Investment Funds subject to policies established by the Board.
- Contract with any necessary outside service providers, such as: investment consultants, investment managers, banks, and/or trust companies and/or any other necessary outside professionals.
- Ensure that the service providers adhere to the terms and conditions of their contracts; have no material conflicts of interests with the interests of UP2S; and, performance monitoring systems are sufficient to provide the Board with timely, accurate and useful information.
- Regularly meet with any outside service providers to evaluate and assess compliance with investment guidelines, performance, outlook and investment strategies; monitor asset allocation and rebalance assets, as directed by the Board and in accordance with approved asset allocation policies, among asset classes and investment styles; and, tend to all other matters deemed to be consistent with due diligence with respect to prudent management of Investment Funds.
- Comply with official accounting and auditing guidelines regarding due diligence and ongoing monitoring of investments, especially alternative investments. Prepare and issue periodic status reports to the Board.

Investment Considerations

All individuals responsible for managing and investing UP2S Investment Funds must do so in good faith and with the care that an ordinarily prudent person in a like position would exercise under similar circumstances. In making any decision relative to the expenditure of Investment Funds, each of the following factors must be considered, and properly documented, in the minutes or other records of the applicable decision-making body:

- General economic conditions.
- Possible effect of inflation or deflation.
- Expected tax consequences, if any, of investment decisions or strategies.
- The role that each investment or course of action plays within the overall investment portfolio of the fund.

- Expected total return from the income and appreciation of investments.
- Other resources of the organization.
- The needs of the organization and the fund to make distributions and preserve capital.
- An asset's special relationship or special value, if any, to the organization's purposes.

Guidelines for Investing

The investment goal of the total return fund is to achieve a total return (income and appreciation) of 5% after inflation, over a full market cycle (3-5 years). The following guidelines apply to the three main investment asset classes:

Money Market Funds

Allowable range - Minimum 5%; Maximum 45% of total assets

A quality money market fund will be utilized for the liquidity needs of the portfolio whose objective is to seek as high a current income as is consistent with liquidity and stability of principal. The fund will invest in "money market" instruments with remaining maturates of one year or less, that have been rated by at least one nationally recognized rating agency in the highest category for short-term debt securities. If non-rated, the securities must be of comparable quality.

Equities

Allowable Range - Minimum 20%; Maximum 60% of total assets

The equity component of the portfolio will consist of high-quality equity securities traded on the New York, NASDAQ or American Stock exchanges. The securities must be screened for above average financial characteristics such as price-to-earnings, return-on-equity, debt-to-capital ratios, etc.

No more than 5% of the equity portion of the account will be invested in any one issuer. As well, not more than 20% of the equity portion of the account will be invested in stocks contained within the same industry.

It is acceptable to invest in an equity mutual fund(s) adhering to the investment characteristics identified above, as long as it is a no-load fund, without 12(b)(1) charges, which maintains an expense ratio consistent with those other funds of similar investment styles as measured by the Lipper and/or Morningstar rating services.

Prohibited equity investments include initial public offerings, restricted securities, private placements, derivatives, options, futures and margined transactions.

Exceptions to the prohibited investment policy may be made only when assets are invested in a Mutual Fund(s) that periodically utilizes prohibited strategies to mitigate risk and enhance return.

Fixed Income

Allowable Range - Minimum 35%; Maximum 75% of total assets

Bond investments will consist solely of taxable, fixed income securities that have an investment-grade rating (BBB or higher by Standard & Poor's and Baa or higher by Moody's) that possess a liquid secondary market. If the average credit quality rating disagrees among the two rating agencies, then use the lower of the two as a guideline.

No more that 5% of the fixed income portfolio will be invested in corporate bonds of the same issuer. As well, not more than 20% of the fixed income portfolio will be invested in bonds of issuers in the same industry.

The maximum average maturity of the fixed income portfolio will be 10 years, with not more than 25% of the bond portfolio maturing in more than 10 years.

Prohibited securities include private placements, derivatives (other than floating-rate coupon bonds), margined transactions and foreign denominated bonds.

Exceptions to the prohibited investment policy may be made only when assets are invested in a Mutual Fund(s) that periodically utilizes prohibited strategies to mitigate risk and enhance return.

Other Investments
Allowable Range - at discretion of Board
UP2S may consider other types of investments in non-wasting assets which shall be approved by a majority of the Board and comply with investment return and goal guidelines of UP2S.

Performance Measurements Standards

The benchmarks to be used in evaluating the performance of the two main asset classes will be:

- Equities: S&P 500 Index- Goal: exceed the average annual return of the index over a full market cycle (3-5 years)

- Fixed Income: Lehman Brothers Government/Corporate Index- Goal: exceed the average annual return of the index over a full market cycle (3-5 years).

It will be the responsibility of the Manager to regularly review the performance of the investment account and investment policy guidelines, and report to the Board at least annually with updates and recommendations as needed.

Expenditure Considerations

The Board of Directors and the Manager are responsible for the establishment of a balanced reserve fund spending policy to: (a) ensure that over the medium-to-long term, sufficient investment return shall be retained to preserve and grow its economic value as a first priority; and, (b) to provide funds for the annual operating budget in an amount which is not subject to large fluctuations from year-to-year to the extent possible.

Expenditure of Investment Funds

All decisions relative to the expenditure of Investment Funds must assess the uses, benefits, purposes and duration for which the Investment Fund was established, and, if relevant, consider the factors:

- The duration and preservation of the Investment Fund.
- Purpose or purposes of the Investment Fund.
- Contractual agreements directly related to the expenditure of a portion or all of the Investment Fund.

- General economic conditions.
- Possible effect of inflation or deflation.
- Expected total return from income and appreciation of investments.

- Other organizational resources.
- All applicable investment policies.
- Where appropriate, alternatives to spending from the institutional fund and the possible effects of those alternatives.

For each decision to appropriate Investment Funds for expenditure, an appropriate contemporaneous record should be kept and maintained describing the nature and extent of the consideration that the appropriate body gave to each of the stipulated factors.

ATTACHMENT B

Endowment Payment Schedule

ENDOWMENT PAYMENT SCHEDULE
Pushmataha Mitigation Site
11/24/2019

Cells with Automatic Formulas

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Headings and Reference Info.

Anticipated Payment Schedule

3.5%	**Endowment Fund Target Rate of Return**
$97,296.97	**FULL ENDOWMENT AMOUNT (INCLUDING 10% CONTINGENCY)**

ENDOWMENT PAYMENT SCHEDULE YEARS 1-30

YEAR	EVERY YEAR	EVERY 5 YEARS	PAYMENT SCHEDULE	EXPECTED ENDOWMENT TOTAL
Year 0				$97,296.97
Year 1	$1,300.00		$1,300.00	$99,402.37
Year 2	$1,300.00		$1,300.00	$101,581.45
Year 3	$1,300.00		$1,300.00	$103,836.80
Year 4	$1,300.00		$1,300.00	$106,171.09
Year 5	$1,300.00	$7,840.00	$9,140.00	$100,747.08
Year 6	$1,300.00		$1,300.00	$102,973.22
Year 7	$1,300.00		$1,300.00	$105,277.29
Year 8	$1,300.00		$1,300.00	$107,661.99
Year 9	$1,300.00		$1,300.00	$110,130.16
Year 10	$1,300.00	$7,840.00	$9,140.00	$104,844.72
Year 11	$1,300.00		$1,300.00	$107,214.28
Year 12	$1,300.00		$1,300.00	$109,666.78
Year 13	$1,300.00		$1,300.00	$112,205.12
Year 14	$1,300.00		$1,300.00	$114,832.30
Year 15	$1,300.00	$7,840.00	$9,140.00	$109,711.43
Year 16	$1,300.00		$1,300.00	$112,251.33
Year 17	$1,300.00		$1,300.00	$114,880.12
Year 18	$1,300.00		$1,300.00	$117,600.93
Year 19	$1,300.00		$1,300.00	$120,416.96
Year 20	$1,300.00	$7,840.00	$9,140.00	$115,491.55
Year 21	$1,300.00		$1,300.00	$118,233.76
Year 22	$1,300.00		$1,300.00	$121,071.94
Year 23	$1,300.00		$1,300.00	$124,009.46
Year 24	$1,300.00		$1,300.00	$127,049.79
Year 25	$1,300.00	$7,840.00	$9,140.00	$122,356.53
Year 26	$1,300.00		$1,300.00	$125,339.01
Year 27	$1,300.00		$1,300.00	$128,425.88
Year 28	$1,300.00		$1,300.00	$131,620.78
Year 29	$1,300.00		$1,300.00	$134,927.51

ENDOWMENT PAYMENT SCHEDULE CALCULATIONS

Task	SPECIFIC ACTIVITY (Briefly Describe)	EVERY YEAR	EVERY 5 YEARS	AS NEEDED
Task 1	Annual Qualitative Monitoring	$700.00		
Task 2	Quantitative Veg. Monitoring		$2,000.00	
Task 3	Annual Report and Work Plan Prep	$360.00	$720.00	
Task 4	Annual Report and Work Plan Submission & Coordination	$240.00	$120.00	
Task 5	Adaptive Management		$5,000.00	
Task 6	Changed Circumstance Funding			$45,000.00
	TOTALS FOR EACH PERIOD:	**$1,300.00**	**$7,840.00**	**$45,000.00**

EXHIBIT B-3

MANAGEMENT PLAN

The Management Period commences upon filing of the Conservation Easement and full funding of the Endowment Fund (hereafter "Mitigation Site Establishment") and ends upon the thirtieth anniversary of Mitigation Site establishment.

The USFWS Guidelines define suitable summer foraging and roosting habitat for Indiana bats and northern long-eared bats as a wide variety of forested/wooded habitats where they roost, forage, and travel, as well as some adjacent and interspersed non-forested habitats. Suitable habitat includes forests and woodlots containing potential roosts. The Mitigation Site is composed of this habitat, and will be managed to continue to provide suitable summer maternity habitat for Indiana bats and northern long-eared bats. Additional management and monitoring activities will be performed during the Management Period as described below.

Financial Assurances
The Endowment (**Exhibit B-1**) will provide financial assurances to ensure these activities will be implemented in a timely fashion and that Mitigation Site performance standards are maintained through the Management Period. Mitigation Agent will fund the Endowment (**Exhibit B-2**) through a single payment upon Mitigation Site establishment. The Management Plan will be funded by interest from the Endowment Fund.

Performance Standards
The following performance standards are to be maintained at the Mitigation Site throughout the management period. The overarching goal of these performance standards is that the Mitigation Site remains high quality summer habitat for the Target Species.

1. No less than 50% canopy closure across the Mitigation Site;
2. No greater than 10% coverage of non-native invasive woody plant species across the Mitigation Site; and
3. Density of at least five potential roost trees (live high-value trees or snags with DBH ≥11 in. and exfoliating bark, cracks, crevices, or other roosting features) per acre.

Management Tasks

Task 1. Annual Qualitative Monitoring

Objective: Qualitatively assess the general condition of the Mitigation Site for annual management planning and reporting purposes.

Threshold for Action: Annually following the first full year after Mitigation Site Establishment

The Land Manager will conduct annual qualitative management monitoring at the Mitigation Site during the Spring to qualitatively monitor the general condition of the Mitigation Site. During each site visit, the baseline report or the prior monitoring year's results will be used as a reference to note any substantial

changes in general habitat conditions. As part of this monitoring the Land Manager will establish photo reference points to be visited annually to document overall habitat quality. Notes and, as applicable, figures showing significant changes or species occurrences will be included in the annual report.

Task 2. Quantitative Vegetation Monitoring
Objective: Assess the vegetation community through quantitative vegetation monitoring to evaluate whether the Mitigation Site is meeting performance standards

Threshold for Action: Years 5, 10, 15, 20, and 25 following Mitigation Site Establishment.

The Land Manager will conduct quantitative vegetation monitoring at the Mitigation Site. The Land Manager will revisit established forest sampling plots and resample the vegetation in a single year on a 5-year cycle during the Management Period. During the 2019 vegetation surveys, the Mitigation Agent sampled nine forest sample plot locations. During the quantitative vegetation monitoring, these plots will be resampled to make assessments of any potential changes in the vegetation characteristics that may have occurred. Modifications to these locations may occur with USFWS concurrence. Monitoring will focus on the ecological conditions of the natural communities as needed to meet Performance Standards and will document the following conditions:

1. Tree community species composition;
2. Maturity of forest;
3. Percent canopy closure;
4. Number of potential roost trees per acre; and
5. Percent coverage of woody invasive plant species.

Task 3. Preparation of the Annual Report and Work Plan
Objective: Prepare the Annual Report and Work Plan with proper documentation.
Threshold for Action: Annually during the Management Period

The first Annual Report of the Management Period will be submitted after the first full calendar year of management activities. All annual reports will include the following:

1. Description of the Mitigation Site conditions, with photos;
2. Description of management activities undertaken on the Mitigation Site for the year, including adaptive management measures and expenditure of funds to implement each of these activities;
3. Management activities planned for the Mitigation Site for the coming year (Work Plan); and
4. Results of any biological monitoring undertaken on the Mitigation Site that year, including photos, copies of data sheets, and field notes.

Task 4. Submission of the Annual Report and Work Plan
Objective: Submit the Annual Report and Work Plan to the USFWS by January 31 following the reporting year.

Threshold for Action: Annually (reporting period will be a calendar year)

The annual reports will be submitted in electronic form to the USFWS. Reports are due on January 31 following the reporting year.

Task 5. Adaptive Management
Objective: Implement management actions to ensure the Mitigation Site continues to meet Performance Standards.

Threshold for Actions: The Land Manager will make every attempt to correct deficiencies and address Mitigation Site risks proactively. The Land Manager will notify the USFWS proactively in any such case. Before considering any adaptive management changes to the Management Plan, the USFWS will consider whether such actions will help ensure the continued viability of the Mitigation Site's biological resources. All relevant federal , state and tribal laws and regulations will be observed when implementing Adaptive Management actions, including but not limited to Section 7 of the Endangered Species Act, sections 401 and 404 of the Clean Water Act, and Section 106 of the National Historic Preservation act.

Below are scenarios that would trigger adaptive management as the proposed management action.

Trigger – The trigger for the Land Manager to implement corrective action is if one or more invasive species that threaten success of the Mitigation Site are documented. The goal is to manage the Mitigation Site such that the percent wood invasive species cover does not exceed 10%.

Response – Invasive species will be removed or threat posed by invasive species will be controlled using best management practices that will have no ground disturbance and the least possible impacts to the Target Species within three years of the Annual Report and Work Plan.

Trigger – The trigger for the Land Manager to implement corrective action is if density of standing snags or potential roost tree species with DBH >11 in. falls below five per acre.

Response – In coordination with USFWS, trees will be selected, girdled and left standing as snags to increase the density of standing snags. An appropriate number of trees will be girdled by hand throughout the Mitigation Site to bring the density of snags with DBH >11 in. above the performance standard of five per acre. If girdled trees do not have an adequate amount of solar exposure to the trunk, any trees with <5 in. DBH within 30 feet and south of the girdled tree will be cut by hand, and non-potential roost trees with DBH between 5 and 11 in. will be girdled by hand to increase the value of the tree as a potential roost.

Task 6. Address Changed Circumstance Event
Objective: Address a change in mitigation project viability due to the impact of a natural disaster, such as a drought, flood, storm, or fire.

Threshold for Action: In the event that a natural disaster destroys all or part of the habitat at the Mitigation Site, the ability of the mitigation project to provide secure habitat for the Target Species may be compromised. The Land Manager will work with the USFWS to conduct a site visit and habitat assessment to determine the status of the mitigation project within three months of becoming aware that a natural disaster is likely to have impacted the Mitigation Site.

If the assessment results indicate that the Mitigation Site no longer provides suitable habitat for the Target Species, the Land Manager and Applicant will work with the USFWS to evaluate potential options for restoration of the Mitigation Site or applying the Changed Circumstance Funds towards an alternative mitigation option.

EXHIBIT C

REAL ESTATE RECORDS AND ASSURANCES

Contents

EXHIBIT C-1

TITLE REVIEW

TITLE REPORT

This is to certify that the undersigned has made a check of the filings in the offices of the Pushmataha County Clerk and Pushmataha County Court Clerk's offices and find the following:

1. RECORDS CERTIFIED from 11-5-2007 at 7:00 AM to 9-23-2019 at 7:00 AM.

2. LEGAL DESCRPITION: All that part lying South and East of the Kiamichi River in the NE/4 of Section 14, Township 1 North, Range 18 East.

3. NAMES SEARCHED: Dale Jackson and Justin Jackson

4. JUDGMENTS, LIENS, PENDING COURT PROCEEDING: None

5. INSTRUMENTS RECORDED: Joint Tenancy Warranty Deed, filed in Book 491 Page 520, M. Terry Stanfill, a single person to Dale Jackson and/or Justin Jackson

6. AD VALOREM TAXES: Paid

We have exercised due care and diligence in preparing this report, however we assume no liability on our Abstractor's Bond for the correctness of this information furnished.

Dated 9-25-2019

PUSHMATAHA COUNTY ABSTRACT COMPANY
By: Lesa Lackey
Bonded Abstractor 1396

Doc 30.00

I-2007-195812 Book 0491 Pg: 520
11/05/2007 1:13 pm Pg 0520-0520
Fee: $ 13.00 Doc: $ 30.00
JANE DUNLAP - Pushmataha County
State of Oklahoma

JOINT TENANCY
WARRANTY DEED
(INDIVIDUAL)

KNOW ALL MEN BY THESE PRESENTS:

That M. Terry Stanfill, a single person party(IES) of the first part, in consideration of the sum of TEN AND NO/100 dollars and other valuable considerations, in hand paid, the receipt of which is hereby acknowledged, do(ES) hereby grant, bargain, sell and convey unto Dale Jackson and/or Justin Jackson as joint tenants and not as tenants in common, with the right of survivorship, the whole estate to vest in the survivor in event of the death of either, parties of the second part, the following described real property and premises situated in Pushmataha County, State of Oklahoma, to-wit: The N 1/2 of SE 1/4 and all that part lying South and East of the Kiamichi River in the NE 1/4 of Section 14, Township 1 North, RAnge 18 East, containing 188 acres, more or less.
M. Terry Stanfill conveys 44 acres of mineral rights to the aforementioned buyers of the above described property in Pushmataha County.

RETURN TO: Dale Jackson P.O. Box 100
Clayton, OK 74536

TAXES TO: Grantee

together with all the improvements thereon, and the appurtenances thereunto belonging, and warrant the title to the same.

TO HAVE AND TO HOLD said described premises unto the said parties of the second part, as such joint tenants, and to the heirs and assigns of the survivor, forever, free, clear and discharged of and from all former grants, charges, taxes, judgments, mortgages and other liens and encumbrances of whatsoever nature.

Signed and delivered 2nd day of Nov, 2007

M. Terry Stanfill

INDIVIDUAL ACKNOWLEDGMENT

STATE OF Oklahoma)
) SS:
COUNTY OF Pittsburg)

Before me, a Notary Public in and for this State, on this 2nd day of Nov 2007 (date), personally appeared M. Terry Stanfill, to me known to be the identical person(s) who executed the within and foregoing instrument, and acknowledged to me that he executed the same as his free and voluntary act and deed, for the uses and purposes therein set forth.

SARA L. HANCE NOTARY PUBLIC #00017004 Exp. 10-09-08 IN AND FOR STATE OF OKLAHOMA PITTSBURG COUNTY

Commission Number: 00017004, Notary Public

My Commission expires: 10/9/08

File #

COUNTY CLERK PUSHMATAHA COUNTY

EXHIBIT C-2

APPROVED-AS-TO-FORM CONSERVATION EASEMENT DEED

CONSERVATION EASEMENT

RECITALS

This Conservation Easement made this _____ day of _____ by, between, and among Dale Jackson and Justin Jackson, individuals, ("Grantor") with an address of 337 Lawson Boulevard, Clayton Oklahoma; Land Legacy, a charitable entity ("Grantee"), with a mailing of 822 East Sixth Street, Suite 200, Tulsa, Oklahoma; and Magnolia Land Partners LLC, a Delaware limited liability company ("Sponsor"), with a mailing address at 166 West Washington Street, Suite 700, Chicago, Illinois. Grantor, Grantee, and Sponsor shall be individually referred to hereinafter as "Party" and collectively referred to hereinafter as the "Parties".

WHEREAS, the Grantor, is the owner in fee simple of certain real property, located in Pushmataha County, Oklahoma (Tax Parcel ID No. 0000-14-01N-18E-0-0002-01), which is more particularly described in **Exhibit A** (hereinafter the "Property") a portion of which has ecological, scientific, educational and aesthetic value in its present state as a natural area which has not been subject to development or exploitation, and which is more particularly described and depicted on **Exhibit B**, attached hereto and incorporated herein by this reference (hereinafter the "Conservation Area"); and

WHEREAS, the Grantee, is a nonprofit corporation incorporated under the laws of the State of Oklahoma as a tax-exempt public charity under Section 501(c)(3) and/or 509(a)(1) of the Internal Revenue Code of 1986, as amended, and the regulations promulgated pursuant thereto ("IRC"), qualified under section 170(h) of the IRC to receive qualified conservation contributions, whose purpose is to preserve natural areas for scientific, charitable, educational and aesthetic purposes; and

WHEREAS, Sponsor is a company engaged in a business operation for the establishment of a site for the restoration, establishment, enhancement and/or preservation of endangered or threatened species habitats, which will enable a designated third party to assume direct responsibility for the conservation commitment relating to one or more specific projects; and

WHEREAS, the Conservation Area consists of 90.0 acres of mixed oaks, hickories, and shortleaf pines; and

WHEREAS, the Conservation Area will protect and enhance high quality forest habitat consisting of mixed oak bottomland habitat, mixed hardwood shaded slopes and pine/oak ridges, particularly as it relates to the Protected Species with regard to breeding, foraging, feeding, sheltering, roosting and migration. The Conservation Area's solar exposure, potential roosts, low presence of invasive species, major streams and proximity to conserved land provides suitable habitat for the Indiana bat and the northern long-eared bat (collectively the "Protected Species"); and

WHEREAS, the Conservation Area is a significant natural area which qualifies as a "...relatively natural habitat of fish, wildlife, or plants, or similar ecosystem," as that phrase is used in Section 170 of the ESA, (P.L. 96-541)26 USC 170(h)(4)(A)(ii), *as amended*, and in regulations promulgated thereunder; specifically, the Conservation Area is habitat for Protected Species; and

WHEREAS, the United States Fish and Wildlife Service (hereinafter the "USFWS") within the United States Department of the Interior, is authorized by Federal law to administer the Federal Endangered Species Act (hereinafter "ESA"), 16 U.S.C. § 1531 et seq., and other laws and regulations; and

WHEREAS, the USFWS has listed the Indiana bat and northern long-eared bat as endangered and threatened, respectively, pursuant to the requirements of the ESA and the regulations thereunder; and

WHEREAS, the USFWS has approved the Conservation Area to be used as a conservation area in accordance with the Indiana bat conservation plan between the USFWS and Sponsor (the "Plan"), incorporated herein by reference; and

WHEREAS, the specific conservation values of the Conservation Area are documented in an Easement Documentation Report, prepared by Grantee and signed and acknowledged by the Grantor, establishing the baseline condition of the Conservation Area at the time of this grant and including reports, maps, photographs, and other documentation; and

WHEREAS, the Parties have the common purpose of conserving the above described conservation values of the Conservation Area in perpetuity.

NOW, THEREFORE, the Grantor, for and in consideration of the facts above recited and of the mutual covenants, terms, conditions and restrictions herein contained and as an absolute and unconditional consideration of $1.00, does hereby give, grant, bargain, sell and convey unto the Grantee, a conservation easement in perpetuity over the Conservation Area of the nature and character and to the extent hereinafter set forth.

PURPOSE

Purpose. It is the primary purpose of this Conservation Easement to assure that the Conservation Area will be retained forever in its forested state as suitable for the Protected Species, irrespective of the federal listing status of the species; and also to the extent consistent with the primary purpose, to protect any other rare plants, animals, or plant communities on the Conservation Area, and to ensure the Conservation Area remains permanently in a natural, scenic and forested condition; and to prevent any use of the Conservation Area that will significantly impair or interfere with the conservation values or interests of the Conservation Area described above.

Grantor intends that this Conservation Easement will confine the use of the Conservation Area to such activities as are consistent with the purpose of this Conservation Easement.

A. Restrictions

A.1 No Industrial Use. No industrial activities, including but not limited to the construction or placement of buildings or parking areas, shall occur in the Conservation Area.

A.2 No New Residential Use. No new residential structures or appurtenances, including but not limited to the construction or placement of new homes, mobile homes or storage sheds, shall be constructed in the Conservation Area.

A.3 No Commercial Use. No commercial activities shall occur in the Conservation Area, except for the low impact recreational uses explicitly identified under Reserved Rights in this Conservation Easement.

A.4 No Agricultural Use. No new agricultural activities that were not previously documented as part of the baseline conditions shall occur in the Conservation Area, including the use of the Conservation Area for cropland, waste lagoons, detention or collection ponds, or pastureland.

A.5 No Vegetative Clearing. No forestry or timbering activities shall occur in the Conservation Area, except that 1) Parties maintain the right to conduct silvicultural modifications with the intent to improve listed species habitat within the Conservation Area through reforestation, afforestation or silvicultural management to improve the health of the Protected Species habitat with the written concurrence of the USFWS of any such modifications; and 2) limited vegetative clearing may only occur as described under the Reserved Rights Section herein and with the written concurrence of the USFWS.

A.6 Development Rights Extinguished. No development rights which have been encumbered or extinguished by this Conservation Easement shall be transferred pursuant to a transferable development rights scheme or cluster development arrangement or otherwise.

A.7 No Subdivision. The Conservation Area may not be divided or subdivided. Further, the Conservation Area may not be divided, partitioned, nor conveyed except in its current configuration as an entity.

A.8 No Utilities (except for those under existing encumbrances). No new utilities, including pipes, pipelines, transmission lines, whether aboveground or underground, shall be constructed or installed in the Property.

A.9 No New Construction. There shall be no new building, facility, mobile home, or other structure, temporary or permanent, constructed or placed in the Conservation Area, except as deemed necessary to construct artificial roosting habitat for the Protected Species.

A.10 No Littering or Dumping. No dumping of soil, trash, ashes, sawdust, garbage, waste, abandoned vehicles, appliances or machinery, dredge spoil, or other material shall occur in the Conservation Area.

A.11 No Burning of Waste or Open Fires. No burning of trash or waste, or building of open air fires including, fires for cooking purposes and campfires shall occur in the Conservation Area.

A.12 No Disposal of Hazardous Waste. No dumping, disposal, or storage of hazardous materials shall occur in the Conservation Area, including but not limited to used motor oil, household chemicals, insecticides, herbicides, or similar chemicals, or of containers of such materials, except to the extent such materials or containers are used for the purposes of managing the conservation values of the Conservation Area and are securely stored and/or maintained.

A.13 No Grading, Mineral Use, Excavation, Dredging. No grading, excavation, dredging, mining, or drilling and no removal of topsoil, sand, gravel, rock, peat, minerals, or other material shall occur in the Conservation Area except to the extent that such activities are consistent with other Reserved Rights, specifically those mentioned in Section B.3. With respect to the removal of minerals, the intent of this Section A.13 is to prohibit any disturbance to the surface of the Conservation Area in connection with Grantor's Reserved Rights under Section B.3; however, notwithstanding the foregoing, any exploration, production, developing, or marketing of oil, gas and/or all other related substances produced in association therewith, including methane gas present in or associated with any coal seam, by any methods now or hereafter known or discovered, in and under the Conservation Area conducted pursuant to Section B.3 of this Conservation Easement shall be allowed insofar as such exploration, production, developing, or marketing does not affect the surface of the Conservation Area or otherwise jeopardize the conservation values of the Conservation Area.

A.14 Placement of Spoils. No filling or placement of dredged spoil, topsoil, or other materials shall occur in the Conservation Area shall occur, except as necessary for stream bank restoration or protection measures approved by the USFWS, and which is consistent with local, state and federal law.

A.15 Limited Signage. No signs shall be permitted in the Conservation Area except interpretive signs describing restoration activities and the Conservation Values of the Conservation Area; signs along hiking, biking or cross-country skiing trails; signs identifying the owner of the Property or Conservation Area and the holder of this Conservation Easement; any signage required by applicable federal, state or local laws; and signs giving directions or prescribing rules and regulations for the use of the Conservation Area.

A.16 No Fencing. No fences shall be erected in the Conservation Area, except to exclude livestock from certain areas, to the extent that such an agricultural use was in existence at the time the baseline was determined, or is necessary as a habitat management tool elsewhere on the Property or in the Conservation Area.

A.17 Pesticide, Herbicide Prohibitions. No rodenticides or other small mammal control measures that may adversely affect the purpose of this Conservation Easement shall be used or undertaken in the Conservation Area. No pesticides, herbicides, or fertilizers will be used in the Conservation Area, except in those instances when the conservation values of the Conservation Area are threatened to the extent that the conservation values may be extirpated or lost without aggressive management and stewardship activities being implemented. The Sponsor, in consultation with the Grantor and Grantee, and with the written concurrence of the USFWS, may use pesticides or herbicides when the conservation values reflecting the Purpose of this Conservation Easement and as described in the Easement Documentation Report may be so affected.

A.18 Prohibitions on mechanized vehicles/equipment. No off-road, all-terrain or similar vehicles are permitted to operate in the Conservation Area, except for emergency vehicles or where necessary to effectuate the terms of this Conservation Easement and for access and egress required for the hauling of game and for accessing hunting stands to the extent that such activities are consistent with other Reserved Rights. Use of mechanized vehicles shall be allowed for the construction and maintenance of artificial roosts for the Protected Species, planting vegetation, moving rocks, soil, and trail maintenance.

A.19 Prohibition on Ground Disturbing Activities. In no event shall any ground disturbance occur within the Conservation Area unless approved by USFWS and in compliance with local, state, and federal law.

B. Reserved Rights

B.1 Recreational Use. No recreational activities shall occur in the Conservation Area, except for low-impact recreational activities, including but not limited to, hunting/fishing, walking, jogging, biking, cross-country skiing, snowshoeing, wildlife observation, photography, horseback riding, and use of interpretive trails, so long as these activities:

1) are consistent with the Purpose of this Conservation Easement; and,

2) do not result in the destruction of, or harm the viability of, trees or other vegetation in the Conservation Area, except that the limited clearing or cutting of vegetation is permissible in accordance with the limitations below.

In constructing trails, the Grantor shall avoid clearing trees greater than five (5) inches in diameter at breast height (dbh) and shall use hand tools to avoid ground disturbance. To the extent that it is necessary to install a crossing of a wet seep or stream deemed to be in need of protection by the Sponsor, such wet seep or stream will be protected by using appropriate structures, such as boardwalks, as are commercially reasonable.

B.2 Educational Use. The Parties reserve the right to conduct educational activities within the Conservation Area, such as site visits, studies and observations. Any educational activities involving attempts to capture the Protected Species or activities that could otherwise

result in the take of the Protected Species, as that term is defined by the ESA, may be undertaken only in accordance with applicable federal and state laws.

B.3 Oil and Gas Exploration, Development, and Production. The Grantor, its successors or heirs, reserves the right to lease the Conservation Area for the purpose of exploring for, developing, producing and marketing oil, gas and/or all other related substances produced in association therewith, including methane gas present in or associated with any coal seam, by any methods now or hereafter known or discovered, in and under the Conservation Area, subject to Section A.13, and provided that:

1) no well shall be drilled in the Conservation Area, nor shall any lessee be allowed to enter upon or install any improvements or facilities of any nature whatsoever, including pipelines in the Conservation Area; and,

2) any lease for oil, gas and/or all other related substances granted shall be for the sole purpose of permitting the lessee thereunder to unitize the portion of the Conservation Area subject to the lease with other leases, lands, and/or interests (collectively, the "Other Lands"); and the Other Lands shall bear all burdens of surface development.

B.4 Vegetative Management. No cutting, removing, mowing, destroying, harming, harvesting, pruning, planting or relocating of trees, shrubs, or other vegetation shall occur in the Conservation Area except that the removal of vegetation is authorized in connection with:

1) The construction and maintenance of trails for low impact recreational activities as identified as a Reserved Right, provided that such trails shall be no more than four (4) feet wide and shall be vegetated or covered with grasses and/or gravel. All vegetative clearing in connection with trail construction shall occur between October 1 and March 31. No trees that are greater than five (5) inches dbh shall be removed in the course of developing such trails;

2) The removal of any trees that present a safety hazard. If removal of any potential roost trees is required between April 1 and September 30, the Parties, with the guidance of a USFWS or appropriate state wildlife agency or other qualified biologist must determine whether the tree is being used as a roost tree by the Protected Species and must contact the USFWS to coordinate prior to tree removal. If a Party has a reasonable, objective basis to believe that a tree that provides Protected Species roosts poses an "Imminent Hazard" (i.e., must be cut down immediately in order to avoid significant injury that will be realized prior to completing consultation with a qualified biologist, the USFWS or State wildlife agency according to the above terms), the Party may cut such tree, provided that the Party shall allow a qualified biologist to examine any such tree immediately after the tree is cut down and before it is removed from the area to determine whether the tree is occupied by the Protected Species or to allow the USFWS or

state wildlife agency to determine how to handle any Protected Species occupying or displaced from the tree; or

3) Restoration or management of the Conservation Area that is consistent with the purposes of this Conservation Easement with the written concurrence of the USFWS.

B.4.a Any vegetation management shall be performed using only hand tools to avoid ground disturbance

B.5 Restoration and Maintenance of Conservation Purpose. Any restoration and maintenance activities must be deemed suitable and necessary by the Sponsor and the USFWS to maintain or improve the conservation values of the Conservation Area, and shall not diminish the mitigation ratios, quality or quantity specified in any plan submitted by Sponsor for a conservation or restoration project in the Conservation Area. Any restoration activities to be conducted by the Sponsor must be proposed in writing by Sponsor as part of a USFWS-approved management plan consistent with the purposes of this Conservation Easement. Upon completion of any restoration or maintenance activities undertaken by Sponsor, as determined by USFWS, any and all rights granted to Sponsor in this Conservation Easement shall transfer to Grantee.

C. Enforcement, remedies, third party rights.

C.1 Grantee and Sponsor Rights of Entry and Enforcement. Grantee and Sponsor are hereby granted the following rights:

C.1.a To enter upon the Property to access the Conservation Area at any time after giving twenty-four (24) hours prior notice to the Grantor, in order to monitor Grantor's compliance with this Conservation Easement, monitor and survey the Conservation Area for use by the Protected Species and otherwise enforce the terms of this Conservation Easement;

C.1.b To enjoin any activity on or use of the Conservation Area that is inconsistent with this Conservation Easement, to require restoration of such areas or features of the Conservation Area that may be damaged by any act, failure to act, or any use or activity that is inconsistent with the purposes of this Conservation Easement and to preserve the conservation values of the Conservation Area;

C.1.c To preserve, protect and sustain the biological resources and conservation values of the Conservation Area unless specifically excluded from this Conservation Easement; and

C.1.d To bring an action at law or equity in a court of competent jurisdiction to enforce the terms, provisions and restrictions of this Conservation Easement.

C.1.e To recover any damages arising from non-compliance with the terms of this Conservation Easement.

C. 2. The USFWS as Third-Party Beneficiary; Enforcement and Remedies.

C.2.a. The Parties hereto agree that, because of the USFWS's duties and powers arising under the ESA, the USFWS has a clear and substantive interest in the preservation and enforcement of this Conservation Easement. Therefore, the Parties grant to the USFWS, its agents, successors and assigns, the rights and standing to be noticed, to enter the Property to access the Conservation Area upon twenty-four (24) hours' prior notice to the Parties, to approve or disapprove requests, and to enforce this Conservation Easement as described in this Section and according to the terms set forth herein.

C.2.b Grantor and Grantee shall notify the USFWS in writing of the names and addresses of any party to whom the Conservation Area, or any part thereof, is to be granted, conveyed or otherwise transferred prior to the time said transfer is consummated, as provided in paragraphs D and E.

C.2.c This Conservation Easement does not convey a general right of access to the public, except that the USFWS, its agents, contractors, and assigns, may enter onto the Property to access the Conservation Area at any time upon twenty-four (24) hours prior notice to the Parties for the purpose of conducting inspections to determine compliance with the terms contained herein, for the purpose of assessing the Protected Species population status and vegetative habitat condition and suitability, and, with the permission of the Parties, conducting certain management and monitoring activities not already identified herein.

C.2.d In addition to any other rights and remedies available to the USFWS at law or in equity, the USFWS shall have the right, but not the obligation to enforce this Conservation Easement and is entitled to exercise the same remedies available to Grantee and Sponsor, identified in paragraph C.1. The USFWS may do so upon the written request of Grantee or if Grantee fails to enforce this Conservation Easement. Prior to taking any enforcement action, the USFWS shall notify the Parties in writing of Grantee's alleged violations, and shall afford Grantee thirty (30) days to negotiate a remedial action and settlement with Grantor prior to commencing its own enforcement action. No failure on the part of the USFWS to enforce any term, condition, or provision hereof shall discharge or invalidate such term, condition, or provision to affect its right or that of the Parties to enforce the same.

D. Assignment. The Parties hereto recognize and agree that the benefits of this Conservation Easement are in gross and are assignable, and the Grantee hereby covenants and agrees that in

the event it transfers or assigns its interest in and to the Conservation Easement, it shall obtain written concurrence of the USFWS, and the organization receiving the interest shall be a qualified organization as that term is defined in Section 170(h)(3) of the IRC (or any successor section) and the regulations promulgated thereunder, which is organized and operated primarily for one of the conservation purposes specified in Section 170(h)(4)(A) of the IRC and Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue to carry out in perpetuity the conservation purposes which the contribution was originally intended to advance.

E. Subsequent Transfers. The Grantor agrees that the terms, conditions, restrictions and purposes of this Conservation Easement or reference thereto will be inserted by Grantor in any subsequent deed or other legal instrument by which the Grantor divests any retained, reserved or reversionary interest and by Grantee if Grantee subsequently transfers any fee simple title or possessory interest in the Conservation Area; and Grantor and Grantee further agree to notify the other Parties, as appropriate, and the USFWS at least thirty (30) days in advance of any pending transfer.

F. Government Permits and Approvals. The conveyance of this Conservation Easement by the Grantor to the Grantee does not replace, abrogate, or otherwise set aside any local, state or federal laws, requirements, or restrictions applicable to the Property or the Conservation Area and shall not relieve Grantor of the obligations and responsibilities to obtain any and all applicable federal, state, and local governmental permits and approvals, if necessary, to exercise Grantor's retained rights and uses of the Conservation Area even if consistent with the conservation purposes of this Conservation Easement.

G. Eminent Domain. Grantee shall join in any eminent domain action to condemn this Conservation Easement and shall seek to recover the full value of the taking and all incidental and direct damages due to the taking.

H. Proceeds. In the event that all or a portion of this Protected Property is sold, exchanged, or involuntarily converted following an extinguishment or the exercise of eminent domain, Grantee shall be entitled to the fair market value of this Conservation Easement. The parties stipulate that the fair market value of this Conservation Easement shall be determined by multiplying the fair market value of the Protected Property before being encumbered by this Conservation Easement (minus any increase in value after the date of this grant attributable to improvements) by the ratio of the value of this easement at the time of this grant to the value of the Protected Property (without deduction for the value of this Conservation Easement) at the time of this grant. The values at the time of this grant shall be the values used, or which would have been used, to calculate a deduction for federal income tax purposes, pursuant to Section 170(h) of the Internal Revenue Code (whether eligible or ineligible for such a deduction). Grantee shall use its share of the proceeds in a manner consistent with the purposes of this Conservation Easement.

I. Interpretation. This Conservation Easement shall be interpreted and performed pursuant to the laws of the State of Oklahoma, the federal Endangered Species Act, and other applicable federal laws.

J. Severability. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Conservation Easement that would render the provision valid shall be favored over any interpretation that would render it invalid. If any provision of this Conservation Easement or the application thereof to any person or circumstance is found to be invalid, the remainder of the provisions of this Conservation Easement and the application of such provisions to persons or circumstances other than those as to which it is found to be invalid shall not be affected thereby.

K. Successors and Assigns. The term "Grantor" shall include the Grantor and the Grantor's heirs, successors, and assigns and shall also include the masculine, feminine, corporate, singular or plural form of the word as needed in the context of its use. The term "Grantee" shall include Grantee and its successors and assigns. The term "Sponsor" shall include Sponsor, its successors and assigns.

L. Notices. Any notices, consents, approvals or other communications required in this Conservation Easement shall be sent by registered or certified mail to the appropriate party or its successor(s) in interest at the following address or such address as may be hereafter specified by notice in writing:

Grantor: _____
_____
_____
_____

Grantee: _____
_____
_____
_____

Sponsor: Magnolia Land Partners LLC
166 West Washington Street, Suite 700
Chicago, Illinois 60602

USFWS: _____
_____
_____
_____

M. Counterparts. The Parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by all Parties; each counterpart shall be deemed an original instrument as against any Party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

N. Captions. The captions herein have been inserted solely for convenience of reference and are not a part of this Conservation Easement and shall have no effect upon construction or interpretation.

O. Monitoring. Grantee shall monitor the Conservation Area to ensure compliance with the terms of this Conservation Easement. Monitoring shall be performed by visual or aerial means at a minimum of every year for the first five (5) years, then once every two (2) years thereafter. Grantee will provide USFWS with a monitoring report identifying the then current condition of the Conservation Area. The monitoring report shall include any observed violations of the terms of this Conservation Easement and any corrective action taken to resolve such violations.

P. Taxes, Costs and Liabilities. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Conservation Area. Grantee or Sponsor shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Conservation Area, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

Q. Title. Grantor warrants that it has valid and marketable title to the Property, free and clear of all mortgages, deeds of trust, or other liens or encumbrances that would rank in priority above this Conservation Easement, except for those permitted exceptions shown on the Preliminary Title Report included in the USFWS-approved Permittee Responsible Conservation Plan. Should USFWS discover the existence of an Unpermitted Exception (defined below) then (i) USFWS shall notify Sponsor in writing of the existence of the Unpermitted Exception; and (ii) Sponsor shall have thirty (30) days from receipt of such notice to cure or remove the Unpermitted Exception. If Sponsor fails to cure or remove the Unpermitted Exception within such 30-day period, USFWS may dismiss the project contemplated by the Permittee Responsible Conservation Plan. As used herein, "Unpermitted Exception" means any exception not approved by USFWS through its approval of the Permittee Responsible Conservation Plan and the Preliminary Title Report contained therein and therefore deemed unsatisfactory to USFWS.

R. Standing. Grantee, Sponsor and/or the USFWS have the right to enforce the terms, provisions and restrictions of this Conservation Easement. Any forbearance on behalf of Grantee, Sponsor or the USFWS to exercise its right of enforcement hereunder shall not be deemed or construed to be a waiver of either of their rights hereunder.

S. Extinguishment. In the event that changed conditions render impossible the continued use of the Conservation Area for the conservation purposes, this Conservation Easement may only be extinguished, in whole or in part, by judicial proceeding.

T. Merger. The Parties agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

U. Parties Subject to this Conservation Easement. This Conservation Easement shall be binding on and shall inure to the benefit of the Parties and their respective successors and assigns subject to the limitations on transfer set forth in this Conservation Easement.

V. Loss of or Injury to Conservation Values. Neither absence of the Protected Species from the Conservation Area nor a loss of or significant injury to conservation values for the Protected Species due to circumstances including, but without limitation, fire, flood, storm, disease, or seismic events, shall be construed to render the purpose of this Conservation Easement impossible to accomplish and shall not terminate or extinguish this Conservation Easement in whole or in part. In the case of loss of or significant injury to any of the conservation values for the Protected Species due to fire, flood, storm, disease, seismic events or similar circumstances, the Grantor, Grantee, or Sponsor may, but shall not be required to, seek to undertake measures in consultation with the USFWS to restore such conservation values.

[The remainder of this page is intentionally left blank.]

INTENDING TO BE LEGALLY BOUND, the undersigned Grantor, Grantee, and Sponsor, by their respective duly authorized representatives, have signed and delivered this Conservation Easement as of the date first above written.

Witness/Attest

_____

Grantor

_____
Name: Dale Jackson

Witness/Attest

_____

Grantor

_____
Name: Justin Jackson

Witness/Attest

_____

Grantee

Land Legacy
An Oklahoma nonprofit corporation

By: _____
Name: _____
Title: _____

Witness/Attest

Sponsor

Magnolia Land Partners LLC,
a Delaware limited liability company

By: _____
Name: _____
Title: _____

STATE OF OKLAHOMA :
: SS
COUNTY OF _____ :

On _____, before me, a Notary Public for the State aforesaid, personally appeared Dale Jackson, known to me or satisfactorily proven to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I have set my hand and official seal.

_____
Notary Public
My commission expires:
_____

[SEAL]

STATE OF OKLAHOMA :
: SS
COUNTY OF _____ :

On _____, before me, a Notary Public for the State aforesaid, personally appeared Justin Jackson, known to me or satisfactorily proven to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I have set my hand and official seal.

_____
Notary Public
My commission expires:
_____

[SEAL]

STATE OF OKLAHOMA :
: SS
COUNTY OF _____ :

On _____, before me, a Notary Public for the State aforesaid, personally appeared _____, who acknowledged himself/herself to be the _____ of Land Legacy, an Oklahoma nonprofit corporation, and that s/he, in the capacity set forth above, on behalf of the Grantee, being authorized to do so, executed, in my presence, the foregoing Conservation Easement for the purposes herein contained.

IN WITNESS WHEREOF, I have set my hand and official seal.

_____
Notary Public
My commission expires:
_____

[SEAL]

STATE OF _____ :
: SS
COUNTY OF _____ :

On _____, before me, a Notary Public for the State aforesaid, personally appeared _____, who acknowledged himself to be the _____ of Magnolia Land Partners LLC, a Delaware limited liability company, and that he, in the capacity set forth above, on behalf of the Sponsor, being authorized to do so, executed, in my presence, the foregoing Easement Agreement for the purposes herein contained.

IN WITNESS WHEREOF, I have set my hand and official seal.

_____
Notary Public
My commission expires:
_____

[SEAL]

EXHIBIT A

Description of the Property

ALL that part of the NE ¼ of Section 14, Township 1 North, Range 18 East lying South and East of the Kiamichi River

CONTAINING 188 Acres, more or less.

TOGETHER WITH all of Grantor's right, title and interest in and to all coal, mineral rights, oil and gas, oil and gas and/or other leases, oil and/or gas or other wells, easements, licenses, privileges, mining rights, contract rights, fixtures and structures, and all other rights of whatsoever nature within, adjoining and in any manner connected with said 188 Acre Tract described hereinabove.

Tax Parcel NO. 0000-14-01N-18E-0-0002-01

EXHIBIT B

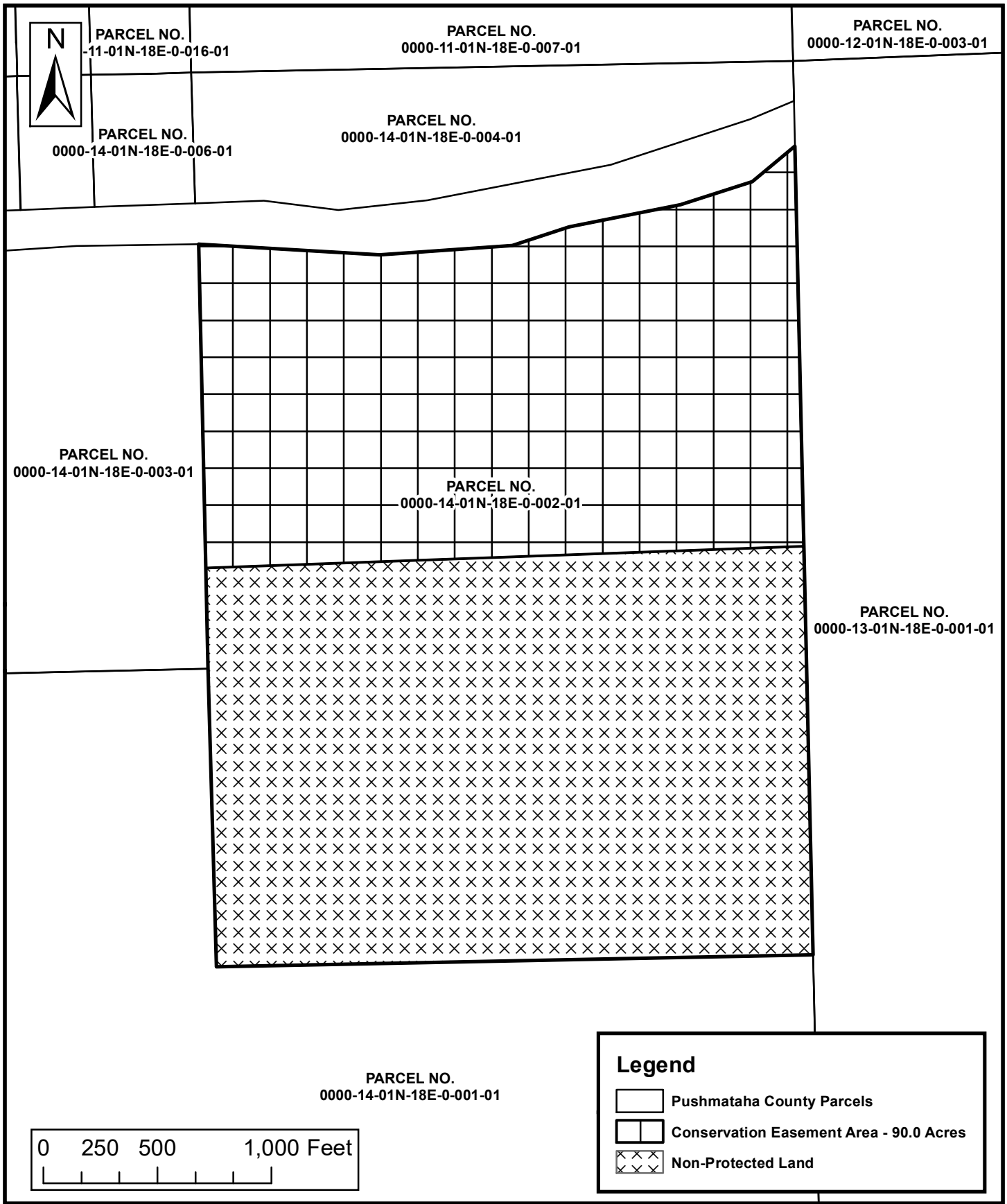
Description and Depiction of the Conservation Area

All that part of the NE ¼ of Section 14, Township 1 North, Range 18 East lying South and East of the Kiamichi River EXCEPT that part described as follows:

Beginning at the southwest corner of said NE ¼, thence North along the west line of said NE ¼ 467.25 feet; thence North 88° 4’ 46” East, 2,622.8 feet, more or less, to the east line of said NE ¼; thence South along the east line of said NE ¼, 498.4 feet, more or less, to the south line of said NE ¼; thence west along the south line of said NE ¼, 2,622.17 feet to the point of beginning.

Containing 90 Acres

[Insert Depiction of the Conservation Area]



Easement Plan

Kiamichi River Conservation Site
Pushmataha County, OK

Magnolia

Date: December 2019

Source: USGS, Esri, OWRB

EXHIBIT D

RESOURCE EQUIVALANCY ANALYSIS

USFWS has developed Resource Equivalency Analysis (REA) models to allow the translation of a given number of protected acres into a reproductive gain for a given species, represented by a gain of a number of reproductive females. The following methodologies were employed to quantify the benefit to the Target Species to be gained from the development of the Mitigation Site:

- Region 3 Indiana Bat Resource Equivalency Analysis Model Version 7; and
- Region 3 Northern Long-Eared Bat Resource Equivalency Analysis Model Version 1.

It was determined that over the 40-year project period, the Mitigation Site has the potential to generate 65 female Indiana bats, and 66 female northern long-eared bats.

REA Inputs

No modifications were made to the REA spreadsheets beyond the entry of the inputs shown in Table 1. Discussion of each input is provided below.

Table 1: REA Model Inputs and Outputs

Target Species	Project Length	Lambda	INBA Habitat Type	Acres Protected	INBA Gain (females)	NLEB Gain (females)
INBA/NLEB	40 Years	Declining	Foraging	90	65	66

Target Species

The Mitigation Site is located in an area of known use by Indiana and northern long-eared bats. Acoustic surveys performed in summer of 2019 confirmed the presence of both of the Target Species on the Site.

Project Length

The Mitigation Site will be used to satisfy compensatory mitigation requirements of the Incidental Take Permit for the Wildhorse Mountain Wind Project. This calculation used a permit length of 30 years. Per the REA instructions, the project length was calculated as the permit length plus an additional ten years.

Lambda

The lambda value for both REA models was listed as declining to match the input values used for the Wildhorse Mountain HCP.

Habitat Type

The Mitigation Site is listed as foraging habitat.

Acres Protected

The “acres protected” value contains the acreage with summer habitat that will be placed under a USFWS-approved conservation easement.

EXHIBIT E

PHASE I ENVIRONMENTAL SITE ASSESSMENT

Phase I Environmental Site Assessment Report

Kiamichi River Mitigation Site

Pushmataha County, OK

12/4/2019

1. Executive Summary

Ecologist Ben Johnson of Magnolia Land Partners performed a Phase I ESA of the parcel of land comprising the Kiamichi River Mitigation Site located in Pushmataha County, Oklahoma. No REC's were identified during the assessment. One de minimis conditions was identified, but the impact of this conditions was deemed to be insignificant with regards to the proposed conservation project.

2. Introduction

Purpose for Performing Phase I ESA

The purpose of this ESA was to:

- Evaluate historical and adjacent land usage to identify conditions that could potentially impact the environmental status of the identified sites
- Evaluate the potential for on-site and off-site contamination
- Conduct "all appropriate inquiry" as defined by ASTM Standard E2247-16
- Identify Recognized Environmental Concerns (REC) and provide a professional opinion as to the potential for environmental impact

Scope of Services

The ESA was conducted in accordance with ASTM E2247-16 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process for Forestland or Rural Property and EPA standards for All Appropriate Inquiry. The assessment will be reviewed and approved by an individual that qualifies as an environmental professional, as defined by 40 CFR §312.10.

Ecologist Ben Johnson of Magnolia Land Partners performed an ASTM Standard E2247-16 Phase I Environmental Site Assessment of the parcels of land comprising the proposed Kiamichi River Mitigation Site located in Pushmataha County, Oklahoma.

Limitations

The ESA involved on-site reconnaissance of the identified parcels of land along with adjacent properties, as well as a review of regulatory and historical information as deemed necessary in accordance with ASTM and EPA standards. No non-scope considerations such as inspection of structures for mold, asbestos, or radon were investigated.

The conclusions presented in this report are based upon a level of investigation deemed to be sufficient by ASTM standards. The intent of this assessment is to identify REC's and other potential conditions that may impact the environmental status of the area; however, no assessment can completely eliminate uncertainty regarding the potential for environmental conditions in connection with the site or adjacent properties. Magnolia Land Partners is not liable for future discovery of hazards that may impact human or environmental health.

Observations and conclusions regarding environmental conditions at the identified site are necessarily limited to conditions observed and/or materials reviewed at the time of the assessment. It is beyond the scope of this assessment to the actual presence, degree, or extent of any contamination. This would require additional exploratory work, including sampling and laboratory analysis.

ASTM E2247-16 defines a recognized environmental condition as "the presence or likely presence of any *hazardous substances* or *petroleum products* in, on, or at a *property*: *(1)* due to any *release* to the *environment*; *(2)* under conditions indicative of a *release* to the *environment*; or *(3)* under conditions that pose a *material threat* of a future *release* to the *environment*." A "de minimis condition" is defined in this report as any condition that generally does not represent a threat to human health or the environment, will not affect the success of the parcels as bat mitigation sites, and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

This report is provided for the exclusive use of Magnolia Land Partners. It is not intended to be used or relied upon in connection with other projects or by other unidentified third parties. The use of this report by any undesignated third party will be at that party's sole risk, and the inspector disclaims liability for any such use or reliance.

3. Site Description and Information

Location

The assessed area consists of approximately 90 acres in a single forest stand located off of Oklahoma State Route 2 in the town of Clayton in Pushmataha County, OK. The parcel's approximate centerpoint is located at 34.559 ° north, 95.379 ° west (WGS 84).

Physical Setting

As determined from USGS topographic maps, the northern parcel ranges from 540 to 880 feet above sea level. The Kiamichi River runs along the northern border of the parcel. Approximately 17 acres of wetlands are mapped by the NWI in the Site. The parcel contains vacant forested habitat.

Current Use

The parcel contains primarily vacant forested land. The forested land is used for recreation, primarily hunting.

Historical Use

A review of historical records and aerial photographs was conducted to determine past uses of the identified parcel. It revealed that the property was primarily forested land used for recreation and timber extraction.

Records Review

A review of regulatory databases was conducted to determine if the site or any adjacent areas were considered areas of environmental concern. The databases searched include:

Federal NPL: The Federal National Priorities List is a subset of Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) that identifies "superfund" sites that have documented incidents.

Federal Delisted NPL: The Delisted NPL identifies sites previously listed on the NPL where no further response is appropriate.

Federal CERCLIS: CERCLIS contains data on potential hazardous waste sites that have been reported to the United States Environmental Protection Agency (USEPA). CERCLIS contains sites that are either

proposed to or on the NPL and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Federal CERCLIS No Further Remedial Action Planned (NFRAP): CERCLIS sites designated as NFRAP have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require federal Superfund action or NPL consideration.

Federal Corrective Action Report (CORRACTS): CORRACTS identifies hazardous waste handlers that have been subject to corrective action under Resource Conservation and Recovery Act (RCRA).

Federal Resource Conservation and Recovery Information System (RCRIS) – Treatment, Storage and Disposal (TSD) Facilities: RCRIS identifies facilities that treat, store or dispose of hazardous wastes as defined by the RCRA. TSDs treat, store or dispose of hazardous waste.

Federal RCRIS – Generators: RCRIS identifies facilities that generate hazardous wastes as defined by the RCRA. Conditionally exempt small quantity generators (CESQGs) generate less than 100 kilograms of hazardous waste, or less than 1 kilogram of acutely hazardous waste, per month. Small quantity generators (SQGs) generate between 100 and 1,000 kilograms of hazardous waste per month. Large quantity generators (LQGs) generate more than 1,000 kilograms of hazardous waste or more than 1 kilogram of acutely hazardous waste per month.

Leaking Underground Storage Unit (LUST) List: The LUST list is a record of reported leaking underground storage units. It may also identify properties that have had soil and/or groundwater contamination associated with documented releases from aboveground storage tanks, surface spills and other sources.

Neither the identified site nor any properties in the vicinity of the site were identified by the databases searched.

On-Site Inspection

A walking inspection was performed in September of 2019. The primary habitat type was oak-hickory broadleaf deciduous forest. Moderate northern slopes were noted. Numerous streams of varying size were noted. In several areas, indicators of wetland hydrology such as saturated soils and hydrophytic vegetation was noted. Agricultural and forested lands bordered the proposed conservation area. No

indicators of contamination due to agricultural activities were noted. Low levels of invasive species were noted. No odors, stressed vegetation, or any other indicators of contamination were noted

4. Findings and Recommendations

The inspector identified no REC's following assessment of the identified parcels of land. The following de minimis condition was identified:

- *Invasive plant species growth*: Non-native invasive plant species growth was noted in several instances across the site. This condition poses no immediate human health hazard, and management of invasive species has been identified by Magnolia Land Partners as a goal of the proposed conservation project.

Based on the assessment performed and the goals of the proposed conservation project, the inspector finds no reason to disqualify the inspected parcel from development as a conservation area.

EXHIBIT F

BIOLOGICAL RESOURCE SURVEYS

Contents

EXHIBIT F-1

ACOUSTIC SURVEY REPORT

Report

Imperiled Bat Species Presence/Probable Absence Acoustic Survey Report for Jackson Property Site, Pushmataha County, Oklahoma

Prepared for:

Magnolia Land Partners LLC

Date: 28 August 2019

Personnel: Surveys and acoustic analysis were conducted by Keith W. Martin, Ph.D., DBA Tallgrass Environmental and Ecological Consulting, Claremore, OK (Vita attached in Appendix D).

Introduction:

This report summarizes the results of an acoustic survey for the federally threatened northern long-eared bat (*Myotis septentrionalis*) and endangered Indiana bat (*Myotis sodalis*). Acoustic surveys at the Dale Jackson (et al.) property in Pushmataha County, OK were conducted by Keith W. Martin dba Tallgrass Environmental and Ecological Consulting (TEEC) to determine if imperiled species of bats are potentially utilizing the forested woodland encompassing the private land holding. This survey was conducted in accordance with the 2019 Range-Wide Indiana Bat (and NLEB) Summer Survey Guidelines (https://www.fws.gov/midwest/Endangered/mammals/inba/surveys/pdf/2018RangewideIBatSurveyGuidelines.pdf). TEEC was retained by the Magnolia Land Partners in August 2019 to conduct the survey. The project was led by Dr. Keith Martin, a federally permitted bat surveyor, and appropriately trained on bat acoustic detector deployment and data analysis.

Objective:

In order to ascertain effective conservation actions, better data are needed to determine the spatial and temporal habits of bats in non-cave habitats in Oklahoma. This survey employed the use of stationary acoustic monitoring locations to assess the current richness, and spatial distributions of foraging bats on a private property in Pushmataha County, OK. When analysis of bat activity corresponds with landscape evaluation, patterns in the availability and condition of bat habitat can be determined and ultimately guide appropriate landscape management decisions (Ball, 2002).

The Northern long-eared bat is widely distributed throughout the eastern half of the United States and Canada (Van Zyll de Jong, 1985; Caceres and Barclay, 2000). It is found in caves or

abandoned mines for hibernacula (Caire et al., 1979) and occupies a variety of habitats, including trees, caves, and anthropogenic structures as day and night roosts in summer (Caceres and Barclay, 2000).

Sporadic records of cave-dwelling habits of the northern long-eared bat in Oklahoma are of note (Glass and Ward, 1959; Stevenson, 1986). However, recent ecological assessments, and particularly interaction between summer roosting (non-cave) habits and physiographic forest components in Oklahoma are non-existent. Captures of the northern long-eared bat were first reported by Glass and Ward (1959) bat in Oklahoma made while mist-netting at cave entrances in Adair, Delaware, and Leflore Counties. Subsequent records on distribution and ecology are unpublished and anecdotal (Stevenson, 1986). Stevenson (1986) captured specimens while netting at 14 cave entrances in Adair (3), Cherokee (1), Delaware (7), and Leflore (3) Counties. Clark and Clark (1997) captured northern long-eared bats in mist nets at 9 locations in eastern Oklahoma including Adair, Bryan, Choctaw, Leflore, and McCurtain counties.

White-nose syndrome is currently the predominant threat to the northern long-eared bat, especially throughout the northeast U.S. where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites. Although the disease has not yet spread throughout the northern long-eared bat's entire range it is currently found in at least 22 of 39 states where the northern long-eared bat occurs. Other threats to the species include: wind energy development, habitat destruction or disturbance (e.g., vandalism to hibernacula, roost tree removal), and contaminants.

Glass and Ward (1959) were the first to report the Indiana bat in Oklahoma from a cave in eastern Pushmataha County in Oklahoma. Saugey et al. (1990) identified a small hibernating population of Indiana bats from Bear Den Caves in Leflore County, Oklahoma. The latter location is <20 miles from the Duke property. Sporadic mist netting during the past 40 years have not recorded captures for the species, and only recent presence/absence acoustic surveys have detected the presence of Indiana bats in southeastern Oklahoma (2015-2018).

The Indiana bat hibernates in caves and mines in the winter. In spring and summer, reproductive females form maternity colonies where they bear and raise their young in woodland habitats. Summer roosts are typically under exfoliating bark of mature, dead or decaying trees. Habitats in which maternity roosts occur include riparian and bottomland habitats, wooded wetlands, and upland communities. Indiana bats typically forage in semi-open to closed forested habitats, edges, and riparian zones. Significant information gaps remain regarding the species' ecology not only in Oklahoma, but range-wide, and inhibits sound management recommendations (U.S. Fish and Wildlife Service, 2007).

Summer ecology and roost site selection of Indiana and northern long-eared bats are generally similar. Indiana bats select roost sites behind loose bark of dead or dying trees, in tree cavities, and especially in trees with exfoliating bark (Menzel et al., 2005; Humphrey et al., 1977, Garner and Gardner, 1992). In summer, habitat consists of wooded or semi-wooded areas, riparian areas, upland forests, ponds, and fields, typically within the shaded forest interior (Callahan et al., 1997). The majority of roost trees occur in areas having a closed (80-100%) or intermediate

(30-80%) canopy, but not in forests with open canopies (10-30%) or in old fields with less than or equal to 10% canopy cover (Garner and Gardner, 1992).

Citing recent presence/absence acoustic surveys, it is evident that transient, foraging individuals of both species use secondary and tertiary waterways in the Ouachita Mountains, where historical notes document the presence of these bats in Oklahoma (Glass and Ward, 1959; Saugey et al., 1990).

Project Location and Description:

The Jackson property encompasses 193 acres, the northern boundary bordering the Kiamichi River in the nw ¼ section 14, T1N R18E in Pushmataha County, OK (Figure 1). The property is a part of the Ouachita Biotic District in Oklahoma, characterized by east-west ridges with elevations of 400-813 m segregated by steep stream gradients. The ridgetops are a mixed pine-deciduous forest dominated by shortleaf pine (*Pinus echinata*) and mature oaks (*Quercus* spp.) and hickories (*Carya* ssp.), and a diverse mid/understory of woody and herbaceous vegetation (Blair and Hubbell 1938; Rolley and Warde, 1985; Bales et al., 2005). The Jackson parcel borders the Kiamichi River, a prominent water source in the Ouachita Mountains. It generally runs east-west in this particular region of Pushmataha County, OK, originating in western AR.

Acoustic Detection Methods:

ANABAT Express acoustic detection units were used in the survey to collect echolocation calls from passing bats foraging in patches of wooded, upland, and riparian habitats. Bat activity was monitored at two locations beginning 17 August and concluding on 21 August for a total of 10 monitoring nights. ANABAT Express detectors were fitted with a detached/extension omnidirectional microphone fixed to aluminum poles elevated 4m above ground level (AGL) facing horizontally into the canopy opening or over the Kiamichi River.

A detector night used in this report is defined as one operational detector for one night, under favorable weather conditions for bat flight and foraging activity (Table 1). Minimum night-time temperature was 73° F on 20 August. Overnight precipitation >.10 in did not fall on any of the dates during the survey period (https://www.mesonet.org/index.php/weather/station_monthly_summaries).

Table 1. Physical information for two detector locations in August 2019.

			Monitoring		Detector	Division Ratio	
Site	**Coordinates**		**Dates**	**Hours**	**Type**	**Audio**	**Data**
1	34.56240	-95.38180	17-21 August	1800-0600	ANABAT Express	16	8
2	34.56326	-95.37631	17-21 August	1800-0600	ANABAT Express	16	8

Individual Site Descriptions:

Site 1: Located in riparian habitat in the nw quarter of the Jackson parcel. The detector was placed on the south bank of the Kiamichi River. Surrounding vegetation was very diverse and densely wooded with a high dense canopy of native hardwoods indicative of

common riparian associates including mature sycamore (*Platanus occidentalis*), red maple (*Acer rubra*), sweetgum (*Luiquidambar styraciflua*), water oak (*Quercus nigra*), river birch (*Betula nigra*), with many >48" DBH not uncommon. A dense mid-story consisted of winged elm (*Ulmus alata*), hop-hornbeam (*Ostrya fagales*), eastern red cedar (*Cercus canadensis*), black locust (*Robinia psuedoacacia*), bitternut hickory (*Carya cordiformis*) and red mulberry (*Morus rubra*). An equally dense ground cover and understory of spice bush (*Lindera benzoin*), sassafras (*Sassafras albidum*), green briar (*Smilax* sp.), fish-on-a-pole (*Chasmanthium latifolium*), Virginia creeper (*Parthenocissus quinquefolia*), pokeweed (*Phytolacca americana*), and poison ivy (*Toxicodendron radicans*). Echolocation calls were recorded using an ANABAT Express detector with an omnidirectional microphone attached to an aluminum pole and elevated 4m above ground level (AGL) facing horizontally (90^{o}) across the Kiamichi River (Figure 2). Qualitatively identified echolocation calls sorted by each of the five detector nights at this location are in Appendix A.

Site 2: Located in riparian habitat in the ne quarter of the Jackson parcel. The detector was placed in the riparian vegetation adjacent to the south bank of the Kiamichi River. Surrounding vegetation was very diverse and densely wooded with a high dense canopy of native hardwoods indicative of common riparian associates including mature sycamore, red maple, sweetgum, water oak, and white and red oaks (*Quercus* sp), with many >48" DBH not uncommon. A dense mid-story consisted of winged elm, hop-hornbeam, eastern red cedar, black locust, bitternut hickory, and red mulberry. An equally dense ground cover and understory of spice bush, sassafras, green briar, fish-on-a-pole, Virginia creeper, pokeweed, and poison ivy. Echolocation calls were recorded using an ANABAT Express detector with an omnidirectional microphone attached to an aluminum pole and elevated 4m above ground level (AGL) facing horizontally (90^{o}) underneath a high, closed canopy (Figure 3). Qualitatively identified echolocation calls sorted by each of the five detector nights at this location are in Appendix B.

Call Analysis Methods:

Zero Crossing (ZCA) echolocation call files were processed with Analook software (Titley Electronics) to filter ambient noise and to ensure that residual noise was not interpreted as echolocation calls. Echolocation calls recorded using the ANABAT detectors were identified using BCID 2.7d identification software (Bat Call Identification Inc.). BCID software species settings were set for Arkansas. If calls for threatened/endangered (T&E) species were detected, the BCID identification was further validated using manual analysis and verification using the Wyoming Natural Diversity Database-Wyoming Bat Call Library (https://www.uwyo.edu/wyndd/data-dissemination/priority-data-comp/wyoming-bat-call-library/), and the investigators call library for eastern OK. Echolocation calls were disaggregated by night and species (Appendix A and B).

Acoustic Survey Results:

For this study the species settings on the BCID software were set for Arkansas, with high frequency myotid calls of the gray bat (*Myotis grisescens*) removed from the sort in an attempt to better define calls of the northern long-eared and Indiana bat. There were 1,410 identifiable

echolocation calls detected for 10 species of bats during the survey (Table 2). Tri-colored bats (*Perimyotis subflavus*) were the most abundant species recorded at the study site comprising 43% of the total calls identified. Echolocation calls for imperiled northern long-eared bat (12) and Indiana bat (32) were identified by BCID 2.7d software (Figure 4 and Figure 5) analysis during monitoring nights at both locations and on multiple nights.

Table 2. Aggregated species distribution of 1,410 echolocation calls at two monitoring locations at the study site and identified using BCID 2.7d software (Bat Call Identification Inc.).

	Big Brown Bat	Silver-haired Bat	Red Bat	Hoary Bat	Small-footed Bat	Little Brown Bat	Northern Long-eared Bat	Indiana Bat	Evening Bat	Tri-colored Bat
Total Calls	70	144	207	113	18	34	12	32	173	607
% of Total	5.0	10.2	14.7	8.0	1.3	2.4	0.9	2.3	12.3	43.0

Summary:

Northern long-eared bats forage under the forest canopy and use riparian regions and forested edge habitats (Caire at al. 1979; Fenton et al. 1983). These habitats dominate the landscape within the Jackson parcel. Automated identification using US Fish and Wildlife-approved software analysis, and manual analysis confirmed the presence of the bat at two separate monitoring locations— 4/5 nights at site 1.

Glass and Ward (1959) were the first to report the Indiana bat from a cave in eastern Pushmataha County in Oklahoma. Saugey et al. (1990) identified a small hibernating population of Indiana bats from Bear Den Caves in Leflore County, Oklahoma. The former location is <25 miles from the Jackson property. Sporadic mist netting during the past 40 years have not recorded captures for the species, and only recent acoustic surveys have detected the presence of Indiana bats in southeastern Oklahoma. Automated identification using US Fish and Wildlife-approved software analysis, and manual analysis confirmed the presence of the bat at both monitoring locations—all five nights at site 1, and 3/5 nights at site 2.

In sum, qualitative analysis in this survey indicate the Indiana bat and northern long-eared bat are present in the diverse woodland habitat that accompanies the riparian shoreline on the south banks of the Kiamichi River forming the northern boundary of the Jackson property Results from the vegetation analysis in this survey indicate that the surrounding woodland habitat does offer favorable roost and foraging site potential for both imperiled species.

Figure 1. Two acoustic monitoring locations at the Jackson Property site. Sites were monitored for 10 detector nights from 17 August-21 August 2019. MYSE and MYSO echolocation calls were detected at both monitoring locations.

Figure 2. ANABAT Express at Jackson property site 1 with omni-directional microphone, detached and elevated by extension cable 4m above ground and positioned to record horizontally across the Kiamichi River in Pushmataha County, OK.

Figure 3. ANABAT Express at Jackson property site 2 with omni-directional microphone, detached and elevated by extension cable 4m above ground and positioned to record horizontally into a high, closed canopy.

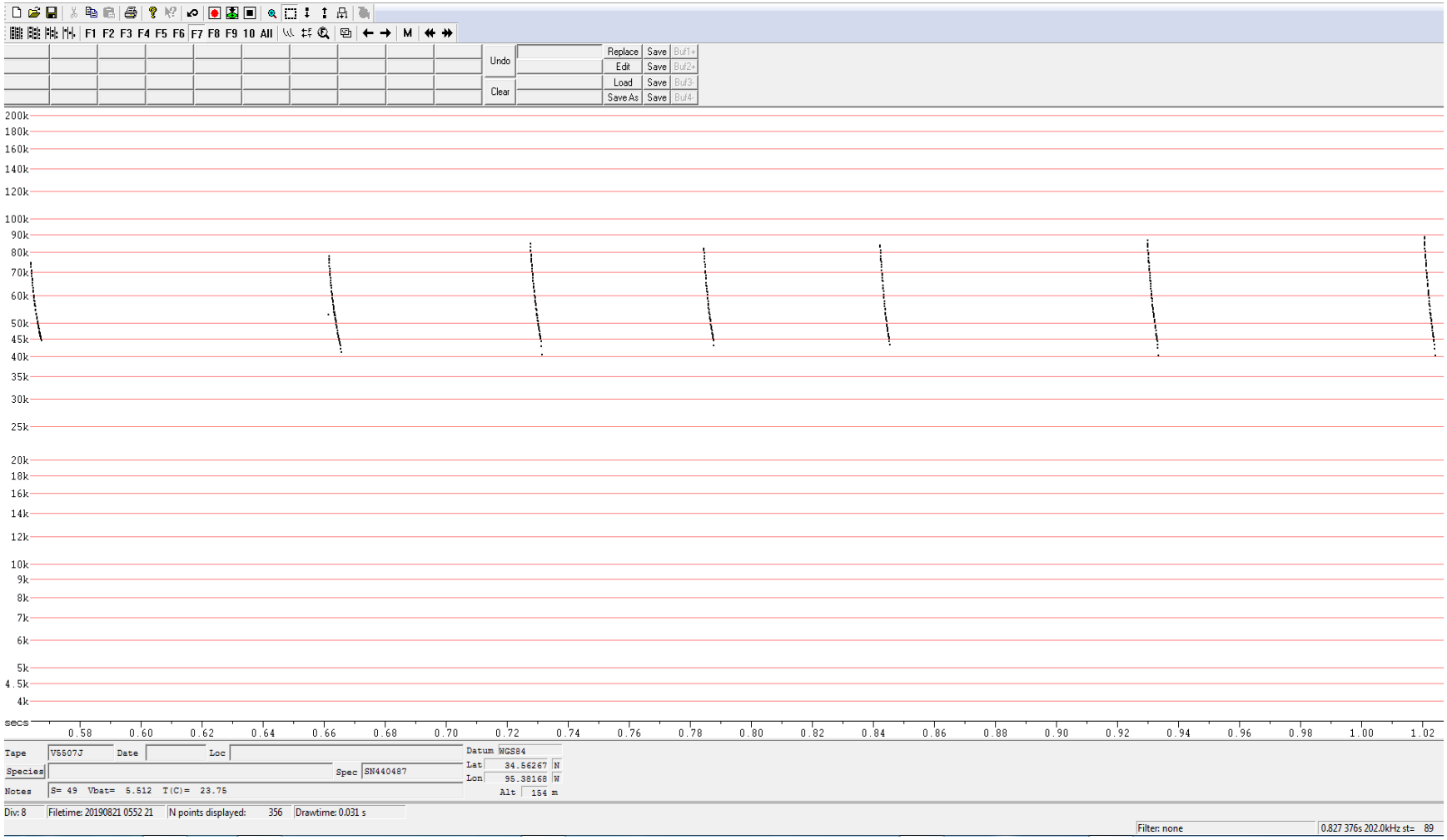


Figure 4. Representative call of a northern long-eared bat detected at site 1 on 21 August 2019 identified by BCID 2.7d software. The call was recorded using an ANABAT Express detector with an omnidirectional microphone attached to an aluminum pole and elevated 4m above ground level (AGL) facing horizontally towards the Kiamichi River, Pushmataha County, OK.

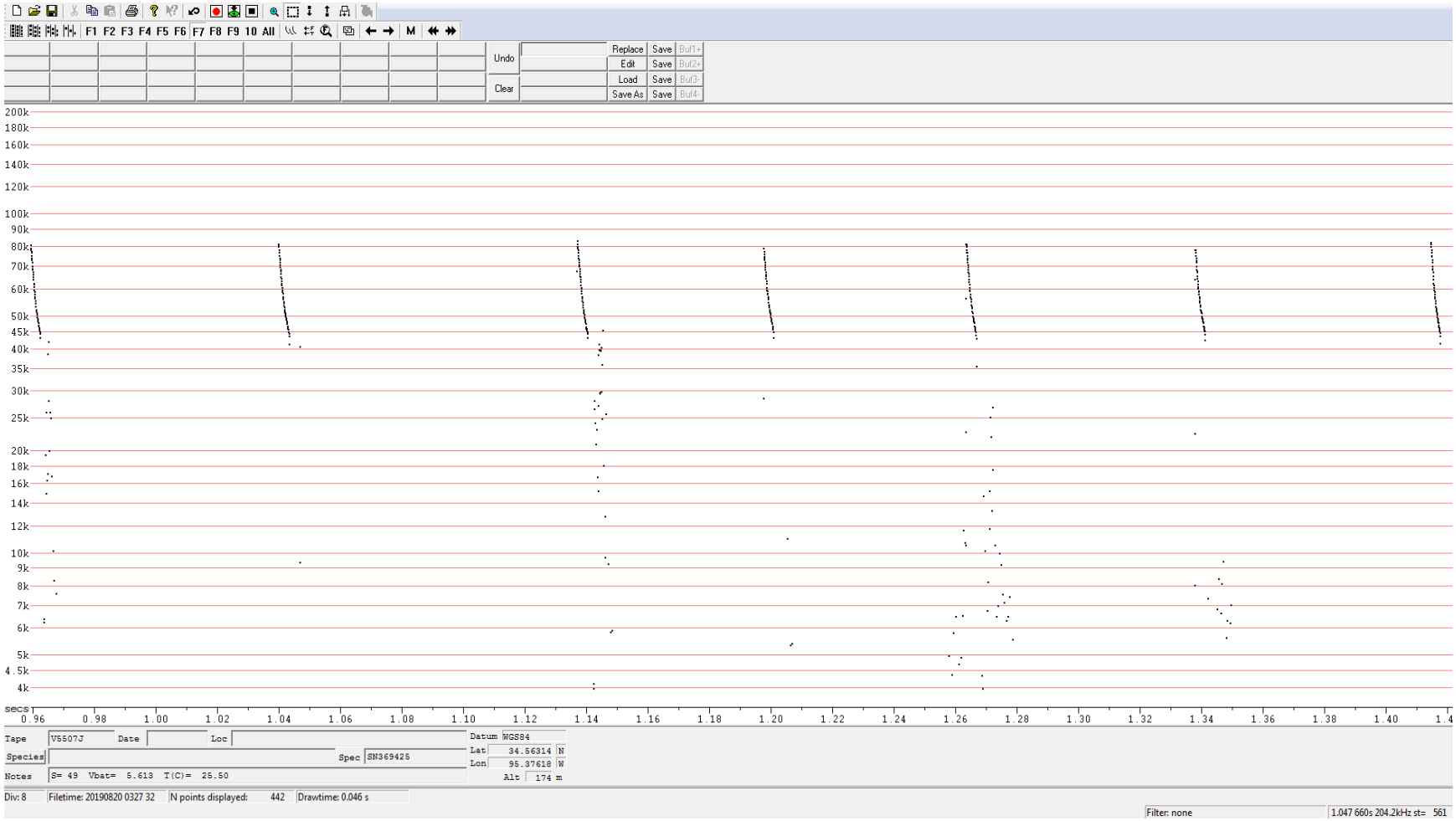


Figure 5. Representative call of an Indiana bat detected at site 2 on 20 August 2019 identified by BCID 2.7d software. The call was collected using an ANABAT Express detector with an omnidirectional microphone attached to an aluminum pole and elevated 4m above ground level (AGL) facing horizontally into a high, open understory beneath the canopy.

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Appendix A

Qualitative analysis of calls by BCID 2.7d disaggregated by night at Jackson monitoring site 1:

BCID Version 2.7d							
c:/users/keith/documents/anabat files/jackson.1\20190817							
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8172025.33#	NYHU	67.5676	MID	100	37	0.613259	20190817
T8172035.20#	NYHU	67.5676	MID	100	37	0.596497	20190817
T8172037.02#	LABO	58.6207	MID	65.5172	29	0.26836	20190817
T8172038.46#	PESU	100	MID	100	6	0.958606	20190817
T8172039.47#	NYHU	58.6207	MID	100	29	0.504009	20190817
T8172039.58#	PESU	95	MID	95	40	0.889871	20190817
T8172040.29#	PESU	92	MID	92	50	0.819667	20190817
T8172041.10#	PESU	98.5915	MID	98.5915	71	0.9569	20190817
T8172041.25#	PESU	100	MID	100	9	0.946628	20190817
T8172043.26#	PESU	88.2353	MID	91.1765	34	0.744417	20190817
T8172045.26#	LABO	83.3333	MID	83.3333	6	0.299345	20190817
T8172047.18#	PESU	91.6667	MID	91.6667	12	0.818413	20190817
T8172047.25#	PESU	100	MID	100	19	0.983357	20190817
T8172047.47#	PESU	100	MID	100	16	0.983045	20190817
T8172048.17#	PESU	81.8182	MID	86.3636	22	0.690095	20190817
T8172048.28#	PESU	45.4545	MID	80	55	0.358008	20190817
T8172049.10#	LACI	69.2308	LOW	75	104	0.490433	20190817
T8172049.25#	LACI	79.3814	LOW	84.5361	97	0.654453	20190817
T8172052.24#	PESU	85.1064	MID	97.8723	47	0.810809	20190817
T8172052.39#	PESU	48.062	MID	56.5891	129	0.271457	20190817
T8172053.08#	PESU	77.9817	MID	94.4954	109	0.708876	20190817
T8172053.43#	PESU	70.8738	MID	88.3495	103	0.617499	20190817
T8172053.59#	PESU	80	MID	95	100	0.734702	20190817
T8172054.14#	PESU	71.4286	MID	92.8571	14	0.637806	20190817
T8172055.30#	LABO	47.0588	MID	82.3529	17	0.0807597	20190817
T8172056.15#	NYHU	60	MID	100	20	0.527486	20190817
T8172057.35#	NYHU	75	MID	100	12	0.691811	20190817
T8172058.32#	LABO	60	MID	100	5	0.0425125	20190817
T8172058.53#	LABO	63.6364	MID	100	22	0.00172071	20190817
T8172059.19#	LABO	60	MID	100	20	0.041704	20190817
T8172059.44#	LABO	55	MID	100	20	0.262309	20190817
T8172059.59#	PESU	50	MID	100	6	0.0579924	20190817
T8172100.11#	NYHU	80	MID	100	10	0.715284	20190817
T8172100.32#	NYHU	61.2903	MID	100	31	0.52867	20190817
T8172101.15#	PESU	68.2353	MID	85.8824	85	0.572023	20190817
T8172101.30#	PESU	52.7778	MID	88.8889	36	0.425402	20190817

T8172101.44#	NYHU	62.5	MID	100	24	0.509981	20190817
T8172101.58#	PESU	40	MID	70	10	0.273563	20190817
T8172102.20#	PESU	76.0563	MID	91.5493	71	0.677977	20190817
T8172102.43#	PESU	61.9048	MID	85.7143	21	0.505884	20190817
T8172103.59#	LABO	35.7143	MID	64.2857	14	0.000809332	20190817
T8172104.11#	LANO	65.2174	LOW	100	23	0.61655	20190817
T8172104.30#	NYHU	69.2308	MID	100	26	0.633429	20190817
T8172106.04#	NYHU	60	MID	100	5	0.514409	20190817
T8172109.46#	LANO	77.2727	LOW	98.4848	66	0.40263	20190817
T8172110.16#	LANO	92.3077	LOW	100	13	0.849948	20190817
T8172110.32#	LABO	53.3333	MID	100	15	0.148219	20190817
T8172110.45#	LANO	61.3636	LOW	77.2727	44	0.131297	20190817
T8172111.12#	MYLU	42.8571	MYOTIS	66.6667	21	0.275169	20190817
T8172111.30#	LANO	46.1538	LOW	61.5385	13	0.222803	20190817
T8172112.03#	MYSO	52	MYOTIS	80	25	0.369836	20190817
T8172114.39#	NYHU	56.6667	MID	98.3333	60	0.482706	20190817
T8172116.53#	LABO	60	MID	100	5	0.462958	20190817
T8172121.47#	LABO	47.0588	MID	70.5882	17	0.158766	20190817
T8172122.48#	LABO	50	MID	75	8	0.104176	20190817
T8172123.19#	PESU	91.6667	MID	91.6667	12	0.677419	20190817
T8172124.44#	MYLU	43.75	MYOTIS	75	16	0.29127	20190817
T8172125.57#	LANO	58.0247	LOW	98.7654	81	0.0918475	20190817
T8172126.12#	PESU	44.8276	MID	58.6207	58	0.261548	20190817
T8172126.35#	PESU	63.1579	MID	89.4737	19	0.554097	20190817
T8172126.52#	PESU	36.5385	MID	71.1538	52	0.254554	20190817
T8172127.17#	LANO	68	LOW	100	25	0.618606	20190817
T8172127.39#	LANO	63.8889	LOW	94.4444	36	0.409343	20190817
T8172127.59#	LANO	84	LOW	100	25	0.707227	20190817
T8172128.12#	PESU	80	MID	80	20	0.62923	20190817
T8172128.41#	LABO	60	MID	100	5	0.0223745	20190817
T8172128.56#	UNKN		MID	47.0588	17		20190817
T8172129.26#	LANO	66.6667	LOW	100	15	0.601272	20190817
T8172129.55#	LACI	60	LOW	60	5	0.291983	20190817
T8172130.07#	PESU	50	MID	50	10	0.24446	20190817
T8172130.25#	LABO	29.6296	MID	55.5556	27	0.0136625	20190817
T8172130.40#	UNKN		LOW	70.5882	17		20190817
T8172131.42#	NYHU	68.1818	MID	100	22	0.643123	20190817
T8172132.19#	EPFU	33.3333	LOW	53.3333	15	0.0146952	20190817
T8172132.48#	LABO	50	MID	92.8571	14	0.227644	20190817
T8172133.10#	LANO	32.3529	LOW	85.2941	34	0.188688	20190817
T8172134.08#	LABO	60	MID	80	5	0.0649871	20190817
T8172134.48#	LACI	72.093	LOW	86.0465	43	0.198632	20190817
T8172137.32#	PESU	71.4286	MID	79.3651	63	0.562196	20190817
T8172139.00#	PESU	69.5652	MID	86.9565	46	0.596751	20190817
T8172139.27#	NYHU	47.0588	MID	88.2353	17	0.277874	20190817
T8172140.01#	MYSO	43.4783	MYOTIS	73.913	23	0.230181	20190817
T8172141.06#	NYHU	56	MID	100	25	0.477515	20190817
T8172142.02#	LANO	62.9213	LOW	80.8989	89	0.373189	20190817
T8172142.17#	LACI	63.6364	LOW	63.6364	11	0.378846	20190817
T8172142.29#	LANO	58.3333	LOW	100	12	0.561491	20190817
T8172143.26#	PESU	100	MID	100	7	0.959137	20190817
T8172144.15#	PESU	72	MID	96	25	0.678004	20190817
T8172145.24#	PESU	100	MID	100	18	0.982832	20190817
T8172145.39#	PESU	83.7838	MID	89.1892	37	0.72242	20190817
T8172145.54#	PESU	93.75	MID	96.875	32	0.880822	20190817
T8172147.13#	NYHU	58.3333	MID	100	12	0.467861	20190817
T8172147.30#	PESU	96.5517	MID	100	29	0.957408	20190817
T8172148.03#	EPFU	52.1739	LOW	100	23	0.0221664	20190817
T8172148.54#	EPFU	63.6364	LOW	100	11	0.348849	20190817
T8172149.04#	PESU	100	MID	100	13	0.948581	20190817

T8172149.15#	PESU	71.4286	MID	100	7	0.0223256	20190817
T8172150.49#	PESU	100	MID	100	5	0.948165	20190817
T8172157.30#	PESU	59.2593	MID	77.7778	27	0.456729	20190817
T8172201.04#	PESU	100	MID	100	7	0.763984	20190817
T8172203.11#	PESU	100	MID	100	6	0.961199	20190817
T8172204.07#	NYHU	63.6364	MID	100	11	0.574204	20190817
T8172205.03#	PESU	88	MID	92	25	0.790297	20190817
T8172207.24#	NYHU	80	MID	100	5	0.720296	20190817
T8172213.53#	PESU	92	MID	100	25	0.751997	20190817
T8172216.39#	PESU	82.3529	MID	97.0588	34	0.793309	20190817
T8172218.10#	PESU	100	MID	100	5	0.921683	20190817
T8172219.43#	UNKN		MID	50	8		20190817
T8172225.55#	PESU	85.7143	MID	100	7	0.827501	20190817
T8172226.45#	PESU	57.1429	MID	71.4286	7	0.377859	20190817
T8172228.20#	LABO	83.3333	MID	83.3333	6	0.586157	20190817
T8172228.45#	NYHU	60	MID	100	5	0.197322	20190817
T8172234.35#	PESU	100	MID	100	13	0.978695	20190817
T8172237.12#	PESU	88.2353	MID	100	34	0.872468	20190817
T8172240.48#	PESU	72.7273	MID	100	11	0.711078	20190817
T8172242.47#	NYHU	83.3333	MID	100	6	0.222735	20190817
T8172246.06#	LANO	68.4211	LOW	100	19	0.478492	20190817
T8172246.36#	EPFU	59.0909	LOW	100	22	0.073511	20190817
T8172250.17#	NYHU	62.5	MID	95.3125	64	0.543979	20190817
T8172252.19#	PESU	100	MID	100	15	0.931202	20190817
T8172258.21#	PESU	62.5	MID	75	8	0.412295	20190817
T8172300.07#	NYHU	57.1429	MID	85.7143	14	0.177346	20190817
T8172301.30#	LABO	37.5	MID	62.5	8	0.117108	20190817
T8172305.43#	PESU	100	MID	100	17	0.983537	20190817
T8172306.19#	PESU	100	MID	100	20	0.9847	20190817
T8172307.42#	PESU	61.1111	MID	77.7778	18	0.452688	20190817
T8172307.55#	PESU	100	MID	100	8	0.964833	20190817
T8172308.10#	PESU	93.3333	MID	100	30	0.919523	20190817
T8172310.15#	LANO	71.4286	LOW	100	7	0.262471	20190817
T8172311.32#	PESU	90	MID	95	20	0.841561	20190817
T8172311.48#	PESU	100	MID	100	46	0.994242	20190817
T8172312.10#	PESU	92.1053	MID	97.3684	38	0.890297	20190817
T8172312.26#	PESU	94.1176	MID	94.1176	68	0.880831	20190817
T8172312.41#	PESU	91.2	MID	96	125	0.867242	20190817
T8172312.56#	PESU	96.875	MID	100	32	0.960472	20190817
T8172313.19#	PESU	100	MID	100	70	0.995752	20190817
T8172313.47#	PESU	73.5294	MID	94.1176	34	0.675559	20190817
T8172314.05#	PESU	100	MID	100	11	0.97334	20190817
T8172314.48#	PESU	100	MID	100	6	0.963548	20190817
T8172315.04#	PESU	93.75	MID	100	16	0.923014	20190817
T8172315.35#	PESU	100	MID	100	17	0.979548	20190817
T8172317.00#	PESU	79.1667	MID	87.5	24	0.685559	20190817
T8172319.07#	PESU	100	MID	100	5	0.956414	20190817
T8172320.48#	PESU	57.1429	MID	91.4286	35	0.514837	20190817
T8172321.42#	PESU	100	MID	100	39	0.989034	20190817
T8172321.54#	PESU	85.7143	MID	100	7	0.828028	20190817
T8172322.33#	PESU	95.4545	MID	95.4545	22	0.899063	20190817
T8172323.23#	LABO	50	MID	100	36	0.0721304	20190817
T8172329.41#	PESU	100	MID	100	19	0.983063	20190817
T8172331.21#	PESU	77.7778	MID	100	9	0.753346	20190817
T8172332.58#	NYHU	50	MID	94.4444	18	0.365368	20190817
T8172334.27#	MYLU	33.3333	MYOTIS	55.5556	9	0.177951	20190817
T8172334.52#	NYHU	50	MID	100	8	0.0173633	20190817
T8172335.13#	PESU	80	MID	100	5	0.765027	20190817
T8172337.41#	LANO	45.4545	LOW	77.2727	22	0.316265	20190817
T8172337.57#	LANO	35.4839	LOW	86.2903	124	0.208315	20190817

T8172338.12#	LANO	75	LOW	100	20	0.673188	20190817
T8172340.36#	PESU	100	MID	100	12	0.979183	20190817
T8172345.23#	LABO	40	MID	60	5	0.170386	20190817
T8172348.16#	PESU	93.1034	MID	96.5517	29	0.889893	20190817
T8172349.22#	PESU	93.75	MID	100	16	0.91753	20190817
T8172350.07#	PESU	100	MID	100	12	0.977376	20190817
T8172351.04#	NYHU	58.3333	MID	100	12	0.0230936	20190817
T8172351.14#	NYHU	60	MID	100	5	0.374595	20190817
T8180005.28#	PESU	100	MID	100	6	0.963178	20190817
T8180008.21#	PESU	100	MID	100	5	0.955311	20190817
T8180013.10#	LABO	42.8571	MID	85.7143	7	0.160509	20190817
T8180014.03#	PESU	93.3333	MID	100	15	0.917755	20190817
T8180016.11#	PESU	84	MID	96	25	0.795586	20190817
T8180016.40#	PESU	100	MID	100	8	0.972152	20190817
T8180016.48#	PESU	100	MID	100	34	0.992751	20190817
T8180017.49#	PESU	96.1538	MID	100	26	0.951448	20190817
T8180041.50#	LABO	37.5	MID	62.5	8	0.167741	20190817
T8180042.15#	PESU	100	MID	100	6	0.961987	20190817
T8180049.47#	PESU	33.3333	MID	40	15	0.0778353	20190817
T8180056.09#	PESU	100	MID	100	33	0.992825	20190817
T8180057.17#	PESU	100	MID	100	21	0.982558	20190817
T8180057.51#	PESU	90.9091	MID	90.9091	33	0.820097	20190817
T8180059.11#	PESU	71.4286	MID	85.7143	7	0.58687	20190817
T8180059.24#	LANO	76.9231	LOW	100	13	0.705548	20190817
T8180102.05#	PESU	100	MID	100	16	0.985274	20190817
T8180103.47#	LABO	83.3333	MID	100	6	0.354871	20190817
T8180105.19#	PESU	52.9412	MID	100	17	0.0150194	20190817
T8180105.37#	LABO	27.2727	MID	43.1818	44	0.0206508	20190817
T8180107.33#	EPFU	60.6061	LOW	60.6061	33	0.0910213	20190817
T8180107.49#	EPFU	56	LOW	88	25	0.0302755	20190817
T8180109.36#	PESU	79.4118	MID	91.1765	34	0.719083	20190817
T8180113.08#	PESU	86.2069	MID	96.5517	29	0.81943	20190817
T8180114.53#	PESU	100	MID	100	12	0.973338	20190817
T8180119.53#	EPFU	58.3333	LOW	66.6667	12	0.15681	20190817
T8180120.50#	PESU	33.3333	MID	55.5556	9	0.0684668	20190817
T8180122.31#	NYHU	66.6667	MID	100	6	0.596907	20190817
T8180123.39#	PESU	47.0588	MID	76.4706	17	0.346455	20190817
T8180124.07#	PESU	100	MID	100	5	0.95579	20190817
T8180126.03#	LABO	60	MID	80	5	0.286306	20190817
T8180130.40#	PESU	66.6667	MID	83.3333	6	0.533512	20190817
T8180131.01#	LANO	46.1538	LOW	92.3077	39	0.393359	20190817
T8180131.19#	PESU	50	MID	100	14	0.0530717	20190817
T8180131.34#	LANO	100	LOW	100	6	0.898435	20190817
T8180139.00#	PESU	100	MID	100	9	0.961252	20190817
T8180140.55#	PESU	94.7368	MID	100	19	0.93594	20190817
T8180141.24#	NYHU	50	MID	100	10	0.0319375	20190817
T8180148.47#	LABO	50	MID	100	8	0.203652	20190817
T8180159.14#	PESU	94.4444	MID	94.4444	18	0.834534	20190817
T8180205.54#	LANO	90	LOW	100	40	0.812699	20190817
T8180206.09#	EPFU	50.4425	LOW	100	113	0.0465738	20190817
T8180208.38#	LABO	33.3333	MID	55.5556	9	0.0362001	20190817
T8180209.08#	PESU	60	MID	80	5	0.425167	20190817
T8180211.32#	PESU	75	MID	100	8	0.297462	20190817
T8180213.17#	PESU	100	MID	100	16	0.985853	20190817
T8180214.04#	PESU	88.8889	MID	96.2963	27	0.820353	20190817
T8180214.27#	PESU	90.4762	MID	100	21	0.889298	20190817
T8180215.13#	NYHU	75	MID	100	8	0.151793	20190817
T8180216.53#	PESU	95	MID	100	20	0.938404	20190817
T8180217.40#	PESU	71.4286	MID	79.5918	49	0.562134	20190817
T8180217.55#	PESU	88.2353	MID	88.2353	17	0.757084	20190817

T8180218.43#	PESU	100	MID	100	7	0.958768	20190817
T8180219.15#	PESU	100	MID	100	25	0.987037	20190817
T8180226.50#	PESU	83.3333	MID	91.6667	12	0.694603	20190817
T8180230.49#	LANO	63.7681	LOW	100	69	0.286574	20190817
T8180233.23#	PESU	90	MID	100	10	0.871541	20190817
T8180235.58#	PESU	70.8333	MID	83.3333	24	0.583982	20190817
T8180236.13#	LANO	50	LOW	100	6	0.47984	20190817
T8180237.15#	LABO	43.75	MID	68.75	16	0.037255	20190817
T8180239.42#	PESU	100	MID	100	5	0.955929	20190817
T8180240.52#	PESU	88.8889	MID	93.3333	45	0.823582	20190817
T8180241.42#	PESU	100	MID	100	6	0.957676	20190817
T8180241.56#	LABO	80	MID	80	5	0.581045	20190817
T8180242.26#	PESU	100	MID	100	17	0.95933	20190817
T8180242.51#	UNKN		MID	80	5		20190817
T8180250.00#	PESU	100	MID	100	13	0.982537	20190817
T8180253.53#	PESU	96.4286	MID	96.4286	28	0.922206	20190817
T8180255.27#	UNKN		MID	100	8		20190817
T8180256.01#	PESU	88.4615	MID	100	26	0.872885	20190817
T8180256.48#	MYLU	55.5556	MYOTIS	100	9	0.412379	20190817
T8180257.37#	PESU	100	MID	100	10	0.977107	20190817
T8180257.52#	EPFU	50	LOW	100	30	0.0269489	20190817
T8180258.14#	LANO	80	LOW	100	35	0.329633	20190817
T8180258.25#	LANO	63.6364	LOW	100	11	0.572714	20190817
T8180259.54#	PESU	100	MID	100	10	0.97657	20190817
T8180302.13#	PESU	91.6667	MID	100	12	0.898104	20190817
T8180305.53#	PESU	76.4706	MID	94.1176	17	0.703051	20190817
T8180306.37#	PESU	90.9091	MID	95.4545	22	0.855526	20190817
T8180309.07#	PESU	92.8571	MID	92.8571	14	0.828013	20190817
T8180309.19#	PESU	100	MID	100	9	0.9599	20190817
T8180310.04#	PESU	90.625	MID	100	32	0.894442	20190817
T8180312.00#	PESU	78.9474	MID	89.4737	19	0.697169	20190817
T8180313.20#	NYHU	66.6667	MID	100	12	0.598698	20190817
T8180314.13#	PESU	100	MID	100	12	0.934774	20190817
T8180315.43#	PESU	100	MID	100	23	0.989333	20190817
T8180324.10#	LANO	72.7273	LOW	100	33	0.459278	20190817
T8180327.59#	PESU	64.7059	MID	88.2353	17	0.561864	20190817
T8180331.59#	PESU	94.7368	MID	97.3684	38	0.896948	20190817
T8180333.56#	PESU	100	MID	100	18	0.975481	20190817
T8180338.00#	PESU	100	MID	100	8	0.971214	20190817
T8180338.20#	LACI	66.6667	LOW	66.6667	12	0.363396	20190817
T8180338.40#	PESU	88.5714	MID	91.4286	35	0.803181	20190817
T8180341.34#	LANO	35.8025	LOW	74.0741	81	0.230364	20190817
T8180341.53#	UNKN		LOW	100	18		20190817
T8180343.09#	PESU	100	MID	100	8	0.969951	20190817
T8180344.16#	LABO	65	MID	65	20	0.374236	20190817
T8180348.52#	PESU	100	MID	100	18	0.95512	20190817
T8180349.59#	PESU	100	MID	100	12	0.957548	20190817
T8180353.02#	PESU	100	MID	100	26	0.989335	20190817
T8180353.36#	LABO	60	MID	60	5	0.061007	20190817
T8180356.06#	LACI	68.4211	LOW	78.9474	19	0.436813	20190817
T8180401.12#	PESU	92.3077	MID	100	13	0.902133	20190817
T8180402.33#	PESU	95.2381	MID	100	21	0.49868	20190817
T8180403.51#	LACI	88.2353	LOW	88.2353	17	0.741243	20190817
T8180404.17#	PESU	100	MID	100	19	0.984176	20190817
T8180406.05#	LABO	40	MID	60	5	0.0540759	20190817
T8180407.47#	PESU	90.3226	MID	100	31	0.87056	20190817
T8180408.50#	NYHU	62.5	MID	100	16	0.572796	20190817
T8180409.39#	LACI	50	LOW	50	6	0.236859	20190817
T8180410.04#	LACI	48.2759	LOW	58.6207	58	0.190435	20190817
T8180410.19#	LACI	50	LOW	54.1667	24	0.24137	20190817

T8180410.39#	LANO	66.6667	LOW	100	6	0.634599	20190817			
T8180410.59#	LACI	46.5517	LOW	53.4483	58	0.157024	20190817			
T8180411.14#	LACI	71.4286	LOW	71.4286	7	0.291133	20190817			
T8180411.42#	LACI	56.25	LOW	59.375	32	0.271548	20190817			
T8180412.02#	LACI	73.3333	LOW	73.3333	15	0.458233	20190817			
T8180412.22#	LACI	85.7143	LOW	85.7143	14	0.717145	20190817			
T8180412.42#	LACI	87.5	LOW	87.5	8	0.735607	20190817			
T8180412.53#	LACI	94.4444	LOW	94.4444	18	0.866142	20190817			
T8180414.55#	LACI	77.2727	LOW	81.8182	22	0.585446	20190817			
T8180415.29#	LACI	100	LOW	100	10	0.951396	20190817			
T8180419.11#	NYHU	70	MID	100	20	0.62575	20190817			
T8180427.33#	EPFU	66.6667	LOW	100	9	0.053618	20190817			
T8180432.22#	PESU	80	MID	88	25	0.686353	20190817			
T8180436.10#	PESU	100	MID	100	31	0.992069	20190817			
T8180436.54#	LACI	94.7368	LOW	94.7368	19	0.771968	20190817			
T8180438.34#	PESU	93.3333	MID	93.3333	15	0.696026	20190817			
T8180447.48#	PESU	86.3636	MID	90.9091	22	0.769413	20190817			
T8180500.43#	PESU	100	MID	100	22	0.987082	20190817			
T8180513.43#	PESU	100	MID	100	5	0.949962	20190817			
T8180525.24#	MYSO	40	MYOTIS	80	5	0.2694	20190817			
T8180527.22#	PESU	72.7273	MID	90.9091	11	0.645184	20190817			
T8180528.45#	MYLE	33.3333	MYOTIS	66.6667	6	0.201969	20190817			
T8180528.57#	PESU	86.6667	MID	91.1111	45	0.781125	20190817			
T8180535.58#	PESU	86.9565	MID	91.3043	23	0.781215	20190817			
T8180540.32#	NYHU	80	MID	100	5	0.744063	20190817			
T8180548.18#	NYHU	64.5833	MID	100	48	0.59775	20190817			
T8180557.34#	NYHU	61.1111	MID	94.4444	18	0.53386	20190817			
T8180607.08#	NYHU	50	MID	100	6	0.0532504	20190817			
T8180611.38#	NYHU	60	MID	100	5	0.552833	20190817			

IDENTIFICATION SUMMARY

ID	EPFU	LANO	LABO	LACI	MYLE	MYLU	MYSO	NYHU	PESU	UNKN
N	10	29	32	21	1	4	3	36	163	6
%	3.28	9.51	10.49	6.89	0.33	1.31	0.98	11.80	53.44	1.97
MLE (p)	0.001301	0.000001	0.000001	0.000001	0.038752	0.000001	0.001171	0.000001	0.000001	

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FILENAME	SPECIES	SP PERCENT	GROUP	GR PERCENT	TOTAL PULSES	DISC PROB	FOLDER			
T8182027.45#	NYHU	64.5161	MID	100	31	0.543206	20190818			
T8182028.10#	LABO	55.5556	MID	100	9	0.0730574	20190818			
T8182028.23#	NYHU	81.8182	MID	100	11	0.706552	20190818			
T8182047.52#	NYHU	80	MID	100	5	0.705586	20190818			
T8182049.59#	LACI	48.2759	LOW	55.1724	29	0.166739	20190818			
T8182050.14#	LACI	44	LOW	100	25	0.271731	20190818			
T8182052.53#	MYSE	33.3333	MYOTIS	60	15	0.194413	20190818			
T8182054.36#	MYLU	41.6667	MYOTIS	66.6667	24	0.0365455	20190818			
T8182054.50#	LABO	80	MID	100	10	0.127914	20190818			
T8182055.42#	NYHU	50	MID	83.3333	6	0.162124	20190818			
T8182100.32#	NYHU	60	MID	100	10	0.570124	20190818			
T8182101.32#	UNKN		MYOTIS	64.2857	14		20190818			
T8182101.49#	LANO	42.1053	LOW	100	19	0.323713	20190818			
T8182102.52#	LABO	40	MID	60	5	0.182732	20190818			
T8182102.58#	LABO	44.4444	MID	100	9	0.233865	20190818			
T8182103.57#	LABO	42.8571	MID	100	14	0.0965909	20190818			
T8182105.23#	LACI	100	LOW	100	9	0.735514	20190818			
T8182108.00#	NYHU	83.3333	MID	100	6	0.660843	20190818			
T8182108.34#	LACI	60	LOW	60	5	0.135632	20190818			
T8182109.11#	LANO	40	LOW	100	10	0.119772	20190818			
T8182112.59#	LANO	51.7241	LOW	100	29	0.203803	20190818			

T8182114.29#	NYHU	53.2258	MID	90.3226	62	0.452726	20190818
T8182115.13#	PESU	66.6667	MID	88.8889	9	0.553395	20190818
T8182125.53#	NYHU	66.6667	MID	100	6	0.227802	20190818
T8182126.31#	LABO	60	MID	80	5	0.304025	20190818
T8182126.51#	UNKN		MID	75	8		20190818
T8182127.44#	LABO	60	MID	60	5	0.0896016	20190818
T8182128.00#	LABO	40	MID	60	5	0.142367	20190818
T8182128.15#	LABO	41.9355	MID	80.6452	31	0.0233468	20190818
T8182128.30#	MYSO	79.4118	MYOTIS	79.4118	34	0.525849	20190818
T8182128.55#	LANO	38.8889	LOW	83.3333	18	0.166894	20190818
T8182129.17#	LANO	50	LOW	100	24	0.422608	20190818
T8182129.47#	PESU	60	MID	70	10	0.406994	20190818
T8182131.27#	NYHU	62.5	MID	100	24	0.574582	20190818
T8182133.17#	PESU	95.2381	MID	100	21	0.936843	20190818
T8182134.46#	UNKN		LOW	100	5		20190818
T8182138.27#	PESU	69.5652	MID	69.5652	23	0.479205	20190818
T8182138.47#	LANO	84.6154	LOW	100	13	0.623058	20190818
T8182139.11#	PESU	100	MID	100	25	0.98223	20190818
T8182141.11#	EPFU	68.0556	LOW	100	72	0.398405	20190818
T8182142.37#	PESU	100	MID	100	7	0.967679	20190818
T8182143.37#	MYLE	50	MYOTIS	83.3333	6	0.383686	20190818
T8182145.01#	UNKN		MID	36.3636	44		20190818
T8182145.16#	MYSO	66.6667	MYOTIS	88.8889	9	0.570582	20190818
T8182148.26#	PESU	100	MID	100	7	0.964295	20190818
T8182148.42#	PESU	100	MID	100	15	0.919755	20190818
T8182150.03#	PESU	100	MID	100	26	0.942934	20190818
T8182151.41#	MYLU	66.6667	MYOTIS	66.6667	9	0.397155	20190818
T8182152.49#	PESU	100	MID	100	17	0.964263	20190818
T8182153.25#	NYHU	58.8235	MID	88.2353	17	0.390969	20190818
T8182156.51#	MYLE	42.8571	MYOTIS	64.2857	14	0.269429	20190818
T8182159.30#	NYHU	56.5217	MID	100	23	0.494871	20190818
T8182202.48#	UNKN		MYOTIS	62.5	8		20190818
T8182203.10#	PESU	96.7742	MID	96.7742	31	0.913294	20190818
T8182204.57#	LABO	80	MID	80	15	0.595197	20190818
T8182206.12#	MYLU	88.8889	MYOTIS	88.8889	9	0.444458	20190818
T8182208.27#	PESU	100	MID	100	24	0.988191	20190818
T8182209.37#	PESU	100	MID	100	5	0.952702	20190818
T8182213.25#	PESU	50	MID	70	10	0.342181	20190818
T8182214.03#	NYHU	72.7273	MID	100	11	0.607993	20190818
T8182216.33#	PESU	73.3333	MID	93.3333	15	0.655972	20190818
T8182217.11#	PESU	96.4286	MID	100	28	0.948277	20190818
T8182224.17#	PESU	100	MID	100	6	0.949652	20190818
T8182231.34#	PESU	91.6667	MID	100	12	0.890103	20190818
T8182237.49#	PESU	100	MID	100	33	0.990295	20190818
T8182244.53#	UNKN		MYOTIS	85.7143	14		20190818
T8182248.40#	LANO	27.2727	LOW	90.9091	11	0.0381229	20190818
T8182250.02#	LABO	60	MID	100	5	0.23063	20190818
T8182254.54#	MYLU	61.5385	MYOTIS	61.5385	13	0.287172	20190818
T8182304.30#	LANO	93.3333	LOW	100	15	0.81439	20190818
T8182311.30#	PESU	66.6667	MID	75	12	0.396776	20190818
T8182311.44#	LABO	57.1429	MID	100	7	0.280084	20190818
T8182313.45#	PESU	100	MID	100	11	0.918522	20190818
T8182315.59#	NYHU	71.4286	MID	100	14	0.60708	20190818
T8182320.10#	LANO	70.5882	LOW	100	17	0.598577	20190818
T8182326.01#	NYHU	50	MID	83.3333	6	0.285604	20190818
T8182331.58#	MYSO	40	MYOTIS	40	5	0.127471	20190818
T8182335.34#	PESU	100	MID	100	15	0.98085	20190818
T8182340.11#	NYHU	83.3333	MID	100	6	0.713622	20190818
T8182340.34#	PESU	100	MID	100	5	0.947163	20190818
T8182342.21#	NYHU	85.7143	MID	85.7143	7	0.608361	20190818

T8182350.06#	LABO	33.3333	MID	60	15	0.121682	20190818
T8182351.58#	PESU	95.4545	MID	95.4545	22	0.895891	20190818
T8182354.49#	PESU	38.0952	MID	45.2381	42	0.154662	20190818
T8182356.52#	LABO	60	MID	60	5	0.300067	20190818
T8190000.34#	NYHU	62.5	MID	100	8	0.557276	20190818
T8190005.34#	LANO	75	LOW	75	12	0.53492	20190818
T8190008.13#	NYHU	83.3333	MID	100	6	0.73464	20190818
T8190013.51#	LACI	77.7778	LOW	77.7778	18	0.594804	20190818
T8190020.44#	LACI	50	LOW	60	20	0.153632	20190818
T8190024.39#	UNKN		MID	66.6667	6		20190818
T8190026.43#	MYLU	33.3333	MYOTIS	83.3333	6	0.267672	20190818
T8190027.21#	LABO	60	MID	80	5	0.183096	20190818
T8190029.43#	MYLU	41.6667	MYOTIS	66.6667	12	0.270892	20190818
T8190034.19#	LABO	60	MID	100	5	0.104034	20190818
T8190042.52#	LACI	100	LOW	100	7	0.42736	20190818
T8190104.46#	PESU	57.1429	MID	71.4286	7	0.391354	20190818
T8190108.50#	LABO	57.1429	MID	85.7143	7	0.250128	20190818
T8190115.00#	PESU	95.2381	MID	100	21	0.941315	20190818
T8190135.06#	PESU	73.3333	MID	84.4444	45	0.607829	20190818
T8190136.53#	LANO	91.6667	LOW	100	12	0.896537	20190818
T8190139.30#	NYHU	50	MID	100	6	0.0629243	20190818
T8190142.17#	UNKN		MID	40	5		20190818
T8190143.08#	LABO	62.5	MID	100	8	0.020175	20190818
T8190150.06#	LANO	62	LOW	100	50	0.503791	20190818
T8190150.21#	LANO	63.6364	LOW	100	33	0.573551	20190818
T8190150.39#	LANO	65.8537	LOW	100	41	0.625593	20190818
T8190154.04#	PESU	60	MID	60	5	0.330561	20190818
T8190200.57#	PESU	100	MID	100	17	0.983437	20190818
T8190201.33#	NYHU	83.3333	MID	100	6	0.740932	20190818
T8190202.31#	PESU	94.4444	MID	94.4444	18	0.88019	20190818
T8190203.44#	PESU	60.9756	MID	73.1707	41	0.437052	20190818
T8190203.59#	PESU	73.5294	MID	73.5294	34	0.525379	20190818
T8190204.36#	MYLU	66.6667	MYOTIS	83.3333	6	0.523536	20190818
T8190205.00#	PESU	100	MID	100	14	0.977687	20190818
T8190207.52#	LABO	44.4444	MID	66.6667	9	0.108894	20190818
T8190212.21#	LANO	55.7692	LOW	94.2308	52	0.430508	20190818
T8190215.36#	LANO	70	LOW	100	20	0.621542	20190818
T8190225.50#	NYHU	60	MID	100	5	0.53397	20190818
T8190236.18#	LABO	33.3333	MID	50	6	0.139365	20190818
T8190238.15#	UNKN		MID	57.1429	7		20190818
T8190239.07#	PESU	50	MID	50	6	0.236738	20190818
T8190244.20#	EPFU	20	LOW	40	10	0.0372253	20190818
T8190244.51#	PESU	100	MID	100	58	0.994605	20190818
T8190245.24#	PESU	100	MID	100	36	0.976594	20190818
T8190245.45#	PESU	94.5946	MID	94.5946	37	0.866093	20190818
T8190247.47#	PESU	100	MID	100	5	0.956302	20190818
T8190247.55#	PESU	100	MID	100	15	0.984425	20190818
T8190251.41#	LABO	61.5385	MID	92.3077	13	0.25581	20190818
T8190253.43#	PESU	58.3333	MID	85.4167	48	0.49375	20190818
T8190254.03#	PESU	55.102	MID	69.3878	98	0.222494	20190818
T8190254.29#	PESU	54.2373	MID	67.7966	59	0.161352	20190818
T8190254.55#	PESU	57.1429	MID	69.0476	42	0.23236	20190818
T8190256.44#	MYSE	55.5556	MYOTIS	83.3333	18	0.440004	20190818
T8190258.33#	PESU	60	MID	95	20	0.524771	20190818
T8190258.44#	UNKN		MYOTIS	71.4286	7		20190818
T8190259.13#	LACI	47.2222	LOW	50	36	0.222755	20190818
T8190300.44#	EPFU	97.0149	LOW	100	67	0.143066	20190818
T8190303.34#	PESU	94.5946	MID	97.2973	37	0.910461	20190818
T8190305.02#	NYHU	66.6667	MID	100	6	0.618452	20190818
T8190305.45#	LABO	40	MID	40	15	0.135379	20190818

T8190306.13#	PESU	94.8718	MID	97.4359	39	0.915535	20190818
T8190306.24#	MYLU	50	MYOTIS	50	10	0.00995511	20190818
T8190306.32#	NYHU	44	MID	84	25	0.31369	20190818
T8190307.10#	EPFU	50	LOW	83.3333	6	0.366171	20190818
T8190310.13#	MYLU	45.4545	MYOTIS	54.5455	11	0.242775	20190818
T8190310.29#	UNKN		MYOTIS	60	5		20190818
T8190311.15#	UNKN		MID	57.1429	7		20190818
T8190313.55#	PESU	90.4762	MID	95.2381	63	0.855525	20190818
T8190314.58#	NYHU	66.6667	MID	100	6	0.618302	20190818
T8190317.14#	LABO	36	MID	60	25	0.0878646	20190818
T8190318.33#	PESU	84.6154	MID	92.3077	26	0.773497	20190818
T8190319.17#	PESU	78.5714	MID	85.7143	28	0.666083	20190818
T8190319.30#	PESU	50	MID	50	6	0.229106	20190818
T8190321.57#	LABO	46.1538	MID	92.3077	13	0.135712	20190818
T8190322.54#	MYSO	33.3333	MYOTIS	77.7778	9	0.251568	20190818
T8190323.55#	MYLU	60	MYOTIS	60	5	0.30679	20190818
T8190324.37#	NYHU	38.4615	MID	76.9231	13	0.280161	20190818
T8190325.25#	NYHU	40	MID	40	5	0.148374	20190818
T8190327.58#	PESU	83.3333	MID	100	24	0.756316	20190818
T8190329.47#	PESU	40	MID	70	10	0.271348	20190818
T8190330.11#	NYHU	50	MID	100	14	0.452208	20190818
T8190330.21#	UNKN		MID	75.8621	29		20190818
T8190330.36#	PESU	50	MID	71.4286	14	0.349053	20190818
T8190331.10#	NYHU	80	MID	100	5	0.532012	20190818
T8190331.37#	LABO	86.6667	MID	86.6667	15	0.595091	20190818
T8190335.47#	UNKN		MID	44.4444	9		20190818
T8190339.03#	LABO	50	MID	50	8	0.212283	20190818
T8190340.28#	LABO	50	MID	83.3333	6	0.116149	20190818
T8190341.00#	LANO	61.5385	LOW	100	13	0.326612	20190818
T8190342.15#	PESU	83.3333	MID	94.4444	18	0.775472	20190818
T8190342.39#	PESU	90.9091	MID	90.9091	22	0.807509	20190818
T8190344.35#	NYHU	42.8571	MID	95.2381	21	0.302659	20190818
T8190345.35#	LABO	42.8571	MID	75	28	0.165177	20190818
T8190345.50#	PESU	43.1373	MID	62.7451	51	0.264499	20190818
T8190346.05#	PESU	87.5	MID	87.5	8	0.641971	20190818
T8190347.32#	NYHU	57.1429	MID	100	14	0.528672	20190818
T8190349.15#	LABO	55.5556	MID	100	9	0.0284485	20190818
T8190349.32#	LABO	42.8571	MID	78.5714	14	0.172689	20190818
T8190350.00#	MYLE	60	MYOTIS	60	5	0.342306	20190818
T8190350.27#	NYHU	65.3846	MID	100	26	0.55971	20190818
T8190352.05#	LABO	43.75	MID	62.5	16	0.0677895	20190818
T8190352.36#	LACI	70.3704	LOW	77.7778	54	0.432324	20190818
T8190353.10#	LANO	91.6667	LOW	100	12	0.650116	20190818
T8190355.00#	MYLE	42.8571	MYOTIS	57.1429	7	0.179466	20190818
T8190356.11#	PESU	65.2174	MID	91.3043	23	0.557316	20190818
T8190356.23#	PESU	66.6667	MID	100	9	0.649509	20190818
T8190357.52#	LABO	83.3333	MID	100	6	0.528645	20190818
T8190358.18#	LABO	87.5	MID	100	8	0.219517	20190818
T8190359.04#	PESU	83.3333	MID	83.3333	6	0.167846	20190818
T8190359.58#	PESU	91.6667	MID	95.8333	24	0.866437	20190818
T8190400.21#	NYHU	78.7879	MID	100	33	0.654807	20190818
T8190400.53#	LABO	33.3333	MID	50	12	0.0762578	20190818
T8190401.17#	MYSO	83.3333	MYOTIS	83.3333	12	0.0770315	20190818
T8190402.26#	LABO	80	MID	80	5	0.123414	20190818
T8190405.25#	NYHU	57.1429	MID	100	7	0.512418	20190818
T8190405.41#	PESU	66.6667	MID	88.0952	42	0.580884	20190818
T8190406.25#	NYHU	54.1667	MID	100	24	0.487212	20190818
T8190406.36#	MYLU	55.5556	MYOTIS	55.5556	9	0.0355447	20190818
T8190406.52#	PESU	53.8462	MID	76.9231	13	0.0751919	20190818
T8190408.23#	PESU	80	MID	100	5	0.641381	20190818

T8190410.51#	LABO	33.3333	MID	50	6	0.0524924	20190818				
T8190414.05#	PESU	91.6667	MID	97.2222	36	0.880543	20190818				
T8190421.16#	LACI	94.7368	LOW	94.7368	19	0.782475	20190818				
T8190424.16#	PESU	52.9412	MID	94.1176	17	0.22232	20190818				
T8190425.13#	PESU	100	MID	100	11	0.978113	20190818				
T8190430.20#	MYLE	66.6667	MYOTIS	83.3333	6	0.525683	20190818				
T8190430.58#	MYLU	60	MYOTIS	80	5	0.457472	20190818				
T8190432.03#	LABO	38.8889	MID	66.6667	18	0.133999	20190818				
T8190432.15#	NYHU	50	MID	91.6667	12	0.365484	20190818				
T8190432.30#	LANO	51.7241	LOW	100	29	0.475182	20190818				
T8190433.11#	PESU	100	MID	100	15	0.971673	20190818				
T8190433.34#	LABO	77.7778	MID	88.8889	9	0.150277	20190818				
T8190433.54#	LABO	42.8571	MID	42.8571	7	0.105655	20190818				
T8190435.22#	EPFU	66.6667	LOW	88.8889	9	0.0274044	20190818				
T8190435.58#	PESU	100	MID	100	21	0.964259	20190818				
T8190436.55#	LABO	35.8974	MID	66.6667	39	0.105682	20190818				
T8190438.38#	PESU	60	MID	80	5	0.457585	20190818				
T8190439.33#	NYHU	40.7407	MID	81.4815	27	0.276003	20190818				
T8190439.58#	LABO	75	MID	75	8	0.138127	20190818				
T8190440.15#	LABO	72.2222	MID	100	18	0.294864	20190818				
T8190440.31#	MYSE	56	MYOTIS	64	25	0.353272	20190818				
T8190441.50#	LABO	33.3333	MID	66.6667	9	0.0952854	20190818				
T8190442.24#	PESU	71.4286	MID	71.4286	7	0.486665	20190818				
T8190442.40#	UNKN		LOW	50	52		20190818				
T8190444.33#	PESU	96.5517	MID	96.5517	29	0.92211	20190818				
T8190446.41#	LABO	50	MID	100	8	0.224041	20190818				
T8190449.04#	LABO	33.3333	MID	50	6	0.0275286	20190818				
T8190449.21#	LABO	42.8571	MID	71.4286	7	0.132513	20190818				
T8190450.13#	PESU	94.4444	MID	94.4444	36	0.871972	20190818				
T8190452.07#	LABO	66.6667	MID	66.6667	6	0.150869	20190818				
T8190455.13#	LABO	60	MID	100	5	0.410847	20190818				
T8190500.38#	LABO	50	MID	70	10	0.0476007	20190818				
T8190501.25#	NYHU	50	MID	87.5	40	0.341723	20190818				
T8190501.45#	NYHU	77.7778	MID	100	9	0.315305	20190818				
T8190502.32#	PESU	100	MID	100	41	0.990624	20190818				
T8190503.30#	LANO	35	LOW	85	20	0.137337	20190818				
T8190504.11#	EPFU	57.1429	LOW	82.1429	28	0.0498796	20190818				
T8190504.41#	PESU	76.4706	MID	100	17	0.753959	20190818				
T8190514.57#	LANO	54.5455	LOW	100	22	0.513646	20190818				
T8190515.11#	PESU	100	MID	100	20	0.97567	20190818				
T8190524.21#	PESU	100	MID	100	8	0.969678	20190818				
T8190527.09#	UNKN		MID	80	10		20190818				
T8190529.50#	PESU	83.3333	MID	100	24	0.812738	20190818				
T8190532.51#	UNKN		UNKN		11		20190818				
T8190534.15#	LABO	100	MID	100	6	0.362754	20190818				
T8190536.12#	PESU	92.5926	MID	100	27	0.916776	20190818				
T8190543.47#	LANO	71.4286	LOW	85.7143	7	0.557843	20190818				
T8190557.15#	NYHU	57.1429	MID	100	14	0.514008	20190818				
T8190557.30#	NYHU	57.7778	MID	100	45	0.52991	20190818				
T8190557.56#	NYHU	60	MID	100	40	0.529014	20190818				
T8190558.09#	NYHU	53.8462	MID	94.8718	39	0.460564	20190818				
T8190558.36#	NYHU	70	MID	100	30	0.63955	20190818				
T8190601.07#	NYHU	66.6667	MID	100	12	0.625149	20190818				
T8190614.57#	PESU	100	MID	100	20	0.982747	20190818				
T8190623.10#	NYHU	60	MID	100	5	0.547171	20190818				
T8190626.07#	NYHU	56	MID	100	25	0.488783	20190818				
IDENTIFICATION SUMMARY											
ID	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLE**	**MYLU**	**MYSE**	**MYSO**	**NYHU**	**PESU**	**UNKN**
N	6	22	50	10	5	12	3	5	46	81	17
%	2.33	8.56	19.46	3.89	1.95	4.67	1.17	1.95	17.90	31.52	6.61
MLE (p)	0.033554	0.000001	0.000001	0.000001	0.000001	0.000001	0.013603	0.001239	0.000001	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8192019.17#	NYHU	66.6667	MID	100	18	0.630972	20190819
T8192019.43#	LABO	50	MID	100	18	0.0463041	20190819
T8192020.00#	LABO	70	MID	70	10	0.106125	20190819
T8192021.37#	LABO	85.7143	MID	85.7143	7	0.146351	20190819
T8192021.50#	LABO	100	MID	100	8	0.160252	20190819
T8192029.56#	PESU	88.4615	MID	96.1538	26	0.84014	20190819
T8192030.29#	PESU	96.2963	MID	100	27	0.953086	20190819
T8192030.40#	PESU	91.6667	MID	95.8333	24	0.867542	20190819
T8192031.19#	NYHU	59.0909	MID	100	22	0.453245	20190819
T8192033.57#	PESU	94.7368	MID	100	19	0.934382	20190819
T8192044.28#	LABO	52.9412	MID	100	17	0.141086	20190819
T8192046.13#	LABO	61.9048	MID	100	21	0.0760283	20190819
T8192048.00#	PESU	95.2381	MID	95.2381	21	0.895841	20190819
T8192048.21#	PESU	59.4937	MID	63.2911	79	0.37545	20190819
T8192048.36#	LACI	52.7778	LOW	52.7778	36	0.0679529	20190819
T8192048.49#	EPFU	60	LOW	60	10	0.294482	20190819
T8192049.04#	PESU	67.4419	MID	88.3721	43	0.574193	20190819
T8192049.16#	PESU	83.3333	MID	100	30	0.814852	20190819
T8192049.29#	PESU	86.9565	MID	100	23	0.842021	20190819
T8192049.43#	PESU	90.3226	MID	95.1613	62	0.842531	20190819
T8192050.00#	PESU	80	MID	100	5	0.761492	20190819
T8192050.17#	PESU	58.1395	MID	88.3721	43	0.462868	20190819
T8192050.42#	PESU	65.9574	MID	97.8723	47	0.626525	20190819
T8192051.13#	PESU	100	MID	100	8	0.901721	20190819
T8192051.31#	PESU	75.9259	MID	94.4444	54	0.698438	20190819
T8192052.49#	PESU	83.3333	MID	95.8333	48	0.780396	20190819
T8192053.17#	PESU	69.4737	MID	88.4211	95	0.592867	20190819
T8192053.40#	PESU	73.2394	MID	97.1831	71	0.693287	20190819
T8192053.58#	PESU	71.7391	MID	84.7826	46	0.589977	20190819
T8192054.13#	PESU	82.4561	MID	98.2456	57	0.794653	20190819
T8192054.28#	PESU	62	MID	92	50	0.548695	20190819
T8192054.54#	PESU	35.7143	MID	53.5714	56	0.190553	20190819
T8192055.09#	PESU	59.5745	MID	78.7234	47	0.449275	20190819
T8192055.30#	PESU	70.3704	MID	85.1852	27	0.588671	20190819
T8192055.41#	LANO	62.5	LOW	100	8	0.334263	20190819
T8192056.19#	LACI	83.3333	LOW	91.6667	12	0.455431	20190819
T8192056.47#	PESU	61.2903	MID	90.3226	62	0.522273	20190819
T8192057.01#	NYHU	54.1667	MID	100	48	0.424627	20190819
T8192057.16#	PESU	50.5618	MID	78.6517	89	0.374578	20190819
T8192057.29#	PESU	86.3636	MID	86.3636	22	0.711472	20190819
T8192057.51#	NYHU	66.6667	MID	100	27	0.512657	20190819
T8192058.19#	PESU	79.0698	MID	97.6744	43	0.72593	20190819
T8192058.49#	PESU	66	MID	92	50	0.586316	20190819
T8192059.03#	PESU	48.9796	MID	77.551	49	0.343187	20190819
T8192059.34#	PESU	83.6735	MID	93.8776	49	0.771955	20190819
T8192100.00#	PESU	83.3333	MID	87.8788	66	0.698205	20190819
T8192100.57#	PESU	74.5098	MID	90.1961	51	0.640789	20190819
T8192101.11#	LANO	100	LOW	100	29	0.973174	20190819
T8192101.45#	LABO	47.3684	MID	100	19	0.154242	20190819
T8192102.07#	LABO	30	MID	50	10	0.075535	20190819
T8192102.56#	PESU	75.5102	MID	93.8776	49	0.675378	20190819
T8192103.13#	MYLE	52.6316	MYOTIS	63.1579	19	0.311822	20190819
T8192103.28#	PESU	63.6364	MID	86.3636	22	0.542347	20190819
T8192105.45#	PESU	60	MID	88	25	0.515393	20190819
T8192106.13#	PESU	87.5	MID	100	8	0.840201	20190819
T8192106.48#	NYHU	64.7059	MID	100	17	0.265277	20190819
T8192107.24#	LABO	37.5	MID	62.5	8	0.171765	20190819
T8192109.56#	MYLE	43.3333	MYOTIS	66.6667	30	0.27831	20190819
T8192111.27#	MYSE	50	MYOTIS	92.8571	14	0.443803	20190819

T8192112.14#	EPFU	75	LOW	100	20	0.201928	20190819
T8192113.04#	EPFU	70	LOW	70	10	0.214996	20190819
T8192113.20#	LACI	71.4286	LOW	71.4286	7	0.211847	20190819
T8192113.27#	NYHU	46.1538	MID	84.6154	13	0.370064	20190819
T8192113.59#	LACI	42.8571	LOW	100	7	0.0318613	20190819
T8192116.07#	NYHU	35.4545	MID	53.6364	110	0.186788	20190819
T8192116.25#	LANO	61.1111	LOW	100	18	0.482076	20190819
T8192117.27#	LANO	77.2727	LOW	100	22	0.707659	20190819
T8192120.24#	PESU	100	MID	100	19	0.986506	20190819
T8192121.01#	LABO	75	MID	75	16	0.4689	20190819
T8192122.40#	PESU	18.75	MID	31.25	16	0.0426497	20190819
T8192123.26#	PESU	54.5455	MID	54.5455	33	0.295162	20190819
T8192123.46#	LANO	94.7368	LOW	100	19	0.895972	20190819
T8192123.58#	LANO	78.5714	LOW	78.5714	14	0.554934	20190819
T8192129.03#	NYHU	66.6667	MID	100	12	0.62977	20190819
T8192130.08#	LABO	63.6364	MID	81.8182	11	0.122526	20190819
T8192130.29#	EPFU	67.3913	LOW	91.3043	46	0.124721	20190819
T8192130.58#	MYLU	57.1429	MYOTIS	57.1429	7	0.0611794	20190819
T8192131.22#	MYSO	45.8333	MYOTIS	58.3333	24	0.175695	20190819
T8192132.07#	MYLU	60	MYOTIS	80	5	0.459112	20190819
T8192132.49#	MYLU	50	MYOTIS	50	14	0.0717136	20190819
T8192133.24#	EPFU	54.5455	LOW	100	11	0.122853	20190819
T8192134.11#	PESU	100	MID	100	8	0.872901	20190819
T8192134.19#	PESU	86.9565	MID	91.3043	46	0.776222	20190819
T8192134.52#	NYHU	60	MID	100	5	0.550818	20190819
T8192135.42#	MYLU	80	MYOTIS	80	5	0.566316	20190819
T8192135.55#	LACI	79.3103	LOW	93.1034	29	0.451093	20190819
T8192136.09#	NYHU	50	MID	75	8	0.0259981	20190819
T8192136.48#	MYSO	50	MYOTIS	83.3333	6	0.396415	20190819
T8192137.28#	UNKN		UNKN		6		20190819
T8192137.44#	LABO	45.4545	MID	63.6364	11	0.0714044	20190819
T8192138.47#	MYLU	50	MYOTIS	66.6667	6	0.294808	20190819
T8192140.22#	PESU	100	MID	100	9	0.97075	20190819
T8192141.19#	LACI	43.75	LOW	100	16	0.0119721	20190819
T8192141.34#	LACI	66.6667	LOW	83.3333	6	0.108499	20190819
T8192143.28#	PESU	71.4286	MID	100	7	0.685414	20190819
T8192148.59#	PESU	80	MID	100	5	0.753315	20190819
T8192151.10#	PESU	89.1892	MID	91.8919	37	0.771457	20190819
T8192152.14#	MYLU	57.1429	MYOTIS	57.1429	7	0.288528	20190819
T8192153.36#	PESU	100	MID	100	5	0.946396	20190819
T8192154.02#	PESU	100	MID	100	26	0.987329	20190819
T8192155.02#	LABO	42.8571	MID	57.1429	7	0.193169	20190819
T8192156.09#	PESU	73.913	MID	91.3043	23	0.658779	20190819
T8192156.34#	UNKN		MID	40	5		20190819
T8192200.38#	PESU	100	MID	100	17	0.980673	20190819
T8192203.52#	NYHU	60	MID	100	5	0.44312	20190819
T8192204.27#	MYLU	33.3333	MYOTIS	58.3333	12	0.190827	20190819
T8192206.04#	PESU	100	MID	100	15	0.979306	20190819
T8192207.33#	PESU	100	MID	100	26	0.989173	20190819
T8192208.25#	LANO	91.1765	LOW	100	34	0.76967	20190819
T8192209.34#	LANO	50	LOW	71.4286	14	0.335516	20190819
T8192210.21#	PESU	88.8889	MID	100	9	0.851684	20190819
T8192211.02#	NYHU	53.8462	MID	84.6154	13	0.0681598	20190819
T8192211.21#	EPFU	91.6667	LOW	97.2222	36	0.35559	20190819
T8192212.12#	PESU	60	MID	60	5	0.22001	20190819
T8192212.53#	PESU	86.3636	MID	95.4545	22	0.782878	20190819
T8192213.15#	LABO	50	MID	83.3333	6	0.0200954	20190819
T8192213.34#	EPFU	59.0909	LOW	90.9091	22	0.100751	20190819
T8192214.18#	NYHU	60	MID	100	5	0.066377	20190819
T8192216.30#	PESU	100	MID	100	23	0.988395	20190819

T8192219.16#	LACI	92.3077	LOW	92.3077	13	0.563847	20190819
T8192219.31#	LACI	70	LOW	70	30	0.180127	20190819
T8192220.50#	LABO	22.5806	MID	51.6129	31	0.083662	20190819
T8192222.35#	PESU	100	MID	100	19	0.987888	20190819
T8192223.57#	LACI	100	LOW	100	19	0.747722	20190819
T8192229.09#	LACI	61.1111	LOW	61.1111	18	0.339283	20190819
T8192233.51#	MYLU	60	MYOTIS	60	5	0.015209	20190819
T8192234.05#	PESU	100	MID	100	9	0.974465	20190819
T8192234.22#	PESU	36.8421	MID	47.3684	19	0.171348	20190819
T8192234.43#	PESU	100	MID	100	32	0.986797	20190819
T8192237.59#	PESU	44.4444	MID	44.4444	9	0.192402	20190819
T8192239.01#	PESU	94.4444	MID	100	18	0.919218	20190819
T8192239.56#	PESU	100	MID	100	16	0.983419	20190819
T8192241.52#	LACI	100	LOW	100	13	0.966278	20190819
T8192242.11#	PESU	70	MID	80	10	0.300072	20190819
T8192243.23#	PESU	72.2222	MID	88.8889	36	0.634538	20190819
T8192245.04#	PESU	100	MID	100	24	0.978548	20190819
T8192245.37#	PESU	100	MID	100	8	0.971347	20190819
T8192245.57#	LABO	60	MID	80	5	0.116075	20190819
T8192250.47#	NYHU	50	MID	95	20	0.110347	20190819
T8192251.04#	LABO	53.8462	MID	53.8462	13	0.194164	20190819
T8192251.22#	LABO	44.4444	MID	100	9	0.121439	20190819
T8192252.14#	MYLE	66.6667	MYOTIS	66.6667	6	0.425405	20190819
T8192255.01#	PESU	100	MID	100	25	0.988336	20190819
T8192255.32#	PESU	100	MID	100	15	0.97957	20190819
T8192256.00#	PESU	57.1429	MID	60	35	0.340524	20190819
T8192256.15#	PESU	100	MID	100	20	0.954943	20190819
T8192256.46#	PESU	88	MID	88	25	0.753617	20190819
T8192257.01#	PESU	100	MID	100	32	0.982337	20190819
T8192257.16#	PESU	100	MID	100	8	0.958365	20190819
T8192257.34#	PESU	100	MID	100	32	0.979898	20190819
T8192257.52#	PESU	85.7143	MID	89.2857	28	0.752827	20190819
T8192258.15#	LABO	57.1429	MID	100	7	0.316402	20190819
T8192258.49#	PESU	93.3333	MID	93.3333	15	0.857638	20190819
T8192259.07#	PESU	100	MID	100	17	0.97273	20190819
T8192301.02#	LABO	56	MID	56	25	0.297003	20190819
T8192301.26#	MYSO	57.5758	MYOTIS	57.5758	33	0.0329531	20190819
T8192301.41#	MYSE	27.5862	MYOTIS	75.8621	29	0.206881	20190819
T8192301.56#	MYLE	57.1429	MYOTIS	71.4286	7	0.386274	20190819
T8192302.11#	MYSO	62.5	MYOTIS	62.5	16	0.276922	20190819
T8192302.26#	PESU	32.5843	MID	51.6854	89	0.166409	20190819
T8192303.01#	LANO	45.9459	LOW	86.4865	37	0.372695	20190819
T8192303.16#	LANO	68.8889	LOW	93.3333	45	0.48193	20190819
T8192303.31#	MYSO	61.9048	MYOTIS	61.9048	84	0.198278	20190819
T8192303.46#	PESU	51.5152	MID	63.6364	33	0.316966	20190819
T8192304.03#	EPFU	23.3333	LOW	43.3333	30	0.0295454	20190819
T8192304.18#	PESU	66.6667	MID	77.7778	9	0.47491	20190819
T8192305.22#	LABO	16.6667	MID	45.8333	24	0.0596175	20190819
T8192305.38#	PESU	83.3333	MID	83.3333	6	0.542493	20190819
T8192307.47#	EPFU	48.8372	LOW	93.0233	43	0.293922	20190819
T8192308.02#	LACI	42.1053	LOW	75.4386	57	0.0595309	20190819
T8192308.17#	EPFU	20	LOW	45	20	0.0391918	20190819
T8192308.59#	EPFU	34.6535	LOW	53.4653	101	0.00692403	20190819
T8192309.15#	EPFU	34.8837	LOW	46.5116	43	0.00518477	20190819
T8192310.02#	EPFU	30.7692	LOW	69.2308	13	0.09619	20190819
T8192311.44#	PESU	35.2941	MID	41.1765	17	0.104662	20190819
T8192311.59#	MYSO	44.4444	MYOTIS	66.6667	9	0.0705467	20190819
T8192313.22#	EPFU	40	LOW	75	20	0.15052	20190819
T8192313.39#	EPFU	29.0909	LOW	52.7273	110	0.0679668	20190819
T8192313.54#	UNKN		UNKN		27		20190819

T8192314.59#	NYHU	50	MID	100	12	0.0682718	20190819
T8192315.21#	NYHU	60.8696	MID	100	23	0.571087	20190819
T8192315.39#	LANO	88.8889	LOW	100	9	0.796889	20190819
T8192316.02#	EPFU	38.4615	LOW	76.9231	13	0.221163	20190819
T8192316.17#	PESU	33.9623	MID	49.0566	53	0.161927	20190819
T8192316.52#	LABO	80	MID	80	15	0.512241	20190819
T8192317.36#	EPFU	31.0345	LOW	55.1724	29	0.0607344	20190819
T8192317.51#	PESU	51.4286	MID	62.8571	35	0.32113	20190819
T8192318.24#	LABO	23.6842	MID	31.5789	38	0.00776986	20190819
T8192321.39#	MYLE	57.1429	MYOTIS	71.4286	7	0.383605	20190819
T8192322.45#	NYHU	50	MID	100	14	0.0444449	20190819
T8192324.58#	LANO	91.6667	LOW	100	12	0.308101	20190819
T8192328.33#	MYLU	44.4444	MYOTIS	72.2222	18	0.316927	20190819
T8192330.53#	LABO	66.6667	MID	66.6667	9	0.421312	20190819
T8192331.15#	LABO	33.3333	MID	50	6	0.0770287	20190819
T8192331.39#	PESU	55.8824	MID	79.4118	34	0.439188	20190819
T8192331.59#	PESU	100	MID	100	35	0.989545	20190819
T8192332.25#	PESU	93.3333	MID	96.6667	30	0.787539	20190819
T8192333.10#	LABO	27.2727	MID	45.4545	22	0.0215907	20190819
T8192333.41#	PESU	96	MID	100	25	0.935742	20190819
T8192337.47#	PESU	100	MID	100	12	0.959818	20190819
T8192343.51#	LABO	83.3333	MID	83.3333	12	0.526238	20190819
T8192346.51#	MYLE	40	MYOTIS	100	5	0.361786	20190819
T8192347.52#	NYHU	61.1111	MID	100	18	0.548077	20190819
T8192350.37#	NYHU	59.0909	MID	100	22	0.454417	20190819
T8192353.10#	LABO	71.4286	MID	100	7	0.146611	20190819
T8192356.44#	NYHU	100	MID	100	7	0.946647	20190819
T8192357.46#	NYHU	80	MID	80	5	0.301054	20190819
T8200002.22#	PESU	50	MID	66.6667	6	0.31963	20190819
T8200002.41#	LABO	62.5	MID	87.5	8	0.0444589	20190819
T8200003.58#	PESU	86.6667	MID	86.6667	15	0.718425	20190819
T8200006.25#	PESU	94.7368	MID	94.7368	19	0.885308	20190819
T8200007.30#	PESU	86.6667	MID	93.3333	15	0.795745	20190819
T8200013.33#	NYHU	77.7778	MID	100	18	0.293262	20190819
T8200014.29#	LABO	66.6667	MID	66.6667	6	0.105275	20190819
T8200016.23#	MYSE	66.6667	MYOTIS	77.7778	9	0.471643	20190819
T8200016.49#	PESU	40	MID	60	5	0.222878	20190819
T8200017.50#	MYSO	62.5	MYOTIS	75	8	0.362069	20190819
T8200022.03#	PESU	100	MID	100	22	0.988176	20190819
T8200026.56#	PESU	70	MID	75	20	0.23467	20190819
T8200027.10#	LANO	71.4286	LOW	71.4286	7	0.49152	20190819
T8200027.26#	LANO	86.6667	LOW	100	15	0.846882	20190819
T8200028.47#	PESU	100	MID	100	44	0.988234	20190819
T8200034.12#	EPFU	57.1429	LOW	92.8571	14	0.0965653	20190819
T8200039.08#	PESU	100	MID	100	5	0.953358	20190819
T8200039.25#	PESU	100	MID	100	15	0.984478	20190819
T8200044.02#	PESU	100	MID	100	6	0.961359	20190819
T8200045.51#	PESU	100	MID	100	21	0.989039	20190819
T8200055.51#	LABO	40	MID	70	10	0.235393	20190819
T8200104.29#	MYLU	40	MYOTIS	60	5	0.229593	20190819
T8200106.17#	EPFU	71.4286	LOW	100	7	0.682445	20190819
T8200108.22#	PESU	60	MID	60	5	0.204978	20190819
T8200115.06#	PESU	63.8298	MID	74.4681	47	0.467309	20190819
T8200116.50#	NYHU	55.5556	MID	100	18	0.497197	20190819
T8200119.00#	LABO	47.0588	MID	82.3529	17	0.0945276	20190819
T8200120.39#	PESU	50	MID	50	6	0.114061	20190819
T8200120.48#	PESU	94.1176	MID	100	17	0.922504	20190819
T8200121.34#	PESU	83.3333	MID	100	6	0.780599	20190819
T8200127.19#	LACI	60	LOW	60	5	0.343199	20190819
T8200128.17#	PESU	100	MID	100	17	0.985164	20190819

T8200132.23#	MYLU	50	MYOTIS	50	6	0.203668	20190819
T8200134.26#	UNKN		MID	33.3333	6		20190819
T8200135.20#	LABO	64.7059	MID	76.4706	17	0.156884	20190819
T8200143.08#	PESU	91.6667	MID	100	12	0.886338	20190819
T8200144.34#	PESU	94.1176	MID	100	17	0.921116	20190819
T8200145.27#	LABO	71.4286	MID	71.4286	7	0.232065	20190819
T8200145.47#	LABO	57.1429	MID	100	7	0.134004	20190819
T8200149.12#	PESU	94.1176	MID	100	17	0.920033	20190819
T8200150.27#	PESU	100	MID	100	9	0.973414	20190819
T8200150.46#	PESU	100	MID	100	20	0.982677	20190819
T8200151.08#	PESU	93.75	MID	93.75	16	0.865606	20190819
T8200151.28#	PESU	100	MID	100	11	0.978682	20190819
T8200151.44#	PESU	100	MID	100	14	0.983443	20190819
T8200151.54#	PESU	100	MID	100	15	0.984373	20190819
T8200153.10#	PESU	90.9091	MID	90.9091	11	0.804844	20190819
T8200153.25#	PESU	100	MID	100	21	0.987901	20190819
T8200154.08#	PESU	100	MID	100	8	0.972009	20190819
T8200154.22#	PESU	100	MID	100	9	0.974042	20190819
T8200155.12#	MYLE	55.5556	MYOTIS	66.6667	9	0.355949	20190819
T8200155.21#	PESU	100	MID	100	7	0.964246	20190819
T8200155.45#	PESU	54.5455	MID	81.8182	11	0.431212	20190819
T8200202.40#	PESU	100	MID	100	25	0.990773	20190819
T8200205.48#	LABO	57.1429	MID	85.7143	7	0.115559	20190819
T8200206.17#	PESU	89.4737	MID	89.4737	19	0.7521	20190819
T8200208.21#	PESU	66.6667	MID	85.1852	27	0.550662	20190819
T8200208.51#	PESU	66.6667	MID	66.6667	6	0.428263	20190819
T8200211.56#	MYLE	25	MYOTIS	25	8	0.056662	20190819
T8200212.31#	PESU	100	MID	100	24	0.989668	20190819
T8200212.58#	PESU	93.75	MID	100	16	0.919624	20190819
T8200214.38#	PESU	40	MID	60	5	0.225246	20190819
T8200216.03#	PESU	75.6757	MID	75.6757	37	0.134005	20190819
T8200216.24#	PESU	82.3529	MID	82.3529	17	0.659476	20190819
T8200217.15#	PESU	57.1429	MID	71.4286	7	0.190641	20190819
T8200217.34#	PESU	100	MID	100	26	0.988452	20190819
T8200219.48#	LABO	66.6667	MID	66.6667	12	0.326978	20190819
T8200221.42#	EPFU	67.8571	LOW	100	28	0.28918	20190819
T8200223.20#	LABO	81.8182	MID	100	11	0.50592	20190819
T8200226.11#	LACI	43.3333	LOW	73.3333	30	0.224848	20190819
T8200227.45#	PESU	100	MID	100	16	0.985594	20190819
T8200230.45#	PESU	95.4545	MID	95.4545	44	0.891224	20190819
T8200231.18#	PESU	100	MID	100	11	0.970679	20190819
T8200231.31#	LANO	38.9831	LOW	57.6271	59	0.158823	20190819
T8200231.52#	PESU	80	MID	82	50	0.652927	20190819
T8200232.13#	PESU	100	MID	100	6	0.962693	20190819
T8200232.25#	PESU	100	MID	100	7	0.946905	20190819
T8200234.16#	PESU	74.4186	MID	74.4186	43	0.526077	20190819
T8200236.40#	PESU	95.2381	MID	100	21	0.941956	20190819
T8200240.40#	MYSO	66.6667	MYOTIS	77.7778	9	0.504978	20190819
T8200241.20#	LABO	58.3333	MID	66.6667	12	0.175279	20190819
T8200244.24#	NYHU	55.5556	MID	100	9	0.479738	20190819
T8200247.47#	PESU	100	MID	100	11	0.973986	20190819
T8200248.11#	PESU	83.3333	MID	100	6	0.801345	20190819
T8200302.36#	PESU	100	MID	100	16	0.984832	20190819
T8200310.04#	PESU	83.7209	MID	97.6744	43	0.812681	20190819
T8200310.43#	PESU	94.1176	MID	94.1176	17	0.873309	20190819
T8200314.09#	PESU	100	MID	100	6	0.963213	20190819
T8200316.31#	PESU	100	MID	100	16	0.977719	20190819
T8200327.45#	MYLU	66.6667	MYOTIS	66.6667	6	0.351821	20190819
T8200334.04#	LANO	54.5455	LOW	100	22	0.500228	20190819
T8200335.58#	NYHU	66.6667	MID	100	6	0.331294	20190819

T8200337.30#	EPFU	75	LOW	75	8	0.178337	20190819				
T8200348.20#	PESU	100	MID	100	19	0.985368	20190819				
T8200357.39#	LACI	100	LOW	100	12	0.857769	20190819				
T8200358.04#	EPFU	63.6364	LOW	63.6364	11	0.0116586	20190819				
T8200358.54#	LANO	51.8519	LOW	100	27	0.449302	20190819				
T8200402.28#	PESU	90.9091	MID	90.9091	11	0.781603	20190819				
T8200405.06#	LANO	52.6316	LOW	89.4737	19	0.418835	20190819				
T8200408.18#	PESU	100	MID	100	26	0.969657	20190819				
T8200409.45#	UNKN		MYOTIS	53.3333	15		20190819				
T8200418.34#	LANO	87.5	LOW	100	8	0.668677	20190819				
T8200424.27#	PESU	74.0741	MID	85.1852	27	0.617387	20190819				
T8200425.00#	LABO	31.5789	MID	47.3684	19	0.112926	20190819				
T8200425.23#	MYSE	85.7143	MYOTIS	100	7	0.647747	20190819				
T8200427.45#	EPFU	65	LOW	70	20	0.04355	20190819				
T8200428.19#	PESU	100	MID	100	6	0.961839	20190819				
T8200435.34#	LABO	51.5152	MID	54.5455	33	0.274897	20190819				
T8200435.56#	PESU	51.3514	MID	75.6757	37	0.356496	20190819				
T8200436.15#	PESU	90.4762	MID	95.2381	21	0.805028	20190819				
T8200436.42#	PESU	33.3333	MID	50	6	0.159188	20190819				
T8200438.38#	LABO	66.6667	MID	83.3333	6	0.190155	20190819				
T8200439.40#	LANO	66.6667	LOW	100	12	0.618698	20190819				
T8200441.34#	PESU	62.5	MID	75	8	0.047446	20190819				
T8200444.59#	MYSO	57.1429	MYOTIS	100	7	0.55343	20190819				
T8200458.51#	PESU	50	MID	50	28	0.0159346	20190819				
T8200501.02#	PESU	76.0563	MID	90.1408	71	0.679136	20190819				
T8200505.25#	MYSO	86.6667	MYOTIS	86.6667	15	0.733191	20190819				
T8200506.19#	NYHU	37.5	MID	60.4167	48	0.129943	20190819				
T8200507.14#	NYHU	40.5405	MID	75.6757	37	0.290177	20190819				
T8200515.20#	PESU	60	MID	60	5	0.331673	20190819				
T8200523.10#	PESU	100	MID	100	14	0.983346	20190819				
T8200526.05#	LABO	66.6667	MID	83.3333	6	0.0392372	20190819				
T8200528.28#	NYHU	60	MID	100	10	0.515851	20190819				
T8200529.53#	PESU	70.5882	MID	82.3529	17	0.569888	20190819				
T8200530.30#	MYSO	60	MYOTIS	100	5	0.572857	20190819				
T8200531.26#	PESU	84.8485	MID	93.9394	33	0.789635	20190819				
T8200533.44#	PESU	77.7778	MID	100	9	0.746788	20190819				
T8200539.38#	MYSO	50	MYOTIS	71.4286	14	0.212506	20190819				
T8200542.09#	LABO	66.6667	MID	66.6667	6	0.0201106	20190819				
T8200543.10#	LABO	53.8462	MID	53.8462	13	0.0384495	20190819				
T8200545.01#	LACI	47.619	LOW	52.381	21	0.217197	20190819				
T8200547.39#	UNKN		LOW	100	20		20190819				
T8200549.55#	PESU	66.6667	MID	100	18	0.213455	20190819				
T8200553.33#	MYSO	60	MYOTIS	100	5	0.335224	20190819				
T8200602.30#	PESU	50	MID	66.6667	6	0.304426	20190819				
T8200609.02#	LABO	75	MID	75	8	0.475989	20190819				
T8200613.43#	PESU	72.973	MID	78.3784	37	0.546082	20190819				

IDENTIFICATION SUMMARY

ID	EPFU	LANO	LABO	LACI	MYLE	MYLU	MYSE	MYSO	NYHU	PESU	UNKN
N	23	20	46	17	8	12	4	13	28	168	6
%	6.67	5.80	13.33	4.93	2.32	3.48	1.16	3.77	8.12	48.70	1.74
MLE (p)	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.007347	0.000001	0.000001	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8202014.54#	NYHU	57.1429	MID	100	7	0.508472	20190820
T8202017.21#	NYHU	50	MID	100	36	0.389562	20190820
T8202018.31#	LABO	50	MID	100	10	0.120225	20190820
T8202018.45#	LABO	62.5	MID	100	8	0.216961	20190820
T8202019.39#	NYHU	71.0526	MID	100	38	0.576095	20190820
T8202019.57#	LABO	53.3333	MID	100	15	0.221376	20190820
T8202032.29#	NYHU	66.6667	MID	100	24	0.527309	20190820
T8202038.38#	NYHU	56.5217	MID	100	23	0.476548	20190820
T8202043.15#	NYHU	66.6667	MID	100	9	0.595614	20190820
T8202044.43#	LABO	59.2593	MID	96.2963	27	0.224563	20190820
T8202046.39#	NYHU	77.1429	MID	100	35	0.666096	20190820
T8202047.01#	LANO	67.6471	LOW	100	34	0.663608	20190820
T8202047.16#	LACI	57.1429	LOW	71.4286	7	0.373301	20190820
T8202050.39#	LANO	90	LOW	100	50	0.839061	20190820
T8202058.13#	EPFU	100	LOW	100	46	0.385318	20190820
T8202058.30#	EPFU	100	LOW	100	6	0.514596	20190820
T8202059.52#	LACI	76.087	LOW	91.3043	46	0.572893	20190820
T8202100.21#	LACI	83.3333	LOW	83.3333	6	0.209609	20190820
T8202101.18#	LANO	45.8333	LOW	95.8333	24	0.202282	20190820
T8202102.29#	EPFU	55.7377	LOW	96.7213	61	0.0353337	20190820
T8202102.44#	LACI	75	LOW	85.7143	28	0.518632	20190820
T8202102.59#	EPFU	52.459	LOW	96.7213	61	0.0218701	20190820
T8202103.14#	LACI	80	LOW	90	10	0.55626	20190820
T8202103.51#	EPFU	71.4286	LOW	100	7	0.439354	20190820
T8202104.07#	EPFU	78.3784	LOW	78.3784	37	0.515652	20190820
T8202106.15#	NYHU	60.7143	MID	100	28	0.492568	20190820
T8202107.16#	PESU	100	MID	100	10	0.974831	20190820
T8202109.01#	PESU	100	MID	100	11	0.953764	20190820
T8202110.15#	PESU	100	MID	100	32	0.99156	20190820
T8202115.22#	PESU	100	MID	100	8	0.967171	20190820
T8202116.04#	PESU	100	MID	100	43	0.989373	20190820
T8202116.28#	PESU	66.6667	MID	66.6667	6	0.0859089	20190820
T8202118.46#	PESU	66.6667	MID	83.3333	6	0.534406	20190820
T8202128.09#	PESU	81.8182	MID	100	22	0.805918	20190820
T8202134.23#	PESU	87.5	MID	93.75	16	0.805845	20190820
T8202138.56#	NYHU	66.6667	MID	100	9	0.570303	20190820
T8202142.57#	LABO	77.7778	MID	88.8889	9	0.145266	20190820
T8202152.09#	LABO	40	MID	60	5	0.129164	20190820
T8202207.03#	NYHU	66.6667	MID	100	6	0.603458	20190820
T8202207.11#	NYHU	60	MID	100	5	0.52459	20190820
T8202214.10#	PESU	84.2105	MID	94.7368	19	0.784174	20190820
T8202214.26#	LABO	57.1429	MID	78.5714	14	0.0393697	20190820
T8202218.17#	PESU	92.8571	MID	92.8571	14	0.84784	20190820
T8202218.42#	PESU	100	MID	100	9	0.974133	20190820
T8202219.05#	LACI	91.4286	LOW	91.4286	35	0.821623	20190820
T8202219.21#	LACI	85.7143	LOW	85.7143	7	0.500698	20190820
T8202219.35#	LACI	71.4286	LOW	79.2208	77	0.507527	20190820
T8202219.53#	LANO	43.6893	LOW	100	103	0.318251	20190820
T8202220.10#	LACI	46.6667	LOW	86.6667	15	0.0031183	20190820
T8202222.43#	PESU	100	MID	100	19	0.985796	20190820
T8202243.43#	NYHU	66.6667	MID	91.6667	12	0.543252	20190820
T8202247.34#	PESU	76.1905	MID	85.7143	21	0.621959	20190820
T8202249.16#	PESU	100	MID	100	9	0.930775	20190820
T8202249.58#	PESU	100	MID	100	18	0.814922	20190820
T8202301.29#	MYSE	77.7778	MYOTIS	88.8889	9	0.648082	20190820
T8202301.45#	MYSO	58.8235	MYOTIS	70.5882	17	0.0423779	20190820
T8202309.00#	MYSO	62.5	MYOTIS	75	8	0.100283	20190820
T8202313.33#	PESU	100	MID	100	15	0.984512	20190820
T8202316.03#	PESU	77.7778	MID	77.7778	9	0.526732	20190820

T8202322.46#	LABO	50	MID	100	10	0.16944	20190820
T8202327.33#	NYHU	56	MID	100	25	0.519539	20190820
T8202333.09#	PESU	85	MID	95	20	0.795795	20190820
T8202334.13#	LANO	77.7778	LOW	100	18	0.481781	20190820
T8202334.36#	LANO	93.75	LOW	100	16	0.722753	20190820
T8202338.19#	PESU	87.5	MID	100	8	0.850619	20190820
T8202341.23#	NYHU	64.5161	MID	100	31	0.59249	20190820
T8202351.43#	PESU	100	MID	100	14	0.964145	20190820
T8202354.21#	NYHU	62.5	MID	100	8	0.58625	20190820
T8202359.13#	PESU	92.8571	MID	92.8571	14	0.84598	20190820
T8210000.23#	PESU	100	MID	100	12	0.976161	20190820
T8210001.25#	NYHU	50	MID	100	6	0.00774844	20190820
T8210006.31#	LABO	60	MID	60	5	0.204818	20190820
T8210012.36#	PESU	27.2727	MID	36.3636	11	0.0959306	20190820
T8210015.20#	LABO	75	MID	75	20	0.341216	20190820
T8210015.34#	LABO	77.7778	MID	77.7778	9	0.444388	20190820
T8210017.17#	LABO	60	MID	100	5	0.067532	20190820
T8210018.21#	LANO	100	LOW	100	5	0.865558	20190820
T8210020.18#	PESU	70	MID	80	20	0.551527	20190820
T8210023.45#	LABO	62.5	MID	100	8	0.000641978	20190820
T8210025.31#	PESU	100	MID	100	10	0.958602	20190820
T8210026.11#	LABO	40	MID	60	5	0.0100568	20190820
T8210027.43#	LACI	57.1429	LOW	57.1429	7	0.159653	20190820
T8210028.01#	EPFU	51.5152	LOW	100	66	0.0902136	20190820
T8210028.23#	LABO	77.7778	MID	77.7778	9	0.589022	20190820
T8210028.52#	LANO	90	LOW	100	10	0.868107	20190820
T8210029.27#	LANO	55.5556	LOW	100	18	0.249068	20190820
T8210029.36#	LANO	63.6364	LOW	100	33	0.393924	20190820
T8210030.20#	LABO	40	MID	40	5	0.086603	20190820
T8210031.37#	LABO	55.5556	MID	66.6667	9	0.0394501	20190820
T8210033.35#	LABO	83.3333	MID	100	6	0.47108	20190820
T8210036.51#	PESU	50	MID	75	12	0.114807	20190820
T8210038.30#	LABO	60	MID	83.3333	30	0.113416	20190820
T8210039.21#	LABO	58.3333	MID	100	12	0.189682	20190820
T8210043.57#	LACI	100	LOW	100	10	0.638597	20190820
T8210053.57#	NYHU	100	MID	100	5	0.523326	20190820
T8210055.52#	MYLE	30	MYOTIS	75	20	0.220239	20190820
T8210056.39#	MYSO	64.2857	MYOTIS	64.2857	14	0.275878	20190820
T8210056.58#	PESU	100	MID	100	8	0.970801	20190820
T8210106.58#	LANO	75	LOW	100	8	0.725892	20190820
T8210107.21#	LACI	50	LOW	50	10	0.244401	20190820
T8210108.45#	LANO	100	LOW	100	11	0.949755	20190820
T8210114.24#	PESU	100	MID	100	8	0.921056	20190820
T8210116.30#	PESU	57.1429	MID	100	7	0.160138	20190820
T8210117.03#	LABO	40	MID	70	10	0.172831	20190820
T8210117.14#	PESU	100	MID	100	14	0.980045	20190820
T8210120.52#	NYHU	100	MID	100	5	0.898926	20190820
T8210121.25#	PESU	71.4286	MID	71.4286	7	0.49295	20190820
T8210121.50#	MYLE	40	MYOTIS	40	10	0.154681	20190820
T8210123.11#	LANO	87.5	LOW	100	8	0.848218	20190820
T8210124.13#	PESU	92.3077	MID	92.3077	13	0.761936	20190820
T8210126.32#	MYSO	75	MYOTIS	75	20	0.462382	20190820
T8210127.42#	LACI	82.6087	LOW	86.9565	23	0.644799	20190820
T8210128.58#	UNKN		MID	33.3333	6		20190820
T8210133.31#	PESU	100	MID	100	11	0.978983	20190820
T8210134.17#	PESU	100	MID	100	9	0.974374	20190820
T8210139.34#	PESU	100	MID	100	9	0.94301	20190820
T8210140.17#	PESU	100	MID	100	12	0.974477	20190820
T8210141.22#	PESU	81.4815	MID	92.5926	27	0.744336	20190820
T8210142.05#	PESU	100	MID	100	13	0.980917	20190820

T8210147.05#	NYHU	60	MID	100	5	0.41618	20190820
T8210149.06#	PESU	100	MID	100	6	0.962892	20190820
T8210157.14#	LACI	100	LOW	100	5	0.956659	20190820
T8210211.01#	PESU	60	MID	80	5	0.0478711	20190820
T8210211.52#	NYHU	80	MID	100	5	0.699115	20190820
T8210216.14#	LANO	100	LOW	100	51	0.679553	20190820
T8210218.26#	PESU	100	MID	100	31	0.982893	20190820
T8210223.16#	PESU	89.4737	MID	94.7368	19	0.835739	20190820
T8210227.52#	PESU	100	MID	100	5	0.955488	20190820
T8210237.50#	PESU	71.4286	MID	100	7	0.172776	20190820
T8210242.19#	PESU	100	MID	100	10	0.964959	20190820
T8210245.38#	LANO	53.125	LOW	100	32	0.419204	20190820
T8210246.26#	LANO	63.6364	LOW	100	11	0.602208	20190820
T8210251.33#	PESU	91.6667	MID	95.8333	24	0.859417	20190820
T8210254.28#	PESU	92.3077	MID	92.3077	13	0.78066	20190820
T8210300.55#	LABO	66.6667	MID	83.3333	6	0.240634	20190820
T8210301.07#	LACI	66.6667	LOW	77.7778	27	0.34157	20190820
T8210302.06#	PESU	76.1905	MID	78.5714	42	0.557931	20190820
T8210302.28#	PESU	100	MID	100	17	0.984126	20190820
T8210307.57#	PESU	33.3333	MID	50	6	0.149555	20190820
T8210315.08#	PESU	90	MID	100	30	0.892241	20190820
T8210319.39#	LABO	60	MID	100	5	0.416819	20190820
T8210328.01#	PESU	93.5484	MID	100	31	0.928163	20190820
T8210329.16#	PESU	100	MID	100	14	0.983239	20190820
T8210329.50#	PESU	100	MID	100	14	0.982937	20190820
T8210331.09#	PESU	100	MID	100	35	0.982496	20190820
T8210334.46#	PESU	100	MID	100	6	0.941577	20190820
T8210347.57#	LANO	45	LOW	100	20	0.366571	20190820
T8210348.16#	LANO	83.3333	LOW	100	18	0.429691	20190820
T8210351.47#	PESU	95	MID	95	20	0.890673	20190820
T8210353.07#	LACI	100	LOW	100	36	0.990535	20190820
T8210403.46#	PESU	94.4444	MID	100	18	0.920548	20190820
T8210404.49#	PESU	100	MID	100	6	0.962964	20190820
T8210415.27#	PESU	83.3333	MID	94.4444	36	0.772297	20190820
T8210423.42#	LABO	50	MID	75	8	0.210932	20190820
T8210426.38#	PESU	95.2381	MID	100	21	0.936698	20190820
T8210426.49#	PESU	100	MID	100	23	0.958848	20190820
T8210428.52#	NYHU	60	MID	100	10	0.533298	20190820
T8210429.11#	PESU	100	MID	100	9	0.941446	20190820
T8210431.45#	MYSO	41.1765	MYOTIS	76.4706	17	0.309794	20190820
T8210435.23#	PESU	96.1538	MID	96.1538	26	0.912057	20190820
T8210438.23#	LACI	87.5	LOW	100	16	0.628255	20190820
T8210441.02#	PESU	100	MID	100	6	0.963011	20190820
T8210444.12#	NYHU	63.1579	MID	94.7368	19	0.512007	20190820
T8210446.11#	PESU	93.0233	MID	93.0233	43	0.763088	20190820
T8210446.59#	LACI	87.5	LOW	87.5	16	0.754693	20190820
T8210448.28#	PESU	80.9524	MID	90.4762	21	0.722657	20190820
T8210451.37#	LABO	60	MID	100	5	0.106624	20190820
T8210451.46#	LANO	40.7407	LOW	87.037	54	0.336122	20190820
T8210452.01#	LANO	56.25	LOW	100	16	0.509312	20190820
T8210455.14#	LABO	60	MID	80	5	0.158011	20190820
T8210457.40#	LABO	50	MID	50	6	0.0137187	20190820
T8210506.03#	LANO	69.2308	LOW	100	26	0.420746	20190820
T8210508.59#	NYHU	50	MID	100	6	0.198218	20190820
T8210510.03#	PESU	100	MID	100	5	0.942749	20190820
T8210514.02#	LABO	60	MID	100	5	0.381395	20190820
T8210516.00#	NYHU	66.6667	MID	100	6	0.537706	20190820
T8210552.21#	MYSE	71.4286	MYOTIS	100	14	0.685763	20190820
T8210620.45#	PESU	100	MID	100	11	0.977872	20190820
T8210624.03#	NYHU	91.6667	MID	100	12	0.811622	20190820

IDENTIFICATION SUMMARY										
ID	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLE**	**MYSE**	**MYSO**	**NYHU**	**PESU**	**UNKN**
N	7	21	28	18	2	2	5	25	70	1
%	3.91	11.73	15.64	10.06	1.12	1.12	2.79	13.97	39.11	0.56
MLE (p)	0.009852	0.000001	0.000001	0.000001	0.003806	0.020056	0.000023	0.000001	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8212022.30#	LABO	55.5556	MID	100	18	0.0562819	20190821
T8212033.27#	PESU	100	MID	100	8	0.965858	20190821
T8212034.33#	PESU	89.2308	MID	90.7692	65	0.79058	20190821
T8212046.23#	LANO	46.1538	LOW	100	13	0.3504	20190821
T8212046.39#	LACI	66.6667	LOW	85.1852	27	0.399781	20190821
T8212049.26#	NYHU	82.3529	MID	100	17	0.708428	20190821
T8212050.25#	UNKN		MID	33.3333	6		20190821
T8212057.02#	LACI	85.1852	LOW	88.8889	27	0.717896	20190821
T8212057.41#	PESU	100	MID	100	12	0.979885	20190821
T8212058.00#	MYLU	66.6667	MYOTIS	100	6	0.641034	20190821
T8212058.15#	MYSO	55	MYOTIS	65	20	0.333643	20190821
T8212059.11#	LABO	40	MID	70	20	0.0607583	20190821
T8212059.24#	LACI	83.3333	LOW	83.3333	12	0.679784	20190821
T8212059.42#	MYSE	66.6667	MYOTIS	93.3333	15	0.584184	20190821
T8212106.09#	PESU	79.7619	MID	91.6667	84	0.726349	20190821
T8212106.24#	PESU	92.3077	MID	94.2308	52	0.854793	20190821
T8212106.41#	PESU	76.2887	MID	81.4433	97	0.6193	20190821
T8212106.56#	PESU	66.6667	MID	85.1852	27	0.546887	20190821
T8212107.07#	PESU	95.0617	MID	97.5309	81	0.920486	20190821
T8212107.36#	EPFU	56.6667	LOW	100	30	0.101015	20190821
T8212111.23#	LACI	52.9412	LOW	58.8235	17	0.303233	20190821
T8212114.58#	LANO	77.2727	LOW	95.4545	22	0.683866	20190821
T8212116.49#	LABO	71.4286	MID	71.4286	7	0.250694	20190821
T8212122.10#	MYLE	50	MYOTIS	62.5	8	0.302979	20190821
T8212122.45#	LANO	66.6667	LOW	100	6	0.637061	20190821
T8212124.21#	UNKN		UNKN		10		20190821
T8212125.12#	LABO	50	MID	50	8	0.198933	20190821
T8212126.02#	LANO	75	LOW	100	8	0.533678	20190821
T8212126.56#	LACI	100	LOW	100	8	0.970128	20190821
T8212127.03#	LACI	100	LOW	100	11	0.97578	20190821
T8212127.30#	LABO	62.5	MID	62.5	8	0.373898	20190821
T8212127.53#	LACI	88.8889	LOW	88.8889	9	0.753825	20190821
T8212128.23#	LANO	83.3333	LOW	100	12	0.639355	20190821
T8212129.06#	LANO	71.4286	LOW	100	28	0.627183	20190821
T8212137.45#	NYHU	80	MID	100	5	0.721934	20190821
T8212148.19#	PESU	100	MID	100	13	0.977179	20190821
T8212149.22#	PESU	100	MID	100	8	0.966132	20190821
T8212149.38#	LACI	62.5	LOW	75	8	0.374934	20190821
T8212151.05#	NYHU	81.25	MID	100	16	0.562619	20190821
T8212156.49#	PESU	83.3333	MID	83.3333	6	0.663406	20190821
T8212159.10#	PESU	100	MID	100	7	0.965205	20190821
T8212207.54#	NYHU	80	MID	100	5	0.720193	20190821
T8212213.07#	LANO	82.6087	LOW	100	23	0.606656	20190821
T8212213.37#	MYSO	75	MYOTIS	100	8	0.726077	20190821
T8212214.12#	PESU	85.7143	MID	85.7143	7	0.610712	20190821
T8212217.48#	PESU	60	MID	60	5	0.344362	20190821
T8212218.39#	LABO	57.1429	MID	100	7	0.0264103	20190821
T8212220.52#	PESU	100	MID	100	9	0.95415	20190821
T8212221.38#	NYHU	57.1429	MID	100	7	0.539653	20190821
T8212224.49#	PESU	50	MID	72.2222	18	0.353608	20190821
T8212225.09#	PESU	73.6842	MID	89.4737	19	0.650358	20190821
T8212229.03#	PESU	100	MID	100	21	0.987963	20190821
T8212236.45#	LABO	50	MID	75	8	0.115014	20190821
T8212238.05#	NYHU	42.8571	MID	92.8571	14	0.331325	20190821
T8212241.04#	PESU	66.6667	MID	100	6	0.641043	20190821
T8212243.51#	PESU	43.75	MID	56.25	16	0.237397	20190821
T8212248.28#	PESU	95	MID	100	20	0.922692	20190821
T8212251.07#	PESU	88.2353	MID	88.2353	17	0.76766	20190821
T8212253.49#	PESU	86.6667	MID	86.6667	15	0.734145	20190821

T8212258.24#	PESU	100	MID	100	18	0.974142	20190821
T8212300.02#	PESU	91.6667	MID	91.6667	12	0.820309	20190821
T8212302.15#	PESU	100	MID	100	17	0.968046	20190821
T8212303.22#	PESU	100	MID	100	8	0.971806	20190821
T8212304.55#	LABO	71.4286	MID	71.4286	7	0.420435	20190821
T8212306.10#	PESU	78.2609	MID	100	23	0.768063	20190821
T8212309.33#	UNKN		LOW	100	5		20190821
T8212312.42#	PESU	81.8182	MID	90.9091	11	0.728266	20190821
T8212324.01#	PESU	100	MID	100	14	0.981315	20190821
T8212326.30#	PESU	100	MID	100	17	0.98137	20190821
T8212328.06#	LANO	72.2222	LOW	100	18	0.669337	20190821
T8212329.39#	PESU	81.25	MID	81.25	16	0.647253	20190821
T8212329.56#	LACI	85.7143	LOW	85.7143	7	0.648345	20190821
T8212330.58#	LANO	100	LOW	100	12	0.868019	20190821
T8212331.20#	LANO	58.8235	LOW	97.0588	34	0.257776	20190821
T8212332.25#	PESU	100	MID	100	7	0.968497	20190821
T8212345.52#	LANO	88.8889	LOW	100	9	0.849892	20190821
T8212346.27#	PESU	54.5455	MID	77.2727	22	0.417166	20190821
T8212347.32#	PESU	50	MID	75	24	0.294104	20190821
T8212347.47#	LANO	62.5	LOW	100	8	0.596949	20190821
T8212351.31#	PESU	91.6667	MID	100	12	0.884868	20190821
T8212355.51#	LANO	8.57143	LOW	80	35	0.0558504	20190821
T8212359.53#	LANO	86.6667	LOW	100	15	0.506979	20190821
T8220002.19#	PESU	46.6667	MID	46.6667	15	0.0468662	20190821
T8220010.03#	PESU	95.2381	MID	95.2381	21	0.889046	20190821
T8220013.53#	PESU	100	MID	100	17	0.985523	20190821
T8220014.19#	NYHU	66.6667	MID	100	12	0.558333	20190821
T8220014.30#	PESU	86.4865	MID	97.2973	37	0.832308	20190821
T8220014.48#	PESU	80	MID	90	10	0.700265	20190821
T8220016.31#	PESU	88.2353	MID	100	17	0.87055	20190821
T8220021.53#	UNKN		MID	66.6667	6		20190821
T8220026.51#	EPFU	53.8462	LOW	88.4615	26	0.113745	20190821
T8220030.34#	PESU	100	MID	100	9	0.975287	20190821
T8220032.50#	LACI	100	LOW	100	16	0.77933	20190821
T8220035.14#	MYSE	94.1176	MYOTIS	94.1176	17	0.867277	20190821
T8220040.21#	PESU	81.8182	MID	81.8182	11	0.654504	20190821
T8220047.43#	NYHU	57.1429	MID	100	7	0.508509	20190821
T8220048.58#	LABO	60	MID	100	5	0.0742583	20190821
T8220051.14#	PESU	77.7778	MID	77.7778	18	0.573893	20190821
T8220052.26#	PESU	77.7778	MID	88.8889	18	0.667275	20190821
T8220055.01#	EPFU	78.5714	LOW	78.5714	14	0.402116	20190821
T8220057.48#	NYHU	57.1429	MID	100	14	0.121379	20190821
T8220101.34#	PESU	57.1429	MID	78.5714	14	0.434255	20190821
T8220101.55#	LACI	66.6667	LOW	66.6667	6	0.428261	20190821
T8220103.41#	UNKN		MID	54.5455	11		20190821
T8220107.51#	LABO	50	MID	83.3333	12	0.146825	20190821
T8220110.22#	PESU	62.5	MID	87.5	8	0.526298	20190821
T8220110.47#	LABO	50	MID	77.7778	18	0.184226	20190821
T8220115.50#	LABO	66.6667	MID	66.6667	12	0.262789	20190821
T8220120.14#	LABO	66.6667	MID	91.6667	12	0.00580528	20190821
T8220120.40#	LABO	40	MID	60	5	0.0642892	20190821
T8220125.49#	NYHU	77.7778	MID	100	9	0.705155	20190821
T8220127.40#	LABO	50	MID	50	6	0.0477589	20190821
T8220129.33#	PESU	77.7778	MID	88.8889	9	0.631899	20190821
T8220130.35#	LABO	75	MID	100	8	0.0744343	20190821
T8220133.25#	PESU	100	MID	100	12	0.980329	20190821
T8220155.41#	NYHU	55.5556	MID	100	18	0.512372	20190821
T8220158.38#	LACI	50	LOW	62.5	16	0.298651	20190821
T8220200.49#	PESU	57.6271	MID	61.0169	59	0.296252	20190821
T8220201.33#	EPFU	80	LOW	100	5	0.119858	20190821

T8220202.50#	LABO	54.5455	MID	54.5455	11	0.278985	20190821
T8220203.28#	PESU	83.3333	MID	83.3333	6	0.177382	20190821
T8220203.41#	PESU	100	MID	100	13	0.981479	20190821
T8220205.44#	NYHU	71.4286	MID	100	7	0.228264	20190821
T8220212.39#	PESU	66.6667	MID	73.3333	15	0.359006	20190821
T8220218.39#	PESU	90.9091	MID	100	11	0.846104	20190821
T8220222.17#	LABO	71.4286	MID	71.4286	7	0.439077	20190821
T8220228.28#	PESU	100	MID	100	17	0.985612	20190821
T8220228.43#	PESU	100	MID	100	37	0.993145	20190821
T8220228.59#	PESU	100	MID	100	10	0.976926	20190821
T8220229.16#	PESU	94.4444	MID	100	36	0.936183	20190821
T8220229.29#	PESU	100	MID	100	50	0.994785	20190821
T8220230.42#	PESU	83.3333	MID	100	6	0.80291	20190821
T8220231.49#	UNKN		LOW	66.6667	21		20190821
T8220238.01#	PESU	85.7143	MID	85.7143	21	0.710852	20190821
T8220238.36#	PESU	91.6667	MID	91.6667	12	0.818193	20190821
T8220238.50#	PESU	75	MID	75	8	0.508681	20190821
T8220239.22#	PESU	100	MID	100	10	0.95783	20190821
T8220242.22#	PESU	60	MID	60	5	0.310571	20190821
T8220243.34#	PESU	100	MID	100	14	0.982924	20190821
T8220248.08#	PESU	100	MID	100	17	0.968232	20190821
T8220248.25#	PESU	100	MID	100	23	0.989761	20190821
T8220249.13#	PESU	90	MID	90	10	0.766646	20190821
T8220249.33#	PESU	85.7143	MID	85.7143	7	0.67636	20190821
T8220249.52#	LABO	50	MID	100	8	0.121113	20190821
T8220250.55#	LACI	80	LOW	80	5	0.609835	20190821
T8220256.53#	LACI	78.5714	LOW	92.8571	14	0.698699	20190821
T8220302.36#	LANO	92	LOW	100	25	0.839975	20190821
T8220302.58#	EPFU	100	LOW	100	29	0.867244	20190821
T8220306.38#	MYSO	83.3333	MYOTIS	83.3333	6	0.660409	20190821
T8220307.31#	PESU	80	MID	80	5	0.584034	20190821
T8220308.36#	PESU	83.3333	MID	88.8889	18	0.730436	20190821
T8220312.02#	LABO	87.5	MID	100	8	0.0680598	20190821
T8220316.19#	LANO	90	LOW	100	10	0.739139	20190821
T8220319.01#	PESU	83.3333	MID	83.3333	6	0.573914	20190821
T8220322.05#	PESU	100	MID	100	10	0.956304	20190821
T8220323.36#	PESU	100	MID	100	23	0.978455	20190821
T8220329.10#	NYHU	60	MID	100	5	0.526294	20190821
T8220332.14#	EPFU	50	LOW	100	14	0.199415	20190821
T8220334.49#	PESU	100	MID	100	24	0.985845	20190821
T8220341.27#	PESU	94.1176	MID	94.1176	17	0.865228	20190821
T8220343.28#	LACI	100	LOW	100	6	0.963619	20190821
T8220346.33#	LANO	45	LOW	100	20	0.349756	20190821
T8220348.09#	MYLU	50	MYOTIS	50	10	0.224184	20190821
T8220352.04#	LANO	63.6364	LOW	100	22	0.567105	20190821
T8220352.20#	LACI	61.5385	LOW	69.2308	13	0.407052	20190821
T8220352.49#	EPFU	100	LOW	100	11	0.603868	20190821
T8220400.57#	LACI	87.5	LOW	87.5	24	0.754153	20190821
T8220401.30#	PESU	100	MID	100	18	0.985097	20190821
T8220412.32#	PESU	83.3333	MID	100	6	0.793131	20190821
T8220416.42#	PESU	85.7143	MID	85.7143	7	0.709267	20190821
T8220417.08#	EPFU	73.8462	LOW	75.3846	65	0.203634	20190821
T8220417.23#	LANO	77.2727	LOW	100	22	0.533372	20190821
T8220418.11#	LANO	81.8182	LOW	100	11	0.448518	20190821

T8220418.21#	LANO	50	LOW	100	30	0.406003	20190821				
T8220418.36#	LANO	60	LOW	100	10	0.3626	20190821				
T8220418.43#	LANO	70.3704	LOW	100	27	0.408181	20190821				
T8220421.18#	PESU	100	MID	100	11	0.970926	20190821				
T8220425.19#	LANO	58	LOW	100	50	0.0471318	20190821				
T8220425.53#	PESU	88	MID	92	25	0.801787	20190821				
T8220432.17#	LABO	50	MID	75	8	0.316786	20190821				
T8220433.05#	PESU	96.4286	MID	100	28	0.954639	20190821				
T8220434.30#	PESU	100	MID	100	12	0.981163	20190821				
T8220439.34#	LACI	51.4286	LOW	71.4286	35	0.27324	20190821				
T8220440.48#	LABO	80	MID	100	5	0.0880118	20190821				
T8220444.20#	UNKN		MID	80	5		20190821				
T8220445.38#	LABO	50	MID	100	6	0.152351	20190821				
T8220446.02#	LABO	50	MID	100	6	0.0859605	20190821				
T8220459.17#	LANO	44.8276	LOW	96.5517	29	0.367828	20190821				
T8220500.18#	PESU	71.4286	MID	71.4286	7	0.467368	20190821				
T8220501.37#	LANO	100	LOW	100	5	0.905766	20190821				
T8220502.19#	MYSE	43.75	MYOTIS	95.8333	48	0.283695	20190821				
T8220502.45#	LABO	46.1538	MID	92.3077	13	0.0379445	20190821				
T8220506.48#	LABO	40	MID	60	5	0.110646	20190821				
T8220510.48#	NYHU	54.5455	MID	100	11	0.415415	20190821				
T8220514.25#	NYHU	80	MID	100	5	0.666816	20190821				
T8220517.10#	PESU	100	MID	100	16	0.981662	20190821				
T8220519.06#	PESU	100	MID	100	6	0.961634	20190821				
T8220554.15#	MYLE	63.6364	MYOTIS	100	11	0.152134	20190821				
T8220637.14#	NYHU	66.6667	MID	100	9	0.575732	20190821				
T8220640.37#	LABO	62.5	MID	100	8	0.0428804	20190821				

IDENTIFICATION SUMMARY

ID	EPFU	LANO	LABO	LACI	MYLE	MYLU	MYSE	MYSO	NYHU	PESU	UNKN
N	8	26	27	18	2	2	3	3	16	88	7
%	4.00	13.00	13.50	9.00	1.00	1.00	1.50	1.50	8.00	44.00	3.50
MLE (p)	0.008385	0.000001	0.000001	0.000001	0.002749	0.000085	0.002042	0.004407	0.000001	0.000001	

Appendix B

Qualitative analysis of calls by BCID 2.7d disaggregated by night at Jackson monitoring site 2:

BCID Version 2.7d							
c:/users/keith/documents/anabat files/jackson.2\SN369425\20190817							
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8172052.11#	LACI	100	LOW	100	7	0.91951	20190817
T8172102.11#	LANO	50	LOW	50	6	0.231362	20190817
T8172104.45#	LABO	40	MID	60	15	0.0343866	20190817
T8172120.20#	NYHU	85.7143	MID	96.4286	28	0.560192	20190817
T8172120.55#	LANO	71.4286	LOW	100	7	0.662301	20190817
T8172129.30#	EPFU	87.5	LOW	87.5	8	0.371744	20190817
T8172244.54#	NYHU	57.1429	MID	100	7	0.49436	20190817
T8172358.13#	LANO	66.6667	LOW	100	9	0.54265	20190817
T8180011.26#	LANO	91.6667	LOW	100	12	0.744651	20190817
T8180036.33#	LANO	100	LOW	100	11	0.905972	20190817
T8180049.47#	LANO	83.3333	LOW	100	6	0.725075	20190817
T8180111.59#	LABO	40	MID	60	10	0.165315	20190817
T8180117.50#	EPFU	66.6667	LOW	66.6667	6	0.214964	20190817
T8180133.38#	PESU	33.3333	MID	33.3333	6	0.101664	20190817
T8180141.26#	PESU	92.8571	MID	92.8571	14	0.84477	20190817
T8180208.39#	LANO	83.3333	LOW	100	6	0.796428	20190817
T8180340.53#	LANO	84.6154	LOW	100	13	0.782697	20190817
T8180341.09#	LANO	60	LOW	100	10	0.522125	20190817
T8180407.42#	PESU	100	MID	100	6	0.585587	20190817
T8180408.00#	LABO	42.1053	MID	63.1579	19	0.037247	20190817
T8180409.31#	LABO	66.6667	MID	88.8889	9	0.339257	20190817
T8180449.38#	LANO	66.6667	LOW	100	6	0.492294	20190817
T8180515.11#	NYHU	60	MID	100	5	0.532496	20190817
T8180516.07#	PESU	60	MID	60	5	0.232751	20190817
IDENTIFICATION SUMMARY							
ID	**EPFU**	**LANO**	**LABO**	**LACI**	**NYHU**	**PESU**	
N	2	10	4	1	3	4	
%	8.33	41.67	16.67	4.17	12.50	16.67	
MLE (p)	0.324154	0.000001	0.000424	0.105323	0.004022	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8182019.29#	NYHU	54.5455	MID	100	11	0.52757	20190818
T8182034.28#	NYHU	80	MID	100	5	0.750088	20190818
T8182045.11#	LACI	90.9091	LOW	90.9091	11	0.799364	20190818
T8182100.24#	LACI	100	LOW	100	9	0.963862	20190818
T8182100.46#	UNKN		LOW	100	8		20190818
T8182110.30#	LACI	50	LOW	50	6	0.00764215	20190818
T8182130.09#	NYHU	57.1429	MID	100	14	0.534404	20190818
T8182136.44#	LACI	60	LOW	60	5	0.240509	20190818
T8182138.02#	LACI	88.8889	LOW	88.8889	9	0.71876	20190818
T8182302.34#	LANO	68.1818	LOW	100	22	0.593691	20190818
T8182311.04#	NYHU	57.1429	MID	100	7	0.532704	20190818
T8182312.57#	MYLU	33.3333	MYOTIS	55.5556	9	0.180638	20190818
T8182315.41#	LANO	100	LOW	100	8	0.962147	20190818
T8190006.48#	UNKN		LOW	100	7		20190818
T8190018.39#	LANO	100	LOW	100	8	0.595703	20190818
T8190151.41#	LANO	100	LOW	100	8	0.962182	20190818
T8190152.04#	LANO	100	LOW	100	7	0.957315	20190818
T8190152.28#	LANO	66.6667	LOW	100	15	0.45917	20190818
T8190156.00#	NYHU	55.5556	MID	100	18	0.526219	20190818
T8190213.59#	LANO	100	LOW	100	12	0.942521	20190818
T8190219.20#	PESU	100	MID	100	6	0.933961	20190818
T8190220.59#	PESU	100	MID	100	6	0.903887	20190818
T8190226.43#	PESU	50	MID	83.3333	6	0.0120149	20190818
T8190301.14#	LABO	66.6667	MID	100	9	0.305875	20190818
T8190331.27#	LANO	66.6667	LOW	100	15	0.625521	20190818
T8190355.09#	LABO	60	MID	60	10	0.308542	20190818
T8190355.24#	PESU	94.4444	MID	97.2222	36	0.899901	20190818
T8190355.41#	PESU	96.5517	MID	100	29	0.945748	20190818
T8190355.56#	PESU	93.3333	MID	96.6667	30	0.879813	20190818
T8190356.32#	PESU	96.1538	MID	96.1538	26	0.909857	20190818
T8190356.56#	PESU	100	MID	100	17	0.98293	20190818
T8190402.46#	LANO	58.3333	LOW	100	12	0.549735	20190818
T8190410.19#	LACI	71.4286	LOW	71.4286	7	0.0445204	20190818
T8190437.00#	LANO	70	LOW	100	10	0.594838	20190818
T8190452.38#	LANO	45.4545	LOW	63.6364	11	0.2622	20190818
T8190452.54#	LANO	60	LOW	100	5	0.494966	20190818
T8190456.53#	LANO	66.6667	LOW	100	15	0.590075	20190818
T8190458.45#	NYHU	100	MID	100	7	0.948358	20190818
T8190502.01#	LANO	91.6667	LOW	100	12	0.701449	20190818
T8190513.29#	PESU	100	MID	100	19	0.889776	20190818
T8190521.28#	LACI	100	LOW	100	5	0.922101	20190818
T8190521.54#	NYHU	100	MID	100	9	0.736221	20190818
T8190538.32#	UNKN		MID	66.6667	9		20190818
T8190601.23#	NYHU	100	MID	100	16	0.694843	20190818

IDENTIFICATION SUMMARY

ID	**LANO**	**LABO**	**LACI**	**MYLU**	**NYHU**	**PESU**	**UNKN**
N	14	2	7	1	8	9	3
%	31.82	4.55	15.91	2.27	18.18	20.45	6.82
MLE (p)	0.000001	0.183544	0.000001	0.000919	0.000001	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**		
T8192028.28#	PESU	100	MID	100	16	0.973643	20190819		
T8192033.59#	LACI	67.4419	LOW	74.4186	43	0.381958	20190819		
T8192034.14#	LACI	77.2727	LOW	77.2727	22	0.529537	20190819		
T8192036.15#	LACI	100	LOW	100	8	0.960176	20190819		
T8192046.50#	LACI	88.8889	LOW	88.8889	9	0.768438	20190819		
T8192053.20#	LABO	30.4348	MID	52.1739	23	0.0996833	20190819		
T8192053.39#	NYHU	60	MID	100	5	0.547616	20190819		
T8192055.31#	NYHU	62.5	MID	100	8	0.577815	20190819		
T8192057.03#	MYLU	83.3333	MYOTIS	83.3333	6	0.66657	20190819		
T8192101.32#	UNKN		MID	40	5		20190819		
T8192103.04#	MYLU	64.7059	MYOTIS	64.7059	17	0.394233	20190819		
T8192109.52#	LACI	62.5	LOW	62.5	8	0.337818	20190819		
T8192110.12#	LACI	100	LOW	100	6	0.663673	20190819		
T8192111.48#	LACI	66.6667	LOW	66.6667	6	0.142185	20190819		
T8192112.04#	LANO	50	LOW	100	8	0.091124	20190819		
T8192112.38#	LANO	80	LOW	80	10	0.407235	20190819		
T8192112.53#	LANO	64.2857	LOW	100	14	0.161893	20190819		
T8192137.43#	LACI	50	LOW	50	6	0.103002	20190819		
T8192149.47#	LABO	50	MID	66.6667	6	0.197286	20190819		
T8192155.19#	LACI	100	LOW	100	6	0.151554	20190819		
T8192159.15#	LANO	60	LOW	100	5	0.566284	20190819		
T8192202.50#	LANO	64	LOW	100	25	0.512814	20190819		
T8192204.31#	LACI	54.5455	LOW	63.6364	11	0.332356	20190819		
T8192214.53#	LANO	50	LOW	100	20	0.452322	20190819		
T8192221.44#	LACI	71.4286	LOW	71.4286	7	0.405665	20190819		
T8192255.38#	NYHU	53.8462	MID	76.9231	13	0.377852	20190819		
T8192304.42#	LABO	63.6364	MID	100	11	0.108277	20190819		
T8192311.49#	LABO	66.6667	MID	100	12	0.396848	20190819		
T8192317.38#	LABO	61.5385	MID	92.3077	13	0.264844	20190819		
T8192317.54#	PESU	80	MID	100	5	0.389382	20190819		
T8192318.22#	PESU	100	MID	100	5	0.69449	20190819		
T8192319.58#	LABO	65	MID	100	20	0.0567327	20190819		
T8192328.19#	LABO	60	MID	93.3333	15	0.164045	20190819		
T8192358.51#	NYHU	80	MID	80	5	0.258272	20190819		
T8200024.38#	LANO	88.8889	LOW	100	9	0.795359	20190819		
T8200104.36#	PESU	61.9048	MID	66.6667	21	0.402023	20190819		
T8200218.12#	LABO	39.3939	MID	51.5152	33	0.182296	20190819		
T8200300.53#	EPFU	63.6364	LOW	100	22	0.0705525	20190819		
T8200326.34#	LABO	60	MID	80	5	0.112884	20190819		
T8200327.32#	MYSO	50	MYOTIS	100	8	0.486215	20190819		
T8200454.40#	PESU	100	MID	100	6	0.94328	20190819		
T8200527.59#	PESU	66.6667	MID	83.3333	6	0.528591	20190819		
T8200608.16#	LABO	55.5556	MID	77.7778	9	0.127266	20190819		
T8200627.48#	NYHU	63.6364	MID	90.9091	11	0.523133	20190819		
IDENTIFICATION SUMMARY									
ID	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSO**	**NYHU**	**PESU**	**UNKN**
N	1	7	10	11	2	1	5	6	1
%	2.27	15.91	22.73	25.00	4.55	2.27	11.36	13.64	2.27
MLE (p)	0.750370	0.000001	0.000001	0.000001	0.000020	0.037278	0.001200	0.000001	

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
T8202018.24#	PESU	71.4286	MID	78.5714	14	0.551783	20190820	
T8202024.46#	NYHU	87.5	MID	100	8	0.364751	20190820	
T8202043.36#	NYHU	66.6667	MID	100	6	0.215988	20190820	
T8202059.56#	PESU	75	MID	75	12	0.464358	20190820	
T8202215.29#	LACI	57.1429	LOW	57.1429	7	0.298508	20190820	
T8202222.05#	LACI	100	LOW	100	6	0.912331	20190820	
T8202348.57#	LABO	45.4545	MID	45.4545	11	0.00841033	20190820	
T8210018.22#	MYLU	55.5556	MYOTIS	66.6667	9	0.358076	20190820	
T8210030.36#	PESU	80	MID	100	10	0.177437	20190820	
T8210041.12#	LACI	75	LOW	75	12	0.510097	20190820	
T8210044.11#	NYHU	66.6667	MID	100	9	0.310667	20190820	
T8210048.35#	LANO	100	LOW	100	11	0.908024	20190820	
T8210051.23#	NYHU	60	MID	100	5	0.56815	20190820	
T8210111.11#	LANO	58.3333	LOW	100	12	0.556925	20190820	
T8210115.37#	PESU	83.3333	MID	83.3333	6	0.666267	20190820	
T8210120.01#	LANO	80	LOW	100	5	0.65395	20190820	
T8210120.46#	LANO	66.6667	LOW	100	6	0.617194	20190820	
T8210210.15#	EPFU	50	LOW	100	12	0.130543	20190820	
T8210214.00#	LANO	80	LOW	100	5	0.549318	20190820	
T8210219.20#	PESU	85.7143	MID	100	14	0.819003	20190820	
T8210255.48#	LANO	100	LOW	100	7	0.957872	20190820	
T8210315.28#	PESU	50	MID	83.3333	6	0.399781	20190820	
T8210319.52#	NYHU	85.7143	MID	100	7	0.632726	20190820	
T8210336.55#	LANO	71.4286	LOW	100	7	0.645942	20190820	
T8210340.34#	PESU	100	MID	100	6	0.946932	20190820	
T8210350.29#	LABO	40	MID	60	5	0.163704	20190820	
T8210352.26#	MYSO	78.5714	MYOTIS	92.8571	14	0.386998	20190820	
T8210359.18#	PESU	100	MID	100	13	0.680891	20190820	
T8210409.41#	PESU	81.8182	MID	90.9091	11	0.727113	20190820	
T8210413.08#	LACI	90.9091	LOW	100	11	0.868529	20190820	
T8210429.21#	LANO	62.5	LOW	100	8	0.239363	20190820	
T8210437.48#	LACI	75	LOW	93.75	16	0.461625	20190820	
T8210448.43#	LANO	50	LOW	100	22	0.417787	20190820	
T8210525.15#	NYHU	63.6364	MID	100	11	0.59727	20190820	
T8210541.25#	PESU	84.8485	MID	84.8485	33	0.659008	20190820	
IDENTIFICATION SUMMARY								
ID	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSO**	**NYHU**	**PESU**
N	1	9	2	5	1	1	6	10
%	2.86	25.71	5.71	14.29	2.86	2.86	17.14	28.57
MLE (p)	0.852804	0.000001	0.134806	0.000001	0.004091	0.020614	0.000001	0.000001

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FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**
T8212014.13#	PESU	65.3846	MID	92.3077	26	0.591221	20190821
T8212014.47#	PESU	39.1304	MID	73.913	23	0.285543	20190821
T8212043.02#	LACI	91.6667	LOW	91.6667	12	0.810417	20190821
T8212043.40#	LACI	83.3333	LOW	83.3333	6	0.669179	20190821
T8212054.23#	LACI	100	LOW	100	8	0.97141	20190821
T8212104.03#	LABO	80	MID	80	5	0.381029	20190821
T8212106.46#	LANO	53.3333	LOW	100	15	0.506712	20190821
T8212207.26#	LANO	77.7778	LOW	100	9	0.665319	20190821
T8212353.31#	LANO	66.6667	LOW	100	6	0.526017	20190821
T8220006.49#	PESU	92.3077	MID	92.3077	13	0.82882	20190821
T8220027.35#	PESU	100	MID	100	13	0.973744	20190821
T8220131.51#	LABO	33.3333	MID	55.5556	9	0.104907	20190821
T8220132.35#	LABO	50	MID	100	6	0.170139	20190821
T8220216.27#	LANO	100	LOW	100	5	0.916367	20190821
T8220220.10#	LANO	100	LOW	100	8	0.660703	20190821
T8220236.08#	LACI	60	LOW	60	5	0.0668461	20190821
T8220236.26#	LANO	88.8889	LOW	100	9	0.828303	20190821
T8220237.08#	LACI	60	LOW	60	10	0.263338	20190821
T8220241.28#	LABO	44.4444	MID	88.8889	9	0.267282	20190821
T8220318.44#	LABO	28.5714	MID	47.619	21	0.0303081	20190821
T8220336.23#	LANO	66.6667	LOW	100	6	0.415596	20190821
T8220356.30#	LANO	60	LOW	100	5	0.429546	20190821
T8220449.34#	MYSO	60	MYOTIS	100	10	0.586613	20190821
T8220459.25#	PESU	62.5	MID	100	16	0.105576	20190821
T8220459.47#	PESU	87.5	MID	87.5	8	0.583899	20190821
T8220507.13#	LABO	55	MID	100	20	0.0635162	20190821
T8220514.06#	PESU	100	MID	100	8	0.654837	20190821
T8220514.21#	PESU	100	MID	100	20	0.510912	20190821

IDENTIFICATION SUMMARY							
ID	**LANO**	**LABO**	**LACI**	**MYSO**	**PESU**		
N	8	6	5	1	8		
%	28.57	21.43	17.86	3.57	28.57		
MLE (p)	0.000001	0.000001	0.000001	0.008578	0.000001		

Appendix C

Professional Vita for
Keith W. Martin

Contractor: Tallgrass Environmental and Ecological Consulting
Keith W. Martin, Ph.D. Sole Proprietor
2705 Highwood Dr.
Claremore, OK 74017
Kmartin2705@gmail.com
918-519-1012

Experience and Qualifications:

Credential: Ph.D. Wildlife and Fisheries Ecology: Oklahoma State University (2001)

Permits Held: Oklahoma Department of Wildlife Conservation: Scientific Collectors Permit #6942
U.S. Fish and Wildlife Service: Native Endangered Species Recovery Permit #TE1 48363-1 for gray, northern long-eared, and Ozark big-eared bats.

Publications:

- Comparative Numbers of Gray Bats (*Myotis grisescens*) at Four Maternity Caves in Northeastern Oklahoma in 1981 and 1991. Proceedings of the Oklahoma Academy of Sciences 73:35-37. (1993)
- Internal Cave Gating as a Means of Protecting Cave-Dwelling Bat Populations in Eastern Oklahoma. Proceedings of the Oklahoma Academy of Sciences 80:133-138. (2000)
- Internal cave gating for protection of colonies of the endangered gray bat (*Myotis grisescens*). Acta Chiropterologica 5:143-150. (2003)
- Impacts of Passage Manipulation on Cave Climate: Conservation Implications for Cave-Dwelling Bats. Wildlife Society Bulletin 34:137-143. (2006)

Successfully Funded Research Grants/Contracts:

- Principle Investigator for Project E-22-1-22 (1993-2017) Oklahoma Department of Wildlife Conservation. *Cave Protection and Management for the Ozark Big-eared Bat and gray bat in Oklahoma*. Funded by the Oklahoma Department of Wildlife Conservation ($393,000).
- *Assessment and Utilization by Bats at The J.T. Nickel Family Preserve, Cherokee Co. Oklahoma*. State Wildlife Grants program, The Oklahoma Department of Wildlife Conservation, and The nature Conservancy 2006-2007 ($3,904.37).
- *Protection, Management, and Monitoring of Cave Habitat for the Federally-Listed Ozark Big-eared Bat (Corynorhinus townsendii ingens) and Other Rare Cave Fauna*

in Oklahoma (2007-2008). Funded by the U.S. Fish and Wildlife Service through the Private Stewardship Grants program ($10,750).

- *Monitoring Patterns and Use by Gray Bat Populations in Caves DL-2 and DL-91 in Delaware County, Oklahoma* (2007-2017). Funded by the Grand River Dam Authority ($30,000).
- *Using Acoustic Monitoring to Assess the Use of the Grand River Drainage and Hudson Reservoir as a Foraging Corridor for the Endangered Gray Bat* (*Myotis grisescens*). 2011. Funded by the Grand River Dam Authority ($7,050).
- Assessing Temporal Use Patterns of Lake Hudson Tributaries as Foraging Corridors for the Endangered Gray Bat (*Myotis grisescens*). 2012. Funded by the Grand River Dam Authority ($7,792).
- Temporal and Spatial Evaluation of Activity Patterns along the Grand Lake Shoreline by Gray Bats (*Myotis grisescens*) and Northern long-eared Bats (*Myotis septentrionalis*). 2015. Funded by the Grand River Dam Authority ($14,750).
- Assessment of Bat Richness at the Cucumber Creek Nature Preserve, Leflore Co. Oklahoma. The Oklahoma Nature Conservancy. 2018–2020. ($15,000).

Consulting Contracts:

- Survey for Federally Listed Threatened, Endangered, and Candidate Species at Camp Gruber, Oklahoma. 2002. Report to the Oklahoma Military Department, Oklahoma City, OK. Schnell, G.D., N.A. McCarty, K.W. Martin, and W.L. Puckette.
- Documentation of Suitable Habitat for Endangered Cave Fauna in the Lake Hudson Vicinity. 2004. Report to Grand River Dam Authority, by Benham Companies, Tulsa, OK. Hunt, G.L., K.W. Martin, and W.L. Puckette.
- Impact Study of a Proposed Bridge Reconstruction on Saline Creek, Delaware County, Oklahoma on Resident Bat Fauna. 2005. Report to the Oklahoma Biological Survey and the Cherokee Nation.
- Climatic Effects of Passage Manipulation Intended to Prevent Desiccation During Flood Events on Grand Lake for a Maternity Colony of Endangered Gray Bats. Report to the Grand River Dam Authority and the U.S. Fish and Wildlife Service Ecological Services Office, Tulsa OK. (2008)
- Protection and Management for the Gray Bat (*Myotis grisescens*) at Twin Cave, Delaware County, OK. Report to the Oklahoma Chapter of the Nature Conservancy. (2012)
- 2015 Presence/Absence Surveys for the Threatened Northern Long-eared Bat. Phoenix Coal Company, Inc., P.O. Box 498, Vinita, OK 74301.
  - 2015-17 Presence/Absence Surveys for the Threatened Northern Long-eared Bat. CP&Y Inc., 1155 Kelly Johnson Blvd., Suite 111, Colorado Springs, CO 80920.
  - 2015 Presence/Absence Surveys for the Threatened Northern Long-eared Bat. Farrell-Cooper Mining Company, 6001 Zero St., Ft. Smith, AR 72903.
  - 2016-18 Presence/Absence Surveys for the Threatened Northern Long-eared Bat. Cherokee Nation, Tahlequah, OK. 74465.
  - Karst Terrain Assessment for Dahlonegah South Rd, Adair County, OK. Project No. CN-0843-06. Cherokee Nation Community/Roads Department. December, 2016.
  - Karst Terrain Assessment for Honey Hill Road-Phase 1. Project No. CN-0848-02 Adair County, OK For Cherokee Nation Community/Roads Department. November, 2016

- Karst Terrain Assessment for Kansas-Dry Creek Road. Project Number CN-0704-07 Delaware County, Oklahoma. For Cherokee Nation Community Services/Roads Department. July, 2018.
- Karst Terrain Assessment for Smith Hollow Road Surface Rehabilitation Adair County, Oklahoma. Prepared for Cherokee Nation Community/Roads Department. September, 2018.
- Small Mammal Survey for Cherokee Nation Park Conservation Easement Sequoyah County, OK. Prepared for The Cherokee Nation Environmental Programs. July, 2018.

Training: ANABAT Techniques Workshop. Western Hills State Lodge, Hulbert, OK. June, 2009.

References:

Richard Stark
Fish and Wildlife Biologist
U. S. Fish and Wildlife Service
Ozark Plateau National Wildlife Refuge
Tulsa, OK
(918) 382-4520; (918) 775-9073
richard_stark@fws.gov

Matt Fullerton
Wildlife Biologist – Threat. & Endan. Sp.
Wildlife Diversity Program
Oklahoma Department of Wildlife Conservation
(580) 571-5820
matthew.fullerton@odwc.ok.gov

Melissa Shackford, Director of Land Protection
The Nature Conservancy/Oklahoma
408 NW 7th Street, Oklahoma City, OK 73102
(405) 445-5049 (direct)
(405) 204-0492 (cell)
mshackford@tnc.org

Andrea Taylor
Manager
Cherokee Nation Environmental Programs
Office: (918) 453-5365
Mobile: (918) 316-1060
andrea-taylor@cherokee.org

Darrell E. Townsend II, Ph.D.
Vice President
Ecosystems and Watershed Management
Grand River Dam Authority
(918) 256-0616: Office
(918) 530-0297: Cell

EXHIBIT F-2

FORESTED HABITAT ASSESSMENT

Kiamichi River Conservation Site

Target Species Habitat Assessment

State Highway 2, Clayton, Oklahoma, 74536

I. Introduction

An assessment was performed on the parcel of land proposed to become a conservation site for threatened and endangered bats (the "Site") to evaluate its value as summer habitat for the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*) (collectively, "Target Species") in September of 2019.

The Site is comprised of a single parcel located in Pushmataha County off State Highway 2, Clayton, OK, 74536. The approximate centerpoint of the parcel is located at 34.561, -95.379 (WGS 84). The location of the Site as well as the boundaries of the assessed areas can be found in in Exhibit A: Habitat Assessment Map. The assessed area consists of 90 acres of contiguous forested habitat. Field data was collected from 0.1-acre sample plots objectively distributed throughout the parcel to obtain a representative view of the forest by a Magnolia ecologist. Observations made included approximate canopy closure, dominant canopy tree species, woody invasive species coverage, aquatic features, slopes, and density of large snags that could serve as roost trees for the Target Species. Data sheets from the assessment can be found in Exhibit B: Data Sheets. Representative Site photos can be found in Exhibit C: Site Photographs.

The results of the assessment indicate that the assessed area contains forested habitat that is likely to be utilized by target species individuals in the vicinity as roosting and/or foraging habitat due to the species composition and age demographics of the forest community and presence of aquatic features. A summary of the results of the assessment can be found below in Table 1.

Table 1: Summary results of forested habitat assessment

Approximate Percent Woody Invasive Species Coverage	Percent Canopy Closure	Snags with DBH >11 in. per Acre
<1%	68%	9

II. Parcel Description

The assessed area contains 90.00 acres of forested habitat along the Kiamichi River. The forest community included a mix of large, mature trees as well as younger trees and saplings in the understory. The dominant canopy trees were oaks (*Quercus* spp.) and hickory species (*Carya* spp.). Shortleaf pines (*Pinus echinata*) were also found in stands throughout the Site. The average canopy cover was estimated to be 68%. Standing snags of varying sizes were found throughout the parcel. It was estimated that there were 9 snags with DBH >11 in. per acre throughout the Site. Numerous large (DBH >11 in.) living trees and snags with features such as cracks, crevices, or sloughing bark that are the preferred roosting habitat for the Target Species were noted throughout the Site. Herbaceous plants were also present in the understory

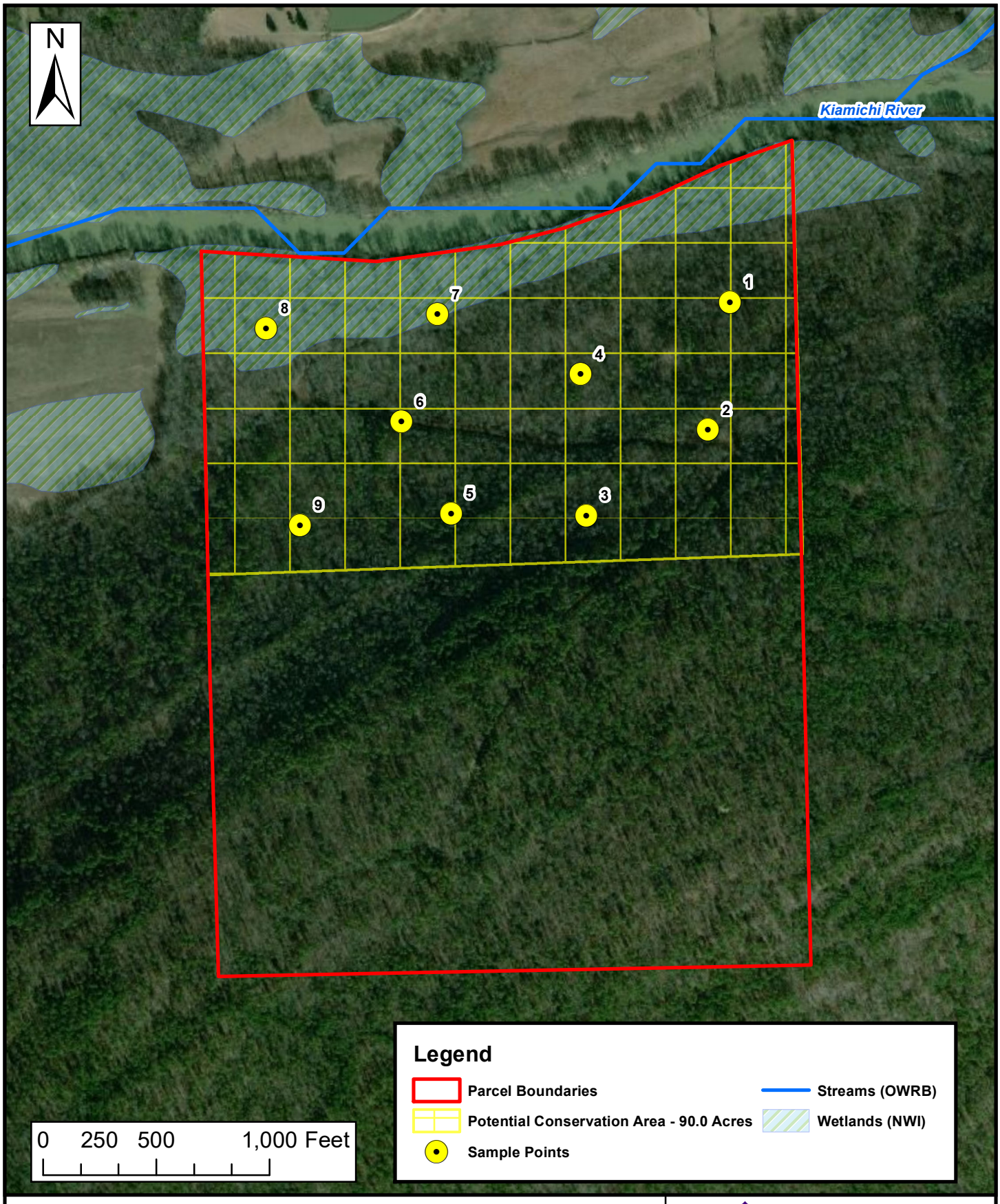
with varying densities. The non-native invasive plant chinaberry (*Melia azedarach*) was noted in low levels, primarily near disturbances caused by trail clearing or gaps in the canopy caused by storm damage. The average woody invasive plant species coverage was estimated to be less than 1%. The Kiamichi River forms the northern border of the Site. Several unmapped ephemeral tributaries to the Kiamichi River were noted on the Site. Approximately 17 acres of wetlands are mapped on the Site by the National Wetlands Inventory, primarily floodplains of the Kiamichi River. Indicators of wetland hydrology such as hydrophytic vegetation, saturated soils, and drift deposit lines were noted on the Site in the floodplain area. A formal wetland delineation was not performed. Slopes within the Site were relatively flat in the floodplain region and sloped steeply to the north moving away from the river. According to the USGS topographic map, the Site ranges from 545 to 880 feet above sea level. The data collected at each point can be found below in Table 2. The location of each sample point is shown in the Habitat Assessment Map, found in Exhibit A.

Table 2: Data collected at each sampling point

Point	Approximate Percent Woody Invasive Species Coverage	Percent Canopy Closure	Snags with DBH >11 in.	Snags with DBH >11 in. per Acre
1	0%	65%	0	0
2	0%	70%	1	10
3	0%	60%	0	0
4	0%	70%	1	10
5	0%	65%	2	20
6	0%	60%	0	0
7	2%	75%	2	20
8	0%	75%	1	10
9	1%	75%	1	10
AVERAGE	**<1%**	**68%**	**0.89**	**9**

EXHIBIT A

HABITAT ASSESSMENT FIGURE



Habitat Assessment

Kiamichi River Conservation Site
Pushmataha County, OK

Magnolia

Date: September 2019

Source: USGS, Esri, OWRB

EXHIBIT B

HABITAT ASSESSMENT DATA SHEETS

Forested Habitat Assessment Data Sheet

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34.5820
Plot Number: 1	**Longitude:** -93.3753
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 85
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 0

NOTES

moderate northern slope

Mixed age canopy, dominated by longleaf pine + mockernut hickory

no noted invasives

1 PRT - living white oak

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34.5812
Plot Number: 4	**Longitude:** -93.3776
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 70
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 1

NOTES

Steep northern slope

mature canopy, dominated by white oak + mockernut hickory

no noted invasives

1 PRT - oak snag

Forested Habitat Assessment Data Sheet

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34 5605
Plot Number: 2	**Longitude:** -95.3757
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 70
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 1

NOTES

Varying apparent age
canopy dominated by pignut hickory, white maple
- several large longleaf pines present
steep northern slope
no noted invasives

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** ~~34.~~ 34.5595
Plot Number: 3	**Longitude:** -95.3775
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 60
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 0

NOTES

Younger canopy w/ several older wolf trees
Canopy dominated by pignut hickory, red maple
steep northern slope
no noted invasives
evidence of recent (<15 y.a.) fire

Forested Habitat Assessment Data Sheet

Site Name:	Jackson	**Date:**	9/18/19
Forest Stand:	1	**Surveyor:**	Ben Johnson
Stand Size:	90 acres	**Latitude:**	34.5595
Plot Number:	5	**Longitude:**	-95.3795
Plot Basal Area:	0.1 acre	**Percent Canopy Closure:**	65
Approximate Woody Invasive Plant Coverage:	0	**Snags with DBH >11 in:**	2

NOTES

steep northern slope
mature canopy dominated by loblolly pine, mockernut hickory
gaps in canopy from rocky outcrops
possible ephemeral stream bed
1 PRT - pine snag

Site Name:	Jackson	**Date:**	9/18/19
Forest Stand:	1	**Surveyor:**	Ben Johnson
Stand Size:	90 acres	**Latitude:**	34.5594
Plot Number:	4	**Longitude:**	-95.3817
Plot Basal Area:	0.1 acre	**Percent Canopy Closure:**	75
Approximate Woody Invasive Plant Coverage:	1	**Snags with DBH >11 in:**	1

NOTES

moderate northern slope
mature canopy dominated by white + red oak
possible ephemeral stream bed
[~~hardwood~~ Chinaberry bush noted
[PRT - Oak snag

Forested Habitat Assessment Data Sheet

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34.5620
Plot Number: 7	**Longitude:** -79.7796
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 75
Approximate Woody Invasive Plant Coverage: 2	**Snags with DBH >11 in:** 2

NOTES

Relatively flat

Mixed age canopy dominated by Red oak and slippery elm

Several chinaberry trees noted

Indicators of wetland hydrology - saturated soils, hydrophytic vegs., drift lines

Site Name:	**Date:**
Forest Stand:	**Surveyor:**
Stand Size:	**Latitude:**
Plot Number:	**Longitude:**
Plot Basal Area:	**Percent Canopy Closure:**
Approximate Woody Invasive Plant Coverage:	**Snags with DBH >11 in:**

NOTES

Forested Habitat Assessment Data Sheet

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34.5607
Plot Number: 6	**Longitude:** -95.3802
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 60
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 0

NOTES

moderate northern slope
younger canopy, dominated by red oak and sycamore
no noted invasives

Site Name: Jackson	**Date:** 9/18/19
Forest Stand: 1	**Surveyor:** Ben Johnson
Stand Size: 90 acres	**Latitude:** 34.5618
Plot Number: 8	**Longitude:** -95.3821
Plot Basal Area: 0.1 acre	**Percent Canopy Closure:** 75
Approximate Woody Invasive Plant Coverage: 0	**Snags with DBH >11 in:** 1

NOTES

slight northern slope
mixed age canopy, dominated by slippery elm and red oak
no noted invasives
likely floodplain to Kiamichi River
1 PRT-oak snag

EXHIBIT C

SITE PHOTOGRAPHS

[BEGINS ON NEXT PAGE]

Photo 1: Photo showing the Kiamichi River, which borders the northern boundary of the Site

Photo 2: Photo showing a mature pignut hickory (*Carya glabra*) tree growing among a rocky outcropping.

Photo 3: Photo showing a mix of young and mature trees, primarily oaks and hickories.

Photo 4: Photo showing a steep, rocky slope populated by herbaceous plants and trees of varying ages.