Bird and Bat Conservation Strategy
Triple H Wind Project
Hyde County, South Dakota

Prepared for:

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July 22, 2019

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1.0 INTRODUCTION

1.1 Background and Purpose

Although wind energy facilities utilize a renewable-energy resource, potential impacts to birds and bats may result from their construction and operation. Interactions with wind turbines and the associated infrastructure such as energy transmission, distribution, and substations may result in fatalities or indirect effects that may include displacement or habitat loss. To address these concerns, Triple H Wind Project, LLC (Triple H) contracted Western EcoSystems Technology, Inc. (WEST) to develop this site-specific Bird and Bat Conservation Strategy (BBCS) for the Triple H Wind Project (Project) in Hyde County, South Dakota. This BBCS outlines various processes that Triple H has employed and/or will employ to: 1) comply with all state and federal avian and bat conservation and protection laws and regulations applicable to the Project; 2) ensure that any effects to avian and bat resources are identified, quantified, and analyzed; and 3) avoid, minimize, and mitigate potential effects consistent with the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012).

Federal laws and regulations protect the majority of birds found in and around the Project area, including the Migratory Bird Treaty Act of 1918 (MBTA), the Bald and Golden Eagle Protection Act of 1940 (BGEPA), and the federal Endangered Species Act of 1973 (ESA). The purpose of the BBCS is to meet the intent of these regulations and guidelines by reducing and managing the risk to avian and bat species. This BBCS has been voluntarily prepared as a good faith effort by Triple H to proactively address potential impacts to birds and bats that may result from the construction and operation of the Project.

1.2 Objectives

Triple H has developed this BBCS to meet the following objectives:

1) Document and describe the scope of the Project, and the biological survey work that was completed during pre-construction, and provide an assessment of risks to avian and bat resources posed by the Project. This objective includes providing a single point of reference for information related to avian and bat studies performed in relation to the Project.
2) Provide a plan that avoids, minimizes, and monitors potential effects to avian and bat species resulting from the construction and operation of the Project consistent with the WEG.
3) Describe post-construction monitoring efforts that will continue to be implemented at the Project to identify impacts to birds and bats, as well as the methods for reporting the results of monitoring.
4) Outline the adaptive management framework that Triple H is committed to over the life of the Project, and how Triple H plans to implement adaptive management during operation of the Project.

5) Provide an educational and practical reference for Triple H's employees and contractors to facilitate the application of measures that avoid and minimize potential negative effects to avian and bat species at the Project.

2.0 SITE AND PROJECT DESCRIPTION

The boundary of the Project has changed in response to the Tier 1- 3 evaluations and project planning. The 2016 and 2017 Project areas were located in Hughes and Hyde Counties, South Dakota, approximately 4.8 kilometers (km; three miles [mi]) south of Highmore, Holabird, and Harrold, South Dakota. The current Project area is located exclusively in Hyde County on 11,026.7 hectares (ha; 27,247.6 acres [ac]; Figure 2.1) within the Northwestern Glaciated Plains Level III Ecoregion. This ecoregion is characterized by high concentrations of seasonal and semi-permanent wetlands (prairie potholes; US Environmental Protection Agency [USEPA] 2015). The topography within the current Project consists of rolling hills, with elevations ranging from 594 to 624 meters (m; 1,950 to 2,050 feet [ft]) above mean sea level. Land ownership is primarily private, with a few scattered State land parcels. A portion of the State Chapelle Water Access Area is also located within the current Project. South Fork Medicine Knoll Creek and Chapelle Creek are the main drainages and prairie potholes occur across the area. The majority of the lands within the current Project support agriculture (91.1%), either as cultivated crop, hay, or pasture lands (Table 2.1, Figure .22; US Department of Agriculture [USDA] National Agriculture Imagery Program [NAIP] 2016]); National Land Cover Database [NLCD] 2011; Homer et al. 2015; USDA National Agricultural Statistics Service [NASS] National Cropland Layer 2017). Wetlands comprise 6.1% of the Project (USFWS National Wetlands Inventory [NWI] 2017) and the remaining land cover types make up less than 2% each of the total Project area (Table 2.1).

Table 2.1. Digitized land cover types, coverage, and composition within the Triple H Wind Project, Hyde County, South Dakota.

Habitat	Hectares	Acres	% Composition
Cropland	6,909.6	17,073.9	62.7
Grassland Pasture	2,846.0	7,032.6	25.8
Wetlands[a]	676.5	1,671.6	6.1
Grass Hay	283.9	701.5	2.6
Developed	209.1	516.8	1.9
Trees	101.6	251.1	0.9
Water	<0.1	0.1	<0.1
Total[b]	11,026.7	27,247.6	100

Calculated using Projected Coordinate System NAD 1983 2011 State Plane South Dakota South FIPS 4002 Feet US.

Data Source: USGS NLCD 2011, Homer et al. 2015

[a] USFWS NWI 2017

[b] Sums of values may not add to total value shown, due to rounding.

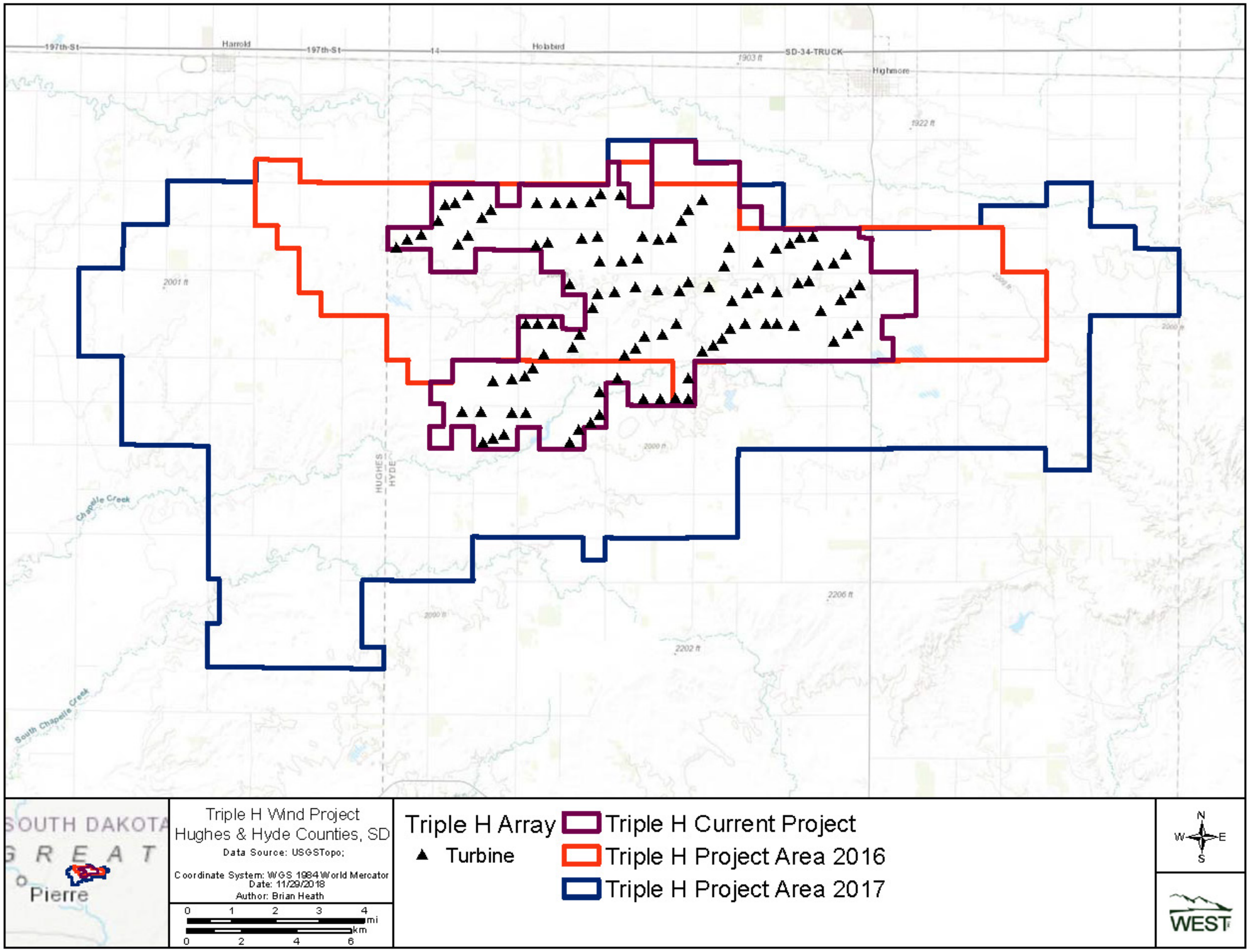

Figure 2.1. Location of the Triple H Wind Project in Hyde County, South Dakota.

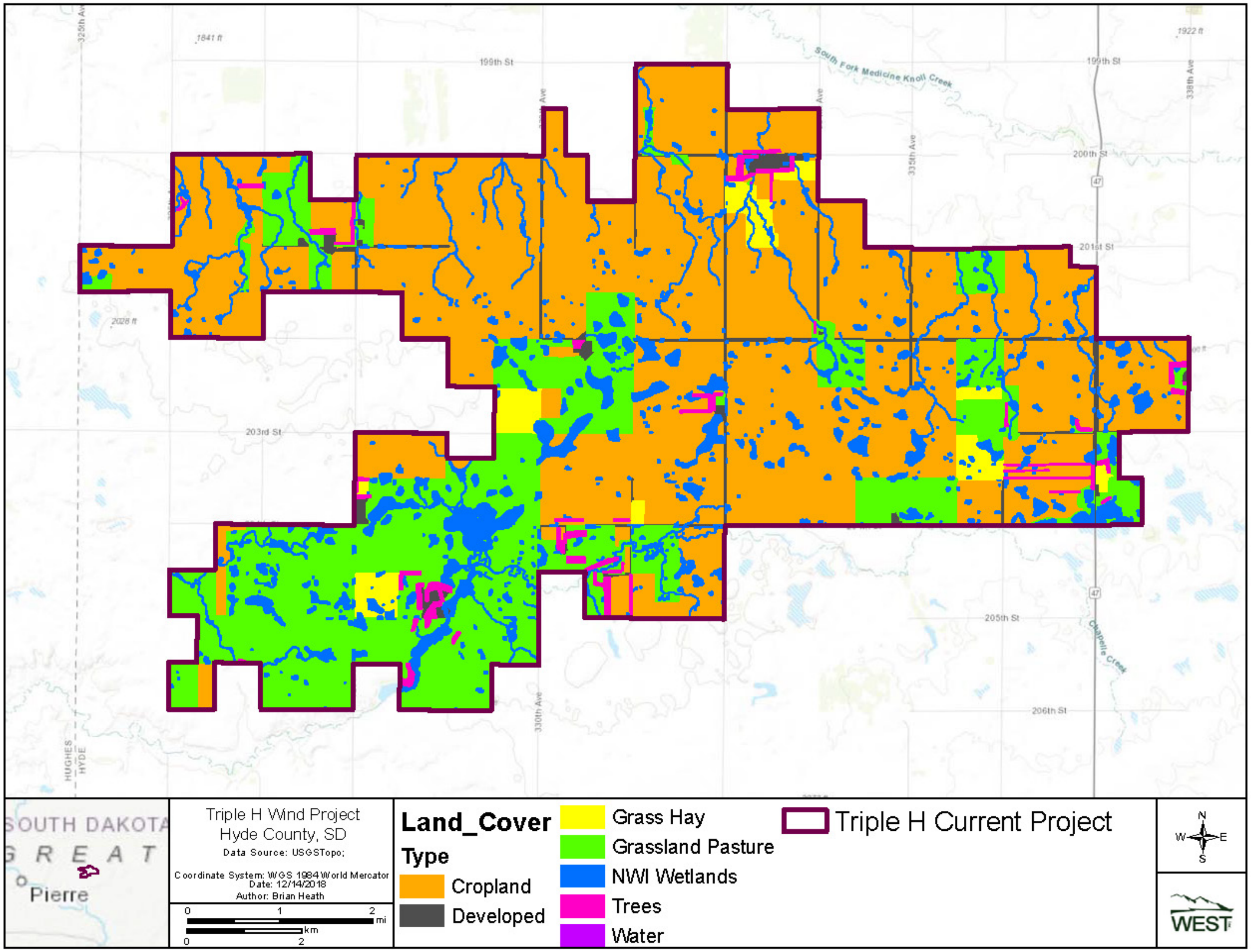

Figure 2.2. Digitized land cover within the current Triple H Wind Project in Hyde County, South Dakota (US Department of griculture 2016, National Land Cover Database [Yang et al. 2018, Multi-Resolution Land Characteristics 2019], US Fish and Wildlife Service National Wetlands Inventory 2017). .

3.0 REGULATORY REQUIREMENTS RELEVANT TO THIS Bird and Bat Conservation Strategy

3.1 Federal Endangered Species Act

Species at risk of extinction, including many birds and bats, are protected under the federal ESA of 1973, as amended (16 U.S. Code [U.S.C.] §§ 1531 *et seq*.). The purpose of the ESA is to protect threatened and endangered species and to provide a means to conserve their habitats. Take under the ESA is defined as "…to harass, harm, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." (ESA § 3(19), 16 U.S.C 1532(19)). Harm is an act which injures or kills a wildlife species, including significant habitat modification or degradation; whereas harass is defined as an intentional or negligent act or omission which creates the likelihood of injury by annoying the animal to the extent it significantly disrupts normal behavior patterns such as breeding, feeding, or sheltering. The ESA authorizes the USFWS to issue permits for "incidental take" of wildlife species, which is take resulting from an otherwise lawful activity.

3.2 Migratory Bird Treaty Act

The MBTA integrates and implements four international treaties that provide for the protection of migratory birds. The MBTA prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." (16 U.S.C. § 703 [1918]). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." (50 Code of Federal Regulations [CFR] § 10.12 [1973]). The USFWS maintains a list of all species protected by the MBTA at 50 CFR § 10.13 (1973). This list includes over 1,000 species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

On December 22, 2017, the US Department of Interior (USDOI) issued a Solicitor's Opinion (USDOI 2017) followed by the USFWS Guidance Memorandum on April 11, 2018 (USFWS 2018b), both of which clarified the following with regards to enforcement of the MBTA: 1) the MBTA's take prohibitions only apply when the purpose of an action is take of migratory birds, their eggs, or their nests; 2) the project's impacts on migratory birds should still be considered during the National Environmental Policy Act of 1969 (NEPA) review process; 3) future settlement agreements for take of listed species or eagles should not include restrictions, minimization measures, or mitigation for purposes of MBTA compliance; 4) future permits under the ESA or BGEPA, or inter-agency consultations under Section 7 of the ESA, should not include restrictions, minimization measures, or mitigation for purposes of MBTA compliance; and 5) the MBTA does not affect protections provided under the ESA or the BGEPA (Locke Lord 2018).

3.3 Bald and Golden Eagle Protection Act

The BGEPA (16 U.S.C. §§ 668-668d [1940]) affords bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) additional legal protection. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. The BGEPA also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," (16 USC § 668c [1940]), and includes criminal and civil penalties for violating the statute (16 USC § 668 [1940]). The USFWS further defined the term "disturb" as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.

In September 2009, the USFWS promulgated a final rule on two new permit regulations that specifically authorize under the BGEPA the non-purposeful (i.e., incidental) take of eagles and eagle nests in certain situations (50 CFR § 22.26 [2009] and § 22.27 [2009]). Revisions to the final rule were issued in December 2016. The permits authorize limited take of bald and golden eagles; authorizing individuals, companies, government agencies and other organizations to disturb or otherwise take eagles in the course of conducting lawful activities. To facilitate issuance of Eagle Take Permits (ETPs) for wind energy facilities the USFWS finalized the *Eagle Conservation Plan Guidance - Module 1 - Land-based Wind Energy Version 2* (ECPG; USFWS 2013). If eagles are identified as a potential risk at a project site, developers are encouraged to follow the ECPG. The ECPG describes specific actions that are recommended to achieve compliance with the regulatory requirements in the BGEPA for an ETP, as described in 50 CFR § 22.26 (2009) and § 22.27 (2009). The ECPG provides a national framework for assessing and mitigating risk specific to eagles through development of Eagle Conservation Plans (ECPs) and issuance of programmatic ETPs for eagles at wind facilities.

3.4 South Dakota Game, Fish, and Parks Siting Guidelines for Wind Power in South Dakota

The *Siting Guidelines for Wind Power Projects in South Dakota* address activities and concerns associated with siting and permitting wind turbines in South Dakota. The guidelines highlight the Missouri Coteau in central South Dakota, where the Project area is located, and the Coteau des Prairies in eastern South Dakota as areas identified as potential sites for wind development in South Dakota. These guidelines also contain contact information for state agencies, wildlife experts and universities, interest groups, and local resource management agencies (SDGFP 2009).

4.0 AGENCY CONSULTATION

The WEG strongly encourages energy developers to coordinate with agencies to obtain information on bird, bat or other wildlife issues within a project area and vicinity. Agencies can help developers identify potential biological resource issues early in the development process. Bird and bat baseline studies were designed in accordance with the USFWS WEG.

5.0 AVIAN AND BAT RESOURCES: TIERS 1-3

The WEG outlines a tiered approach that assesses the habitat suitability and risks to wildlife at a potential wind resource area. The "tiered" approach ensures that sufficient data are collected to enable project proponents to make informed decisions about continued development of a proposed project (USFWS 2012). At each tier, potential issues associated with the development or operations of the project are identified and questions are formulated to guide the decision process. This process starts at a broad scale and provides more site-specific detail at each tier as more data are gathered and the potential for avian and bat issues are better understood. This approach ensures that sufficient data are collected to enable Triple H to make informed decisions regarding the Project while ensuring that Triple H is complying with its corporate environmental policy.

5.1 Tiers 1 and 2 – Preliminary Site Evaluation and Characterization

As described in the WEG, Tiers 1 and 2 provide a framework for evaluating potential issues that may need to be addressed before further actions can be taken relative to the development or operations of the Project. The objective of the Tier 1 study is to assist the developer in further identifying a potential wind energy site. Tier 1 studies provide a preliminary desktop evaluation or screening of public data from federal, state, and tribal entities and offer early guidance about the sensitivity of the site, in regards to flora and fauna. The objective of Tier 2 studies is to determine potential effects of the proposed project on any federal and state sensitive species. Tier 2 studies typically include a more substantive review of existing information, including publicly available data on land use/and land cover, topography, wetland data, wildlife, habitat, and sensitive plant distribution, a reconnaissance level site visit (to confirm presence of habitat types), and contacting the agencies involved.

5.1.1 Site Characterization Study

In 2016, a Site Characterization Study was conducted by WEST to address the recommendations of a Tier 2 study described in the WEG (Appendix A). This study described potentially sensitive habitats and other protected lands and associated wildlife. Three identified protected lands were all contained outside of the Project area. A review of federally protected species identified nine species that could potentially occur within the Project included one mammal (northern long-eared bat [*Myotis septentrionalis*]), seven birds (Table 5.1), and one fish (pallid sturgeon [*Scaphirhynchus albus*]). Although occurrence of these species are generally unknown, they are likely not to occur due to habitat requirements, landscape features, and previous observations from publically available data.

Additionally, a Habitat Characterization study (HCS) was conducted by WEST in 2016 which focused on landscape cover within the Project area. (Appendix B). The HCS identified no critical issues associated with the Project area which included areas in Hughes and Hyde Counties, South Dakota. The review was comprised of 2014 USDA NAIP aerial imagery in combination with 2011 South Dakota Land Cover Patterns (USGS NLCD 2011, Homer et al. 2015), 2015 USDA NASS cropland classification data, and field inspections. USFWS NWI (2016) data were used to represent water features within the study area. Water features visible on aerial imagery but not in the NWI data were digitized as "water" habitat.

Additional desktop reviews were conducted by WEST prior to Tier 3 studies and during the drafting of this BBCS to address insufficient information and changes made to the Project boundary over the development of the Project. Table 5.1 provides a list of federal and state-protected bird species potentially occurring in Hyde County, where the current Project is located. In addition, USFWS Birds of Conservation Concern (BCC) with the potential to occur in Hyde County are listed in Table 5.2. Furthermore, a list of bat species, including the federally threatened northern long-eared bat (*Myotis septentrionalis*), with the potential to occur in Hyde County is presented in Table 5.3 (SDGFP 2016, USFWS 2019).

Table 5.1. Bird species listed as state or federally threatened, endangered, or otherwise protected with the potential to occur at the Triple H Wind Project, Hyde County, South Dakota.

Common Name	Scientific Name	Status
bald eagle	*Haliaeetus leucocephalus*	BGEPA
golden eagle	*Aquila chrysaetos*	BGEPA
least tern	*Sterna antillarum*	FE, SE
piping plover	*Charadrius melodus*	FT, ST
whooping crane	*Grus americana*	FE, SE
rufa red knot	*Calidris canutus rufa*	FT
Sprague's pipit	*Anthus spragueii*	FC

BGEPA = Bald and Golden Eagle Protection Act (1940), FE = Federally Endangered (USFWS 2019), FT = Federally Threatened (USFWS 2019), FC = Federal Candidate (USFWS 2016), SE = State Endangered (SDGFP 2016), ST = State Threatened (SDGFP 2016)

Table 5.2. US Fish and Wildlife Service Birds of Conservation Concern (BCC) potentially occurring at the Triple H Wind Project, Hyde County, South Dakota.

Common Name	Scientific Name
American Golden-plover[1]	*Pluvialis dominica*
black tern[2]	*Chlidonias niger*
black-billed cuckoo[1]	*Coccyzus erythropthalmus*
bobolink[1]	*Dolichonyx oryzivorus*
chestnut-collared longspur[1, 2]	*Calcarius ornatus*
dickcissel[2]	*Spiza Americana*
Franklin's gull[1]	*Leucophaeus pipixcan*
grasshopper sparrow[2]	*Ammodramus savannarum*
Hudsonian godwit[1]	*Limosa haemastica*
lesser yellowlegs[1]	*Tringa flavipes*
marbled godwit[1, 2]	*Limosa fedoa*
red-headed woodpecker[1]	*Melanerpes erythrocephalus*
semipalmated sandpiper[1]	*Calidris pusilla*
Swainson's hawk[2]	*Buteo swainsoni*
upland sandpiper	*Bartramia longicauda*
willet[1, 2]	*Tringa semipalmata*

[1] USFWS 2019
[2] Observed during site-specific avian studies

Table 5.3. Bat species, categorized by echolocation call frequency, with potential to occur at the Triple H Wind Project, Hyde County, South Dakota.

Common Name	Scientific Name
High Frequency (HF; > 30 kilohertz [kHz])	
eastern red bat[1,2]	*Lasiurus borealis*
western small-footed bat	*Myotis ciliolabrum*
little brown bat[1]	*Myotis lucifugus*
northern long-eared bat[1,3]	*Myotis septentrionalis*
Low Frequency (LF; 15 – 30 kHz)	
big brown bat[1]	*Eptesicus fuscus*
hoary bat[1,2]	*Lasiurus cinereus*
Townsend's big-eared bat	*Corynorhinus townsendii*

Data Source: International Union for Conservation of Nature [IUCN] 2018, USFWS 2019

[1] Species known to have been killed at wind energy facilities (Species reported by O'Connell and Piorkowski 2010, Kunz et al. 2007, Miller 2008, Thompson et al. 2011, American Wind Wildlife Institute 2018)

[2] Long-distance migrant

[3] Federally threatened species (USFWS 2019)

5.1.2 Whooping Crane Stopover Habitat Assessment

A desktop review and analysis of potential whooping crane (*Grus americana*) stop-over habitat within and adjacent to the Project was conducted to evaluate whether or not the proposed current Project area represents unique whooping crane stop-over habitat compared to the surrounding landscapes (Appendix C). The federally-listed whooping crane migrates through South Dakota enroute to breeding grounds in Canada and wintering grounds in Texas along the Gulf of Mexico (Canadian Wildlife Service [CWS] and USFWS 2007). The current Project is located in the distance bands where 75-80% of observations have occurred, based on confirmed sightings (Cooperative Whooping Crane Tracking Project [CWCTP] 2016).

Potential stopover habitat for whooping cranes was evaluated using a model developed by The Watershed Institute, Inc. (TWI 2012). The TWI habitat assessment model is a quantitative and easily-replicated desktop approach to evaluating the quantity, quality, and locations of potential whooping crane stopover habitat in a given area. The model is based on available data for water regime, water depth, visibility obstructions, wetland size, disturbance, and proximity to feeding areas; all factors that have been shown to affect how whooping cranes choose stopover habitat. The initial goal of the TWI model was to provide electric utilities with a tool for making power line-marking decisions, but the USFWS stated in a personal communication (D. Mulhern, USFWS [retired], November 19, 2012) that the model should also be applicable to wind power development areas for the identification of potential whooping crane stopover habitat. The desktop evaluation of potential whooping crane stopover habitat using the TWI model included the current Project area plus a 16.1-km (10-mi) buffer (Figure 5.1).

The results of wetland feature scores calculated by TWI within the current Project and 16.1-km buffer were compared to Quivira National Wildlife Refuge (Quivira), a traditional stopover site for whooping cranes in Kansas. Based on the average score for Quivira wetlands, scores of 12 or higher were considered by TWI to be potentially suitable habitat.

High-scoring (12+) features throughout the landscape (Project area plus 16.1-km buffer [Figure 5.1]). However, most of these high-scoring features identified outside of the Project area (Figure 5.1). The largest high-scoring features in terms of acreage, and the areas with the most densely occurring high-scoring features were outside of the Project boundary to the north, southeast, and west. The widespread availability of suitable stopover habitat indicates that if cranes are displaced by development of the Project, they are likely to find similar habitat nearby. Due to the lack of a concentration of high-scoring features within the Project, relative to the surrounding landscape, whooping cranes are unlikely to be more attracted to the Project compared to surrounding areas.

Through the fall of 2016, no whooping crane observations were confirmed within the current Project, but three observations were confirmed within 16.1 km (CWCTP 2016). CWCTP emphasizes that the whooping crane observation data are incidental sightings and not accurate documentations of absence in areas where no observations are recorded, nor are observation locations representative of all sites used by tracked cranes as only the location of the first observation is logged in the database.

The US Geological Survey (USGS) evaluated the spatial intensity of use by 58 whooping cranes fitted with platform transmitting terminals to identify areas that may be important for migrating whooping cranes (Pearse et al. 2015). Stopover sites used during spring and fall migration were tracked over five years. Based on stopover site use density and duration, 20 km^2 (12 mi^2) grid cells were categorized as unoccupied, low use, core intensity, or extended-use core intensity. Overlaying the USGS site use intensity data with the current Project indicates that the Project is located in an area with unoccupied and lower use intensity.

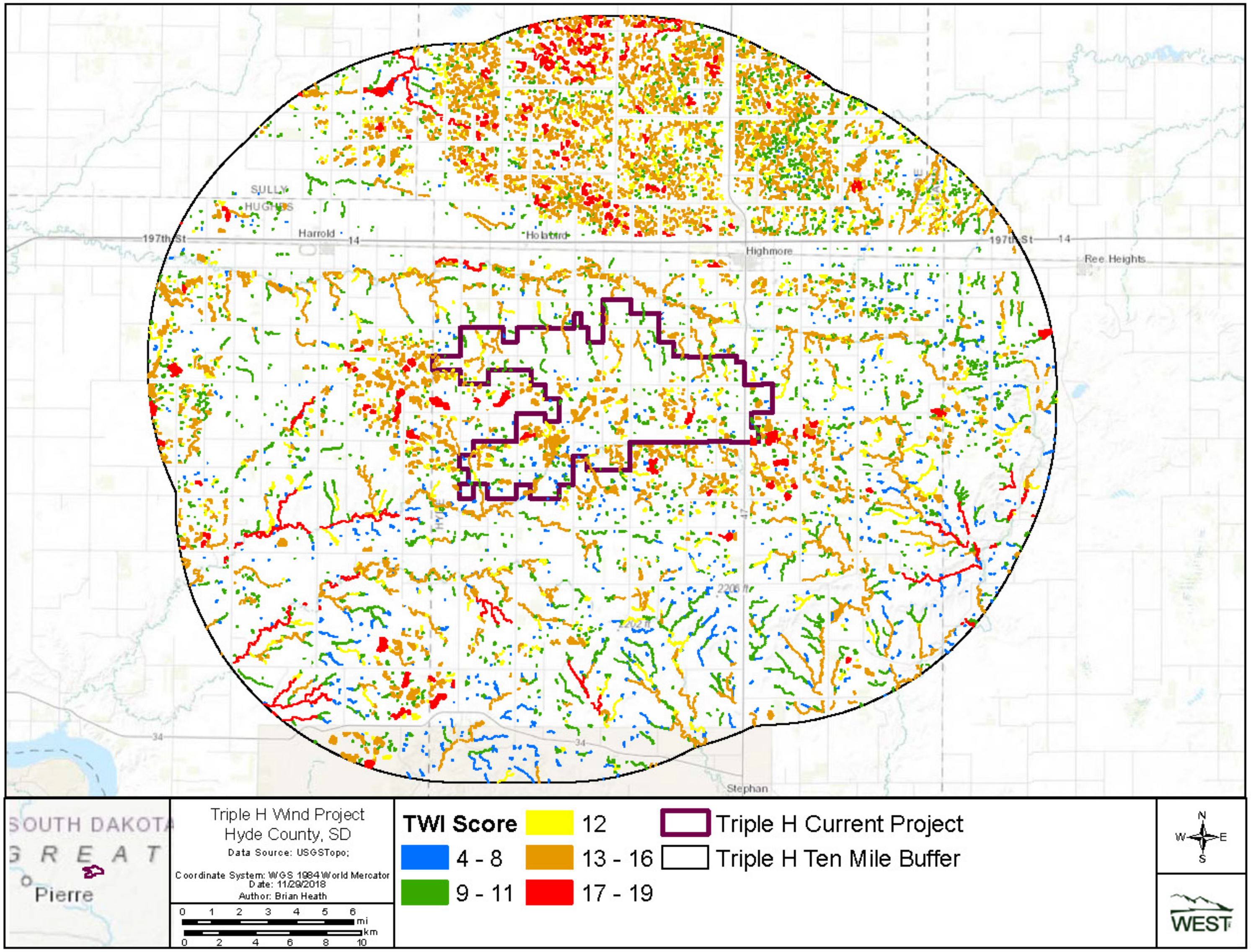

Figure 5.1. Map of wetlands scored using the The Watershed Institute model for the current Triple H Wind Project and 16.1 kilometer (10-mile) buffer.

5.1.3 Northern Long-eared Bat Habitat Assessment

The range of the federally-threatened NLEB overlaps with the current Project area, and the species is known to occur in Hyde County, adjacent to the current Project (SDGFP 2016). In 2017, WEST conducted a desktop review of land cover data and aerial imagery to assess the presence of potentially suitable summer NLEB habitat within the entire Triple H Project area (Appendix D), which encompassed the entire wind resource area (Figure 5.2).

During the summer, suitable habitat for NLEB consists of forested areas where bats may roost, forage, and commute between roosting and foraging sites. NLEB habitat suitability was evaluated based primarily on the presence of forested areas that NLEB might use for roosting and foraging. The desktop assessment of potentially suitable NLEB habitat included reviewing the 2011 USGS NLCD data within a 4.0 km (2.5 mi) buffer of the 2017 Project area, and delineating potentially suitable habitat types (i.e., deciduous forest, evergreen forest, mixed forest, and woody wetlands) using Geographic Information Systems. The habitat delineations were then cross-checked and edited based on the most recent publicly available aerial imagery from the USDA NAIP for the Project area. The overall habitat layer was then edited to remove areas that had been cleared of trees and to refine habitat boundaries. Narrow commuting corridors not captured by the NLCD were also added based on the aerial imagery.

A habitat analysis was then conducted to assess connectivity of suitable foraging habitats (i.e., woodlots, forested riparian corridors, and natural vegetation communities adjacent to these habitats), roosting habitats, and commuting habitats (i.e., shelterbelts/tree-lines, wooded hedgerows) as suggested in the USFWS Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (USFWS 2011). The guidance suggests assessing the potential presence of Indiana bats (*Myotis sodalis*) and NLEB within a Project based on the availability of travel/commuting corridors within the Projects' boundary, and connectivity to foraging or roosting habitat within a 4.0 km buffer of the Project. The minimum size for suitable foraging/roosting habitat is not well understood, but lower estimates are approximately eight ha (20 ac; Broders et al. 2006); therefore a minimum patch size of six ha (15 ac) was used to conservatively assign potential roosting habitat. Trees up to 305 m (1,000 ft) from the next nearest suitable roost tree, woodlot, or wooded fencerow were also considered suitable habitat, based on USFWS guidance (USFWS 2017b; USFWS 2011).

Forested patches were sorted by size into the following groups: less than six ha (less than15 ac): small forest patches, 6-20 ha (15-50 ac); potential NLEB roost/foraging habitat; and greater than 20 ha (greater than 50 ac); large potential roost/foraging habitat. All polygons representing forested habitats were buffered by 152 m (500 ft) and dissolved to group any connecting habitat patches within 305 m of each other. This buffer, representing all forested habitats within 305 m of each other, was then purged of small isolated patches by selecting only those connected habitats containing forested patches at least six ha in size. This selection of habitat patches was then buffered by 305 m to represent the potential foraging area for NLEB.

The NLEB bat habitat assessment resulted in four forested patches large enough to provide potential roosting/foraging habitat (i.e., greater than six ha) within the 2017 Project area, and two additional forested patches greater than six ha outside of the 2017 Project area within the 4-km buffer (Figure 5.2). Within the current Project area, two forested patches large enough to provide potential roost/foraging habitat (i.e., greater than six ha) are located within current Project boundary near the State Chapelle Water Access Area (Figure 5.2). Given that there were forested patches greater than six ha within the current Project and 4.0-km buffer, further on-site evaluation may be warranted.

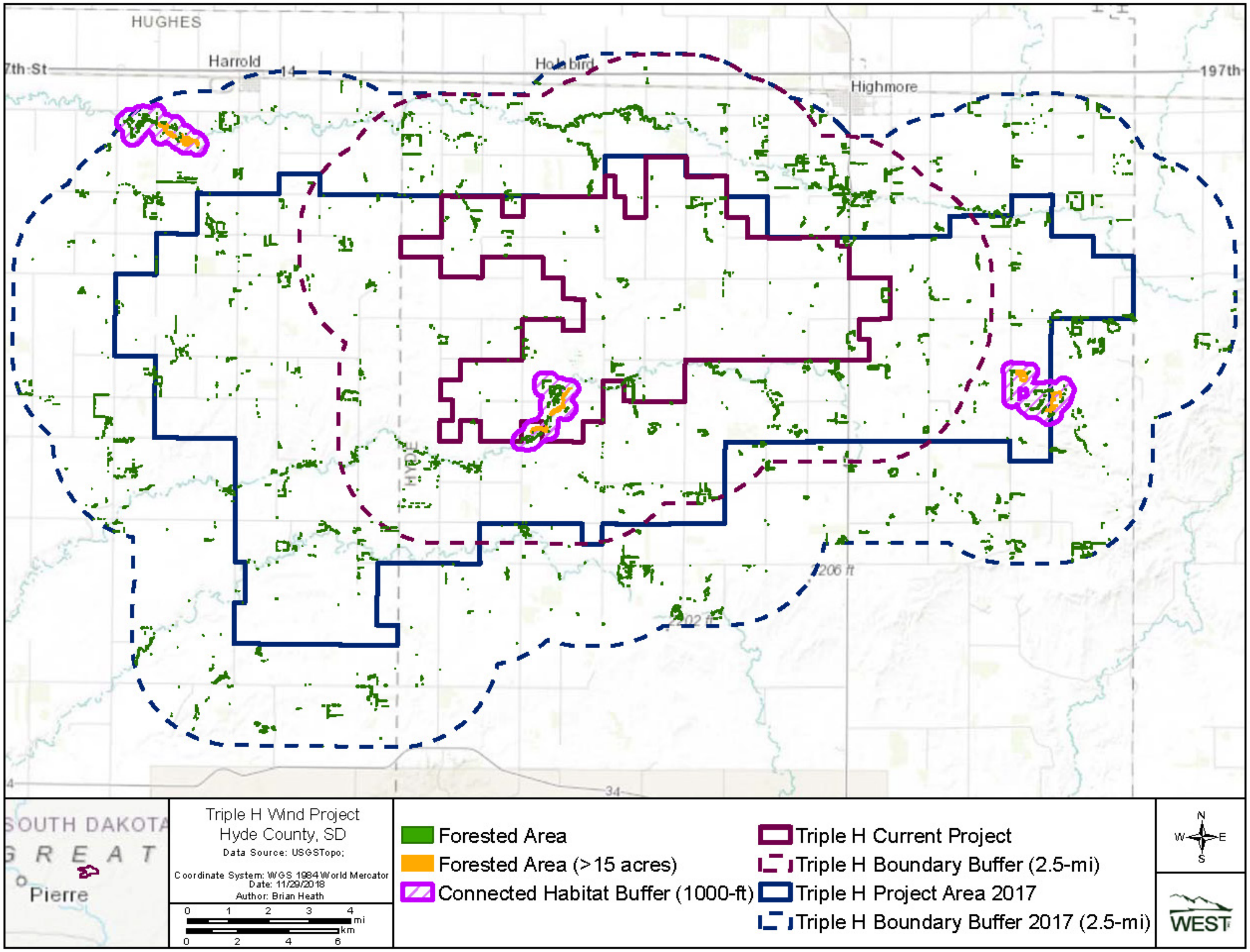

Figure 5.2. Northern long-eared bat habitat assessment of the expanded Triple H Wind Project relative to the current Triple H Wind Project

5.2 Tier 3 – Baseline Avian and Bat Studies

Baseline small and large bird use surveys have been conducted for two years at each survey location between 2016 and 2019. Raptor nest surveys, prairie grouse lek surveys, and bat acoustic surveys were all conducted in both 2016 and 2018.

5.2.1 Eagle and Other Large Bird Use Surveys

5.2.1.1 Methods

Two years of eagle and other large bird use surveys were conducted within the current Project area (Figure 5.3; purple outline). The objective of the eagle and other large bird use surveys was to collect spatial and temporal information about eagle and other large bird use at the Project, identify areas of increased avian risk, and evaluate eagle use in the Project area following the ECPG (USFWS 2013) to inform turbine siting decisions.

The first year of study was conducted from April 18, 2016 to March 28, 2017 at 24 point count locations (Figure 5.3, Appendix E). Points were selected such that survey viewsheds covered approximately 30% of the 2016 Project area, per ECPG recommendations for assessing eagle use (USFWS 2013). The Project area was expanded in November 2017. The second year of study was conducted from January 23, 2018 to January 14, 2019 at 38 point count locations that provided at least 30% coverage of the 2017 Project area (Figure 5.3, Appendix F). The Project boundary was revised to the current Project area following the conclusion of the second year of study. Twenty-two of the 2016 and 2018 point count locations are within the current Project boundary (Figure 5.3). Collective coverage among both years of data collection is approximately 30.3% of the current Project footprint, which meets the 30% spatial survey coverage recommended by the ECPG. However, the level of effort in the ECPG and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016) recommends two years of surveys at this spatial coverage. All 2016 and 2018 points were each surveyed for a year, and none of the points were surveyed for two years. The 2016 and 2018 surveys points outside of the current Project will provide additional information pertaining to general avian use and potential risk to birds in the Project area.

Surveys were conducted using the methods described by Reynolds et al. (1980) and consistent with the methods recommended in the WEG and ECPG, though the recommended two year survey effort was not achieved (USFWS 2012, USFWS 2013). Points were surveyed for 60 minutes (min) each, approximately once per month, during daylight hours using a random start location to vary the visitation times of each point throughout the day during each season. At each point, all large birds were recorded; however, analysis was restricted to large bird observations within 800 m (2,625 ft) from the observer. The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded for each survey. Information collected for each observation included: species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center (i.e., observer) when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s). Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height and distance from the observer at first observation were recorded to the nearest 5-m (16-ft) interval. Additional minute by minute data were collected for the duration of all eagle observations following ECPG methodology (USFWS 2013).

5.2.1.2 Results

During the first year of study (April 18, 2016 to March 28, 2017), 238 eagle and other large bird use surveys were conducted (Appendix E). The majority of survey points (15 of 24 total points) were visited 11 or 12 times, while the remaining nine points were visited only seven or eight times due to weather-related issues (e.g., flooded roads, snow and ice, drifted minimum maintenance roads, etc.) during the winter and spring. A total of 9,969 large bird observations were recorded within 423 separate groups. Field biologists identified 29 large bird species. Species diversity was greatest during the spring (21 species), followed by summer (18 species), fall (15 species), and winter (six species). Sandhill crane (*Grus canadensis*), snow goose (*Chen caerulescens*), and Canada goose (*Branta Canadensis*) comprised 86.5% of all large bird observations. All other species accounted for less than 5.1% of all large bird observations, individually. Six diurnal raptor species were identified: northern harrier (*Circus cyaneus*; 21 observations), red-tailed hawk (*Buteo jamaicensis;* 17 observations), Swainson's hawk (Buteo swainsoni; four observations), bald eagle (four observations), American kestrel (*Falco sparverius*; three observations), and merlin (*Falco columbarius*; one observation). In addition to the four bald eagles observed during surveys, two bald eagles and four golden eagles were observed incidentally.

The highest overall use occurred during the spring (120.50 birds/800-m plot/60-min survey), followed by fall (57.52), summer (4.28), and winter (0.57). Diurnal raptor use was highest during the spring (0.34 birds/plot/60-min survey) and lowest during the winter (0.09). Mean annual diurnal raptor use was 0.12 raptors/plot/60-min survey, which ranked 44^{th} compared to 46 other studies at wind energy facilities where protocols similar to the present study were implemented and data was collected for three or four different seasons (Appendix E). While overall risk to raptors is low, based on species composition of the most common raptor fatalities at other western wind energy facilities and species composition of raptors observed within the 2016 Project area, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawks. It is expected that risk to raptors would be unequal across seasons, with the lowest risk in the winter and highest risk during the spring. Raptor fatality rates are expected to be comparable to other wind energy facilities in South Dakota and the Midwest region.

Overall, 16.8% of flying large birds were recorded within the rotor-swept height (RSH) for turbine blades of 25 to 150 m (82 – 492 ft) above ground level (AGL), 13.4% were below the RSH, and the majority (69.8%) were flying above the RSH. Approximately half (48.1%) of shorebirds were recorded within the RSH, with the remaining 51.9% observed below the RSH. The majority of waterbirds and waterfowl were recorded above the RSH (75.1% and 77.1%, respectively). All upland gamebirds and dove/pigeons (100%) and most large corvids (99.1%) were observed below the RSH. The majority (70.0%) of flying diurnal raptors were observed below the RSH, while 18.0% were within the RSH and 12.0% were above the RSH. A total of four eagle minutes, defined as one minute of flight below 200 m (656 ft) AGL were recorded (two minutes in the spring and two minutes in the winter).

An exposure index, based on initial flight height and use estimates, was calculated for each species (Appendix E). Sandhill cranes had an exposure index far higher than any other species (3.43), followed by Canada geese (1.54) and snow geese (1.02). All other species had an exposure index of 0.10 or less. The only diurnal raptor species with exposure indices greater than zero were red-tailed hawk (0.02), bald eagle (less than 0.01), and Swainson's hawk (less than 0.01).

During the second year of study (January 23, 2018 to January 14, 2019), 412 eagle and other large bird use surveys were conducted (Appendix F). Adverse weather, unsafe minimum maintenance road conditions, and landowner issues resulted in some missed surveys throughout the survey period, especially during the fall and winter. A total of 65,438 large bird observations were recorded within 516 separate groups. Field biologists identified 46 large bird species. Species diversity was greatest during the spring (36 species), followed by summer (19 species), fall (17 species), and winter (15 species). Snow goose, unidentified goose, greater white-fronted goose (*Anser albiforns*), and Canada goose comprised 93.3% of all large bird observations. Nine diurnal raptor species were identified of which northern harrier was the most common. There were 18 eagles (nine bald and nine golden eagles) observations recorded in 412 hours of survey effort. In addition to the eagles observed during surveys, six bald eagles and 18 golden eagles were observed incidentally.

The highest overall use occurred during the spring (548.97 birds/800-m plot/60-min survey), followed by fall (25.91), summer (3.45), and winter (1.83). Diurnal raptor use was highest during the fall (0.34 birds/plot/60-min survey), followed by spring (0.28), winter (0.15, and summer (0.09). High use during fall was attributed primarily to northern harrier and red-tailed hawk, while spring use was comprised primarily of northern harrier and bald eagles. Use during winter was attributed primarily to golden eagle and rough-legged hawk (*Buteo lagopus*) observations, while summer use was comprised primarily of northern harrier and red-tailed hawks. Overall estimates of diurnal raptor use within the Project area were lower to other publicly available diurnal raptor use estimates from wind resource areas evaluated in South Dakota and relatively low compared to the Midwestern US using similar methods (Appendix F).

Overall, 57.3% of flying large birds were recorded within the RSH for turbine blades of 25 to 150 m AGL, 3.8% were below the RSH, and 38.8% were flying above the RSH. All shorebirds were recorded below the RSH. The majority of waterbirds (62.9%) were recorded above the RSH, while the majority of waterfowl (58.4%) were recorded within RSH. Approximately half (45.0%) of upland gamebirds and most dove/pigeons (97.8%) and large corvids (98.8%) were observed below the RSH. The majority (75.4%) of flying diurnal raptors were observed below the RSH, while 23.0% were within the RSH and 1.6% were above the RSH. Seventeen eagle min were recorded (11 min in spring, five min in winter, and one min in the summer).

An exposure index, based on initial flight height and use estimates, was calculated for each species (Appendix F). Snow goose had an exposure index far higher than any other species (43.19), followed by unidentified goose (15.51, greater white-fronted goose (10.31, Canada goose

(7.60, and sandhill crane (2.20). All other species had an exposure index of 0.82 or less. All diurnal raptor species had exposure indices less than or equal to 0.01.

Sixteen sensitive bird species were recorded during surveys or incidentally during eagle and other large bird use surveys (Appendices E and F; Table 5.4). No state and/or federally-listed species were observed. Of the 16 species recorded during surveys or incidentally within the Project, 13 species were designated as state species of greatest conservation need (SGCN; SDGFP 2014) and/or federal birds of conservation concern (BCC) in the Prairie Potholes Bird Conservation Region (11; USFWS 2008; Table 5.4). Three rare species that are monitored by the South Dakota Natural Heritage Program (SDNHP) were observed during surveys or incidentally within the Project (SDNHP 2018; Table 5.4). Although these rare species were detected within the Project area, they are uncommon and impacts to populations are unlikely.

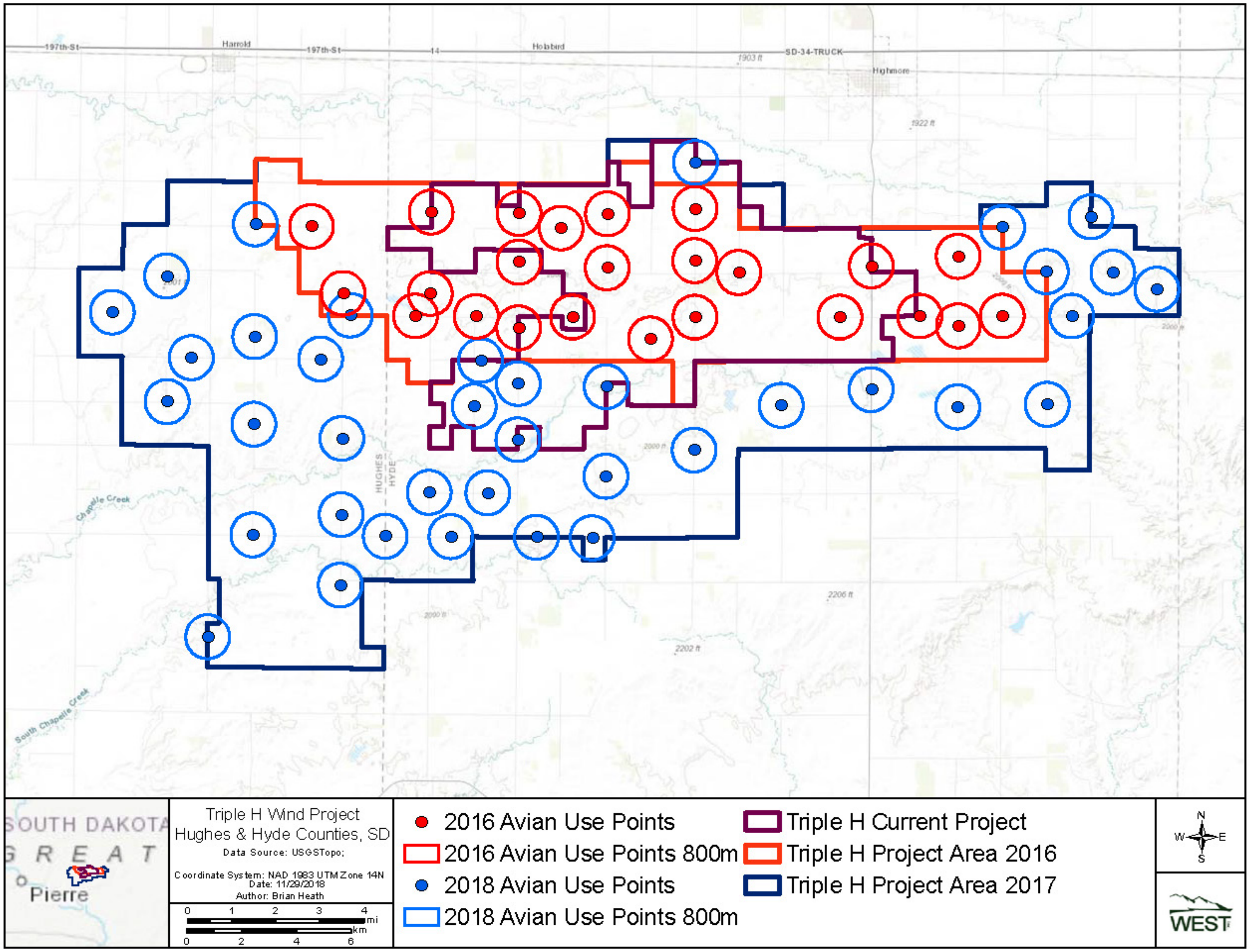

Figure 5.3. Location of fixed-point bird use surveys at the Triple H Wind Project, Hyde County, South Dakota.

Table 5.4. Summary of sensitive species observed at the Triple H Wind Project during avian use surveys (AU) and as incidental wildlife observations (Inc.) from April 18, 2016 to March 28, 2017 and January 24, 2018 to January 14 2019.

			AU		Inc.		Total	
Species	**Scientific Name**	**Status**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
bald eagle	*Haliaeetus leucocephalus*	SGCN, RA	13	13	7	8	20	21
black tern	*Chlidonias niger*	BCC, SGCN, RA	1	4	0	0	1	4
chestnut-collared longspur	*Calcarius ornatus*	BCC, SGCN	11	18	0	0	11	18
Cooper's hawk	*Accipiter cooperii*	RA	0	0	2	2	2	2
dickcissel	*Spiza Americana*	BCC	3	6	0	0	3	6
ferruginous hawk	*Buteo regalis*	SGCN, RA	0	0	2	3	2	3
golden eagle	*Aquila chrysaetos*	BCC, SGCN, RA	9	9	20	22	29	31
grasshopper sparrow	*Ammodramus savannarum*	BCC	7	8	0	0	7	8
great blue heron	*Ardea herodias*	RA	3	3	0	0	3	3
greater prairie-chicken	*Tympanuchus cupido*	SGCN	10	107	10	92	20	199
lark bunting	*Calamospiza melanocorys*	SGCN	17	31	0	0	17	31
marbled godwit	*Limosa fedoa*	BCC, SGCN	16	18	2	2	18	20
merlin	*Falco columbarius*	RA	1	1	0	0	1	1
Swainson's hawk	*Buteo swainsoni*	BCC, RA	4	4	1	1	5	5
upland sandpiper	*Bartramia longicauda*	BCC	24	30	0	0	24	30
willet	*Tringa semipalmata*	SGCN	3	3	0	0	3	3
Total	**16 species**		122	255	44	130	166	385

BCC = USFWS Birds of Conservation Concern in Prairie Potholes Bird Conservation Region (BCR 11; USFWS 2008); SGCN = state species of greatest conservation need (SDGFP 2014b); RA = Rare Animals track by South Dakota Natural Heritage Program (SDNHP 2018).

5.2.2 Small Bird Use Surveys

5.2.2.1 Methods

The objective of small bird use surveys was to provide a species list for small birds recorded during surveys and to document their relative abundance at the sampling locations. Small birds were defined as cuckoos, hummingbirds, swifts, woodpeckers, and passerines.

The small bird use surveys consisted of small bird counts at the same observation points used for eagle and other large bird surveys (Figure 5.3). During the first year of study, small bird use surveys were conducted during the initial 20 min of eagle and other large bird surveys, concurrent with large bird observations. During the second year of study, small bird use surveys were conducted 10 min preceding the eagle and other large bird surveys. All small birds were recorded at each survey location, but analyses were restricted to only those within 100 m (328 ft) from the observer. The estimated distance to each bird observed to the nearest 5-m (16-ft) interval was recorded, as well as the following data: date, start and end time of the survey period; species or best possible identification; number of individuals; sex and age class, distance from plot center (i.e., observer) when first observed; closest distance; behavior; flight height above ground; activity; and habitat.

5.2.2.2 Results

During the first year of study from April 2016 through March 2017, 15,880 small bird observations were recorded within 585 groups (Appendix E). Field biologists identified 30 small bird species. Species diversity greatest during the summer (23 species), followed by spring (18 species), fall (11 species), and winter (four species). Approximately 37.8% of observations were unable to be identified to species. Of those identified, six species comprised the majority of observations: horned lark (*Eremophila alpestris*), red-winged blackbird (*Agelaius phoeniceus*), snow bunting (*Plectrophenax nivalis*), brown-headed cowbird (*Molothrus ater*), European starling (*Sturnus vulgaris*), and song sparrow (*Melospiza melodia*). The 24 remaining species, accounted for less than 0.3% of observations individually.

Small bird use was considerably higher in the winter (103.27 birds/100-m plot/20-min survey) compared to spring (56.25), summer (9.25), and fall (8.96). Passerines were observed during 81.1% of spring surveys, 93.1% of summer surveys, 49.5% of fall surveys, and 33.0% of winter surveys. Overall, passerines accounted for over 95% of small bird use during summer and fall, but only 74.7% in spring and 4.6% in winter. This lower percentage of use in spring and winter was attributed to several large groups of unidentified small birds observed in spring (601 individuals in eight groups) and winter (5,271 individuals in 14 groups), which comprised 25.3% of overall small bird use in spring and 95.4% in winter. The majority (97.0%) of small birds recorded during surveys were observed below the estimated the RSH, with only 3.0% recorded within the RSH and none observed flying above the RSH.

During the second year of study, 1,432 small bird observations were recorded within 413 groups (Appendix F). Field biologists identified 32 small bird species. Species diversity greatest during the summer (26 species), followed by fall (14 species), spring (eight species), and winter (five species). Approximately 29.5% of observations were unable to be identified to species. Of those identified, six species comprised the majority of observations: western meadowlarks (*Sturnella neglecta*), horned lark, brown-headed cowbird, and red-winged black bird. The 26 remaining species, each accounted for less than XX% of observations.

Small bird use was highest in the summer (5.30 birds/100-m plot/10-min survey) compared to winter (4.18), spring (2.01), and fall (1.93). Passerines were observed during 99.2% of winter surveys, 99.1% of spring surveys, 98.5% of summer surveys, and 93.5% of summer surveys. Nearly all observations were of passerines; two woodpecker observations were the other small bird type recorded. Approximately half (50.5%) of small birds recorded during surveys were observed within the RSH, while to other half (49.5%) were observed below RSH, and none were observed flying above the RSH

5.2.3 Raptor Nest Surveys

5.2.3.1 <u>Methods</u>

Two separate aerial eagle and raptor nest surveys were conducted at the Project in the spring of 2016 and 2018 (Appendices G and H). The first year of surveys was conducted from March 28 to April 1, 2016 and the second year of surveys was completed from March 9 to 14, 2018. The objectives of the nest surveys were to gather information on eagle nest locations and other raptor species nesting in the area which may be subject to disturbance or displacement effects from wind facility construction and operation.

Surveys were conducted within the Project area at the time the survey was completed and extended to a 16.1 km (10-mi) buffer as pre recommendations in the ECPG (USFWS 2013). All raptor nests within 1.6 km (one mi) of the Project area and eagle nests within 16.1 km of the Project area were recorded. Prior to the surveys, topographic and aerial maps were evaluated to determine where raptor and eagle nesting habitat was likely to occur (e.g., riparian habitat along creeks, open lakes with large trees, etc.) so that these areas could be targeted during surveys. A biologist conducted the surveys in a helicopter operated by a pilot experienced in conducting low-altitude wildlife surveys. Surveys were generally conducted on days with good visibility and no precipitation. The locations of all raptor nests and survey paths were recorded using a hand-held onboard Global Positioning System (GPS) receiver. During the 2018 surveys, observations of non-nesting eagles, prey sources (i.e., prairie dog towns), and heron rookeries were also recorded. Aerial imagery was used to delineate the approximate perimeter of prairie dog towns. In addition, raptor nests detected from the ground while conducting other field surveys were also recorded.

For all raptor and eagle nest structures detected, the biologist recorded nest location coordinates with the GPS receiver, species present (if any), condition of the nest, presence of eggs or young (if visible), and the substrate of the nest (e.g., tree, power pole, rock outcrop). The status of each nest was determined as either: “occupied” - an adult in incubating position, eggs, nestlings or fledglings, a newly constructed or refurbished stick nest, and/or the presence of one or more adults on or immediately adjacent to the nest structure(s); or “inactive” - a nest with no evidence of recent use, or attendance by adult raptors. Efforts were made to minimize disturbance to nesting raptors, livestock, or occupied dwellings to the greatest extent possible. High resolution pictures were recorded for each nest determined as an eagle nest, or potential eagle nest.

5.2.3.2 Results

During the 2016 aerial survey, 16 raptor nests were documented within the 2016 Project area and 1.6 km buffer (Appendix G). Three nests were occupied by red-tailed hawks, one was occupied by a great-horned owl (*Bubo virginianus*), and the remaining nests were inactive. No eagle nests were located during the survey within the 2016 Project area or 16.1 km survey area.

During the 2018 surveys, the 16 nests previously documented during 2016 surveys were re-visited; 10 were confirmed present and six could not be relocated. In addition, 38 previously undocumented raptor nests were detected within the Project area and 1.6-km buffer at the time surveys were conducted (Appendix H). Thirty-three nests were detected during the initial aerial survey in March 2018 and five were recorded from the ground while conducting other field work. Of the 48 raptor nests documented, 27 were classified as occupied by the following species: 12 great-horned owls, eight Swainson's hawks, and seven red-tailed hawks. All nests were located within deciduous trees. No eagle nests were documented within the 2018 Project area or 1.6-km buffer.

Two occupied eagle nests (one bald eagle and one golden eagle) were documented between 1.6 km and 16.1 km of the Project area at the time the surveys were conducted (Appendix G; Figure 5.4). Both eagle nests were located southwest of the Project near the Missouri River. In addition, one inactive nest, assumed to be an alternative eagle nest site, was detected approximately 27.4 m (90 ft) north of the occupied golden eagle nest.

Eleven black-tailed prairie dog (*Cynomys ludovicianus*) towns were documented during the surveys (Appendix G). Active prairie dog towns may attract raptors such as bald eagles, ferruginous hawks (*Buteo regalis*), and golden eagles since they provide a concentrated prey source and provide nesting habitat or structure for burrowing owls.

Nineteen raptor nests recorded during the 2016 and 2018 surveys are located within the current Project area and one mi buffer (Figure 5.5). Eight of these nests are located within the current Project and 11 are located within 1.6 km of the current Project. During 2018 surveys, eight of the 19 nests were classified as occupied, nine were inactive, and two were nests identified in 2016 that could not be relocated. The eight occupied nests included: three great-horned owls, four red-tailed hawks, and one Swainson's hawk. No eagle nests were located within 16.1 km of the current Project. One small black-tailed prairie dog town is located near a ranch house in the south central portion of the current Project area, and larger prairie dog towns are located between 1.6 km and 16.1 km of the current Project (Figure 5.5).

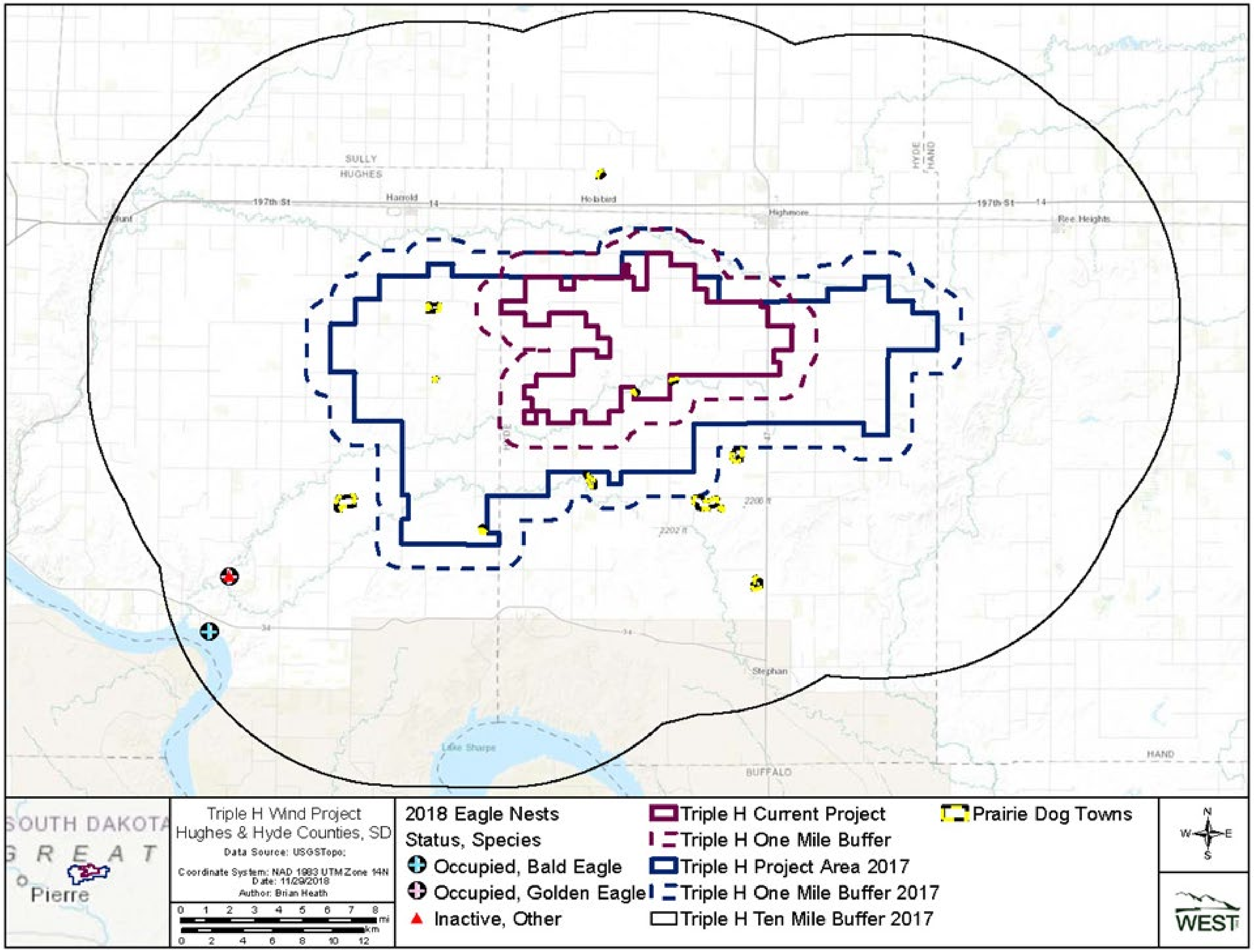

Figure 5.4. Location of eagle nests identified during 2018 surveys for the 2017 Triple H Wind Project area and 10 mile buffer. Black-tailed prairie dog towns and current Triple H Wind Project boundary included for reference.

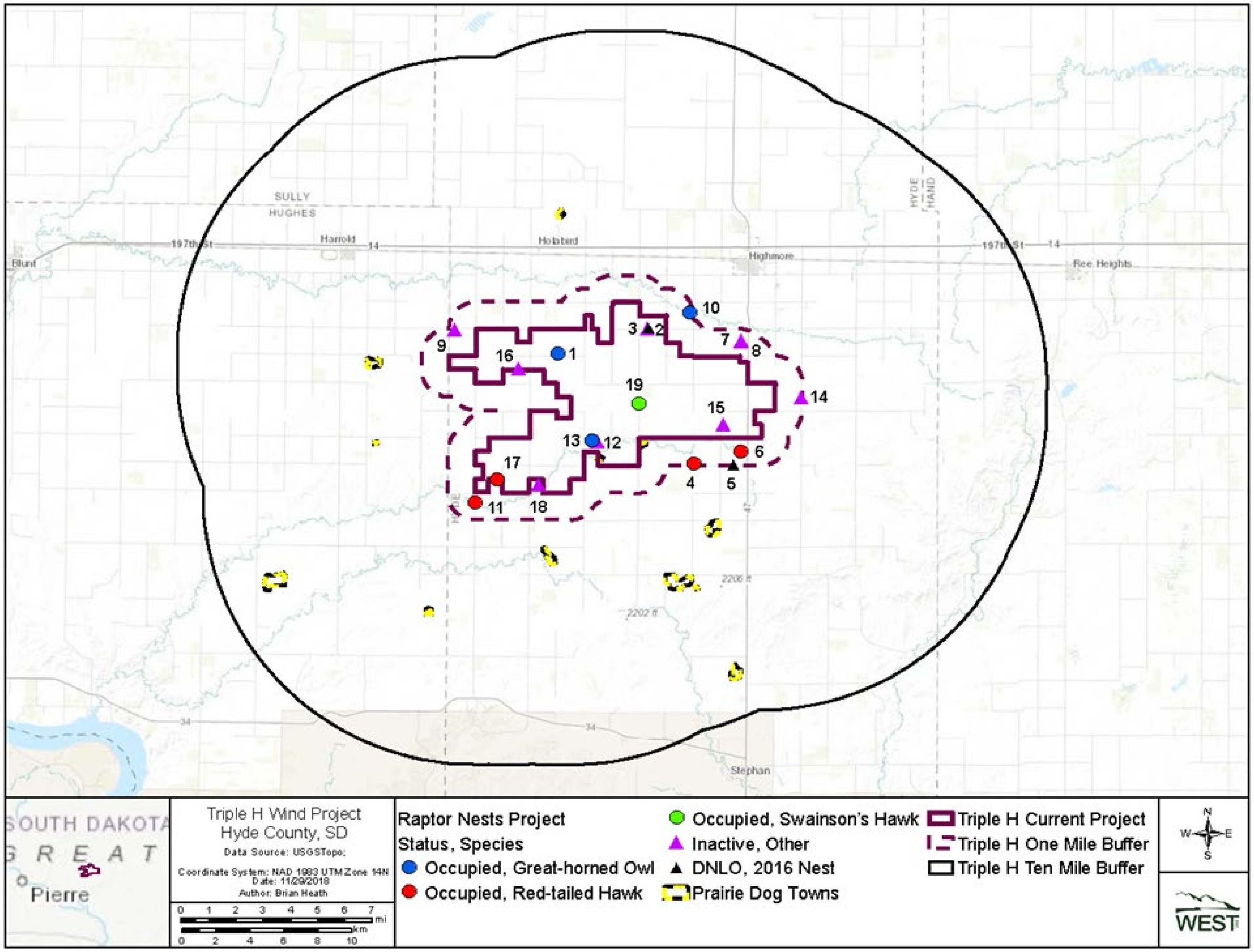

Figure 5.5. Location of raptor nests and black-tailed prairie dog towns identified during 2016 and 2018 surveys relative to the current Triple H Wind Project in Hyde County, South Dakota.

5.2.4 Prairie Grouse Lek Surveys

5.2.4.1 Methods

Prairie grouse lek surveys were conducted in the Project area during the 2016 and 2018 breeding seasons (Appendices I and J). The Project area occurs within the occupied range of the greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus),* hereafter collectively referred to as prairie grouse. Greater prairie-chickens are listed as a SGCN in South Dakota, but both species are considered upland game birds and are hunted in South Dakota (SDGFP 2014). The objective of the prairie grouse lek surveys was to collect pre-construction data that could be used to assist in turbine siting to minimize Project impacts on prairie grouse.

In 2016, surveys were completed three times between March 29 and April 30 across the 2016 Project area and a 0.8 km (0.5 mi) buffer. A combination of aerial and ground-based surveys was used to search for breeding prairie grouse locations. The first survey was ground-based and conducted between March 29 and April 2, 2016 by traveling accessible roads throughout the 2016 Project area and 0.8 km buffer. Surveys commenced 30 min before sunrise and continued until two hours after sunrise. Four-wheel drive vehicles were driven along county roads and stops made at approximately 1.6 km intervals or more frequently depending upon habitat type. The biologist walked approximately 5-10 m (16-32 ft) from the vehicle and looked and listened for breeding grouse for approximately five min. If a lek was visually located, the observer marked the location on a hard copy map and recorded the distance and direction from the observation point along with the number of males, females, and birds of unknown sex attending the lek. For leks where only auditory detection occurred, biologists recorded the GPS location and noted the bearing and estimated distance from the point. The observer then obtained a second bearing and distance to triangulate the lek location. Triangulated locations were plotted on a project map and later digitized by ArcMap geographical information system software to obtain coordinates.

The second survey was conducted by small plane (Cessna 172) on April 20 and 21, 2016. North/south transects were flown across the survey area approximately 0.4 km (0.25 mi) apart at an altitude of approximately 30-45 m (100-150 ft) AGL (Figure 5.6). Surveys commenced approximately 30 min before sunrise and lasted for approximately two hours after sunrise on mornings with good visibility, clear skies, relatively calm winds (less than 16-24 km per hpur [10-15 mi per hour]) and no precipitation. An onboard GPS unit was used to keep the plane on transect, document lek locations, and record daily flight paths. For each lek identified, the biologists recorded the species and number of birds present. Any suspected leks observed were later re-checked from the ground to verify the presence of displaying males, confirm species, and obtain a count of the birds attending the lek. Where access to private land was granted, each lek was visited to record the approximate center of the lek with a GPS receiver. The presence of feathers, droppings, or trampled vegetation was used to confirm the location as a lek

A combination of aerial and ground-based surveys following the methods described above was used to complete the third round of surveys from April 28 to 30, 2016. Aerial surveys were conducted within the western-half of the survey area on April 28 and ground-based surveys were conducted across the eastern-half of the survey area from April 29 to 30.

In 2018, all leks documented during 2016 surveys were visited at least three times between March 27 and May 6, 2018. The majority of visits occurred from the ground; however, for leks that were inactive during initial ground checks follow-up visits were conducted by helicopter to survey the general area in the event the location of the lek moved since 2016 surveys. The date, time, status, number and species of prairie grouse were recorded during each visit.

Surveys for new leks were also conducted three times between March 27 and May 6, 2018 within the 2017 Project area and one mile buffer, excluding areas that were previously surveyed within the 2016 Project area (Figure 5.7). A combination of ground based and aerial surveys were used to search for breeding prairie grouse locations. The methods and data recorded for the 2016 surveys were implemented during the ground based and aerial based surveys conducted in 2018.

The first survey was ground-based and conducted between March 27 – 30, 2018 by traveling accessible roads throughout the 2017 Project area and 1.6-km buffer. A major blizzard occurred in mid-April that delayed the initial aerial survey; however, some leks documented during 2016 surveys were accessible by road and revisited between April 15 – 17, 2018. Two rounds of aerial surveys were conducted from April 23 - 27 and May 2 – 5, 2018.

5.2.4.2 Results

Eight greater prairie-chicken leks were documented during 2016 surveys, all during ground surveys, within the 2016 Project area and 0.8-km buffer (Figure 5.6). Five leks were located within the 2016 Project area and three were within 0.8 km. No sharp-tailed grouse leks were located. Two additional greater prairie-chicken leks were detected between 0.8 km and 1.6 km of the 2016 Project area and were included within results to aid in planning.

Of the 10 prairie grouse leks documented during 2016 surveys, six were active with displaying males and four were inactive during at least three lek activity checks in 2018 (Figure 5.7). Sharp-tailed grouse were documented on Lek #1 in 2018; whereas, in 2016 greater prairie-chickens were observed on the lek. The lek was in approximately the same location within grassland habitat that appeared to have been hayed in 2017. Leks 2, 4, 7, 9, and 10 were active, in approximately the same locations as in 2016, and greater-prairie chickens were observed displaying at each at least three times during the breeding season. All active leks were within grasslands; however, the landowner broke the sod where Lek #4 was located during early May 2018. Greater prairie-chickens were still observed on the lek even after the ground had been broken. Leks 3, 5, 6, and 8 were documented as inactive during three visits. The grassland habitat remained intact where Leks 3, 5, and 8 were previously documented in 2016. Lek 6 was located within a wheat field during 2016 surveys and the field contained corn stubble during in 2018 surveys.

Thirty new leks, 29 greater prairie-chicken and one sharp-tailed grouse were documented during 2018 surveys (Figure 5.7). Eighteen were located within the 2017 Project area, 11 were located within the 1.6-km buffer, and one lek was located approximately 2.4 km (1.5 mi) south of the 2017 Project area. Four leks were located within croplands and the 26 other leks were located within grassland habitats, primarily native grass pastures.

Sixteen prairie grouse leks are located within the current Project or within 3.2 km (two mi) of the current Project area (Figure 5.7); 13 were classified as active and three as inactive during the 2018 breeding season. Six leks are located within the current Project, eight are located within 1.6 km of the current Project, and two are located between 1.6 km and 3.2 km of the current Project (Figure 5.7). Greater prairie-chickens were observed on 12 leks and sharp-tailed grouse were observed on the other lek. The three leks classified as inactive; #3, #5, and #6, were observed in 2016 and no grouse were noted during at least three checks during the 2018 breeding season.

The maximum number of birds on greater prairie-chicken leks varied from 4-19 birds with an average maximum count of 12 birds (Appendices I and J). The high count for the sharp-tailed grouse lek was six birds. It was often difficult to obtain an accurate count of males versus females during surveys as most birds flushed during aerial surveys when the plane approached the lek and distance or vegetation limited visibility during ground surveys. Therefore, the maximum number of birds is reported and not maximum number of males or females.

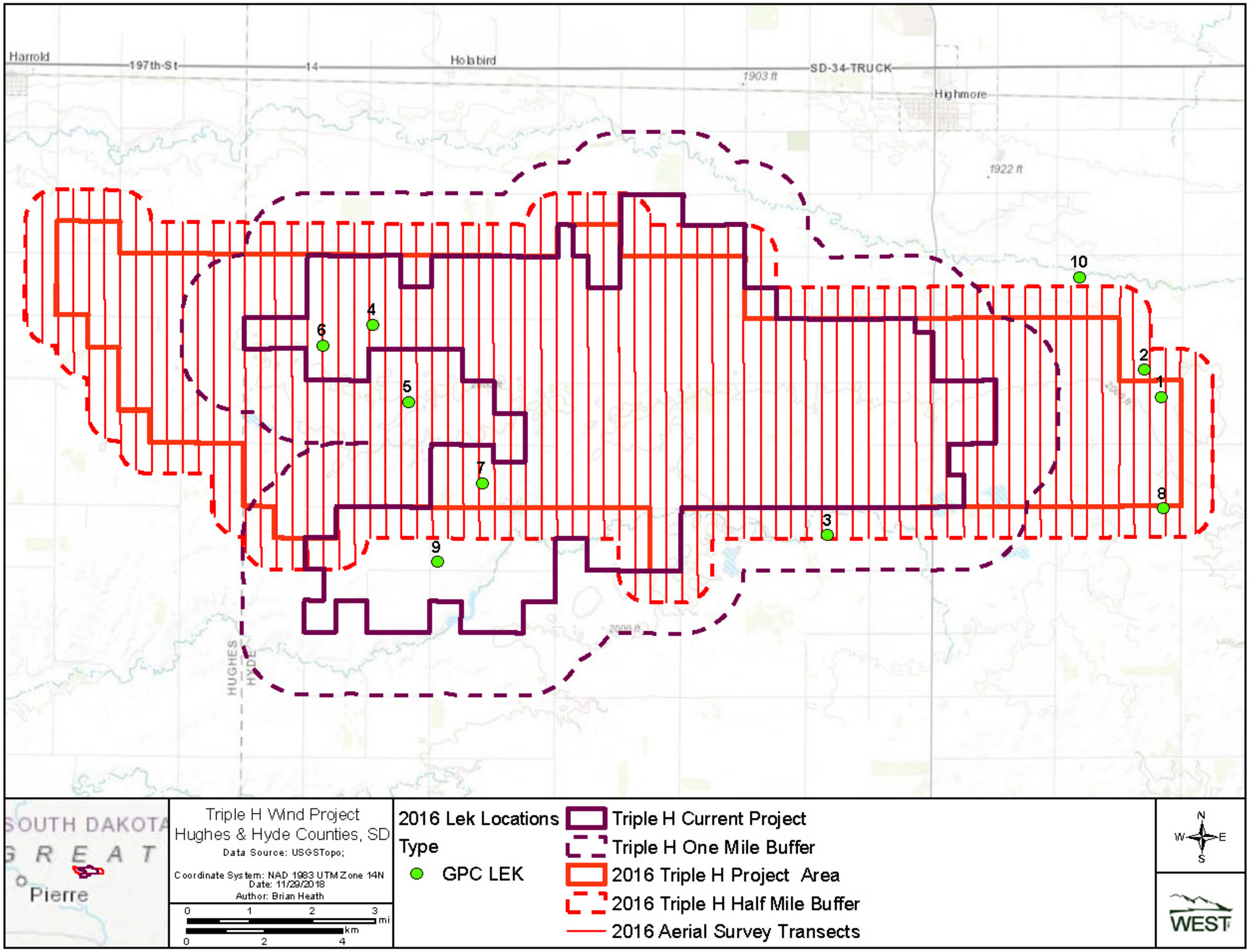

Figure 5.6. Location of prairie grouse leks identified during 2016 surveys for the Triple H Wind Project and 1.6-kilometer (1-mile) buffer. Current Triple H Wind Project boundary included for reference.

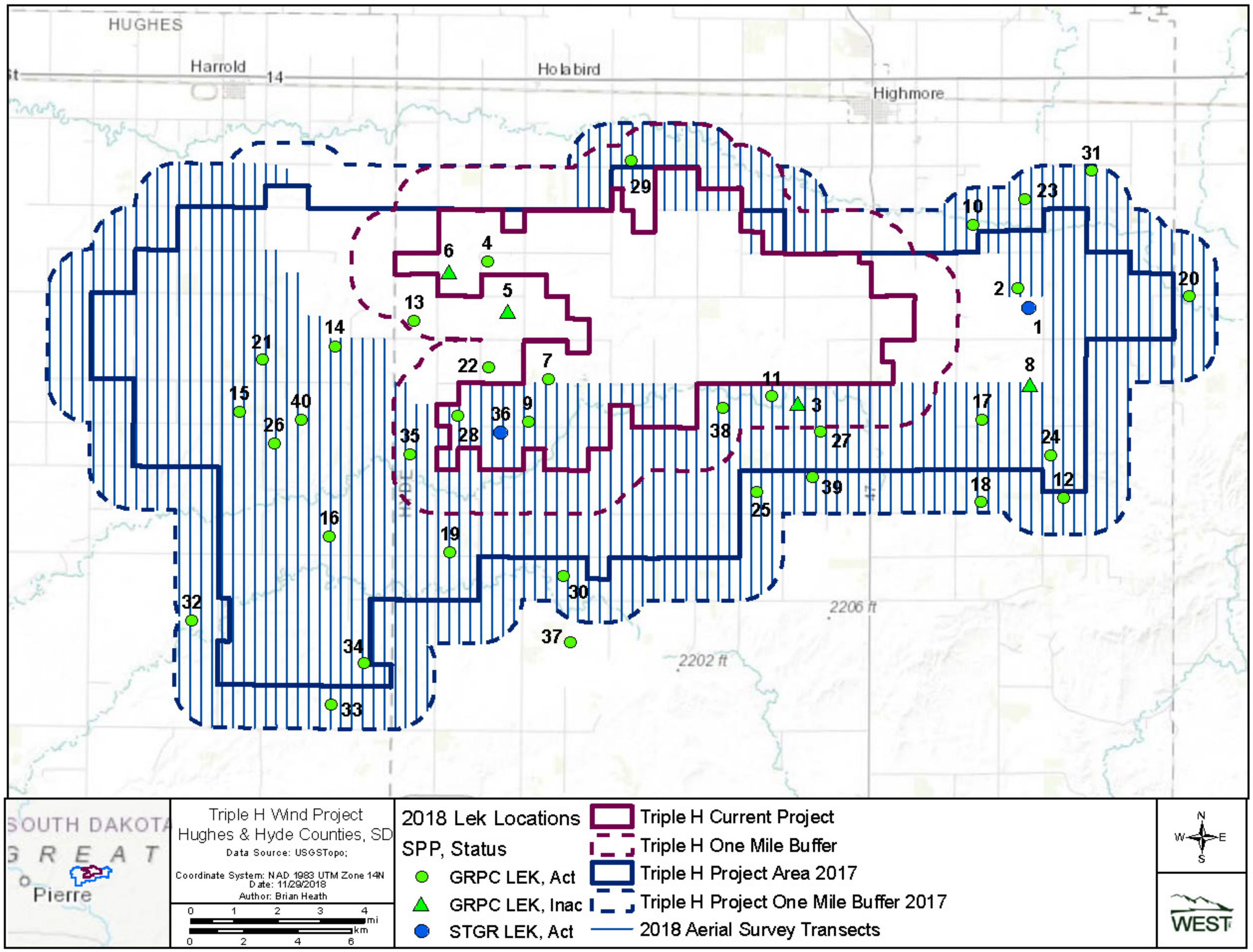

Figure 5.7. Location and status of prairie grouse leks identified during 2018 surveys for the 2017 Triple H Wind Project area and one mile buffer. Current Triple H Wind Project boundary also included for reference.

5.2.5 Bat Acoustic Surveys

5.2.5.1 Methods

WEST conducted acoustic monitoring surveys to estimate levels of bat activity throughout the Project area during summer and fall 2016 and spring, summer, and fall 2018 (Appendices K and L) using AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific™, Columbia, Missouri) placed 1.5 m (4.9 ft) AGL. All detectors were programmed to turn on nightly at least 30 min before sunset and turn off at least 30 min after sunrise. Studies of bat activity followed the recommendations of the USFWS (USFWS 2012) and Kunz et al. (2007). To highlight seasonal activity patterns, the study was divided into three survey periods: spring (April 25 to May 31), summer (June 1 [May 26 for 2016 surveys] to August 15) and fall (August 16 – October 25). Mean bat activity was also calculated for a standardized Fall Migration Period (FMP), defined here as July 30 – October 14, for comparison with activity from other wind energy facilities.

For each survey location, bat passes were sorted into two groups based on their call's minimum frequency. High-frequency (HF) bats, such as eastern red bats (*Lasiurus borealis*) and *Myotis* species have minimum frequencies greater than 30 kilohertz (kHz). Low-frequency (LF) bats, such as big brown bats (*Eptesicus fuscus*), silver-haired bats (*Lasionycteris noctivagans*), and hoary bats (*Lasiurus cinereus*), typically emit echolocation calls with minimum frequencies below 30 kHz.

In 2016, acoustic surveys were conducted at four ground stations located in grassland or cropland habitat near features that could be attractive to bats (e.g., along hedge rows, deciduous trees, near ponds, etc.) from May 26 through October 21, 2016 (Appendix K). Station locations were selected to provide spatial coverage throughout the 2016 Project area, and one of the stations deployed was located within the current Project area (Figure 5.8).

In 2018, acoustic surveys were conducted at six ground stations within the 2017 Project area (Appendix L; Figure 5.8) from April 26 through October 26, 2018. Four of the stations were located in habitat representative of potential turbine locations ('representative stations'; two in croplands and two in grassland habitat). The remaining two stations were placed in habitat with features attractive to bats for foraging, drinking, or roosting opportunities ('bat feature stations'; e.g., ponds, deciduous trees, and shelterbelts). Monitoring at bat feature stations provides an upper threshold for bat activity in the Project. Station locations were selected to provide spatial coverage throughout the 2017 Project area, and two of the stations deployed were located within the current Project area (Figure 5.8).

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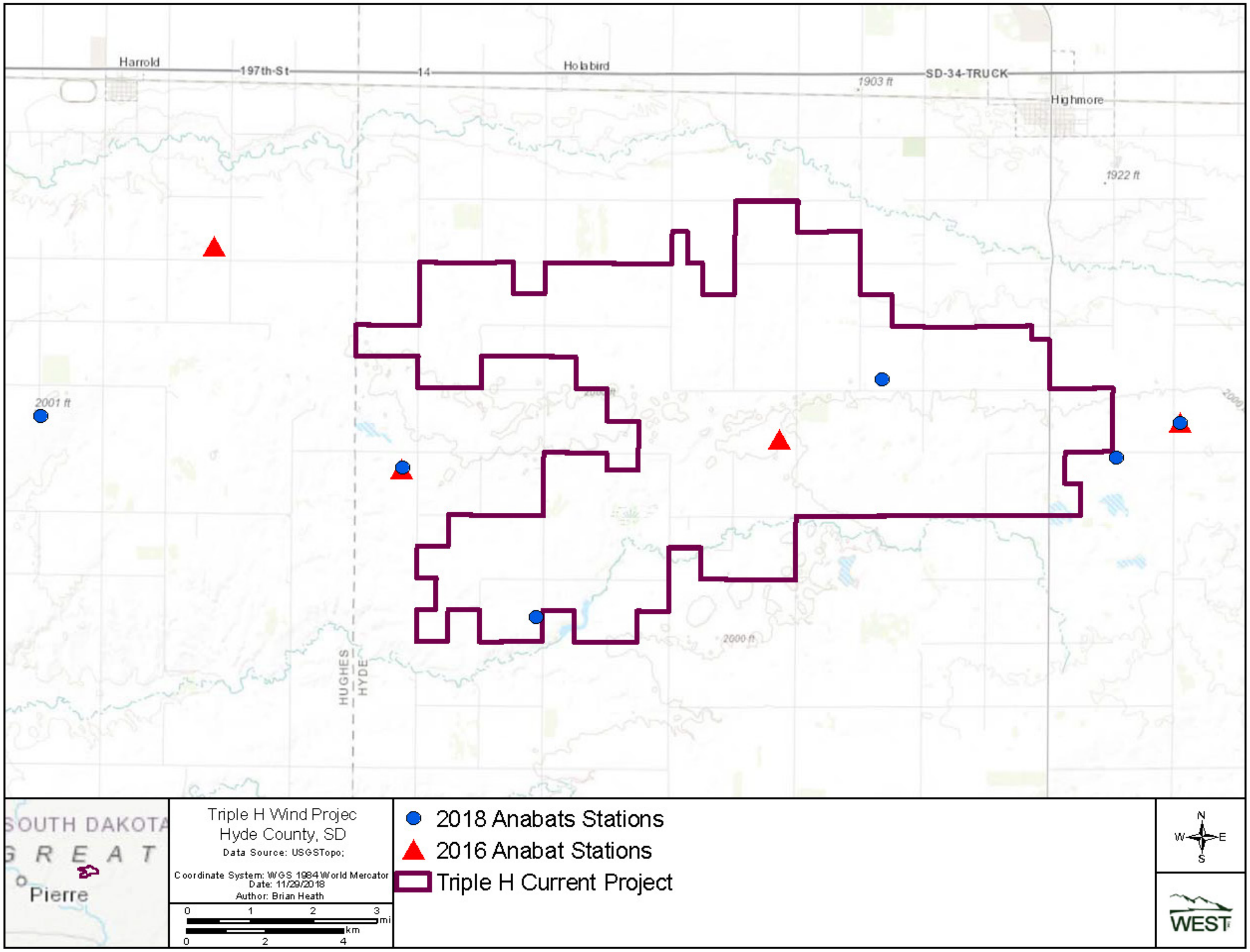

Figure 5.8. Location of stations used during bat acoustic surveys at the Triple H Wind Project, Hyde County, South Dakota.

5.2.5.2 Results

During the 2016 surveys, AnaBat units recorded 1,663 bat passes during 291 detector-nights (Appendix K). All units recorded a combined mean (± standard error) of 5.64 ± 1.61 bat passes per detector-night. For all stations, 57.7% of bat passes were classified as HF (e.g., eastern red bats, and little brown bats [*Myotis lucifugus*]), while 42.3% of bat passes were classified as LF (e.g., big brown bats, hoary bats, and silver-haired bats).

Bat activity varied between seasons, with lower activity in the summer and higher activity in fall. Both LF and HF bat pass rates peaked during the first part September. Bat activity recorded in the 2016 Project area during the standardized FMP (9.08 ± 3.23 bat passes per detector-night) was similar to activity observed at publicly available and comparable studies from facilities in the Midwest (Appendix K).

During the 2018 surveys, AnaBat units recorded 454 bat passes during 979 detector-nights (Appendix L). Variation among representative stations was low and recorded a combined mean (± standard error) of 0.29 ± 0.04 bat passes per detector-night. Variation among activity at bat feature stations was also low, but approximately three times higher (0.86 ± 0.12 bat passes per detector-night) than representative stations. Of the total bat passes recorded at representative stations, 62.1% were classified as LF, and 37.9% of bat passes were classified as HF. At bat feature stations, the majority of recorded calls also were produced by LF bats (64.1%; Appendix L).

Similar to 2016 results, bat activity varied between seasons, with lower activity in the spring and summer and higher activity in fall. Activity peaked in late-August and early-September. Bat activity during the FMP was 1.24 ± 0.29 bat passes per detector-night and 0.39 ± 0.06 bat pass per detector-night at bat feature and representative stations, respectively. The estimates are lower than the national median (7.68 bat passes per detector-night; Appendix L) and Midwest median (6.97 bat passes per detector night) reported in publicly available studies.

6.0 ASSESSMENT OF RISKS TO BIRDS AND BATS

Impacts to species from wind energy development may include collisions during construction and operation, as well as other impacts such as habitat loss/fragmentation and disturbance/displacement of individuals from converted habitats and areas near project infrastructure. The data from site-specific and regional pre-construction avian and bat surveys, as well as publicly available information from other wind energy projects, were used to provide an assessment of risk to birds and bats at the Project. Bird risk associated with other sources of mortality (e.g., powerline electrocutions/or collisions, vehicle collisions) was also assessed by reviewing literature of other sources of bird mortality.

6.1 Mortality Risk Assessment

6.1.1 Birds

Project construction can result in the direct mortality of birds and other wildlife. Incidental impacts from construction activities could include the destruction of nests, eggs, or young, as well as collisions with vehicles and construction equipment. Collision with various man-made structures can be a significant source of bird mortality (Table 6.1). On a nationwide scale, wind turbines are estimated to be responsible for 0.01% to 0.02% of all avian mortalities due to human structures (Table 6.1; Erickson et al. 2001b, 2002b, 2005).

Table 6.1. Estimated annual avian mortality from anthropogenic causes in the United States.

Mortality Source	Estimated Annual Mortality	Reference
Depredation by domestic cats	1.4 – 3.7 billion	Loss et al. 2013
Collisions with buildings	98 – 980 million	Klem 1990
Collisions with power lines	Tens of thousands to 174 million	USFWS 2002, Avian and Powerline Line Interaction Committee 2006
Automobiles	60 – 80 million	Erickson et al. 2005
Pesticides	67 million	Pimentel et al. 1991
Communication towers	6.8 million	Longcore et al. 2012
Oil pits	500,000 – 1 million	USFWS 2009
Wind turbines	368,000 – 573,000	Smallwood 2013, Erickson et al. 2014
Aircraft	4,722	Dolbeer et al. 2009

The number of avian mortalities at wind energy facilities is generally low when compared to the total number of birds observed at these sites (Erickson et al. 2002b). Although avian collision mortality can occur during both the breeding and migration seasons, patterns in avian mortality at tall towers, buildings, wind turbines, and other man-made structures suggest that the majority of mortalities occur during the spring and fall migration periods (National Research Council [NRC] 2007). Limited data from existing wind facilities suggest that migratory species represent roughly half of documented mortalities, while resident species represent the other half (NRC 2007).

6.1.1.1 Diurnal Raptors

Diurnal raptors occur in most areas with the potential for wind energy development (NRC 2007). At the Project, diurnal raptor use was highest in spring and fall for the first year and second year of study, respectively. In both years, the most common diurnal raptor species observed during spring, summer, and fall was the northern harrier. Though there is no publicly available data on diurnal raptor use in South Dakota, comparison of publicly available data from 46 other wind facilities (spanning raptor use between 0.06 to 2.34 raptors/800-m plot/20-min survey) in the US indicated relatively low (zero to 0.5) raptor use within the Project during all seasons (0.09 – 0.34; Figure 6.1).

Of the nine species of diurnal raptors documented during the study, exposure indices were less than or equal to 0.02 in any year (Appendices E and F). The exposure indices of all species are calculated with a small sample size and should be interpreted with caution; however, due to the overall low abundance and diurnal raptor use at the Project (Appendices E and F), relatively low exposure indices for these species appear reasonable. This suggests that the Project will likely have relatively low risk to diurnal raptors.

Potential impacts to bald and golden eagles are of particular concern for wind projects in the US. Both species are protected by the BGEPA and MBTA. During the first year (April 2016 through March 2017) four total eagle minutes were out of 237 survey hours were recorded within 800 meters and below 200 meters (Appendix E). Similarly, observations recorded during the second year (January 2018 through January 2019) resulted in 23 eagle minutes out of 412 survey hours. Although levels of bald and golden eagle use were relatively low within the Project area, there is the potential for collision risk to both bald and golden eagles at the Project. Siting turbines away from known raptor nest locations and abrupt topographic features, as well as away from areas of identified concentrated use or prey sources, may help to minimize potential impacts to raptors including eagles. Two eagle nests have been previously documented (Appendix H), one bald eagle and one golden eagle. Both of these are close to the Missouri River and the Project area is sited more than ten miles from these nests.

Twenty-five studies from wind energy facilities in South Dakota, North Dakota, and Minnesota have publicly available raptor mortality data. Among these, diurnal raptor fatalities ranged from zero fatalities/megawatt (MW)/year to 0.47 fatality/MW/year (Figure 6.2). Based on the general proximity of these facilities to the Project, diurnal raptor fatalities at the Project may be within this range; however, other factors, such as comparisons of abundance or use in relation to other facilities, habitat, or species compositions, may help further inform potential risk.

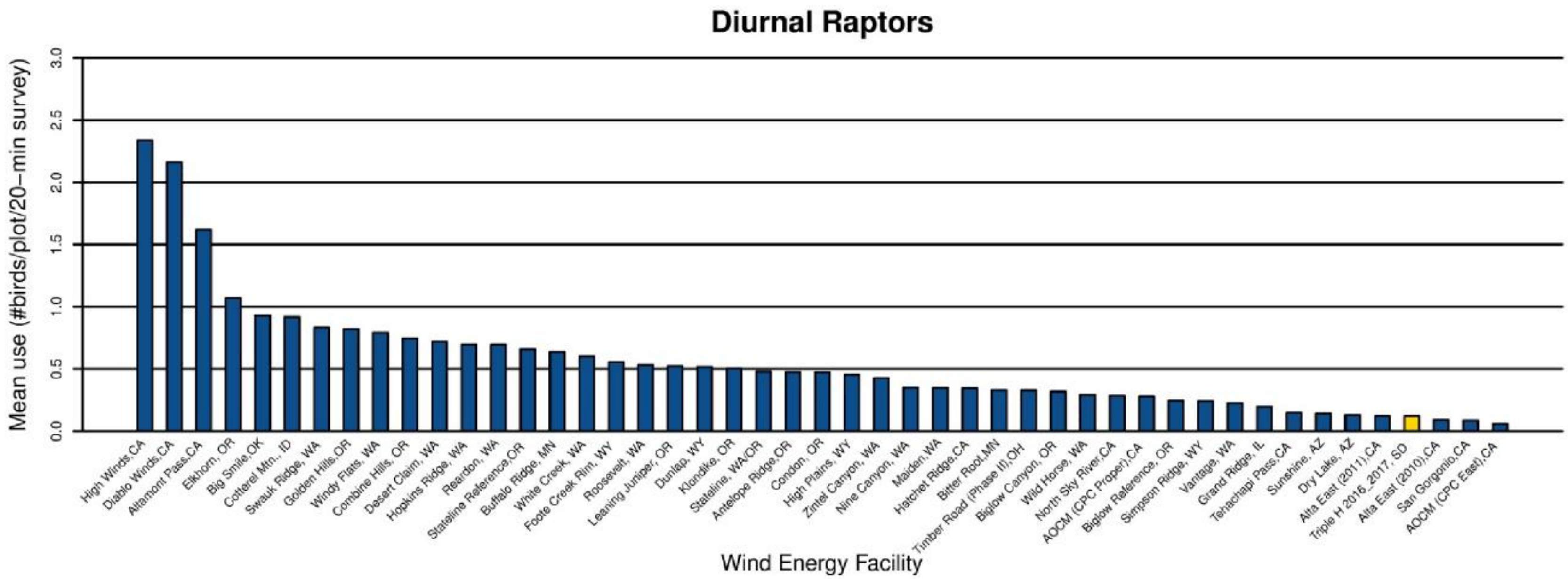

Figure 6.1. Comparison of estimated annual diurnal raptor use during fixed-point bird use surveys at the Triple H Wind Project and diurnal raptor use at other US wind resource areas with three or four other seasons of raptor use data.

Figure 6.1 (*continued*). Comparison of estimated annual diurnal raptor use during fixed-point bird use surveys at the Triple H Wind Project and diurnal raptor use at other US wind resource areas with three or four other seasons of raptor use data.

Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference
Triple H (2016-2018)	This study		
High Winds, CA	Kerlinger et al. 2005	High Plains, WY	Johnson et al. 2009b
Diablo Winds, CA	WEST 2006	Zintel Canyon, WA	Erickson et al. 2002a, 2003c
Altamont Pass, CA	Orloff and Flannery 1992	Sunflower, ND	Derby and Thorn 2014
Elkhorn, OR	WEST 2005b	Nine Canyon, WA	Erickson et al. 2001a
Big Smile (Dempsey), OK	Derby et al. 2010a	Maiden, WA	Young et al. 2002
Cotterel Mtn., ID	Bureau of Land Management 2006	Hatchet Ridge, CA	Young et al. 2007a
Swauk Ridge, WA	Erickson et al. 2003b	Bitter Root. MN	Derby and Dahl 2009
Golden Hills, OR	Jeffrey et al. 2008	Timber Road (Phase II), OH	Good et al. 2010
Windy Flats, WA	Johnson et al. 2007	Biglow Canyon, OR	WEST 2005c
Combine Hills, OR	Young et al. 2003c	Wild Horse, WA	Erickson et al. 2003d
Desert Claim, WA	Young et al. 2003b	North Sky River, CA	Erickson et al. 2011
Hopkins Ridge, WA	Young et al. 2003a	AOCM (CPC Proper), CA	Chatfield et al. 2010
Reardon, WA	WEST 2005a	Biglow Reference, OR	WEST 2005c
Stateline Reference, OR	URS et al. 2001	Simpson Ridge, WY	Johnson et al. 2000b
Buffalo Ridge, MN	Johnson et al. 2000a	Vantage, WA	Jeffrey et al. 2007
White Creek, WA	NWC and WEST 2005	Grand Ridge, IL	Derby et al. 2009, 2010h
Foote Creek Rim, WY	Johnson et al. 2000b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Roosevelt, WA	NWC and WEST 2004	Sunshine, AZ	WEST et al. 2006
Leaning Juniper, OR	Kronner et al. 2005	Dry Lake, AZ	Young et al. 2007b
Dunlap, WY	Johnson et al. 2009a	Alta East (2011), CA	Chatfield et al. 2011
Klondike, OR	Johnson et al. 2002	Alta East (2010), CA	Chatfield et al. 2011
Stateline, WA/OR	Erickson et al. 2003a	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Antelope Ridge, OR	WEST 2009	AOCM (CPC East), CA	Chatfield et al. 2010
Condon, OR	Erickson et al. 2002b		

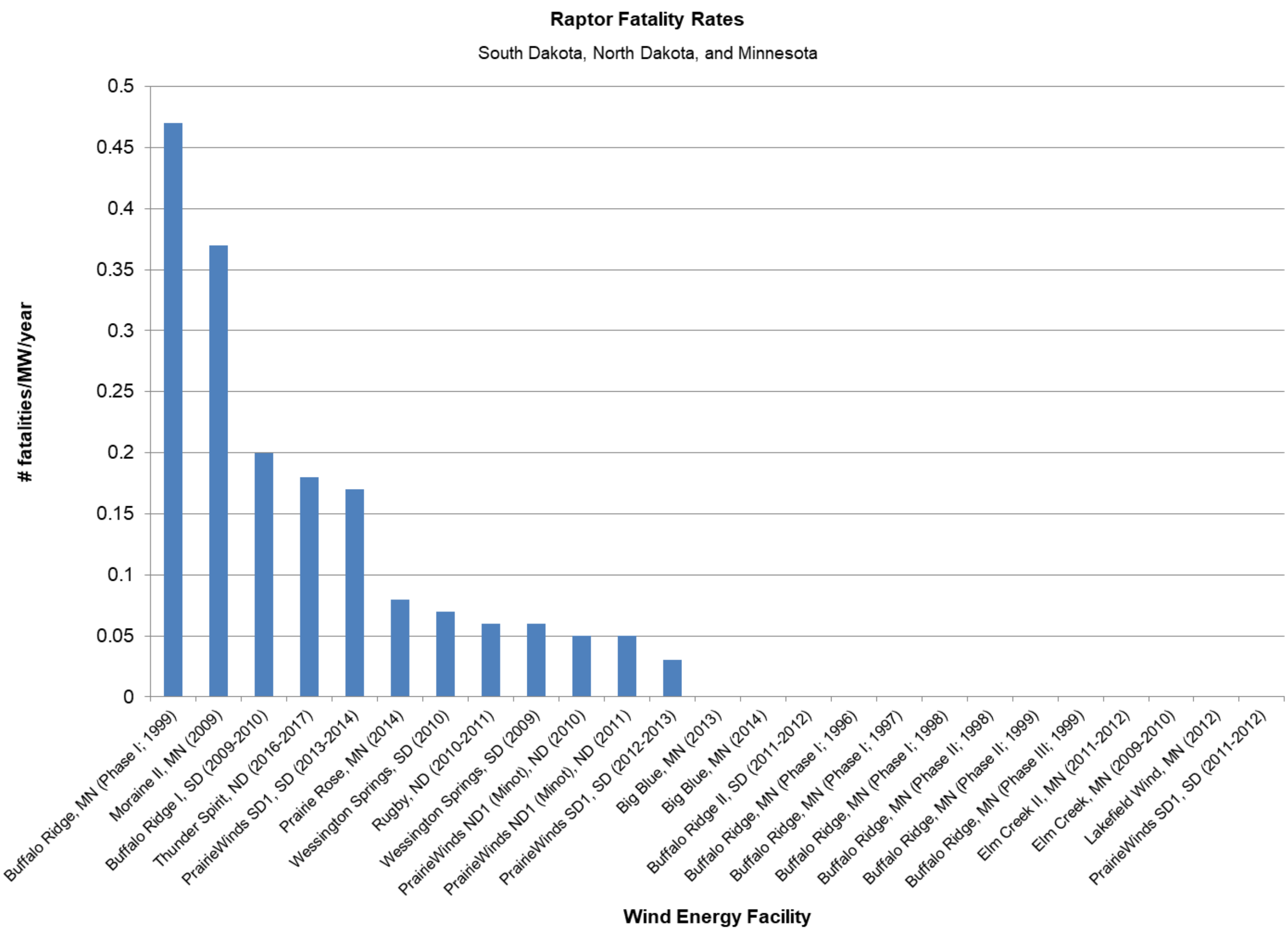

Figure 6.2. Fatality rates for diurnal raptors (number of raptors per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota.

Figure 6.2 (*continued*). Fatality rates for bats (number of bats per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota

Data from the following sources:

Wind Energy Facility	Fatality Reference
Buffalo Ridge, MN (Phase I; 1999)	Johnson et al. 2000a
Moraine II, MN (2009)	Derby et al. 2010e
Buffalo Ridge I, SD (2009-2010)	Derby et al. 2010c
Thunder Spirit, ND (2016-2017)	Derby et al. 2018
PrairieWinds SD1, SD (2013-2014)	Derby et al. 2014a
Prairie Rose, MN (2014)	Chodachek et al. 2015
Wessington Springs, SD (2010)	Derby et al. 2011d
Rugby, ND (2010-2011)	Derby et al. 2011b
Wessington Springs, SD (2009)	Derby et al. 2010g
PrairieWinds ND1 (Minot), ND (2010)	Derby et al. 2011c
PrairieWinds ND1 (Minot), ND (2011)	Derby et al. 2012d
PrairieWinds SD1, SD (2012-2013)	Derby et al. 2013a
Big Blue, MN (2013)	Fagen Engineering 2014
Big Blue, MN (2014)	Fagen Engineering 2015
Buffalo Ridge II, SD (2011-2012)	Derby et al. 2012a
Buffalo Ridge, MN (Phase I; 1996)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1997)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1998)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1998)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1999)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase III; 1999)	Johnson et al. 2000a
Elm Creek II, MN (2011-2012)	Derby et al. 2012b
Elm Creek, MN (2009-2010)	Derby et al. 2010d
Lakefield Wind, MN (2012)	Minnesota Public Utilities Commission 2012
Prairie Winds SD1, SD (2011-2012)	Derby et al. 2012d

6.1.1.2 Passerines

Mean use by passerines was highest in the spring, although percent of use and frequency of occurrence was highest in summer. The lower percentage of use in the spring was attributed to several large groups of unidentified small birds observed during surveys. The results of this study show that risk of collisions with wind turbines for passerines would most likely be greatest in the spring and summer, as mean use and the percent of total use were highest in those seasons. Given the presence of small birds throughout the Project, risk of collisions with wind turbines will likely be uniform throughout most of the Project area (Appendices E and F).

6.1.2 Bats

Bat fatalities have been discovered at most wind energy facilities monitored in North America, with estimated mortality rates ranging from 0.10 (Tierney 2007) to 39.70 bats/MW/year (Fiedler et al. 2007). In 2012, an estimated 600,000 bats died as a result of interactions with wind turbines in the US (Hayes 2013). Bat mortality at wind farms is largely due to collisions with moving turbine blades (Grodsky et al. 2011, Rollins et al. 2012), but the underlying reasons for why bats come near turbines are still largely unknown (Cryan and Barclay 2009). While it is generally expected that pre-construction bat activity is positively correlated to post-construction bat mortalities (Kunz et al. 2007), to date, this relationship has not been found to be significantly correlated (Hein et al. 2013). Therefore, the current approach to assessing the risk to bats requires a qualitative analysis of activity levels, spatial and temporal relationships, species composition, and comparison to regional fatality patterns.

Overall, bat activity rates at the Project were low to moderate, with the majority of bat passes consisting of HF bats during the 2016 study and LF bats during the 2018 study. Given that hoary bats, eastern red bats, and silver-haired bats are among the most commonly found bat fatalities at many facilities (Arnett et al. 2008, Arnett and Baerwald 2013), it is expected that these three species would likely be the most common fatalities at the Project.

Most bat fatality studies at wind energy facilities in the US have shown a peak in fatality in August and September, generally lower mortality earlier in the summer, and very low mortality during the spring (Johnson 2005, Arnett et al. 2008). At the Project, peak activity occurred from late July to early August in 2018 and early September in 2016. These results suggest that bat fatalities at the Project may be highest during the late summer to early fall, and consist largely of migrating individuals.

Among facilities with publicly available data in South Dakota, North Dakota, and Minnesota, bat fatalities have ranged between 0.16 and 19.87 fatalities/MW/year (Figure 6.3). The closest operating wind energy facility to the Project with public post-construction fatality data is the Prairie Winds SD, located approximately 80 km (50 mi) southeast of the Project. Bat casualty rates at Prairie Winds South Dakota have ranged from 0.52–1.23 bats/MW/study period (Derby et al. 2012d, 2013a, and 2014b). It is likely that the Project will have similar fatality rates as the Prairie Winds South Dakota wind energy facility; however Prairie Winds South Dakota is primarily composed of herbaceous grassland habitat, whereas the Project is primarily composed of cropland and grassland habitat. Some studies indicate that facilities in agricultural settings in the Midwest can produce higher levels of bat fatalities (Jain 2005, Baerwald 2008, Gruver et al. 2009); therefore fatalities at the Project may be more similar to other wind energy facilities in the Midwest. Mean bat activity at the Project during the FMP (9.08 ± 3.23 in 2016 and 0.39 ± 0.06 in 2018 for representative sites) was within the range of values reported for publicly available Midwest studies (median 6.97 bat passes per detector-night; Appendices K and L). Therefore, it is expected that bat mortality at the Project would be low to moderate and follow similar patterns as those observed at other facilities in the Midwest.

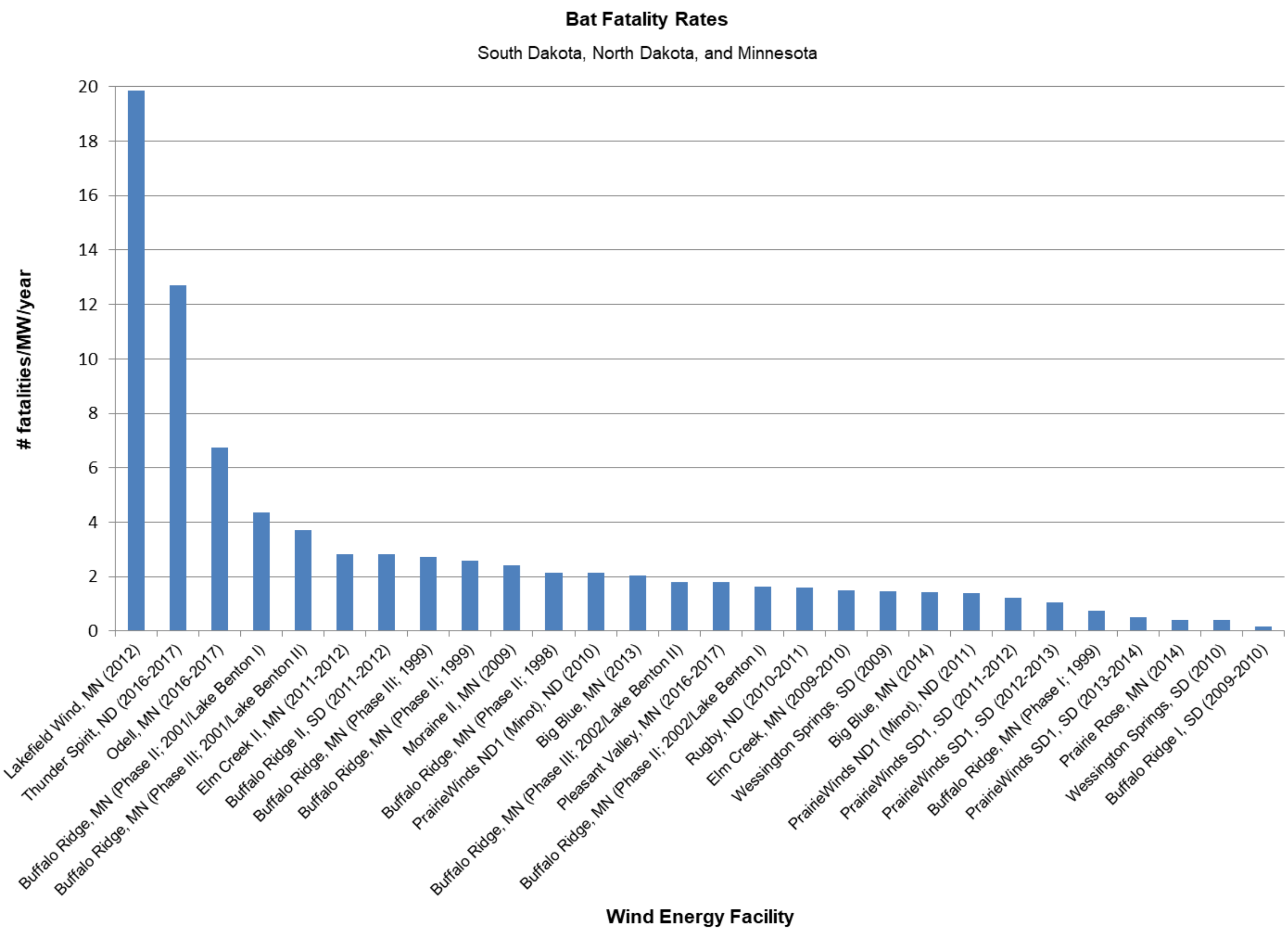

Figure 6.3. Fatality rates for bats (number of bats per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota.

Figure 6.3 (*continued*). Fatality rates for bats (number of bats per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota.

Data from the following sources:

Wind Energy Facility	Fatality Reference
Lakefield Wind, MN (2012)	Minnesota Public Utilities Commission 2012
Thunder Spirit, ND (2016-2017)	Derby et al. 2018
Odell, MN (2016-2017)	Chodachek and Gustafson 2018
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	Johnson et al. 2004
Elm Creek II, MN (2011-2012)	Derby et al. 2012b
Buffalo Ridge II, SD (2011-2012)	Derby et al. 2012a
Buffalo Ridge, MN (Phase III; 1999)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1999)	Johnson et al. 2000a
Moraine II, MN (2009)	Derby et al. 2010e
Buffalo Ridge, MN (Phase II; 1998)	Johnson et al. 2000a
PrairieWinds ND1 (Minot), ND (2010)	Derby et al. 2011c
Big Blue, MN (2013)	Fagen Engineering 2014
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	Johnson et al. 2004
Pleasant Valley, MN (2016-2017)	Tetra Tech 2017
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	Johnson et al. 2004
Rugby, ND (2010-2011)	Derby et al. 2011b
Elm Creek, MN (2009-2010)	Derby et al. 2010d
Wessington Springs, SD (2009)	Derby et al. 2010g
Big Blue, MN (2014)	Fagen Engineering 2015
PrairieWinds ND1 (Minot), ND (2011)	Derby et al. 2012d
PrairieWinds SD1, SD (2011-2012)	Derby et al. 2012d
PrairieWinds SD1, SD (2012-2013)	Derby et al. 2013a
Buffalo Ridge, MN (Phase I; 1999)	Johnson et al. 2000a
PrairieWinds SD1, SD (2013-2014)	Derby et al. 2014a
Prairie Rose, MN (2014)	Chodachek et al. 2015
Wessington Springs, SD (2010)	Derby et al. 2011d
Buffalo Ridge I, SD (2009-2010)	Derby et al. 2010c

6.2 Disturbance/Displacement

6.2.1 Birds

In addition to removing habitat, wind turbines may displace wildlife from an area due to the creation of edge habitat, the introduction of vertical structures, and disturbances directly associated with turbine operation (e.g., noise and shadow flicker; USFWS 2012, NRC 2007). Impacts are concentrated near turbine locations and along access roads, although available data indicate that avoidance of wind turbines by birds generally extends 75 to 800 m (245 to 2,625 ft) from a turbine, depending on the environment and the bird species affected (Strickland 2004). The magnitude of these impacts is expected to be minimal, as the Project will result in a relatively small amount of habitat loss and disruption relative to the surrounding landscape. Impacts are expected to consist primarily of shifts in species distribution within the Project area that are similar to existing conditions resulting from anthropogenic effects (USFWS 2012).

A review of the literature by Dooling (2002) on how well birds can hear in noisy (windy) conditions suggests that birds cannot hear the noise from wind turbine blades as well as humans can. In practical terms, a human with normal hearing can probably hear a wind turbine blade twice as far away as can the average bird. Although Dooling's study was intended to explore potential avoidance measures for birds, he found that birds habituate to acoustic disturbances and that blade noise becomes inaudible to some bird species at 25 m (82 ft) from the turbine, suggesting that impacts from noise may be minimal at these distances.

Raptors nesting closer to turbines have the potential to be disturbed due to construction or operation of the facility. Birds displaced from wind energy facilities might move to lower quality habitat with fewer disturbances, with an overall effect of reducing breeding success. Most studies on raptor displacement at wind energy facilities, however, indicate effects to be negligible (Howell and Noone 1992; Johnson et al. 2000a, 2003; Madders and Whitfield 2006). Given the low density of raptor nests documented within the current Project boundary and surrounding area during two years of nest surveys, limited displacement of nesting raptors is anticipated for the Project.

Wind energy facility construction appears to cause small-scale local displacement of grassland passerines. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996; Johnson et al. 2000a). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program grasslands at the Buffalo Ridge wind energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas located 180 m (591 ft) from turbines than they were at grasslands nearer turbines. Similarly, Shaffer and Buhl (2015) demonstrated reduced breeding density by seven of nine breeding grassland birds and the attraction of one species (killdeer [*Charadrius vociferous*]) likely attributed to increased nesting habitat from road and pad construction. Johnson et al. (2000a) found reduced use of habitat by seven of 22 grassland-breeding birds following construction of the Buffalo Ridge wind energy facility. Results from the Stateline wind energy facility in Oregon and Washington (Erickson et al. 2004) and the Combine Hills wind energy facility in Oregon (Young et al. 2005) suggest a relatively small impact of wind energy facilities on grassland-nesting passerines. Transect surveys conducted prior to and after construction of the wind energy facilities found that grassland passerine use was significantly reduced within approximately 50 m (164 ft) of turbine strings, but areas further away from turbine strings did not have reduced bird use. The majority (62.7%) of the Project area consists of cultivated croplands, which have limited value to nesting passerines and other bird species; however grassland-nesting birds could utilize grassland pastures (25.8%) within the Project. Overall displacement impacts resulting from Project development are anticipated to be low to moderate, based on the amount of grassland pastures in the current Project.

6.2.2 Bats

Limited information is available regarding the disturbance or displacement of bats at wind energy facilities (Kunz et al. 2007). Any bats roosting in the Project area may be temporarily disturbed by human activities, although roosting habitat is limited within the Project area and activities would largely occur away from water resources and human structures that could attract bats. Bat habitat for resident bats within the Project area is limited to a few forested patches, small groves of trees, fencerows near homesteads, and limited wetland areas. Outbuildings and other anthropogenic structures may be used as roosting habitat by some species, and cultivated crops may provide marginal foraging habitat for bat species adapted to using habitat. Due to the lack of any known maternity roosts near the Project, as well as the limited amount of wetland/water habitat for foraging, displacement impacts to bats at the Project are expected to be minimal.

6.3 Potential Risk to Endangered, Threatened, and Sensitive Species

The USFWS Information for Planning and Consultation (IPaC) tool (USFWS 2019) and SDGFP county distribution list (SDGFP 2016) identified the potential for several federally- and state-listed species to occur within Hyde County, South Dakota (Section 5.1.1, Table 5.1). In addition, the USFWS IPaC identified several BCC species that may potentially occur in the Project (Section 5.1.1, Table 5.2). Some of these BCC species, as well as other BCC species were identified during site-specific avian use studies (Section 5.2.1, Table 5.4). The potential impacts to these species are described below.

6.3.1 Northern Long-eared Bat and Other Sensitive Bat Species

The Project area is not located near any large, known bat colonies, water sources, caves, rocky outcrops, or other features that are likely to attract large numbers of bats. In addition, the Project area does not contain topographic features that may funnel migrating bats. Roosting habitat within the Project is limited to a few forested patches (Appendix D; Section 5.1.3), trees near homesteads, and various barns and outbuildings. Although the Project provides limited roosting opportunities for bats, identified roosting habitats have been avoided pursuant to USFWS recommendations, thus minimizing impacts to sensitive bat species.

6.3.2 Bald and Golden Eagle

There are no known eagle concentration areas within the Project area or immediate vicinity of the Project. Eagle observations recorded during baseline studies conducted in and adjacent to the Project area suggests that eagle use of the area is low (Appendices E and F). Based on the results of avian use surveys, the Project does not appear to contain areas of concentrated eagle foraging opportunities, though two small prairie dog towns are located within or adjacent to the southern boundary of the Project (Appendix H). Larger prairie dog towns are located between 3.2 km and 16.1 km of the Project (Appendix H). The rolling hills topography comprising the Project area is not expected to create conditions suitable for strong updrafts of wind and would not be expected to greatly influence the potential collision risk to eagles. Additionally there has been no detection of an occupied eagle nest within the current Project area or a 16.1-km buffer (Appendices G and H). Based on low eagle use and the lack of nesting eagles in the Project area and surrounding vicinity, impacts to eagles are estimated to be low.

6.3.3 Least tern

No least terns (*Sternula antillarum*; state-endangered [SE] and federally-endangered [FE; USFWS 1985b]) were detected in the Project area during avian surveys or incidentally in the Project area (Appendices E and F); however the species is known to breed in locations within the Missouri River system (SDGFP 2016). Due to the lack of detections and the Project's location outside of the species breeding locations in South Dakota, impacts to least tern are estimated to be low.

6.3.4 Piping Plover

No piping plovers (*Sternula antillarum*; state-threatened [ST] and federally-threatened [FT; USFWS 1985a]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the species is known to breed in locations within the Missouri River system (SDGFP 2016). Due to the lack of detections and the Project's location outside of the species breeding locations in South Dakota, impacts to piping plover are estimated to be low

6.3.5 Whooping Crane

No whooping cranes (*Grus americana*; SE and FE [USFWS 1967]) were detected in the Project area during avian surveys or incidentally; however potentially suitable whooping crane stopover habitat does occur in the Project and surrounding landscape (Section 5.1.2), and the species is known to occur in Hyde County (SDGFP 2016). The widespread availability of suitable stopover habitat indicates that if cranes are displaced by development of the Project, they are likely to find similar habitat nearby. Due to the lack of concentrated whooping crane stopover habitat within the Project, relative to the surrounding landscape, impacts to whooping crane are estimated to be low.

6.3.6 Rufa Red Knot

No rufa red knots (*Calidris canutus rufa*; FT [USFWS 2014]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the species may potentially migrate over the Project area (USFWS 2019). Limited stopover habitat for the species (i.e., wetlands) exists within the Project. Due to the lack of detections, limited suitable stopover habitat, and the Project's location outside of the species breeding and winter ranges, impacts to rufa red knot are estimated to be low.

6.3.7 American Golden Plover

No American golden plovers (Pluvialis dominica; BCC throughout range [USFWS 2019]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the species may potentially utilize plowed agricultural fields and grazed or short grass prairies in the Project for stopover habitat during migration (USFWS 2019). Due to the lack of detections and the Project's location outside of the species breeding and winter ranges, impacts to American golden plover are estimated to be low.

6.3.8 Black tern

Four black terns (*Chlidonias niger*; BCC [USFWS 2008] and South Dakota SGCN (SDGFP 2014) were detected in the Project area during avian surveys (Appendices E and F). Although the Project area lies within the breeding range of the species, impacts to black terns are estimated to be low due to the limited amount of suitable habitat (e.g. marshes, ponds, lakes, flooded fields) in the Project area.

6.3.9 Black-billed Cuckoo

No black-billed cuckoos (*Coccyzus erythropthalmus*; BCC [USFWS 2008]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the Project lies within the species breeding range (USFWS 2019). Due to the lack of detections and suitable breeding habitat (e.g., deciduous forest), impacts to black-billed cuckoo are estimated to be low.

6.3.10 Bobolink

No bobolinks (*Dolichonyx oryzivorus;* BCC throughout range [USFWS 2019]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the Project lies within the species breeding range (USFWS 2019). Due to the lack of detections and suitable breeding habitat (e.g., damp meadows and dense prairies), impacts to bobolinks are estimated to be low.

6.3.11 Chestnut-collared Longspur

Seventeen chestnut-collared longspurs (*Calcarius ornatus*; BCC [USFWS 2008] and SGCN [SDGFP 2014]) were detected in the Project area during avian surveys (Appendices E and F). The Project area lies within the breeding range of the species (USFWS 2019). Due to the number of detections in the Project area and the amount of potentially suitable breeding (e.g., short-grass prairie) and foraging (e.g., agricultural land) habitat, impacts to chestnut-collared longspur are estimated to be low to moderate.

6.3.12 Dickcissel

Six dickcissels (*Spiza Americana*; BCC [USFWS 2008]) were detected in the Project area during avian surveys (Appendices E and F). Although the Project area lies within the breeding range of the species, impacts to dickcissel are estimated to be low due to the limited amount detections and suitable habitat (e.g. alfalfa and clover fields, native grasslands) in the Project area.

6.3.13 Franklin's Gull

No Franklin's gulls (*Leucophaeus pipixcan*; BCC throughout range [USFWS 2019]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the Project lies within the species breeding range (USFWS 2019). Due to the lack of detections and suitable breeding habitat (e.g., wetlands) in the Project area, impacts to Franklin's gull are estimated to be low.

6.3.14 Grasshopper sparrow

Eight grasshopper sparrows (*Ammodramus savannarum*; BCC [USFWS 2008]) were detected in the Project area during avian surveys (Appendices E and F). The Project area lies within the breeding range of the species. Due to the number of detections in the Project area and the amount of potentially suitable habitat (e.g., grasslands, prairies, hayfields, agricultural fields), impacts to grasshopper sparrow are estimated to be low to moderate.

6.3.15 Hudsonian Godwit

No Hudsonian godwits (*Limosa haemastica*; BCC [USFWS 2008]) were detected in the Project area during avian surveys or (Appendices E and F); however the species may potentially utilize wetlands in the Project for stopover habitat during migration (USFWS 2019). Due to the lack of detections, limited suitable habitat, and the Project's location outside of the species breeding and winter ranges, impacts to Hudsonian godwit are estimated to be low.

6.3.16 Lesser Yellowlegs

No lesser yellowlegs (*Tringa flavipes*; BCC throughout range [USFWS 2019]) were detected in the Project area during avian surveys or (Appendices E and F); however the species may potentially utilize wetlands in the Project for stopover habitat during migration (USFWS 2019). Due to the lack of detections, limited suitable habitat, and the Project's location outside of the species breeding and winter ranges, impacts to lesser yellowlegs are estimated to be low.

6.3.17 Marbled Godwit

Fifteen marbled godwit (*Limosa fedoa*; BCC [USFWS 2008] and SGCN [SDGFP 2014]) were detected in the Project area during avian surveys (Appendices E and F). Although the Project area lies within the breeding range of the species (USFWS 2019), impacts to marbled godwit are estimated to be low due to the limited amount of suitable habitat (e.g. native prairie with nearby wetlands) in the Project area.

6.3.18 Red-headed Woodpecker

No red-headed woodpeckers (*Melanerpes erythrocephalus*; BCC [USFWS 2008]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the Project lies within the species breeding range (USFWS 2019). Due to the lack of detections and limited suitable breeding habitat (e.g., isolated tree groves and shelterbelts, orchards, shade trees), impacts to red-headed woodpecker are estimated to be low.

6.3.19 Semipalmated Sandpiper

No Semipalmated sandpipers (*Calidris pusilla*; BCC throughout range [USFWS 2019]) were detected in the Project area during avian surveys or incidentally (Appendices E and F); however the species may potentially utilize wetlands in the Project for stopover habitat during migration (USFWS 2019). Due to the lack of detections, limited suitable habitat, and the Project's location outside of the species breeding and winter ranges, impacts to semipalmated sandpiper are estimated to be low.

6.3.20 Swainson's hawk

Five Swainson's hawks (BCC [USFWS 2008]) were detected in the Project area; four during avian surveys and one incidentally (Appendices E and F). The Project area lies within the breeding range of the species. Due to the low number of detections in the Project area, and the limited amount of suitable nesting habitat (e.g. stands of deciduous forest cover) in the Project area, impacts to Swainson's hawk are estimated to be low.

6.3.21 Upland Sandpiper

Thirty upland sandpipers (*Bartramia longicauda*; BCC [USFWS 2008]) were detected in the Project area during avian surveys (Appendices E and F). The Project area lies within the breeding range of the species. Due to the number of detections in the Project area and the amount of potentially suitable habitat (e.g., grasslands, prairies, pastures), impacts to upland sandpiper are estimated to be low to moderate.

6.3.22 Willet

Three willets (*Tringa semipalmata*; SGCN [SDGFP 2014]) were detected in the Project area during avian surveys (Appendices E and F). Although the Project area lies within the breeding range of the species (USFWS 2019), impacts to willet are estimated to be low due to the low number of detections in the Project area and the limited amount of suitable habitat (e.g. native grasslands near freshwater marshes) in the Project area.

7.0 AVOIDANCE AND MINIMIZATION MEASURES

Information gathered during Tier 1, 2, and 3 studies will be used during the Project design and turbine and infrastructure siting process to reduce potential impacts to birds and bats and their habitats. The following conservation measures will be implemented during the design, construction, and operational phases of the Project. These conservation measures represent Triple H's willingness to ensure the least harm to avian and bat species.

7.1 Conservation Measures Implemented During Site Selection and Project Design

Based on the initial Tier 1-3 studies, Triple H determined the Project area to be the preferred location for a wind energy project based upon the following reasons related to potential avian and bat impacts:

- The Project area does not contain known federally threatened or endangered species or designated critical habitat.
- Eagle and raptor use of the Project area is considered low for the region.
- The Project area contains few wetlands and/or streams.

Triple H will make efforts during initial site selection and during project design to locate and select wind turbines, meteorological (met) towers, and other appurtenances such that bird and bat collisions are minimized. Project design and siting measures to avoid or minimize risk to avian and bat species will include the following:

- Use the existing road network to reduce the need for road construction.
- Coordinate with the Federal Aviation Administration to minimize the number of wind turbines and met towers that require lighting.
- Keep lighting at substations and other operations and maintenance (O&M) facilities at a minimum required for safety and security needs (i.e., directional, hooded and/or shielded, low-intensity, low-sodium lights equipped with motion sensors). Extinguish all internal turbine nacelle and tower lighting when unoccupied.
- Maximize power generation per turbine in order to reduce the number of turbines needed to achieve maximum energy production, to the extent commercially reasonable.

7.2 Conservation Measures to be Implemented During Construction

Construction of the Project is expected to begin in 2019 and occur over a period of approximately 18 months, which will be the heaviest use of the site during the life of the Project. The following conservation measures will be implemented to avoid or minimize risk to avian and bat species during construction:

- Vehicle speeds will be limited to 25 mile-per-hour (mph) to avoid wildlife collisions. Construction vehicles will be restricted to pre-designated access routes. Following Project construction, roads not needed for site operations will be restored to native vegetation.
- To the extent feasible, the area required for Project construction and operation will be minimized. Triple H will develop a restoration plan for restoring all areas of temporary disturbance to their previous condition, including the use of native species when seeding or planting during restoration. The restoration plan will ensure:
    - All areas disturbed temporarily by Project construction will be restored including temporary disturbance areas around structure construction sites, laydown/ staging areas, and temporary access roads.
    - Topsoil salvage will be included in all grading activities, to the extent feasible.
    - Performance criteria, habitat replacement specifications, and tentative timeframes for restoration of the site, in addition to provisions for a monitoring program to assess the success of the restoration efforts will be included.
- Appropriate natural fiber erosion control methods will be used during construction to eliminate or minimize runoff in highly sensitive areas, and avoid impacts to hydrology.
- Triple H will develop and implement a noxious weed control plan in accordance with the land lease agreements.
- Triple H will provide training resources to all construction and site personnel on identification of sensitive species and their habitats to minimize and/or avoid disturbance.
- Gravel will be placed at least 1.5 m (five ft) around each turbine foundation to discourage small mammals and reptiles from burrowing under or near turbine bases.
- Sensitive resources (e.g., nests) identified during pre-construction activities will be flagged and all site personnel notified of their presence and necessary setbacks.
- No unleashed dogs will be allowed on the Project site during construction.
- All trash will be covered in containers and work sites will be cleared daily of any garbage and debris related to food.
- All permanent met towers will be un-guyed.

- All power lines will be constructed in accordance with the most current Avian Power Lines Interaction Committee (APLIC) Guidelines (APLIC 2012) to protect birds from electrocution and collision.

7.3 Conservation Measures to be Implemented During Operations

- Low speed limits (e.g., less than 25 mi per hour) will be enforced on all roads within the facility.
- Other than maintenance vehicles, which will park at the entrance of turbines for maintenance purposes, parts and equipment which may be used as cover for prey will not be stored at the base of wind turbines while a turbine is operational and spinning.
- Fire hazards from vehicles and human activities will be reduced (e.g., use of spark arrestors on power equipment, avoiding driving vehicles off roads, allowing smoking in designated areas only).
- Triple H will develop and implement a noxious weed control plan in accordance with the land lease agreements.
- Pest and weed control measures will be implemented as specified by county, state, and federal requirements.
- A two-year avian and bat fatality monitoring program will be implemented at the start of operation.
- Develop and implement a site-specific worker training plan throughout the operational life of the Project to inform workers of the biological resources present on-site. This training will include whooping crane identification and turbine curtailment procedures to shut down turbines in the event a whooping crane is observed within two mi (3.2 km) of a turbine. All employees and contractors working in the field will be required to participate in the plan prior to working on site
- A carcass removal program will be implemented to minimize potential attractants for carrion-feeding raptors.
- All of Triple H's employees and contractors working on site will receive worker awareness training for identifying and responding to encounters with sensitive biological resources, including avian and bat species. The training will:
    - Be conducted by Triple H or their designee.
    - Include instructions for all employees, contractors, and site visitors to avoid harassing or disturbing wildlife.
    - Include instruction on identification and values of plant and wildlife species and significant natural plant community habitats, the issue of micro-trash and its effects, fire protection measures and measures to minimize the spread of weeds during construction, and hazardous material spill and containment measures.
    - Provide information to workers on the Project detailing information on potential state and federal special-status animal and plant species that might be discovered on the Project site.
    - Include an overview of the distribution, general behavior, and ecology of golden and bald eagles. Employees will be informed that they are not authorized to approach, handle, or otherwise move any eagles that might be encountered during

construction, whether alive, injured, or deceased. Operations personnel will be instructed to report any finding of an injured or deceased eagle to USFWS within 24 hours of positive identification by a qualified biologist.

8.0 POST-CONSTRUCTION MONITORING: TIER 4

8.1 Tier 4a – Avian and Bat Fatality Monitoring

Post-construction fatality monitoring is a critical component of this BBCS. The primary objective of fatality monitoring is to estimate avian and bat mortality at the Project and to determine whether the estimated mortality is lower, similar to, or higher than the average mortality observed at other regional projects, and consistent with the low levels of mortality predicted during the pre-construction risk assessments (see Section 6.0).

8.1.1 Baseline Monitoring

Baseline monitoring consists of short-term intensive surveys involving standardized carcass searches, bias trials for searcher efficiency, and carcass removal trials conducted by trained biologists. Baseline fatality monitoring will be conducted during the first year of commercial operations of the Project. The monitoring study design will be consistent with the recommendations for operations monitoring included in the WEG. Additionally, the scope and duration of the fatality monitoring study will be developed to be consistent with monitoring programs that have been conducted at wind projects in the Midwest, or otherwise recommended by USFWS Region 6 Office.

8.1.1.1 Monitoring Activities

Baseline fatality monitoring will be conducted during all seasons of the two years of commercial operations of the Project. Baseline avian and bat monitoring will consist of the following components:

1) Standardized carcass searches of selected turbines in a rectangular plot centered on the turbine;
2) Searcher efficiency trials to estimate the percentage of carcasses found by searchers;
3) Carcass persistence trials to estimate the length of time that a carcass remains in the field for possible detection;
4) Data analysis and calculation of fatality rates.

Following the first year of monitoring, Triple H will coordinate with the USFWS and the SDGFP to determine if additional years of monitoring are warranted.

8.1.1.2 Reporting

An annual report will be completed following the post-construction monitoring program and will be submitted to the USFWS and the SDGFP within three months of completion of surveys. The report will detail the results of mortality surveys, as well as the results of searcher efficiency and carcass removal trials. Fatality rates will be estimated following the most recent and acceptable methods. Annual reports will also include a validation of risk assessment, comparing the results of pre-construction avian and bat use data with the actual impacts as determined by the post-construction fatality monitoring.

8.1.2 Long Term Monitoring

All injured raptors, waterfowl, waterbirds, federally- or state-listed bird species, and federally listed bats will be promptly delivered to the appropriate rehabilitation center or other approved facility as specified in state and federal permits; or as directed by necessary law enforcement personnel. All injured non-protected bird and bat species will be humanely euthanized on-site.

Carcasses of federally listed species or eagle carcasses, if discovered, will be flagged, covered, and left in place. The USFWS will be notified within 24-hours of discovery, and any handling of the carcass will be at the USFWS direction/authorization. For non-federally listed and non-eagle carcasses, Triple H may either leave in place or properly collect and dispose of carcasses, depending on the current practice at the Project, as determined by ENGIE legal. Should "leave in place" be the current practice at the Project, then the personnel making the discovery will complete the ENGIE Wildlife Incident Report form and file the form in facility files. Should it be Project practice to collect and dispose of non-listed and non-eagle carcass discoveries, the appropriate wildlife salvage and collection permits will be obtained from the state and USFWS prior to any collection of carcasses. Upon completing the ENGIE Wildlife Incident Report, the personnel will collect and dispose of the carcass in accordance with the applicable permit(s) and complete any reporting required by the applicable permit(s).

8.2 Tier 4b – Assessing Impacts to Habitat

No Tier 4b studies to assess impacts to habitat or species of special concern are deemed necessary at this time, based on Tier 3 findings.

9.0 RESEARCH: TIER 5

In addition to the Tiers 1-4 described above, the WEG contain a *Tier 5 Other Post-Construction Studies*. In general, the studies identified in Tier 5 are research related and "will not be necessary for most wind energy projects". Considering that the site-specific and regional information collected during the pre-construction period indicated low potential impacts, no Tier 5 studies are currently planned.

10.0 ADAPTIVE MANAGEMENT

Within the WEG, the USFWS defines adaptive management as "an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process" (USFWS 2012). The WEG further notes that adaptive management at a wind facility is unlikely to be needed if it is sited in accordance with the tiered approach. Nevertheless, Triple H recognizes the value of applying this approach to its Project activities that include some uncertainty. As such, Triple H will incorporate an adaptive approach for the conservation of wildlife potentially impacted by the Project.

Section 5.0 of this BBCS describes the tiered approach used to study pre-construction wildlife conditions and predict Project impacts. Based on Project siting and the results of pre-construction wildlife studies, no significant adverse impacts are anticipated from the Project and mortality is expected to fall within the overall range of other projects in the Midwest and Mountain Prairie USFWS Regions (see Section 6.0). Tier 4 post-construction monitoring will be conducted to estimate the actual level of avian and bat mortality at the Project. If impacts are determined to be minimal, further action may be needed. Should the results of the Tier 4 studies indicate higher than anticipated impacts, adaptive management measures could be considered to further avoid, minimize, or compensate for unanticipated and significant project impacts to wildlife. Thresholds for considering an adaptive response may include:

- Mortality of an eagle or a species listed as state or federally endangered/threatened; or
- Significant levels of mortality of unlisted species of birds or bats. Significance will be determined by qualified biologists and will be based on the latest information available, including the most recent data on species' population sizes and trends. For example, even relatively high levels of mortality of the most common species may not be significant. Conversely, lower levels of mortalities of less common species may be of more concern, particularly if these species appear to be at risk (e.g., USFWS Birds of Conservation Concern).

If effects are determined to be higher than anticipated, an assessment of why effects are occurring will be conducted to aid in developing appropriate mitigation actions. If causation of effects is unknown, further monitoring efforts may be implemented to help understand effects. Some of the adaptive management options that could be considered depending on the results of the post-construction mortality monitoring and taking into account economic feasibility[1] include:

- Additional on-site studies (e.g., more intensive area use studies, prey base studies);
- Addition or modification of anti-perching, anti-nesting, or electrocution protection devices on "problem" project facilities;
- Prey-base management through habitat alteration; and
- Experimentation with visual and/or auditory bird flight diverters.

Once the mitigation measures are put into place, additional monitoring to determine the effectiveness of the mitigation measures may be conducted, and, depending on the results, further remedial measures may or may not be warranted.

[1] Once a project is operational there is a fixed amount of capital expenditure and the only available source of funding is from operational budgets, which must be within the economic parameters of the Project.

11.0 CONCLUSIONS

This BBCS was written to provide guidance for avoiding, minimizing, and monitoring potential effects to avian and bat species at the Triple H Wind Project. The measures described in this document are intended to help protect and reduce effects to avian and bat species during the construction phase of the Project, as well as to monitor potential effects to avian and bat species following implementation of the Project. Further, it is anticipated that this BBCS will facilitate adaptive management at the Project based on information gathered following construction of the Project.

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Exhibit 1. ***[Placeholder for agency notes (if applicable)]***

Appendix A: Triple H Wind Project –Site Characterization Study - Report

Appendix B: Triple H Wind Project Habitat Characterization - Memo

Appendix C. Whooping Crane Stopover Habitat Assessment for the Triple H Wind Project, Hughes and Hyde Counties, SD

Appendix D. Triple H Wind Project Northern Long-eared Bat Desktop Summer Habitat Assessment, Hughes and Hyde Counties, South Dakota

Appendix E. Avian Use Surveys for the Triple H Wind Project, Hughes and Hyde Counties, South Dakota – Final Report April 2016 – March 2017

Appendix F. Avian Use Studies Triple H Wind Project Hughes and Hyde Counties, South Dakota – Draft Report June 2019

Appendix G. 2016 Triple H Wind Project Raptor Nest Surveys – Memo

Appendix H. 2018 Triple H Wind Project Raptor Nest Surveys – Memo

Appendix I. Prairie Grouse Lek Surveys for the Triple H Wind Project, Hughes and Hyde Counties, SD – 2016 Prairie Grouse Lek Report

Appendix J. Prairie Grouse Lek Surveys for the Triple H Wind Project, Hughes and Hyde Counties SD – 2018 Prairie Grouse Lek Report

Appendix K. Bat Activity Studies for the Triple H Wind Project, Hughes and Hyde Counties, South Dakota – Final Report May 26 – October 21, 2016

Appendix L. Bat Activity Survey for the Triple H Wind Project, Hyde and Hughes Counties, South Dakota – Final Report April 25 – October 25, 2018