

Appendix C
Triple H Wind Project Field Studies Summary 2016–2018

Triple H Wind Project Field Studies Summary 2016 – 2018, Hughes and Hyde Counties, South Dakota



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INTRODUCTION

Triple H Wind Project, LLC (Triple H) is considering the development of the Triple H Wind Project (Project) in Hyde County, South Dakota. Triple H contracted with Western EcoSystems Technology, Inc. (WEST) to conduct baseline wildlife and habitat studies to evaluate potential impacts of wind energy facility construction and operations on wildlife.

In 2016, baseline wildlife studies were completed within a Project area encompassing 39,068 acres (ac; 15,810.3 hectares [ha]) based on a 200 megawatt (MW) project. In 2017, Triple H expanded the Project boundary to encompass approximately 110,059 ac (44,539.3 ha) based on up to three separate 250 MW phases. Triple H has refined the current Project to currently include 103 turbine locations which is primarily located within the central portion of the 2016 Project boundary and encompasses approximately 27,226 ac (11,018.0 ha; Figure 1).

Baseline wildlife studies at the Project were designed to address the questions posed under Tier 3 of the US Fish and Wildlife Service (USFWS) *Final Land-based Wind Energy Guidelines* (WEG; USFWS 2012) and Tier 2 of the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013). Studies conducted at the Project from 2016 to 2018 include avian use surveys, raptor and eagle nest surveys, prairie grouse lek surveys, acoustic monitoring for bats, whooping crane (*Grus americana*) stop-over habitat analysis, northern long-eared bat (*Myotis septentrionalis*) summer habitat analysis, and land cover characterization study.

The studies conducted to date also incorporate WEST's experience working in South Dakota with USFWS Ecological Services, the USFWS Region 6 office, and South Dakota Game, Fish and Parks (SDGFP). The following provides a summary of studies conducted, being conducted, or applicable to the current Project area.

PROJECT AREA DESCRIPTION

The 2016 and 2017 Project areas expanded across Hughes and Hyde Counties, South Dakota approximately three miles (mi) south of Highmore, Holabird, and Harrold, South Dakota. The current Project is located within Hyde County within the Northwestern Glaciated Plains Level III Ecoregion, a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest (USEPA 2015). This ecoregion is characterized by high concentrations of seasonal and semi-permanent wetlands (prairie potholes [USEPA 2015]). The topography within the current Project consists of rolling hills, with elevations ranging from 1,950 to 2,050 feet (ft; 594-624 meters [m]) above mean sea level. Land ownership in the current Project 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 area. South Fork Medicine Knoll Cree and Chapelle Creek are the main drainages within the current Project and prairie potholes occur across the area. The majority of the lands within the current Project support agriculture, either as cultivated crop, hay, or pasture lands.

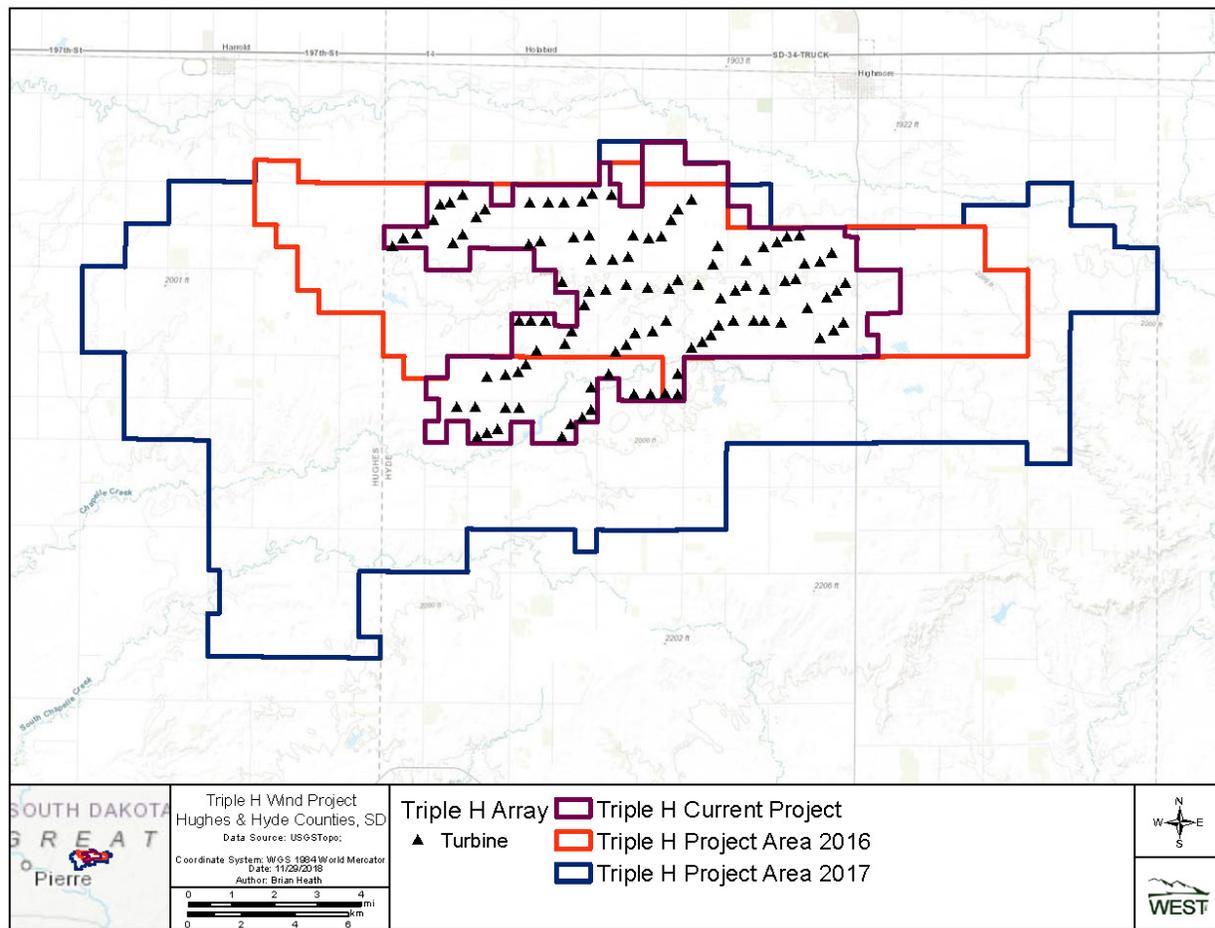


Figure 1. Triple H Wind Project boundaries for field studies conducted between 2016 and 2018. The current Project turbine array is also depicted.

LAND COVER

Land cover types were digitized using ArcGIS, ArcMap 10.5 within the current Project. Using US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP [USDA 2016]) aerial imagery in combination with 2011 South Dakota Land Cover Patterns (National Land Cover Database (NLCD; US Geological Survey [USGS] NLCD 2011, Homer et al. 2015), and USDA National Agricultural Statistics Service (NASS) National Cropland Layer (USDA NASS 2017) cropland classification, and field inspections, all lands within the current Project were digitized and assigned one of six cover types (excluding National Wetland Inventory [NWI] wetlands; Table 1). NWI data was used to represent water within the current Project area. Those water features visible on the aerial imagery but not in the NWI data were digitized as “water”.

Croplands included fields where corn (*Zea mays*), soybeans (*Glycine max*), sunflowers (*Helianthus annuus*), sorghum (*Sorghum bicolor*), alfalfa (*Medicago sativa*), winter wheat (*Triticum aestivum*), or other row crops were grown. Herbaceous grassland vegetation was

divided into grassland pastures or grass hay. Grassland pastures typically were characterized by a mixture of native cool and warm season grasses including western wheatgrass (*Pascopyrum smithii*), green needle grass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), and little blue stem (*Schizachyrium scoparium*). Grass hay fields typically contained fewer species such as smooth brome grass (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*) and could possibly have been older Conservation Reserve Program (CRP) fields that were hayed in 2017. Trees typically included shelterbelts with a mixture of evergreen and deciduous species, near residences or along field borders. Developed lands included roads, ranches and residential areas, fed lots, and stock yards.

The dominant land cover type within the current Project area is cropland, covering 63.7% of the land area (17,345.2 ac [7,019.4 ha]; Figure 2). The second most common cover type is grassland pasture (6,742.5 ac [2,728.6 ha; 24.8%]). NWI wetlands was the next highest cover type (1,670.3 ac [675.9 ha; 6.1%]), followed by grass hay (701.0 ac [283.7 ha; 2.6%]), and developed space (516.4 ac [209.0 ha; 1.9%]). Trees accounted for only 250.9 ac (101.5 ha; 0.9%) and one small additional water source was digitized within the current Project (0.1 ac [<0.1 ha; $<0.1\%$]).

Table 1. Digitized Land Cover within the current Triple H Wind Project, Hyde County, South Dakota.

Land Cover Type	Acres	% Project
Cropland	17,345.2	63.7%
Grassland Pasture	6,742.5	24.8%
NWI Wetlands ^a	1,670.3	6.1%
Grass Hay	701.0	2.6%
Developed	516.4	1.9%
Trees	250.9	0.9%
Water	0.1	$<0.1\%$
Total	27,226.4	100.0%

^a US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI; USFWS NWI 2017a).

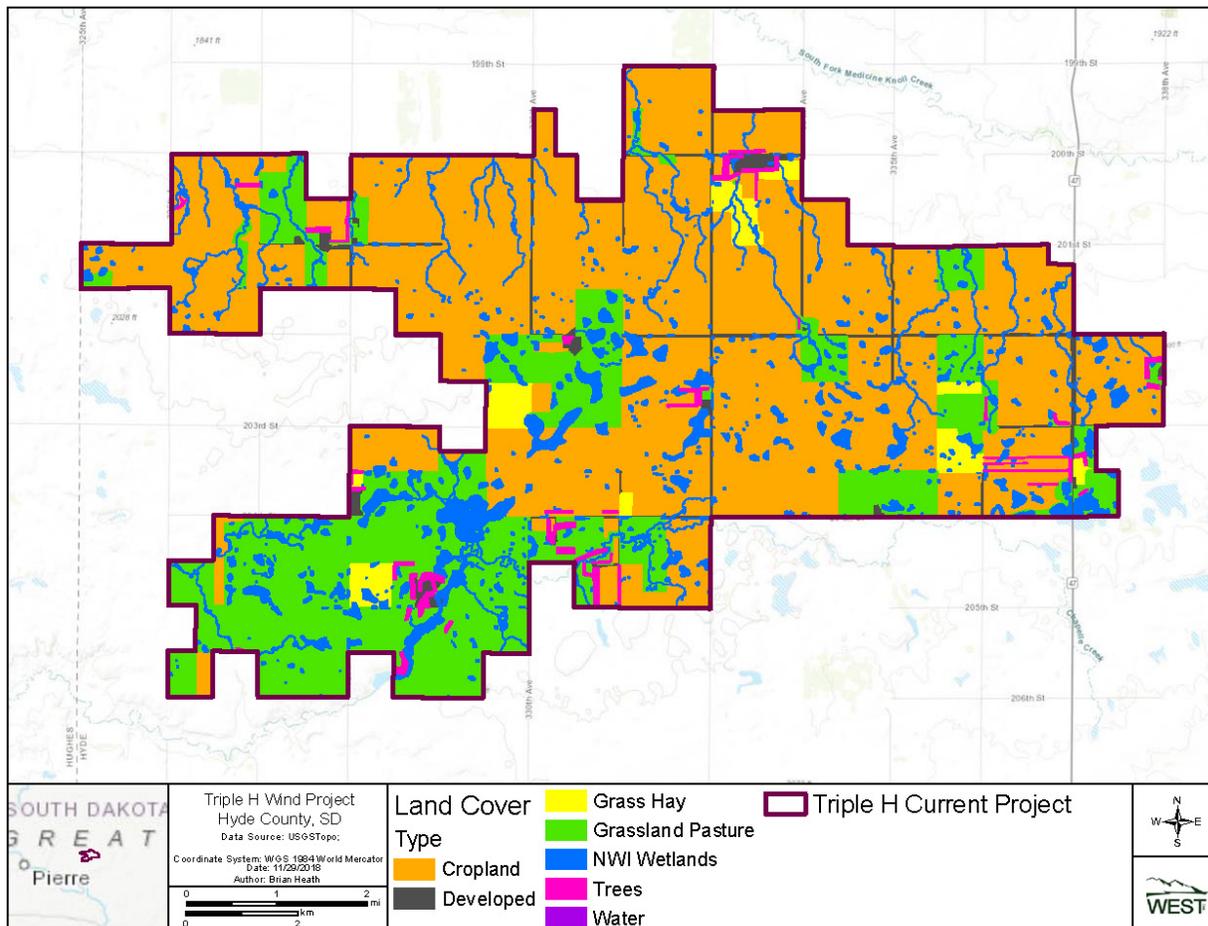


Figure 2. Digitized land cover within the current Triple H Wind Project.

AVIAN USE SURVEYS

Avian point count surveys are the most widely used methodology for pre-construction avian use characterization and risk analysis (e.g., USFWS “Tier 3” studies [USFWS 2012]), because of their effectiveness and efficiency for characterizing the use of selected sites by a broad spectrum of diurnally-active birds (Ralph et al. 1993, Strickland et al. 2011). The objective of the fixed-point avian use surveys was to estimate the seasonal and spatial use of the Project area by birds. WEST conducted avian use surveys within the 2016 Project area and is currently conducting surveys within the expanded Project, excluding areas surveyed during the 2016 point counts. The following provides an overview of the avian use surveys conducted or being conducted and reference to surveys that have or are being conducted within current Project area.

2016 Surveys

Year-round avian use surveys were conducted at 24 points established throughout the 2016 Project from April 18, 2016 to March 28, 2017. Points were established throughout the 2016 Project with each survey plot consisting of an 800-m (2,625 ft) radius circle centered on the point (Figure 3). Plots were selected to survey representative habitats and topography of the

2016 Project, while meeting ECPG spatial sampling recommendations. The ECPG recommends at least 30% survey coverage of areas within one kilometer (km; 1.6 miles [mi]) of turbine locations (USFWS 2013). Because turbine locations were unknown at the start of surveys, plots were selected such that survey viewsheds covered approximately 30% of the 2016 Project area.

Points were surveyed for 60 minutes (min) each, with all species of birds recorded during the first 20 min of the survey period, and then only large birds recorded for the remaining 40 min. The initial 20 min surveys allowed for comparison of small and large bird use, including diurnal raptor use, with the majority of wind projects in the region. The 60 min surveys that encompassed large birds were consistent with the ECPG and were used to obtain a stronger dataset with which to evaluate large bird use and potential risk, particularly for eagles. Large birds observed within an 800-m plot and small birds within a 100-m (328 ft) plot were used for quantitative analysis and other comparative metrics. Small birds were defined as cuckoos, hummingbirds, swifts, woodpeckers, and passerines. Large birds were defined as waterbirds, waterfowl, shorebirds, diurnal raptors (i.e., kites, accipiters, buteos, eagles, falcons, northern harrier [*Circus hudsonius*], and osprey [*Pandion haliaetus*]), vultures, upland game birds, doves and pigeons, large corvids (e.g., black-billed magpie (*Pica hudsonia*), American crow (*Corvus brachyrhynchos*), and common raven (*C. corax*), large cuckoos, and goatsuckers.

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. Every bird group (each group may be as small as just one individual) observed during a survey was recorded and identified by a unique observation number. Information collected for each observation included: species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center 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 plot center at first observation were recorded to the nearest five m (16 ft) interval. Other information collected included whether or not the observation was auditory only, as well as the 10 min interval of the survey during which the detection first occurred. Additionally, for all eagle observations, data were collected following ECPG methodology, including minute by minute data collected throughout the duration of each eagle observation (USFWS 2013).

Locations of diurnal raptors, other large birds, and species of concern observed during surveys were recorded on field maps by unique observation numbers. Flight paths and perch locations were digitized using ArcGIS 10.4.

A total of 238 60 min fixed-point surveys were completed and 59 unique bird species were identified. Regardless of bird size, five species composed 63.5% of all observations: red-winged blackbird (*Agelaius phoeniceus*), sandhill crane (*Grus canadensis*), snow goose (*Chen caerulescens*), horned lark (*Eremophila alpestris*), and Canada goose (*Branta Canadensis*). All other species accounted for less than 3% of the observations, individually. The most abundant large bird species observed were sandhill crane (3,970 individuals in 20 groups) and snow goose (3,875 individuals in six groups).

Diurnal raptor use was highest during the spring (0.34 birds/plot/60-min survey) and lowest during the winter (0.09 birds/plot/60-min survey). Six diurnal raptor species were identified with the most common being northern harrier (21 observations) and red-tailed hawk (17 observations [*Buteo jamaicensis*]). Diurnal raptor use was recorded at all but three of the 24 points. A total of four eagles (all bald eagles [*Haliaeetus leucocephalus*]) were recorded during surveys, with an additional two bald eagles and four golden eagles (*Aquila chrysaetos*) observed incidentally during the study. The raptor species with the highest exposure index to the rotor-swept height was the red-tailed hawk (0.02), which was ranked sixth of all species.

Mean annual diurnal raptor use was 0.12 raptors/plot/20-min survey, which ranked 44th compared to 46 other studies of wind energy facilities where protocols similar to the present study were implemented and had data for three or four different seasons. 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 at the 2016 Project during the surveys, 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.

A total of 15 sensitive species were observed within the 2016 Project during surveys or incidentally during the study. No state and/or federally-listed species were observed. Sensitive species recorded during the study included 12 species designated as either a 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). Three rare species that are tracked by the South Dakota Natural Heritage Program were observed during surveys or incidentally within the Project.

2018 Surveys

Fixed-point avian use surveys are being conducted within the expanded 2017 Project area, excluding areas surveyed within the 2016 Project area. Surveys commenced on January 24, 2018 and will continue for a year until mid-January 2019. The objective of the surveys will again be to provide information that can be used to predict potential impacts, and identify methods of avoiding and/or mitigating impacts based on overall, temporal, and spatial use of the expanded Project area by eagles and other large birds.

WEST established a total of 38 point count locations consisting of 800-m radius circular plots within the one km radius surrounding proposed turbines within the expanded 2017 Project (Figure 3). Thirty-three points are located within one km of the turbine layout as proposed in November 2017 and five points located outside of the one km turbine buffer but within the expanded 2017 Project area boundary. The points were systematically selected to provide at least 30% coverage of the one km buffer, separated by at least 1,600 m (5249.3 ft) to avoid overlap of the 800-m plots, while providing spatial coverage of the proposed development. Point count stations were adjusted in the field in order to maximize viewsheds and land access restraints.

Points are surveyed once per month with half of the points surveyed one-week and the other half approximately two-weeks later. Each observation point is surveyed for 70 min, with only small birds recorded during the first 10 min of the survey period, immediately followed by surveys that record eagle/large birds during the next 60 min as recommended by survey standards in the ECPG (USFWS 2013) and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016). Data recorded during the small and large bird surveys are consistent with 2016 data collection (e.g. survey radius of the circular plots for analysis will be 100-m for small birds and 800-m for large birds, recording species, distance, eagle minutes, flight paths, etc.) except as noted where small birds are only surveyed during the first 10 min and only eagle/large birds during the next 60 min.

Total survey effort for 2018 avian use surveys will be over 400 hours for the year. A summary report of the avian use surveys is scheduled to be drafted by March 2019.

Current Project Area

Twenty-two of the 2016 and 2018 800-m survey plots are located within or intersect the current Project boundary. Collective coverage with both years 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. Although 2016 or 2018 points were surveyed for a year, none of the points were surveyed for two years. The 2016 and 2018 surveys points outside of the current Project but within the general area of the current Project will also provide an indication of general avian use and potential risk to birds.

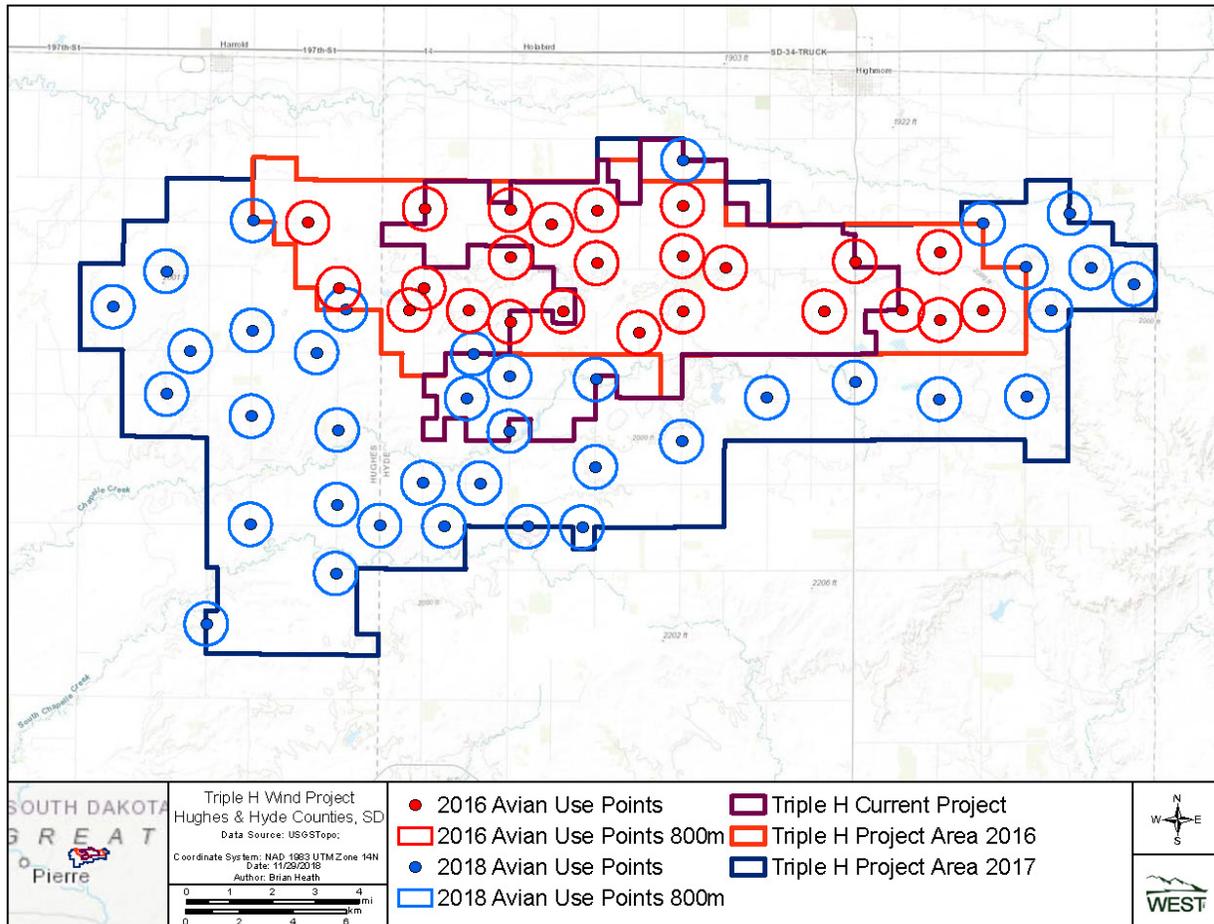


Figure 3. Location of fixed-point avian use survey stations within the 2016, 2017, and current Triple H Wind Project areas.

RAPTOR NEST SURVEYS

Raptor nest surveys were conducted for the Project in the spring of 2016 and 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 areas and extended to a 10 mi (16.1 km) buffer as pre recommendations in the ECPG (USFWS 2013).

2016 Surveys

Aerial surveys were conducted from March 28-April 1, 2016 to search for raptor nests within one mi (1.6 km) of the 2016 Project area. Surveys were also conducted to document eagle nests within 10 mi of the 2016 Project. Prior to the surveys, topographic and aerial maps were evaluated to determine where raptor and eagle nesting habitat is likely to occur (e.g., riparian habitat along creeks, open lakes with large trees, etc.) so that these areas could be targeted during the aerial 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.

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 present and 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. Photographs were taken of possible eagle nests.

During the 2016 aerial survey, 16 raptor nests were documented within the 2016 Project and one mi buffer (Figure 4). Three nests were occupied by red-tailed hawks and one was occupied by a great-horned owl (*Bubo virginianus*), while all the remaining nests were inactive. No eagle nests were located during the survey within the 2016 Project area or 10 mi survey area.

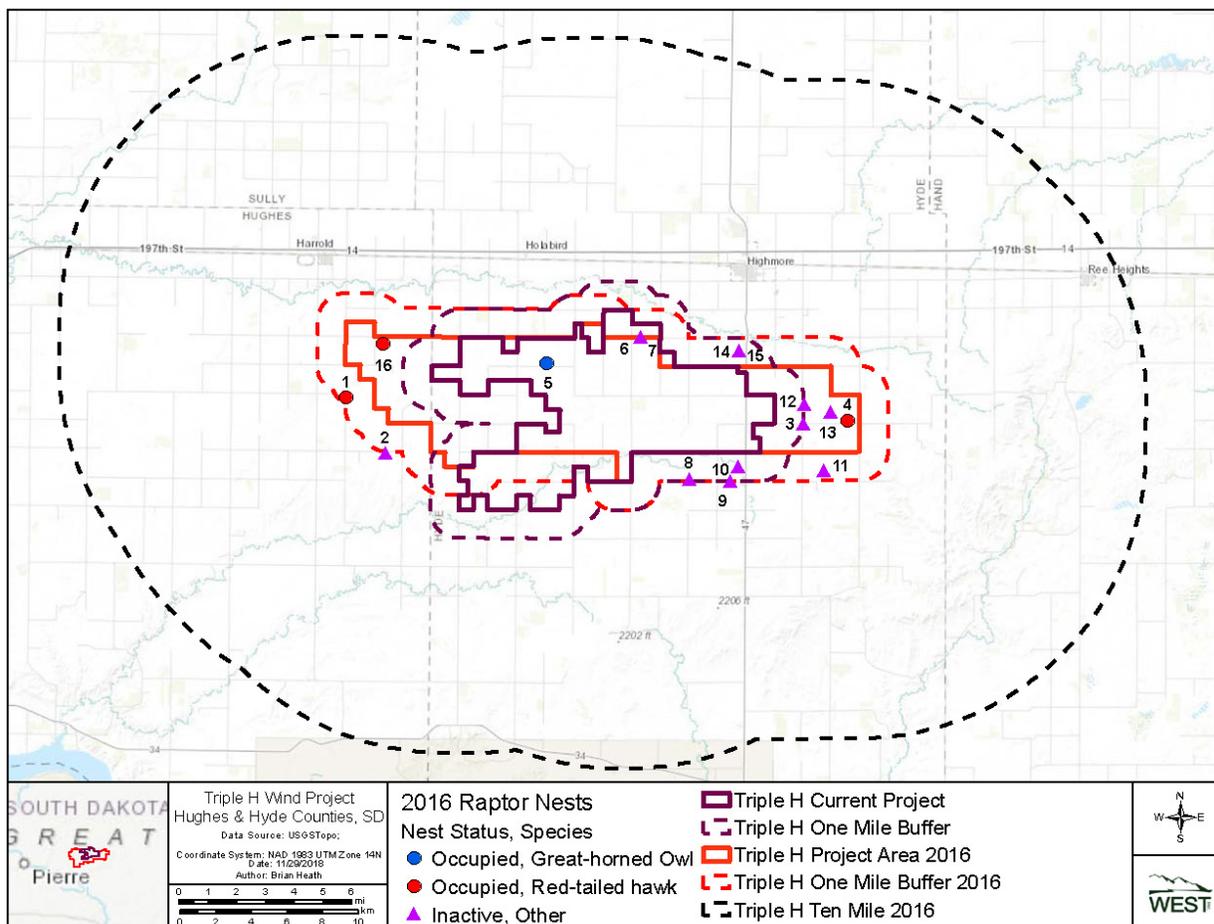


Figure 4. Location of raptor nests identified during surveys for the 2016 Triple H Wind Project and one mile buffer. No eagle nests were identified during the surveys within the Project or 10 mile buffer. Current Triple H Wind Project boundary also included for reference.

2018 Surveys

Surveys for raptor nests were completed for the expanded Project from March 9-14, 2018, by biologists from WEST. The objective of the nest survey was 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 within the expanded Project. Observations of non-nesting eagles and prey sources (e.g. prairie dog towns) were also recorded during the 2018 aerial surveys. Aerial imagery was used to delineate the approximate perimeter of prairie dog towns. Raptor nests detected from the ground while conducting other field surveys were also recorded.

During the surveys, 16 nests previously documented in 2016 were re-visited; 10 were confirmed present and six could not be relocated. In addition, 38 previously undocumented raptor nests were detected within the expanded Project and one mi buffer during surveys (Figure 5). 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: 12 great-horned owls, eight Swainson's hawk (*Buteo swainsoni*), and seven red-tailed hawks. All nests were located within deciduous trees. Generally, great-horned owls were observed occupying nests during the aerial survey; whereas, red-tailed hawks and Swainson's hawks were observed occupying nests during May. No eagle nests were documented within the expanded Project or one mi buffer.

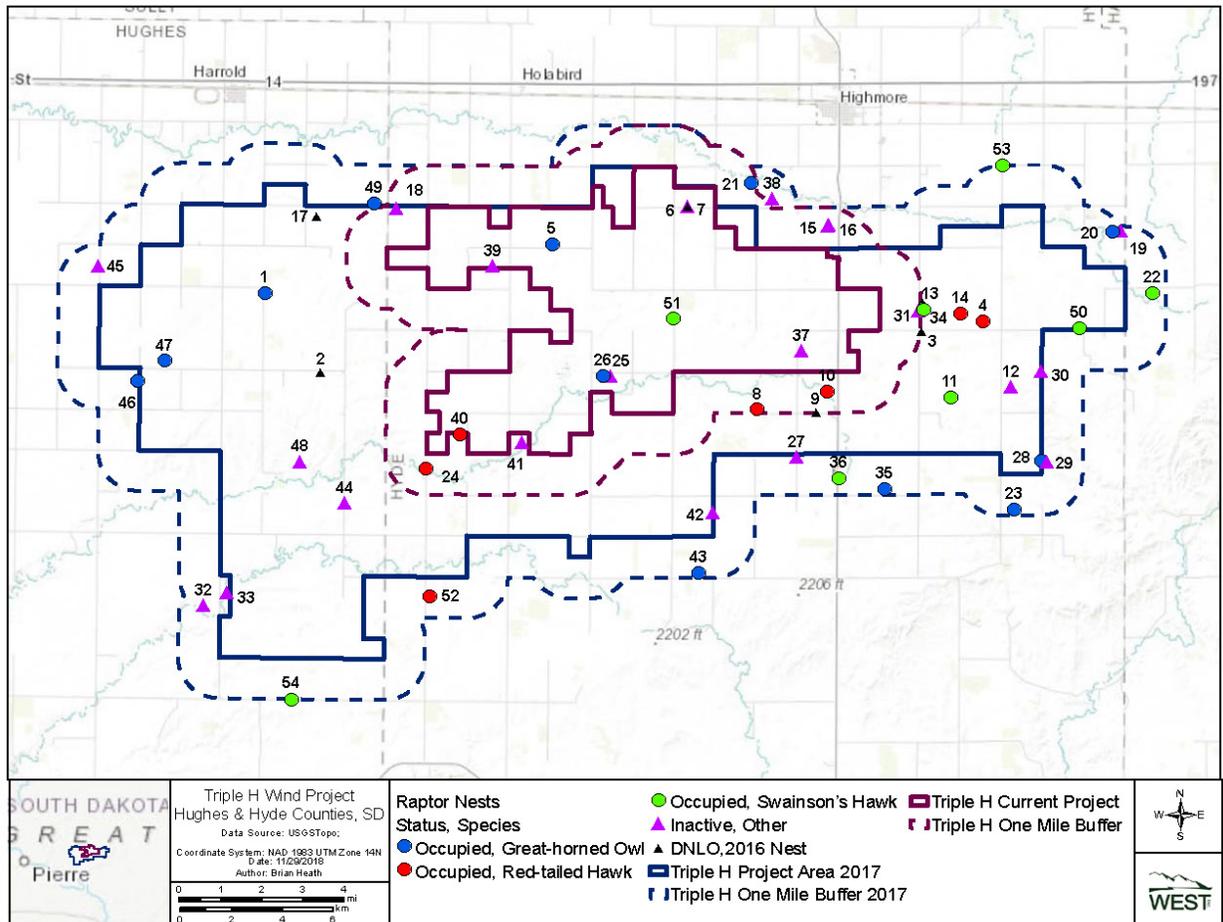


Figure 5. Location of raptor nests identified during surveys for the expanded Triple H Wind Project and one mile buffer in spring 2018. Current Triple H Wind Project boundary included for reference.

Two occupied eagle nests were documented during surveys between one and 10 mi of the expanded Project (Figure 6). A bald eagle nest was detected within a snag along the Missouri River approximately 8.7 mi (14.0 km) southwest of the expanded Project. During the first inspection of the nest, a bald eagle was observed circling the snag and then landed within an adjacent snag. There was no new greenery within the nest. The nest was re-checked the following day and an adult bald eagle was observed perched on the nest. No egg or fresh greenery was observed during the second observation as well.

A golden eagle was observed incubating on a nest within a deciduous tree along Chapelle Creek on March 10, 2018. An inactive nest, assumed to be an alternate eagle nest site, was detected approximately 90 ft (27.4 m) north of the occupied golden eagle nest. The nests are located approximately 7.2 mi (11.6 km) southwest of the expanded Project boundary. The bald eagle and golden eagle are listed as Species of Greatest Conservation Need (SGCN) in South Dakota (SDGFP 2014).

Eleven black-tailed prairie dog (*Cynomys ludovicianus*) towns were documented during the surveys; five towns were located within the expanded Project and the other six were located within the 10 mi of the expanded Project (Figure 6). Active prairie dog towns may attract raptors such as eagles, ferruginous hawks (*Buteo regalis*), and golden eagles since they provide a concentrated prey source and provide nesting habitat or structure for burrowing owls.

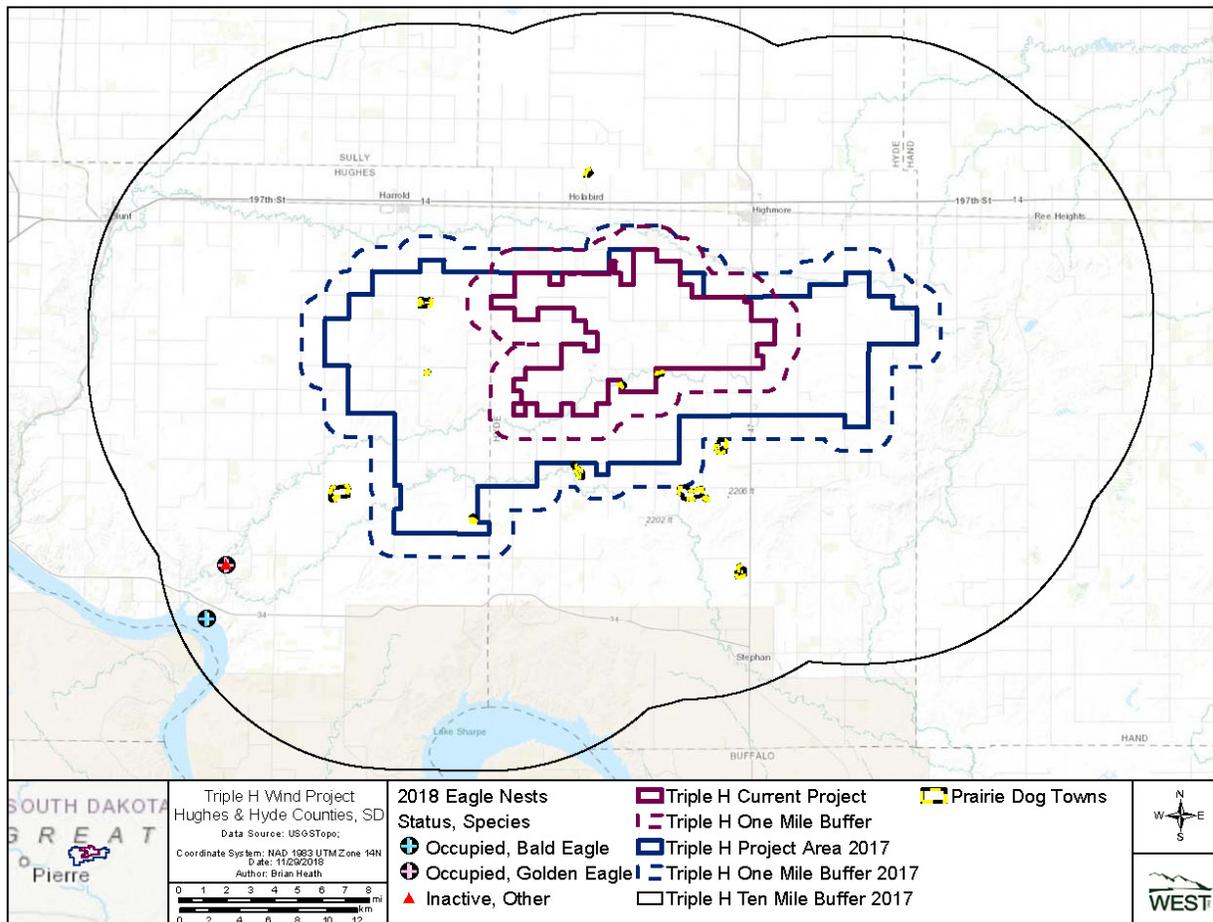


Figure 6. Location of eagle nests identified during surveys for the expanded Triple H Wind Project and 10 mile buffer in spring 2018. Black-tailed prairie dog towns and current Triple H Wind Project boundary included for reference.

Current Project Area

Nineteen raptor nests recorded during the 2016 and 2018 surveys are located within the current Project area and one mi buffer. Eight of the nests are located within the current Project and 11 within one mi of the current Project (Figure 7). Eight of the 19 nests were classified as occupied during the 2018 surveys, nine were inactive, and two nests identified during 2016 could not be relocated. Three nests were occupied by great-horned owls, four by red-tailed hawks, and one by a Swainson's hawk (Table 2). No eagle nests are located within 10 mi 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. Active prairie dog towns may attract raptors such as eagles,

ferruginous hawks, and golden eagles since they provide a concentrated prey source and provide nesting habitat or structure for burrowing owls.

Table 2. Raptor nest observations during the aerial nest surveys within current Triple H Wind Project and one mile buffer, March 2018. Observations include a raptor nest identified in May 2018 that was documented during other field work.

NestID ¹	Date	Species	Status ²	Adults	Evidence	Eggs	Chicks	Condition	Substrate	Comment
1*	3/10/2018	Great-horned Owl	Occupied	1	Incubating	2	1	Good	Tree	
2*	3/10/2018	Other	Inactive					Fair	Tree	
3*	3/11/2018		DNLO							
4*	5/5/2018	Red-tailed Hawk	Occupied	1	Incubating			Good	Tree	3/10/2018 GRHO incubating, re-check indicated RTHA incubating
5	3/10/2018		DNLO							
6	5/1/2018	Red-tailed Hawk	Occupied	1	Incubating			Good	Tree	3/10/2018 Inactive, re-check RTHA incubating
7	3/9/2018	Other	Inactive					Fair	Tree	Re-check 5/3/2018 inactive
8	3/10/2018	Other	Inactive					Fair	Tree	Re-check 5/3/2018 inactive
9	3/11/2018	Other	Inactive					Fair	Tree	Re-check 5/3/2018 inactive
10	3/9/2018	Great-horned Owl	Occupied	1	Incubating	3		Good	Tree	
11	5/4/2018	Red-tailed Hawk	Occupied	1	Incubating			Good	Tree	3/10/2018 GRHO incubating, re-check indicated RTHA incubating
12	3/10/2018	Other	Inactive					Fair	Tree	Re-check 5/3/2018 still inactive
13	5/3/2018	Great-horned Owl	Occupied	1	Tending Chicks		1	Fair	Tree	3/10/2018 inactive, GRHO 1+ chicks in nest on re-check 5/3/2018
14	3/10/2018	Other	Inactive					Good	Tree	
15	3/10/2018	Other	Inactive					Good	Tree	5/3/2018 re-check still inactive
16	3/10/2018	Other	Inactive					Good	Tree	
17	5/3/2018	Red-tailed Hawk	Occupied	1	Incubating			Good	Tree	3/10/2018 inactive, re-check adult RTHA incubating on 5/3/2018
18	3/11/2018	Other	Inactive					Fair	Tree	5/3/2018 Heron tending nests in area
19	5/5/2018	Swainson's Hawk	Occupied	1	Nest Tending			Good	Tree	Recorded during other filed work

¹* = Nests documented during 2016 surveys and re-checked in 2018

² DNLO = Did Not Locate Nest from 2016 Survey

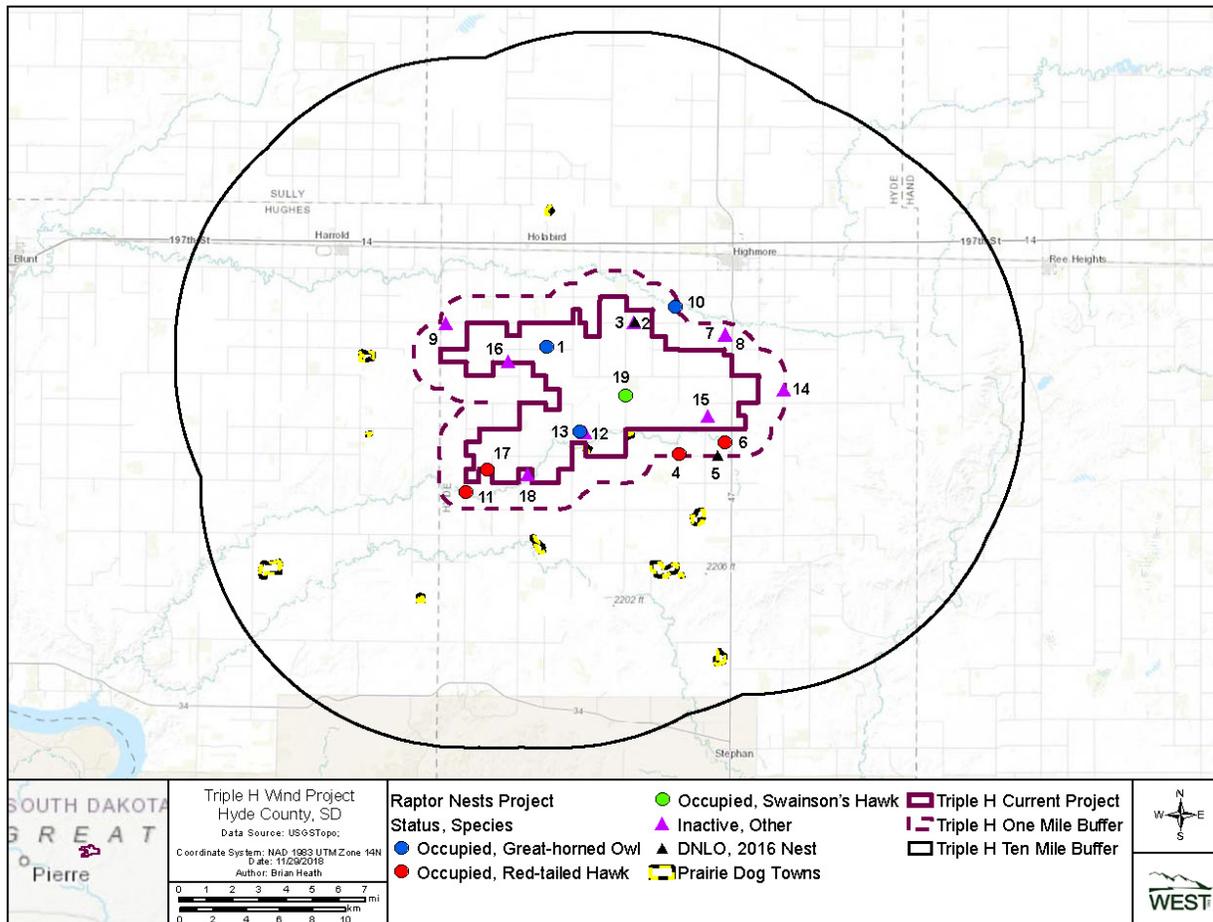


Figure 7. Location of raptor nests and black-tailed prairie dog towns identified during surveys relative to the current Triple H Wind Project. No eagle nests were identified within current Triple H Wind Project boundary or a 10 mile buffer.

PRAIRIE GROUSE LEK SURVEYS

The Project area occurs within the occupied range of the greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus*) hereafter referred to as prairie grouse for both species combined. 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). WEST conducted surveys to document prairie grouse leks during the 2016 and 2018 breeding seasons within the 2016 and expanded Project areas. The objective of the prairie grouse lek survey was to collect pre-construction data that can be used to help site the wind turbines to minimize impacts on prairie grouse.

2016 Surveys

Lek surveys were completed across the 2016 Project area and one-half mi (about 800 m) buffer three times between March 29 and April 30, 2016. 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-April 2, 2016 by traveling accessible roads throughout

the 2016 Project area and one-half mi 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 one mi intervals or more frequently depending upon habitat type. The biologist walked approximately 16-32 ft (5-10 m) from the vehicle and looked and listened for breeding grouse for approximately 5 min.

The second survey was conducted from the air on April 20-21, 2016. A Cessna 172 flew north/south transects across the survey area spaced approximately one-quarter mi (0.4 km) apart at an altitude of approximately 100-150 ft (30-45 m) above ground level. 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 (<10-15 mph; 16-24 kmh) and no precipitation. An onboard GPS unit was used to keep the plane on transect, document lek locations, and record daily flight paths. Biologists recorded the number of birds on the lek and whether occupied by greater prairie-chicken or sharp-tailed grouse. The following characteristics were used to distinguish between these species from the air. A square-tail shape and dark, blocky body for greater prairie-chickens versus a pointed-tail with white under tail coverts and lighter body color for sharp-tailed grouse.

A combination of aerial and ground-based surveys was used to complete the third round of surveys within the 2016 Project area and one-half mi buffer from April 28-30, 2016. Aerial surveys were conducted within the western-half of the survey area on April 28, 2016 and ground-based surveys were conducted across the eastern-half of the survey area from April 29-30, 2016. The methods described above for aerial and ground-based surveys were again employed for these surveys.

If a lek was visually located from a road, 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 on the road 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.

Any suspected lek observed from the air was 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.

Eight greater prairie-chicken leks were documented, all during ground surveys, within the 2016 Project area and one-half mi buffer (Figure 8). Five leks were located within the 2016 Project area and three were within one-half mi of the 2016 Project boundary. No sharp-tailed grouse leks were located. Two additional greater prairie-chicken leks were detected between one-half mi and one mi of the 2016 Project and were included within results to aid in planning.

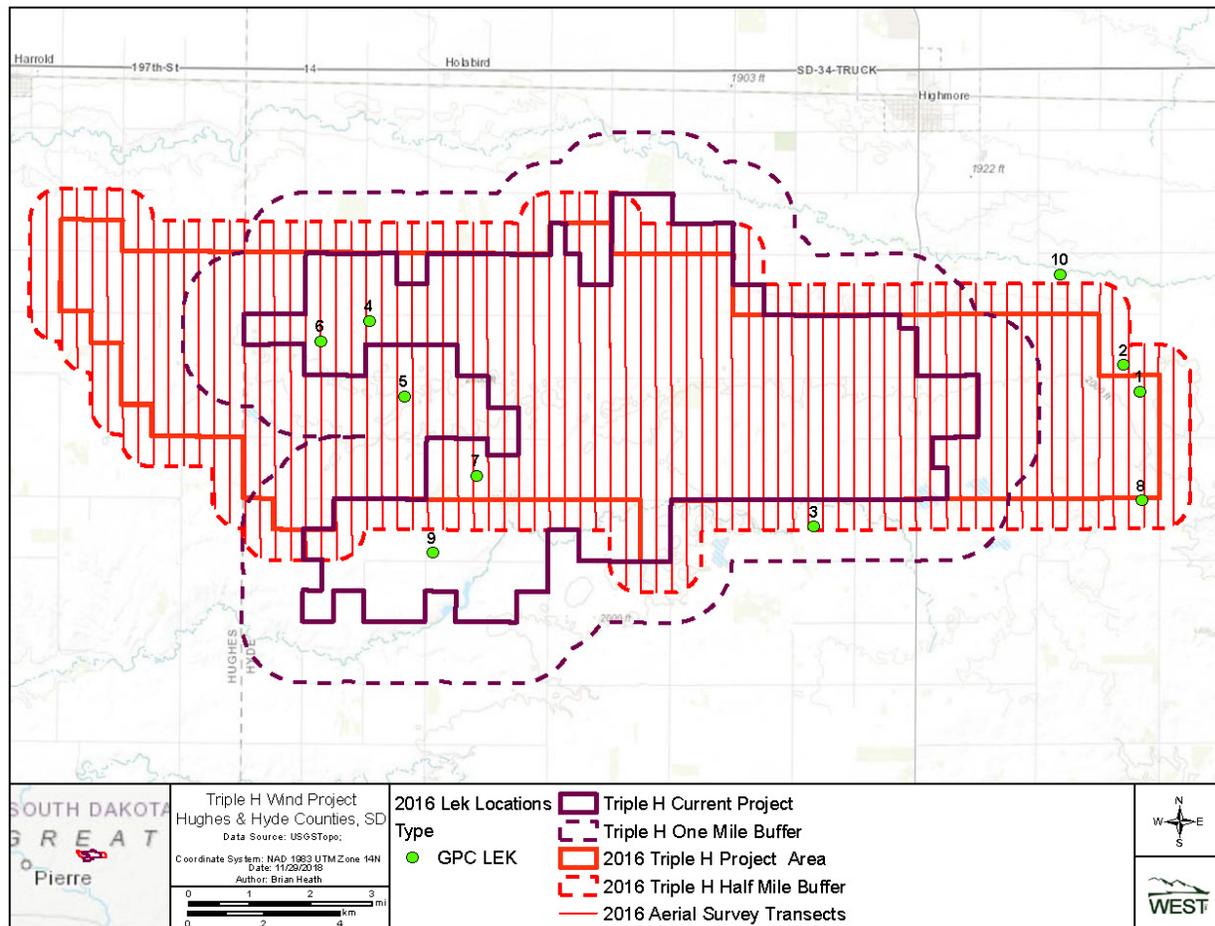


Figure 8. Location of prairie grouse leks identified during surveys for the 2016 Triple H Wind Project and one-half mile buffer. Current Triple H Wind Project boundary included for reference.

2018 Surveys

Leks documented during 2016 surveys were visited at least three times between March 27 and May 6, 2018 to document current breeding season activity and record counts of prairie grouse attending the leks, if active. The majority of visits occurred from the ground; however, some visits were conducted from the air for leks that were inactive during initial ground checks to survey the general area in the event the location of the lek moved since the previous survey. 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 entire expanded Project area excluding areas that were previously surveyed within the 2016 Project area (Figure 9). The surveys extended to a one mi buffer of the expanded Project area. A combination of ground based and aerially surveys were used to search for breeding prairie grouse locations.

The first survey was ground-based and conducted between March 27-30, 2018 by traveling accessible roads throughout the expanded Project area and one mi buffer. A major blizzard

occurred in mid-April and delayed the initial aerial survey. However, several county roads had been cleared and allowed some of the leks documented during the 2016 surveys and during the initial ground survey in March 2018 to be revisited and obtain counts of birds attending the leks. These counts were conducted from April 15-17, 2018 and any new leks detected during the surveys were also recorded. Two rounds of aerial surveys were conducted from April 23-27 and May 2-5, 2018. Methods detailed and data recorded for the 2016 surveys were implemented during the ground based and aerial based surveys conducted in 2018.

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 (Figure 9). 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, #10 were active, in approximately the same locations as in 2016, and greater-prairie chickens were observed displaying at each of the locations 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 broke. 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. In 2016, Lek #6 was located within a wheat field and the field contained corn stubble in 2018.

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

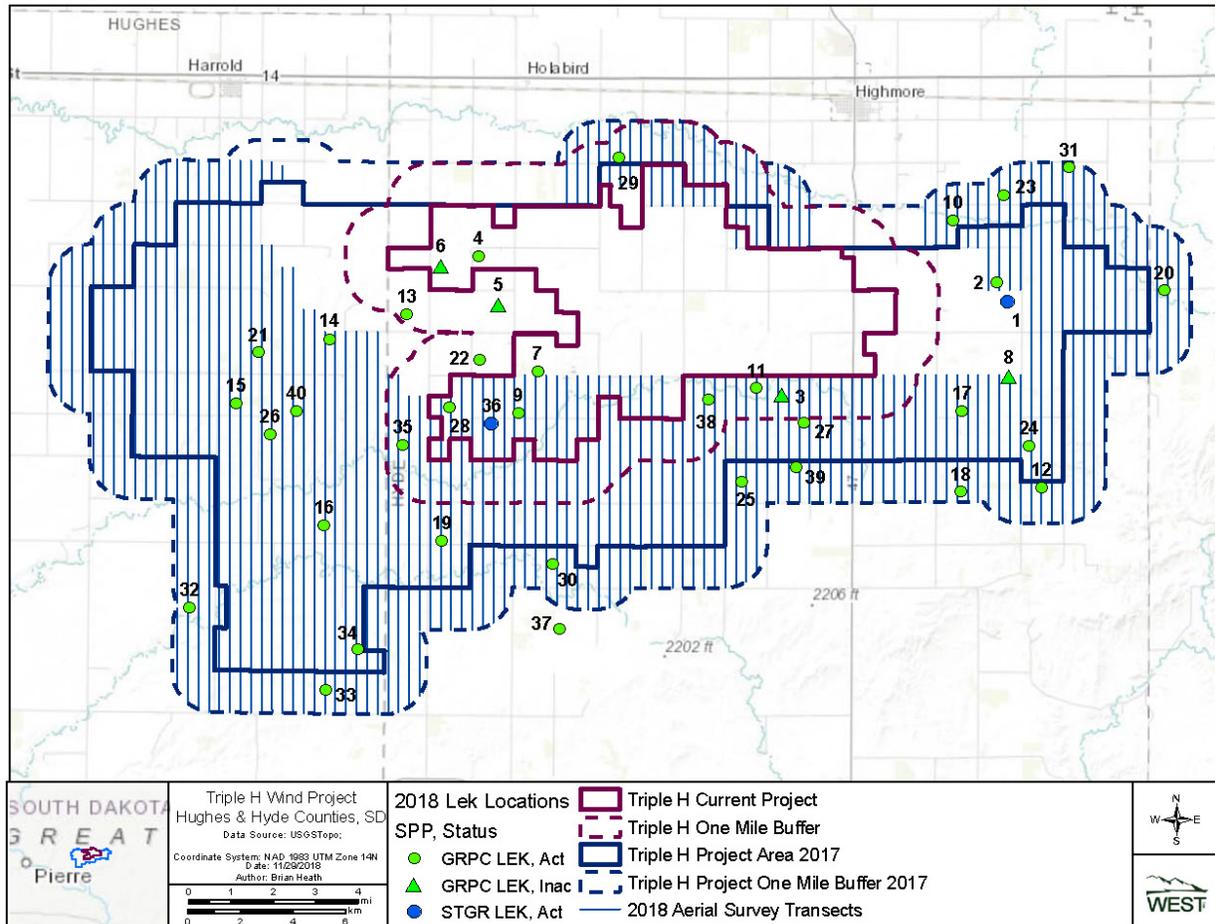


Figure 9. Location and status of prairie grouse leks identified during surveys for the expanded Triple H Wind Project and one mile buffer during the 2018 breeding season. Current Triple H Wind Project boundary also included for reference.

Current Project

Sixteen prairie grouse leks are located within the current Project or within two mi (3.2 km) of the current Project area; 13 were classified as active and three as inactive during the 2018 breeding season (Table 3). Six leks are located within the current Project, eight are located within one mi of the current Project boundary, and two are located between one and two mi of the current Project boundary. 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 (Table 3). 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 aerial surveys as most birds flushed when the plane approached the lek as well as from the ground due to the vegetation and distance from the county roads when attempting to get counts of the birds. Therefore, the maximum number of birds is reported and not maximum number of

males; however, in several counts the maximum count represents the number of males observed displaying.

Table 3. Location and maximum number of prairie grouse observed at leks during surveys for the current Triple H Wind Project, Hyde County, South Dakota, Spring 2018.

Id ¹	Date	SPP ²	Status	# Birds ³	QQ	Sec	Twn	Rng	Habitat	Location
3*	3/27/2018	GRPC LEK	Inactive	0	SWNW	15	111	72	Grassland	One-Mile Buffer
4*	4/15/2018	GRPC LEK	Active	14	NWNW	33	112	72	Grassland	Project
5*	3/28/2018	GRPC LEK	Inactive	0	SWNE	4	112	73	Grassland	One-Mile Buffer
6*	3/29/2018	GRPC LEK	Inactive	0	SWNW	32	112	73	Cropland	Project
7*	4/24/2018	GRPC LEK	Active	7	NESE	10	111	73	Grassland	Project
9*	4/27/2018	GRPC LEK	Active	19	SWSW	15	111	73	Grassland	Project
11	4/15/2018	GRPC LEK	Active	13	SWNE	16	111	72	Grassland	One-Mile Buffer
13	3/28/2018	GRPC LEK	Active	12	NWSW	6	111	73	Grassland	One-Mile Buffer
19	3/28/2018	GRPC LEK	Active	8	SESW	32	111	73	Grassland	Two-Mile Buffer
22	4/24/2018	GRPC LEK	Active	7	NESW	9	111	73	Grassland	One-Mile Buffer
27	4/24/2018	GRPC LEK	Active	4	NENE	22	111	72	Grassland	Two-Mile Buffer
28	4/26/2018	GRPC LEK	Active	15	SESW	17	111	73	Grassland	Project
29	4/26/2018	GRPC LEK	Active	11	SESW	13	112	73	Cropland	One-Mile Buffer
35	5/3/2018	GRPC LEK	Active	15	NESW	19	111	73	Grassland	One-Mile Buffer
36	5/6/2018	STGR LEK	Active	6	NWNE	21	111	73	Grassland	Project
38	5/4/2018	GRPC LEK	Active	14	NWSE	17	111	72	Grassland	One-Mile Buffer

¹ * Denotes leks documented during 2016 surveys and re-visited in 2018

² Species – GRPC LEK = greater prairie-chicken lek; STGR Lek = sharp-tailed grouse lek.

³ # Birds – Maximum number of prairie grouse observed at a lek during surveys regardless of sex.

BAT ACOUSTIC SURVEYS

WEST conducted acoustic monitoring surveys to estimate levels of bat activity throughout the 2016 and expanded Project during summer and fall 2016 and spring, summer, and fall 2018. Studies of bat activity followed the recommendations of the US Fish and Wildlife Service (USFWS) Land-based Wind Energy Guidelines (USFWS 2012) and Kunz et al. (2007).

2016 Surveys

WEST conducted acoustic monitoring studies to estimate levels of bat activity throughout the 2016 Project from May 26 through October 21, 2016. Four AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific™, Columbia, Missouri) placed 1.5 m (4.9 ft) above the ground to minimize insect noise were used during the study. 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.). 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 10).

Detectors were programmed to turn on approximately 30 min before sunset and turn off approximately 30 min after sunrise each night. To highlight seasonal activity patterns, the study was divided into two survey periods: summer (May 26 – August 15) and fall (August 16 – October 21). Mean bat activity was also calculated for a standardized Fall Migration Period (FMP), defined here as July 30 – October 14. The FMP was defined by WEST as a standard for

comparison with activity from other wind energy facilities. During this time bats begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008, Arnett and Baerwald 2013).

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.

To assess potential for bat fatalities, bat activity in the 2016 Project was compared to existing data at other wind energy facilities in the Midwest region. Among studies measuring both activity and fatality rates, most data were collected during the fall using AnaBat detectors placed near the ground. Therefore, to make valid comparisons to the publicly available data, the activity rate recorded at fixed ground detectors during the FMP was used as a standard for comparison with activity data from other wind energy facilities. Given the relatively small number of publicly available studies and the significant ecological differences between geographically dispersed facilities, the risk assessment is qualitative, rather than quantitative.

The AnaBat units recorded 1,663 bat passes during 291 detector-nights. All units recorded a combined mean (\pm standard error) of 5.64 ± 1.61 bat passes per detector-night. For all stations, 57.7% of bat passes were classified as high-frequency (HF; e.g., eastern red bats, and little brown bats), while 42.3% of bat passes were classified as low-frequency (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. At these stations, LF and HF bat pass rates peaked during the first part September. Higher activity during the late summer and early fall may be due to the presence of migrating bats passing through the area.

Bat activity recorded at the 2016 Project by ground detectors during the standardized Fall Migration Period (July 30 – October 14; 9.08 ± 3.23 bat passes per detector-night) was similar to activity observed at publicly available and comparable studies at facilities in the Midwest, and the Project is expected to experience similar fatality rates to these other Midwestern facilities.

2018 Surveys

In 2018, acoustic surveys were conducted at six ground stations; two were located in grassland, two in cropland, and two near features that could be attractive to bats (e.g., near deciduous trees and ponds) from April 26 through October 26, 2018. Station locations were selected to provide spatial coverage throughout the expanded Project area and two of the stations deployed in 2018 were located within the current Project area (Figure 10). Detectors setup and data

collection followed methods described for 2016 surveys. Data is currently being reviewed and analyzed. A report is scheduled to be drafted by mid-January 2019.

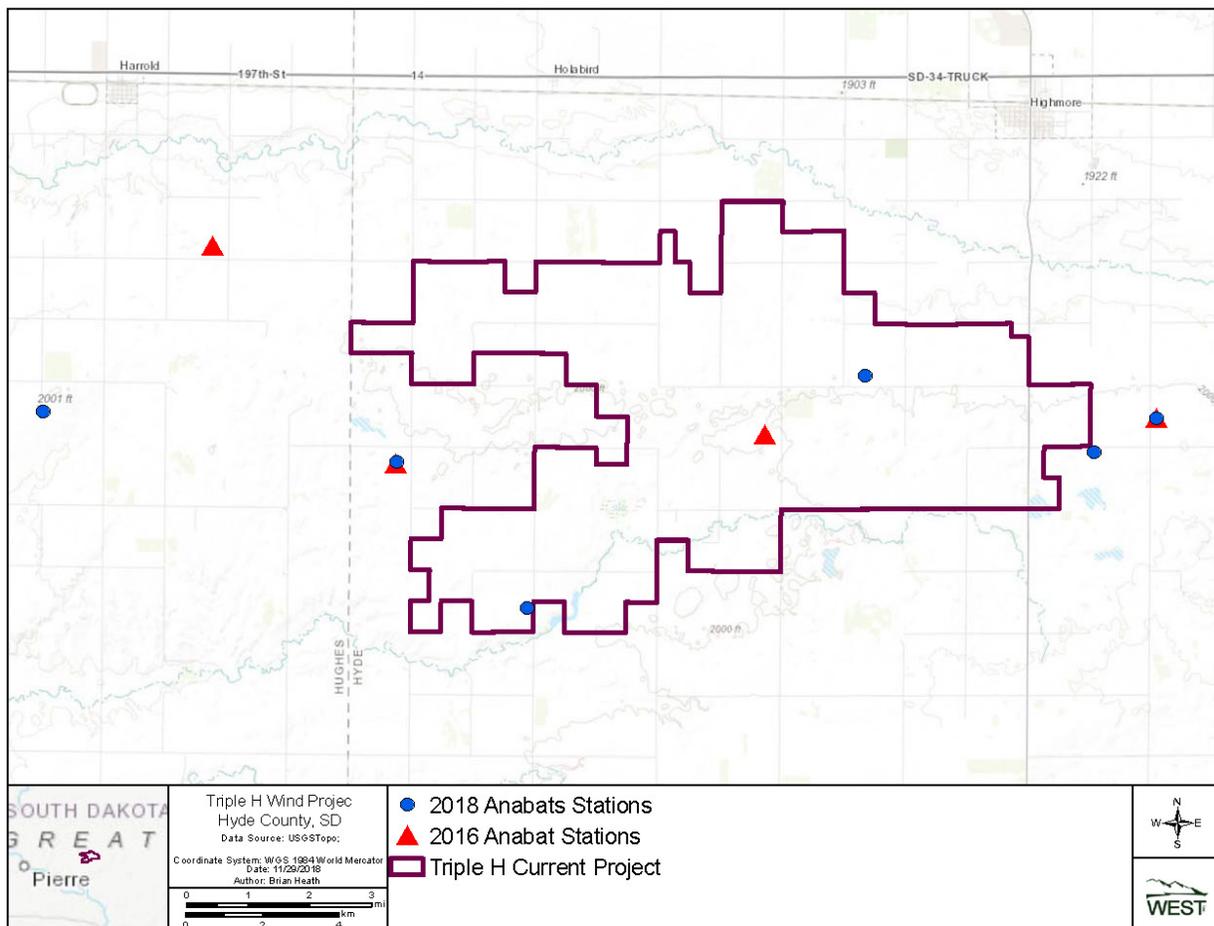


Figure 10. Location of AnaBat detectors deployed during 2016 and 2018 relative to the current Triple H Wind Project area.

WHOOPING CRANE STOPOVER HABITAT

Triple H requested WEST implement a desktop review and analysis of potential whooping crane stop-over habitat within and adjacent to the Project. The habitat review and analysis evaluated whether or not the proposed current Project area represents unique whooping crane stop-over habitat compared to the surrounding landscapes.

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 (CWCTP 2016).

Potential stop-over 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. It is based on available data on water regime, water depth, visibility obstructions, wetland size, disturbance, and proximity to feeding areas, which are 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 it should be applicable to wind power development areas for the identification of potential whooping crane stop-over habitat as well. The desktop evaluation of potential whooping crane stopover habitat using the TWI model included the Project area plus a 10 mi buffer.

Results of wetland feature scores calculated by TWI within the current Project and 10 mi buffer were compared to Quivira National Wildlife Refuge (Quivira), which is a traditional stop-over 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 were present within the current Project and 10 mi buffer area (Figure 11). When comparing the TWI model results between the current Project area and the 10 mi buffer area, the areas are similar in that features scoring 12 were most common. The largest high-scoring features in terms of acreage, and the areas with the most densely occurring high-scoring features were outside of the current Project boundary to the north, southeast, and west. The widespread availability of suitable stopover habitat indicates that if cranes are displaced from suitable habitat by development of the current Project, they are likely to find similar habitat nearby. The lack of a concentration of high-scoring features within the current Project relative to the surrounding landscape also infers whooping cranes may not be more attracted to the current Project and risky areas near wind turbine blades.

Through fall of 2016, no whooping crane observations were confirmed within the current Project and three observations were confirmed within 10 mi of the current Project (CWCTP 2016). The Cooperative Whooping Crane Tracking Project (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 since only the location of the first observation is logged in the database.

The U.S. Geological Survey (USGS) evaluated spatial intensity of use by 58 whooping cranes fitted with platform transmitting terminals (PTT; 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-square-kilometer grid cells were categorized as unoccupied, low use, core intensity, or extended-use core intensity. The resulting data are meant as a tool to identify areas that may be important for migrating whooping cranes. 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.

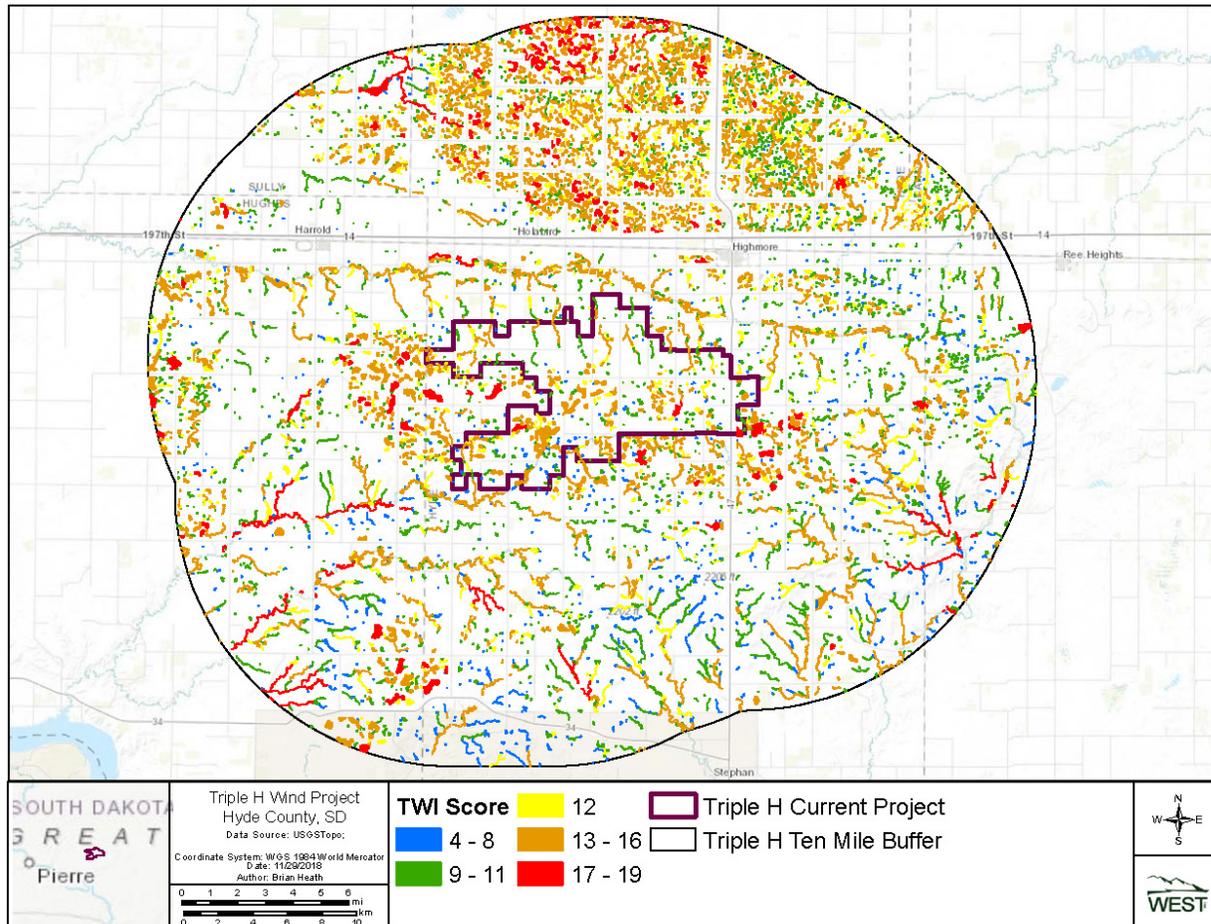


Figure 11. Map of wetlands scored using the TWI model for the current Triple H Wind Project and 10 mile buffer.

NORTHERN LONG-EARED BAT HABITAT ASSESSMENT

The northern long-eared bat (NLEB) is listed as a federally threatened species. The range of the NLEB is considered to be across all of South Dakota, including Hughes and Hyde counties. A desktop assessment of the presence of potentially suitable habitat for the NLEB was conducted within the proposed expanded Project. During the summer, suitable habitat for this species consists of forested areas where bats might roost, forage, and commute between roosting and foraging sites. NLEB primarily forage or travel in forest habitat and are typically constrained to forest features (Boyles et al. 2009). Therefore, habitat suitability was evaluated based primarily on the presence of forested areas that NLEB might use for roosting and foraging.

Desktop review of land cover data and aerial imagery was used to assess the presence of suitable habitat for NLEB within the expanded Project area which encompasses the entire current Project area. WEST's definition of suitable summer habitat for the NLEB is intended to describe typical habitat used by reproductive females and juveniles during the summer. The

USFWS 2017 *Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2017b) was used to define suitable habitat for NLEB.

WEST conducted a desktop assessment of potential suitable NLEB habitat by reviewing the USGS NLCD within a 2.5 mi (4.0 km) buffer of the expanded Project area, and delineating potential suitable habitat types (i.e., deciduous forest, evergreen forest, mixed forest, and woody wetlands) using GIS. 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 and NLEB within a Project based on availability of travel/commuting corridors within the Projects' boundary, and connectivity to foraging or roosting habitat within a 2.5 mi buffer of the Project. The minimum size for suitable foraging/roosting habitat is not well understood, but lower estimates are around 20 ac (8 ha; Broders et al. 2006). We used a minimum patch size of 15 ac (6 ha) to assign potential roosting habitat. Trees up to 1,000 ft (305 m) from the next nearest suitable roost tree, woodlot, or wooded fencerow were considered suitable habitat (USFWS 2011). The 1,000 ft distance is based on observations of NLEB behavior indicating that isolated trees might only be suitable as habitat when they are less than 1,000 ft from other forested/wooded habitats. These estimates are based on available telemetry data on foraging activity. Based on this informed guidance, it is reasonable to conclude that NLEB are unlikely to occur within project area located more than 1,000 ft from the nearest connected suitable habitat (USFWS 2017b; USFWS 2011).

Forested patches were sorted by size into the following groups: <15 ac: small forest patches, 15-50 ac (6-20 ha): potential NLEB roost/foraging habitat, and >50 ac: large potential roost/foraging habitat. All polygons representing forested habitats were buffered by 500 ft (152 m) and dissolved to group any habitat patches within 1000 ft of each other. This buffer, representing all forested habitats within 1,000 ft of each other, was then purged of small isolated patches by selecting only those connected habitats containing forested patches at least 15 ac in size. This selection of habitat patches was then buffered by 1,000 ft to represent the potential foraging area for NLEB.

The NLEB bat habitat assessment resulted in four forested patches greater than 15 ac within the expanded Project boundary (Figure 12). Two additional forested patches greater than 15 ac occurred outside of the expanded Project boundary within the 2.5 mi buffer.

Two forested patches greater than 15 ac are located within current Project boundary around the State Chapelle Water Access Area (Figure 12). Given that there were 0–6 forested patches greater than 15 ac within the 2.5 mi buffer of the expanded Project boundary, further on site evaluation may be warranted.

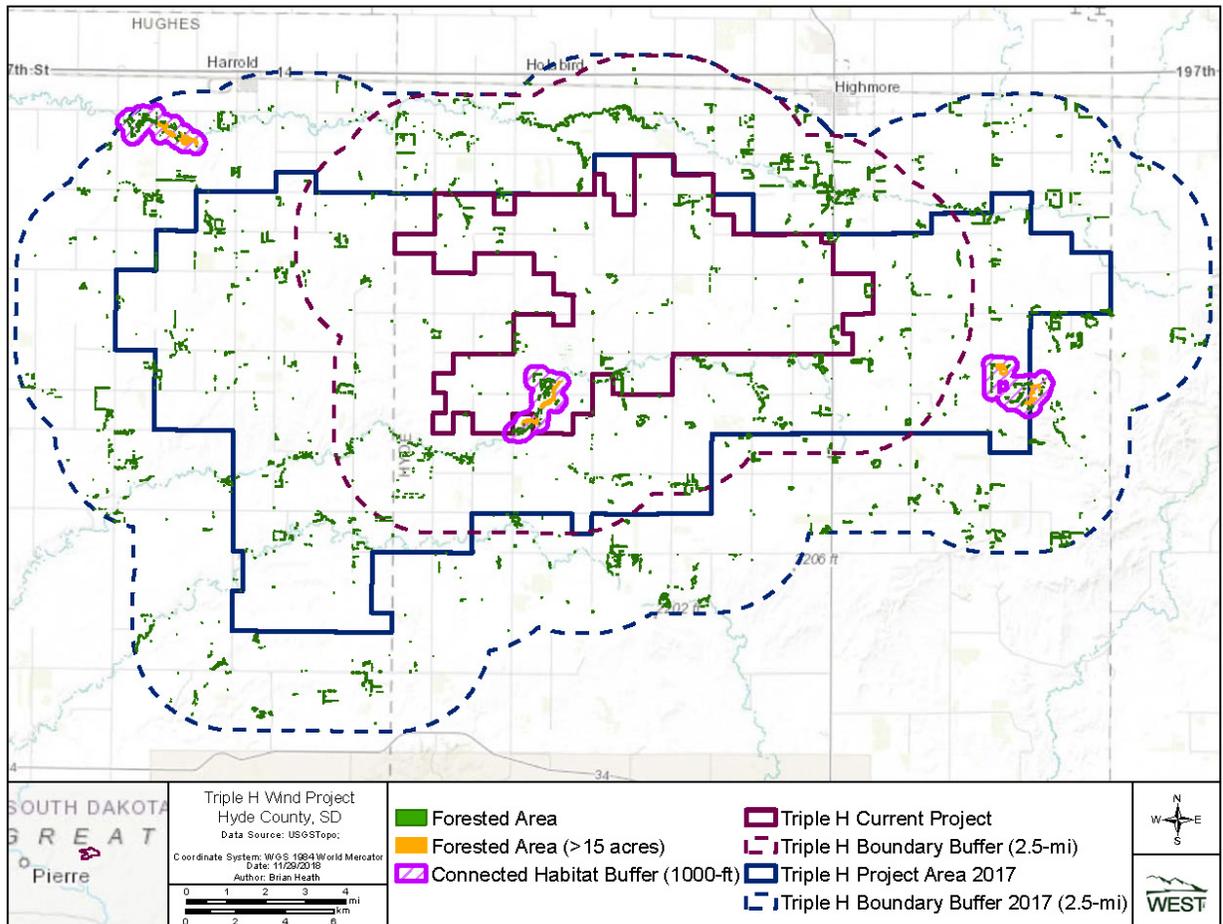


Figure 12. Northern long-eared bat habitat assessment of the expanded Triple H Wind Project relative to the current Triple H Wind Project.

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