Appendix D. Bird and Bat Conservation Strategy for the North Bend Wind Farm

Draft Bird and Bat Conservation Strategy
North Bend Wind Project
Hyde and Hughes Counties, South Dakota

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January 27, 2023

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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 have been found to result in fatalities or indirect effects, including displacement and habitat loss. To address these concerns, North Bend Wind Project, LLC (North Bend), contracted Western EcoSystems Technology, Inc. (WEST) to develop this site-specific Bird and Bat Conservation Strategy (BBCS) for the North Bend Wind Project (Project) in Hyde and Hughes counties, South Dakota. This BBCS outlines various processes North Bend 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 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 most 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 North Bend to proactively address potential impacts to birds and bats resulting from the construction and operation of the Project.

1.2 Objectives

North Bend developed this BBCS to meet the following objectives:

1) Document and describe the scope of the Project, and the biological survey work 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 to be implemented at the Project to identify impacts to birds and bats, as well as the methods for reporting the monitoring results.
4) Outline the adaptive management framework North Bend is committed to over the life of the Project, and how North Bend plans to implement adaptive management during operation of the Project.

5) Provide an educational and practical reference for North Bend's employees and contractors to facilitate the application of measures to reduce potential negative effects to avian and bat species at the Project.

2.0 SITE AND PROJECT DESCRIPTION

The Project area is in Hughes and Hyde counties, South Dakota, approximately 6 kilometers (km; 4 miles [mi]) south of Harrold, South Dakota. This area is within the intersection of the Northwestern Great Plains Level III Ecoregions (US Environmental Protection Agency [USEPA] 2013) and the Bird Conservation Region (BCR 11; Prairie Potholes [US North American Bird Conservation Initiative 2021]; Figure 2.1). The Northwestern Glaciated Plains ecoregion has broad surface irregularity and dense concentrations of wetlands. In contrast, this area along the Southern Missouri Coteau exhibits a topography of gentle, rolling hills rather than steep hummocks, with fewer areas of high wetland density, and more stream erosion (USEPA 2013) much of which has been converted to cultivated crops. The river breaks landform is also common near riparian areas and consists of uplands with broken terraces that descend to the Missouri River and its major tributaries.

The topography within the Project area consists of rolling hills, with elevations ranging from 548.5–653.8 meters (m; 1,800.0–2,145.0 feet [ft]) above mean sea level (US Geological Survey [USGS] 2021). Land ownership within the Project area is primarily private, with a few scattered State Resource Management Areas (USGS Protected Areas Database of the US 2019) one of which fall within the Project area (Figure 2.2). Named creeks in the Project area are Chapelle Creek and South Chapelle Creek (Figure 2.2; USGS 2019). Wetlands are dispersed throughout the Project area, but most are in the northeastern portion of the Project area (Figure 2.2; USFWS National Wetlands Inventory [NWI] 2021). Most wetlands are herbaceous wetlands, followed by open water (i.e., freshwater pond, and lakes; Table 2.1).

Land cover types were digitized using ArcGIS (version 10.4) within the current Project area. Using US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP [USDA 2019]) aerial imagery in combination with 2011 South Dakota Land Cover Patterns (National Land Cover Database (NLCD; 2016), USDA National Agricultural Statistics Service (NASS) National Cropland Layer (USDA NASS 2018) cropland classification, and field inspections, all lands within the current Project area were digitized and assigned one of eight cover types (Table 2.1). NWI data were used to represent water for the purpose of mapping within the current Project area. Water features visible on the aerial imagery, but not located in the NWI data tables, were digitized as "Wetland/Water" on the map (Figure 2.2).

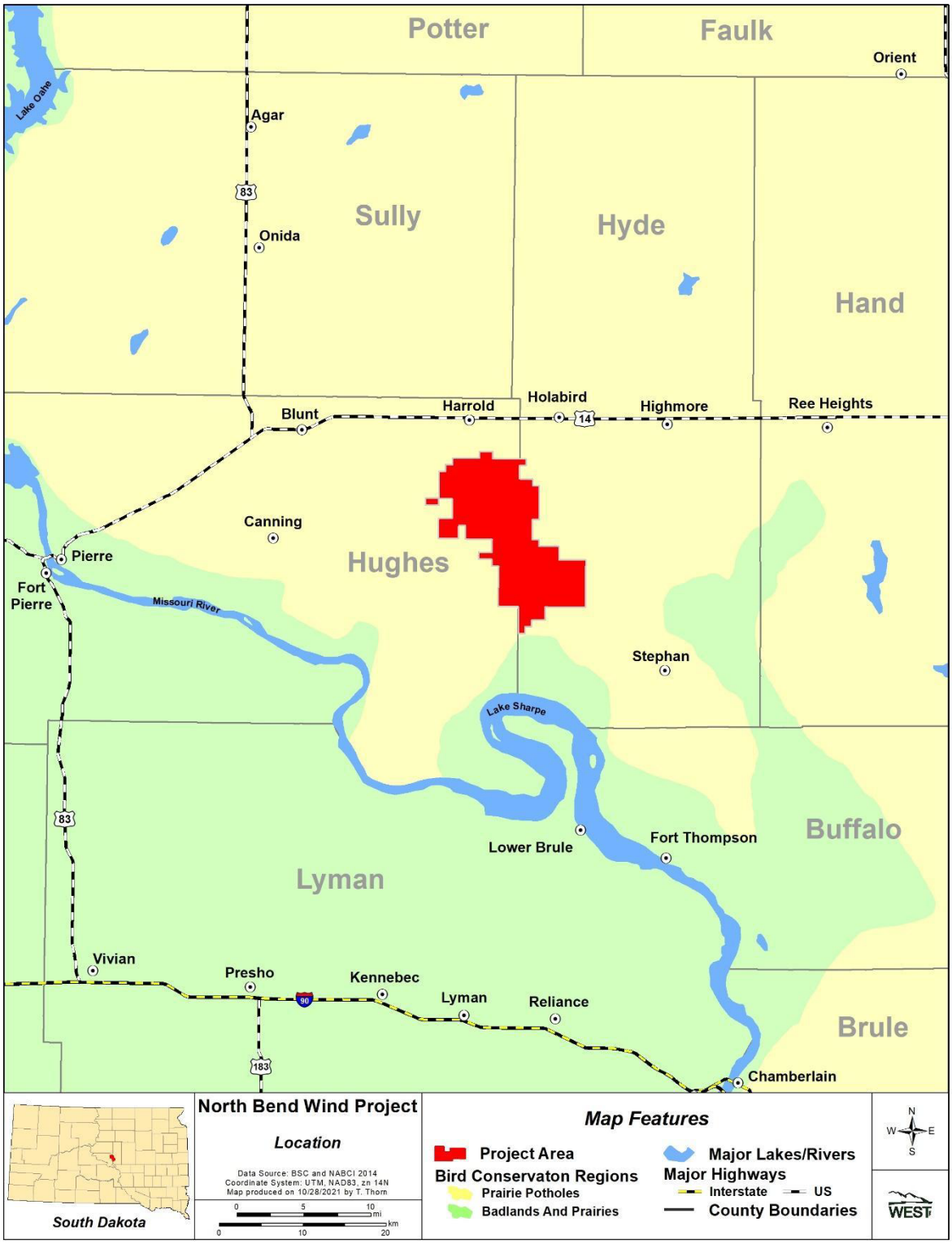

Figure 2.1. Project overview of the North Bend Wind Project in Hyde and Hughes counties, South Dakota. Shaded regions indicate Bird Conservation Regions 11 (Prairie Potholes) and 17 (Badlands and Prairies).

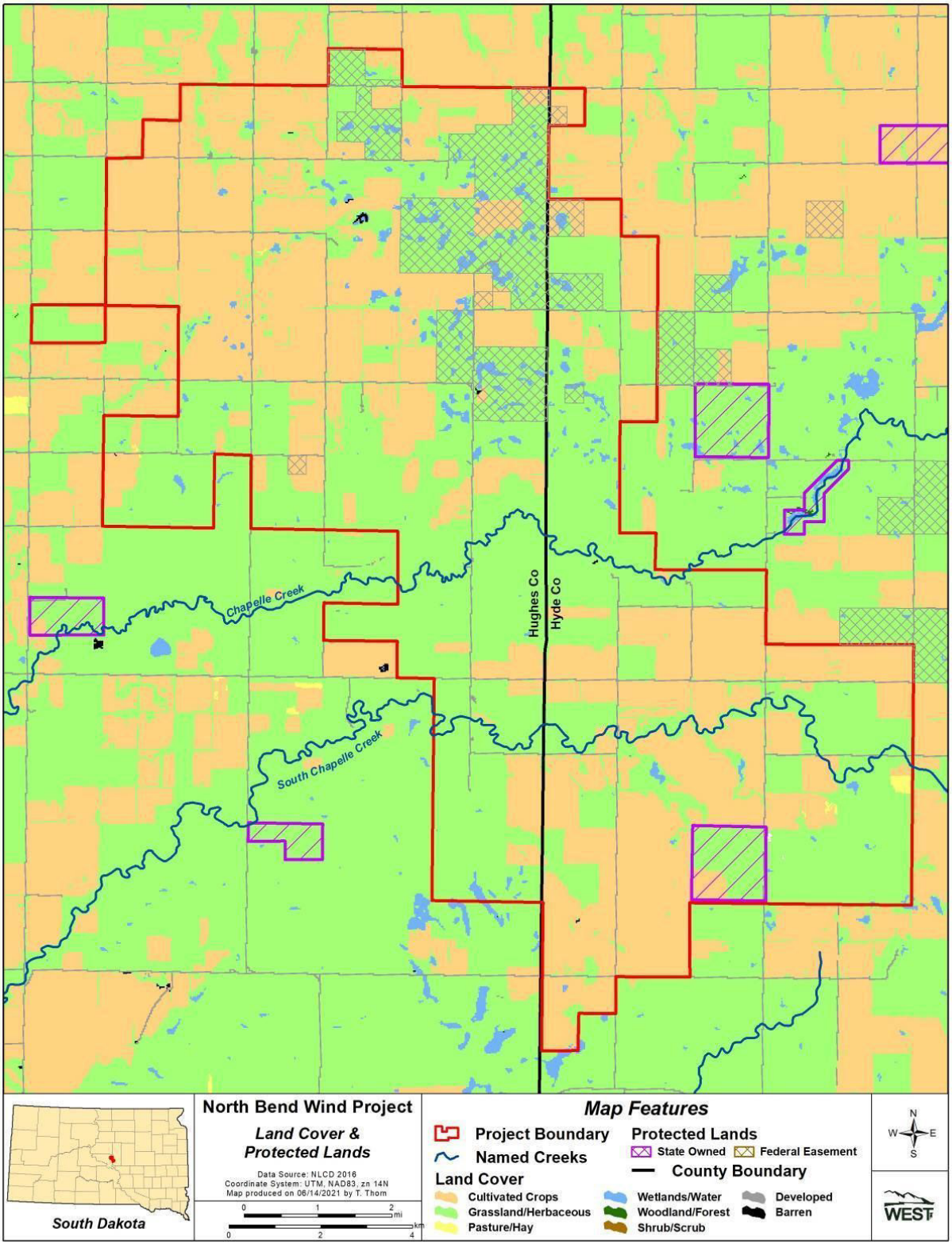

Figure 2.2. Digitized land cover within the current North Bend Wind Project in Hyde and Hughes counties, South Dakota.

Table 2.1. Land cover, coverage, and percent (%) composition within the North Bend Wind Project, Hughes and Hyde counties, South Dakota.

Land Cover	Coverage (Hectares)	% Composition
Herbaceous	9,846.3	51.9
Cultivated crops	8,334.6	43.9
Developed	389.7	2.1
Herbaceous wetlands	347.7	1.8
Open water	29.1	0.2
Hay/Pasture	22.9	0.1
Barren land	6.6	<0.1
Shrub/Scrub	1.8	<0.1
Total	**18,978.7**	**100**

Source: National Land Cover Database (2016).

The dominant land cover type within the current Project area is herbaceous, representing 51.9% of the land cover (9,846.3 ha [24,330.7 ac]) followed by cultivated crops (43.9%; 8,334.6 ha [20,595.2 ac]; Table 2.1, Figure 2.2). Additional land cover types included developed (2.1%; 389.7 ha [963.0 ac]), followed by herbaceous wetlands (1.8%; 347.7 ha [859.1 ac]). All remaining land cover types in the Project area were less than 0.5% collectively (Table 2.1).

3.0 REGULATORY REQUIREMENTS RELEVANT TO THIS BIRD AND BAT CONSERVATION STRATEGY

3.1 Federal Endangered Species Act

Species at risk of extinction are protected under the federal ESA, as amended (16 US Code [USC] 1531 *et seq*. [1973]). 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 Section 3(19), 16 USC 1532(19) [1973]). Harm is defined as 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 some 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 USC 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 October 4, 2021, the Department of the Interior's (USDOI) USFWS published the final rule (86 Federal Register [FR] 54642) in the FR to revoke the January 7, 2021 (86 FR 1134), Solicitor's Office Opinion M-37050 (M-Opinion), which codified the Solicitor's Office memorandum opinion release in December 22, 2017 (see USDOI 2017). The M-Opinion determined that the legal scope of the MBTA applies only to intentional take of migratory birds and concluded that the incidental take of birds resulting from an otherwise lawful activity is not prohibited. The recent ruling (October 4, 2021) to revoke the M-Opinion will become effective December 3, 2021. The result of this rule will return implementation of the MBTA, prohibiting incidental take and applying enforcement discretion, to previous agency practices prior to the 2017 M-Opinion. This is consistent with the Department of Energy commitments under Executive Order 13186 (2001).

3.3 Bald and Golden Eagle Protection Act

The BGEPA (16 USC 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 on December 16, 2016 (81 FR 91494). 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 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 (South Dakota Game, Fish and Parks [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 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 a 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 North Bend to make informed decisions regarding the Project, while ensuring that North Bend 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-listed 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 and included 1 mammal (northern long-eared bat [*Myotis septentrionalis*];

NLEB), 7 birds (Table 5.1), and 1 fish (pallid sturgeon [*Scaphirhynchus albus*]). Although occurrence of these species is generally unknown, these species are likely not to occur often due to limited habitat, landscape features, and no to scarce previous observations from publicly available data.

Table 5.1. Bird species listed as state or federally threatened, endangered, or protected by the Bald and Golden Eagle Protection Act with the potential to occur at the North Bend Wind Project, Hyde and Hughes counties, South Dakota.

Common Name	Scientific Name	Status
bald eagle	*Haliaeetus leucocephalus*	BGEPA
golden eagle	*Aquila chrysaetos*	BGEPA
least tern[1]	*Sterna antillarum*	DL, 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 (US Fish and Wildlife Service [USFWS] 2021d), FT = Federally threatened (USFWS 2021d), FC = Federal candidate (USFWS 2021d), DL = Delisted (USFWS 2021c, 2021d), SE = State endangered (South Dakota Game, Fish and Parks [SDGFP] 2016), ST = State threatened (SDGFP 2016).

[1] Delisted as of February 12, 2021 (USFWS 2021c, 2021d).

Additionally, a Habitat Characterization Study (HCS) was conducted by WEST in 2016, which focused on land cover within the Project area (Appendix B). The HCS quantified habitat types into five general habitat categories in the Project area, which included areas in Hughes and Hyde counties, South Dakota. The review comprised 2014 USDA NAIP aerial imagery in combination with 2011 South Dakota Land Cover Patterns (NLCD 2011), 2015 USDA National Agricultural Statistics Service 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 database, 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 species protected under the state's endangered species law, federal ESA and BGEPA potentially occurring in Hyde and Hughes counties. In addition, USFWS Birds of Conservation Concern (BCC; USFWS 2021a) with the potential to occur in Hyde and Hughes county are listed in Table 5.2. A list of bat species with the potential to occur in Hyde and Hughes counties, including the federally threatened NLEB, (SDGFP 2016, USFWS 2021d), is presented in Table 5.3.

Table 5.2. US Fish and Wildlife Service Birds of Conservation Concern potentially occurring at the North Bend Wind Project, Hyde and Hughes counties, South Dakota.

Common Name	Scientific Name
American golden-plover	*Pluvialis dominica*
black tern[1]	*Chlidonias niger*
black-billed cuckoo	*Coccyzus erythropthalmus*
bobolink[1]	*Dolichonyx oryzivorus*
chestnut-collared longspur[1]	*Calcarius ornatus*
Franklin's gull[1]	*Leucophaeus pipixcan*
golden eagle[1]	*Aquila chrysaetos*

Table 5.2. US Fish and Wildlife Service Birds of Conservation Concern potentially occurring at the North Bend Wind Project, Hyde and Hughes counties, South Dakota.

Common Name	Scientific Name
grasshopper sparrow[1]	*Ammodramus savannarum*
greater prairie-chicken[1]	*Tympanuchus cupido*
Hudsonian godwit	*Limosa haemastica*
lesser yellowlegs	*Tringa flavipes*
marbled godwit[1]	*Limosa fedoa*
northern harrier[1]	*Circus hudsonius*
red-headed woodpecker[1]	*Melanerpes erythrocephalus*
semipalmated sandpiper	*Calidris pusilla*
willet[1]	*Tringa semipalmata*

[1] Observed during site-specific avian studies

Table 5.3. Bat species potentially occurring at the North Bend Wind Project, Hyde and Hughes counties, South Dakota[1].

Common Name	Scientific Name
big brown bat	*Eptesicus fuscus*
little brown bat	*Myotis lucifugus*
long-legged bat	*Myotis volans*
northern long-eared bat	*Myotis septentrionalis*[2]
Townsend's big-eared bat	*Corynorhinus townsendii*
western small-footed bat	*Myotis ciliolabrum*
eastern red bat	*Lasiurus borealis*
hoary bat	*Lasiurus cinereus*
silver-haired bat	*Lasionycteris noctivagans*
evening bat	*Nycticeius humeralis*

Source:

[1.] Listed in the South Dakota Bat Management Plan (South Dakota Bat Working Group 2004)

[2] Federally listed species (US Fish and Wildlife Service 2021d)

5.1.2 Whooping Crane Stopover Habitat Assessment

From the most recent telemetry data available (2009 through 2018) and confirmed whooping (*Grus americana*) crane sightings managed by USFWS (to include data from spring 2021), there have been two detections of whooping crane within the Project area (Pearse et al. 2020, USFWS 2021b; Figure 5.1). The first was in 1997 of four adult birds visually identified along the northwestern portion of the Project. The second was of an individual radio-tagged bird in 2011 in the northeastern portion of the Project area.

A desktop review and analysis of potential whooping crane stopover habitat within and adjacent to the Project was conducted in 2018 using The Watershed Institute model (TWI 2012; Figure 5.2; Appendix C) and updated in 2021 using the Niemuth model (Niemuth et al. 2018; Appendix N). The federally endangered whooping crane migrates through South Dakota to breeding grounds in Canada and wintering grounds in Texas along the Gulf of Mexico (Canadian Wildlife Service [CWS] and USFWS 2007). The entire Project area is contained within the 50th percentile of all sightings along the migration corridor (Niemuth et al. 2018, Pearse et al. 2018).

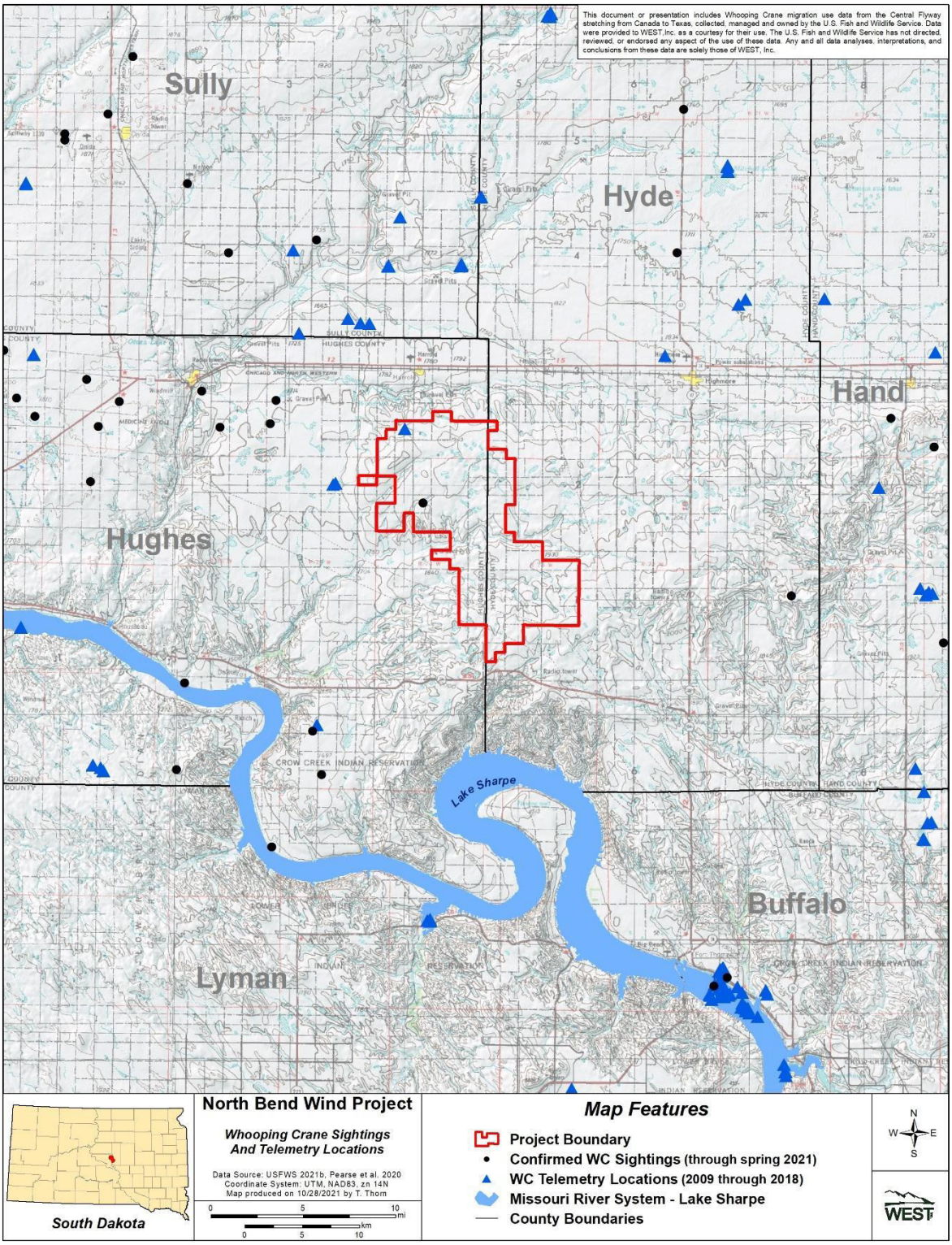

Figure 5.1. Whooping crane sighting (circles; US Fish and Wildlife Service 2021b) and telemetry locations (triangles; Pearse et al. 2020) in and within the vicinity of the North Bend Wind Project, Hyde and Hughes counties, South Dakota.

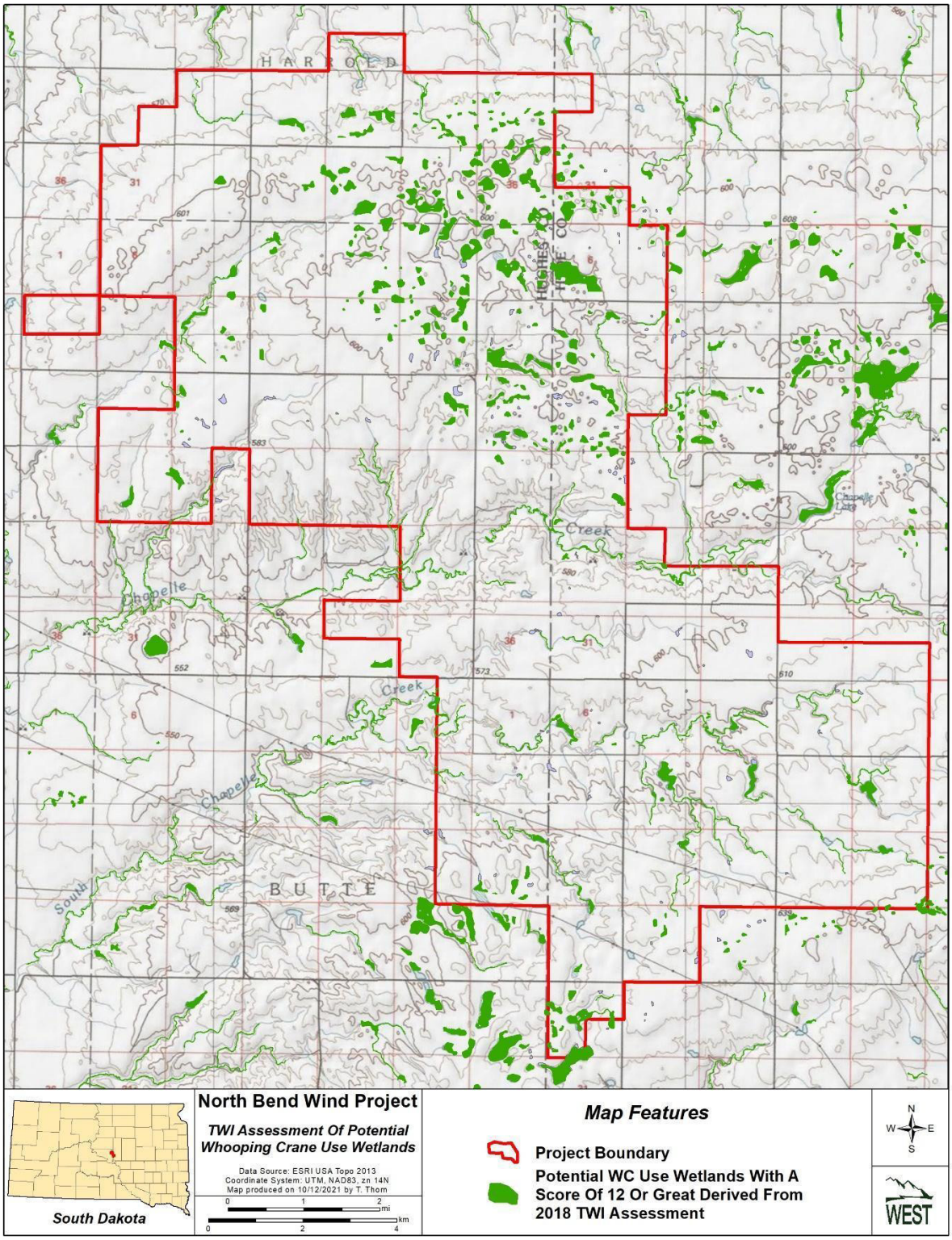

Figure 5.2. Map of wetlands scored using the The Watershed Institute (TWI) method in 2018 for the current North Bend Wind Project, Hyde and Hughes counties, South Dakota.

Potential stopover habitat for whooping cranes was initially evaluated using a model developed by The Watershed Institute (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 an area. The model is based on available data for water regime, water depth, visibility obstructions, wetland size, disturbance, and proximity to feeding areas, which are all factors 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 and immediately adjacent lands (Figure 5.2). High-scoring features (12+; considered suitable stopover habitat by TWI analysis) throughout the Project area are depicted in Figure 5.2. High-scoring features occur both within the Project area and in the immediately adjacent landscape.

Since the initial review of potentially suitable migratory stopover habitat in 2018, USFWS has recommended the use of new models and available information, including a landscape-scale approach to whooping crane use areas (Pearse Model; Pearse et al. 2015), a predicted whooping crane use model (Niemuth Model; Niemuth et al. 2018), and an evaluation of NWI wetlands within the five highest use deciles (deciles 6 – 10), as described in Niemuth et al. (2018) and recommended by Western Area Power Administration (WAPA; January 5, 2023.)

Using a grid-based approach, the Pearse Model used telemetry data from 58 whooping cranes over five years. The grid was created using 20-square-km (7-square-mi) grid cells across the extent of stopover sites used by whooping cranes. By using the telemetry data, stopover sites were assessed for each grid cell and later categories into four groups: unoccupied, low intensity, core intensity, and extended-core intensity. These categories were based on the density of stopover sites and the time whooping crane spent in that area. This model extends across the entire migration corridor and provides general trend information. Overlaying the USGS site use intensity data with the current Project indicates that the Project is located in an area with three unoccupied grid cells and one low-intensity use grid cell that spans approximately half the Project area (Figure 5.3).

The Niemuth Model was developed using 13 variables to identify whooping crane probability of use across the landscape in North and South Dakota, such as habitat attributes, survey effort, and distance from the center of the migration corridor. To aid in conservation planning, the Niemuth model then divided the probability dataset into 10 equal-area bins, or deciles, with the lowest probability use areas in the lower bins, and the higher probability use areas in the higher bins (Niemuth et al. 2018)[1]. This model was then validated by analyzing the frequency of use against the probability of use based on location data from 46 radio-tagged individuals. The performance of the Niemuth model from whooping crane sightings was adequately validated by

[1] Niemuth et al. (2018) decile data is displayed in reverse order from the published paper. As displayed in Figure 5.5, deciles 5 – 10 are the deciles with the highest probability of use by whooping cranes based on the model

the telemetry data, where the highest three deciles of probability of use (based on habitat) contained 89% of documented whooping cranes. In the Project area, the relative probability of whooping crane use ranged from 0.009 to 0.257 on a probability scale of 0–1.0 (Figure 5.4; see also Appendix N). These values fall within the highest five deciles of probability of use (Niemuth et al. 2018).

In general, potential stopover habitat within the Project area has no to low intensity use within the migration corridor, since nearly half the Project area contains unoccupied grid cells (Pearse et al. 2015; Figure 5.3) and the highest relative probability of use is only 0.257 out of 1.0 (Niemuth et al. 2018; Figure 5.4). However, much of the Project area falls within the highest use deciles (Niemuth et al. 2018; Figure 5.5). Additionally, there have been two whooping cranes documented within the Project area either by telemetry or from sightings (Figure 5.1). To satisfy the conservation requirements of the Programmatic Environmental Impact Statement and Biological Assessment for the Upper Great Plains, the Project will provide conservation funds for the 1,310.8 ac of wetlands within 0.5 mi of proposed turbine locations since they all fall within the five highest whooping crane use deciles (Niemuth et al. 2018; Figure 5.5).

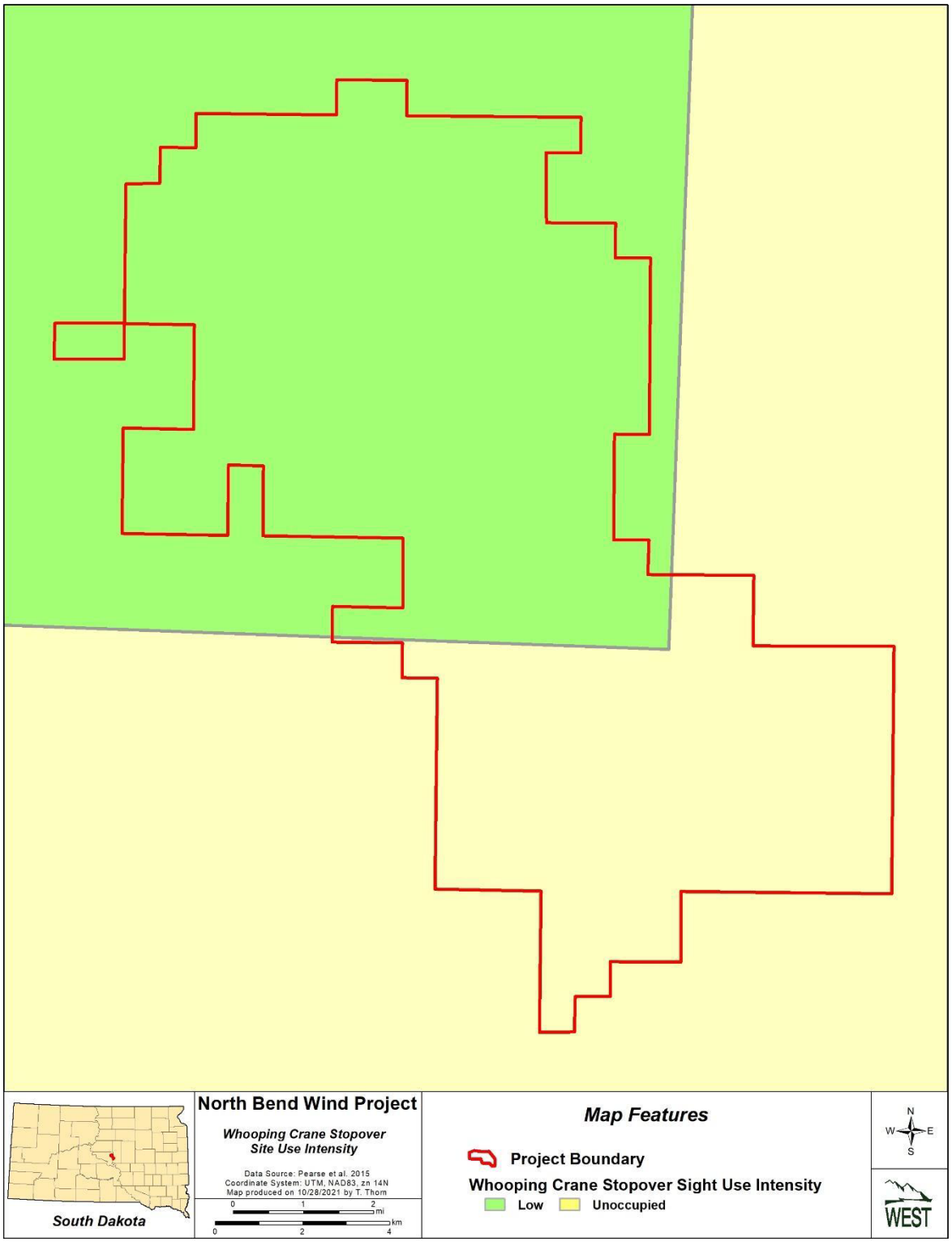

Figure 5.3. Pearse et al. (2015) whooping crane stopover sight use intensity map of the North Bend Wind Project, Hyde and Hughes counties, South Dakota.

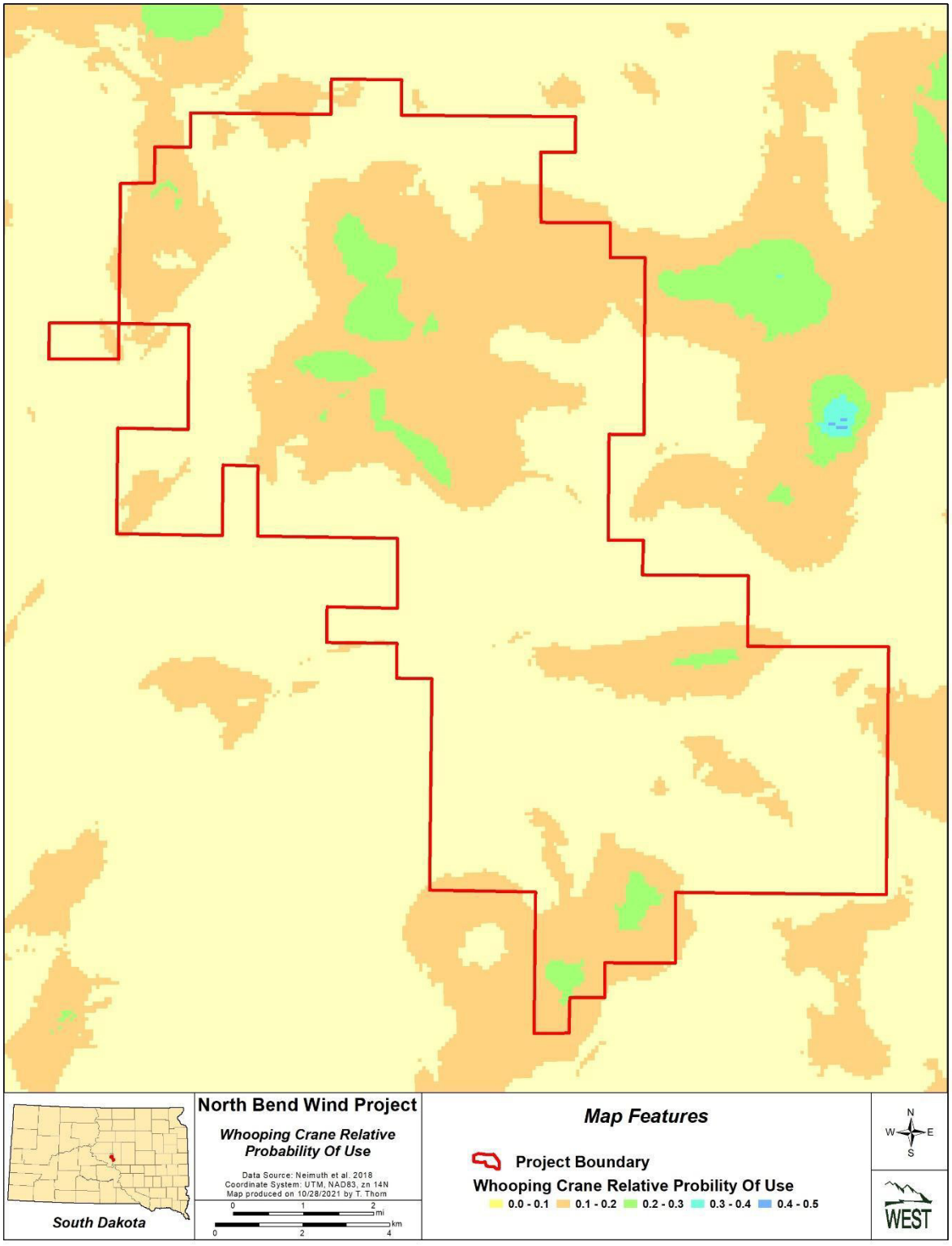

Figure 5.4. Niemuth et al. (2018) relative probability of whooping crane use map, North Bend Wind Project, Hyde and Hughes counties, South Dakota. Probability of use above 0.5 is not visible at this scale.

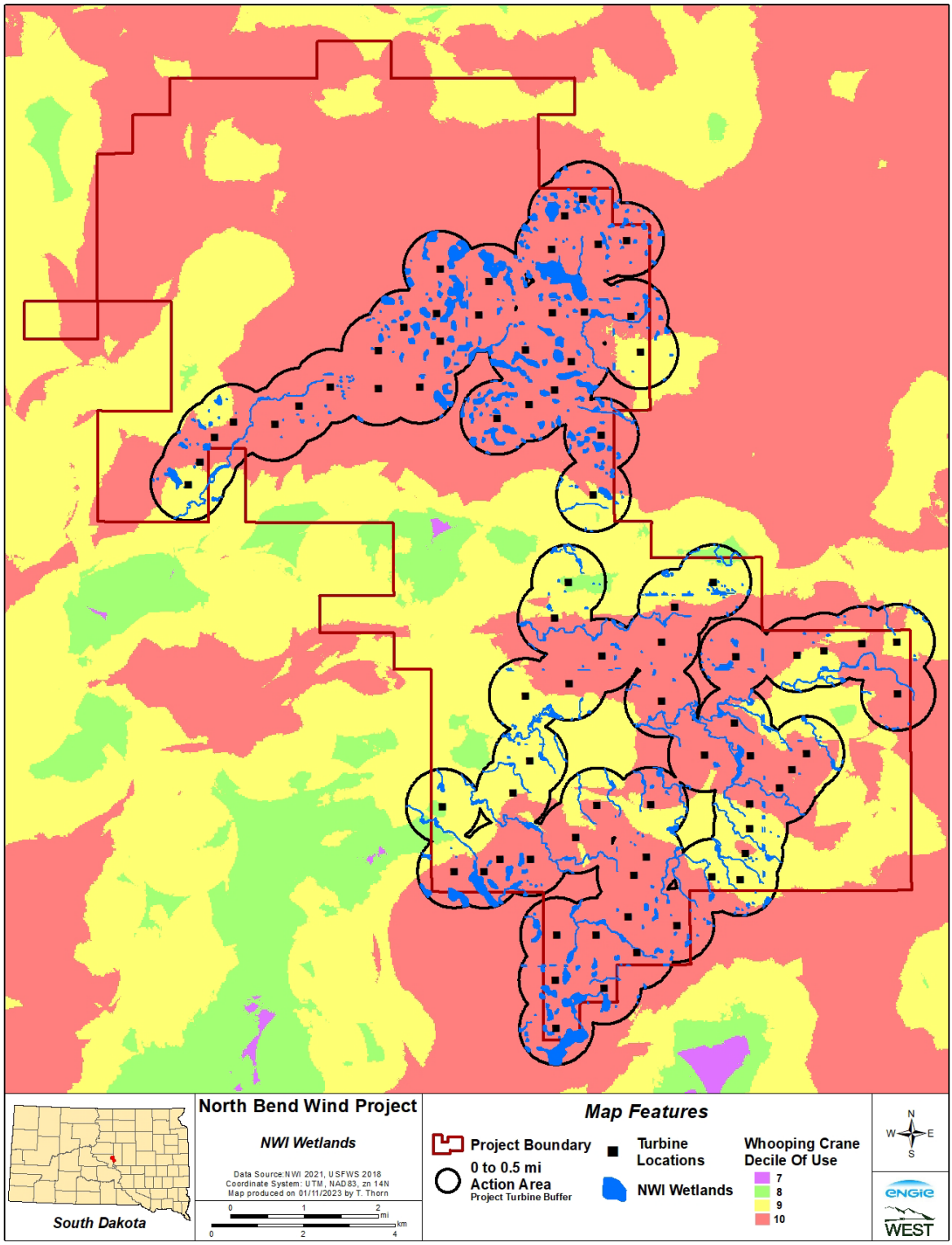

Figure 5.5. Niemuth et al. (2018) whooping crane use by deciles, North Bend Wind Project, Hyde and Hughes counties, South Dakota. National Wetland Inventory (USFWS 2021) data displayed within 0.5 miles of proposed turbine locations.

5.1.3 Northern Long-eared Bat Habitat Assessment

The NLEB is listed as a federally threatened species (USFWS 2015, 2021d), but will be reclassified on March 31, 2023 as federally endangered (https://public-inspection.federalregister.gov/2023-01656.pdf). The range of the NLEB is 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 across the Project area in 2017 (Appendix D) and updated in 2020 using the *2020 Range-wide Indiana Bat Survey Guidelines* (USFWS 2020a; Figure 5.6 ; Appendix N). Suitable habitat for NLEB 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.

WEST conducted a desktop assessment of potentially suitable NLEB habitat by reviewing the 2016 NLCD within a 4.0-km (2.5-mi) buffer of the Project area, and delineating potential suitable habitat types (e.g., deciduous forest, evergreen forest, mixed forest, and woody wetlands) using ArcGIS (version 10.4). The habitat delineations were then cross-checked and edited based on the most recent publicly available aerial imagery from the USDA NAIP (2019) for the Project area. The overall habitat layer was edited to remove areas cleared of trees and to refine habitat boundaries. Narrow commuting corridors not captured by the NLCD were also added, based on the aerial imagery.

Once the desktop assessment was completed, a habitat analysis was 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 *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 availability of travel/commuting corridors within the project's 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 8 ha (20 ac; Broders et al. 2006). A minimum patch size of 4 ha (10 ac) was assigned to potential roosting habitat. Trees up to 305 m (1,000 ft) from the next nearest suitable roost tree, woodlot, or wooded fencerow were considered suitable habitat (USFWS 2011). The 305-m distance is based on observations of NLEB behavior indicating isolated trees might only be suitable as habitat when the trees are less than 305 m from other forested/wooded habitats (USFWS 2020a). Based on this informed guidance, it is reasonable to conclude NLEB are unlikely to occur within the Project area beyond patches separated by more than 305 m from the nearest connected suitable habitat (USFWS 2011, 2020a; Figure 5.6).

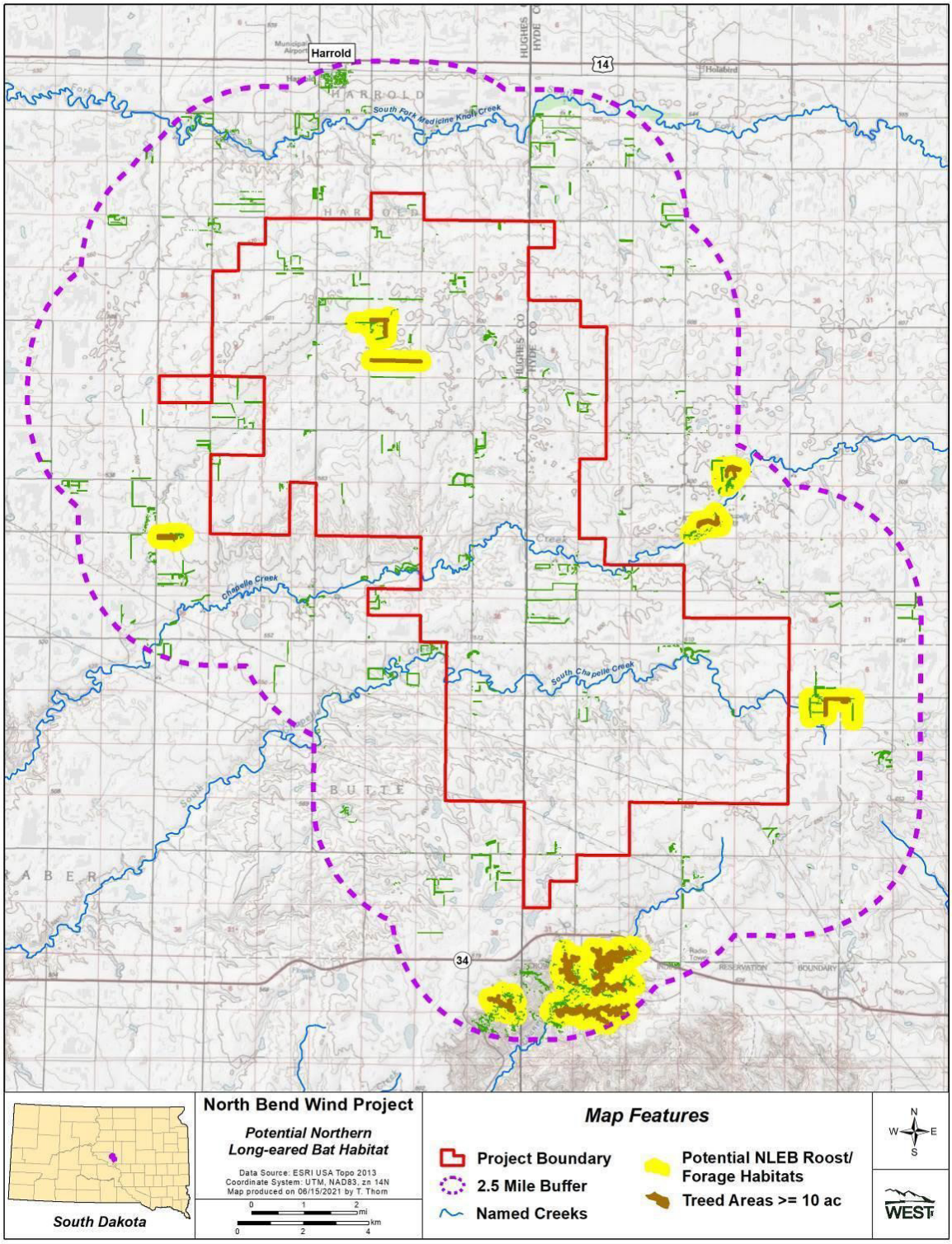

Figure 5.6. Northern long-eared bat habitat assessment of the North Bend Wind Project and 4.0-kilometer (2.5-mile) buffer, Hughes and Hyde counties, South Dakota.

Forested patches were sorted by size into the following groups: less than 4 ha (small forest patches), 4 – 20 ha (10 – 50 ac; potential NLEB roost/foraging habitat), and greater than 20 ha (large potential roost/foraging habitat). All polygons representing forested habitats were buffered by 152 m (500 ft) and dissolved to group any 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 4 ha in size. This selection of habitat patches was then buffered by 305 m to represent the potential foraging area for NLEB, resulting in eight patches covering 1,734.4 ha (4,285.7 total ac) within the Project area and 4.0-km buffer (Figure 5.6). Within the Project, potentially suitable NLEB habitat was limited to two patches that covered 277.6 ha (686.0 ac).

5.2 Tier 3 – Baseline Avian and Bat Studies

Tier 3 pre-construction studies have been ongoing within the Project area since 2016 and will continue into 2022. These studies have included eagle and avian use surveys, raptor nest surveys, prairie grouse lek surveys, and bat acoustic surveys. Details and summaries of the methods and results are provided in the sections below.

5.2.1 Eagle and Avian Use Surveys

Fixed-point avian use surveys are the most widely used methodology for pre-construction avian use characterization and turbine siting considerations (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 over the 4-year period when surveys were conducted. Project boundaries changed over time, and therefore altered avian use survey locations. Unless otherwise noted, surveys were conducted once a month for 70 minutes (min) each. Small bird species (e.g., passerines and woodpeckers) were recorded during the first 10 min of the survey period, and then only large bird species were recorded for the next 60 min. The initial 10-min surveys allowed for comparison of small bird use with the majority of wind projects in the region. The 60-min surveys encompassing large birds (e.g., waterfowl, raptors, vultures) were consistent with the ECPG and were used to obtain a stronger dataset with which to evaluate large bird use, particularly for eagles.

Survey plots were selected to survey representative habitats and topography of the Project area while meeting ECPG spatial sampling recommendations. The ECPG recommended at least 30% coverage of areas within 1.0 km (0.6 mi) of turbine locations or within the minimum convex polygon (MCP) of the complete turbine array (USFWS 2013) should be surveyed. As location of turbines were unknown at the time of sampling, survey coverage attempted to include 30% coverage of the Project area at the time. Based on the final turbine layout, survey coverage covered 28.1% of the proposed MCP. Large birds observed within an 800-m (2,625-ft) plot and small birds observations within a 100-m (328-ft) plot were used for quantitative analysis and other comparative metrics. During surveys, observation locations of raptors, other large birds, and species of concern (SOC) were recorded on field maps by unique observation numbers. Flight

paths and perch locations were digitized using ArcGIS 10.4. Additionally, for all eagle observations, data were collected following ECPG methodology (USFWS 2013).

A number of protected avian or SOC have the potential to occur within South Dakota. This includes bald and golden eagles (two federally listed species), and four additional state-listed species (SDGFP 2014). Recently, the USFWS has updated the BCC for each BCR (USFWS 2021a). There are 34 BCC species and eight Tier 2a South Dakota bird species of greatest conservation need (SGCN; SDGFP 2014) with the potential to be present within the Project area.

The Project area has shifted numerous times during development due to various logistic constraints. As such, avian use information from 2016 to 2019 (see Appendix E) is synthesized with additional survey efforts from 2019 to 2021 (Appendix N) to provide a high-level overview of the methods and results as limited sampling points overlap the most recent and constricted Project area.

5.2.1.1 Fixed-point Survey Efforts (2016 – 2017)

The following provides a summary of the avian use survey effort conducted April 18, 2016 – March 28, 2017, within the current Project area (Figure 5.7). During this effort, surveys were conducted for 60 min at each survey point location with all birds recorded for the first 20 min, and only large birds recorded for the following 40 min. While this methodology differs from later surveys, results from these previous efforts can provide general information on species composition and diversity within the current Project area. Sixty hours of surveys were completed at five point-count locations. This effort resulted in 41 unique bird species observed during surveys with horned lark (*Eremophila alpestris*; 387 observations, 9 groups), Canada goose (*Branta canadensis*; 201, 5), and Franklin's gull (*Leucophaeus pipixcan*; 95, 1), being the most commonly observed species. Northern harrier (*Circus hudsonius*; 4, 4), bald eagle (1) and merlin (*Falco columbarius*; 1) were the only raptors identified to species during surveys. No golden eagles were documented during survey efforts. No federally or state-listed species were observed during the surveys.

5.2.1.2 Fixed-point Survey Efforts (2018 – 2019)

The following provides a summary of avian use survey effort conducted January 23, 2018 – January 14, 2019, within the current Project area (Figure 5.7). There were 27 survey locations resulting in 324 fixed-point surveys completed. This effort resulted in 60 unique large bird species being observed. The most commonly recorded large bird species were snow goose (*Anser caerulescens*; 19,515 observations, 19 groups), Canada goose (6,007, 31), and greater white-fronted goose (*Anser albifrons*; 4,870, 14). Nine diurnal raptor species were documented during surveys, with northern harrier (17, 17) the most frequently recorded species. For small birds, western meadowlark (*Sturnella neglecta*; 197, 102) was the most commonly observed species, followed by red-winged blackbird (*Agelaius phoeniceus*; 91, 25), and brown-headed cowbird (*Molothrus ater*; 90, 31). Six golden eagle observations and four bald eagle observations were documented during survey efforts. No federally or state-listed species were observed while conducting surveys.

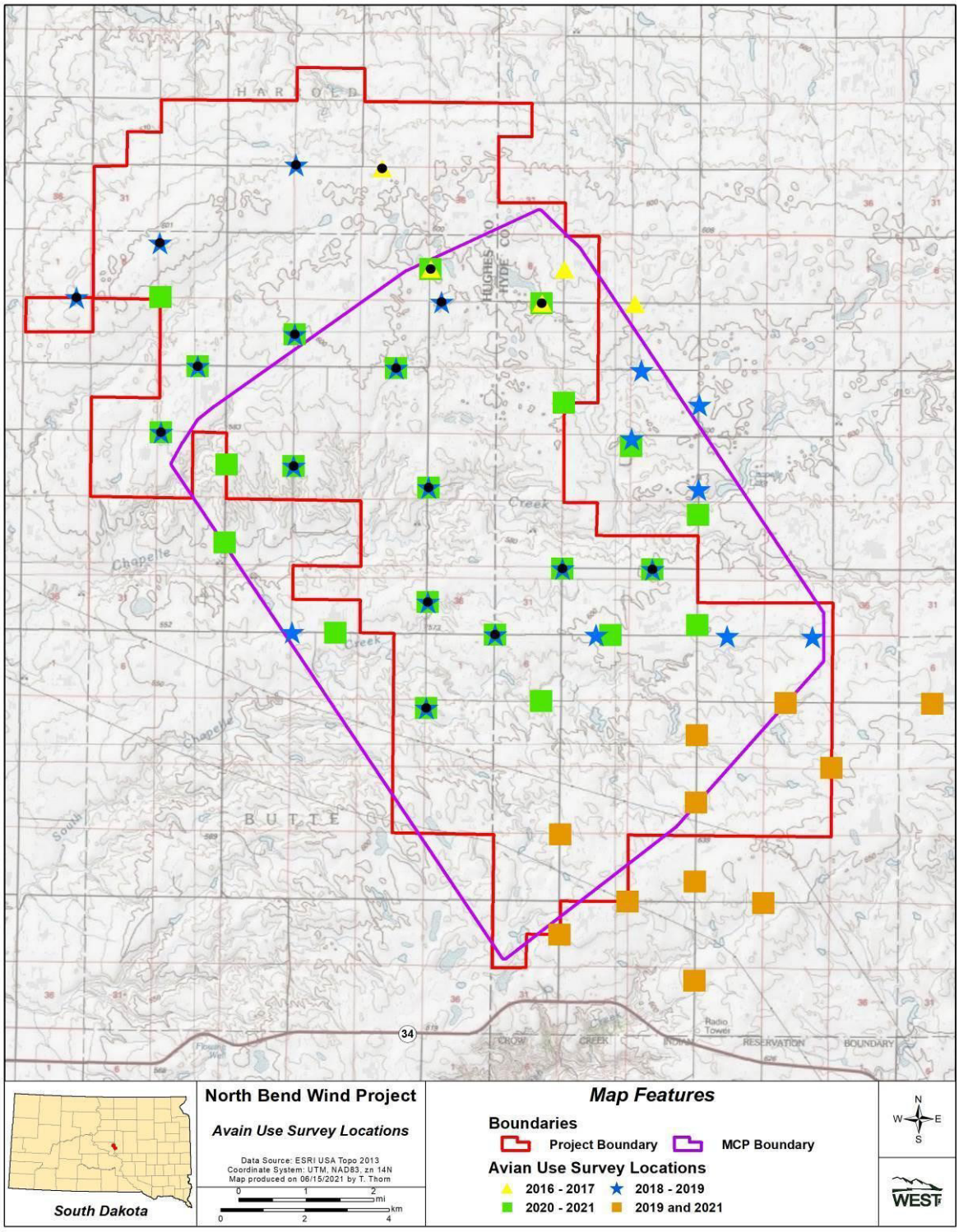

Figure 5.7. Location of fixed-point avian use survey stations completed in from 2016 – 2021 throughout the North Bend Wind Project boundary located in Hughes and Hyde counties, South Dakota. The minimum convex polygon (MCP) boundary (purple outline) encapsulates the final proposed turbine layout.

5.2.1.3 Fixed-point Survey Efforts (2019 – 2020)

Surveys were conducted from April 5, 2019 – March 31, 2020, at 19 survey points (Figure 5.7). There were 212 fixed-point surveys completed for both large and small bird. Sixty unique species were recorded during surveys, including 38 unique large birds and 22 unique small birds. The most observed large bird species were sandhill crane (*Antigone canadensis*; 2,950 observations, 15 groups), Canada goose (674, 26), and mallard (*Anas platyrhynchos*; 175, 45). The most observed raptors identified within the Project area were red-tailed hawk (*Buteo jamaicensis*; 48, 30), followed by northern harrier (16, 15). Red-winged blackbird (714, 84), brown-headed cowbird (274, 58), and western meadowlark (251, 145) were the most recorded small bird species. One bald eagle was observed during fixed-point surveys. No other eagle or federal- or state-listed species was observed while conducting surveys within the Project area during the 2019 – 2020 survey year. There were four species identified as both BCC and SGCN recorded, including marbled godwit (*Limosa fedoa*; 22 observations), black tern (*Chlidonias niger;* 16), greater prairie-chicken (*Tympanuchus cupido*; 1), and chestnut-collared longspur (*Calcarius ornatus*; 11). Five additional species identified are categorized as BCC species, including Franklin's gull (65 observations), northern harrier (27), bobolink (*Dolichonyx oryzivorus*; 73), grasshopper sparrow (*Ammodramus savannarum*; 36), and red-headed woodpecker (*Melanerpes erythrocephalus;* 2). Lark bunting (*Calamospiza melanocorys*), a SCCN, was also recorded (45 observations).

5.2.1.4 Fixed-point Survey Efforts (2020 – 2021)

Surveys were conducted from April 6, 2020 – March 13, 2021, at 23 survey points (Figure 5.7). There were 276 fixed-point surveys completed for both large and small birds. Sixty-nine unique species were recorded during surveys, including 37 unique large birds and 32 unique small birds. For large birds, the most commonly observed species recorded included Canada goose (589 observations, 27 groups), snow goose (428, 6), and sandhill crane (94, 5). Five diurnal raptor species were identified within the Project area, with northern harrier (31, 31) and red-tailed hawk (25, 25) being the most commonly observed. For small birds, red-winged blackbird (211 observations, 39 groups), western meadowlark (192, 192), horned lark (177, 38), and brown-headed cowbird (101, 22) were the most commonly observed species. No eagles or federal- or state-listed species were observed while conducting surveys within the Project area during this effort. There were three species identified as both BCC and SGCN, including marbled godwit (1 observation), black tern (5), and chestnut-collared longspur (26). Five species were BCC, including Franklin's gull (9 observations), northern harrier (31), bobolink (4), grasshopper sparrow (56), and red-headed woodpecker (4).

5.2.1.5 Fixed-point Survey Efforts (2020 – 2021)

An additional 11 points were surveyed in the southern portion of the Project area (Figure 5.7 ; orange squares) in 2019 for a brief time, but surveys at these points were later stopped due to anticipated Project development. In early 2021, it was determined there could be potential development in this area again. These 11 survey locations were again surveyed, starting February 25, 2021, and this summary includes data collected through September 2021. There were 88 fixed-point surveys completed for both large and small bird. Fifty-one unique species were recorded during surveys, including 31 unique large birds and 20 unique small birds. The most commonly observed large bird species were Franklin's gull (153 observations, 3 groups), Canada

goose (137, 7), and American white pelican (*Pelecanus erythrorhynchos*; 69, 2). The most commonly observed raptors identified within the Project area were red-tailed hawk (23 observations, 23 groups), followed by northern harrier (9, 9) and Swainson's hawk (*Buteo swainsoni*; 8, 8). Western meadowlark (80, 78), red-winged blackbird (75, 12), and brown-headed cowbird (64, 26) were the most frequently recorded small bird species. No eagles or federal- or state-listed species were observed while conducting surveys within the Project area during this effort. There were two species identified as both BCC and SGCN, marbled godwit (11 observations) and chestnut-collared longspur (24). Four additional species are categorized as BCC species, including Franklin's gull (153 observations), northern harrier (9), bobolink (4), and grasshopper sparrow (25).

5.2.1.6 Fixed-point Survey Efforts Summarized

Since the beginning of development (i.e., 2016), there were 47 unique fixed-point survey locations for eagles and other avian species within the Project area, resulting in approximately 960 hours of survey effort. A total of six bald and four golden eagle observations have been detected during this effort. No eagle has been detected within the Project area since 2019. Table 5.4 summaries the number of sensitive species (i.e., protected by BGEPA, BCC, and SGCN) observations reported since the 2016–2021 survey efforts (see Section 5.2.1.3).

Table 5.4. Summary of protected and sensitive species observed at the North Bend Wind Project during avian use surveys from April 18, 2016, through September 30, 2021.

Species	Scientific Name	Status[1]	Observations
bald eagle[2]	*Haliaeetus leucocephalus*	SGCN; BGEPA	6
golden eagle[2]	*Aquila chrysaetos*	BCC, SGCN, BGEPA	4
marbled godwit	*Limosa fedoa*	BCC, SGCN	34
black tern	*Chlidonias niger*	BCC, SGCN	21
greater prairie-chicken	*Tympanuchus cupido*	BCC, SGCN	6
chestnut-collared longspur	*Calcarius ornatus*	BCC, SGCN	61
Franklin's gull	*Leucophaeus pipixcan*	BCC	227
northern harrier	*Circus hudsonius*	BCC	67
bobolink	*Dolichonyx oryzivorus*	BCC	81
grasshopper sparrow	*Ammodramus savannarum*	BCC	117
red-headed woodpecker	*Melanerpes erythrocephalus*	BCC	6
lark bunting	*Calamospiza melanocorys*	SGCN	45

[1] SGCN = Species of Greatest Conservation Need (SDGFP 2016); BGEPA = USFWS Bald and Golden Eagle Protection Act (1940) BCC = USFWS Birds of Conservation Concern in Prairie Potholes Bird Conservation Region (BCR 11; USFWS 2021a).

[2] Combined efforts from April 2016 through October 2021.

5.2.2 Raptor Nest Surveys

Raptor nest surveys were conducted in the spring of 2016 (Appendix G), 2018 (Appendix H), 2019, and 2020 (Appendix N). The objectives of the nest surveys were to gather information on eagle nest locations and information on other raptor species nesting in the area, all of which may be subject to disturbance or displacement effects from wind facility construction and operation. Surveys were conducted within the Project area and a 1.0-mi (1.6-km) buffer for all raptors. Due to various guidance from USFWS over the past several years, additional eagle nest survey efforts

have included various buffers from 10.0 mi (16.1 km; USFWS 2013), 4.0 mi (6.4 km; USFWS 2020b) and 2.0 mi (3.2 km; USFWS 2020c). For the purposes of this section, the current 2.0-mi buffer was used to summarize the results of these efforts. 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) so 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 Unoccupied – 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.

5.2.2.1 2016 Surveys

Aerial surveys were conducted from March 28 – April 1, 2016, to search for eagle and raptor nests. During the 2016 aerial survey, three raptor nests were documented within the Project area (Table 5.5, Figure 5.8). Two nests were occupied by red-tailed hawks, while one nest was inactive. No eagle or potential eagle nests were located within the Project area and 2.0-mi buffer.

Table 5.5. Location of raptor nest sites observed during 2016 surveys located in the current North Bend Wind Project and surrounding 2.0-mile (3.2-kilometer) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species[1]	2016 Status
1	442383	4922347	RTHA	Occupied
2	444594	4919242	UNRA	Unoccupied
16	444423	4925361	RTHA	Occupied

[1] RTHA = red-tailed hawk, UNRA = unknown raptor.

ID = Identification.

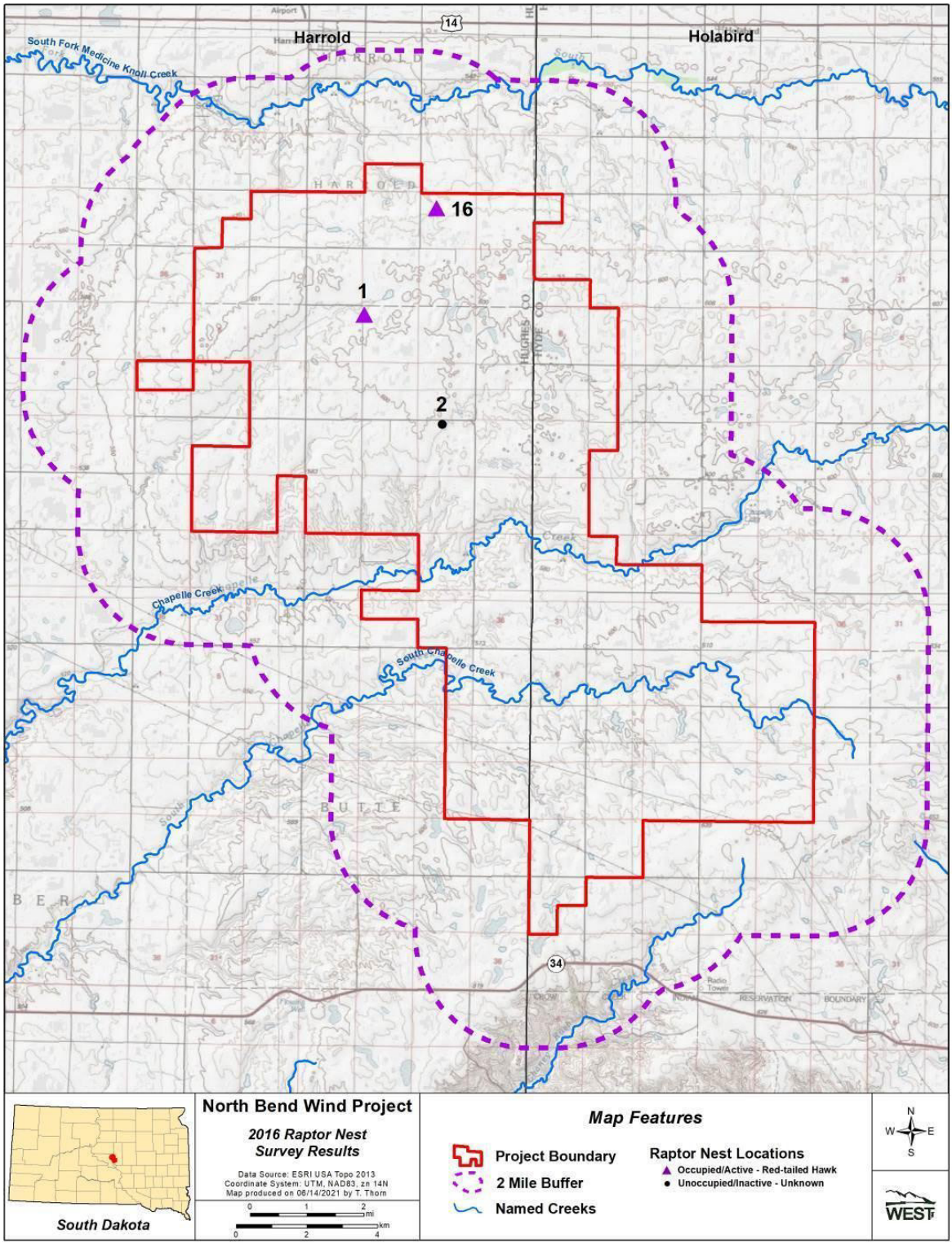

Figure 5.8. Location of raptor nests identified during surveys in 2016 for the North Bend Wind Project and 2.0 miles (3.2-kilometer) buffer in Hughes and Hyde counties, South Dakota.

5.2.2.2 2018 Surveys

An aerial survey for raptor nests was completed for the Project from March 9 – 14, 2018, with follow-up ground surveys conducted in conjunction with other work in May 2018. During these surveys, 15 raptor nests were identified (Figure 5.9). All three of the previously documented nests from 2016 were re-visited; one was confirmed occupied with a great-horned owl (*Bubo virginianus*) nest and two could not be relocated. No potential eagle nests were identified within the Project area or 2.0-mi buffer. Nine of the 15 nests were classified as unoccupied nests of unknown raptor species. The remaining occupied nests included four great-horned owl nests, one Swainson's hawk nest, and one red-tailed hawk nest (Table 5.6).

Table 5.6. Location of raptor nest sites surveyed and/or observed during 2018 surveys located in the current North Bend Wind Project and surrounding 3.2-kilometer (2.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species[1]	2018 Status
1	442383	4922347	GHOW	Occupied
2	444594	4919242	DNL	n/a
17[2]	444423	4925361	DNL	n/a
19	447561	4925661	UNRA	Unoccupied
30	448709	4915493	GHOW	Occupied
46	451315	4923410	UNRA	Unoccupied
47	450147	4927430	UNRA	Unoccupied
48	450012	4916820	UNRA	Unoccupied
53	452476	4916512	UNRA	Unoccupied
58	445523	4914147	UNRA	Unoccupied
59	435866	4923410	UNRA	Unoccupied
60	437402	4918910	UNRA	Unoccupied
61	438491	4919700	GHOW	Occupied
62	443789	4915766	UNRA	Unoccupied
63	446691	4925852	GHOW	Occupied
69	448861	4910473	RTHA	Occupied
70	443433	4906458	SWHA	Occupied

[1] DNL = did not locate, GHOW = great horned owl, UNRA = unknown raptor, RTHA = red-tailed hawk, SWHA = Swainson's hawk.

[2] Originally labeled Nest ID 16 in 2016 survey efforts.

ID = Identification; n/a = denotes nest no longer available (e.g., due to being in a new No Fly Zone or falling out of a tree due to winds).

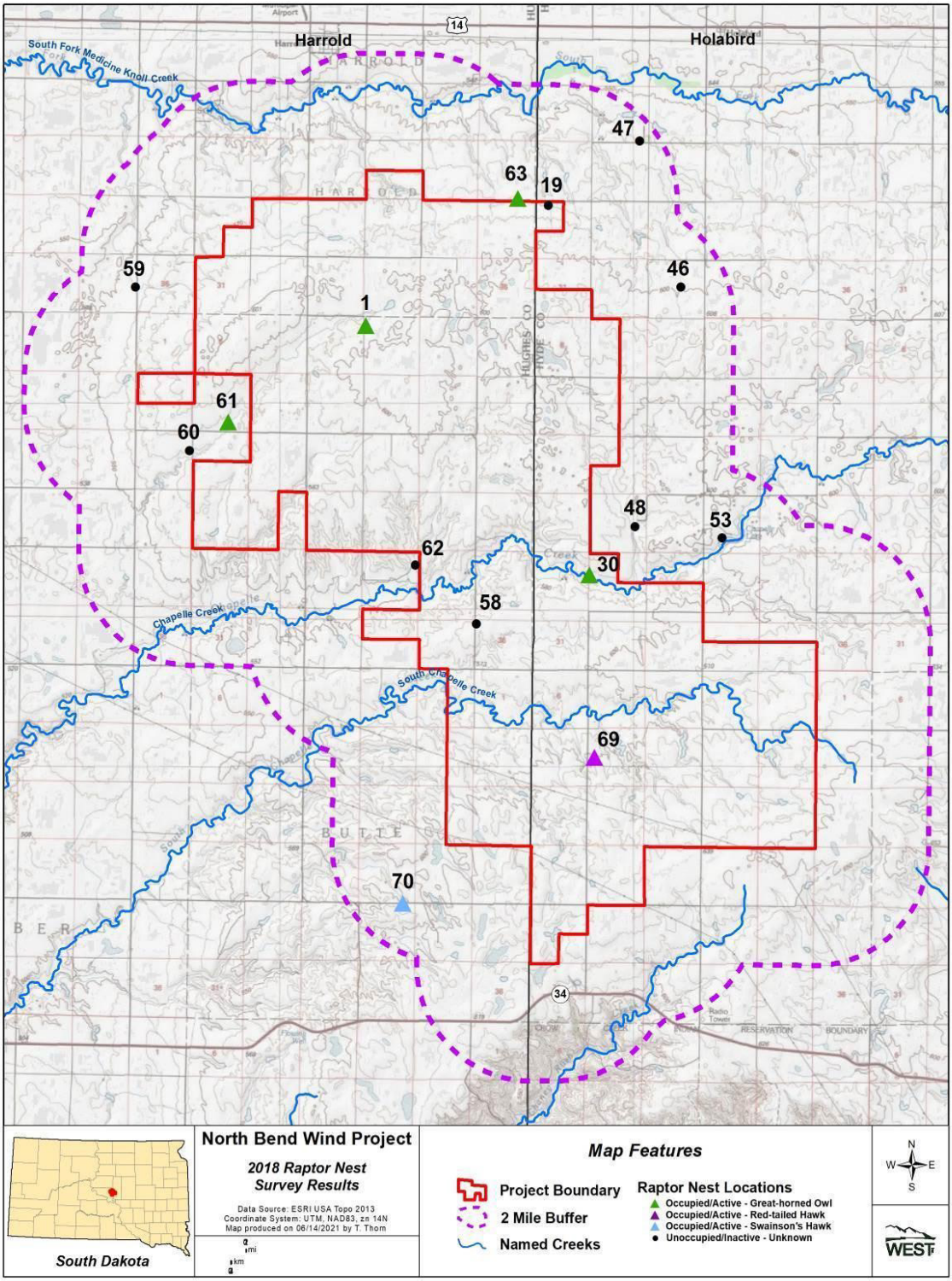

Figure 5.9. Location of raptor nests identified during surveys in 2018 for the North Bend Wind Project and 2.0-mile (3.2-kilometer buffer in Hughes and Hyde counties, South Dakota.

5.2.2.3 2019 Surveys

Two aerial nest surveys for the Project were conducted on March 26 and April 16 – 17, 2019. Eighteen nests were documented during surveys (Figure 5.9) and seven previously identified nests were either not present or were excluded from surveys due to access considerations (Figure 5.9; No Fly Areas; no permission). Eleven nests were determined to be occupied, with adults in the nest, adults perched in the same tree, or with eggs in the nest. Seven nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG (Figure 5.10 , Table 5.7). Of occupied nests, five were occupied by great horned owl, one by ferruginous hawk (*Buteo regalis*), three by red-tailed hawk, and two by unidentified raptors (eggs were present in the nest or adults were not identified; Table 5.7). No eagle or potential eagle nests were identified within the Project area or 2.0-mi buffer.

Table 5.7. Location of raptor nest sites surveyed and/or observed during 2019 surveys located in the current North Bend Wind Project and surrounding 3.2-kilometer (2.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species	2019 Status
2	444594	4919242	DNL	n/a
17	444423	4925361	DNL	n/a
19	444179	4925747	DNL	n/a
30	448709	4915493	UNRA	Occupied
46	451315	4923410	UNRA	Unoccupied
47	450147	4927430	GHOW	Occupied
48	450012	4916820	DNL	n/a
56	459961	4913766	DNL	n/a
58	445523	4914147	UNRA	Unoccupied
59	435866	4923410	DNL	n/a
60	437402	4918910	UNRA	Unoccupied
61	438491	4919700	GHOW	Occupied
62	443789	4915766	RTHA	Occupied
63	446691	4925852	DNL	n/a
70	443433	4906458	UNRA	Unoccupied
73	437079	4918884	UNRA	Unoccupied
75	447665	4925512	RTHA	Occupied
86	447117	4911890	RTHA	Occupied
87	442263	4909846	FEHA	Occupied
89	440967	4914462	GHOW	Occupied
90	439921	4917768	UNRA	Occupied
91	439620	4917741	GHOW	Occupied
92	456143	4916029	GHOW	Occupied
94	437892	4926281	UNRA	Unoccupied
95	435635	4920750	UNRA	Unoccupied

[1] DNL = did not locate, UNRA = unknown raptor, GHOW = great horned owl, RTHA = red-tailed hawk, FEHA = ferruginous hawk.

ID = Identification, n/a = denotes nest no longer available (e.g., due to being in a new No Fly Zone or falling out of a tree due to winds).

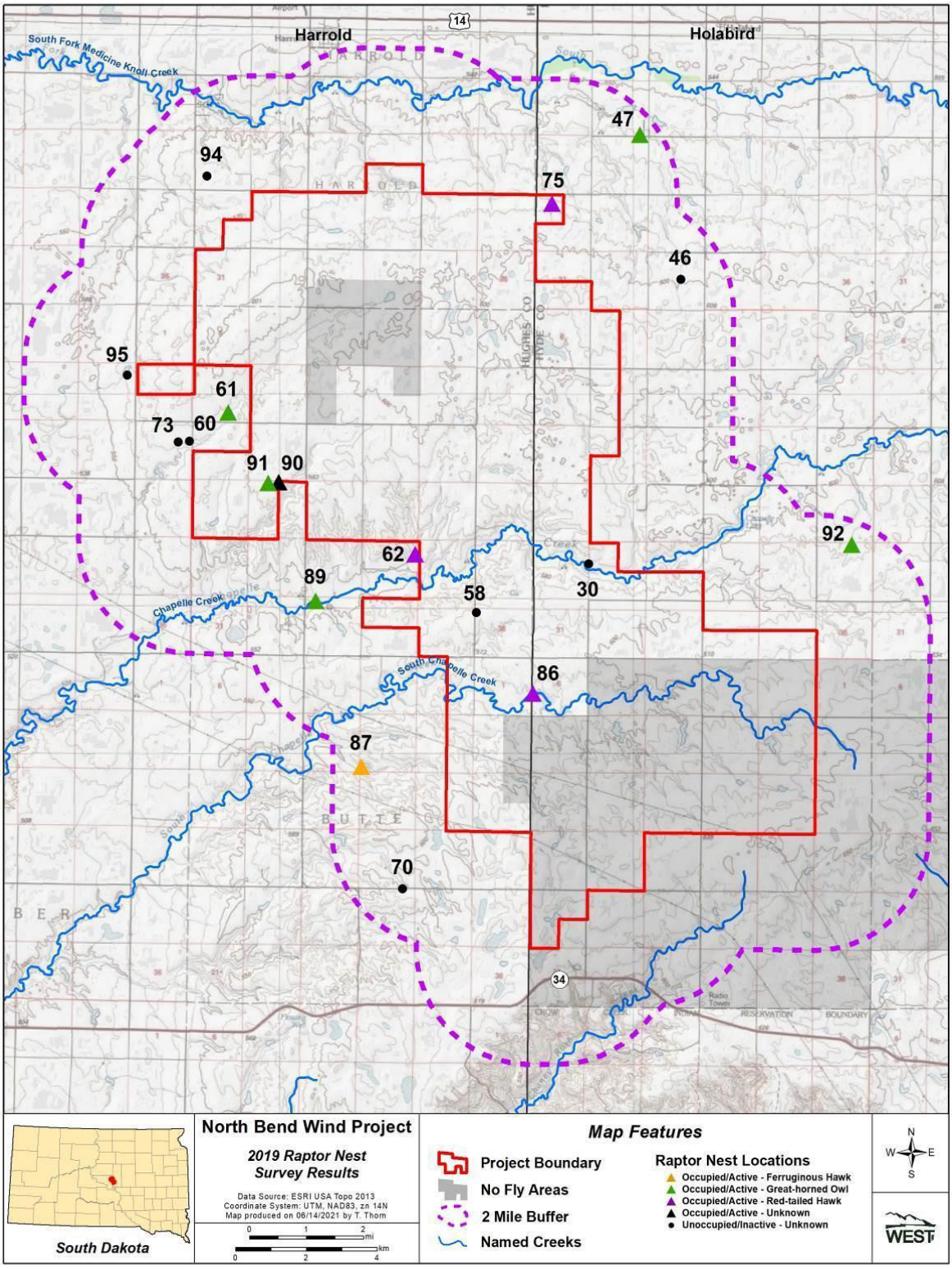

Figure 5.10. Location of raptor nests identified during surveys in 2019 for the North Bend Wind Project and 2.0-mile (3.2-kilometer) buffer in Hughes and Hyde counties, South Dakota. Shaded "No Fly Areas" include areas not surveyed in 2019.

5.2.2.4 2020 Surveys

Three nest surveys for the Project area were conducted on March 2 – 3, March 12 and 20, and April 20, 2020. Thirty-five nests were documented during surveys. Nineteen nests were previously identified within the Project and the associated 2.0-mi buffer, and four previously identified nests were either not present or were excluded from surveys due to access considerations (no permission). Of the 35 observed nests, seven were occupied by red-tailed hawks, five by great horned owls, and one by ferruginous hawks. One occupied nest could not be identified to species (i.e., unknown raptor). Of special interest, two nest locations were used by two different species (Table 5.8, Figure 5.11). Nest 62 and Nest 90 were first occupied by great horned owls and then by red-tailed hawks. A final nest (Nest 108) was a raptor stick nest with a Canada goose occupying the nest. The remaining nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG (Figure 5.11). No eagle or potential eagle nests were identified within the Project area or the 2.0-mi buffer. Table 5.8 presents a cumulative summary of survey results in 2016, 2018, 2019, and 2020 for occupied nests within the Project area and 2.0-mi buffer.

Table 5.8. Yearly summary of all potential raptor nests[1] surveyed and/or observed during survey efforts for the North Bend Wind Project, Hughes and Hyde counties, South Dakota[2].

Nest ID	Northing	Easting	2016 Status	2018 Status	2019 Status	2020 Status
1	442383	4922347	RTHA	GHOW	n/a[3]	n/a
2	444594	4919242	UNRA	DNL	DNL	n/a
16[4]	444423	4925361	RTHA	DNL	DNL	n/a
19	447561	4925661		UNRA	DNL	
30	448709	4915493		GHOW	UNRA	RTHA
46	451315	4923410		UNRA	UNRA	UNRA
47	450147	4927430		UNRA	GHOW	
48	450012	4916820		UNRA	DNL	
53	452476	4916512		UNRA		RTHA
54	452741	4916572				GHOW
56	459961	4913766		UNRA	DNL	
58	445523	4914147		UNRA	UNRA	UNRA
59	435866	4923410		UNRA	DNL	n/a
60	437402	4918910		UNRA	UNRA	UNRA
61	438491	4919700		GHOW	GHOW	UNRA
62	443789	4915766		UNRA	DNL	GHOW
62	443789	4915766			RTHA	RTHA
63	446691	4925852		GHOW	DNL	
69	448861	4910473		RTHA	n/a	
70	443433	4906458		SWHA	UNRA	
73	437079	4918884			UNRA	UNRA
75	447665	4925512			RTHA	GHOW
86	447117	4911890			RTHA	RTHA
87	442263	4909846			FEHA	DNL
89	440967	4914462			GHOW	GHOW
90	439921	4917768			UNRA	GHOW
90	439921	4917768			UNRA	RTHA
91	439620	4917741			GHOW	UNRA
92	456143	4916029			GHOW	RTHA

Table 5.8. Yearly summary of all potential raptor nests[1] surveyed and/or observed during survey efforts for the North Bend Wind Project, Hughes and Hyde counties, South Dakota[2].

Nest ID	Northing	Easting	2016 Status	2018 Status	2019 Status	2020 Status
94	437892	4926281			UNRA	UNRA
95	435635	4920750			UNRA	UNRA
100	452654	4916585				UNRA
101	450680	4917677				GHOW
102	437420	4918824				UNRA
103	440497	4921656				RTHA
104	440905	4910925				UNRA
106	447119	4920622				GHOW
107	444593	4919229				UNRA
108[5]	452741	4916580				CAGO
109	443810	4915783				UNRA
110	448289	4920613				UNRA
111	447491	4926950				UNRA
113	450014	4916821				RTHA
114	441881	4911305				UNRA
115	443356	4906471				FEHA
116	454972	4914450				UNRA

[1] UNRA = unknown raptor, GHOW = great horned owl, RTHA = red-tailed hawk, SWHA = Swainson's hawk, FEHA = ferruginous hawk, CAGO = Canada goose.

[2] Occupied nest sites in a given year are denoted by species code of the individuals that nested there.

[3] n/a denotes nests no longer available (e.g., due to being in a new No Fly Zone or falling out of a tree due to winds)

[4] Nest 16 was changed to Nest 17 for 2018, 2019, and 2020.

[5] Raptor stick nest identified with a nesting Canada goose.

ID = identification

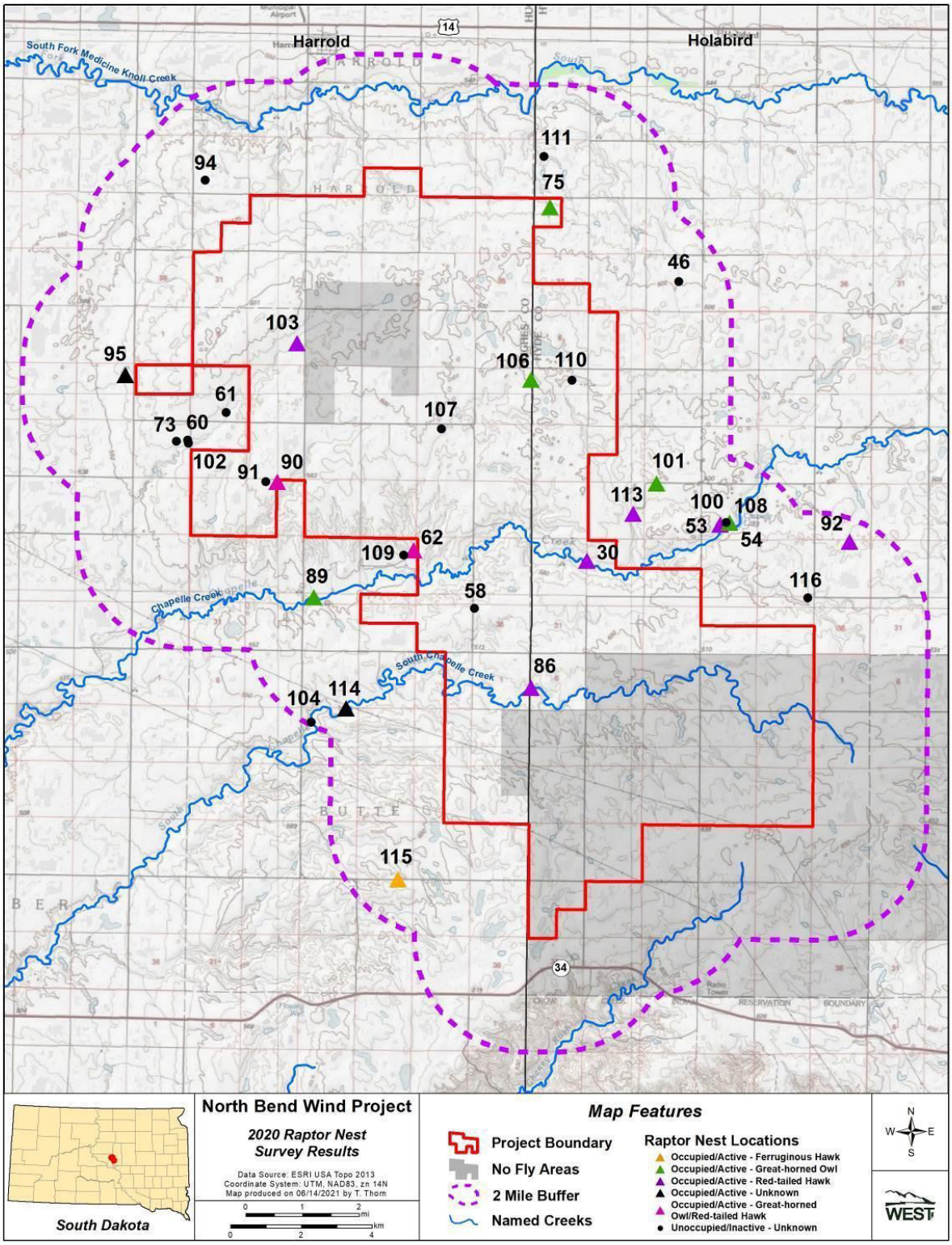

Figure 5.11. Location of raptor nests identified during surveys in 2020 for the North Bend Wind Project and 2.0-mile (3.2-kilometer) buffer in Hughes and Hyde counties, South Dakota. Shaded "No Fly Area" included areas not surveyed in 2020.

5.2.3 Prairie Grouse Lek Surveys

The Project area occurs within the occupied range of the greater prairie-chicken and sharp-tailed grouse (*Tympanuchus phasianellus*; combined as "prairie grouse"). Greater prairie-chicken is 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 breeding season within the Project area. The objective of the prairie grouse lek surveys was to identify potential leks and determine status of each lek to help inform Project development decisions. These surveys were conducted in 2016 (Appendix I), 2018 (Appendix J), 2019, and 2020 (Appendix N), and followed Project changes as described above in "Eagle and Avian Use Surveys" for the respective years (Figure 5.7).

Surveys were conducted three times each survey year from late March to the end of the first week of May (with the exception of 2019 surveys) and included the respective Project areas and a 1.0-mi buffer. Surveys began approximately 30 min prior to sunrise until 90–120 min after sunrise. To the extent possible, all surveys were conducted on relatively calm mornings (winds less than 24–32 km per hour [kph; 15–20 mi per hour (mph)]) and on days with no precipitation. Surveys were conducted to document the presence and the number of male and female birds attending leks. Because both sharp-tailed grouse and greater prairie-chicken are found within the area, the identification of species observed during the surveys was recorded, when possible. Information collected during all surveys included date, time, temperature, cloud cover, precipitation, and observer(s).

The SDGFP defines a lek as "a traditional display area where two or more male sage-grouse have attended in two or more of the previous five years" (Connelly et al. 2003). "Active leks" are locations where two or more birds were observed or heard in courtship behavior during more than one survey period. "Potential leks" are locations where birds were observed or heard engaging in courtship behavior during only one survey period, where birds were observed in more than one survey period but not in courtship behavior, or where the number of birds could not be confirmed (e.g., heard at least one bird). If no birds were seen or heard in any of the three surveys, the lek was classified as inactive for the season. Results include a cumulative summary of all survey efforts across years as it relates to the current Project area and a 1.0-mi buffer (Figure 5.12).

5.2.3.1 Aerial Surveys

Aerial surveys were conducted in 2016 and 2018 with a Cessna 172. Surveys included north/south transects across the Project area and 1.0-mi buffer spaced approximately 0.25 mi (0.40 km) apart at an altitude of approximately 100–150 ft (30-45 m) above ground level. An onboard GPS unit was used to keep the plane on transect, document lek locations, and record daily flight paths. Observers recorded the number of birds on the lek and whether the lek was 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-chicken, versus a pointed-tail shape with white under tail coverts and lighter body color for sharp-tailed grouse.

5.2.3.2 Ground Surveys

Ground visits were conducted in 2019 and 2020 by traveling publicly accessible roads (or roads where permission was previously obtained) throughout the Project area and a 1.0-mi buffer (Appendix N) During ground visits, the following information was recorded and included lek identification, location, species, type of detection (auditory or visual), number of males (if possible), and number of females (if possible). If a new lek was identified during this effort, it was documented with the same information and identified using a new unique lek identification number.

Sixteen prairie grouse leks were identified during a combination of aerial surveys and ground lek visits during the 2016, 2018, 2019, and 2020 breeding seasons within the Project area and 1.0-mi buffer (Figure 5.12). One lek location was active in 2016, 14 in 2018, six in 2019, and eight in 2020 (Table 5.9). Of these active and potential leks, all were greater prairie-chicken leks (Table 5.9).

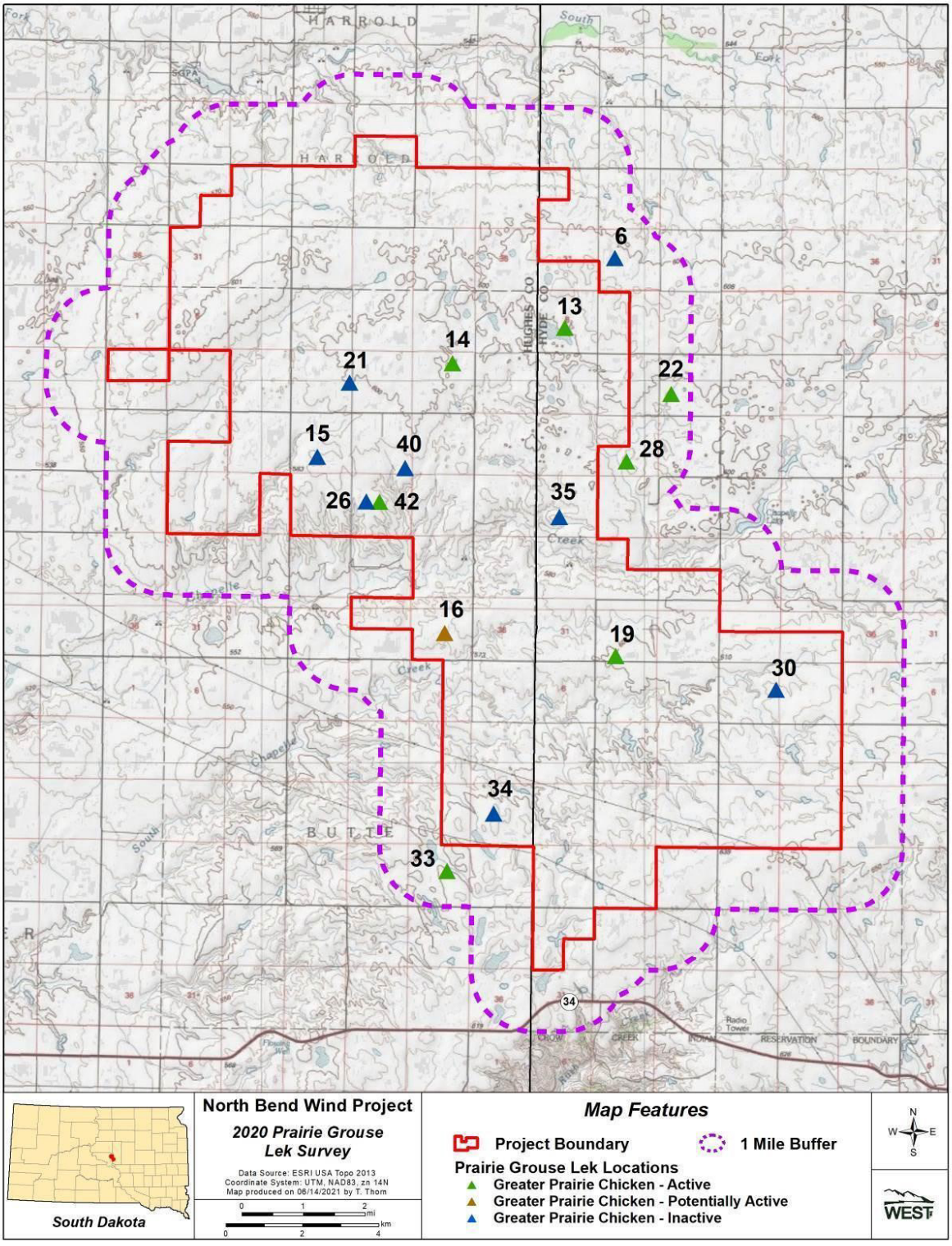

Figure 5.12. Location and 2020 status of potential prairie grouse leks identified in the 2016, 2018, 2019, and 2020 breeding seasons during surveys within the North Bend Wind Project and 1.6-kilometer (1.0-mile) buffer from, Hughes and Hyde counties, South Dakota.

Table 5.9. Location and maximum number of prairie grouse observed at potential leks during surveys for the current North Bend Wind Project and 1.6-kilometer (1.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Lek ID	Species	2016 Status	2018 Status	2019 Status	2020 Status	Grouse Numbers (2020)
6	GRPC	Active	Inactive	Inactive	Inactive	0
13	GRPC	n/a	Active	Active	Active	5
14	GRPC	n/a	Active	Active	Active-auditory only	At least 3
15	GRPC	n/a	Active	Inactive	Inactive	0
16	GRPC	n/a	Active	Active-auditory only	Potentially active	At least 1
19	GRPC	n/a	Active	Active	Active	4
21	GRPC	n/a	Active	Inactive	Inactive	0
22	GRPC	n/a	Active	Inactive	Active-auditory only	At least 2
26	GRPC	n/a	Active	Inactive	Inactive	0
28	GRPC	n/a	Active	Inactive	Active	5
30	GRPC	n/a	Active	Inactive	Inactive	0
33	GRPC	n/a	Active	Active	Active-auditory only	Unknown
34	GRPC	n/a	Active	Inactive	Inactive	0
35	GRPC	n/a	Active	Inactive	Inactive	0
40	GRPC	n/a	Active	Inactive	Inactive	0
42	GRPC	n/a	n/a	Active	Active-auditory only	At least 3

ID = identification; GRPC = greater prairie-chicken; n/a = not surveyed.

5.2.4 Bat Acoustic Surveys

WEST conducted acoustic monitoring studies to estimate levels of bat activity within the Project area from May 26 – October 21, 2016, and April 25 – October 25, 2018, at three locations, including two in cropland to be representative of proposed turbine locations,] and one bat feature; Figure 5.13; Appendices K and L). The bat feature included proximity with water features, trees, hedge rows, and other bat-associated habitats. AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific, Columbia, Missouri), placed 1.5 m (5.0 ft) above the ground to minimize insect noise, were used during the study. Studies of bat activity followed the recommendations of the WEG and Kunz et al. (2007a), detectors were programmed to turn on approximately 30 min before sunset and turn off approximately 30 min after sunrise each night. The study was divided into two primary seasons (summer and fall). WEST defined the fall migration period (FMP; July 30 – October 14) as a standard for comparison with activity from other wind energy facilities. During the FMP, 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 (WEST 2019).

For each survey location, bat passes were sorted into two groups based on the call's minimum frequency. High-frequency (HF) bats, such as eastern red bats (*Lasiurus borealis*) and *Myotis* species (such as NLEB]) 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.

Summarized results of these efforts included three general trends. First, overall bat activity varied by season, with lower activity recorded in the summer and higher activity in the fall. Second, at all stations and frequencies, bat passes peaked during the first half of September. Finally, the bat feature recorded more bat passes/detector night than in the cropland, as was expected. However, there was little variation in the overall activity between seasons between the detectors in croplands.

There was some variation between years in the composition of HF and LF activity. In 2016, there were more HF bat passes recorded, while in 2018 more LF bat passes were recorded (Table5.10). Generally, there was less activity recorded in 2018 than in 2016.

Table 5.10. Results of bat activity surveys conducted at stations within the North Bend Wind Project area, Hughes and Hyde counties, South Dakota, from May 26 – October 21, 2016, and April 25 – October 25, 2018. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).

Year	Station	Type	# of HF Bat Passes	# of LF Bat Passes	Total Bat Passes	Detector-Nights	Bat Passes/Night[1]
2016	West	cropland	49	53	102	61	1.67 ± 0.44
	East	bat feature	128	95	223	95	2.35 ± 0.37
Total			**177**	**148**	**325**	**156**	**-**
2018	West	cropland	5	12	17	151	0.11 ± 0.04
	East	bat feature	54	79	133	127	1.05 ± 0.20
Total			**59**	**91**	**150**	**278**	**-**

[1]± bootstrapped standard error.

---Total not given due to differences in how stations were selected and their objectives.

Use of bat activity to predict post-construction mortality is difficult to relate and lacks any direct relationship based on pre-construction survey efforts (Hein, et al. 2013, Solick et al. 2020). Furthermore, there is some evidence that activity increases from pre-construction to post-construction (Richardson et al, 2021). Acoustic surveys can provide some level of species composition including the presence of HF bats within the Project area and possible presence of listed species such as NLEB. Additional analysis of HF calls collected during the 2016 and 2018 surveys were completed following USFWS guidance (USFWS 2019a, 2022). All calls were initially vetted through Kaleidoscope Pro 5.4.7 using the Bats of North America classifier 5.4.0 for 2016 data and Kaleidoscope Pro 5.1.6 using the Bats of North America classifier 4.2.0. A total of 11 HF calls were flagged by the software, and manual review of those calls by a bat expert determined that none were NLEB (Appendix P).

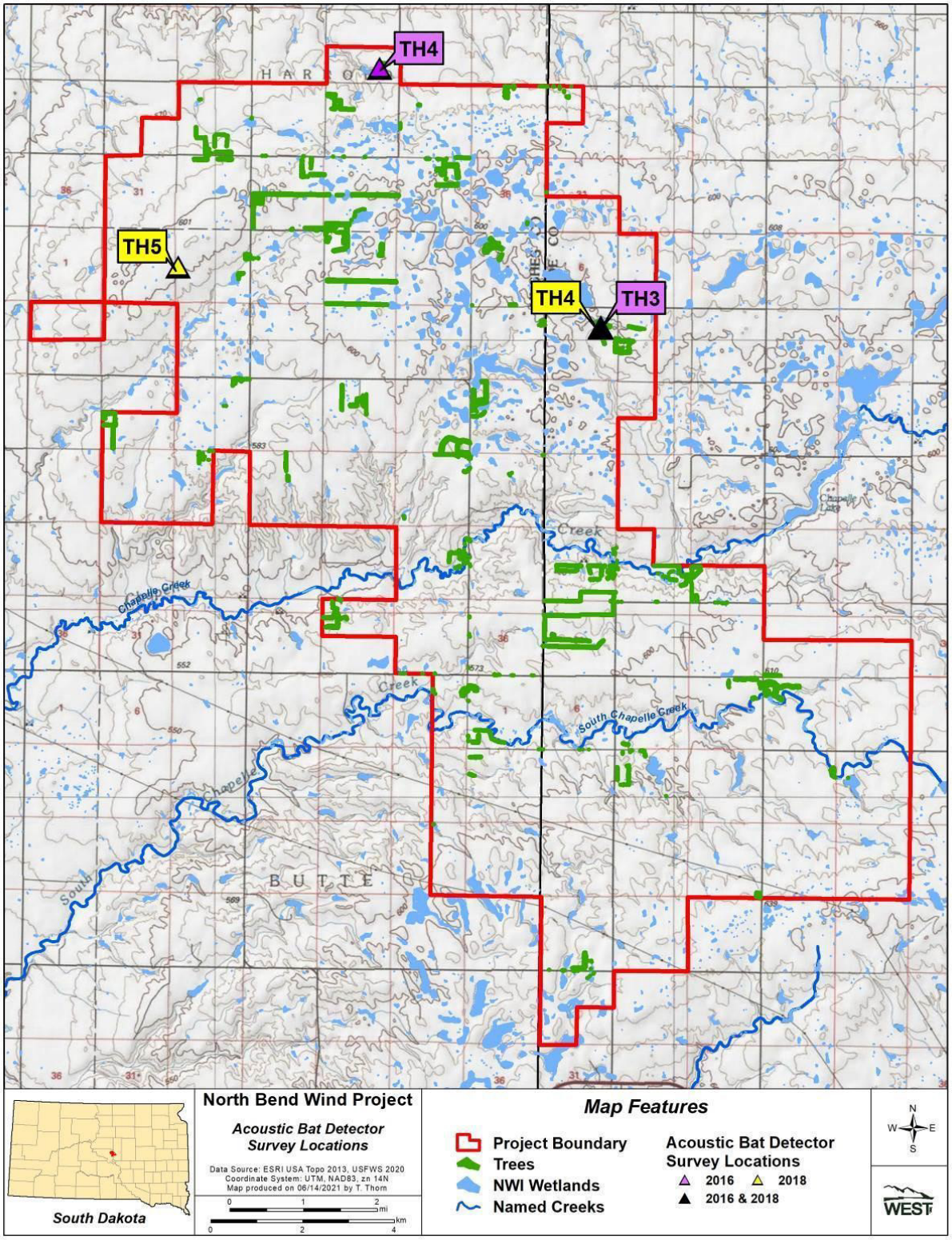

Figure 5.13. Location of AnaBat detectors deployed during 2016 and 2018 within the North Bend Wind Project boundary in Hughes and Hyde counties, South Dakota.

6.0 ASSESSMENT OF RISKS TO BIRDS AND BATS

Potential impacts to species from wind energy development includes 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., power line 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. 2001, 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	US Fish and Wildlife Service (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 Raptors

Raptors occur in most areas with the potential for wind energy development (NRC 2007) and raptor use within the Project area was assessed using fixed-point avian use surveys. The Project area and survey methodology have shifted numerous times during development (Figure 6.1) due to various logistic constraints and changes in Project area. However, observations collected from all years of field effort (2016-2017, 2018-2019, 2019-2020, 2020-2021, and ongoing 2021-2022 field effort) are included in this report to provide general information on raptor use.

No federal or state endangered non-eagle raptor species were seen within the Project during any field effort. One BCC, the northern harrier, was observed within the Project and was the most commonly observed raptor species during spring, summer, and fall for all years except for the 2019-2020 and ongoing 2021-2022 field effort.

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. From January 2016 through September 2021, 12 total eagle observations (six of bald eagles and six of golden eagles) were recorded during 900 hours of survey effort (following the ECPG) within 800 m from observation point and below 200 m above ground level. 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. There are no known eagle nests within two mi of the Project.

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 per megawatt (MW) per 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.

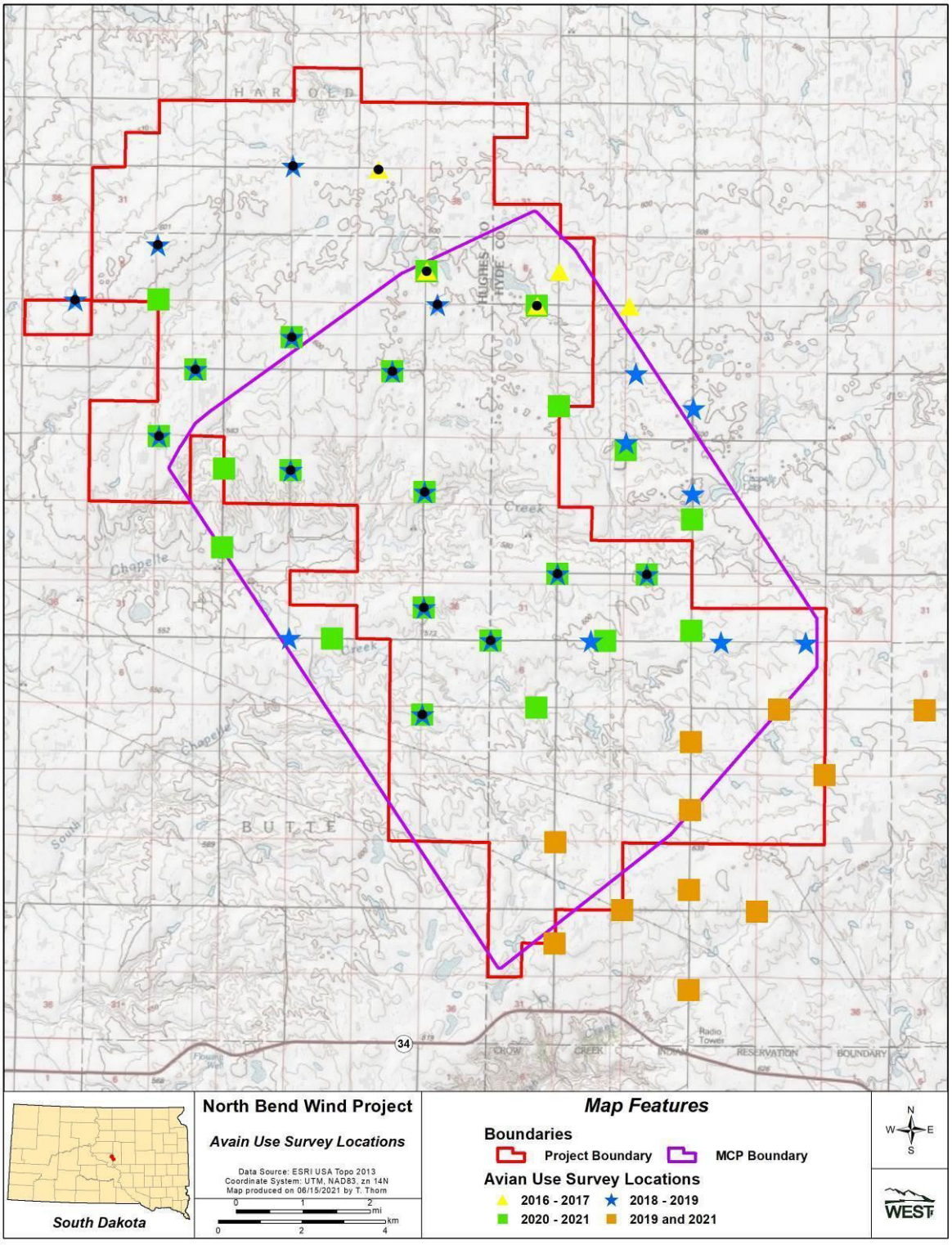

Figure 6.1. Location of fixed-point avian use survey stations completed in from 2016-2021 throughout the North Bend Wind Project boundary located in Hughes and Hyde counties, South Dakota. The Minimum Convex Polygon Boundary (purple outline) encapsulates the final proposed turbine layout.

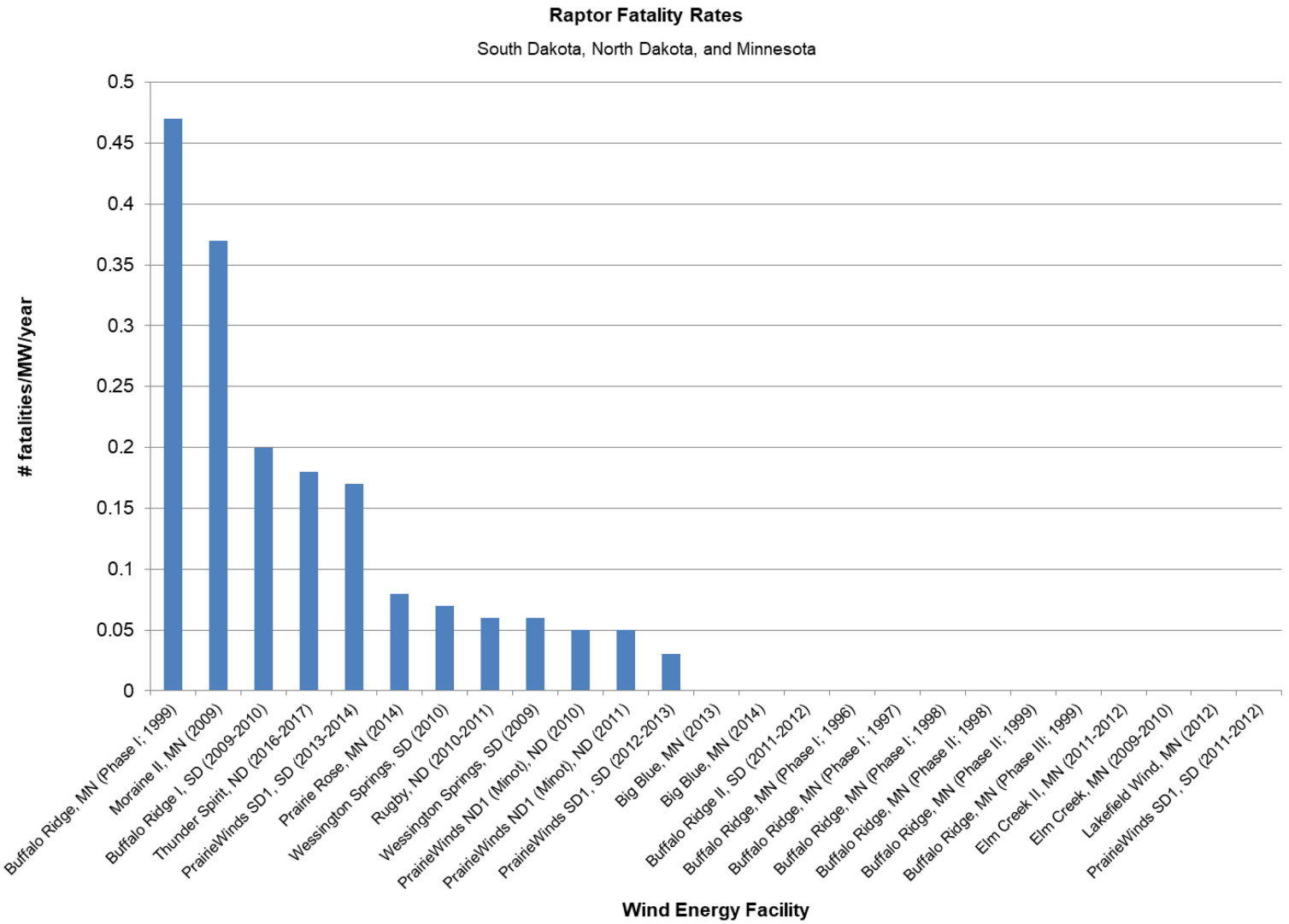

Figure 6.2. Fatality rates for diurnal raptors (number of raptors per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota.

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. 2014
Prairie Rose, MN (2014)	Chodachek et al. 2015
Wessington Springs, SD (2010)	Derby et al. 2011a
Rugby, ND (2010-2011)	Derby et al. 2011b
Wessington Springs, SD (2009)	Derby et al. 2010b
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. 2013
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. 2012c

6.1.1.2 Non-raptor Species

Several birds of conservation concern (BCC) species and species of greatest conservation need (SGCN) were observed throughout the years that avian use fixed-point surveys were conducted. Two BCC passerine species, bobolink and grasshopper sparrow, and one BCC gull species, Franklin's gull, were observed in the Project area during the 2019-2020, 2020-2021, and ongoing field efforts. Chestnut-collared longspur and marbled godwit, species that are both a BCC and SGCN, were also observed in avian use fixed-points during those time frames. Red-headed woodpecker, a BCC species, and lark bunting, a SGCN, were observed only during the 2019-2020 field effort. 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 non-raptorial birds throughout the Project, risk of collisions with wind turbines will likely be uniform throughout most of the Project area (Appendix E).

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 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 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. 2007a), to date, this relationship has not been found to be significantly correlated (Hein et al. 2013, Solick et al. 2020). 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 (177 calls), and LF bats during the 2018 study (91 calls) with no NLEB calls detected. 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 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 bat fatalities at the Project may be highest during the late summer to early fall, consistent with fall bat migration.

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 PrairieWinds SD1, located approximately 80 km (50 mi) southeast of the Project. Bat casualty rates at PrairieWinds SD1 have ranged from 0.52–1.23 bats/MW/year (Derby et al. 2012c, 2013, 2014). It is likely the Project will have similar fatality rates as the PrairieWinds SD1 wind energy facility; however, PrairieWinds SD1 is composed of more herbaceous grassland habitat (64%) and less cropland 33% habitats whereas the Project is primarily composed of less grassland (52%) and more cropland (44%) habitats. Some studies indicate 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.

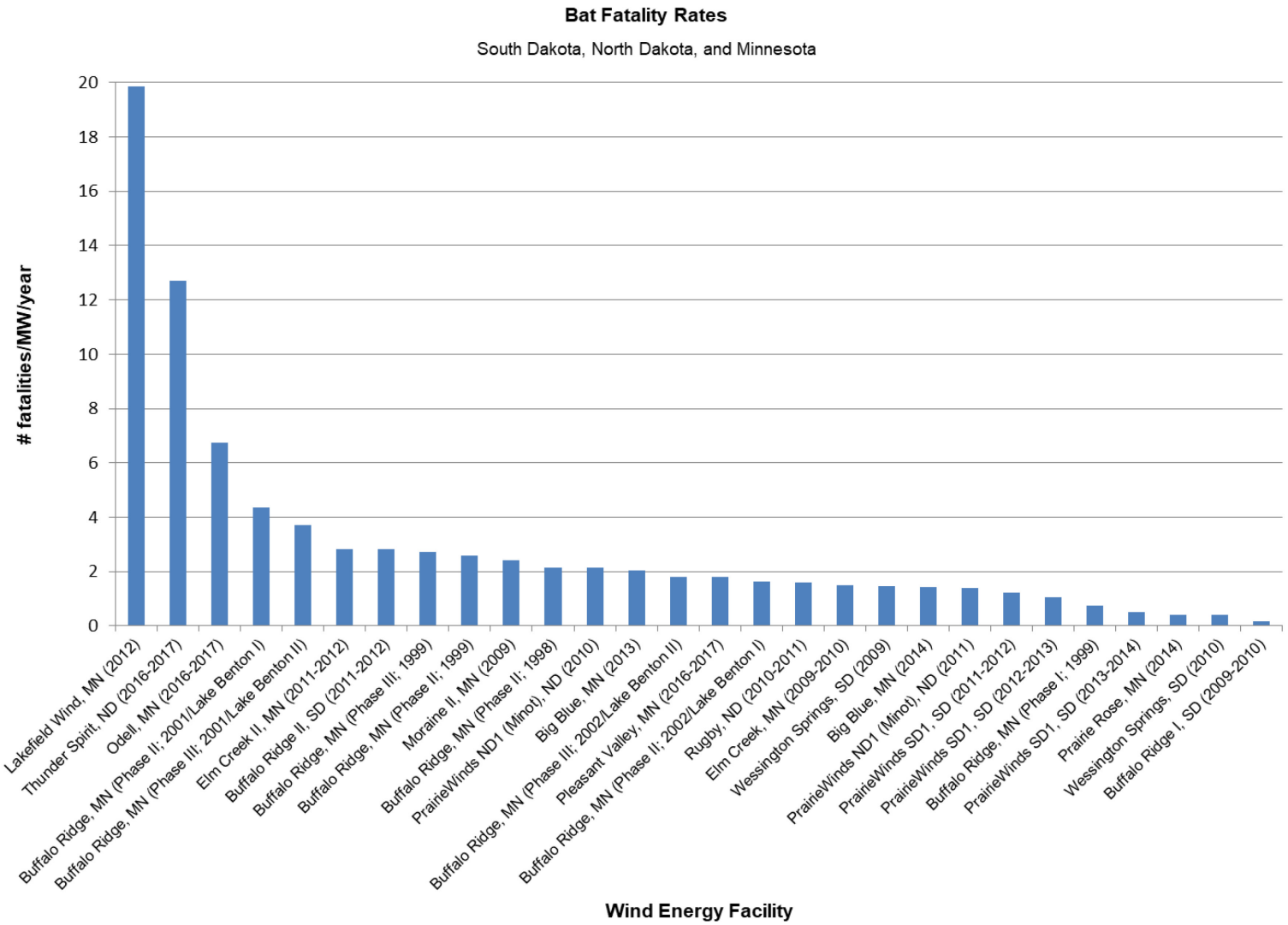

Figure 6.3. Fatality rates for bats (number of bats per megawatt [MW] per year) from publicly available studies at wind energy facilities in South Dakota, North Dakota, and Minnesota.

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. 2010b
Big Blue, MN (2014)	Fagen Engineering 2015
PrairieWinds ND1 (Minot), ND (2011)	Derby et al. 2012d
PrairieWinds SD1, SD (2011-2012)	Derby et al. 2012c
PrairieWinds SD1, SD (2012-2013)	Derby et al. 2013
Buffalo Ridge, MN (Phase I; 1999)	Johnson et al. 2000a
PrairieWinds SD1, SD (2013-2014)	Derby et al. 2014
Prairie Rose, MN (2014)	Chodachek et al. 2015
Wessington Springs, SD (2010)	Derby et al. 2011a
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; NRC 2007, USFWS 2012). Impacts are concentrated near turbine locations and along access roads, although available data indicate avoidance of wind turbines by primarily grassland 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; Shaffer and Buhl 2016). 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 similar to existing trends in species distribution resulting from other ongoing anthropogenic effects, such as grassland conversion to cropland and wetland drainage (USFWS 2012). Pearse et al. (2021) described a “Zone of Influence” (potential avoidance) extending out to five km (3.1 mi) from existing wind turbines based on an analysis of

telemetry locations from whooping crane along their migration corridor. Similar to grassland birds, potential impacts to whooping cranes is expected to be minimal as potential stopover habitat (i.e., wetlands) can be found in the surrounding area (Appendix C; Section 5.1.2).

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 from twice as far away as can the average bird. Although Dooling's study was intended to explore potential avoidance measures for birds, the author 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; Madders and Whitfield 2006). Given the low density of raptor nests documented within the current Project boundary and surrounding area during four 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 (Leddy et al. 1999, Johnson et al. 2000a, Shaffer and Buhl 2016). 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 (2016) demonstrated reduced breeding density by seven of nine breeding grassland birds and the attraction of one species (killdeer [*Charadrius vociferus*]), likely attributed to increased nesting habitat from road and pad construction, and has recommended assessing displacement out to 300 m (984.3 ft) for grassland species (Shaffer et al. 2019). 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. 2006) 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 (51.9%) of the Project area consists of herbaceous (e.g., grassland) cover while 43.9% of the Project area consists of cultivated crops. While turbines have been sited to avoid and minimize impacts to grasslands to the extent possible given other limiting factors by moving turbines out of grasslands or to the periphery of those grasslands, some displacement may still occur for avian grassland species.

6.2.2 Bats

Limited information is available regarding the disturbance or displacement of bats at wind energy facilities (Kunz et al. 2007b). 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 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 that habitat. Due to the lack of any known maternity roosts near the Project (nearest in the Black Hills, South Dakota [Abernethy et al. 2019]), and avoidance of siting turbines near larger (≥ 10 ac) tracts of trees, 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 2021d) and SDGFP county distribution list (SDGFP 2016) identified the potential for several federally and state-listed species to occur within Hyde and Hughes counties, South Dakota (Section 5.1.1, Tables 5.1, 5.2, 5.3). 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. Federally listed species are also addressed in the Project's biological assessment.

6.3.1 Northern Long-eared Bat and Other Sensitive Bat Species

The Project area is not located near any large, known bat colonies (Appendix A), 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 (e.g., long draws or treed riparian corridors). 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, North Bend has avoided areas identified as potential roosting habitats for siting turbines pursuant to USFWS recommendations, thus minimizing impacts to sensitive bat species. Additionally, curtailment below 5.0 m/s during the fall season (August 15 – October 15) shall be implemented to further reduce potential impacts to the species as required under the PEIS and PBA.

6.3.2 Bald and Golden Eagle

There are no known eagle concentration areas (see Section 5.2) within the Project area or immediate vicinity of the Project. Eagle observations recorded during baseline studies conducted in the Project area suggest eagle use is relatively low (Appendix E). Based on the results of avian use surveys, the Project does not appear to contain areas of concentrated eagle foraging opportunities (e.g., carcass pits, prairie dog colonies, large lakes). Additionally, there are no known prairie dog (*Cynomys* spp.) colonies within the Project area. The rolling hills comprising the Project area are 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 2.0 mi of the Project area (Appendices G and H). Based on relatively 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 Piping Plover

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

6.3.4 Rufa Red Knot

No rufa red knots (*Calidris canutus rufa*; FT [USFWS 2014]) were detected in the Project area during avian use surveys or incidentally (Appendix E); however, the species may potentially migrate over the Project area (USFWS 2019b). Limited stopover habitat for the species (e.g., 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.

6.3.5 Whooping Crane

The Project area is contained completely within the 50th percentile whooping crane migration corridor and occasional sightings are expected. However, no whooping cranes (state-listed endangered species [SDGFP 2016] and federal-listed endangered species [USFWS 1967]) were detected in the Project area during avian use 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 and Hughes counties (SDGFP 2016) based on one observation from 1997 (Appendix C). The widespread availability of suitable stopover habitat indicates that if whooping cranes are displaced by development of the Project, the birds are likely to find similar or better 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. Implementation of biomonitoring and curtailment (Appendix M) has been successful at the adjacent Triple H Wind Project (Appendix O).

6.3.6 Black Tern

Twenty-one black tern (BCC [USFWS 2021a] and South Dakota SGCN [SDGFP 2014]) observations were detected in the Project area incidentally or during avian use surveys (Section 5.2.1.6). Although the Project area lies within the breeding range of the species, impacts to black tern are estimated to be low due to the limited amount of suitable habitat (e.g., marshes, ponds, lakes, flooded fields, and wetlands) in the Project area.

6.3.7 Greater Prairie-chicken

Six greater prairie-chicken (BCC [USFWS 2021a] and South Dakota SGCN [SDGFP 2014]) observations were detected in the Project area during avian use surveys (Section 5.2.1.6). Additionally, a total of 16 leks have been identified as active since 2016 (Section 5.2.3). However, in the last survey (2020), only eight of these leks remained active with at least two males in attendance for two or more years in the past five years. As greater prairie-chicken is a grassland bird, avoidance of grasslands will help reduce potential impacts to the species. As the Project is within a landscape that includes grasslands and not all turbines (or infrastructure) could avoid grasslands, turbines are expected to be sited within one mile of active leks, potential local impacts to this species.

6.3.8 Chestnut-collared Longspur

Sixty-one chestnut-collared longspur (BCC [USFWS 2021a] and SGCN [SDGFP 2014]) observations were detected in the Project area during avian use surveys (Section 5.2.1.6). The Project area lies within the breeding range of the species (Bleho et al. 2020). 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.

6.3.9 Franklin's Gull

Franklin's gull (BCC [USFWS 2021a]) was the most common sensitive status species recorded within the Project area, totaling 227 observations (Section 5.2.1.6). The Project lies within the species' breeding range (USFWS 2021d). Due to the number of observations and suitable breeding habitat (e.g., wetlands) in the Project area, impacts to Franklin's gull are estimated to be low to moderate.

6.3.10 Northern Harrier

Sixty-seven northern harrier (BCC [USFWS 2021a]) observations were detected in the Project area during avian use surveys (Section 5.2.1.6). The Project area contains foraging and nesting habitat (e.g., grasslands) that the species uses with some regularity. Due to the number of detections and potentially suitable foraging habitat, impacts to this species are estimated to be low to moderate.

6.3.11 Bobolink

Eighty-one bobolink (BCC [USFWS 2021a]) observations were detected in the Project area during avian use surveys or incidentally (Section 5.2.1.6); and, the Project lies within the species' breeding range (USFWS 2021d). Due to the few detections (see Section 5.2) and limited suitable breeding habitat (e.g., damp meadows and dense prairies), impacts to bobolinks are estimated to be low.

6.3.12 Grasshopper Sparrow

Grasshopper sparrow (BCC [USFWS 2021a]) was the second most often observed species in the Project area during avian use surveys with 117 detections (Section 5.2.1.6). 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.

6.3.13 Red-headed Woodpecker

Six red-headed woodpecker (BCC [USFWS 2021a]) observations were detected in the Project area during avian use surveys (Section 5.2.1.6); however, the Project lies within the species' breeding range (USFWS 2021d). 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.

6.3.14 Marbled Godwit

Thirty-four marbled godwit (BCC [USFWS 2021] and SGCN [SDGFP 2014]) observations were detected in the Project area during avian surveys (Section 5.2.1.6). Although the Project area lies within the breeding range of the species (USFWS 2021d), impacts to marbled godwit are estimated to be low to moderate due to the presence of potentially suitable habitat (e.g., native prairie with nearby wetlands) in the Project area.

6.3.15 Lark Bunting

Forty-five lark bunting (BCC [USFWS 2021a]) observations were detected in the Project area during avian surveys (Section 5.2.1.6). Although the Project area lies within the breeding range of the species (USFWS 2021d), impacts to lark bunting are estimated to be low to moderate due to the presence of potentially suitable habitats (e.g., native prairies, hay/pasture).

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 North Bend'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, North Bend 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 with exception of one whooping crane observation in 1997.
- Eagle and raptor use of the Project area was considered relatively low for the region.

North Bend made 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 included the following:

- Avoidance of eagle nests by at least two miles.
- Northern long-eared bat summer roosting and foraging habitats were avoided.
- 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 facilities at a minimum required for safety and security needs (e.g., 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 to reduce the number of turbines needed to achieve maximum energy production, to the extent commercially reasonable.
- Larger wetland complexes and any associated wetland easements were avoided to the extent practical.

7.2 Conservation Measures to be Implemented during Construction

Construction of the Project is expected to begin in 2022 and occur over a period of approximately 16 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 mph (40 kph; DeVault et al. 2014). 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. North Bend 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 to avoid impacts to hydrology.

- North Bend will develop and implement a noxious weed control plan in accordance with the land lease agreements.
- North Bend will provide training resources to all construction and site personnel on identification of sensitive species and their habitats to minimize and/or avoid disturbance.
- No construction activities will occur within 2.0 mi of a prairie grouse lek (as defined on February 17, 2017; per the SDGFP) from March 1 – June 30. If a 2.0-mi avoidance buffer cannot be maintained, then no construction activities will occur within the first two hours after sunrise.
- Gravel will be placed at least 1.5 m (5.0 ft) around each turbine foundation that could 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 (*Canis familiaris*) 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.
- A mitigation offset for potentially impacted whooping crane stopover habitat (1,310.8 ac) will be implemented by a third party in accordance to direction from the WAPA and USFWS prior to an interconnect.

7.3 Conservation Measures to be Implemented during Operations

- Low speed limits (e.g., less than 25 mph) will be enforced on all roads within the Project.
- Other than maintenance vehicles, which will park at the entrance of turbines for maintenance purposes, parts and equipment that 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).
- North Bend 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.

- One year of post-construction monitoring will be conducted following the draft protocol in Section 8.1). With support from SDGFP, North Bend is also working cooperatively with SDGFP on a Tier 5 project to assess grassland bird displacement within a fragmented grassland landscape.
- Curtailment of turbine operation between August 15 and October 15 at wind speed below 5.0 m/s.
- North Bend will 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 2.0 mi of a turbine (Appendix M). 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 North Bend'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 North Bend 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 hazardous material spill and containment measures.
    - Provide information to contractors and employees on the Project detailing information on potential state and federal special-status animal and plant species that might be discovered on the Project site.
    - 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 the USFWS within 24 hours of positive identification of the eagle by a qualified biologist.

8.0 POST-CONSTRUCTION MONITORING: TIER 4

Based on preliminary analysis of data from Triple H Year 1 post-construction monitoring, fatalities are relatively low as compared to other projects in the Midwest and upper Great Plains at an estimated rate of 0.56 bird fatalities/megawatt (MW) and 0.53 bats/MW. These results were generated using GenEst (Dalthorp et al. 2018) as a fatality estimator and 2,662 standardized carcass searches with associate bias trials. No federally or state listed species were detected. No

raptor were detected. Two species of greatest conservation need were detected during standard carcass searches including upland sandpiper (4) and grasshopper sparrow (1). Thirteen total bats were detected including eastern red bat (6), hoary bat (5), and silver-haired bat (2). It is expected, due to proximity, that North Bend will have similar results to the adjacent Triple H wind project.

8.1 Tier 4a – Avian and Bat Fatality Monitoring

North Bend will complete one year of Tier 4a avian and bat fatality monitoring efforts that are consistent with recommendations for operations monitoring included in the WEG, the PEIS, and are consistent with monitoring programs that have been conducted at wind projects in the Midwest and upper Great Plains. This post-construction study shall consist of three primary survey components: 1) standardized carcass searches, 2) searcher efficiency (SEEF) trials to estimate the probability a carcass was found by technicians during a standardized search, and 3) carcass persistence trials (CPT) to estimate the average length of time a carcass remained in the search area for possible detection. In addition, a search area adjustment will be estimated to account for carcasses that fell outside of search areas. Surveys will use a combination of square plots, roads and pads, and eagle/large bird scans. The survey was designed to achieve a g-value of 0.205 for northern long-eared bats using the USGS's Evidence of Absence (EoA) estimator (Huso et al. 2015) based on guidance from WAPA (pers. comm. January 5, 2023), as described below.

8.1.1 Survey Design – Carcass Searches

8.1.1.1 Square Plots

During the early spring months (approximately May 1 – May 15), when vegetation is short or sparse, all of the proposed turbines (71) will be searched with 160-m (525-ft) square plots until such time visibility is reduced to preclude effective searcher efficiency. Search frequency shall be approximately every three days. Starting October 1 through October 31, all proposed turbines will be searched with square plots once every two weeks. Starting March 1 through March 31, all proposed turbines will be searched with square plots once every two weeks. Searches will be done by walking a grid pattern within the search plot using a 10-m (33-ft) spacing between transects.

8.1.1.2 Roads and Pads

During late winter and early spring, (approximately April 1 - May 1), all turbines will be searched once every two weeks via road and pads out to 100 m (328 ft) from the turbine base. Starting May 16 (or once vegetation reduces visibility), through September 30, all 71 turbines will be searched via road and pads approximately every three days. Searches will be done by a biologist walking the road and pad within 100 m of the turbine while scanning for carcasses.

8.1.1.3 Eagle/Large Bird Scans

During late winter and early spring (approximately April 1 – May 15) and late fall (September 16 – October 31), eagle/large bird scans will be conducted at each turbine once every two weeks. During the winter months (November 1 – February 28), eagle/large bird scans will be conducted at each turbine once per month. Using binoculars, a biologist will scan the ground that is visible

around each turbine, in each cardinal direction (north, east, south, west) up to 200 m (656 ft) out from the turbine.

8.1.2 Bias Trials

8.1.2.1 Searcher Efficiency Trials

The objective of SEEF trials is to collect data to estimate the probability observers detected bird and bat carcasses. This effort accounts for biases associated with changes in conditions such as vegetation, topography, weather (e.g., rain and/or cloud cover, muddy plots), and searcher variability that could have affected SEEF. Estimates of SEEF shall be used to adjust the total number of carcasses found to account for those missed by technicians.

SEEF trials will begin at the start of carcass searches and will be conducted in the same search areas throughout the study period. Approximately eight SEEF trials will be stratified by the type and size of carcasses (large bird, small bird, or bat), by search area (road and pad or full), and season (spring, summer, or fall) totaling approximately 144 individual SEEF trials. A bias trial administrator will place SEEF carcasses in search areas to keep technicians unaware of when and where the SEEF trial carcasses (SEEF carcasses) will be placed. Bird carcasses used for the trials can include non-native/non-protected or commercially available species, including rock pigeon (*Columba livia*) for large birds, two-week old quail (*Coturnix* spp.) for small birds. Brown-colored house mice (*Mus musculus*) can be used as surrogates for bats.

8.1.2.2 Carcass Persistence Trials

The objective of CPT is to collect data to estimate the average probability a bird or bat carcass remains available to be found during the search interval. The data collected will be used to adjust for the potential bias of carcasses removed during carcass searches. CPT will be conducted throughout the spring, summer, and fall, to incorporate the effects of varying weather, climatic conditions, and scavenger rates. Possible means of carcass removal include predators, scavengers, insects, or agricultural practices (e.g., being plowed into a field). Estimates of bird and bat carcass persistence will be used to adjust the total number of carcasses found as compared to those removed from the search area.

An estimated 30 CPT carcasses (10 large birds, 10 small birds, and 10 mice) will be used at each search type for CPT (road and pad plots and full plots). CPT carcasses will be monitored over a 30-day period according to the following schedule: every day for the first four days, then on day seven, 10, 14, 20, and 30. The condition of carcasses will be recorded each time the CPT carcasses were checked.

8.1.3 Statistical Analysis

8.1.3.1 Fatality Rate Estimation

Carcasses included in fatality rate estimates will include those found within the search areas (square plots or road and pad) and have an estimated time of death within the study period. Fatality estimates will be calculated for all categories (all birds, large birds, small birds, and bats) by season using GenEst (a generalized estimator of fatality; Dalthorp et al. 2018, Simonis et

al. 2018). To obtain an overall estimate of fatality, each carcass included in the analysis will be adjusted for SEEF, carcass persistence, a detection reduction factor (also referred to as "*k*"; see below), and a search area adjustment. Estimates and confidence intervals (CI) will be calculated using a parametric bootstrap (Dalthorp et al. 2018) for each individual category listed above, assuming more than five fatalities were detected for the respective category (e.g., all birds, bats). Because fatalities of northern long-eared bats are considered rare events, the USGS's Evidence of Absence (EoA) estimator (Huso et al. 2015) was used to predict take of northern long-eared bats and to quantify uncertainty around those take predictions. As noted above, the survey methodology achieved an estimated overall g-value of 0.205.

8.1.3.2 Searcher Efficiency Estimation

Data collected during SEEF trials will be used to estimate the probability bird and bat carcasses detected by technicians. Estimates of SEEF will be used to adjust carcass counts for detection bias. Estimates will be obtained for each size class separately using a logit regression model (Dalthorp et al. 2018). Model selection will be done using an information theoretic approach known as AICc or corrected Akaike Information Criteria (Burnham and Anderson 2002). The best model will be selected as the most parsimonious model within two AICc units of the model with the lowest AICc value.

8.1.3.3 Carcass Persistence Estimation

Data collected during CPT will be used to estimate the amount of time in days that carcasses remained available to be located by the searcher. Estimates of carcass persistence will be used to adjust carcass counts for removal bias. The persistence of a carcass will be modeled using an interval-censored survival regression for each size class using exponential, log-logistic, lognormal, and Weibull distributions (Kalbfleisch and Prentice 2002, Dalthorp et al. 2018). Covariates (explanatory variables of interest) will be fitted to each of the parameters of the distributions. The best model will be selected as the most parsimonious model within two AICc units of the model with the lowest AICc value.

8.1.3.4 Detection Reduction Factor

The change in SEEF between successive searches will be defined by a parameter called the *detection reduction factor* (*k*) that ranges from zero to one. When *k* is zero it implies that a carcass is missed on the first search and that carcass would never be found. A *k* of one implied SEEF remains constant no matter how many times a carcass is missed. The detection reduction factor is a required parameter for GenEst; however, data will not collected to estimate *k*. A value for *k* of 0.67 has been estimated for bats (Huso et al. 2017) and this value will be assumed in this study for birds and bats.

8.1.3.5 Search Area Adjustment Estimate

The search area adjustment accounts for unsearched areas beneath turbines and is calculated as a probability that ranged from zero to one. For example, an area adjustment of 0.75 means that an estimated 75% of carcasses will fall within the search area. Unsearched areas can be attributed to obstacles such as ground cover (e.g., tall crops) or terrain, or areas where carcasses fall outside the search area (e.g., a carcass landed 120 m [394 ft] away from the turbine on a plot

searched out to 100 m from the turbine base). The area adjustment will be estimated as the product of the unsearched area around each turbine and a carcass-density distribution. The carcass-density distribution predicts the likelihood a carcass falls a given distance from the turbine base. Separate area adjustments will be estimated for large birds, small birds, and bats.

A number of analysis methods exist to calculate the search area adjustment. The method used will be determined by the number of carcasses found during surveys. The proportion of area searched will be calculated in a geographic information system as the amount of area searched divided by the total area searched at each 1-m (3-ft) annulus around the turbine. The area adjustment will be estimated by combining the carcass-density distribution with the proportion of area searched for each 1-m annulus across the search area and summarizing across the distances.

In addition to implementing the previously described fatality monitoring protocol, the Project has committed to long-term monitoring for injured or deceased bird and bats. During operations, all injured MBTA-covered species, 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 the discovery, and any handling of the carcass will be at the USFWS' direction/authorization. For non-federally listed species and non-eagle carcasses, North Bend may, at their option, either leave the carcasses in place or properly collect and dispose of the carcasses, depending on the selected practice at the Project, as determined by the Project's legal counsel. Should "leave in place" be the practice at the Project, then the person making the discovery will complete the Wildlife Incident Report form and file the form in the facility's 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 SDGFP and USFWS prior to any collection of the carcasses. Upon completing the Wildlife Incident Report, the person 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

Tier 3 studies have identified grassland habitats and species of habitat fragmentation concern (e.g., generally grassland bird species) within the Project that have the potential to be displaced based on previous research (Shaffer and Buhl 2016). Shaffer et al. (2019) provides an approach to quantify impacted grasslands for mitigation offsets. North Bend has followed guidance from both the USFWS and SDGFP to avoid grasslands to the extent possible and/or to site turbines to the periphery of grasslands as a minimization measure. However, based on the approach provided by Shaffer et al. (2019) and applying wildlife agency recommended avoidance and minimization measures, there could still be substantial voluntary grassland offsets requested. The current offset mitigation analysis (Shaffer et al. 2019), quantifies the proportion of grassland

area that intersects a specified buffer around turbines, regardless of the habitat where that turbine is placed. With the support of SDGFP (support letter dated July 12, 2021), an alternative approach has been proposed to include a Tier 5 research effort, described in Section 9.

9.0 RESEARCH: TIER 5

In addition to Tiers 1-4 described above, the WEG discuss *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". However, considering the concern about potentially impacted grasslands and with the support of SDGFD (support letter provided on July 16, 2021), North Bend elected to proceed with a Tier 5 study to evaluate grassland breeding bird displacement along habitat edges that will incorporate results of post-construction monitoring (Section 8.1). This effort is designed using a robust before-after-control-impact design with a minimum of one year pre-construction data and two years of post-construction data. The objective of this study is to evaluate the effect of implementing avoidance and minimization measures on breeding grassland bird displacement.

10.0 ADAPTIVE MANAGEMENT

In 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, North Bend recognizes the value of applying this approach to its Project activities that include some uncertainty with respect to wildlife impacts. As such, North Bend 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 (Section 6.0). More specifically, Project impacts are expected to be similar to those at Triple H (Section 8.1). Since the results of post-construction monitoring at Triple H did not show higher than anticipated impacts and in fact impacts were lower than most wind projects in the upper Great Plains and Midwest, adaptive management responses are not anticipated at this time. Thresholds for considering an adaptive response will follow those for Triple H and 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 BCC).

If impacts are determined to be higher than anticipated, an assessment of why this is 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[2], 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.

If 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.

11.0 CONCLUSIONS

This BBCS was written to provide guidance for avoiding, minimizing, and monitoring potential effects to avian and bat species at the 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 during all phases of the Project and based on Tier 4 efforts at the Project.

12.0 REFERENCES

12.1 Literature Cited

Abernethy, I., E. Whittle, and A. Chalfoun. 2019. Maternity roost selection by northern long-eared bats (*Myotis septentrionalis*) on the Black Hills National Forest, Wyoming. Prepared for, Wyoming Natural Diversity Database. Final Report. 17-CS-11020000-005. Pp 34. Available online: http://www.uwyo.edu/wyndd/_files/docs/Reports/WYNDDReports/19abe01.pdf

[2] Once the 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.

Anderson, R., D. Strickland, J. Tom, N. Neumann, W. Erickson, J. Cleckler, G. Mayorga, G. Nuhn, A. Leuders, J. Schneider, L. Backus, P. Becker, and N. Flagg. 2000. Avian Monitoring and Risk Assessment at Tehachapi Pass and San Gorgonio Pass Wind Resource Areas, California: Phase 1 Preliminary Results. Pp. 31-46. *In*: Proceedings of the National Avian Wind Power Planning Meeting III (PNAWPPM-III), May 1998, San Diego, California. National Wind Coordinating Collaborative (NWCC)/RESOLVE, Washington, D.C.

ArcGIS. Geographic Information System (GIS) Software. Environmental Systems Research Institute (Esri), Redlands, California.

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78. doi: 10.2193/2007-221.

Arnett, E. B. and E. F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Pp. 435-456. *In*: R. A. Adams and S. C. Pederson, eds. Bat Ecology, Evolution and Conservation. Springer Science Press, New York.

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D. C. and Sacramento, California. Available online: https://www.nrc.gov/docs/ML1224/ML12243A391.pdf

Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC, Washington, D.C. Available online: https://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf

Baerwald, E. F. 2008. Variation in the Activity and Fatality of Migratory Bats at Wind Energy Facilities in Southern Alberta: Causes and Consequences. Thesis. University of Calgary, Calgary, Alberta, Canada.

Bird Studies Canada and NABCI. 2014. Bird Conservation Regions. Published by Bird Studies Canada on behalf of the North American Bird Conservation Initiative. http://www.birdscanada.org/research/gislab/index.jsp?targetpg=bcr

Bleho, B., K. Ellison, D. P. Hill, and L. K. Gould. 2020. Chestnut-Collared Longspur (*Calcarius Ornatus*), Version 1.0. *In*: P. G. Rodewald, ed. Birds of the World. Cornell Lab of Ornithology, Ithaca, New York. Available online: http://birdsoftheworld.org/bow/species/chclon/cur/

Boyles, J. G., J. C. Timpone, and L. W. Robbins. 2009. Bats of Missouri. Indiana State University Center for North American Bat Research and Conservation, Publication Number 3. Indiana State University Press, Terre Haute, Indiana.

Broders, H. G., G. J. Forbes, S. Woodley, and I. D. Thompson. 2006. Range Extent and Stand Selection for Roosting and Foraging in Forest-Dwelling Northern Long-Eared Bats and Little Brown Bats in the Greater Fundy Ecosystem, New Brunswick. Journal of Wildlife Management 70: 1174-1184.

Bureau of Land Management (BLM). 2006. Final Environmental Impact Statement for the Proposed Cotterel Wind Power Project and Proposed Resource Management Plan Amendment. FES 06-07. Serial No. IDI-33676. Prepared for the US Department of the Interior (USDOI), BLM, Twin Falls District, Burley Field Office, Cassia County, Idaho, on behalf of Windland, Inc., Boise, Idaho, and Shell WindEnergy Inc., Houston, Texas. March 2006.

Canadian Wildlife Service (CWS) and US Fish and Wildlife Service (USFWS). 2007. International Recovery Plan: Whooping Crane (*Grus americana*). Third Revision. Recovery of Nationally Endangered Wildlife (RENEW), Ottawa, and USFWS, Albuquerque, New Mexico. March 2007. Available online at: http://ecos.fws.gov/docs/recovery_plan/070604_v4.pdf

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Avian Baseline Studies at the Sun Creek Wind Resource Area, Kern County, California. Final Report: May 2009 - May 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming. September 30, 2010. Available online: https://www.kerncounty.com/planning/pdfs/eirs/AltaEast/Appendices/ApD/D3%20Avian%20Baseline%20Studies%202010.pdf

Chatfield, A., W. P. Erickson, and K. Bay. 2011. Avian Baseline Studies at the Alta East Wind Resource Area, Kern County, California. Final Report: July 10, 2010 - June 1, 2011. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming. July 13, 2011. Appendix D-8. *In:* Bureau of Land Management (BLM). 2013. Alta East Wind Project: Proposed Plan Amendment and Final Environmental Impact Statement. CACA #0052537. US Department of the Interior BLM. February 2013. Proposed Plan Amendment and Final Environmental Impact Statement available online: https://eplanning.blm.gov/epl-front-office/projects/nepa/66300/80735/93985/Vol1_BLM_Alta_East_FEIS.pdf; Appendix D-8 available online: https://eplanning.blm.gov/epl-front-office/projects/nepa/66300/80732/93960/D8_Avian_Baseline_Studies_2011.pdf

Chodachek, K., K. Adachi, and G. DiDonato. 2015. Post Construction Fatality Surveys for the Prairie Rose Wind Energy Facility, Rock County, Minnesota. Final Report: April 15 to June 13, 2014, and August 15 to October 29, 2014. Prepared for Enel Green Power, North America, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. January 23, 2015. Available online: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BF38C2FEC-ED84-4813-AF3E-5A397A954A34%7D&documentTitle=20152-107006-01

Chodachek, K. and Z. Gustafson. 2018. Tier 4 Post-Construction Mortality Monitoring Study for the Odell Wind Energy Project, Cottonwood and Jackson Counties, Minnesota. Final Fatality Report: December 2016 – December 2017. Prepared for Odell Wind Farm, LLC, Oakville, Ontario, Canada. Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. March 15, 2018. Available online https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={E0912A62-0000-C93E-88EA-844E240F695B}&documentTitle=20183-141067-02

Connelly, J. W., K. P. Reese, and M. A. Schroeder. 2003. Monitoring of Greater Sage-Grouse Habitats and Populations. College of Natural Resources Experiment Station, Station Bulletin 80, University of Idaho, Moscow, Idaho.

Cryan, P. M. 2008. Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines. Journal of Wildlife Management 72(3): 845-849. doi: 10.2193/2007-371.

Cryan, P. M. and R. M. R. Barclay. 2009. Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy 90(6): 1330-1340. doi: 10.1644/09-MAMM-S-076R1.1.

Dalthorp, D. H., L. Madsen, M. M. Huso, P. Rabie, R. Wolpert, J. Studyvin, J. Simonis, and J. M. Mintz. 2018. GenEst Statistical Models—a Generalized Estimator of Mortality. US Geological Survey Techniques and Methods, Volume 7, Chapter A2. 13 pp. doi: 10.3133/tm7A2. Available online: https://pubs.usgs.gov/tm/7a2/tm7a2.pdf

Derby, C. and A. Dahl. 2009. Wildlife Studies for the Bitter Root Wind Resource Area, Yellow, Medicine, and Lincoln Counties, Minnesota. Annual Report: March 25, 2008 - October 8, 2008. Prepared for Buffalo Ridge Power Partners, Argyle, New York. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismark, North Dakota. April 16, 2009. *In:* Minnesota Department of Commerce, Office of Energy Security. 2010. Bitter Root Wind Farm Project, Environmental Report. Site Permit Application, Appendix F. Minnesota Public Utilities Commission, Docket 25538. March 2010. April 16, 2009.

Derby, C., K. Bay, and J. Ritzert. 2009. Bird Use Monitoring, Grand Ridge Wind Resource Area, La Salle County, Illinois. Year One Final Report, March 2008 - February 2009. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 29, 2009.

Derby, C., K. Bay, and A. Dahl. 2010a. Wildlife Baseline Studies for the Dempsey Wind Resource Area, Roger Mills County, Oklahoma. Final Report: March 2008 – February 2009. Prepared for HDR Engineering, Minneapolis, Minnesota, and Dempsey Ridge Wind Farm, LLC, a wholly owned subsidiary of Acciona Wind Energy USA LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. February 10, 2010.

Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010b. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010c. Post-Construction Fatality Survey for the Buffalo Ridge I Wind Project. May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc., Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010d. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010e. Post-Construction Fatality Surveys for the Moraine II Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., A. Dahl, K. Bay, and L. McManus. 2011a. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011b. Post-Construction Fatality Surveys for the Rugby Wind Project: Iberdrola Renewables, Inc. March 2010 - March 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: October 14, 2011.

Derby, C., K. Chodachek, T. Thorn, K. Bay, and S. Nomani. 2011c. Post-Construction Fatality Surveys for the PrairieWinds ND1 Wind Facility, Basin Electric Power Cooperative, March - November 2010. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 2, 2011.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012a. Post-Construction Casualty Surveys for the Buffalo Ridge II Wind Project. Iberdrola Renewables: March 2011- February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012b. Post-Construction Fatality Surveys for the Elm Creek II Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.

Derby, C., A. Dahl, and A. Merrill. 2012c. Post-Construction Monitoring Results for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2011 - February 2012. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 27, 2012.

Derby, C., K. Chodachek, T. Thorn, and A. Merrill. 2012d. Post-Construction Surveys for the PrairieWinds ND1 (2011) Wind Facility Basin Electric Power Cooperative: March - October 2011. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western Ecosystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., A. Dahl, and D. Fox. 2013. Post-Construction Fatality Monitoring Studies for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2012 - February 2013. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 13, 2013.

Derby, C., A. Dahl, and G. DiDonato. 2014. Post-Construction Fatality Monitoring Studies for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2013 - February 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., D. Klostermeier, R. Tupling, and K. Moratz. 2018. Post-Construction Bird and Bat Fatality Monitoring for the Thunder Spirit Wind Energy Facility, Adams County, North Dakota. Final Fatality Report. Prepared for Thunder Spirit Wind, LLC, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. March 1, 2018.

DeVault, T. L., B. F. Blackwell, T. W. Seamans, S. L. Lima, and E. Fernández-Juricic. 2014. Effects of Vehicle Speed on Flight Initiation by Turkey Vultures: Implications for Bird-Vehicle Collisions. PloS ONE 9(2): e87944. https://doi.org/10.1371/journal.pone.0087944

Dolbeer, R. A., S. E. Wright, M. J. Begier, and J. Weller. 2009. Wildlife Strikes to Civil Aircraft in the United States 1990-2008. Federal Aviation Administration National Wildlife Strike Database Serial Report Number 15. Report of the Associate Administrator of Airports Office of Airport Safety and Standards & Certification, Washington, D. C.

Dooling, R. 2002. Avian Hearing and the Avoidance of Wind Turbines. NREL/TP-500-30844. National Renewable Energy Laboratory, Golden, Colorado.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka, and R. E. Good. 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Bird Collision Mortality in the United States. National Wind Coordinating Collaborative (NWCC) Publication and Resource Document. Prepared for the NWCC by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 2001.

Erickson, W. P., G. D. Johnson, K. Bay, and K. Kronner. 2002a. Ecological Baseline Study for the Zintel Canyon Wind Project. Final Report April 2001 – June 2002. Technical report prepared for Energy Northwest. Prepared for Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. June 2002. Available online: https://tethys.pnnl.gov/sites/default/files/publications/EricksonZintel-2002.pdf

Erickson, W. P., G. D. Johnson, D. P. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002b. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared for Bonneville Power Administration, Portland, Oregon by WEST, Inc., Cheyenne, Wyoming. December 2002. Available online: https://www.fs.fed.us/psw/publications/documents/psw_gtr191/psw_gtr191_1029-1042_erickson.pdf

Erickson, W. P., K. Kronner, and R. Gritski. 2003a. Nine Canyon Wind Power Project Avian and Bat Monitoring Report: September 2002 - August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. Available online: https://tethys.pnnl.gov/publications/nine-canyon-wind-power-project-avian-bat-monitoring-report

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2003b. Stateline Wind Project Wildlife Monitoring Annual Report, Results for the Period July 2001 – December 2002. Technical report submitted to FPL Energy, the Oregon Office of Energy, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc., Cheyenne, Wyoming. May 2003. Available online: https://tethys.pnnl.gov/sites/default/files/publications/EricksonFPL-2003.pdf

Erickson, W. P., J. Jeffrey, D. P. Young, K. Bay, R. Good, K. Sernka, and K. Kronner. 2003c. Wildlife Baseline Study for the Kittitas Valley Wind Project: Summary of Results from 2002 Wildlife Surveys. Final Report: February 2002– November 2002. Prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. January 2003.

Erickson, W. P., D. P. Young, G. D. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003d. Wildlife Baseline Study for the Wild Horse Wind Project. Summary of Results from 2002-2003 Wildlife Surveys: May 10, 2002 – May 22, 2003. Prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 2003. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Ericksonetal2003.pdf

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report: July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 2004. Available online: https://tethys.pnnl.gov/publications/stateline-wind-project-wildlife-monitoring-final-report-july-2001-december-2003

Erickson, W. P., G. D. Johnson, and D. P. Young, Jr. 2005. A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions. US Department of Agriculture (USDA) Forest Service General Technical Report PSW-GTR-191. Available online: https://www.fs.fed.us/psw/publications/documents/psw_gtr191/psw_gtr191_1029-1042_erickson.pdf

Erickson, W. P., A. Chatfield, and K. Bay. 2011. Avian Baseline Studies for the North Sky River Wind Energy Project, Kern County, California. Final Report: May 18, 2010 – May 26, 2011. Final Report. Prepared for CH2M HILL, Portland Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 7, 2011.

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

Esri. 2021. World Imagery and Aerial Photos (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California. Accessed October 2021. Available online: https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=10df2279f9684e4a9f6a7f08febac2a9

Fagen Engineering, LLC. 2014. 2013 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC. May 2014.

Fagen Engineering, LLC. 2015. 2014 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC.

Fiedler, J. K., T. H. Henry, R. D. Tankersley, and C. P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005. Tennessee Valley Authority. June 28, 2007. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Fiedler-et-al-2007.pdf

Good, R. E., M. Ritzert, and K. Bay. 2010. Wildlife Baseline Studies for the Timber Road Phase II Wind Resource Area, Paulding County, Ohio. Final Report: September 2, 2008 – August 19, 2009. Prepared for Horizon Wind Energy, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. April 28, 2010.

Grodsky, S. M., M. J. Behr, A. Gendler, D. Drake, B. D. Dieterle, R. J. Rudd, and N. L. Walrath. 2011. Investigating the Causes of Death for Wind Turbine-Associated Bat Fatalities. Journal of Mammalogy 92(5): 917-925. doi: 10.1644/10-MAMM-A-404.1.

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond du Lac County, Wisconsin. July 21 - October 31, 2008 and March 15 - June 4, 2009. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009. Available online: https://tethys.pnnl.gov/sites/default/files/publications/West_FondDuLac_BlueSkyWind.pdf

Hallingstad, E. G., P. A. Rabie, A. C Thelander, J. A. Roppe, and L. R. Nagy. 2018. Developing an efficient protocol for monitoring eagle fatalities at wind energy facilities. PLoS ONE 13(12): e0208700. Available online: https://doi.org/10.1371/journal.pone.0208700

Hayes, M. A. 2013. Bats Killed in Large Numbers at United States Wind Energy Facilities. Bioscience 63(12): 975-979. doi: 10.1525/bio.2013.63.12.10.

Hein, C. D., J. Gruver, and E. B. Arnett. 2013. Relating Pre-Construction Bat Activity and Post-Construction Bat Fatality to Predict Risk at Wind Energy Facilities: A Synthesis. A report submitted to the National Renewable Energy Laboratory (NREL), Golden Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013. Available online: https://tethys.pnnl.gov/sites/default/files/publications/relating-preconstruction-bat-activity.pdf

Howell, J. A. and J. Noone. 1992. Examination of Avian Use and Mortality at a U.S. Windpower Wind Energy Development Site, Montezuma Hills, Solano County, California. Final Report. Prepared for Solano County Department of Environmental Management, Fairfield, California.

Huso, M. M. P., D. Dalthorp, D. Dail, and L. Madsen. 2015. Estimating Wind-Turbine-Caused Bird and Bat Fatality When Zero Carcasses Are Observed. Ecological Applications 25: 1213-1255. doi: 10.1890/14-0764.1

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. Thesis. Iowa State University, Ames, Iowa.

Jeffrey, J. D., V. K. Poulton, K. J. Bay, K. F. Flaig, C. C. Roderick, W. P. Erickson, and J. E. Baker. 2007. Wildlife and Habitat Baseline Study for the Proposed Vantage Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Invenergy. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. August 2007. Available online: https://www.co.kittitas.wa.us/uploads/cds/land-use/Wind%20Farm/WSA-07-01%20Vantage%20Wind%20%20Power%20Project%20Application/VANTAGE_WILDLIFE_BASELINE%20REPORT_8.27.07.pdf

Jeffrey, J. D., W. P. Erickson, K. J. Bay, V. K. Poulton, W. L. Tidhar, and J. E. Baker. 2008. Wildlife Baseline Studies for the Golden Hills Wind Resource Area, Sherman County, Oregon. Final Report May 2006 – October 2007. Prepared for BP Alternative Energy North America Inc., Houston, Texas, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000a. Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. Available online: https://tethys.pnnl.gov/sites/default/files/publications/JohnsonBuffalo-2000.pdf

Johnson, G. D., D. P. Young, W. P. Erickson, C. E. Derby, M. D. Strickland, R. E. Good, and J. W. Kern. 2000b. Final Report: Wildlife Monitoring Studies, Seawest Windpower Project, Carbon County, Wyoming, 1995-1999. Final report prepared for SeaWest Energy Corporation, San Diego, California, and the Bureau of Land Management, Rawlins, Wyoming, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 9, 2000.

Johnson, G. D., W. P. Erickson, K. Bay, and K. Kronner. 2002a. Baseline Ecological Studies for the Klondike Wind Project, Sherman County, Oregon. Final report prepared for Northwestern Wind Power, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. May 29, 2002.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2002b. Collision Mortality of Local and Migrant Birds at a Large-Scale Wind-Power Development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30(3): 879-887.

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Johnson, G. D. 2005. A Review of Bat Mortality at Wind-Energy Developments in the United States. Bat Research News 46(2): 45-49.

Johnson, G. D., J. Jeffrey, J. Baker, and K. Bay. 2007. Baseline Avian Studies for the Windy Flats Wind Energy Project, Klickitat County, Washington. Prepared for Windy Point Partners, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. May 29, 2007.

Johnson, G. D., K. Bay, and J. Eddy. 2009a. Wildlife Baseline Studies for the Dunlap Ranch Wind Resource Area, Carbon and Albany Counties, Wyoming. Prepared for CH2M HILL, Englewood, Colorado. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G. D., K. Bay, and J. Eddy. 2009b. Wildlife Baseline Studies for the High Plains Wind Resource Area, Carbon and Albany Counties, Wyoming. Prepared for CH2M HILL. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Year One Report. Prepared for High Winds, LLC and FPL Energy.

Klem, D., Jr. 1990. Collisions between Birds and Windows: Mortality and Prevention. Journal of Field Ornithology 61(1): 120-128.

Kronner, K., R. Gritski, J. Baker, V. Marr, G. Johnson, and K. Bay. 2005. Wildlife Baseline Study for the Leaning Juniper Wind Power Project, Gilliam County, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). Prepared for PPM Energy, Portland, Oregon and CH2M HILL, Portland, Oregon by NWC, Pendleton, Oregon, and WEST, Cheyenne, Wyoming. November 3, 2005.

Kunz, T. H., E. B. Arnett, B. M. Cooper, W. P. Erickson, R. P. Larkin, T. Mabee, M. L. Morrison, M. D. Strickland, and J. M. Szewczak. 2007a. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management 71(8): 2449-2486. doi: 10.2193/2007-270.

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007b. Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. Frontiers in Ecology and the Environment 5(6): 315-324.

Leddy, K. L. 1996. Effects of Wind Turbines on Nongame Birds in Conservation Reserve Program Grasslands in Southwestern Minnesota. Thesis. South Dakota State University, Brookings.

Leddy, K. L., K. F. Higgins, and D. E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands. Wilson Bulletin 111(1): 100-104.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, D. G. Bert, L. M. Sullivan, E. Mutrie, S. A. Gauthreaux, Jr., M. L. Avery, R. L. Crawford, A. M. Manville, II, E. R. Travis, and D. Drake. 2012. An Estimate of Avian Mortality at Communication Towers in the United States and Canada. PLoS ONE 7(4): e34025. doi: 10.1371/journal.pone.0034025.

Loss, S. R., T. Will, and P. P. Marra. 2013. The Impact of Free-Ranging Domestic Cats on Wildlife of the United States. Natural Communications 4: 1396.

Madders, M. and D. P. Whitfield. 2006. Upland Raptors and the Assessment of Wind Farm Impacts. Ibis 148(S1): 43-56. doi: 10.1111/j.1474-919X.2006.00506.x.

Minnesota Public Utilities Commission (MPUC). 2012. Lakefield Wind Project Avian and Bat Fatality Monitoring. MPUC Site Permit Quarterly Report and USFWS Special Purpose – Utility (Avian Take Monitoring) 30-Day Report: April 1 – September 30, 2012. USFWS Permit No: MB70161A-0; MDNR Permit No: 17930; MPUC Permit No: IP-6829/WS-09-1239, Permit Special Condition VII.B. October 15, 2012. Available online: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={DEE3ABC0-1AD5-45CF-9451-EBF6F3C4C489}&documentTitle=201210-79566-01

National Land Cover Database (NLCD). 2011. *As cited* includes:

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States - Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354.

and

Multi-Resolution Land Characteristics (MRLC). 2019. National Land Cover Database (NLCD) 2011. Multi-Resolution Land Characteristics (MRLC) Consortium. US Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, MRLC Project, Sioux Falls, South Dakota. May 10, 2019. Available online: https://www.mrlc.gov/data

National Land Cover Database (NLCD). 2016. *As cited* includes:

Yang, L., S. Jin, P. Danielson, C. Homer, L. Gass, S. M. Bender, A. Case, C. Costello, J. Dewitz, J. Fry, M. Funk, B. Granneman, G. C. Liknes, M. Rigge, and G. Xian. 2018. A New Generation of the United States National Land Cover Database: Requirements, Research Priorities, Design, and Implementation Strategies. ISPRS Journal of Photogrammetry and Remote Sensing 146: 108-123. doi: 10.1016/j.isprsjprs.2018.09.006.

and

Multi-Resolution Land Characteristics (MRLC). 2019. National Land Cover Database (NLCD) 2016. Multi-Resolution Land Characteristics (MRLC) Consortium. US Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, MRLC Project, Sioux Falls, South Dakota. May 10, 2019. Available online: https://www.mrlc.gov/data.

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects. National Academies Press, Washington, D.C.

Niemuth, N. D., A. J. Ryba, A. T. Pearse, S. M. Kvas, D. A. Brandt, B. Wangler, J. E. Austin, and M. J. Carlisle. 2018. Opportunistically Collected Data Reveal Habitat Selection by Migrating Whooping Cranes in the U.S. Northern Plains. Condor 120(2): 343-356. doi: 10.1650/CONDOR-17-80.1.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2004. Ecological Baseline Studies for the Roosevelt Wind Project, Klickitat County, Washington. Final Report. Prepared by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. September 2004.

Northwest Wildlife Consultants, Inc. (NWC), and Western EcoSystems Technology, Inc. (WEST). 2005. Ecological Baseline Studies and Wildlife Impact Assessment for the White Creek Wind Power Project, Klickitat County, Washington. Prepared for Last Mile Electric Cooperative, Goldendale, Washington. Prepared by K. Kronner, R. Gritski, and J. Baker, NWC, Goldendale, Washington, and G.D. Johnson, K. Bay, R.Good, and E. Lack, WEST, Cheyenne Wyoming. January 12, 2005.

Orloff, S. and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report P700-92-001 to Alameda, Contra Costa, and Solano Counties, and the California Energy Commission, Sacramento, California, by Biosystems Analysis, Inc., Tiburon, California. March 1992.

Pearse, A. T., D. A. Brandt, W. C. Harrell, K. L. Metzger, D. M. Baasch, and T. J. Hefley. 2015. Whooping Crane Stopover Site Use Intensity within the Great Plains. USGS Open-File Report 2015-1166. US Geological Survey (USGS). 12 pp. doi: 10.3133/ofr20151166. Available online: https://pubs.usgs.gov/of/2015/1166/ofr2015-1166.pdf

Pearse, A. T., M. Rabbe, M. T. Bidwell, L. M. Juliusson, L. Craig-Moore, D. A. Brandt, and W. Harrell. 2018. Map of Whooping Crane Migration Corridor. US Geological Survey (USGS) ScienceBase-Catalog, USGS Data Release Products. Available online: https://data.usgs.gov/datacatalog/data/USGS:5a314a72e4b08e6a89d707e0

Pearse, A. T., D. A. Brandt, D. M. Baasch, M. T. Bidwell, J. A. Conkin, M. J. Harner, W. Harrell, and K. L. Metzger. 2020. Location Data for Whooping Cranes of the Aransas-Wood Buffalo Population, 2009-2018. US Geological Survey (USGS) data release. USGS, Reston, Virginia. May 15, 2020. doi: 10.5066/P9Y8KZJ9. Available online: https://www.sciencebase.gov/catalog/item/5ea3071582cefae35a19349a

Pimentel, D., L. McLaughlin, A. Zepp, B. Lakitan, T. Kraus, P. Kleinman, F. Vancini, W. J. Roach, E. Graap, W. S. Keeton, and G. Selig. 1991. Environmental and Economic Impacts of Reducing U.S. Agricultural Pesticide Use. Pp. 679-718. *In*: D. Pimentel, ed. Handbook of Pest Management in Agriculture. Second Edition. CRC Press, Boca Raton, Florida.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. General Technical Report (GTR). PSW-GTR-144. US Department of Agriculture (USDA) Forest Service General Technical Report (GTR), Pacific Southwest (PSW) Research Station, Albany, California. Available online: http://www.fs.fed.us/psw/publications/documents/gtr-144/

Richardson, S. M., P. R. Lintott, D. J. Hosken, T. Economou, and F. Mathews. 2021. Peaks in bat activity at turbines and the implications for mitigating the impact of wind energy development on bats. Scientific Reports. 11, 3636. doi: 101038/s41598-021-82014-9. Available online: https://doi.org/10.1038/s41598-021-82014-9

Rollins, K. E., D. K. Meyerholz, G. D. Johnson, A. P. Capparella, and S. S. Loew. 2012. A Forensic Investigation into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? Veterinary Pathology 49(2): 362-371.

Shaffer, J. A. and D. A. Buhl. 2016. Effects of Wind-Energy Facilities on Breeding Grassland Bird Distributions. Conservation Biology 30(1): 59-71. doi: 10.1111/cobi.12569.

Shaffer, J. A., C. R. Loesch, and D. A. Buh. 2019. Estimating Offsets for Avian Displacement Effects of Anthropogenic Impacts. Ecological Applications: doi: 10.1002/eap.1983.

Smallwood, K. S. 2013. Comparing Bird and Bat Fatality-Rate Estimates among North American Wind-Energy Projects. Wildlife Society Bulletin 37(1): 19-33.

Solick, D., D. Pham, K. Nasman, and K. Bay. 2020. Bat Activity Rates Do Not Predict Bat Fatality Rates at Wind Energy Facilities. Acta Chiropterologica 22(1): 135-146. doi: 10.3161/15081109ACC2020.22.1.012.

South Dakota Bat Working Group. 2004. South Dakota Bat Management Plan, Wildlife Division Report 2004-08. July 13, 2004. Available online: https://gfp.sd.gov/UserDocs/nav/bat-managment-plan.pdf

South Dakota Game, Fish and Parks (SDGFP). 2014. South Dakota Wildlife Action Plan. Wildlife Division Report 2014-03. SDGFP, Pierre, South Dakota. Available online: http://gfp.sd.gov/images/WebMaps/Viewer/WAP/Website/PlanSections/SD%20Wildlife%20Action%20Plan%20Revision%20Final.pdf

South Dakota Game, Fish and Parks (SDGFP). 2016. State and Federally Listed Threatened, Endangered and Candidate Species Documented in South Dakota by County. SDGFP, Pierre, South Dakota. Updated July 19, 2016. Available online: https://gfp.sd.gov/userdocs/docs/ThreatenedCountyList.pdf

South Dakota Game, Fish and Parks (SDGFP) 2009. Siting Guidelines for Wind Power Projects in South Dakota. SDGFP, Pierre, South Dakota. 17 pp. Available online: https://gfp.sd.gov/userdocs/docs/wind-energy-guidelines.pdf

Strickland, M. D. 2004. Non-Fatality and Habitat Impacts on Birds from Wind Energy Development. S. S. Schwartz, ed. *In*: Proceedings of the Wind Energy and Birds/Bats Workshop: Understanding and Resolving Bird and Bat Impacts. Washington, D.C. May 18-19, 2004. September 2004. Prepared by RESOLVE, Inc., Washington, D.C.

Strickland, M. D., E. B. Arnett, W. P. Erickson, D. H. Johnson, G. D. Johnson, M. L. Morrison, J. A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative (NWCC), Washington, D.C., USA. June 2011. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Comprehensive-Guide-to-Studying-Wind-Energy-Wildlife-Interactions.pdf

Tetra Tech. 2017. 2016 - 2017 Post-Construction Mortality Monitoring Annual Report, Pleasant Valley Wind Farm, Mower and Dodge Counties, Minnesota. Prepared for Northern States Power Company-Minnesota, Xcel Energy. Prepared by Tetra Tech, Bloomington, Minnesota. June 2017. Available online: https://mn.gov/commerce/energyfacilities/Docket.html?Id=25724

The Watershed Institute (TWI). 2012. Potentially Suitable Habitat Assessment for the Whooping Crane (*Grus americana*). TWI, Topeka, Kansas. Accessed October 2021. Available online: https://thewatershed.org/

Tierney, R. 2007. Buffalo Gap I Wind Farm Avian Mortality Study: February 2006-January 2007. Final Survey Report. Final Survey Report. Prepared for AES SeaWest, Inc. TRC, Albuquerque, New Mexico. TRC Report No. 110766-C-01. May 2007.

URS Corporation, Western EcoSystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. (NWC). 2001. Avian Baseline Study for the Stateline Project. Prepared for FPL Energy Vansycle, LLC, Juno Beach, Florida.

US Department of Agriculture (USDA). 2019. Imagery Programs - National Agriculture Imagery Program (NAIP). USDA, Farm Service Agency (FSA), Aerial Photography Field Office (APFO), Salt Lake City, Utah. Accessed October 2021. Available online: https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). 2015. Cropscape and Cropland Data Layer. USDA NASS, Washington, D. C.

US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). 2018. 2018 South Dakota Cropland Data Layer. USDA NASS, Washington, D.C. Available online: https://nassgeodata.gmu.edu/CropScape/

US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP). 2019. NAIP Aerial Imagery. USDA Farm Service Agency.

US Department of the Interior (USDOI). 2017. The Migratory Bird Treaty Act Does Not Prohibit Incidental Take. Memorandum M-37050. Office of the Solicitor, Washington, D. C. December 22, 2017. 41 pp. Available online: https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf

US Environmental Protection Agency (USEPA). 2013. Level III and Level IV Ecoregions of the Continental United States. Ecosystems Research, USEPA. April 16, 2013. Accessed October 2021. Available online: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states

US Fish and Wildlife Service (USFWS). 1967. The Endangered Species List - 1967. 32 Federal Register (FR) 48: 4001. March 11, 1967.

US Fish and Wildlife Service (USFWS). 1985. Determination of Endangered and Threatened Status for Piping Plover; Final Rule. Department of the Interior Fish and Wildlife Service. 50 Federal Register (FR) 50726-50734. December 11, 1985.

US Fish and Wildlife Service (USFWS). 2002. Migratory Bird Mortality: Many Human-Caused Threats Afflict Our Bird Populations. USFWS Division of Migratory Bird Management, Arlington, Virginia. January 2002.

US Fish and Wildlife Service (USFWS). 2009. Migratory Bird Mortality in Oilfield Wastewater Disposal Facilities. Wyoming Ecological Services Field Office - Environmental Contaminants Program. Available online: http://www.fws.gov/mountain-prairie/contaminants/documents/COWDFBirdMortality.pdf

US Fish and Wildlife Service (USFWS). 2011. Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects. Revised October 26, 2011. Available online: http://www.fws.gov/midwest/endangered/mammals/inba/pdf/inbaS7and10WindGuidanceFinal26Oct2011.pdf

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. 103 pp. + frontmatter. Available online: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

US Fish and Wildlife Service (USFWS). 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot; Final Rule. 50 CFR Part 17. Department of the Interior Fish and Wildlife Service. 79 Federal Register (FR) 239: 73706-73748. December 11, 2014.

US Fish and Wildlife Service (USFWS). 2015. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(d) Rule; Final Rule and Interim Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. 80 Federal Register (FR) 63: 17974-18033. April 2, 2015.

U.S. Fish and Wildlife Service (USFWS). 2019a Range-Wide Indiana Bat Summer Survey Guidelines. USFWS Region 3, Bloomington, Indiana. April 209. 63 pp., including appendices. Available online: https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2019_Rangewide_IBat_Survey_Guidelines.pdf

US Fish and Wildlife Service (USFWS). 2019b. Recovery Outline for the Rufa Red Knot (*Calidris canutus rufa*). March 2019. 33 pp. Available online: https://ecos.fws.gov/docs/recovery_plan/20190409%20Red%20Knot%20Recovery%20Outline%20final%20signed.pdf

US Fish and Wildlife Service (USFWS). 2020a. Range-Wide Indiana Bat Survey Guidelines. March 2020. 65 pp. Available online: https://www.fws.gov/midwest/Endangered/mammals/inba/surveys/pdf/FINAL%20Range-wide%20IBat%20Survey%20Guidelines%203.23.20.pdf

US Fish and Wildlife Service (USFWS). 2020b. Region 6 Recommended Protocol for Conducting Pre-Construction Eagle Nest Surveys at Wind Energy Projects. USFWS, Region 6, Migratory Bird Management Office, Mountain-Prairie Region. January 14, 2020. Available online: https://www.fws.gov/mountain-prairie/migbirds/library/USFWS%20R6%20recommended%20Eagle%20Nest%20Survey%20Protocol%20for%20wind%20projects_14Jan2020.pdf

US Fish and Wildlife Service (USFWS). 2020c. Updated Eagle Nest Survey Protocol. 4 pp. *Attachment to:* US Fish and Wildlife Service (USFWS). 2020. Eagle Surveys. Memorandum to Regional Directors, Regions 1-12. From J. Ford, Assistant Director for Migratory Birds. USFWS, Washington, D.C. April 21, 2020. Available online: https://www.fws.gov/migratorybirds/pdf/management/EagleNestSurveyGuidanceUpdated.pdf

US Fish and Wildlife Service (USFWS). 2021a. Birds of Conservation Concern 2021. USFWS Migratory Birds, Falls Church, Virginia. April 2021. Available online: https://www.fws.gov/migratorybirds/pdf/management/birds-of-conservation-concern-2021.pdf

US Fish and Wildlife Service (USFWS). 2021b. Cooperative Whooping Crane Tracking Project (CWCTP). Whooping Crane Sightings through Spring 2021. GIS Layer from CWCTP database. USFWS Nebraska Ecological Services Field Office, Grand Island, Nebraska.

US Fish and Wildlife Service (USFWS). 2021c. Endangered and Threatened Wildlife and Plants; Removal of the Interior Least Tern from the Federal List of Endangered and Threatened Wildlife; Final Rule. 50 CFR Part 17. Department of the Interior Fish and Wildlife Service. 86 Federal Register (FR) 8: 2564-2581. 86 FR 2564. January 13, 2021.

US Fish and Wildlife Service (USFWS). 2021d. Initial Project Scoping: IPaC - Information for Planning and Consultation. IPaC, Environmental Conservation Online System (ECOS), USFWS. Accessed September 2021. Available online: http://ecos.fws.gov/ipac/

U.S. Fish and Wildlife Service (USFWS). 2022. Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines. USFWS, Department of the Interior. March 2022. 67 pp. Available online: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines

US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2014. Seamless Wetlands Data by State: South Dakota. USFWS NWI Data Mapper. USFWS NWI, Fort Snelling, Minnesota. Updated May 1, 2014. Available online: http://www.fws.gov/wetlands/data/State-Downloads.html

US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2016. Seamless Wetlands Data by State. National Wetlands Inventory website. USFWS, Washington, D. C. Last updated October 13, 2016.

US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2021. Wetlands Mapper. USFWS NWI Fort Snelling, Minnesota. Updated May 3, 2021. Accessed October 2021. Available online: https://www.fws.gov/wetlands/data/Mapper.html

US Geological Survey (USGS). 2019. National Hydrography Dataset (NHD). USGS NHD Extracts. August 8, 2019. Accessed October 2021. Available online: https://www.usgs.gov/core-science-systems/ngp/national-hydrography

US Geological Survey (USGS). 2021. 3D Elevation Program (3DEP). 3D elevation data from light detection and ranging (lidar) data: conterminous United States, Hawaii, and the US territories. USGS, Reston, Virginia. Accessed October 2021. Available online: https://www.usgs.gov/core-science-systems/ngp/3dep

US Geological Survey (USGS) Protected Areas Database of the United States (PAD-US). 2019. Protected Areas Data. USGS National Gap Analysis Program (GAP) - Protected Areas Data Portal. Accessed September 2021. Available online: http://gapanalysis.usgs.gov/padus/data/

US North American Bird Conservation Initiative (NABCI). 2021. Bird Conservation Regions Map. NABCI. Accessed April 2021. Available online: https://nabci-us.org/resources/bird-conservation-regions-map/

USA Topo. 2013. USA Topo Maps. US Geological Survey (USGS) topographical maps for the United States. ArcGIS. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California.

Western EcoSystems Technology, Inc. (WEST). 2005a. Ecological Baseline Study at the Elkhorn Wind Power Project. Exhibit A. Final report prepared for Zilkha Renewable Energy, LLC, Portland, Oregon, by WEST, Cheyenne, Wyoming. June 2005.

Western EcoSystems Technology, Inc. (WEST). 2005b. Ecological Baseline Study for the Proposed Reardan Wind Project, Lincoln County, Washington. Draft Final Report. Prepared for Energy Northwest, Richland, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 2005.

Western EcoSystems Technology, Inc. (WEST). 2005c. Wildlife and Habitat Baseline Study for the Proposed Biglow Canyon Wind Power Project, Sherman County, Oregon. March 2004 - August 2005. Prepared for Orion Energy LLC., Oakland, California. WEST, Cheyenne, Wyoming. October, 2005.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 – February 2006. Technical report submitted to FPL Energy and Alameda County California. Prepared by WEST, Cheyenne, Wyoming. April 2006. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=23991

Western EcoSystems Technology, Inc. (WEST), the Colorado Plateau Research Station (CPRS), and Ecological Monitoring and Assessment Program. 2006. Avian Studies for the Proposed Sunshine Wind Park, Coconino County, Arizona. Prepared for Sunshine Arizona Wind Energy, LLC., Flagstaff, Arizona. Prepared by WEST, Cheyenne, Wyoming, and CPRS and Ecological Monitoring and Assessment Program, Northern Arizona University, Flagstaff, Arizona. May 2006.

Western EcoSystems Technology, Inc. (WEST). 2009. Wildlife Baseline Studies for the Antelope Ridge Wind Resource Area, Union County, Oregon. August 28, 2008 - August 12, 2009. Draft final report prepared for Horizon Wind Energy, Houston, Texas. Prepared by WEST, Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2019. Regional Summaries of Wildlife Fatalities at Wind Facilities in the United States. 2019 Report from the Renew Database. WEST, Cheyenne, Wyoming. December 31, 2019. Available online: https://west-inc.com/wp-content/uploads/2020/10/WEST_2019_RenewWildlifeFatalitySummaries-1.pdf

Young, D. P., Jr., W. P. Erickson, K. Bay, and R. Good. 2002. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report, April 2001 - April 2002. Prepared for Bonneville Power Administration, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. November 20, 2002. Available online: https://tethys.pnnl.gov/publications/baseline-avian-studies-proposed-maiden-wind-farm-yakima-benton-counties-washington

Young, D. P., Jr., W. P. Erickson, J. Jeffrey, K. Bay, R. E. Good, and E. G. Lack. 2003a. Avian and Sensitive Species Baseline Study Plan and Final Report. Eurus Combine Hills Turbine Ranch, Umatilla County, Oregon. Technical report prepared for Eurus Energy America Corporation, San Diego, California and Aeropower Services, Inc., Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 10, 2003.

Young, D. P., Jr., W. P. Erickson, K. Bay, J. Jeffrey, E. G. Lack, and H. H. Sawyer. 2003b. Baseline Avian Studies for the Proposed Desert Claim Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Desert Claim Wind Power, LLC, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 2003.

Young, D. P., Jr., W. P. Erickson, K. Bay, J. Jeffrey, E. G. Lack, R. E. Good, and H. H. Sawyer. 2003c. Baseline Avian Studies for the Proposed Hopkins Ridge Wind Project, Columbia County, Washington. Final Report: March 2002 - March 2003. Prepared for RES North America, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. April 30, 2003. Available online: https://tethys.pnnl.gov/publications/baseline-avian-studies-proposed-hopkins-ridge-wind-project-columbia-county-washington

Young, D. P., Jr., J. Jeffrey, W. P. Erickson, K. Bay, V. K. Poulton, K. Kronner, R. Gritski, and J. Baker. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report: February 2004 - February 2005. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla Washington, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. February 21, 2006. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Young-2006.pdf

Young, D. P., Jr., V. K. Poulton, and K. Bay. 2007a. Ecological Baseline Studies Report. Proposed Dry Lake Wind Project, Navajo County, Arizona. Prepared for PPM Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 1, 2007. Available online: https://tethys.pnnl.gov/sites/default/files/publications/YoungWEST-2007.pdf

Young, D. P., Jr., G. D. Johnson, V. K. Poulton, and K. Bay. 2007b. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 31, 2007. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Young-et-al-2007.pdf

12.2 Acts, Rules, and Regulations

16 United States Code (USC) § 668. 1940. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter II - Protection of Bald and Golden Eagles; Section (§) 668 - Bald and Golden Eagles. 16 USC 668. [June 8, 1940, Chapter (Ch.) 278, Section (§) 2, 54 Statute (Stat.) 251; Public Law (PL) 87-884, October 24, 1962, 76 Stat. 1246; PL 92–535, §2, October 23, 1972, 86 Stat. 1065; PL 95-616, §9, November 8, 1979, 92 Stat. 3114.]. Available online: https://www.gpo.gov/fdsys/pkg/USCODE-2010-title16/pdf/USCODE-2010-title16-chap5A-subchapII.pdf

16 United States Code (USC) § 668c. 1940. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter II - Protection of Bald and Golden Eagles; Section (§) 668c - Definitions. 16 USC 668c. [June 8, 1940, Chapter (Ch.) 278, Section (§) 4, 54 Statute (Stat.) 251; Public Law (PL) 92-535, § 4, October 23, 1972, 86 Stat. 1065.]. Available online: https://www.gpo.gov/fdsys/pkg/USCODE-2010-title16/pdf/USCODE-2010-title16-chap5A-subchapII.pdf

16 United States Code (USC) § 703. 1918. Title 16 - Conservation; Chapter 7 - Protection of Migratory Game and Insectivorous Birds; Subchapter II - Migratory Bird Treaty; Section (§) 703 - Taking, Killing, or Possessing Migratory Birds Unlawful. 16 USC 703. [July 3, 1918, Chapter (Ch.) 128, § 2, 40 Statute (Stat). 755; June 20, 1936, Ch. 634, § 3, 49 Stat. 1556; Public Law (P.L.) 93–300, § 1, June 1, 1974, 88 Stat. 190; P.L. 101–233, § 15, December 13, 1989, 103 Stat. 1977; P.L. 108-447, division E, title I, § 143(b), December 8, 2004, 118 Stat. 3071.].

16 United States Code (USC) § 1531. 1973. Title 16 - Conservation; Chapter 35 - Endangered Species; Section (§) 1531 - Congressional Findings and Declaration of Purposes and Policy. 16 USC 1531. December 28, 1973. [Public Law (P.L.) 93-205, Section (§) 2, December 28, 1973, 87 Statute [Stat.] 884; P.L. 96-159, § 1, December 28, 1979, 93 Stat. 1225; P.L. 97-304, § 9(a), October 13, 1982, 96 Stat. 1426; P.L. 100-478, Title I, § 1013(a), October 7, 1988, 102 Stat. 2315.]. Available online: https://www.gpo.gov/fdsys/pkg/USCODE-2011-title16/pdf/USCODE-2011-title16-chap35-sec1531.pdf

16 United States Code (USC) § 1532. 1973. Title 16 - Conservation; Chapter 35 - Endangered Species; Section (§) 1532 - Definitions. 16 USC 1532. December 28, 1973. [Public Law (P.L.) 93-205, § 3, December 28, 1973, 87 Statute (Stat.) 885; P.L. 94-359, § 5, July 12, 1976, 90 Stat. 913; P.L. 95-632, § 2, November 10, 1978, 92 Stat. 3751; P.L. 96-159, § 2, December 28, 1979, 93 Stat. 1225; P.L. 97-304, § 4(b), October 13, 1982, 96 Stat. 1420; P.L. 100-478, Title I, § 1001, October 7, 1988, 102 Stat. 2306.]. Available online: https://www.gpo.gov/fdsys/pkg/USCODE-2011-title16/pdf/USCODE-2011-title16-chap35-sec1532.pdf

16 United States Code (USC) §§ 668-668d. 1940. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter II - Protection of Bald and Golden Eagles; Sections (§§) 668-668d - Bald and Golden Eagles. 16 USC 668-668d. [June 8, 1940, Chapter (Ch.) 278, Section (§) 4, 54 Statute (Stat.) 251; Public Law (PL) 92-535, § 4, October 23, 1972. 86 Stat. 1064.]. Available online: https://www.gpo.gov/fdsys/pkg/USCODE-2010-title16/pdf/USCODE-2010-title16-chap5A-subchapII.pdf

50 Code of Federal Regulations (CFR) § 10.12. 1973. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§) 10.12. Definitions. 50 CFR 10.12. [38 Federal Register (FR) 22015, August 15, 1973, as amended at 42 FR 32377, June 24, 1977; 42 FR 59358, November 16, 1977; 45 FR 56673, August 25, 1980; 50 FR 52889, December 26, 1985; 72 FR 48445, August 23, 2007.].

50 Code of Federal Regulations (CFR) § 10.13. 1973. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§) 10.13. List of Migratory Birds. 50 CFR 10.13. [38 Federal Register (FR) 22015, August 15, 1973, as amended 50 FR 52889, December 26, 1985.].

50 Code of Federal Regulations (CFR) § 22.26. 2009. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.26 - Permits for Eagle Take That Is Associated with, but Not the Purpose of, an Activity. 50 CFR 22.26. [74 FR 46877, September 11, 2009, as amended at 79 FR 73725, December 9, 2013.].

50 Code of Federal Regulations (CFR) § 22.27. 2009. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.27 - Removal of Eagle Nests. 50 CFR 22.27. [74 Federal Register (FR) 46877, September 11, 2009.].

81 Federal Register (FR) 242: 91494-91554. 2016. Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests; Final Rule. Department of the Interior Fish and Wildlife Service. 81 FR 91494. December 16, 2016. Available online: https://www.gpo.gov/fdsys/pkg/FR-2016-12-16/pdf/2016-29908.pdf

86 Federal Register (FR) 4: 1134-1165. 2021. Regulations Governing Take of Migratory Birds; Final Rule. Department of the Interior, Fish and Wildlife Service. 50 CFR Part 10. 86 FR 1134. January 7, 2021. Available online: https://www.govinfo.gov/content/pkg/FR-2021-01-07/pdf/2021-00054.pdf

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Sections (§§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 250; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].

Endangered Species Act (ESA). 1973. 16 United States Code (USC) Sections (§§) 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.

Executive Order (EO) 13186. 2001. Responsibilities of Federal Agencies to Protect Migratory Birds. President Clinton. [66 Federal Register (FR) 11: 3853-3856. January 17, 2001.]. January 10, 2001. Available online: https://www.gpo.gov/fdsys/pkg/FR-2001-01-17/pdf/FR-2001-01-17.pdf

Migratory Bird Treaty Act (MBTA). 1918. 16 United States Code (USC) Sections (§§) 703-712. July 13, 1918.

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

Appendix B. Triple H Wind Project Habitat Characterization – Technical Memo

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

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

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

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

Appendix J. Prairie Grouse Lek Surveys for the Triple H Wind Project, Hughes and Hyde Counties, South Dakota – 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 Wind Project, Hyde and Hughes Counties, South Dakota – Final Report April 25 – October 25, 2018

Appendix M. Whooping Crane Operational Procedure and Monitoring Program for the North Bend Wind Project,

Appendix N. North Bend Wind Project Field Studies and Habitat Assessments Summary
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Appendix O. Summary of Triple H Whooping Crane Monitoring Efforts: April 11 – 20, 2022, Hyde County, South Dakota

Appendix P. 2016 and 2018 Bat Acoustic Monitoring at the North Bend Wind Project, Hyde and Hughes Counties, South Dakota - Technical Memo