Bird and Bat Conservation Strategy
Tatanka Ridge Wind Project

Deuel County, South Dakota

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LIST OF ACRONYMS AND ABBREVIATIONS

ac	acre
Avangrid	Avangrid Renewables, LLC
AWWI	American Wind Wildlife Institute
BCC	birds of conservation concern
BBCS	Bird and Bat Conservation Strategy
BGEPA	Bald and Golden Eagle Protection Act
ECPG	*Eagle Conservation Plan Guidance*
ESA	Endangered Species Act
FR	Federal Register
ft	foot/feet
GE	General Electric
in	inches
IPaC	Information for Planning and Consultation
m	meter
MBTA	Migratory Bird Treaty Act
met	meteorological
mi	mile
min	minute
MRLC	Multi-Resolution Land Characteristics
MW	megawatts
NHD	National Hydrography Dataset
NLEB	northern long-eared bat
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
Project	Tatanka Ridge Wind Project
RD	rotor diameter
SDGFP	South Dakota Game, Fish, and Parks
SDNHP	South Dakota Natural Heritage Program
SDPUC	South Dakota Public Utilities Commission
Summer Survey Guidelines	*2018 Range-Wide Indiana Bat Summer Survey Guidelines and 2019 Range-Wide Indiana Bat Survey Guidelines*
SWCA	SWCA Environmental Consultants Inc.
SWPPP	Stormwater Pollution Prevention Plan
Tatanka Ridge	Tatanka Ridge Wind, LLC
USACE	US Army Corps of Engineers
USC	United States Code
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey

LIST OF ACRONYMS AND ABBREVIATIONS (CONT'D.)

WC	Tatanka Ridge Wildlife Coordinator
WEG	*Land-Based Wind Energy Guidelines*
WEST	Western EcoSystems Technology, Inc.
WMA	Wildlife Management Area
WNS	white-nose syndrome
WPA	Waterfowl Production Area

NOTES ON UNITS

Imperial units are used throughout this document, with the exception of describing survey methodology, where metric is used to be consistent with agency guidelines, or describing turbine specifications to be consistent with the manufacturer descriptions. Conversions are provided below.

Unit Conversions

Imperial	Metric
1 foot	0.3048 meter
3.28 feet	1 meter
1 mile	1.61 kilometers
0.621 mile	1 kilometer
1 acre	0.40 hectare
2.47 acres	1 hectare

Common Conversions

Imperial	Metric
0.12 mile	200 meters
0.5 mile	800 meters
10 miles	16.1 kilometers

Revision Number	Document Date	Comments	Reviser Initials
00	April 15, 2020	SDPUC filing, Construction	

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1. INTRODUCTION

The Tatanka Ridge Wind Project (Project) is a proposed utility-scale wind energy facility in Deuel County, South Dakota approximately 6 miles (mi) west of the South Dakota/Minnesota border, and directly north of the town of Toronto, South Dakota (Figure 1). The Project will be owned and operated by Tatanka Ridge Wind, LLC (Tatanka Ridge), a subsidiary of Avangrid Renewables, LLC (Avangrid). The proposed Project will consist of 56 wind turbines with an estimated total nameplate capacity of 154.8 megawatts (MW). Construction of the Project is planned to begin in April 2020, with commercial operations anticipated to begin by the end of 2020. This Bird and Bat Conservation Strategy (BBCS) has been developed in accordance with Condition No. 34 of the site permit issued by the South Dakota Public Utilities Commission (SDPUC; Project Docket EL19–026: 11/27/19 – Final Decision and Order Granting Permit to Construct Facility; Notice of Entry) and following recommendations in the *Land-Based Wind Energy Guidelines* (WEG; US Fish and Wildlife Service [USFWS] 2012).

The purpose of this BBCS is to document strategies for avoiding and minimizing risks to wildlife during the construction and subsequent operation of the Project. It further provides a framework for complying with federal and state laws and meeting wildlife-related requirements as described in the SDPUC site permit for the Project. This document also describes monitoring and adaptive management protocols for potential impacts to affected species, specifically birds and bats.

1.1. Project Description

The Project is a proposed utility scale wind energy facility that is planned to include up to 56 turbines (Figure 2), comprising a combination of 50 General Electric (GE) 2.82-127 turbines with a 2.82-MW rating and a 127-meter (m) rotor diameter (RD) and six GE 2.3-116 turbines with a 2.3-MW rating and a 116-m RD to achieve a total generating capacity of 154.8 MW. Associated permanent infrastructure will include turbine pads, access roads, an underground collection system, meteorological (met) tower, a substation, an overhead line connecting the Project substation to the interconnection substation (referred to as a gen-tie line), and an operations and maintenance facility. Additional temporary facilities associated with construction will include staging and construction laydown yards, road improvements at public intersections to allow for delivery of large components, crane paths, and a concrete batch plant.

The Project is located within the Northern Glaciated Plains Level III Ecoregion, which covers much of the eastern portion of South Dakota (US Environmental Protection Agency [USEPA] 2017). The Northern Glaciated Plains are characterized by a flat to gently rolling landscape composed of glacial drift and serves as a transitional zone between tall and shortgrass prairie with high concentrations of temporary and seasonal wetlands (USEPA 2017). The Project is located in both the Prairie Coteau and Big Sioux Basin Level IV ecoregions (USEPA 2017), with over half the Project located in the latter. The Big Sioux Basin Ecoregion is characterized by a higher percentage of tilled land due to the general paucity of wetlands and gently rolling topography when compared to the Prairie Coteau Ecoregion.

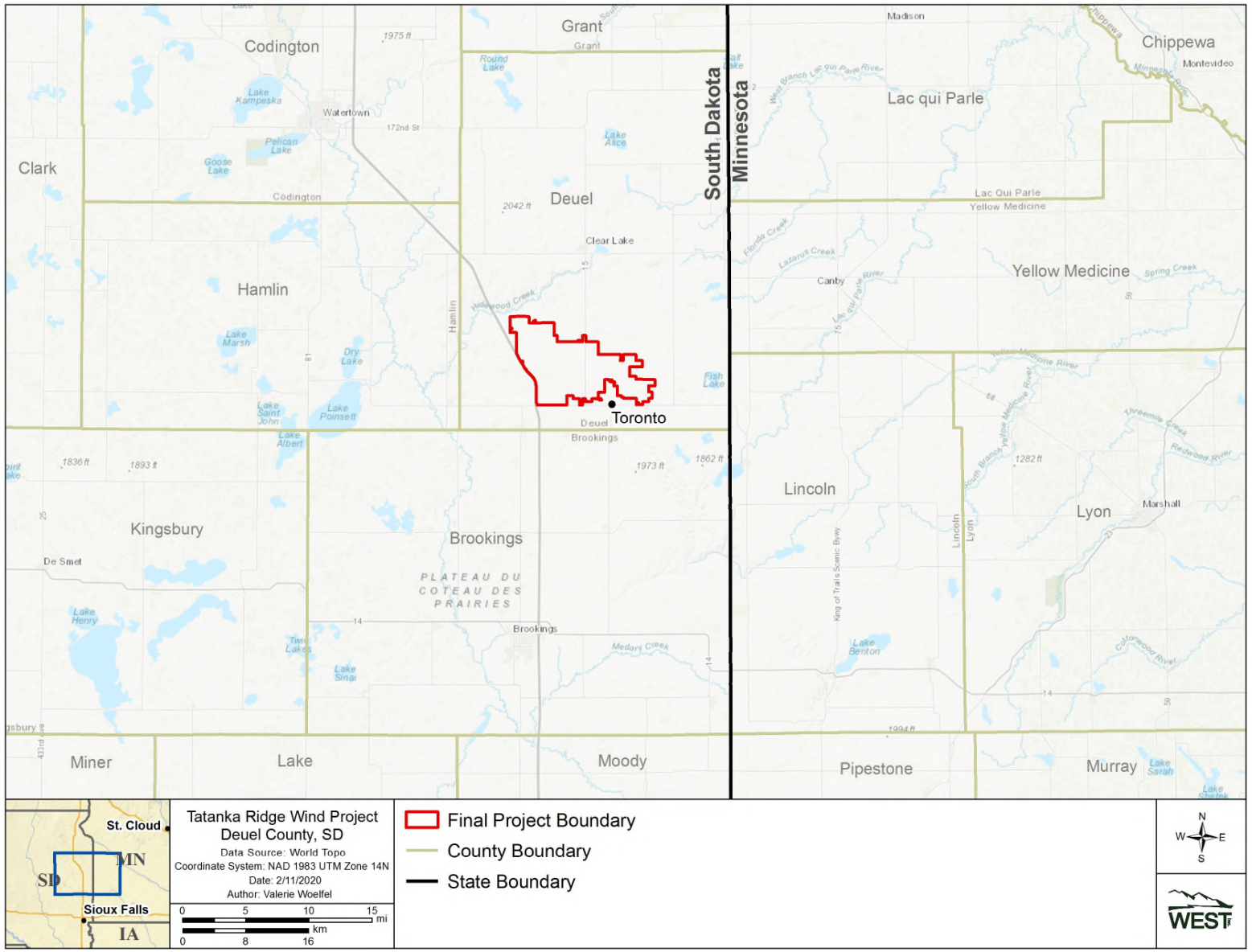

Figure 1. Location of the Tatanka Ridge Wind Project.

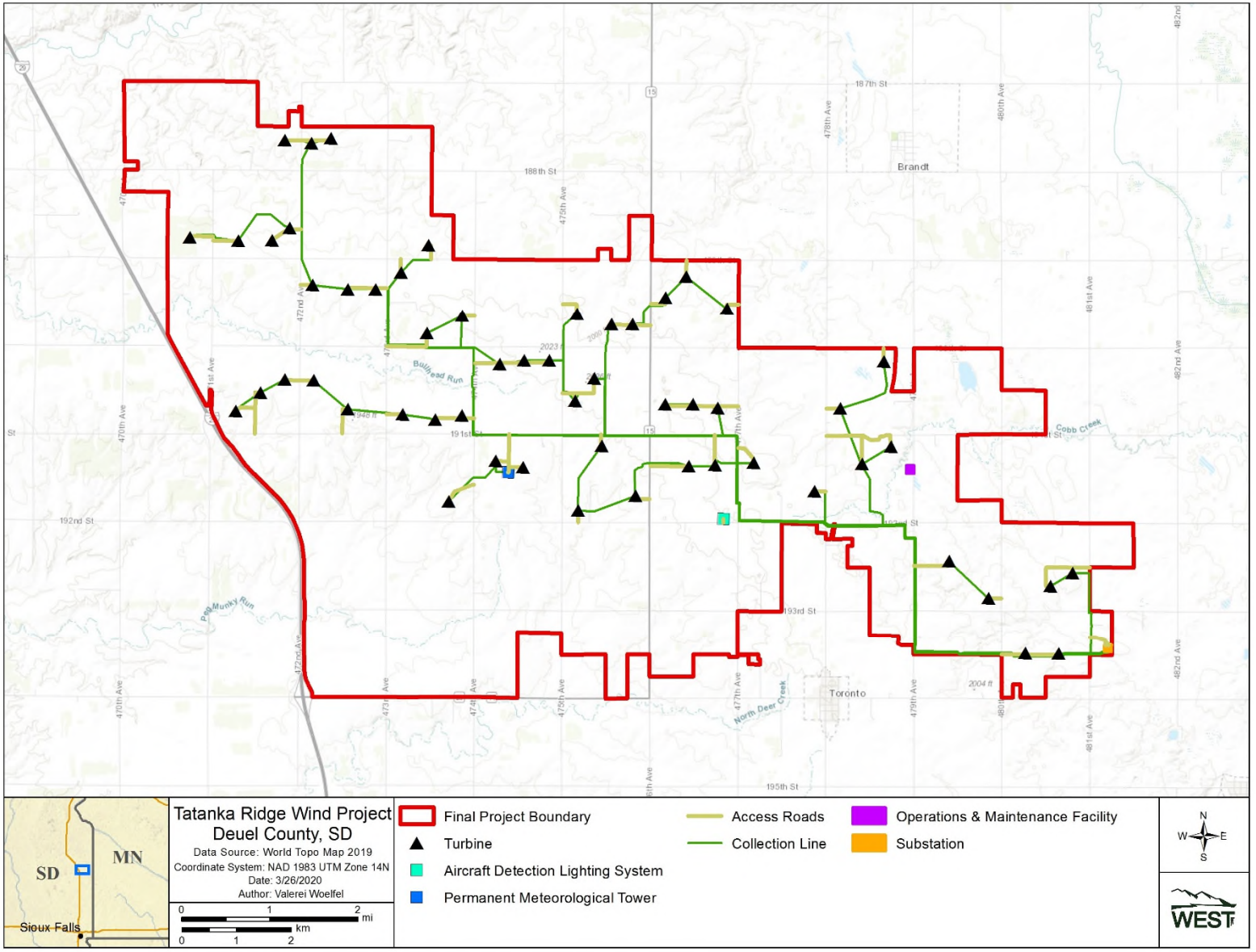

Figure 2. Layout of the Tatanka Ridge Wind Project.

1.2. Regulatory Framework

1.2.1. Endangered Species Act

Federal law protects endangered and threatened species under the Endangered Species Act of 1973 (ESA; 16 United States Code [USC] 1531–1544 [1973]). The ESA is administered by the USFWS and National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Federally listed species and their designated critical habitats are protected under the ESA, which prohibits the take or trade of listed animals; however, there is a mechanism to grant permission for take that is incidental to an otherwise lawful activity.

1.2.2. Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA; 16 USC 703–712 [1918]) assigns legal authority to the USFWS to protect over 800 species of raptors, diurnal migrants, and passerine migratory birds from take. Unlike the ESA, the MBTA only regulates direct take of migratory birds; it does not prohibit modification of habitat. The USFWS does not have a permit for incidental take of migratory birds associated with otherwise lawful activities, such as commercial or industrial operations. The USFWS released a memorandum on April 11, 2018 stating, "the MBTA's prohibitions on take apply when the purpose of an action is to take migratory birds, their eggs, or their nests." (USFWS 2018c). Accordingly, the current policy of the USFWS is that incidental take of migratory birds resulting from the operation of a wind project is not regulated by the MBTA.

1.2.3. Bald and Golden Eagle Protection Act

Bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles are afforded legal protection under authority of the Bald and Golden Eagle Protection Act of 1940 (BGEPA; 16 USC 668–668d [1940]). BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase, or barter, 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. Take is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (16 USC 668c [1940]). Disturb is defined 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 (16 USC 668c [1940]). There is a mechanism to grant permission for incidental take.

1.2.4. State Endangered and Threatened Species Law

State law protects endangered and threatened species under South Dakota Codified Law 34A–8. This law prohibits the take, possession, purchase, sale, transportation, exportation, or shipment of endangered or threatened plants and animals. Although the state of South Dakota has a process by which take of endangered and threatened species can be authorized (South Dakota Codified Law 34A–8–8), it is designed to authorize take associated with scientific, zoological, or educational purposes, and does not include take associated with otherwise lawful activity (typically referred to as incidental take).

1.2.5. State of South Dakota Site Permitting

The state of South Dakota requires wind energy facilities with a generating capacity of 100 MW or more of electricity to obtain a permit from the SDPUC before construction (South Dakota Codified Laws Chapter 49–41B and South Dakota Administrative Rules Chapter 20:10:22). The SDPUC's primary duty when reviewing an application for a permit is to ensure the location, construction, and operation of the facilities will produce minimal adverse effects on the environment and the citizens. The SDPUC issued the permit for the Project on November 27, 2019 (SDPUC Project Docket EL19–926: 11/27/19 – Final Decision and Order Granting Permit to Construct Facility; Notice of Entry).

1.2.6. Wind Development Guidance

Guidance, recommendations, and regulations regarding wind project development and wildlife impacts are constantly changing at federal, state, and local levels. On March 23, 2012, the USFWS released the WEG to guide efforts to avoid, minimize, and mitigate, impacts to wildlife and their habitats, where needed, related to land-based wind energy facilities (USFWS 2012). The guidelines outline a tiered research approach that includes searches of existing literature and data to identify potential issues of concern, field studies to provide additional data where necessary, and post-construction fatality studies to identify and quantify impacts where appropriate. This guidance document recommends that wind developers voluntarily adhere to these guidelines and communicate with USFWS as part of their due diligence process in order to avoid, minimize, and mitigate impacts to birds and bats, as well as species protected under the BGEPA and MBTA.

1.3. Agency Coordination

The WEG recommends coordination with state and federal wildlife agencies early in the development process as the developer gathers information necessary for the tiered review process. Tatanka Ridge has coordinated with the USFWS, South Dakota Game, Fish, and Parks (SDGFP), South Dakota Natural Heritage Program (SDNHP), and the SDPUC throughout the siting and development processes (Table 1). This BBCS reflects the comments and recommendations made during the coordination process with these agencies. As additional recommendations and comments are received from the agencies, this BBCS will be updated accordingly.

Table 1. Summary of agency coordination regarding wildlife at the Tatanka Ridge Wind Project in Deuel County, South Dakota.

Date	Agency	Coordination Summary
May 30, 2018	SDGFP SDNHP	WEST, on behalf of Tatanka Ridge, submitted a request for South Dakota Natural Heritage Data from the SDNHP; WEST received a response on May 30, 2018, detailing the records from the Natural Heritage Database that occurred within the 2018 Project Boundary.
Sept 5, 2018	USFWS	Conference call with Tatanka Ridge, WEST, and the USFWS to introduce and discuss the Project, other Avangrid projects in the area, construction timeline, turbine placement, and site-specific surveys conducted to date.
April 4, 2019	USFWS SDGFP	Conference call with Tatanka Ridge, WEST, SWCA, the USFWS, and the SDGFP to provide an update for the Project. The meeting participants discussed Tier 2 and Tier 3 studies conducted to date, as well as ongoing or anticipated field surveys.
May 6, 2019	SDGFP	Letter from Jesse Bermel (Tatanka Ridge) to Hilary Meyer (SDGFP) to document that the Project will not impact state-listed species, to conclude consultation under South Dakota Codified Law 34A–8–9, and to seek SDGFP comments regarding any potential concerns or issues that may exist within the Project, as well as additional permits and approvals that could be necessary.
May 6, 2019	USFWS	Letter from Jesse Bermel (Tatanka Ridge) to Scott Larson (USFWS) to seek USFWS comments regarding any potential concerns or issues that may exist within the Project.
May 14, 2019	SDGFP SDNHP	WEST, on behalf of Tatanka Ridge, submitted a request for South Dakota Natural Heritage Data from the SDNHP; WEST received a response on May 14, 2019, detailing the records from the Natural Heritage Database that occurred within 2 miles of the Final Project Boundary.
May 30, 2019	USFWS	Letter from Scott Larson (signed by Natalie Gates; USFWS) to Jesse Bermel (Tatanka Ridge) providing comments and avoidance recommendations for the Project in response to the May 6, 2019, letter from Tatanka Ridge.
June 17, 2019	SDPUC	Tatanka Ridge submitted the SDPUC Site Permit Application and Direct Written Testimony for wildlife-related studies conducted for the Project.
Sept 11, 2019	SDPUC	Supplemental Written Testimony submitted for wildlife-related studies conducted for the Project.
Oct 29, 2019	SDPUC	Supplemental Written Testimony submitted for wildlife-related studies conducted for the Project.
Nov 4, 2019	SDPUC	Wildlife-related testimony provided in evidentiary hearing for the Project.
Nov 8, 2019	SDPUC	Letter from the SDPUC to Tatanka Ridge, which included language that SDPUC staff and Tatanka Ridge had agreed to include as a condition in the site permit to resolve agency concerns regarding whooping cranes.
Nov 27, 2019	SDPUC	Final Decision and Order Granting Permit to Construct Facility issued by SDPUC to Tatanka Ridge.

Avangrid = Avangrid Renewables, LLC; Tatanka Ridge = Tatanka Ridge Wind, LLC; Project = Tatanka Ridge Wind Project; SDGFP = South Dakota Department of Game, Fish, and Parks; SDNHP = South Dakota Natural Heritage Program; SDPUC = South Dakota Public Utilities Commission, SWCA = SWCA Environmental Consultants, Inc.; USFWS = US Fish and Wildlife Service; WEST = Western EcoSystems Technology, Inc.

2. SITE CHARACTERIZATION

As part of this Project, Tatanka Ridge contracted Western EcoSystems Technology, Inc. (WEST) to conduct Tier 1 and Tier 2 site characterization studies in accordance with the WEG, which included analyzing available data in the literature and soliciting information from expert sources. On May 22, 2018, a WEST biologist conducted a site visit to field verify land cover and potential habitat for species of concern. These analyses were used to identify broader environmental and site-development issues. Detailed information from the site characterization studies is found in the WEST *Site Characterization Study Report* (Rieland and Pickle 2018).

In early 2019, subsequent to completing the Tier 1 and Tier 2 site characterization studies described above, the Project boundary expanded and shifted westward. Consistent with materials reviewed by the SDPUC associated with the site permit for the Project, this BBCS summarizes the findings from studies conducted using the 2018 boundary (referred to as the 2018 Project Boundary) as well as Tier 1 and Tier 2 studies conducted using the Project boundary developed in early 2019 (referred to as the Final Project Boundary). Both the 2018 Project Boundary and Final Project Boundary are depicted on Figure 3.

2.1. Land Cover and Habitat

The Final Project Boundary comprises 27,905 acres (ac) of mainly cultivated croplands. Based on National Land Cover Data (Yang et al. 2018, Multi-Resolution Land Characteristics [MRLC] 2019), 79.0% of the Project is composed of cultivated cropland (Table 2). Less prominent land cover types include herbaceous (14.7%), developed lands (3.4%), and hay/pasture (1.3%). The remaining land cover types each compose less than 1% of the total land cover at the Project (Table 2).

Table 2. Land cover types, coverage, and percent composition within the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Land Use	Acres	% Composition
Cultivated Crops	22,038	79.0
Herbaceous	4,089	14.7
Developed	945	3.4
Hay/pasture	354	1.3
Deciduous Forest	250	0.9
Emergent Herbaceous Wetlands	185	0.7
Open Water	34	0.1
Shrub/Scrub	4	<0.1
Woody Wetlands	4	<0.1
Mixed Forest	2	<0.1
Barren Land	<1	<0.1
Total[1]	**27,905**	**100**

Yang et al. 2018, Multi-Resolution Land Characteristics 2019

[1] Sums may not equal values shown due to rounding.

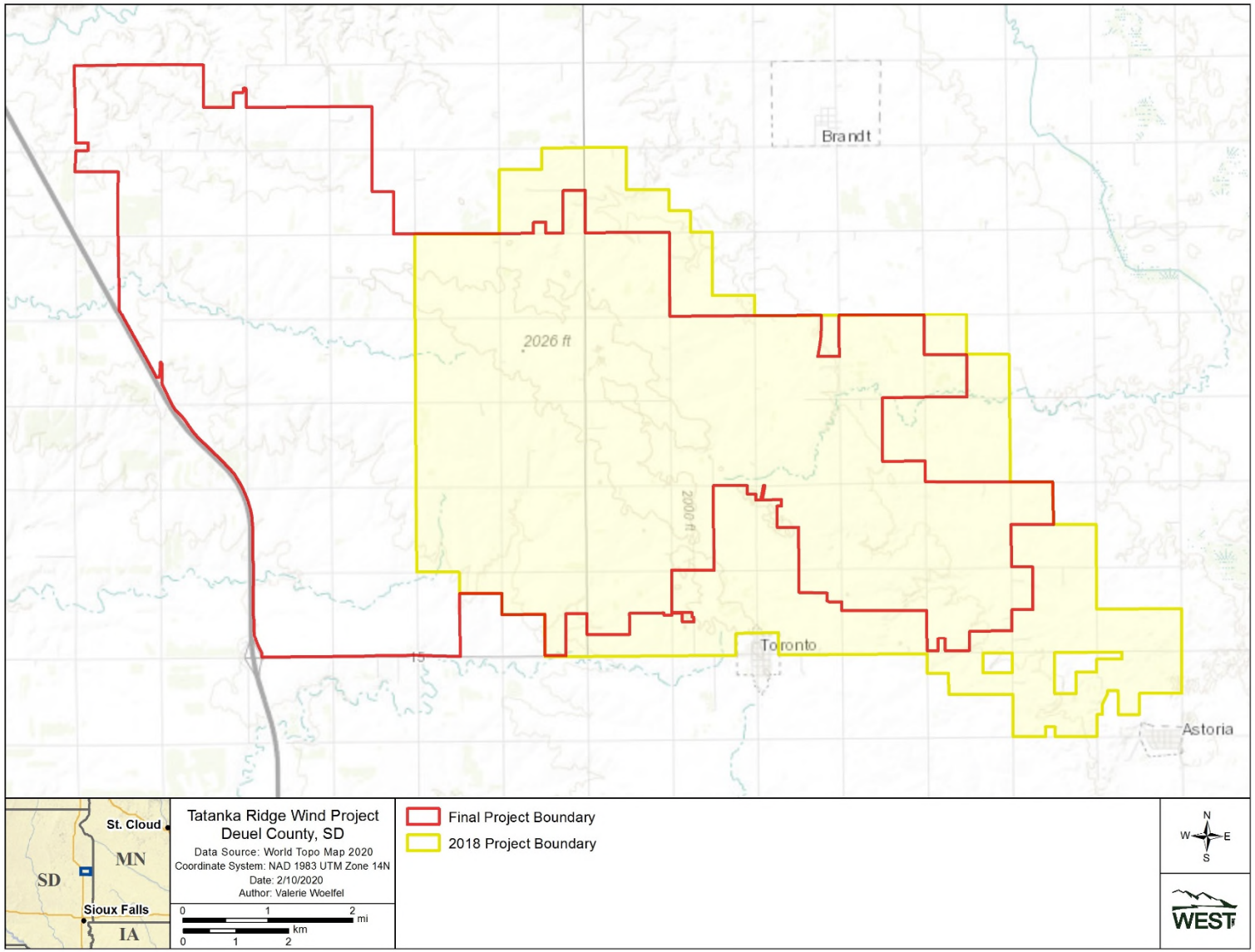

Figure 3. Project boundaries used in the site characterizations and field studies conducted for the Tatanka Ridge Wind Project.

Based upon USFWS National Wetlands Inventory (NWI) data, 768 ac (2.8%) of the land within the Final Project Boundary is made up of wetlands and open water, consisting of approximately 668 ac of freshwater emergent wetlands, 59 ac of riverine, 33 ac of freshwater ponds, and 8 ac of freshwater forested or shrub wetland habitat (USFWS NWI 2018). Numerous waterbodies are present within the Final Project Boundary, most of which are tributaries to Cobb Creek, Bullhead Run, Hidewood Creek, North Deer Creek, and Peg Munky Run (Figure 4).

Based upon data from the US Geological Survey (USGS) Gap Analysis Program Protected Areas Database of the United States and coordination with the USFWS (USFWS 2018b), one USFWS grassland easement and five USFWS wetland easements exist within the Project (USGS Gap Analysis Program 2018; Figure 4).[1] Additionally, the Dakota Tallgrass Prairie Wildlife Management Area (WMA) 152 abuts the Project in the northwest corner, which is adjacent to the USFWS grassland easement (Figure 4). A small parcel managed as part of the Deuel County Waterfowl Production Area (WPA) lies adjacent to and north of the southeastern portion of the Project. Although found to the east of the Project, no lands owned or managed by the state are present within the Project.

2.2. Protected Species

2.2.1. Federally Listed Threatened and Endangered Species

Per review of the USFWS Information for Planning and Consultation (IPaC) Environmental Conservation Online System and county distribution list (USFWS 2017b, 2019c), there are five federally listed species with potential for occurrence in the Project vicinity: northern long-eared bat (NLEB; *Myotis septentrionalis;* threatened), red knot (*Calidris canutus rufa*; threatened), Topeka shiner (*Notropis topeka*; endangered), Dakota skipper (*Hesperia dacotae*; threatened), and Poweshiek skipperling (*Oarisma poweshiek*; endangered; Table 3). Although not identified by the aforementioned resources or during Project-specific coordination with the USFWS and SDGFP described in Table 1, the federally and state-endangered whooping crane (*Grus americana*) was identified by the SDPUC as a species of concern during its review of the site permit application; therefore, it is included in this analysis. The life history of each of the federally listed species and its potential to occur within the Project are described below.

[1] Note that two of the USFWS wetland easements in the eastern central portion of the Project are adjacent to each other, so appear as one polygon on Figure 4.

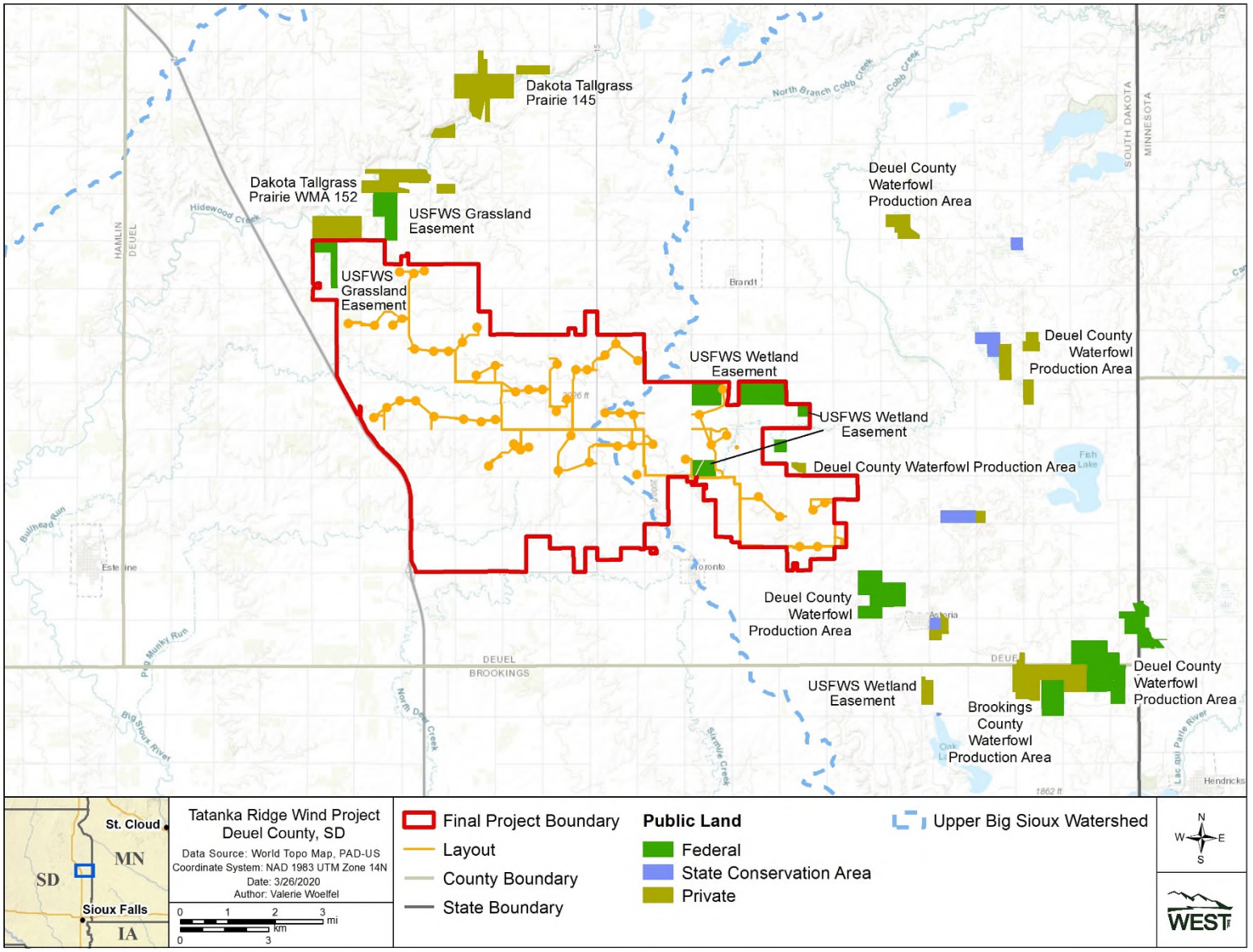

Figure 4. Public lands in and near the Tatanka Ridge Wind Project.

Table 3. Federally listed threatened and endangered species with potential for occurrence near the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Species	Federal Status	Habitat	Potential for Occurrence
Mammals			
northern long-eared bat *Myotis septentrionalis*	T[1]	Found in forest interior and riparian areas (Lausen 2009). Typically avoids open habitats (Owen et al. 2003). Hibernates in caves, mines, and sometimes buildings. In summer, roosts singly or in colonies underneath tree bark or in tree cavities (USFWS 2014a).	Low potential to occur within the Project during the summer due to limited forested habitat. Potential to pass through Project during spring and fall migration.
Birds			
red knot *Calidris canutus rufa*	T	Stopover habitat during migration includes shorelines with an abundance of easily digested foods invertebrates with thin or no shell; (USFWS 2013b).	Minimal potential to occur within the Project because waterbodies supporting food sources are not present.
whooping crane[2] *Grus americana*	E	Forages in marshes and submerged sandbars in rivers with sufficient horizontal visibility, water depth of 12 in or less, and wetlands at least 0.1 ac in size.	Minimal potential to occur within the Project during migration because the Project is outside of the corridor containing 95% of documented occurrences (USFWS 2007, Tacha et al. 2010, Pearse et al. 2018, USGS 2020) and suitable stopover habitat within the Project is limited.
Fishes			
Topeka shiner *Notropis topeka*	E	Occurs within slow-moving and naturally winding waterbodies, with sand, gravel, or rubble substrates that are often covered by a deep layer of silt (USFWS 2019g).	Moderate potential to occur in waterbodies within the western portion of the Project (within Upper Big Sioux watershed). Species has been documented approximately 1,200 ft west and south of the Project within Peg Munky Run and North Deer Creek, respectively.
Insects			
Dakota skipper *Hesperia dacotae*	E	Occurs within two types of native prairie habitat, including moist bluestem prairie and dry upland prairie along ridges and hillsides (USFWS 2019a).	Low potential to occur within only 39 ac of suitable grassland habitats within the Project. Adult protocol surveys in 2018 and 2019 determined that suitable habitat within the Project is not occupied.
Poweshiek skipperling *Oarisma poweshiek*	E	Occurs within high-quality tallgrass prairie in both upland, dry areas, as well as low, moist areas (USFWS 2019b).	Low potential to occur within only 39 ac of suitable grassland habitats within the Project. Adult protocol surveys in 2018 and 2019 determined that suitable habitat within the Project is not occupied.

Table 3. Federally listed threatened and endangered species with potential for occurrence near the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Species	Federal Status	Habitat	Potential for Occurrence

Source: USFWS 2019c

E = Endangered; T = Threatened

[1] On January 28, 2020 the US District Court for the District of Columbia held that the USFWS' decision to list the NLEB as threatened rather than endangered was "arbitrary and capricious", and remanded the listing decision back to the agency for a new determination. The NLEB's status as a threatened species under the ESA will remain in place while the USFWS reviews the status of the species and issues a new listing decision.

[2] Federally listed species identified as potentially occurring in the county per concerns raised by the South Dakota Public Utilities Commission, but not identified through the USFWS Information for Planning and Consultation system, county distribution list, or during Project-specific coordination with the USFWS and SDGFP.

Northern Long-Eared Bat

The NLEB is currently listed as a threatened species throughout its geographic range as a response to the documentation of white-nose syndrome (WNS) in the United States (81 Federal Register [FR] 1900). Deuel County is within 150 mi of several known WNS-infected hibernacula (USFWS 2019d); therefore, the Project falls within the WNS-buffer zone (81 FR 1900). However, incidental take of NLEBs due to operation of a wind project is not prohibited under the ESA, per the Final 4(d) Rule.

WEST biologists conducted site-specific desktop habitat assessments in 2018 and 2019. Because the Project boundary expanded in early 2019 and recent coordination with the USFWS resulted in a different minimum forested patch size (10 ac) being used for the 2019 NLEB habitat assessment (WEST 2018), only the results of the 2019 habitat assessment are discussed in this section. The habitat assessments used a machine learning classification algorithm developed by WEST to delineate forest patches within and near the Project (WEST 2018). Based on guidance from and coordination with the USFWS, the classifier was built using imagery from the Landsat 8 and Sentinel-2 satellites (USGS 2016, European Space Agency 2017) as well as aerial imagery from the National Agriculture Imagery Program (US Department of Agriculture 2018a) and used in a Random Forests model (Breiman 2001). The results from the model were filtered and visually assessed for accuracy, whereby false positives (areas mistakenly identified as forest) were removed, and forest boundaries were adjusted, as necessary.

WEST identified approximately 195 ac of potentially suitable NLEB habitat within the Final Project Boundary, which was largely limited to small woodlots and windbreak tree rows consisting of small, scattered patches. A total of 12 forested patches that were large enough to provide suitable summer habitat for the NLEB were identified within or overlapping with the Project, which ranged in size from 10 ac to 21 ac. Although the suitable summer forested habitat was limited, the NLEB could utilize this habitat during the summer, and may pass through the general area during migration. Based on the presence of suitable habitat for the NLEB, presence/probable absence surveys were conducted to further inform risk to NLEB (species-specific surveys are described in Section 3.3).

Red Knot

The red knot is federally listed as a threatened species, and has one of the longest known migration distances, traveling between breeding grounds in the central Canadian arctic to wintering areas primarily in South America (USFWS 2019f). Due to its long migration, red knots require stopover habitats rich in easily digested foods, such as invertebrates with thin or no shell (USFWS 2013b). Red knots typically rely on key stopover areas in coastal regions, but also use stopover areas along the Northern Plains of the Midwest during migration (Baker et al. 2013).

Although the USFWS IPaC report generated for the Project indicates that there is potential for this species to occur within Deuel County, the red knot has not been reported in the county and has rarely been observed in the region (eBird 2020, SDNHP 2019). Only four records of red knots have been submitted to eBird within 50 mi of the Project, the closest of which is an observation of one red knot approximately 31 mi northeast of the Project in Lac qui Parle County, Minnesota from 2007 (eBird 2020). The most recent record in the area is an observation of eight red knots approximately 38 mi northwest of the Project in Clark County, South Dakota from 2014 (eBird 2020). One red knot was observed in 1991 approximately 38 mi south of the Project, and two red knots were observed in 2006 approximately 49 mi southeast of the Project (eBird 2020). Because suitable stopover habitat is not present within the Project and the red knot is a rare migrant in the spring and fall along the Missouri River corridor, the potential for the red knot to occur within the Project is minimal.

Whooping Crane

The whooping crane is federally listed as an endangered species, except where experimental populations exist; this species is also listed as endangered by the state of South Dakota. The self-sustaining wild population of whooping cranes typically migrates from its breeding grounds in Wood Buffalo National Park, Canada to its wintering areas in the Aransas National Wildlife Refuge, Texas (Lewis 1995). In South Dakota, suitable stopover habitat for whooping cranes includes marshes and submerged sandbars in rivers with sufficient horizontal visibility and water depth of 12 inches (in) or less for foraging that are proximate to wetlands that are at least 0.1 ac for roosting (SDGFP 2014).

The USFWS defined both a national and South Dakota state-specific migration corridor, which contain 95% of the whooping crane observations documented during migration from the early 1960s through 2007 (USFWS 2007, Tacha et al. 2010). The Project is located over 30 mi east of the USFWS state-specific corridor, and over 75 mi east of the USFWS national corridor. The USGS has also defined a national migration corridor based on both historical sightings from 1942–2016 and location data from 58 telemetered birds from 2010–2016 (Pearse et al. 2018, USGS 2020). The Project is located approximately 38 mi east of the more recent USGS corridor. Additionally, based on data through spring 2018 from the Cooperative Whooping Crane Tracking Partnership (USFWS 2018e) the closest whooping crane sightings are approximately 33 mi southwest (one sighting from 1995) and 42 mi northwest of the Project (three sightings from 1973, 1985, and 2000). There is minimal potential for the whooping crane to occur at the Project because of the distance from the migration corridor (>30 mi) and limited suitable stopover habitat within the Project.

Topeka Shiner

The Topeka shiner, federally listed as an endangered species, is a small minnow that lives in small to mid-size prairie streams in the central United States, where it is usually found in pool and run areas (SDGFP 2003). Within South Dakota, the Topeka shiner occupies tributaries of the James, Vermillion, and Big Sioux rivers. The Topeka shiner has been documented near the western half of the Project in the Upper Big Sioux watershed (Figure 4), which flows into the Missouri River, but not within the Laq Qui Parle watershed, which flows into the Minnesota River (SDGFP 2003). Suitable streams tend to have good water quality and cool to moderate temperatures. Prairie rivers and streams where Topeka shiners are found are also generally slow-moving and naturally winding, with bottoms made of sand, gravel, or rubble often covered by a deep layer of silt (USFWS 2019g).

Critical habitat was designated for the Topeka shiner in 2004 (69 FR 44736 [July 27, 2004]). Designated critical habitat is not present within the Final Project Boundary; the closest designated critical habitat is in Lincoln County, Minnesota, approximately 18 mi southeast of the Project.

Within the Upper Big Sioux watershed, the Topeka shiner has been documented within 2.0 mi of the Project in three waterbodies: North Deer Creek, Peg Munky Run, and Hidewood Creek. The closest of these records is 1,200 feet (ft) south of the Project in North Deer Creek, where the shiner was most recently documented in 2011. The Topeka shiner was also documented in 2012 in Peg Munky Run, just over 1,200 ft west of the Project, and as recently as 2017 just over 1 mi west of the Project in this same stream. The Topeka shiner was documented in Hidewood Creek as recently as 2016, approximately 1.4 mi northwest of the Project. All three of these waterbodies maintain connectivity to stream segments within the Project. Based on the documented occurrence of Topeka shiners in North Deer Creek, Peg Munky Run, and Hidewood Creek, and the connectivity of these waterbodies to tributaries within the Project, aquatic resource delineations were conducted (delineations are described in Section 3.4).

Dakota Skipper and Poweshiek Skipperling

The Dakota skipper (federally threatened) and Poweshiek skipperling (federally endangered) are small butterflies that occur within native prairie habitat. Critical habitat was designated for the Dakota skipper and Poweshiek skipperling in 2015 (80 FR 59248 [October 1, 2015]). South Dakota Unit 2 is the nearest designated critical habitat for the Dakota skipper and Poweshiek skipperling, which is approximately 3.0 mi south-southeast of the Project, adjacent to Oak Lake in Brookings County.

The Dakota skipper is endemic to North American tallgrass and mixed-grass prairie and does not inhabit non-native grasslands, weedy roadsides, tame hayland, or other habitats that are not remnant native prairie. In addition, Dakota skippers have not been recorded in reconstructed prairie (USFWS 2019a).

The Poweshiek skipperling also occurs within high quality tallgrass prairie in upland, dry areas as well as prairie fens, grassy lake and stream margins, moist meadows, sedge meadow, and wet-

to-dry prairie. Although South Dakota historically contained approximately 24% of all known records of the Poweshiek skipperling, the species is suspected to be extirpated from the state (USFWS 2019b). The species was last observed in South Dakota in 2008 (79 FR 63672 [October 24, 2014]).

To identify native prairie habitat that could support the Dakota skipper or Poweshiek skipperling within the Project, a desktop habitat assessment was completed for the Project, which was conducted in two phases due to a change in the Project boundary in early 2019. The desktop assessment for the eastern portion of the Project was completed in June 2018 (using the 2018 Project boundary), and the assessment for the western portion of the Project was conducted in March 2019 (using the Final Project Boundary).

Biologists used aerial imagery and geospatial datasets to conduct a qualitative desktop assessment of the Project and identify potentially undisturbed grassland areas that could be impacted by the Project. A total of 1,920 ac of potentially undisturbed grasslands were identified within the Final Project Boundary that could support federally listed skippers. The majority of these areas were associated with streams and adjacent hillsides in the Project, with several larger areas of potentially undisturbed lands extending from the upper northcentral portion of the Project to the southeastern portion of the Project. Based on the presence of suitable skipper habitat, flight surveys were conducted to further inform risk to Dakota skippers and Poweshiek skipperling (species-specific surveys are described in Section 3.5).

2.2.2. Eagles

While both bald and golden eagles have the potential to occur in South Dakota, golden eagles would likely be an infrequent migrant and bald eagles are the predominant eagle species in the area. Bald eagles prefer to use mature trees near permanent bodies of water (e.g., rivers or lakes) with an abundant prey source for their nesting, roosting, and foraging activities (Swenson et al. 1986, Mojica et al. 2008). The Project does not include large rivers, lakes, or wetland systems that might provide substantial foraging opportunities for eagles. Bald eagles may use the Project for foraging activities during the winter, migration, and breeding/nesting seasons. However, it is likely that most bald eagle nesting and foraging activities would be concentrated at the nearby lakes and rivers that are outside of the Project. Although breeding within the Project is unlikely, due to the potential for bald eagle use of the Project, additional Tier 3 studies were conducted (surveys relating to bald eagles are described in Sections 3.1 and 3.2).

2.2.3. State-listed Threatened and Endangered Species

To obtain information on state-listed species potentially present within or near the Project, WEST biologists reviewed South Dakota's list of threatened, endangered, and candidate species documented within Deuel County and last updated in 2016 (SDGFP 2016), and requested a SDNHP database review of rare plants, animals, and ecosystems documented in or near the Project in both 2018 and 2019 for different iterations of the Project. The SDNHP responded to these requests on May 30, 2018, and May 14, 2019 (SDNHP 2018, 2019).

Based on this review, three state-listed endangered or threatened species have been documented within Deuel County, including the northern river otter (*Lontra canadensis*; threatened), banded killifish (*Fundulus diaphanous*; endangered), and northern redbelly dace (*Chrosomus eos*; threatened; Table 4). The northern river otter occurs within large, slow-moving waterbodies where large fish are present (Kiesnow and Dieter 2005), which are not present within the Project. The northern redbelly dace and banded killifish occur within a variety of aquatic habitats, including streams, ponds, and lakes (Ohio Department of Natural Resources 2012, Pasbrig 2014), which are present at the Project. However, only the northern redbelly dace has been documented within 2 mi of the Project; this species has been documented in an intermittent waterbody in the southeastern corner of the Project, and in Peg Munky Run near the western portion of the Project (SDNHP 2019). Therefore, aquatic resource delineations were conducted (delineations are described in Section 3.4).

2.2.4. Birds

The Project is located within the Central Flyway, which is used by migrating waterfowl, waterbirds, shorebirds, songbirds, and raptors. Of these species groups, waterfowl has the greatest potential to migrate through the Project (see Section 3.1, below). Waterfowl migration corridors that follow a broad front through eastern South Dakota are used by as many as three million dabbling ducks annually (USGS 2013). The USFWS wetland easements within the Project, as well as the WPAs and WMAs near the Project provide feeding and resting areas for waterfowl, waterbirds, and shorebirds migrating through this region.

The USFWS lists 27 species as birds of conservation concern (BCC) within the Bird Conservation Region where the Project is located (Prairie Potholes, US portion; USFWS 2008). The USFWS has determined that six of these species are of particular concern at the Project location (Table 5) due to population declines in the area (2008, 2019c). A review of eBird data (2020) indicates that the BCC species identified by the USFWS have been sighted near the Project in recent years, but that sightings are relatively infrequent and primarily occur near Oak Lake, approximately 4 mi southeast of the Project. Black-billed cuckoo (*Coccyzus erythropthalmus*) and ruddy turnstone (*Arenaria interpres*) have been observed the least frequently in the area (eBird 2020). Of these six BCC species, only the bobolink (*Dolichonyx oryzivorus*) has an eBird record within the Final Project Boundary (eBird 2020).

During migration, raptors could rest and forage in the Project, depending on habitats preferred by individual raptor species, weather, and prey availability. Several factors influence the migratory patterns of raptors, the most significant of which is geography (Liguori 2005). Two geographical features are primarily used by raptors during migration: ridgelines and shorelines of large bodies of water (Liguori 2005). Updrafts formed as wind hits ridges and thermals created over land, not water, make for energy-efficient travel for raptors over long distances (Liguori 2005). It is for this reason that raptors tend to follow prominent ridges with defined edges during migration. The Project is situated in a flat to gently rolling landscape with no distinct ridges or other prominent topographical features, and therefore, raptor migration would be expected to occur in a broad front fashion with no areas of concentration or funneling in the Project.

Table 4. State-listed threatened and endangered species with potential for occurrence near the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Species [a]	State Status	Habitat [b]	Potential for Occurrence
Mammals			
northern river otter *Lontra canadensis*	Threatened	Occurs in large, slow-moving waterbodies with intact riparian vegetation where medium to large fishes are present (Kiesnow and Dieter 2005).	Minimal potential to occur within the Project because neither medium nor large waterbodies are present.
Birds			
whooping crane *Grus americana*	Endangered	Forages in marshes and submerged sandbars in rivers with sufficient horizontal visibility, water depth of 12 in or less, and wetlands at least 0.1 ac in size.	Minimal potential to occur within the Project during migration because the Project is outside of the corridor where 95% of documented occurrences have been recorded (USFWS 2007, USGS 2020) and suitable stopover habitat within the Project is limited.
Fishes			
banded killifish *Fundulus diaphanous*	Endangered	Occurs in slow-moving waterbodies with abundant rooted aquatic vegetation, clear water, and substrates free of silt (Ohio Department of Natural Resources 2012).	Low potential to occur within waterbodies within the Project.
northern redbelly dace *Chrosomus eos*	Threatened	Occurs within slow-moving rivers and ponds with dense aquatic vegetation within the Big Sioux River drainage (Pasbrig 2014).	Moderate potential to occur within waterbodies within the western portion of the Project based on multiple documented occurrences within and near the Project.

[a] South Dakota Natural Heritage Program (SDNHP) 2019.

[b] Unless otherwise stated, sources used to describe suitable habitat for state-listed species include South Dakota Department of Game, Fish and Parks (SDGFP) 2014 and 2016.

Table 5. Birds of conservation concern identified by the USFWS as being of particular concern near the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Species	Season
Black tern (*Chlidonias niger*)	Breeding
Black-billed cuckoo (*Coccyzus erythropthalmus*)	Breeding
Bobolink (*Dolichonyx oryzivorus*)	Breeding
Franklin's gull (*Leucophaeus pipixcan*)	Breeding
Red-headed woodpecker (*Melanerpes erythrocephalus*)	Breeding
Ruddy turnstone (*Arenaria interpres*)	Migration

Source: USFWS 2019c

Habitat within the area is primarily composed of cultivated croplands (approximately 79%) and is highly fragmented; therefore, use of the Project by breeding birds is expected to be relatively low. However, based on the Project's location within a portion of the Central Flyway where waterfowl use could be high during the migration season, and the presence of nearby WPAs and WMA that may provide feeding and resting areas for waterfowl, waterbirds, and shorebirds, additional Tier 3 studies were recommended.

2.2.5. Bats

Six bat species occur in eastern South Dakota (Harvey et al. 2011, Bat Conservation International 2018; Table 6). These species could potentially occur in the Project during all seasons except winter when they are hibernating or have migrated to warmer places. More detailed information on the NLEB is provided in Sections 2.2.1 and 3.3.

Table 6. Bat species with potential to occur in or near the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Common Name	Scientific Name
Big brown bat	*Eptesicus fuscus*
Eastern red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Little brown bat	*Myotis lucifugus*
Northern long-eared bat[1]	*Myotis septentrionalis*
Silver-haired bat	*Lasionycteris noctivagans*

[1] Federally listed as a threatened species

The Project contains approximately 252 ac of woodland habitat that may be suitable for tree-roosting bats (Yang et al. 2018, MRLC 2019), with most of this habitat located in scattered woodlots throughout the Project (discussed in additional detail in Section 3.3). The presence of wetlands, ponds, and cultivated cropland may also attract bats for foraging and drinking opportunities. Based on the presence of suitable habitat for tree-roosting bats, additional Tier 3 studies were conducted (surveys are discussed in Section 3.3).

3. FIELD STUDIES

Tier 3 field studies have been conducted in accordance with the WEG (USFWS 2012) to obtain additional data on birds, bats, native prairies, and protected species' habitats. Numerous wildlife studies have been completed for the Project between 2009 and 2020. Since wildlife studies began, Tatanka Ridge modified the original Project (previously known as the Buffalo Ridge III Wind Project); studies prior to 2018 were completed using a previous iteration of the Project, and therefore are not included in detail in this BBCS. These studies include the following:

- 2009–2010 Avian Use Surveys (Derby et al. 2010f);
- 2015–2016 Avian Use Surveys (Dernovsek et al. 2019b);
- 2015 Eagle and Raptor Nest Survey (Kreger and Pickle 2016);
- 2009 General Acoustic Bat Survey (Derby et al. 2010f);
- 2009, 2010, and 2015 Dakota Skipper and Poweshiek Skipperling Habitat Assessments (Selby 2009, 2010, WEST 2016); and
- 2009 and 2015 Dakota Skipper and Poweshiek Skipperling Adult Protocol Surveys (Selby 2009, HDR Engineering 2015).

The sections below provide a summary of the recent (2018–2020) assessments and surveys conducted at the Project relating to migratory birds, bats, and special status species. Wildlife studies are ongoing and will continue through March 2020 to provide a robust analysis of wildlife use within the Project. These surveys have and will continue to inform Tatanka Ridge of the types and extent of wildlife present within and adjacent to the Project. Survey results have also informed Project infrastructure siting as practicable to comply with regulatory programs, such as the ESA, MBTA, and BGEPA. These field surveys include the following:

- 2018–2019 Avian Use Surveys (Dernovsek et al. 2019a);
- 2019–2020 Avian Use Surveys (surveys were completed in March 2020 and are currently undergoing review and analysis);
- 2018 and 2019 Raptor Nest Surveys (Kreger and Rieland 2018, Cossette et al. 2019);
- 2018 and 2019 NLEB Presence/Probable Absence Surveys (Hyzy and Rieland 2018, Cossette and Rieland 2019);
- 2018 Dakota Skipper and Poweshiek Skipperling Adult Protocol Surveys (SWCA Environmental Consultants Inc. [SWCA] 2018);
- 2019 Dakota Skipper and Poweshiek Skipperling Habitat Surveys (SWCA 2019a); and
- 2018 and 2019 Aquatic Resource Delineation (SWCA 2019b).

3.1. Fixed-point Avian Use Surveys

3.1.1. 2018–2019 Avian Use Surveys

WEST was contracted to conduct fixed-point avian use surveys at the Project from April 20, 2018 – March 26, 2019 (Dernovsek et al. 2019a). The survey objective was to estimate the seasonal, spatial, and temporal use patterns of avian species within the study area. Additionally, surveys were intended to provide information that could be used for project planning and design of the facility to minimize impacts to avian species and to collect data on eagle use in the areas following the USFWS *Eagle Conservation Plan Guidance'*s (ECPG; USFWS 2013a).

Methods – Avian use surveys followed methodology similar to Reynolds et al. (1980) and were consistent with the WEG (USFWS 2012). Fourteen points were originally selected for survey across a variety of habitats and topography, and provided even coverage of the Project (Figure 5). One of the original survey locations, Point 15, was relocated and renamed Point 18 after eight months of survey, as the location was consistently difficult to access safely. Additionally, due to an expansion of the Project, and in order to achieve the ECPG's (USFWS 2013a) recommended 30% coverage, the total number of survey locations increased to 21 (Points 19–25 were added) for the final two months of the study. The survey points consisted of 800-m radius circular plots for large birds (focusing on eagles) and 100-m radius circular plots for small birds. Surveys were conducted once per month, with seasons defined as spring (March 1 – May 31), summer (June 1 – August 31), fall (September 1 – November 30), and winter (December 1 – February 28). In order to be in full compliance with the survey protocols as codified in the 2016 Eagle Rule (81 FR 91494 [December 16, 2016]), the 10-minute (min) small bird surveys preceded the 60-min eagle and large bird use surveys, for a total of 70 min of observation.

Results – A total of 178 surveys were conducted at the Project with 9,672 bird observations in 925 groups. A total of 71 bird species were identified, including 37 unique large bird species and 34 unique small bird species observed. Bird diversity (the number of species identified) for large birds was highest during spring (26 species), followed by fall (24), summer (21) and winter (5). Bird diversity for small birds was highest during summer (31), followed by spring (27), fall (16), and was lowest in the winter (2).

A total of 8,424 large bird observations were recorded in 470 separate groups. Snow goose (*Chen caerulescens*; 6,310 observations) accounted for approximately 75% of all large bird observations, due to eight large flocks of geese migrating through the Project during spring migration. By comparison, the second most abundant large bird species observed was Franklin's gull (*Leucophaeus pipixcan*; 542 observations), which composed 6.4% of all large bird observations. Mean large bird use was highest during spring (121.15 observations/800-m plot/60-min survey), followed by fall (21.21), summer (6.43), and winter (2.66). Elevated large bird use in spring was influenced by high waterfowl use, particularly snow goose (105.70 observations/800-m plot/60-min survey). Large bird use in the fall was primarily due to use by gulls/terns, while large bird use in the summer and winter was primarily due to use by shorebirds and doves/pigeons, respectively. Large bird use was highest at Point 5 (494.50 observations/60-min survey) due to several large flocks of snow geese migrating through the area during surveys; use ranged from 0 to 43.58 at the other survey points. Two bald eagle and two golden eagle observations were recorded during the fixed-point surveys, and no eagles were observed incidentally. No federally or state-listed threatened or endangered species were observed.

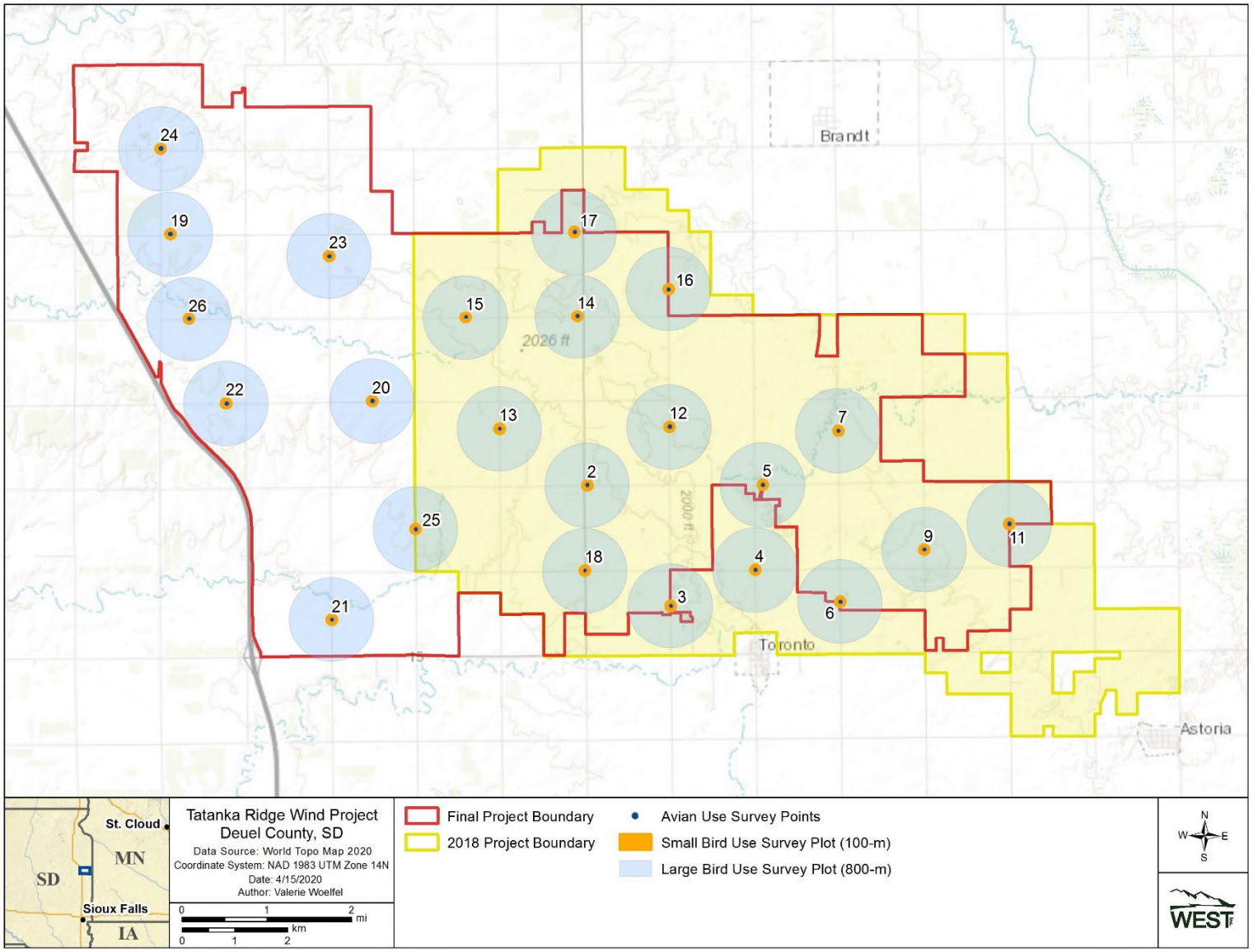

Figure 5. Survey locations for fixed-point avian use surveys at the Tatanka Ridge Wind Project.

A total of 1,248 small bird observations were recorded within 455 separate groups. Three species (8.8% of all species) composed 49.8% of all observations: red-winged blackbird (*Agelaius phoeniceus*; 285 observations), Lapland longspur (*Calcarius lapponicus*; 170 observations), and horned lark (*Eremophila alpestris*; 166 observations). Mean small bird use was highest during summer and spring (10.33 and 9.75 observations/100-m plot/10-min survey, respectively), followed by fall (4.45), and winter (2.18). Small bird use was dominated by passerines (over 99% of observations), although small numbers of woodpeckers were also recorded. Red-winged blackbirds represented most of the small bird use during spring and fall, and barn swallow (*Hirundo rustica*) composed the majority of small bird use during summer; only horned lark and blue jay (*Cyanocitta cristata*) were recorded in winter. Small bird use was highest at Point 5 (16.50 observations/10-min survey) and use ranged from 0.50 to 12.18 at other points. No federally or state-listed threatened or endangered species were observed.

Of the six BCC species listed in Table 5, three were observed during the 2018–2019 avian use surveys. Observations included 23 bobolink (13 groups), 542 Franklin's gull (nine groups), and one red-headed woodpecker.

3.1.2. 2019–2020 Avian Use Surveys

Tatanka Ridge contracted WEST to conduct fixed-point avian use surveys from April 3, 2019 – March 7, 2020. The objective of these surveys was to provide a second year of site-specific small and large bird use data to help evaluate potential impacts from the proposed Project.

Methods – Surveys followed methodology similar to Reynolds et al. (1980), were consistent with the WEG (USFWS 2012), and followed methodology consistent with the 2018–2019 avian use surveys, described above. The same 21 points surveyed for the last two months of the first year of surveys were used for the 2019–2020 avian use surveys, and Point 26 was added, resulting in a total of 22 points surveyed (Figure 5).

Results – At the time of this writing, the data from the 2019–2020 avian use surveys is undergoing review and analysis. Preliminary results of surveys are qualitatively summarized below. This BBCS will be updated to include the quantitative results of the 2019–2020 avian use surveys once the results are finalized.

Both large and small bird use of the Project was similar to that observed during the first year of avian use surveys. Use of the Project was highest by greater white-fronted goose (*Anser albifrons*) and Canada goose (*Branta canadensis*), which accounted for nearly half of the large bird observations through February 2020. Two species, common grackle (*Quiscalus quiscula*) and red-winged blackbird, composed over half of the small bird observations during the first 11 months of survey. No federally or state-listed species were observed; of the six BCC species of particular concern identified by the USFWS IPaC review (Table 5), only Franklin's gull and bobolink have been observed. Bald eagle use of the Project was slightly higher than the first year of surveys; no golden eagles were observed during the second year of avian use surveys.

3.2. Raptor Nest Surveys

WEST was contracted to conduct aerial raptor nest surveys in 2018 and 2019. Surveys were conducted in order to record the location and status of bald eagle nests and other raptor nests in and near the Project. The aerial surveys were conducted in accordance with the guidance provided in the ECPG (USFWS 2013a) and the USFWS *Interim Golden Eagle Technical Guidance* (Pagel et al. 2010).

3.2.1. 2018 Nest Survey

Methods – Surveys were conducted from helicopters in April 2018 prior to leaf out when raptors and eagles would be actively attending to nests. Raptor species, nest type, nest status, nest condition, and nest substrate were recorded at each nest location to the extent possible. The survey area for all raptor stick nests consisted of a 1-mi buffer of the 2018 Project boundary and the survey area for bald eagle nests consisted of a 10-mi buffer of the 2018 Project boundary.

Results – The 2018 nest surveys identified 24 raptor nests within 1 mi of the 2018 Project Boundary (Figure 6, Table 7). Ten nests were considered occupied and active, and 14 nests were considered unoccupied. Of the occupied and active nests, six were red-tailed hawk (*Buteo jamaicensis*) nests and four were great horned owl (*Bubo virginianus*) nests. The aerial nest survey also documented seven bald eagle nests within 10 mi of the 2018 Project Boundary; the closest, Nest 2207, was occupied and active, and located 3.5 mi southeast of the 2018 Project Boundary (and approximately 5.4 mi southeast of the Final Project Boundary). No eagle nests were located within 2 mi of the 2018 Project Boundary.

3.2.2. 2019 Nest Survey

Methods – Surveys were conducted from helicopters in April 2019 prior to leaf out when raptors and eagles would be actively attending to nests, and followed methodology consistent with the 2018 nest survey, described above. In addition to identifying bald eagle nests within a 10-mi buffer of the Project, the nest survey also confirmed the status of bald eagle nests identified in 2018 that were greater than 10 mi from the Final Project Boundary.

Results – The 2019 nest surveys identified 27 raptor nests within 1 mi of the Final Project Boundary (Figure 7, Table 7). One unidentified raptor nest observed in 2018 was unable to be located during the 2019 survey. Five nests were considered occupied and active, and 22 nests were considered unoccupied. Of the occupied and active nests, three were red-tailed hawk nests, one was a great horned owl nest, and one was an unidentified raptor nest. Additionally, one great horned owl nest was identified as occupied and active approximately 7.8 mi northeast of the Final Project Boundary (Nest 1621); although beyond the 1-mi raptor nest survey boundary, the status of this nest was documented in 2019 because it was an occupied bald eagle nest in 2018. The aerial nest survey also documented eight bald eagle nests (seven occupied active and one occupied inactive), seven of which were within 10 mi of the Final Project Boundary. No eagle nests were within 2 mi of the Final Project Boundary. The closest bald eagle nest, Nest 2207, was occupied and active in 2019; this nest is 5.4 mi southeast of the Final Project Boundary and 5.9 mi southeast of the closest turbine.

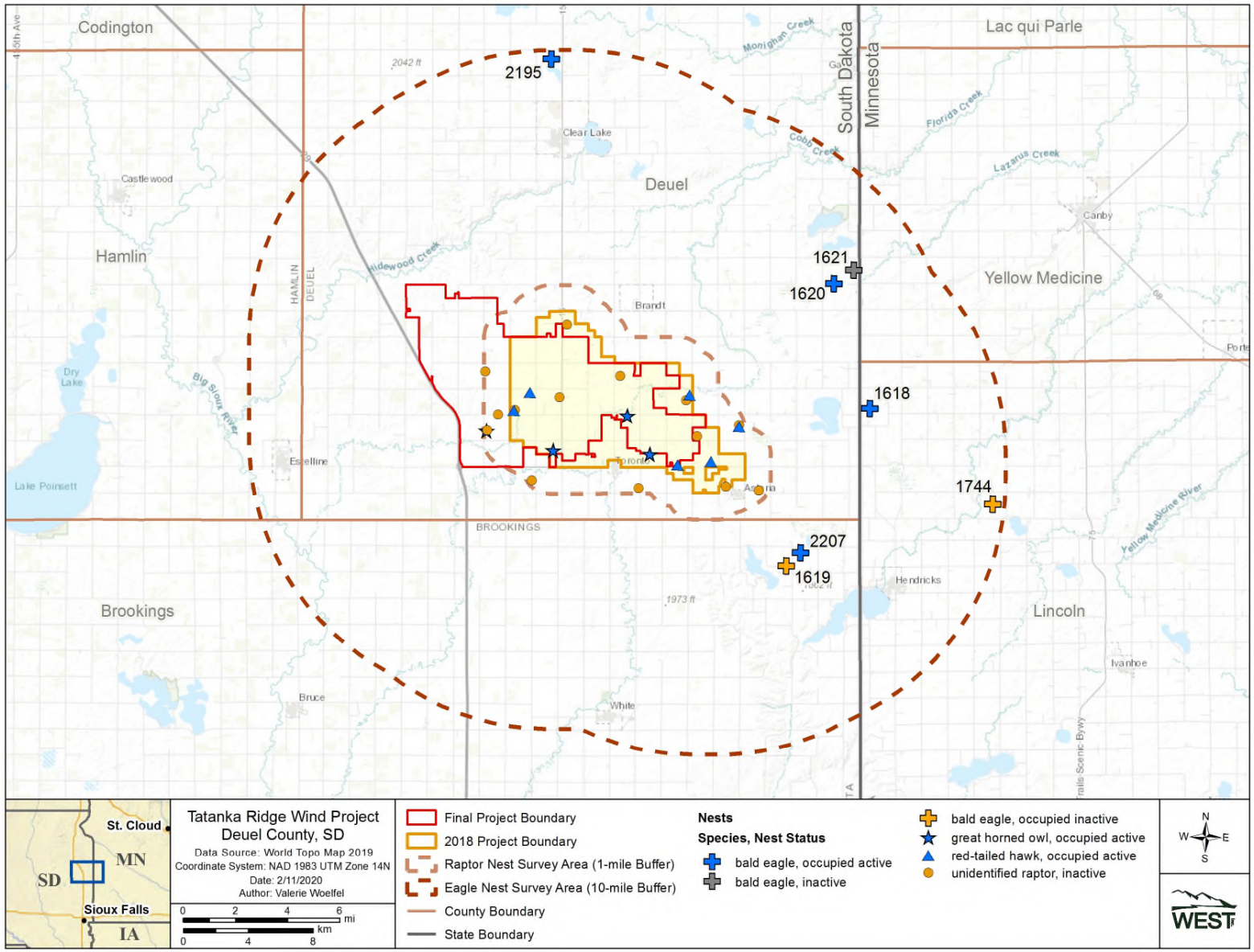

Figure 6. Results of the 2018 aerial nest surveys at the Tatanka Ridge Wind Project.

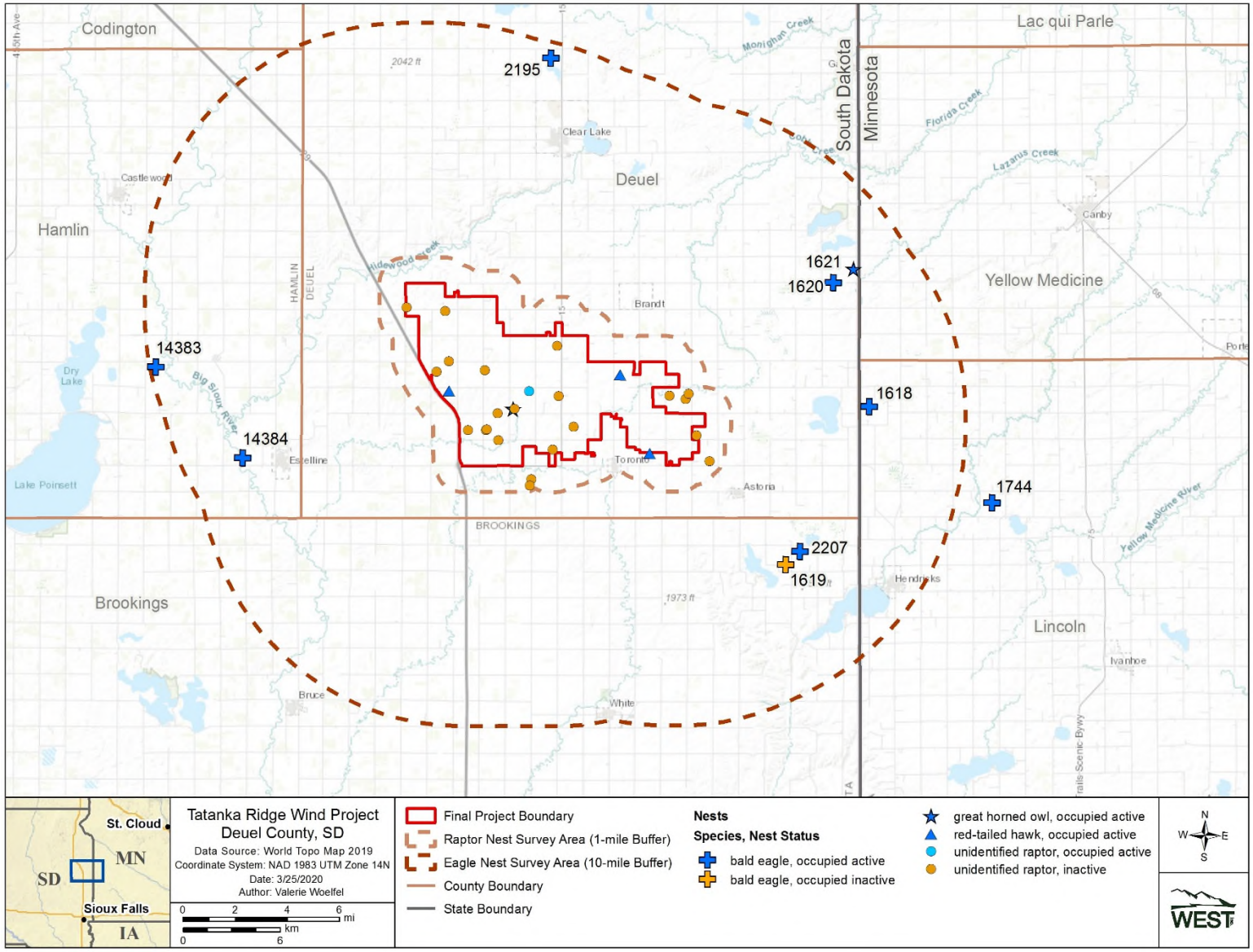

Figure 7. Results of the 2019 aerial nest surveys at the Tatanka Ridge Wind Project.

Table 7. Raptor nest ID, species, distance from nearest turbine, status, condition, location, and substrate documented during the 2018 and 2019 aerial raptor nest surveys for the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Distance from Nearest Turbine (mi)	Nest ID	2018 Survey		2019 Survey	
		Species	Nest Status	Species	Nest Status
Raptor Nests Consistent in Size and/or Structure with a Bald Eagle Nest					
5.9	2207	BAEA	occupied active	BAEA	occupied active
5.9	1619	BAEA	occupied inactive	BAEA	occupied inactive
7.0	1618	BAEA	occupied active	BAEA	occupied active
7.9	1620	BAEA	occupied active	BAEA	occupied active
8.1	14384	not observed	occupied active	BAEA	occupied active
9.8	2195	BAEA	occupied active	BAEA	occupied active
10.4	14383	not observed	-	BAEA	occupied active
12.0	1744	BAEA	occupied inactive	BAEA	occupied active
8.8	1621	BAEA	occupied inactive	GHOW	occupied active
Raptor Nests Not Consistent in Size and/or Structure with a Bald Eagle Nest					
0.4	2200	RTHA	occupied active	GHOW	occupied active
0.5	14387	not observed	-	RTHA	occupied active
0.2	2194	UNRA	inactive	RTHA	occupied active
0.8	2189	GHOW	occupied active	RTHA	occupied active
0.3	2198	RTHA	occupied active	UNRA	occupied active
1.1	2184	GHOW	occupied active	UNRA	inactive
0.4	2193	UNRA	inactive	UNRA	inactive
0.5	2199	UNRA	inactive	UNRA	inactive
0.3	2201	UNRA	inactive	UNRA	inactive
0.5	2202	UNRA	inactive	UNRA	inactive
1.0	2203	UNRA	inactive	UNRA	inactive
1.6	2204	GHOW	occupied active	UNRA	inactive
1.1	14385	not observed	-	UNRA	inactive
0.4	14386	not observed	-	UNRA	inactive
0.5	14388	not observed	-	UNRA	inactive
0.5	14389	not observed	-	UNRA	inactive
1.6	14390	not observed	-	UNRA	inactive
1.3	14391	not observed	-	UNRA	inactive
0.3	14392	not observed	-	UNRA	inactive
1.0	14393	not observed	-	UNRA	inactive
0.5	3045	UNRA	inactive	UNRA	inactive
1.3	14394	not observed	-	UNRA	inactive
1.1	2186	not observed	-	UNRA	inactive
1.1	2187	UNRA	inactive	UNRA	inactive
1.3	3043	RTHA	occupied active	UNRA	inactive
2.7	2196	UNRA	inactive	UNRA	inactive
2.9	2197	not observed	-	UNRA	inactive
0.7	2191	GHOW	occupied active	not observed	-

Table 7. Raptor nest ID, species, distance from nearest turbine, status, condition, location, and substrate documented during the 2018 and 2019 aerial raptor nest surveys for the Tatanka Ridge Wind Project, Deuel County, South Dakota.

Distance from Nearest Turbine (mi)	Nest ID	2018 Survey		2019 Survey	
		Species	Nest Status	Species	Nest Status
0.5	2188	RTHA	occupied active	not observed	-
1.1	3046	RTHA	occupied active	not observed	-
2.0	3042	RTHA	occupied active	not observed	-
0.7	2192	UNRA	inactive	not observed	-
2.1	3051	UNRA	inactive	not observed	-
3.2	2206	UNRA	inactive	not observed	-
2.0	2185	UNRA	inactive	not observed	-
1.9	2190	UNRA	inactive	not observed	-

3.3. Northern Long-eared Bat Presence/Probable Absence Surveys

In 2018 and 2019, Tatanka Ridge contracted WEST to conduct acoustic surveys to determine the presence/probable absence of the federally threatened NLEB at the Project during the summer. Surveys were conducted in accordance with procedures specified in the *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014a), and with the 2018 *Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2018d) and 2019 *Range-Wide Indiana Bat Survey Guidelines* (USFWS 2019e); collectively, these documents are referred to as the USFWS Summer Survey Guidelines.

Methods – The USFWS Summer Survey Guidelines describe the survey effort for acoustic surveys associated with non-linear projects to be a minimum of eight detector nights per 123 ac of suitable summer habitat. As stated above (see Section 2.2.1), the 2019 desktop habitat assessment identified 195 ac of suitable NLEB summer habitat within the Final Project Boundary; therefore, presence/probable absence surveys were conducted at two sites (Figure 8). One of the sites was located in the southeastern portion of the Project, and was surveyed in July 2018 (Hyzy and Rieland 2018); the second site was located in the northcentral portion of the Project and was surveyed from May 30 – June 6, 2019 (Cossette and Rieland 2019).

Acoustic detectors were placed within or near suitable habitat for the NLEB (i.e., small clearings and forest-canopy openings, parallel to woodland edges, and road and/or stream corridors). In accordance with the USFWS Summer Survey Guidelines, detectors were placed in areas with open tree canopies or canopy heights greater than 10 m, were spaced at least 200 m apart, and microphones were positioned at least 3 m off the ground. Acoustic data was collected at each survey site for a total of eight detector nights, in accordance with the USFWS Summer Survey Guidelines.

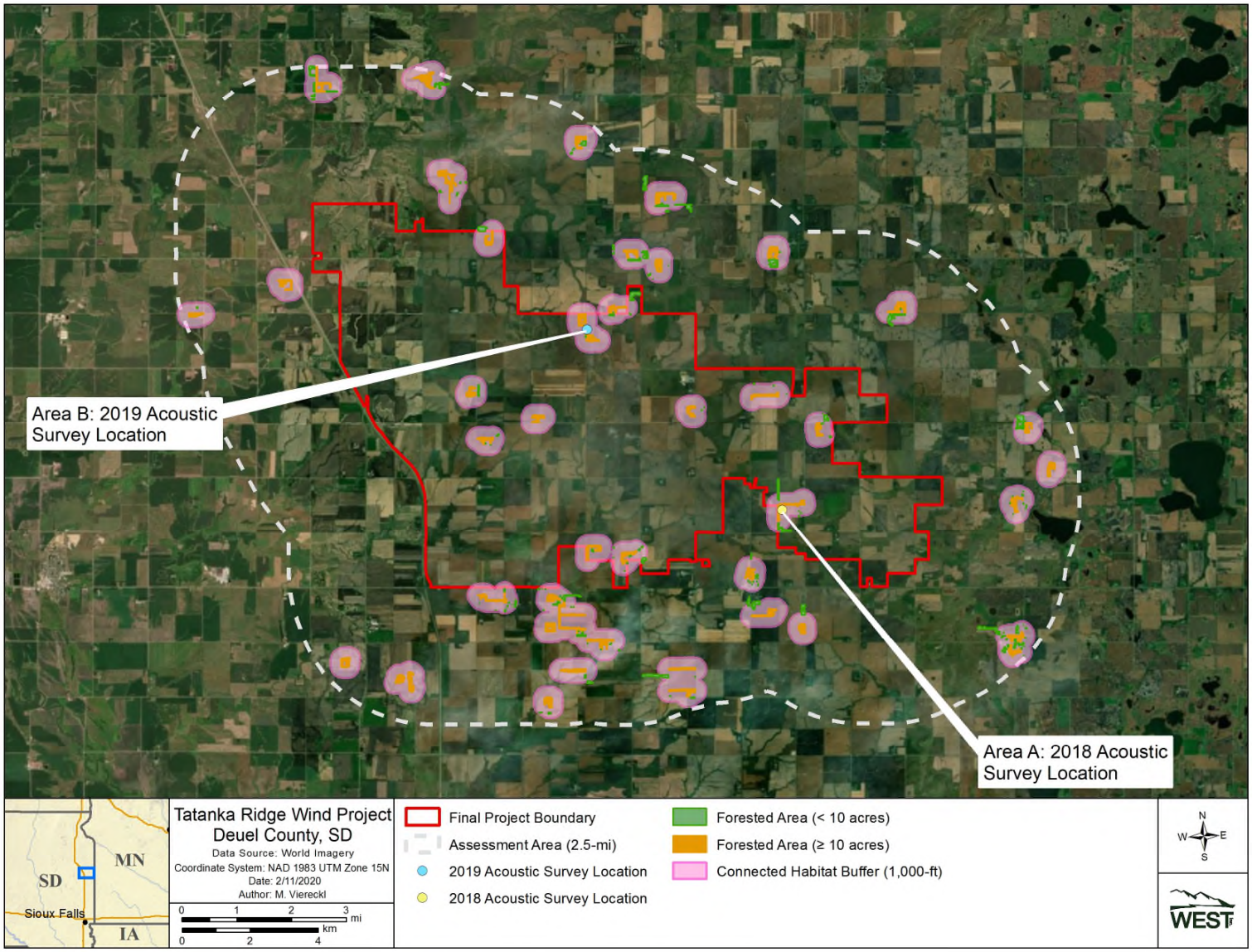

Figure 8. Northern long-eared bat desktop habitat assessment and 2018 and 2019 acoustic survey locations at the Tatanka Ridge Wind Project.

Results – Bat calls recorded during acoustic surveys were identified using the Bats of North America classifier in program Kaleidoscope (Wildlife Acoustics, Concord, Massachusetts). Kaleidoscope Pro identified no probable NLEB calls at either of the survey sites. Therefore, these surveys suggest the probable absence of NLEB at the Project during the summer (Hyzy and Rieland 2018, Cossette and Rieland 2019). These survey results are valid for a minimum of five years[2] from the completion of the surveys unless new information (e.g., other nearby surveys) suggests otherwise (USFWS 2018d, 2019e).

3.4. Topeka Shiner

Tatanka Ridge contracted SWCA to conduct an aquatic resource delineation for areas within the Project that could be affected by Project construction. SWCA identified and delineated aquatic resources within the survey area provided by Tatanka Ridge that could support the federally listed Topeka shiner, as well as waters that may be considered waters of the US and be subject to permitting by the US Army Corps of Engineers (USACE) under Sections 404 and 401 of the Clean Water Act (33 USC 1251 et seq.). Desktop review and field surveys were conducted for the eastern portion of the Project in 2018 and for the western portion of the Project 2019.

Methods – Aquatic resources at the Project were identified and delineated using a combination of desktop review and field surveys. Prior to conducting field surveys, SWCA completed a desktop review of the survey area. The desktop review included examining existing data from USGS topographic quadrangle maps, the NWI database, the National Hydrography Dataset (NHD), color infrared imagery, and historic and current aerial photographs of the survey area. The NWI is a USFWS database that identifies and categorizes wetland areas based primarily on aerial imagery interpretation (USFWS NWI 2018). Maintained by the USGS, the NHD identifies surface water systems in the United States, including lakes, streams, rivers, and canals (USGS NHD 2018). SWCA used Natural Resource Conservation Service (NRCS) soil survey data (US Department of Agriculture NRCS 2018) to review area soils. This desktop review identified locations of potential aquatic resources for investigation during the field surveys.

Delineations for aquatic resources were conducted in accordance with the Corps of Engineers Wetland Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0; USACE 2010). The field delineations were conducted to verify the results of the desktop review and to delineate all aquatic resources in the survey area that were potential waters of the United States. A global positioning system unit with sub-meter accuracy was used in the field to map the spatial extent of features, geographically reference data points, and delineate boundaries during the field surveys. GIS was used in the office to analyze the delineated features, calculate areas, and generate report maps.

Results – A total of 96 wetlands and five non-wetland waterbodies with ordinary high water marks were delineated in the survey area (SWCA 2019b). All of the delineated wetlands were palustrine (freshwater), as defined in Cowardin et al. (1979). The majority of wetlands delineated were dominated by emergent vegetation; one wetland was dominated by scrub-shrub vegetation. Five

[2] The timeframe may be reduced if significant habitat changes have occurred in the area or increased based on local information (USFWS 2018d, 2019e).

waterbodies (one pond and four streams segments) were identified. One unnamed tributary draining to Fish Lake exhibited perennial flows based on field surveys and desktop review of aerial imagery; the pond identified during surveys was associated with this stream. The remaining three streams are unnamed tributaries of Hidewood Creek; of these, two were segments of the same perennial stream and one was an intermittent stream (SWCA 2019b). As described in Section 2.2.1, the Topeka shiner has been documented within Hidewood Creek. Section 4.2 outlines the measures Tatanka Ridge will implement to avoid impacts to Topeka shiner potential habitat.

3.5. Dakota Skipper and Poweshiek Skipperling Surveys

Tatanka Ridge contracted SWCA to identify and survey potential native prairie habitat for the federally threatened Dakota skipper and federally endangered Poweshiek skipperling at the Project. Surveys were conducted in accordance with procedures specified in the *Dakota Skipper* (Hesperia dacotae) *North Dakota Survey Protocol* (USFWS 2018a).

Methods – Surveys were conducted using a three-step approach: desktop assessment, habitat surveys, and adult protocol surveys. The desktop assessment and habitat surveys were conducted in two phases due to a change in the Project boundary in early 2019. Adult protocol surveys were conducted within the eastern portion of the Project in 2018; however, because suitable native prairie habitat was not confirmed within the western portion of the Project during the 2019 habitat surveys (described in additional detail below), adult protocol surveys were not warranted within the western portion of the Final Project Boundary.

As stated above (see Section 2.2.1), the desktop assessments identified a total of 1,920 ac of potentially undisturbed grasslands within the Final Project Boundary that could support federally listed skippers (Figure 9). The majority of these areas were associated with streams and adjacent hillsides in the Project, with several larger areas of potentially undisturbed grasslands extending from the upper northcentral portion of the Project to the southeastern portion of the Project (Figure 9).

Habitat surveys were conducted within the areas identified as potentially undisturbed grasslands to field-verify whether the habitat identified during the desktop review was suitable or unsuitable for the Dakota skipper and/or Poweshiek skipperling. Determinations regarding the suitability of the habitat for federally listed skippers were made based on habitat characteristics outlined in the published literature (Rigney 2013; Royer and Marrone 1992a; Royer and Marrone 1992b; Selby 2013; Skadsen 2003; USFWS 2014b, 2016, 2018a).

Three rounds of Dakota skipper and Poweshiek skipperling adult protocol surveys were conducted in 2018 within areas identified during habitat surveys as suitable native prairie habitat. The adult protocol surveys followed the procedures specified in the *Dakota Skipper* (Hesperia dacotae) *North Dakota Survey Protocol* (USFWS 2018a). Surveys were conducted by permitted biologists between June 29 and July 12, 2018 (within the adult flight period of both species), with 48 hours between survey rounds.

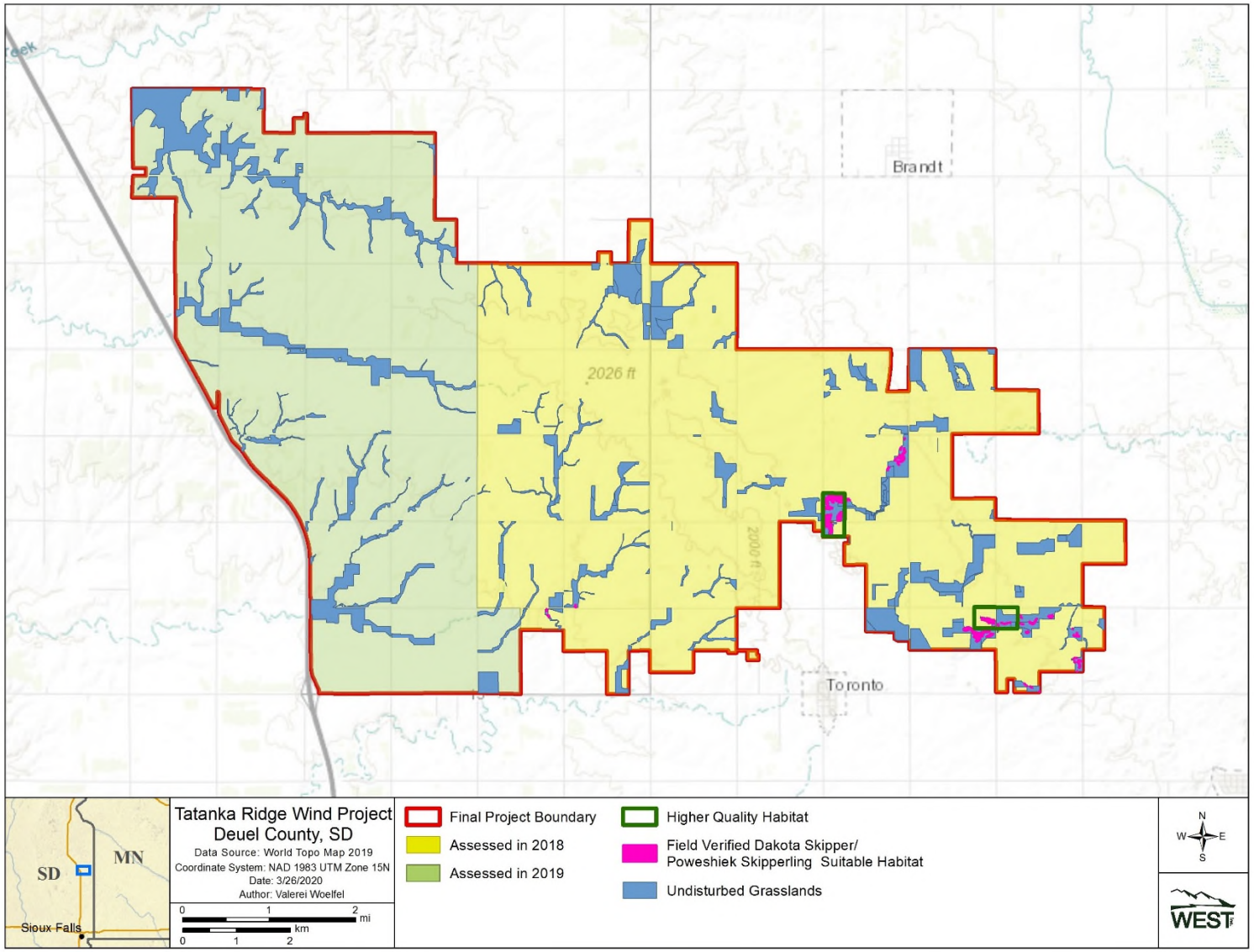

Figure 9. Grassland desktop habitat assessment and field survey results for Dakota skipper and Poweshiek skipperling at the Tatanka Ridge Wind Project.

Results – Habitat surveys conducted in 2018 verified suitable skipper habitat within the eastern portion of the Project (SWCA 2018), which included approximately 39.0 ac of suitable habitat within the southeastern portion of the Final Project Boundary (Figure 9). Surveys conducted in 2019 did not identify any suitable habitat in the western portion of the Project (SWCA 2019a).

The majority of the areas classified as Dakota skipper/Poweshiek skipperling habitat during 2018 field surveys were considered to be suitable with a lower potential for maintaining a viable population of the Dakota skipper or Poweshiek skipperling (USFWS 2016, 2018a). These areas were primarily small in size, dominated by smooth brome (*Bromus inermis*), contained populations of the noxious musk thistle weed (*Carduus nutans*), had relatively few or scattered nectar species, had poor juxtaposition in relation other suitable habitat polygons, or lacked the requisite species diversity (SWCA 2018). However, the areas were verified as suitable habitat due to the presence of some native grassland species, including:

- big bluestem (*Andropogon gerardii*);
- black-eyed Susan (*Rudbeckia hirta*);
- Canada goldenrod (*Solidago canadensis*);
- candle anemone (*Anemone cylindrica*);
- native thistle (*Cirsium* spp.);
- pale-spike lobelia (*Lobelia spicata*);
- prairie coneflower (*Ratibida columnifera*);
- prairie lily (*Lilium philadelphicum*);
- purple coneflower (*Echinacea angustifolia*);
- purple prairie clover (*Dalea purpurea*);
- sideoats grama (*Bouteloua curtipendula*); and
- smooth deathcamas (*Zigadenus elegans*).

Smaller areas of higher quality suitable habitat were identified in the east-central and southeastern portion of the Final Project Boundary (Figure 9). The areas in the east central portion of the Project occurred along low-lying flats adjacent to wetlands (SWCA 2018) and included smooth deathcamas; pale-spike lobelia; Canada goldenrod; candle anemone; and a few prairie lily, black-eyed Susan, and big bluestem. The areas in the southeastern portion of the Project were within undisturbed grasslands and contained big bluestem, sideoats grama, and purple prairie clover; these areas also contained scattered purple coneflower and prairie coneflower.

Three rounds of adult protocol surveys were conducted within areas of suitable habitat in the eastern portion of the 2018 Project Boundary between June 29 and July 12, 2018. No Dakota skippers or Poweshiek skipperlings were observed during any of the three rounds of adult protocol surveys (SWCA 2018). Therefore, based on the USFWS protocols (USFWS 2018a), the 39.0 ac of suitable habitat within the Final Project Boundary where adult protocol surveys were conducted are considered not occupied by either the Dakota skipper or Poweshiek skipperling. Because the 2018 surveys included all suitable habitat out to a distance of 250 m from the suitable skipper

habitat identified during habitat surveys, the surveys are considered valid for a minimum of two additional seasons, or through 2020 (USFWS 2018a). Species-specific surveys for listed skippers also occurred within previous iterations of the Project in 2009 and 2015. Surveys were conducted in accordance with guidelines from the USFWS in place at that time; neither Dakota skippers nor Poweshiek skipperlings were documented during the 2009 or 2015 surveys (Selby 2009, HDR Engineering 2015).

4. AVOIDANCE AND MINIMIZATION MEASURES

4.1. Pre-construction Siting and Design

Wind turbines and associated facilities for the Project have been be sited with consideration for the topographic and environmental characteristics of the site, efficiency of selected turbine models, and to minimize impacts to area residents. Pre-construction siting considerations follow guidance from the USFWS, SDGFP, and SDPUC, and include methods to avoid and minimize impacts to wildlife and sensitive habitats.

Turbines are a monopole design, which minimizes opportunities for perching and nesting birds. This measure minimizes risk of collision for raptors and other birds. During Project development, wind turbines and the majority of the associated facilities have been sited on cultivated croplands and no turbines will be located in grasslands or wetlands, minimizing impacts to birds, bats, and other wildlife by avoiding higher quality habitat. Project facilities will avoid the USFWS grassland easement in the northwestern corner of the Project (Figure 4). Tatanka Ridge coordinated with the USFWS regarding wetland easements and construction limits of disturbance within the Final Project Boundary. The underground collection system was rerouted to avoid the parcel of land containing the wetland easement, and the turbine (F2) was shifted to avoid temporary impacts to wetlands within the USFWS easement. Tatanka Ridge adjusted the siting of turbine L9 to avoid the perennial reaches of a tributary to Hidewood Creek. Additionally, the underground collection from turbine S5, S6, and S8 will be directionally bored under that tributary to Hidewood Creek to avoid potential impacts to Topeka shiners. The overhead gen-tie line will be installed to meet Avian Power Line Interaction Committee recommendations.

As Sections 2.2.1 and 3.5 detail, Tatanka Ridge conducted habitat assessments and species-specific surveys for listed skippers. Grassland habitat that could be affected by construction of the Project was assessed to determine if suitable habitat for listed skippers was present. Within the 39.0 ac of suitable habitat identified, presence/absence surveys were conducted in accordance with USFWS guidelines, which did not document the presence of either skipper; therefore, these areas are considered not occupied by either the Dakota skipper or Poweshiek skipperling (SWCA 2018). The final layout avoided suitable habitat to the greatest extent feasible. As described above, no turbines will be located within grasslands; impacts will be limited to one area where the collection lines traverse approximately 127 ft of suitable habitat that is not occupied by either the Dakota skipper or Poweshiek skipperling. Measures taken during construction to further avoid and minimize impacts to listed butterfly habitat are included below.

4.2. Construction

During construction, the following avoidance and minimization measures will be implemented:

1. *Minimize Temporary Disturbance* – Areas of construction and temporary ground-disturbance activities associated with the Project have been minimized and will occur within tilled and cultivated croplands to the extent feasible, thereby minimizing impacts to higher quality habitat and minimizing habitat fragmentation. Temporary disturbances include crane pads at each turbine location, crane paths, widening of access roads, trenching to install underground collection lines, laydown yard, and road improvements at public intersections to allow for delivery of large components.

   During the construction period, heavy trucks, light trucks, and other construction equipment will access construction sites via existing county and gravel roads wherever possible. Temporary crane paths will be utilized across the Project, avoiding sensitive resources whenever practicable.

   Construction of the Project will include the installation of approximately 84 mi of underground collection lines. Tatanka Ridge will install underground collection lines at a typical depth of 42 in below grade via trenching, plowing, or directional bores. Communication cables will be co-located underground with the collection system whenever feasible. Topsoil will be segregated from subsoil when installing the collection lines and communication system using the trenching method, and backfill will place topsoil at the surface.

2. *Minimize Impacts to Higher Quality Habitat* – No turbines will be located within grasslands, and forested habitat was avoided during the siting and design of the Project. Further, construction of the Project will minimize impacts within grassland and wetland habitats. Tatanka Ridge has largely avoided the grassland habitat within the Project, and will minimize ground disturbance within the area where installation of the collection lines traverses approximately 127 ft of unoccupied suitable habitat for federally listed skippers. As described in Section 3.5, species-specific surveys conducted in 2018 indicated this area is considered not occupied by either the Dakota skipper or Poweshiek skipperling.

3. *Erosion and Sediment Control* - Tatanka Ridge will develop a Stormwater Pollution Prevention Plan (SWPPP) as part of the Surface Water Discharge Permit (National Pollutant Discharge Elimination System)/South Dakota Department of Environment and Natural Resources General Permit Authorizing Stormwater Discharges (Permit Number SDR100000) for construction activity. The conditions of the Project's stormwater permit and the best management practices identified in the SWPPP to prevent or minimize erosion and sedimentation will be implemented throughout construction and site restoration.

4. *Noxious Weed Control* – The spread of noxious weeds will be minimized to the extent feasible by delivering clean, washed vehicles to the site; using weed-free straw or wattles for erosion control, if readily available; and through the use of weed-free seed mixes following construction. The SWPPP includes protocol to manage noxious weeds during construction.

5. *Access Roads* – Approximately 16 mi of permanent access roads will be constructed across the Project. During construction, the roads will temporarily be up to approximately 50 ft wide to accommodate transportation of heavy construction equipment; however, upon completion of construction, the width of the access roads will be reduced to approximately 16 ft. The finished elevation of the access roads will be similar to existing grade to minimize impacts to farming activities to the extent practicable, based on existing grades and the requirement to facilitate proper drainage. Tatanka Ridge will strip and stockpile the topsoil to allow for site restoration to preserve the drainage present prior to construction. Culverts will be installed as necessary to prevent the ponding of water. Culvert installation will meet all USACE Section 404 and regional condition requirements, as applicable. Access roads will be maintained throughout construction and operation of the Project.

6. *Minimize Risk of Vehicular Collisions* – Approved work space limits will be maintained throughout the construction period, and vehicular speed will be limited to 25 mi per hour or less on Project access roads for employees and contractors. This measure will minimize the risk of wildlife collisions with vehicles and will reduce the occurrence of carcasses that could attract avian scavengers to the Project.

7. *Waterbodies within the Upper Big Sioux Watershed* – The Topeka shiner occurs within the Upper Big Sioux watershed and has been documented near the Project in Peg Munky Run, North Deer Creek, and Hidewood Creek. Due to the potential presence of the Topeka shiner, no in-stream activities will occur within the Upper Big Sioux watershed. This will also minimize potential impacts to both the state-listed banded killifish and redbelly dace. Further, Tatanka Ridge will implement a 50-ft buffer along each side of waterbodies, with ordinary high water marks, where federally or state-listed species have been documented near the Project. If intermittent streams are completely dry at the time of construction activities, crane paths may cross these features. If this occurs, Tatanka Ridge will implement the measures described in the *Programmatic Biological Opinion for the Issuance of Selected Nationwide Permits Impacting the Topeka Shiner in South Dakota* (USFWS 2014c), as follows:

    - erosion and sediment control measures will be installed, monitored, and maintained;
    - impacts to both the dry waterbody as well as riparian and grassland habitat will be minimized to the extent feasible;
    - the site will be restored to pre-disturbance condition;
    - manual revegetation of all disturbed areas will be initiated immediately following construction, or at the first opportunity if outside of the growing season. If outside of the growing season, erosion and sediment control measures will be monitored and maintained until the site is permanently stabilized;
    - revegetated areas will be monitored, and any failures addressed, until the site is permanently stabilized; and
    - livestock and machinery will both be excluded from the site following disturbance until the site is permanently stabilized.

8. *Training* - A site-specific worker environmental training program will be developed and implemented throughout construction of the Project. All employees and contractors working in the field will be required to attend the construction site safety training, which will include environmental training prior to working on site. This training will include Project-specific information regarding environmental permits and conditions, compliance, natural resources, wildlife, sensitive species, sensitive areas, restrictions, protection measures, and consequences of non-compliance. The training will also include a description of the process that would occur if a federally or state-listed species is documented in the vicinity of construction activities at the Project, and notification protocols for injured wildlife detected on site that is consistent with Avangrid's Corporate Wildlife Plan. The training program will continue to be implemented throughout the operational life of the Project, as described in Section 4.3.

9. *Whooping Crane* – In accordance with Condition 38 of the SDPUC permit for the Project (SDPUC Project Docket EL19–926: 11/27/19 – Final Decision and Order Granting Permit to Construct Facility; Notice of Entry), although highly unlikely, if a whooping crane is observed near the Project, construction activities will be halted within 2 mi of the sighting until the whooping crane is confirmed to have left the area.

10. *Restoration* – In areas where ground-disturbance occurs outside of cultivated croplands, temporarily disturbed areas will be restored to pre-construction conditions using a seed mix recommended by the NRCS, other land management agency, or in accordance with landowner requests. In areas where wetlands cannot be avoided, wetlands will be restored to pre-construction conditions per the SWPPP and wetland permits.

4.3. Operations and Maintenance

During operations and maintenance, the following measures will be implemented:

1. *Minimize Lighting*. Outdoor lights at the substation will be on timers and have down-shielding.

2. *Limit Foraging Opportunities.* Foraging opportunities for raptors and other scavengers will be limited by:

   - Monitoring for and removing or covering road-killed animals or other carcasses detected incidentally (e.g., while travelling within the site or during daily job functions) by personnel on or near the Project, as allowed by regulation and landowner agreement. This activity would likely reduce scavenger food sources. Eagle and migratory bird carcasses will not be handled. Any documented state- or federally listed avian species will be reported.

   - Prohibiting food waste littering by employees.

3. *Minimize Risk of Vehicular Collisions*. Project access roads will have a 25 mi per hour speed limit or less for Project staff.

4. *Minimize Fire Risk*. Minimizing fire risk by utilizing spark arrestors on electrical equipment, and by restricting smoking to designated site areas.

5. *Proper Hazardous Materials Handling*. Hazardous materials will be handled in accordance with federal and state regulations.

6. *Blade Feathering for Bats*. All operating turbines at the Project will be programmed to be feathered at wind speeds up to the manufacturer's standard cut-in speed (3.0 m per second), when temperatures are above 50° Fahrenheit, from one-half hour before sunset to one-half hour after sunrise, between July 15 and October 15 of each year.

7. *Whooping Crane Monitoring.* In accordance with Condition 38 of the SDPUC permit for the Project (SDPUC Project Docket EL19–926: 11/27/19 – Final Decision and Order Granting Permit to Construct Facility; Notice of Entry), Tatanka Ridge will coordinate with the SDGFP to develop a procedure for minimizing whooping crane collisions with turbines during operations, including formal plans for monitoring the Project for whooping cranes during spring and fall migration periods. The plan, which will be implemented throughout the operational life of the Project, and will be appended to this BBCS once established. Although highly unlikely, if a whooping crane is sighted, Project turbines will be shut down within 2 mi of the sighting until the whooping crane is confirmed to have left the area.

8. *Employee Training*. A site-specific wildlife training plan will be developed and implemented throughout the Project operating life. All employees and contractors working in the field will be required to attend the wildlife training session prior to working on site. All operations personnel complete Wildlife Awareness training and an annual refresher.

9. *Harassment*. Project employees and contractors will be instructed to avoid disturbing or harassing wildlife.

10. *Reporting*. Project employees and contractors will be instructed to report any sensitive wildlife observations or fatalities found incidentally to the Tatanka Ridge Wildlife Coordinator (WC) who will report any discovery of a federal or state-listed species to the appropriate agency within 48 hours of confirmed species identification.

5. POTENTIAL IMPACTS TO BIRDS, BATS, & OTHER WILDLIFE

5.1. Birds

5.1.1. Direct Impacts Due to Construction and Turbine Operation

The most probable direct impact to birds from wind energy facilities is direct mortality or injury due to collisions with turbines. Collisions could occur with resident birds foraging and flying within the Project or with migrant birds seasonally moving through the Project. Project construction also could directly impact birds, although mortality from construction equipment is expected to be low.

Passerine bird fatalities during spring and fall migration typically make up the majority of bird fatalities at wind energy developments (Allison et al. 2019). Migratory passerine use of the Project is likely typical of agricultural habitats in the region based on the avian use surveys conducted at the Project. Passerine fatality rates are anticipated to be similar to that at other wind energy facilities in this region (Table 8). Because the Project is adjacent to, and contains similar land cover as the Buffalo Ridge II Wind Project (Buffalo Ridge II; an operating wind project located directly south of the Tatanka Ridge Project), it is possible that the fatality rate would be similar to the relatively low fatality rate documented at Buffalo Ridge II during the 2011–2012 post-construction fatality surveys (1.99 birds/MW/year; Derby et al. 2012a). Most passerines are relatively short-lived, have comparatively high reproductive output, and their population growth rates are more sensitive to reproductive failure than to adult survival (Stahl and Oli 2006, Arnold and Zink 2011). Recent research indicates that collisions with wind turbines kill relatively small proportions (less than 0.05% annually) of passerine populations (Erickson et al. 2014).

Many grassland bird species have experienced relatively drastic population declines over the past 50 years due to the reduction and fragmentation of grassland habitat in North America as the landscape is converted to croplands (Wilsey et al. 2019). Minimizing disturbance to grassland habitats is important for the ongoing conservation of grassland bird species. Tatanka Ridge conducted desktop and field surveys for grassland habitat at the Project, and sited Project facilities and infrastructure to avoid grassland habitat when feasible. The first year of avian use surveys documented relatively low use of the Project by grassland birds (Dernovsek et al. 2019a), which is consistent with the majority (nearly 80%) of the Project consisting of cultivated croplands. For these reasons, and because similar or higher quality habitat is present in areas in the vicinity of the Project (e.g., several units within the Dakota Tallgrass Prairie WMA are present less than 10 mi north of the Final Project Boundary), impacts to grassland birds are expected to be minimal.

Waterfowl was the most abundant bird type recorded during the first year of avian use surveys, which was primarily associated with eight large groups of snow goose migrating through the Project during spring (Dernovsek et al. 2019a). Consistent with its location in the central flyway (and with the large groups of snow goose observed), waterfowl use at the Project was highest during the spring and fall, and substantially lower in the summer and winter (Dernovsek et al. 2019a). While it is possible that waterfowl utilize breeding habitat within the Project, the relatively high use observed during spring and lower use observed during summer suggest that waterfowl primarily migrate through, rather than nest within, the Project. Given that wetland habitat is highly fragmented within the Project, and that several areas of higher quality nesting habitat for waterfowl are present outside of the Project to the east (see WPAs on Figure 4), it is likely that impacts to breeding waterfowl due to reduced use of the area would be minor. Although the Project will be sited to avoid impacts to wetlands whenever feasible, waterfowl could potentially be at risk of collision due to the tendency to fly at heights corresponding to the rotor-swept area; however, waterfowl also have been documented to show relatively high rates of avoidance (Jain 2005, National Research Council 2007, Johnson and Erickson 2011) and comparatively few fatalities have been documented at wind energy facilities (Allison et al. 2019). Overall, impacts to waterfowl at the Project are expected to be relatively low; at the adjacent Buffalo Ridge II Project, four coots and two ducks were documented during searches during the 2011–2012 post-construction fatality surveys (Derby et al. 2012a).

Table 8. Avian and bat fatality rates from publicly available data from wind projects in the region.

Project Name, Location, (Study Period)	Fatality Rate (adjusted per megawatt per year)			Reference
	Birds	Raptors	Bats	
Adair, IA (2014–2015)	4.64	0.07	14.05	Bay et al. 2017a
Adams, IA (2015–2016)	1.56	0	10.08	Bay et al. 2017b
Barton I & II, IA (2010–2011)	5.50	0	1.85	Derby et al. 2011b
Big Blue, MN (2013)	0.60	0	2.04	Fagen Engineering 2014
Big Blue, MN (2014)	0.37	0	1.43	Fagen Engineering 2015
Black Oak Getty, MN (2017)	8.69	0	29.88	Pickle et al. 2018
Black Oak Getty, MN (2018)	3.50	0.06	37.59	Pickle et al. 2019
Buffalo Ridge I, SD (2009–2010)	5.06	0.2	0.16	Derby et al. 2010c
Buffalo Ridge II, SD (2011–2012)	1.99	0	2.81	Derby et al. 2012a
Buffalo Ridge, MN (Phase I; 1996)	4.14	0	NA	Johnson et al. 2000
Buffalo Ridge, MN (Phase I; 1997)	2.51	0	NA	Johnson et al. 2000
Buffalo Ridge, MN (Phase I; 1998)	3.14	0	NA	Johnson et al. 2000
Buffalo Ridge, MN (Phase I; 1999)	1.43	0.47	0.74	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1998)	2.47	0	2.16	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1999)	3.57	0	2.59	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	NA	NA	4.35	Johnson et al. 2004
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	NA	NA	1.64	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 1999)	5.93	0	2.72	Johnson et al. 2000
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	NA	NA	3.71	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	NA	NA	1.81	Johnson et al. 2004
Carroll, IA (2014–2015)	3.55	0	11.71	Bay et al. 2017a
Century, IA (2015–2016)	3.54	0.01	9.07	Bay et al. 2017b
Charles City, IA (2015–2016)	4.13	0	10.41	Bay et al. 2017b
Crystal Lake II, IA (2009)	NA	NA	7.42	Derby et al. 2010a
Eclipse, IA (2014–2015)	3.62	0.12	10.01	Bay et al. 2017a
Elm Creek II, MN (2011–2012)	3.64	0	2.81	Derby et al. 2012b
Elm Creek, MN (2009–2010)	1.55	0	1.49	Derby et al. 2010d
Highland, IA (2015–2016)	2.25	0	8.63	Bay et al. 2017b
Intrepid, IA (2015–2016)	2.93	0.02	18.37	Bay et al. 2017b
Laurel, IA (2015–2016)	2.96	0	14.22	Bay et al. 2017b
Lundgren, IA (2014–2015)	2.91	0	28.74	Bay et al. 2017a
Lundgren, IA (2015–2016)	3.37	0	8.8	Bay et al. 2017b
Macksburg, IA (2014–2015)	3.38	0	73.08	Bay et al. 2017a
Macksburg, IA (2015–2016)	4.94	0.02	10.79	Bay et al. 2017b
Moraine II, MN (2009)	5.59	0.37	2.42	Derby et al. 2010e
Morning Light, IA (2014–2015)	2.36	0	20.19	Bay et al. 2017a

Table 8. Avian and bat fatality rates from publicly available data from wind projects in the region.

Project Name, Location, (Study Period)	Fatality Rate (adjusted per megawatt per year)			Reference
	Birds	Raptors	Bats	
NPPD Ainsworth, NE (2006)	1.63	0.06	1.16	Derby et al. 2007
Pioneer Prairie I, IA (Phase II; 2011–2012)	0.27	0	4.43	Chodachek et al. 2012
Pioneer Prairie II, IA (2013)	NA	NA	3.83	Chodachek et al. 2014
Pomeroy, IA (2015–2016)	2.76	0.19	6.25	Bay et al. 2017b
PrairieWinds ND1 (Minot), ND (2010)	1.48	0.05	2.13	Derby et al. 2011e
PrairieWinds ND1 (Minot), ND (2011)	1.56	0.05	1.39	Derby et al. 2012d
PrairieWinds SD1, SD (2011–2012)	1.41	0	1.23	Derby et al. 2012c
PrairieWinds SD1, SD (2012–2013)	2.01	0.03	1.05	Derby et al. 2013
PrairieWinds SD1, SD (2013–2014)	1.66	0.17	0.52	Derby et al. 2014
Red Pine, MN (2018)	2.68	0	18.74	Trana et al. 2019
Rolling Hills, IA (2014–2015)	1.79	0.04	6.13	Bay et al. 2017a
Rolling Hills, IA (2015–2016)	3.48	0.08	6.3	Bay et al. 2017b
Rugby, ND (2010–2011)	3.82	0.06	1.6	Derby et al. 2011c
Top of Iowa, IA (2003)	0.42	0	7.16	Jain 2005
Top of Iowa, IA (2004)	0.81	0.17	10.27	Jain 2005
Victory, IA (2014–2015)	1.52	0	6.48	Bay et al. 2017a
Vienna I, IA (2015–2016)	5.70	0.03	9.09	Bay et al. 2017b
Vienna II, IA (2015–2016)	3.57	0.07	10.28	Bay et al. 2017b
Walnut, IA (2014–2015)	2.88	0	21.69	Bay et al. 2017a
Waverly Wind, KS (2016–2017)	5.62	0.33	8.2	Tetra Tech 2017
Wellsburg, IA (2015–2016)	8.44	0	12.3	Bay et al. 2017b
Wessington Springs, SD (2009)	8.25	0.06	1.48	Derby et al. 2010b
Wessington Springs, SD (2010)	0.89	0.07	0.41	Derby et al. 2011a
Winnebago, IA (2009–2010)	3.88	0.27	4.54	Derby et al. 2011d
Range	**0.27–8.69**	**0–9.47**	**0.16–73.08**	

NA = not available/not applicable

Raptor use at the Project was generally low and was mainly attributed to red-tailed hawk observations in the fall, spring, and summer, while one bald eagle observation accounted for the only raptor use in the winter (Dernovsek et al. 2019a). Evidence suggests that raptors become habituated to the presence of wind turbines and a number of studies have shown no reduction in nesting and raptor use when wind turbines are present (Howell and Noone 1992, Erickson et al. 2004). Raptor fatality rates at the Project are expected to be within the range of fatality rates observed at other facilities in the region (Table 8). At the adjacent Buffalo Ridge II Project, no raptors were documented as fatalities during the 2011–2012 post-construction fatality surveys (Derby et al. 2012a).

5.1.2. Protected Bird Species Assessment

Threatened and Endangered Species – Based on a review of the USFWS IPaC and South Dakota's list of threatened, endangered, and candidate species documented within Deuel County, one protected bird species (red knot) has the potential to occur in the vicinity of the Project. As described above (see Section 2.2.1, Red Knot), stopover habitat for the red knot includes waterbodies containing an abundance of easily digested foods, such as invertebrates with thin or no shell. Because these types of waterbodies are not present, it is unlikely that the red knot will occur at the Project. Additionally, this species has not been observed during avian use surveys conducted to date at the Project. Therefore, although the Project is within the migratory range of the red knot, it is unlikely that the species will occur at the Project and no adverse effects are anticipated.

Although not identified through the USFWS IPaC tool or coordination with the USFWS or SDGFP, the federally and state-endangered whooping crane was identified by the SDPUC as a species of concern at the Project. The project is located over 30 mi east of the migration corridors defined by the USFWS and the USGS, and the closest confirmed whooping crane observation occurred 33 mi southwest of the Project in 1995. The field visit and aquatic resources delineations conducted in 2018 and 2019 identified limited and marginal suitable stopover habitat for this species; further, this species was not observed during avian use surveys conducted at the Project.

Based on a review of publicly available information on avian fatalities at wind farms, whooping crane injury or mortality has not been documented at a wind farm. In addition to their overall rarity, whooping cranes typically fly at elevations from 1,000 to 5,000 ft above ground level (above the rotor swept height) during daylight hours in fair weather, and studies suggest that whooping cranes may be able to avoid turbine collisions by flying around, over, or through gaps in turbine strings (Nagy et al. 2012, Derby et al. 2018). Therefore, in the unlikely event that whooping cranes were to occur at the Project, collision with turbines is considered unlikely. Tatanka Ridge has agreed to develop a procedure in coordination with the SDGFP for monitoring the Project for whooping cranes during spring and fall migration periods throughout the operational life of the Project. If a whooping crane is sighted, turbines will be shut down within 2 mi of the sighting until the whooping crane is confirmed to have left the area as described above (see Section 4.3). Based on the minimal potential for the whooping crane to occur at the Project, adverse impacts to whooping cranes are not anticipated.

Eagles – Eagle use documented during avian use surveys conducted to date at the Project has been relatively low, and no bald eagle nests have been documented within 5 mi of the Project turbines. Additionally there are no specific topographic features or large waterbodies that are expected to concentrate particularly high levels of bald or golden eagles within the Final Project Boundary. It is expected that although bald and golden eagles will continue to use the Project for some foraging activities or during migration, most bald eagle nesting and foraging activities will likely be concentrated outside the Final Project Boundary. Therefore, based on the qualitative risk assessment provided in this BBCS, risk to both bald and golden eagles is expected to be comparatively low, and adverse impacts are not anticipated.

5.2. Bats

5.2.1. Direct Impacts Due to Turbine Operation

Migratory tree-roosting bat species (e.g., hoary bat [*Lasiurus cinereus*], eastern red bat [*Lasiurus borealis*], and silver-haired bat [*Lasionycteris noctivagans*]) appear to be most susceptible to collision with wind turbines (American Wind Wildlife Institute [AWWI] 2018, Allison et al. 2019). To date, post-construction monitoring studies of wind energy facilities in the US show the following: a) migratory tree-roosting species compose approximately 72% of reported bat fatalities; b) the majority of fatalities occur during the fall migration season (August and September); and c) most fatalities occur on nights with relatively low wind speeds (e.g., less than 6.0 m per second; Arnett et al. 2008, Arnett and Baerwald 2013, Arnett et al. 2013, AWWI 2018, Thompson et al. 2017, Allison et al. 2019).

Although the Project contains limited suitable habitat (forest) for migratory bat species, it is likely that some amount of bat fatalities will occur at the Project. Potential for fatalities during the fall migration season will be reduced through implementation of the feathering regime described in Section 4.3. Fatality rates are anticipated to be similar to other wind energy projects in the region (Table 8). Because the Project is adjacent to and in similar land cover as Buffalo Ridge II, it is possible that the Project's fatality rate would be similar to the relatively low rate (2.81 bats/MW/year) that was found at Buffalo Ridge II during the 2011–2012 post-construction fatality surveys (Derby et al. 2012a).

5.2.2. Listed Bat Species Assessment

The NLEB is the only listed bat species that could occur at the Project. The limited forest habitat within the Project provides finite summer roosting and foraging habitat for the NLEB. Additionally, presence/probable absence surveys conducted in 2018 and 2019 did not identify any NLEB calls at the Project, indicating that NLEB is likely absent from the Project in the summer. Potential risk to NLEB during migration will be reduced through implementation of the feathering regime, as described in Section 4.3.

5.3. Other Wildlife

5.3.1. Topeka Shiner, Banded Killifish, and Northern Redbelly Dace

The Topeka shiner is a small minnow species that is restricted to small prairie streams that are tributaries of the Missouri River in the Upper Big Sioux Watershed. The Topeka shiner has been documented within 2.0 mi of the Project in three waterbodies: North Deer Creek, Peg Munky Run, and Hidewood Creek. Due to the potential presence of the Topeka shiner, no in-stream activities will occur within the Upper Big Sioux watershed. This will also minimize potential impacts to both the state-listed banded killifish and redbelly dace. Further, Tatanka Ridge will implement a 50-ft buffer along each side of waterbodies, with ordinary high water marks, where federally or state-listed species have been documented near the Project. Therefore, significant or adverse impacts to Topeka shiner from construction and operation of the Project are considered unlikely.

The state-listed threatened banded killifish and northern redbelly dace occur within a variety of aquatic habitats, including streams, ponds, and lakes (ODNR 2012, Pasbrig 2014). The banded killifish has not been documented in or near the Project, and the SDGFP has not raised concerns relating to this species during Project coordination. The northern redbelly dace has been documented in an intermittent waterbody in the southeastern corner of the Project and west of the Project within Peg Munky Run. Tatanka Ridge has committed to avoiding in-stream activities within the Upper Big Sioux watershed to minimize potential impacts to the Topeka shiner; this commitment will also minimize potential impacts to both the banded killifish and northern redbelly dace. Therefore, adverse impacts to these species from construction and operation of the Project are considered unlikely.

5.3.2. Dakota Skipper and Poweshiek Skipperling

The federally threatened Dakota skipper and the federally endangered Poweshiek skipperling have the potential to occur within the Project. Due to the dominance of cultivated croplands, negative results of species-specific surveys, and the limited amount of suitable habitat (39.0 ac), these two species are unlikely to occur within the Project. The final layout avoided suitable habitat to the extent feasible. No turbines will be located within grasslands, and construction of the Project will occur within only one area of suitable habitat for listed skippers (collection lines will be installed through this area). Although species-specific surveys indicated the area is considered not occupied by either the Dakota skipper or Poweshiek skipperling, and survey results are considered valid through 2020, Tatanka Ridge will minimize ground disturbance within this native grassland. Ground disturbance within skipper habitat is not anticipated during regular operation or maintenance of the Project. Therefore, no adverse effects are expected for the Dakota skipper or Poweshiek skipperling due to Project construction or operation.

6. POST-CONSTRUCTION FATALITY MONITORING

6.1. Incidental Monitoring

Tatanka Ridge will voluntarily conduct incidental wildlife monitoring at the Project. Fatalities or injuries discovered onsite at any time will be reported to the WC for further documentation and reporting. Tatanka Ridge will report any discovery of a federal or state-listed species to the appropriate agency within 48 hours of confirmed species identification. These protocols will continue for the life of the Project with the addition of two years of formal monitoring and reporting required by the state (see Section 6.2).

6.2. Post-construction Avian and Bat Fatality Monitoring

In accordance with Condition No. 33 of the SDPUC site permit and to assess actual direct collision impacts to bird and bat species from the Project, post-construction fatality monitoring will be conducted at the site by a qualified, independent third party for two years. The objective of the monitoring will be to determine if bird and bat fatality rates are lower, similar to, or higher than other South Dakota, regional, and national studies. The monitoring program will include searcher efficiency and carcass removal trials, and the overall mortality rate will be adjusted based on the trial results. The monitoring protocol is detailed in Appendix A (Post-Construction Fatality

Monitoring Plan). This protocol is based on guidelines from the WEG (USFWS 2012) and the *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions* (Strickland et al. 2011). The proposed methods are consistent with other fatality monitoring projects at wind facilities and reporting will be formatted in a way that is similar to other data summaries (AWWI 2018, 2019a, 2019b).

The two years of formal post-construction mortality data will be compiled on an annual basis and reported to the USFWS, SDGFP, and SDPUC. Results of the post-construction mortality monitoring will be evaluated based on comparison with other fatality estimates for similar wind energy projects. Should any of the bird or bat fatality rates be higher than the range typically seen in South Dakota and or the region, coordination with agencies will be conducted to determine what adaptive management measures, if any, could be reasonably employed (see Section 7).

7. ADAPTIVE MANAGEMENT

Within the WEG, the USFWS defines adaptive management as "an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process" (USFWS 2012). The WEG further notes that adaptive management at most wind facilities is unlikely to be needed during operation if they are sited in accordance with the tiered approach. Tatanka Ridge sited and will develop the Project in coordination with the USFWS, SDGFP, SDPUC, and SDNHP. The Project was designed to avoid and minimize environmental impacts. Given the relatively low levels of avian and bat fatalities found at nearby wind projects and the avoidance and minimization commitments of Tatanka Ridge, this Project appears to pose low risk to bird and bat species of concern. Nevertheless, Tatanka Ridge acknowledges the value that adaptive management might play to respond to unanticipated circumstances during long-term Project operations.

Findings during post-construction fatality monitoring or operational incidental monitoring could trigger the need for adaptive management actions. Unexpected findings that could potentially trigger an adaptive management response will be evaluated by Tatanka Ridge in coordination with the appropriate state and federal agencies. As necessary, Tatanka Ridge will consider adaptive management options if warranted, based on the effectiveness and practicability of an adaptive management response.

Avoidance, minimization, and mitigation actions that may be discussed with the appropriate state and federal agencies as adaptive management approaches include, but are not limited to, the following:

1. Remove or modify the source(s) of a designed attraction.
2. Adjust turbine operational protocols to reduce bird or bat fatalities targeted to the particular issue or species identified during monitoring, if shown effective.

This adaptive management plan will apply throughout the life of the Project to provide effective avoidance, minimization, and mitigation measures for avoiding and reducing impacts to birds and bats.

8. DECOMMISIONING AND RESTORATION

The goal of Project decommissioning will be to remove the installed power generation equipment and restore the site to pre-construction conditions to the extent practicable. The major activities required for decommissioning are as follows:

- remove wind turbines and crane pads;
- remove turbine foundations to a depth of 42 in below grade;
- remove Project substation and foundation to a depth of 42 in below grade;
- remove met tower and foundation to a depth of 42 in below grade;
- remove O&M building and foundation to a depth of 42 in below grade, if not desired for other purposes by landowner;
- remove access roads not desired for other purposes by landowners;
- re-grade and re-contour the disturbed area; and
- re-vegetate non-cultivated areas with native species or as directed by landowner.

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Appendix A. Post-Construction Fatality Monitoring Plan

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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STUDY PLAN

Post-Construction Fatality Monitoring for the Tatanka Ridge Wind Project

Submitted to:

Tatanka Ridge Wind, LLC

Submitted by:
Western EcoSystems Technology, Inc.
7575 Golden Valley Road, Suite 300
Golden Valley, MN 55427

April 15, 2020

INTRODUCTION

Tatanka Ridge Wind, LLC (Tatanka Ridge), a subsidiary of Avangrid Renewables, LLC (Avangrid), is developing and will be operating the Tatanka Ridge Wind Project (Project) in Deuel County, South Dakota (Figure 1). The Project will consist of up to 56 wind turbines and has a total nameplate capacity of 154.8 megawatts (MW). The Project consists of 50 General Electric (GE) 2.82 MW turbines with a 127-meter (m) rotor diameter (RD) and a hub height of 88.6 m, and six GE 2.3 MW turbines with a 116-m RD and a hub height of 90 m. Construction of the Project is planned to begin in the April 2020, with commercial operations anticipated to begin by the end of 2020.

Condition No. 33 of the South Dakota Public Utilities Commission (SDPUC) Energy Facility Permit for the Project (Docket EL19-026: 11/27/29 – Final Decision and Order Granting Permit to Construct Facility; Notice of Entry), requires Tatanka Ridge to "undertake a minimum of two years of independently-conducted post-construction avian and bat mortality monitoring for the Project, and to provide a copy of the report and all further reports to the United States Fish and Wildlife Service, South Dakota Game, Fish, and Parks, and the Commission." Tatanka Ridge is planning two years of independently conducted post-construction bird and bat fatality monitoring at the Project once construction and restoration are completed. The monitoring will be conducted in accordance with the recommendations of the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and the *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions* (Strickland et al. 2011). The proposed methods are consistent with other fatality monitoring projects at wind facilities and reporting will be formatted in a way that is similar to other data summaries (American Wind Wildlife Institute [AWWI] 2018, 2019a, 2019b).

At Tatanka Ridge's request, Western EcoSystems Technology, Inc. (WEST) has developed the following proposed Post-Construction Fatality Monitoring (PCFM) plan for the Project.

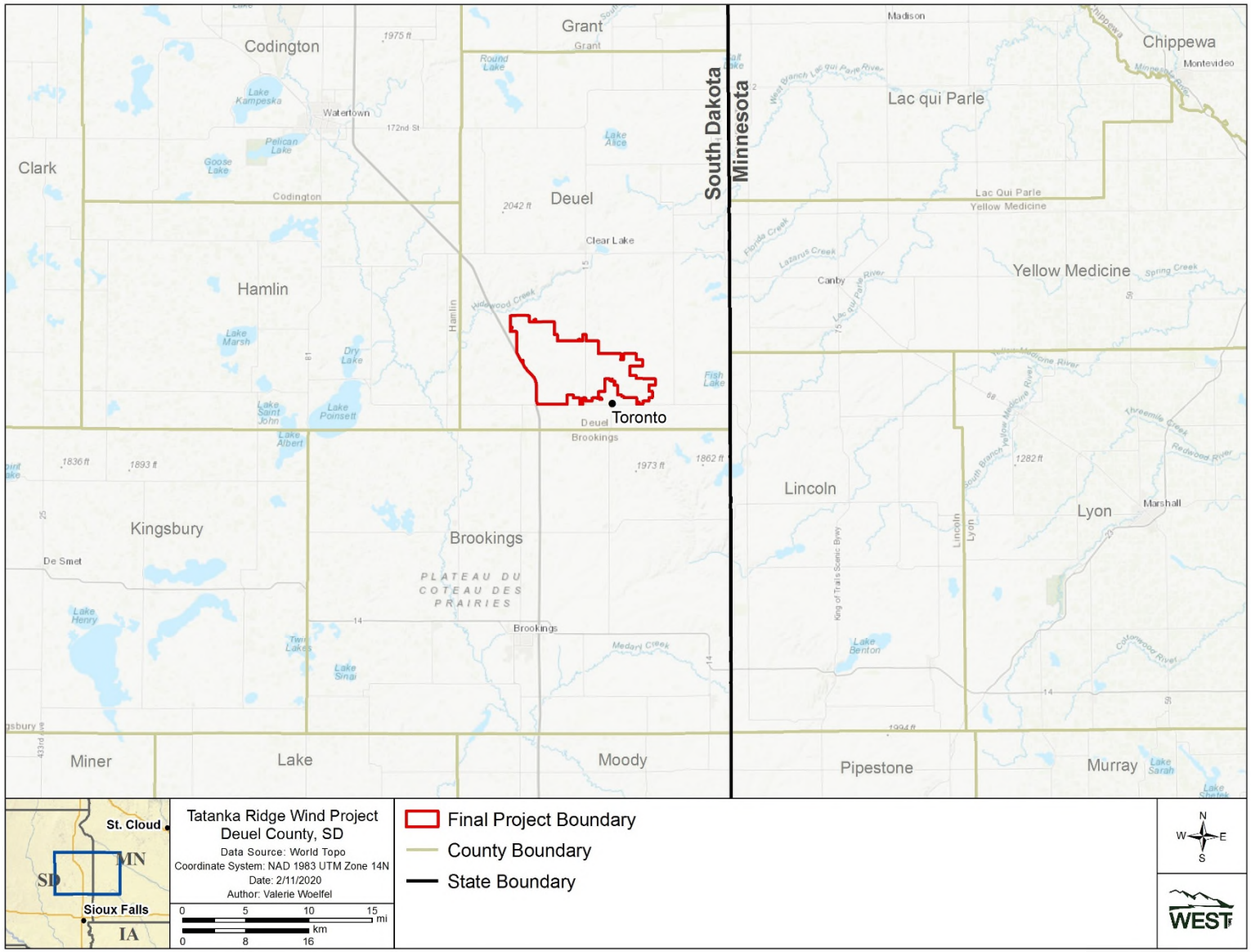

Figure 1. Location of the Tatanka Ridge Wind Project.

STUDY PLAN

Bird and Bat Post-Construction Fatality Monitoring

Fatality monitoring will provide information on the impact of the Project on birds and bats. Impacts to bird and bat species are anticipated to be within the overall range of other wind facilities in South Dakota and the Upper Midwest. The objective of the monitoring will be to determine if the bird and bat fatality rates are lower, similar to, or higher than other South Dakota, regional, and national studies. Annual fatality estimates will be provided for the following groups: all birds, small birds, large birds, bats, and raptors, if appropriate.

Fatality monitoring at the Project will include standardized carcass searches as well as searcher efficiency and carcass persistence trials, as described below. The searcher efficiency and carcass persistence trials will be conducted to collect information necessary to perform bias correction when calculating fatality estimates.

Standardized Carcass Searches

The bird and bat fatality monitoring will include a search of roads and pads for all turbines at the Project. Carcass searches will occur at each turbine once per week from March 1 to November 15 (i.e., spring, summer, and fall; consisting of approximately 1,904 searches), and once per month in winter from November 16 – February 28 (consisting of approximately 224 searches). Clearing surveys of the roads and pads will be conducted prior to the start of the study.

This schedule will result in a total of 38 weeks of searches, and a total of approximately 2,128 road and pad turbine searches (Table 1). It is anticipated that monitoring will start on September 1 or November 16, 2021. The start date for searches will depend on when civil restoration activities have decreased to the point where they would not be expected to affect bird and bat use at the Project.

Table 1. Seasonal dates and monitoring frequency.

Season	Dates	Search Frequency
Spring	March 1 – May 31	Weekly
Summer	June 1 – August 31	Weekly
Fall	September 1 – November 15	Weekly
Winter	November 16 – February 28	Monthly

For road and pad searches, biologists will search the gravel pad around the turbine and the access road out to 100 meters (m) from the turbine (referred to as a plot). Plot size and configuration may vary with the extent and configuration of turbine pad and access road surfaces available within 100 m of the turbine. Based on ground assessments and GIS analysis, plots will be mapped. If any searches are missed due to inclement conditions, the searchers will record the missed plots and reasons for missing the search.

At each plot, the following data will be recorded: date; start time; end time; observer; and the turbine number. When a bird or bat carcass is found during a search, the searcher will place a metal pin flag or similar marker at the carcass and finish searching the plot. After the plot has been completely searched, the searcher will return to each carcass and record information on a fatality data sheet. Data for each carcass to be recorded will include, at a minimum: date; GPS location; distance from observer when detected; identification of closest Project structure (e.g., turbine number); distance to nearest Project structure; species identity; size class (i.e., large bird, small bird, or bat); carcass condition; and dominant vegetation/ground cover. All bird and bat carcasses located will be photographed as found and plotted on a detailed map of the study area showing the location where the carcass was found. The condition of each carcass found will be recorded using the following categories:

- Intact – a carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.
- Scavenged – an entire carcass, which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, legs, pieces of skin).
- Dismembered – a portion of a carcass that does not show signs of being fed upon, or two portions of a carcass in close proximity that do not show signs of being fed upon.
- Feather Spot – 10 or more feathers at one location indicating predation or scavenging.

All bat carcasses found will be labeled with a unique number, bagged, and frozen for confirmation of species (if needed; which would occur through a qualified, federally permitted bat biologist) and for possible use in future searcher efficiency and/or carcass persistence trials. A copy of the data sheet for each carcass will be maintained with the carcass at all times. Required wildlife salvage permits will be obtained for the Project from South Dakota Game, Fish, and Parks (SDGFP) for handling dead or injured bats. Rubber gloves will be used to handle all bat carcasses to eliminate possible transmission of rabies or other diseases and to reduce possible human scent bias for carcasses later used in carcass persistence trials. Bird carcasses will not be collected and will be spray painted to minimize the potential for double-counting the specimen during the next search.

Carcasses found outside the search area, as well as those found within the search area but outside of the search window, will be treated following the above protocol to the extent feasible. These carcasses will be coded as incidental discoveries and will be documented in a similar fashion as those found during standard searches but will not be included when calculating fatality estimates.

In addition to carcasses, all injured birds or bats observed in search areas or elsewhere in the Project area (e.g., found incidentally) will be recorded and treated as a fatality for reporting purposes. Injured animals will not be handled. If injured birds or bats are discovered during the study they will be reported to the Tatanka Ridge Wildlife Coordinator (WC), who will coordinate with a contracted wildlife rehabilitation facility to facilitate appropriate actions.

Observations (i.e., live sighting, injury, fatality) of sensitive species including eagles, federally threatened and endangered species, and state-protected species will be immediately reported to the WC for further documentation and reporting, and the appropriate federal or state agency will be notified within 48 hours of confirmed species identification. Notes regarding observations of sensitive species will include the outcome of the observation (e.g., subject last seen leaving Project boundary).

Searcher Efficiency Trials

The objective of the searcher efficiency trials is to estimate the percentage of carcasses that are found by searchers. Estimates of searcher efficiency will be used to adjust the total number of carcasses found for those missed by searchers, correcting for detection bias.

Searcher efficiency trials will begin when PCFM begins and will be conducted in the same plots that PCFM occurs. Personnel conducting carcass searches will not know when trials are conducted or the location of the detection carcasses. Searcher efficiency trials will occur during each season to account for varying site conditions. Up to 180 bird and bat carcasses, distributed approximately evenly among the three size classes, will be used for searcher efficiency trials during the study period; however, if bats are not available, mice or a suitable bat surrogate will be used. Specifically, 12 to 15 bat, 12 to 15 small bird, and 12 to 15 large bird carcasses will be used each season (i.e., spring, summer, fall, and winter).

Searcher efficiency carcasses will include commercially available species, such as dark hopper-sized house mice (*Mus musculus*; approximately two- to three-week-old weaned mice) as bat surrogates; house sparrows (*Passer domesticus*) and two-week-old northern bobwhite quail (*Colinus virginianus*) for small birds; and rock pigeons (*Columba livia*) and ring-necked pheasants (*Phasianus colchicus*) for large birds. As bat carcasses can be difficult to obtain, mice, salvaged rodents, or small birds may be used as surrogates. As the study progresses, if bat carcasses are found they will be incorporated into the searcher efficiency trials for later seasons.

Trial carcasses will be placed randomly and carcasses of different sizes will be allocated to ensure equitable representation among different observers, sampling areas, and seasons. Carcasses will be dropped from waist high or higher and allowed to land in a random posture. Each trial carcass will be discreetly marked prior to dropping so that it can be identified as a study carcass after it is found. The number and location of the detection carcasses found during the carcass search will be recorded. The number of carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses. Specimens will be recovered from the site and/or may be used in carcass persistence trials.

Carcass Persistence Trials

The objective of carcass persistence trials is to estimate the likelihood that a carcass is available to be found by searchers and not removed, as a function of the time (measured in days), since the trial carcass was placed in the field. Carcass removal includes removal by predation or scavenging, or removal by other means such as being plowed into a field. Estimates of carcass

persistence will be used to adjust the total number of carcasses found for those removed from the study area, correcting for removal bias.

Carcass removal trials will begin in the season when carcass searches begin. Carcass persistence trials will be conducted within each season to account for varying weather conditions as well as variability in scavenger types and densities. Up to 180 bird and bat carcasses (if bats are not available, mice or suitable bat surrogate will be used) will be used during the study period. Specifically, 12 to 15 bat, 12 to 15 small bird, and 12 to 15 large bird carcasses will be used each season (e.g., spring, summer, fall, and winter).

During each trial, carcasses will be placed at randomly chosen locations throughout the Project to minimize bias caused by scavenger swamping. Carcasses will be dropped from waist high or higher and allowed to land in a random posture. Each trial carcass will be discreetly marked prior to dropping so that it can be identified as a study carcass if it is found by other searchers or wind facility personnel.

Personnel conducting carcass searches will monitor the trial small bird and bat carcasses over a 30-day period according to the following schedule as closely as possible. Carcasses will be checked every day for the first 4 days, and then on day 7, day 10, day 14, day 20, and day 30. This schedule may vary depending on weather and coordination with the other survey work. Experimental carcasses will be left at the location until the end of the carcass removal trial. At the end of the 30-day period any evidence of the carcasses that remain will be removed.

If raptor carcasses are found as fatalities at the Project, they will be marked in the field as described above, and incorporated into carcass persistence trials. Raptor and large bird carcasses will be checked every day for the first 4 days, and then on the following approximate schedule: day 7, day 10, day 14, day 20, and every 10 days thereafter, up to a maximum of 120 days; similar to the other persistence trials, this schedule may vary depending on weather and coordination with the other survey work.

Scavenger removal rates will be regularly evaluated to confirm that removal rates are not exceedingly short. If the removal time is very short, there are means to address this such that additional uncertainty is not added into the analysis unnecessarily. Ways to address very short removal times are to increase search frequency, put out carcasses at night if scavengers are suspected of removing carcasses (i.e., some predators that are active during the day may cue in on and remove carcasses immediately after placement), or possibly other options. The frequency of the standardized searches may be increased if carcass removal rates by scavengers are so high at the Project site that it precludes accurate bird and bat fatality estimates. Based on carcass persistence trials at other wind project sites in the region, this level of carcass scavenging is not anticipated.

STATISTICAL ANALYSIS

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures will be implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers are responsible for inspecting data forms for completeness, accuracy, and legibility. A sample of records from an electronic database will be compared to the raw data forms and any errors detected will be corrected. Irregular codes or data suspected as questionable will be discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis will be traced back to the raw data forms, and appropriate changes in all steps will be made.

Data Compilation and Storage

A database, such as Microsoft SQL Server, will store, organize, and retrieve survey data. Data in the electronic database will follow a pre-defined format to facilitate subsequent QA/QC and data analysis. All field collected data, and electronic data files will be retained for reference.

Fatality Rate Estimation

Fatality estimation is a complex task due to a number of variables present in every study. Fatalities occur at an unknown rate, persist for variable amounts of time, and can be detected with varying levels of success based on carcass characteristics and ground cover. To account for these variables, fatality rate estimation methods have been developed.

Estimates of facility-related fatalities are based on:

(1) observed number of carcasses found during standardized searches for which the cause of death is either unknown or is assumed to be facility-related;

(2) persistence rates expressed as the estimated average probability a carcass is expected to remain in the study area and be available for detection by the searchers;

(3) searcher efficiency expressed as the proportion of planted carcasses found by searchers during searcher efficiency trials; and

(4) search area adjustment based on the plot size (as visible/available to be searched) and carcass density.

Annual fatality estimates will be provided for the following groups: all birds; small birds; large birds; raptors; and bats, if appropriate. The total number of fatalities in each of these groups will be estimated by adjusting for carcass persistence, searcher efficiency rates, and density-weighted search area using a fatality estimator model, assuming a sufficient number of fatalities (i.e., more than five per group) are detected. The fatality estimator used to estimate fatality rates on a per-turbine and per-MW rate will include the GenEst (Dalthorp et al. 2018a, 2018b, Simonis et al. 2018), Schoenfeld (2004), and/or Huso estimators (Huso 2010, Huso et al. 2018). Incidental

finds that occur outside of search areas will not be included in calculations of adjusted fatality estimates, but will be summarized in reports.

Standard errors and 90% confidence intervals will be calculated using bootstrapping (Manly 2018). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances, and confidence intervals for complicated test statistics. A total of 1,000 bootstrap samples are planned to be used. The standard deviation of the bootstrap estimates is the estimated standard error. The lower 5^{th} and upper 95^{th} percentiles of the 1,000 bootstrap samples will be estimates of the lower limit and upper limit of 90% confidence intervals.

REPORTING

Estimated fatality rates for birds and bats per turbine and per MW will be calculated based on the methods described above. These calculated fatality rates will be compared to publicly available data from other wind facilities to determine if rates are lower than, similar to, or higher than other South Dakota, regional, and national studies. PCFM results will be compiled on an annual basis and reported to Tatanka Ridge to provide a copy of the report to the USFWS, SDGFP, and SDPUC.

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