Tiers 1 and 2 Report
for the Prevailing Winds Wind Project
Bon Homme and Charles Mix
Counties, South Dakota

Prepared for:

Prevailing Winds, LLC

101 Second Street West
P.O. Box 321
Chokio, Minnesota 56221

Prepared by:

Sarah Hamilton and Clayton Derby

Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, North Dakota 58503

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EXECUTIVE SUMMARY

The Prevailing Winds Wind Project (Project) is located in Bonne Homme and Charles Mix counties, South Dakota. The purpose of this report is to: 1) characterize biological resources throughout the proposed Project as well as identify the needs and timing of recommended future studies based on the species of concern, and 2) to summarize the results of Tier 1 and Tier 2 studies. The Project area was evaluated during a February 2015 visit.

The majority of the Project is located in the Southern Missouri Coteau Slope, while a small portion is located in the Southern Missouri Coteau Level IV Ecoregions. Historically, the Project and surrounding area was mixed grass prairie consisting of grama, needlegrass, and wheatgrass species, with numerous wetlands scattered throughout. Today, the majority of the Project has been converted to agricultural use with crop production and livestock grazing as the main agricultural practices. There are trees and woodlands found mainly in planted shelter belts and within draws and on hillslopes. Wetlands are scattered throughout the Project.

One of the main concerns regarding impacts from wind energy facilities in South Dakota is development in native grasslands and other native prairie habitats and displacement of wildlife from these areas. Approximately 45% of the Project is categorized as grassland (grass/herbaceous/pasture/hay). Because the Project includes grasslands (native or planted), it is possible that some grassland-dependent wildlife species may be displaced. The magnitude and significance of the displacement will depend on the affected species and the plan for development of the site.

Based on National Wetland Inventory (NWI) data, there are approximately 1,305.8 acres (528.8 hectares) of wetlands found within the Project. Freshwater emergent wetlands (77.5%) accounted for the majority of the wetlands, followed by freshwater ponds (14.7%), lakes (4.4%), and freshwater forested/shrub wetlands (3.4%).

Seven animal species listed as threatened, endangered, or proposed endangered under the federal Endangered Species Act have been documented in Bonne Homme and/or Charles Mix counties, including: pallid sturgeon, Topeka shiner, interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. Five of these species have the potential to occur in the Project during some portion of the year: interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. The interior least tern, red knot, whooping crane, and piping plover could migrate through the Project area during the spring and fall, but are otherwise not expected to occur in the Project. The Project is located outside of the defined national whooping crane migration corridor, and there have been no confirmed whooping crane sightings within the Project as of fall 2010. The Project is with the defined range of the northern long-eared bat, and while unlikely, the species could be present during the summer breeding period. The pallid sturgeon and Topeka shiner are federally-listed fish species, but have not been found within the Project. There are no known occurrences of federally-listed plant species within the Project.

Western EcoSystems Technology, Inc. (WEST) conducted a preliminary review of the birds and bats listed as threatened or endangered by the state of South Dakota, as birds and bats are most likely impacted by wind facility development. WEST identified two bird species, bald eagle and osprey, that are listed as threatened by the state of South Dakota that may occur within the Project. Bald eagles are also protected under the Bald and Golden Eagle Protection Act.

The following diurnal raptor and vulture species could potentially breed in or near the Project: American kestrel, bald eagle, golden eagle, Cooper's hawk, northern harrier, red-tailed hawk, Swainson's hawk, ferruginous hawk, broad-winged hawk, peregrine falcon, osprey, and turkey vulture. Owls with the potential to breed in or near the Project include barn owl, burrowing owl, eastern screech owl, long-eared owl, short-eared owl, and great horned owl. Diurnal raptor species that may also occur within the Project outside of the breeding season (migration, winter, or post-breeding dispersal) include northern goshawk, Cooper's hawk, red-tailed hawk, golden eagle, bald eagle, merlin, peregrine falcon, prairie falcon, gyrfalcon, rough-legged hawk, and sharp-shinned hawk. Four red-tailed hawk and two unidentified raptor observations were recorded at the Project during the site visit in February 2015. Potential nest structures for above ground nesting species were present in the form of living and dead trees; grassland areas could also provide nesting habitats for ground-nesting raptors and owls, such as the northern harrier and burrowing owl.

Colonial rodents are known to attract feeding raptors but were not observed during the site visit. It is likely that some bird species migrate through the proposed Project, including passerines, raptors, and waterfowl. Harvested crop fields located in the Project could serve as feeding areas for migrating birds. During the site visit, approximately 70 mallards were seen throughout the area and feeding in crop fields.

Two US Geological Survey (USGS) Breeding Bird Survey (BBS) routes are located in the vicinity of the Project. The Tripp BBS route is approximately 13 miles (20.9 kilometers [km]) northeast of the Project, and the Sparta BBS route is approximately 21.5 miles (34.6 km) southeast of the Project. Seventy bird species have been recorded along the Tripp BBS route from 2011 to 2014, of which three are considered Species of Conservation Concern by the US Fish and Wildlife Service (USFWS): dickcissel, grasshopper sparrow, and red-headed woodpecker. Along the Sparta BBS route, 65 bird species were recorded in 2011 and 2013, of which four are considered Species of Conservation Concern by the USFWS: dickcissel, grasshopper sparrow, red-headed woodpecker, and upland sandpiper.

Seven bat species are potential residents and/or migrants in the Project, including big brown bat, eastern red bat, hoary bat, silver-haired bat, northern long-eared bat, little brown bat, and western small-footed bat. Potential roosting habitat within the Project is found in the form of scattered trees, wooded hillslopes, and abandoned buildings; no caves were observed during the site visit. No known caves were documented in a literature search; however, karst formations may be found within the Project. Although the operation of the proposed wind energy

facility will likely result in the mortality of some bats, the magnitude of these fatalities and the degree to which bat species will be affected is difficult to predict.

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INTRODUCTION

The Prevailing Winds Wind Project (hereafter referred to as Project) is located in Bonne Homme and Charles Mix Counties, South Dakota (Figure 1). Identification of potential biological resource issues early in the development phase of wind energy facilities helps the industry identify, avoid, and minimize future problems. This Tier 1 and 2 report involved a desktop review of publicly available information gathered from a variety of data sources, including US Fish and Wildlife Service (USFWS) websites; South Dakota Game, Fish and Parks (SDGFP) websites; US Geological Survey (USGS) Gap Analysis datasets; and various field guides, maps, and aerial imagery; and non-governmental organization (NGO) websites (e.g., The Nature Conservancy, Audubon, American Wind Wildlife Institute). This report is intended to meet the requirements described in Chapters 2-3 of the USFWS Land-Based Wind Energy Guidelines (USFWS 2012b).

STUDY AREA

The proposed Project (37,016.6 acres [ac]; 14,980.1 hectares [ha]) is located in the southeastern South Dakota counties of Bon Homme and Charles Mix (Figure 1). The landscape of the Project is flat to rolling hills, with elevations ranging from 454.5 to 573.7 meters (m; 1,491.2 to 1,882.3 feet [ft]) above sea level (Figures 2).

The majority of the Project is located in the Southern Missouri Coteau Slope, with the rest of the Project in the Southern Missouri Coteau Level IV Ecoregions (US Environmental Protection Agency [USEPA] 2013). Historically, the Project and surrounding area was mixed grass prairie consisting of grama (*Bouteloua* spp.), needlegrass (*Stipa* spp.), and wheatgrass (*Agropyron* spp.) species with numerous wetlands scattered throughout. Today, the majority of the Project has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices (Figure 4; USGS National Land Cover Data [NLCD] 2011). There are trees and woodlands found mainly in planted shelter belts and within draws and on hillslopes. Wetlands are scattered throughout the Project.

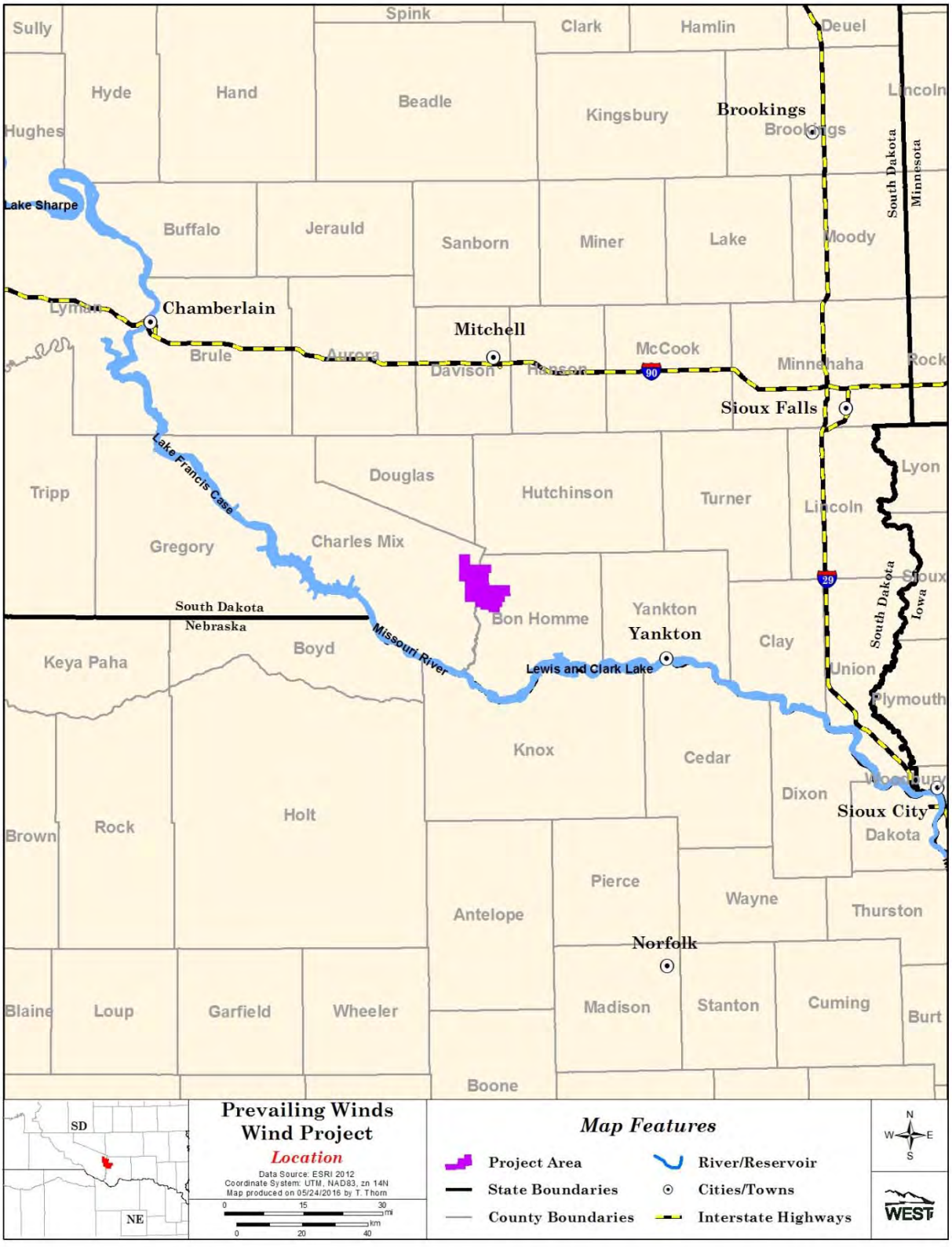

Figure 1. Location of the Prevailing Winds Wind Project.

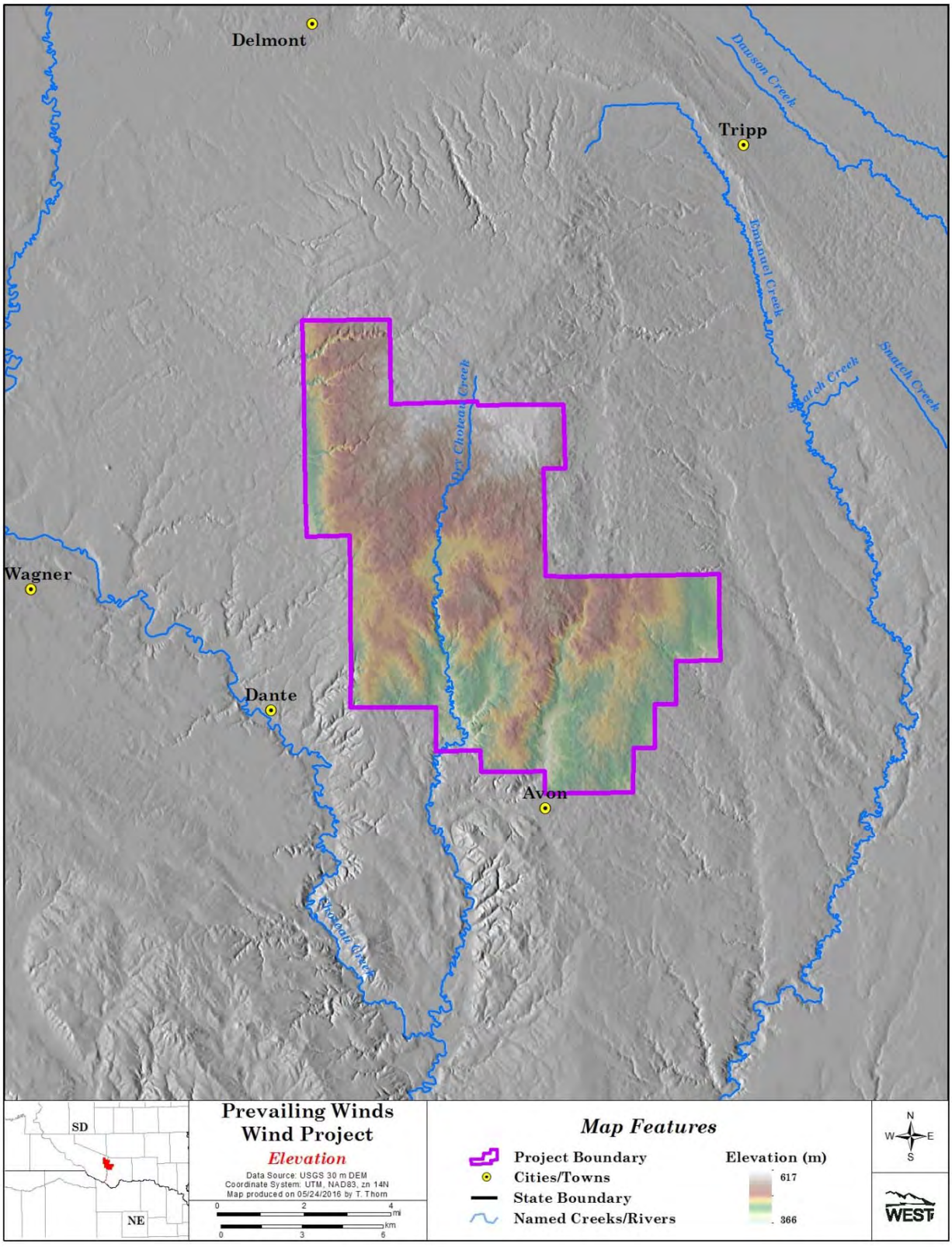

Figure 2. Elevation of the Prevailing Winds Wind Project.

METHODS

Tier 1 and 2 Study

Desktop review of publicly available information was gathered from a variety of data sources; including USFWS websites, SDGFP websites, USGS Gap Analysis datasets, various field guides, maps and aerial imagery, and NGO websites. In addition, biological resources within the Project were evaluated through a site reconnaissance visit conducted from public roads on February 25 and 26, 2015. Biological features and potential wildlife habitat, including plant communities, topographic features, and potential raptor nesting habitat and prey populations, were identified during the site visit. Photographs representative of the Project were also taken (Appendix A). All wildlife species observed were recorded (see Wildlife section below). Information about the presence and locations of sensitive species may be requested from the SDGFP and the USFWS.

Land Use/Land Cover

Approximately 47.5% of the Project is cultivated crops (Table 1, Figure 3; USGS NLCD 2011). The next most common land use is pasture/hay (37.6%). Grassland/herbaceous cover within the Project accounts for 6.7% of the land cover, followed by developed areas (4.3%) and wetlands/open water (2.7%). All other land cover types each account for less than 2% of the Project (Table 1).

Table 1. Land use/land cover within the Prevailing Winds Wind Project.

Land Use/Cover	Project Acres	% Total
Cultivated Crops	17,594.9	47.5
Pasture/Hay	13,901.8	37.6
Grassland/Herbaceous	2,479.6	6.7
Developed	1,575.1	4.3
Wetlands/Open Water	1,013.1	2.7
Deciduous Forest	368.3	1.0
Shrub/Scrub	67.5	0.2
Barren Land	14.7	<0.1
Evergreen Forest	1.1	<0.1
Total	**37,016.1**	**100**

Data Source: USGS NLCD 2011

For overall comparison of Land Use/Cover, the sole data source was USGS NLCD (2011). However, a more refined assessment was conducted by digitizing grasslands (pasture, hay, grassland, and herbaceous land cover) in ArcGIS 10.3 using 2014 National Agriculture Imagery Program (NAIP) aerial imagery. This method determined grassland acreage within the Project to be 9,949.97 acres (4,026.61 ha; 26.9%) in 2014, while USGS NLCD (2011) reported 16,381.40 acres (6,629.32 ha), indicating there has been a reduction in grassland in the Project since 2011.

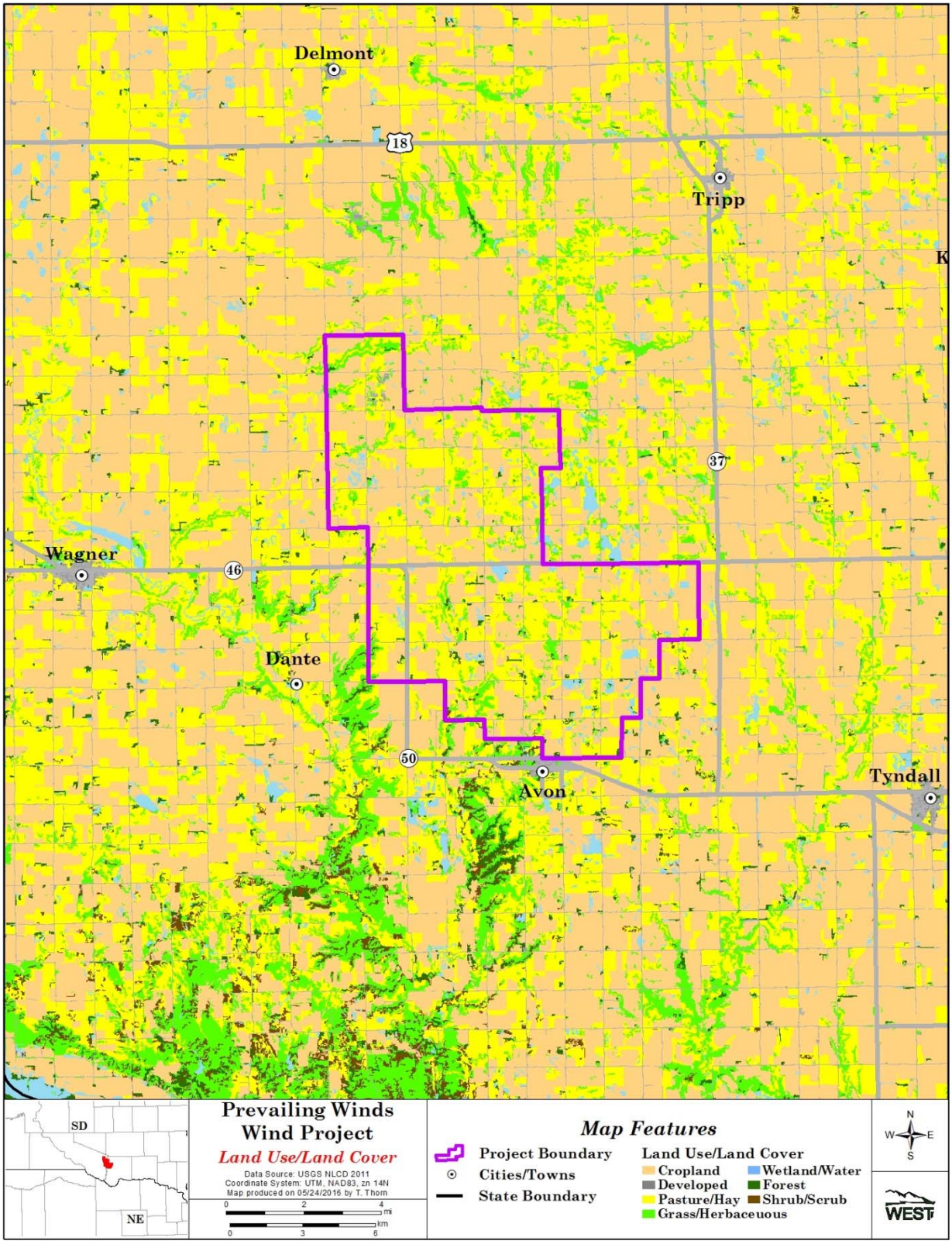

Figure 3. Land Use/Land Cover within and around the Prevailing Winds Wind Project.

Sensitive Habitats

Concern has been expressed by the USFWS and SDGFP on all projects in South Dakota regarding the potential impacts development of the Project may have on grasslands, particularly native grasslands and the impact to nesting grassland birds in these areas. Only 6.7% of the Project's area is categorized as grassland/herbaceous, but another 37.6% of the Project is considered pasture/hay, which may also contain native grass (Table 1, Figure 3; USGS NLCD 2011). If construction takes place within these areas, it is possible that some grassland and/or shrub-dependent species could be displaced (see the Breeding Bird section for more discussion on displacement). Project development is being planned to minimize impacts and disturbances to grasslands.

Wetlands and Riparian Areas

Based on National Wetland Inventory (NWI) data (USFWS NWI 2009), there are approximately 1,305.8 ac (528.8 ha) of wetlands within the Project. Freshwater emergent (77.5%) accounted for the majority of the wetlands, followed by freshwater ponds (14.7%), lakes (4.4%), and freshwater forested/shrub wetlands (3.4%; Table 2, Figure 4). A portion of Dry Choteau Creek is found within the Project. WEST did not conduct wetland delineations for the Project.

Table 2. National Wetland Inventory (NWI) wetlands present within the Prevailing Winds Wind Project (USFWS NWI 2009).

Wetland Type	Project Acres	Percent Total
Freshwater Emergent Wetland	1,011.7	77.5
Freshwater Pond	192.3	14.7
Lake	57.4	4.4
Freshwater Forested/Shrub Wetland	44.4	3.4
Total	**1,305.8**	**100**

Data Source: USFWS NWI 2009

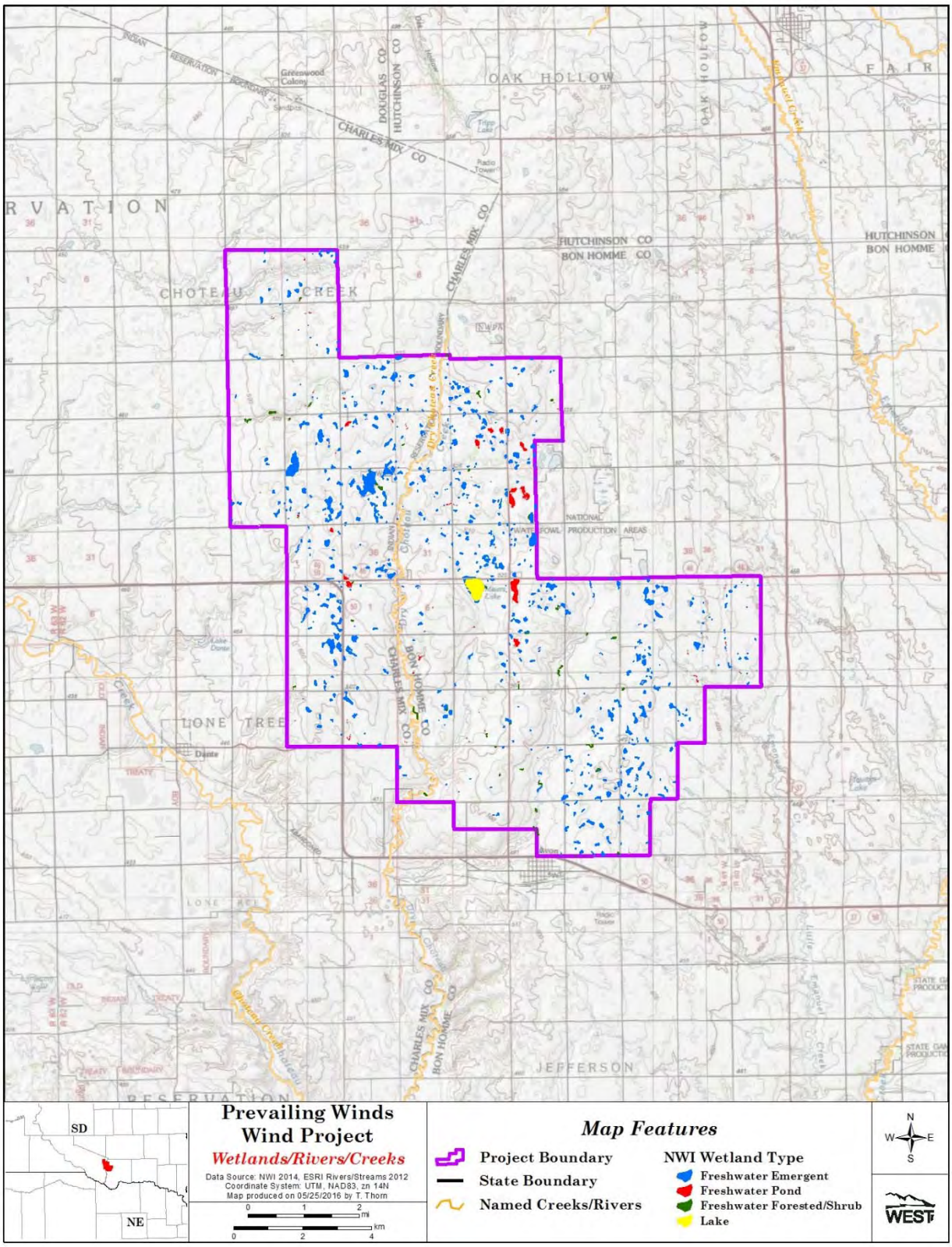

Figure 4. NWI wetlands within and around the Prevailing Winds Wind Project.

Wildlife

Wildlife species associated with croplands, grasslands, and shrublands are the most common types of species observed and expected to occur at the Project. A list of the species observed during the site visit on February 25 and 26, 2015, is provided in Table 3.

Table 3. Wildlife species observed at the Prevailing Winds Wind Project during a site visit on February 25 and 26, 2015.

Common Name	Scientific Name
Birds	
American robin	*Turdus migratorius*
European starling	*Sturnus vulgaris*
horned lark	*Eremophila alpestris*
mallard	*Anas platyrhynchos*
northern flicker	*Colaptes auratus*
red-tailed hawk	*Buteo jamaicensis*
ring-necked pheasant	*Phasianus colchicus*
rock pigeon	*Columba livia*
unidentified raptor	

Federally-Listed Species

A total of seven animal species listed as threatened, endangered, or proposed under the federal Endangered Species Act (ESA 1973) have been documented in Bonne Homme and/or Charles Mix counties (USFWS 2015c). Based on habitats found within the proposed Project during desktop evaluation and the site visit, five of the animal species have the potential to occur in the Project during some portion of the year, including: federally-endangered interior least tern (*Sterna antillarum athalassos*; USFWS 2013c) and whooping crane (*Grus americana*; USFWS 2013), federally-threatened piping plover (*Charadrius melodus*; USFWS 2013e), red knot (*Calidris canutus rufa*; USFWS 2014), and northern long-eared bat (*Myotis septentrionalis*; USFWS 2013b, 2015b). These species are discussed in further detail below.

The pallid sturgeon (*Scaphirhynchus albus*) is a federally-endangered fish species (USFWS 2013d) listed in all counties that are contiguous with the Missouri River. It can be found in the Missouri River, which is located approximately six miles (9.66 kilometers [km]) south of the Project. The federally-endangered Topeka shiner (*Notropis topeka*; USFWS 2013f) is a small minnow native to the streams of the prairie and prefers small, quiet streams with clean gravel or sand substrates and vegetated banks (Shearer 2003). The shiner can be found in the James River and tributaries, which is about 17.1 miles (27.5 km) to the northeast of the Project (SDGFP 2015c). It is unlikely that the pallid sturgeon or Topeka shiner will be affected by the development of and operations associated with a wind facility.

No federally-listed species were observed during the site visit.

Table 4. Species listed as endangered, threatened, or proposed endangered by the US Fish and Wildlife Service (USFWS) with the potential to occur within the Prevailing Winds Wind Project.

Common Name	Scientific Name	Federal Status
Birds		
interior least tern	*Sterna antillarum athalassos*	E
whooping crane	*Grus americana*	E
piping plover	*Charadrius melodus*	T
red knot	*Calidris canutus rufa*	T
Bats		
northern long-eared bat	*Myotis septentrionalis*	PE

E=endangered, T=threatened, PE=Proposed Endangered
Data Source: USFWS 2015c

Interior Least Tern

The interior least tern is a federally-endangered species (USFWS 2013c) that nests along sand and gravel bars within wide, unobstructed river channels and open flats along shorelines of lakes and reservoirs (TPWD 2015). Unnatural water fluctuations, permanent flooding or vegetation coverage of nesting habitat caused by water management may contribute to nest failure. No suitable nesting habitat was identified within the Project, but the least interior tern could potentially nest along the Missouri River or pass through the Project during spring and fall migration.

Whooping Crane

The federally-endangered whooping crane (USFWS 2013) migrates from its breeding grounds in Wood Buffalo National Park, Canada, to its wintering areas in Aransas National Wildlife Refuge, Texas (USFWS 2009). Threats to wild cranes include habitat destruction, chemical spills in its wintering habitat, lead poisoning, collisions with manmade objects such as fences and power lines, disease (e.g., avian cholera and parasites), and shooting (USFWS 2015d). Cranes typically utilize shallow wetlands and marshes, the edges and sandbars of shallow rivers, and agricultural fields near a water source during migration (USFWS 2015d). Thus, suitable whooping crane stopover habitat includes shallow livestock ponds surrounded by agricultural and grassland parcels and freshwater emergent wetlands. Some of these habitat features are scattered throughout the Project. Additionally, the Project is located 2.2 miles (3.5 km) east of the eastern edge of the 220-mile (354.1-km) wide whooping crane migration corridor, based on national flyway information (Figure 6), but it is within the 95% migration corridor when considered specific to South Dakota. Therefore, it is possible but unlikely that whooping cranes could occur in the Project.

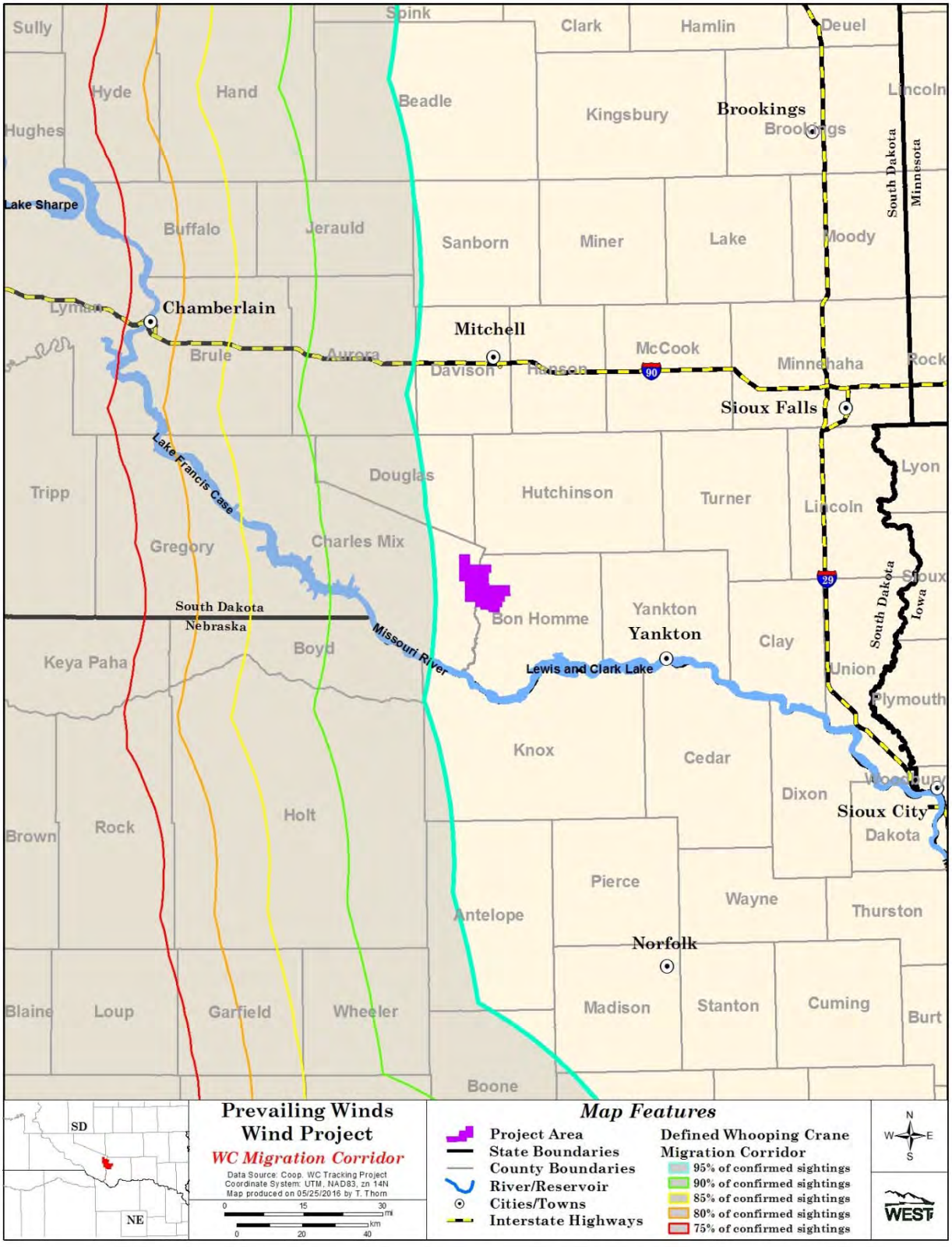

Figure 5. Designated Whooping Crane migration corridor.

Piping Plover

The federally-threatened piping plover (USFWS 2013e) is typically found on sandy beaches, mudflats, and exposed areas around wetlands and lakes. Suitable nesting habitat includes barren sandbars in large river systems and on alkaline lake shores (USFWS 2002). Piping plover populations are threatened by habitat loss due to vegetation encroachment, shoreline development, anthropogenic and animal disturbances, and water management activities, such as dam construction and channelization. Designated critical habitat for the piping plover is located approximately six miles (9.66 km) south of the Project along the Missouri River (Figure 6; USFWS 2015a). No suitable piping plover habitat was observed in the Project during the site visit. Piping plovers are unlikely to breed within the Project, but the species could potentially migrate through the Project.

Red Knot

The federally-threatened red knot is a medium-sized shorebird that migrates from its breeding grounds in Canada's Arctic region to multiple wintering grounds, including the Northeast Gulf of Mexico, the Southeastern US, northern Brazil, and Tierra del Fuego at the southern point of South America. During the breeding season, red knots are typically found in sparsely vegetated, dry tundra areas (Harrington 2001, All About Birds 2015b). Outside of the breeding season, red knots are usually found along intertidal, marine beaches (Harrington 2001). During migration, some red knots can be found flying over inland areas, but these cases are rare (Sibley 2003). The red knot population is threatened by habitat loss in migration and wintering areas, reduction of quality and quantity of food resources, asynchronies in timing throughout its breeding and migration range, and high predation on the breeding grounds every three to four years (USFWS 2014). No suitable red knot habitat was observed in the Project during the site visit. Red knots are unlikely to breed within the Project, but the species could potentially migrate through the Project.

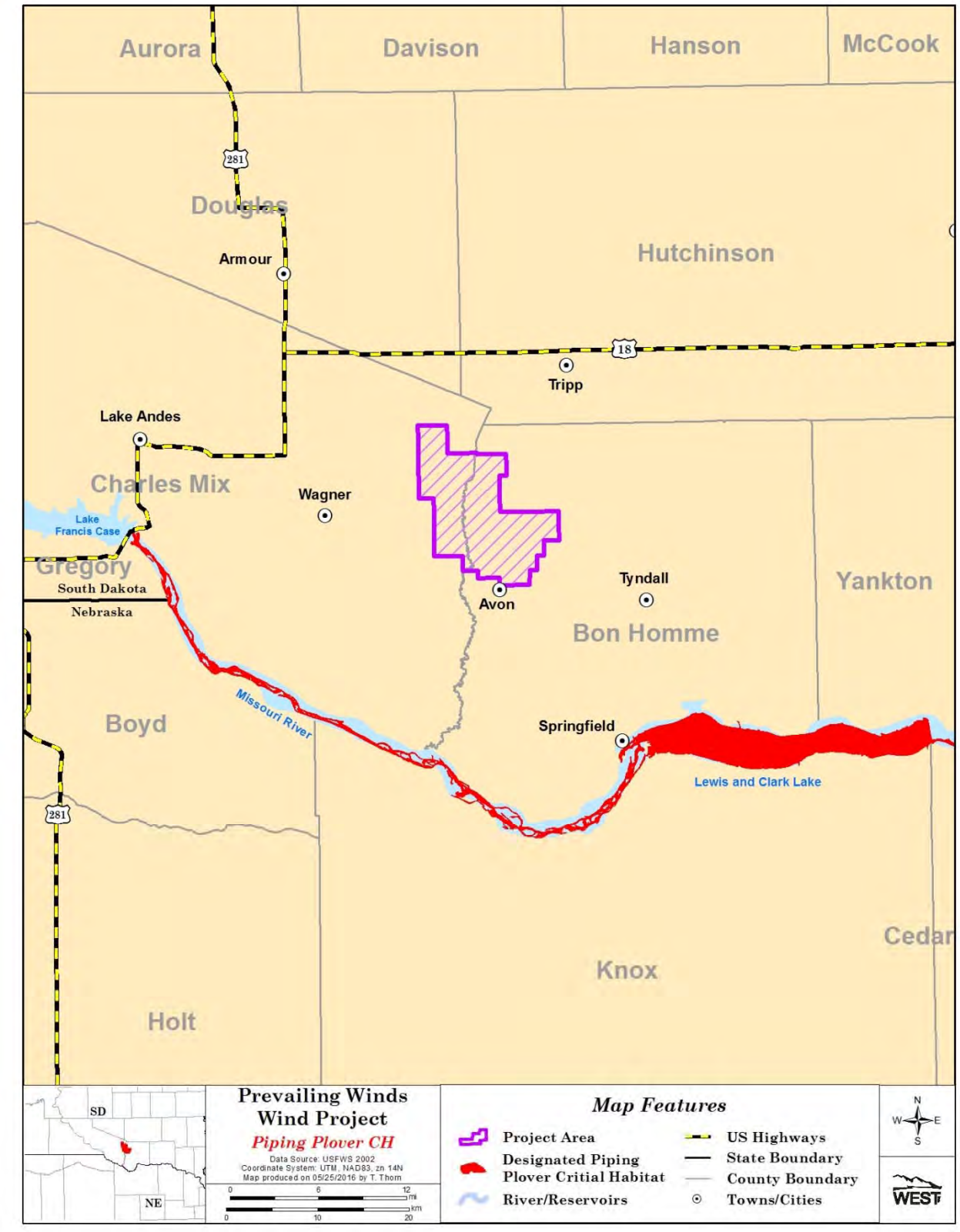

Figure 6. Designated Piping Plover critical habitat.

Northern Long-Eared Bat

The northern long-eared bat was listed as a threatened species on April 2, 2015. It is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through part of South Dakota (BCI 2015a). The Project is on the western fringe of the estimated range for the species (BCI 2015a). This species hibernates in caves and abandoned mines during winter (BCI 2015a); however, no known hibernacula exist in the Project, with the closes being in the Black Hills on the South Dakota/Wyoming border. During the summer, individuals may roost alone or in small colonies beneath exfoliating bark, or in cavities or crevices of both live and dead trees (BCI 2015a). Some of these habitat features are located in the Project. Although white-nose syndrome (WNS; caused by the fungus *Pseudogymnoascus destructans*) is the primary threat to northern long-eared bat populations (USFWS 2015b), there is concern about the impacts of wind facilities on bat species. However, under the final 4(d) rule published on January 14, 2016 (USFWS 2016), it was determined that wind-energy development has not led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species in the face of WNS. In other words, take of the species by a wind facility is not currently considered a violation of Section 9 of the ESA. This will change if the species becomes listed as endangered or if the 4(d) rule is rescinded. Bat acoustic surveys will be conducted to determine presence/absence of the northern long-eared bat within the Project.

State-Listed Species

Twelve species listed by the SDGFP as state-threatened or endangered have records of occurrence in the two counties in which the Project is located (SDGFP 2015b, Table 5). Eight of these species (northern river otter [*Lontra Canadensis*], false map turtle [*Graptemys pseudogeographica*], banded killifish [*Fundulus diaphanus*], blacknose shiner [*Notropis heterolepis*], northern redbelly dace [*Chrosomus eos*], pallid sturgeon [*Scaphihynchus albus*], sicklefin chub [*Macrhybopsis meeki*], and sturgeon chub [*Macrhybopsis gelida*]) are only associated with the Missouri River and would not occur in the Project. State-threatened or endangered species that have potential to occur in the Project are described below. Interior least tern, whooping crane, and piping plover, are both state- and federally-listed species and are only described in the Federally-Listed Species section of this report.

Table 5. Species listed as endangered or threatened by the state of South Dakota that occur in Bon Homme and Charles Mix Counties.

Common Name	*Scientific Name*	Status
Mammals		
northern river otter	*Lontra canadensis*	State-Threatened
Birds		
bald eagle	*Haliaeetus leucocephalus*	State-Threatened
interior least tern	*Sterna antillarum athalassos*	Federally-Endangered, State-Endangered
piping plover	*Charadrius melodus*	Federally-Threatened, State-Threatened
whooping crane	*Grus americana*	Federally-Endangered, State-Endangered
Reptiles		
false map turtle	*Graptemys pseudogeographica*	State-Threatened

Table 5. Species listed as endangered or threatened by the state of South Dakota that occur in Bon Homme and Charles Mix Counties.

Common Name	*Scientific Name*	Status
Fish		
banded killifish	*Fundulus diaphanus*	State-Endangered
blacknose shiner	*Notropis heterolepis*	State-Endangered
northern redbelly dace	*Chrosomus eos*	State-Threatened
pallid sturgeon	*Scaphihynchus albus*	Federally-Endangered, State-Endangered
sicklefin chub	*Macrhybopsis meeki*	State-Endangered
sturgeon chub	*Macrhybopsis gelida*	State-Threatened

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as a state-threatened species in South Dakota (SDGFP 2015b). Bald eagles are typically found near rivers, marshes, lakes, reservoirs, and coasts (Buehler 2000). They usually nest in forested places close to water bodies, avoiding heavily developed areas when possible (Buehler 2000). According to the SDGFP, and confirmed during the site visit, a bald eagle nest is located approximately 1.8 miles (2.9 km) north of the Project. Additionally, bald eagles could move through/over the Project year-round.

Grassland-Dependent Bird Species of Concern

Displacement of grassland nesting birds is often one of the primary concerns of wildlife agencies in regards to the siting of wind facilities in and near grasslands. Recent research has focused on the potential displacement of grassland passerines at wind energy facilities, and some uncertainty currently exists over the effects of wind energy facilities on the breeding success of these birds. In Minnesota, researchers found that breeding passerine density on Conservation Reserve Program (CRP) grasslands was reduced in the immediate vicinity of wind turbines (Leddy et al. 1999), but changes in density at broader scales was not detected (Johnson et al. 2000a). Erickson et al. (2004) documented a decrease in density of some native grassland passerines, such as grasshopper sparrow (*Ammodramus savannarum*), near wind turbines in Washington; however, it was not determined if the decreased density of grassland birds after the project was operating was the result of behavioral disturbance or habitat loss. Piorkowski (2006) conducted a displacement study at a wind energy facility in Oklahoma where, of the grassland species present in the wind resource area, only the western meadowlark (*Sturnella neglecta*) showed significantly lower densities near wind turbines. Piorkowski (2006) suggested that habitat characteristics were more important to determining passerine breeding densities than the presence of wind turbines. Shaffer and Buhl (2015) documented avoidance by grasshopper sparrows out to 300 m (984 ft) over time at wind projects in North and South Dakota.

Sharp-tailed grouse (*Tympanuchus phasianellus*), greater prairie chicken (*T. cupido*), Nelson's sparrow (*Ammodramus nelsoni*), Le Conte's sparrow (*A. leconteii*), chestnut-collared longspur (*Calcarius ornatus*), and bobolink (*Dolichonyx oryzivorus*) are dependent on grassland habitat, particularly large blocks of grassland (Johnson and Igl 2001), and may occur in the Project (Jennings et al. 2005). These species could be susceptible to adverse effects of grassland habitat fragmentation if this type of disturbance occurs as a result of facility construction. The Project has previously been subjected to fragmentation, primarily due to the conversion of

grassland to areas of cultivated cropland (Table 1, Figure 4). Grassland areas that may support grassland birds are located throughout the Project, especially in the western portion of the Project where the landscape is more bisected by ravines. Facility development in the areas with less native grasslands, wetlands, and shrublands would likely have lower direct (e.g., habitat loss) and indirect impacts (e.g., displacement) to wildlife and plants, particularly to grassland-nesting bird species and native grassland plants. Limiting the footprint of any proposed developments, as well as utilizing previously developed roads and/or transmission corridors, could help to minimize any additional fragmentation.

Prairie Grouse

Sharp-tailed grouse and greater prairie chicken are prairie-obligate species that require relatively undisturbed or natural tallgrass prairie. These species tolerate some agricultural land interspersed with prairie, but both species generally become less numerous as the amount of agricultural land increases. Sharp-tailed grouse and greater prairie chicken are lekking species; leks are typically located on knolls or gentle rises. Male grouse and chickens may begin defending their territories on lekking grounds in late February, with peak hen attendance in early April.

Depending on findings during point counts and ultimately turbine placement, agencies may recommend that surveys for grouse species be conducted pre- and post-construction, with lek surveys for prairie grouse species conducted in the spring.

Birds of Conservation Concern

Although not protected under the ESA (1973), numerous bird species have been identified by the USFWS as Birds of Conservation Concern (BCC; USFWS 2008). These are “species, subspecies, and populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973” (USFWS 2008). The Project lies within Bird Conservation Region (BCR) 11 (Prairie Potholes), a landscape dotted with many small depressional wetlands called potholes.

Twenty-seven bird species are listed as BCC within BCR 11 (USFWS 2008, Appendix B), many of which would have potential for occurrence within the Project (Jennings et al. 2005). Four diurnal raptors are among the BCC within BCR 11 with potential to occur in the Project (bald eagle [also a state-threatened species], Swainson’s hawk [*Buteo swainsoni*], and peregrine falcon. In addition to bald eagles, golden eagles (*Aquila chrysaetos*) have the potential to occur in the Project during some time of the year. The bald and golden eagles are protected by the Migratory Bird Treaty Act (MBTA 1918) and the Bald and Golden Eagle Protection Act (BGEPA 1940). Swainson’s hawks may breed in the Project, and peregrine falcons potentially migrate through the Project (Jennings et al. 2005). The remaining BCC species are a mix of shorebirds, waterbirds, owls, woodpeckers, and passerines, all of which likely have some potential for impacts from wind energy development (Appendix B).

Raptors

Species Likely to Occur in the Area

The following diurnal raptor and vulture species could potentially breed in or near the Project: American kestrel (*Falco sparverius*), bald eagle, golden eagle, Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*B. regalis*), Swainson's hawk, broad-winged hawk (*B. platypterus*), peregrine falcon, osprey, and turkey vulture (*Cathartes aura;* Jennings et al. 2005). Owls with the potential to breed in or near the Project include barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), eastern screech owl (*Otus asio*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*) and great horned owl (*Bubo virginianus;* Jennings et al. 2005).

Diurnal raptor species that may also occur within the Project outside of the breeding season (migration, winter, or post-breeding dispersal), include northern goshawk (*Accipiter gentilis*), Cooper's hawk, golden eagle, bald eagle, merlin (*Falco columbarius*), peregrine falcon, prairie falcon (*F. mexicanus*), gyrfalcon (*F. rusticolus*), red-tailed hawk, rough-legged hawk (*Buteo lagopus*), and sharp-shinned hawk (*Accipiter striatus*; Jennings et al. 2005). Owls that may occur outside of the breeding season include the eastern screech owl, great horned owl, northern saw-whet owl (*Aegolius acadicus*), long-eared owl, and short-eared owl (Jennings et al. 2005). During the site visit, four red-tailed hawk observations and two unidentified diurnal raptor observations were recorded at the Project (Table 3).

Potential for Raptor Migration in the Area

Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features often used by raptors during migration are ridgelines and the shorelines of large bodies of water (Liguori 2005). Updrafts formed as the wind hits the ridges, and thermals, created over land and not water, make for energy-efficient travel over long distances (Liguori 2005). It is for this reason that raptors sometimes follow corridors or pathways, for example, along prominent ridges with defined edges, during migration.

It is likely that raptors migrate through the proposed Project in a broad front pattern with some potential for more localized use of ridge on the southwestern portion of the Project (Figure 3). Trees, shrubs, and water impoundments may provide some stopover habitat for migrating raptors; which are scattered throughout the Project and region (Figure 4).

Potential Raptor Nesting Habitat

During the site visit, small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides were observed that could provide raptor nesting habitat for species such as red-tailed hawk and Swainson's hawk. Grassland areas could provide nesting habitats for ground-nesting raptors and owls, such as the northern harrier and burrowing owl.

One known bald eagle nest is located approximately 1.8 mile north of the Project area. Additional surveys should focus on determining how or if eagles from this nest utilize the Project.

Potential Prey

Areas with colonial rodents or other prey species, such as rabbits and other birds, tend to attract foraging raptors. Small mammal colonies could potentially exist within the Project, but were not visible from public roads. No colonial rodents were observed during the site visit in February 2015. It is difficult to assess potential prey densities during a short-term site visit, and prey densities can fluctuate dramatically based on habitat and climatic factors. If roost sites and food resources are available, it is likely that raptors will use the area. However, it is not likely that raptors will use the area to a greater degree than the surrounding areas with similar habitat and resources.

Does the Topography of the Site Increase the Potential for Raptor Use?

At wind energy facilities located on prominent ridges with defined edges (e.g., rims of canyons, steep slopes), raptors often fly along the rim edges, using updrafts to maintain altitude while hunting, migrating or soaring (Johnson et al. 2000b, Hoover and Morrison 2005). Topography in the Project is relatively flat in the east but with slightly steep slopes in the western half of the Project Area (Figure 3). In addition, the Missouri River is approximately 6 miles south of the Project, which could increase overall raptor migration potential in the region.

Bird Migration

Although many species of passerines migrate at night and may collide with tall human-made structures, few large mortality events at wind energy facilities in North America have been documented on the same scale as those seen at communication towers (National Wind Coordinating Collaborative [NWCC] 2004). Large numbers of passerines have collided with lighted communication towers and buildings when foggy conditions occur at night during spring or fall migration. Birds appear to become confused by the lights during foggy or low cloud ceiling conditions, flying circles around lighted structures until they become exhausted or collide with the structure (Erickson et al. 2001). Most collisions at communication towers are attributed to the guy wires on these structures, which wind turbines do not have. Additionally, the large mortality events observed at communication towers have occurred at structures greater than 500 ft (152 m) in height (Erickson et al. 2001), likely because most small birds migrate at elevations of 500 to 1,000 ft (152.4 to 304.8 m) above the ground (USFWS 1998), which is higher than most modern turbines. Migrating passerines are likely more at risk of turbine collision when ascending and descending from stopover habitat, locations where migrating birds stop to rest or refuel, or during foggy conditions when they fly lower and may become confused by lights.

It is likely that birds such as passerines, raptors, and waterfowl may migrate through the proposed Project. Wetlands, woodlots, and grasslands, which are found throughout the Project, may provide stopover habitat for migrants or individuals during post-breeding dispersal. The combination of wetlands, ponds, lakes, and grasslands found in the Project may be attractive to a broader suite of bird species than when only one of these land cover types occurs. Harvested crop fields could also serve as feeding areas for migrating and wintering cranes and waterfowl.

These land cover types are found throughout the region, so use by these species should not be more concentrated in the Project than compared to adjacent areas.

Breeding Birds

Important Bird Areas

The National Audubon Society (Audubon) lists Important Bird Areas (IBAs) that are sites providing essential habitat for one or more species of birds (Audubon 2015). There are no Audubon IBAs or The Nature Conservancy (TNC) protected lands (USGS 2012) within the Project; however, there are two IBAs located south of the Project. The Missouri National Recreational River IBA is approximately 10 miles (16.1 km) south of the Project, while the Lower Missouri River Channel IBA is about 10.5 miles (16.9 km) south of the Project (Audubon 2013).

USGS Breeding Bird Survey

Two U.S. Geological Survey Breeding Bird Survey (BBS) routes are located in the vicinity of the Project (Figure 7; USGS 2013). The west end of the Tripp BBS route is approximately 13 miles (20.9 km) northeast of the northeast corner of the Project. The north end of the Sparta BBS route is south of the Missouri River, approximately 21.5 miles (34.6 km) southeast of the southeast corner of the Project. Each BBS route is about 25 miles (40.2 km) long, and all birds seen or heard are tallied for a 3-minute period every half-mile (0.8 km) along the route (USGS 1998).

A total of 70 bird species were recorded along the Tripp BBS route from 2011 to 2014 (Pardieck et al. 2014) and three of these species are listed as USFWS BCC (USFWS 2008; Appendix B). All three of these species were observed each year, from 2011-2014: red-headed woodpecker (*Melanerpes erythrocephalus*), grasshopper sparrow, and dickcissel (*Spiza americana*; Pardieck et al. 2014). In 2014, 915 individual bird observations of 56 species were made on the Tripp Route (Pardieck et al. 2014). The most abundant birds observed were the western meadowlark, brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), barn swallow (*Hirundo rustica*), and dickcissel. No federally- or state-listed threatened or endangered species have been recorded at the Tripp BBS route.

A total of 65 bird species have been recorded along the Sparta BBS route in 2011 and 2013 (Pardieck et al. 2014) and four of these species are listed as USFWS BCC (USFWS 2008; Appendix B). All four of these species were observed in 2011 and 2013: red-headed woodpecker, grasshopper sparrow, dickcissel, and upland sandpiper (*Bartramia longicauda*; Pardieck et al. 2014). In 2013, 1,392 individual bird observations of 56 species were made on the Sparta Route (Pardieck et al. 2014). The most abundant birds observed were the dickcissel, red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), mourning dove, and western meadowlark. No federally- or state-listed threatened or endangered species have been recorded at the Sparta BBS route.

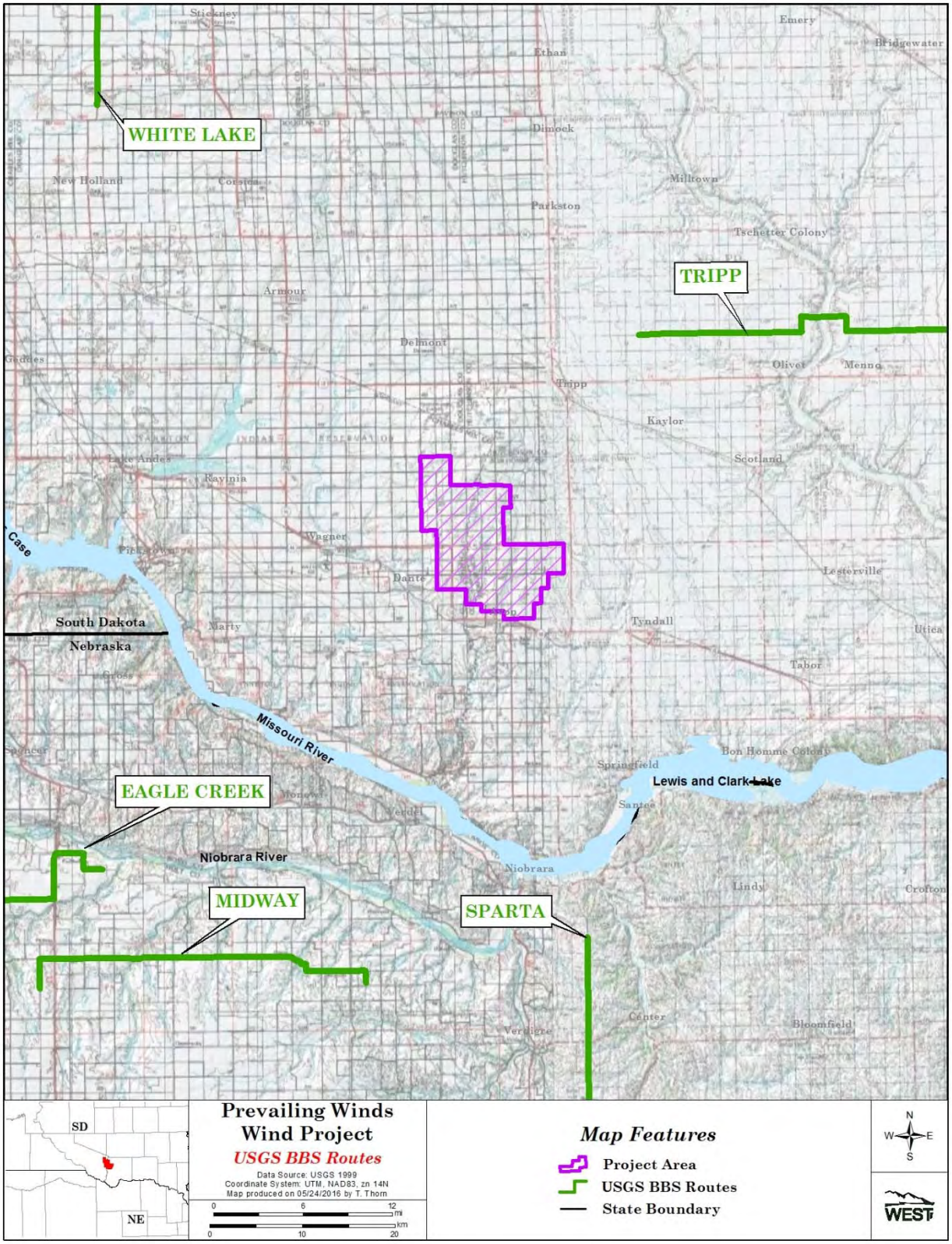

Figure 7. USGS Breeding Bird Survey routes.

Bats

At least 19 bat species have been documented as fatalities at wind energy facilities throughout the U.S. (Table 6). Up to 13 species of bats occur in South Dakota, and seven of these species are likely residents and/or migrants in the Project (Table 7, based on range maps [International Union for Conservation of Nature (IUCN) 2014]), including big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), northern long-eared bat (*Myotis septentrionalis*), little brown bat (*M. lucifugus*), and western small-footed bat (*M. ciliolabrum*).

Table 6. Summary of bat fatalities (by species) from wind energy facilities in North America.

Common Name	Scientific Name	# Fatalities[1]	% Composition
hoary bat[2]	*Lasiurus cinereus*	5,027	36.5
eastern red bat[2]	*Lasiurus borealis*	3,179	23.1
silver-haired bat[2]	*Lasionycteris noctivagans*	2,500	18.2
little brown bat[2]	*Myotis lucifugus*	1,121	8.1
tricolored bat	*Perimyotis subflavus*	625	4.5
big brown bat[2]	*Eptesicus fuscus*	517	3.8
Mexican free-tailed bat	*Tadarida brasiliensis*	377	2.7
unidentified bat		325	2.4
unidentified myotis	*Myotis* spp.	32	0.2
northern long-eared bat[2]	*Myotis septentrionalis*	15	0.1
Seminole bat	*Lasiurus seminolus*	12	0.1
western red bat	*Lasiurus blossevillii*	9	0.1
big free-tailed bat	*Nyctinomops macrotis*	5	<0.1
evening bat	*Nycticeius humeralis*	5	<0.1
western yellow bat	*Lasiurus xanthinus*	3	<0.1
eastern small-footed bat	*Myotis leibii*	2	<0.1
Indiana bat	*Myotis sodalis*	2	<0.1
pocketed free-tailed bat	*Nyctinomops femorosacca*	2	<0.1
canyon bat	*Pipistrellus hesperus*	1	<0.1
cave bat	*Myotis velifer*	1	<0.1
long-legged bat	*Myotis volans*	1	<0.1
unidentified free-tailed bat		1	<0.1
unidentified Lasiurus bat	*Lasiurus* spp.	1	<0.1
Total	**19 species***	**13,763**	**100**

[1] These are raw data and are not corrected for searcher efficiency or scavenging.

[2] Potential resident or migrant in the BWP (BCI 2003).

Cumulative fatalities and species from data compiled by Western EcoSystems Technology, Inc. from publicly available fatality documents (listed in Appendix C). Indiana bat fatalities are reported by USFWS (2010, 2011c). Three additional Indiana bat fatalities (USFWS 2011b, 2012a, 2012c) are not included in this total.

* One incidental long-eared bat (*Myotis evotis*) was recorded at Tehachapi, California (Anderson et al. 2004), but is not included in the total fatalities. An additional 677 bat fatalities (evening bat, eastern red bat, hoary bat, tricolored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species was not reported.

Canyon bat formerly known as western pipistrelle (*Pipistrellus hesperus*), and tricolored bat formerly known as eastern pipistrelle (*Pipistrellus subflavus*; BCI 2015b, 2015c).

Table 7. Bat species, based on International Union for Conservation of Nature (IUCN) 2014 range maps, with the potential to occur in the Prevailing Winds Wind Project.

Species	Scientific Name	State Status/ Federal Status	Habitat	Likelihood of Occurrence
northern long-eared bat	*Myotis septentrionalis*	PE[a/]FT	Associated with forests; chooses maternity roosts in buildings, under loose bark, and in the cavities of trees; caves and underground mines are their choice sites for hibernating. On western edge of range.	Unlikely
big brown bat	*Eptesicus fuscus*		Common in most habitats, abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark, tree cavities, buildings, barns, and bridges.	Likely
silver-haired bat	*Lasionycteris noctivagans*	S4[b]	Common bat in forested areas, particularly old growth; maternity colonies in tree cavities or hollows; hibernates in forests or cliff faces.	Likely
eastern red bat	*Lasiurus borealis*		Abundant tree bat; roosts in trees; solitary.	Likely
hoary bat	*Lasiurus cinereus*		Usually not found in man-made structures; roosts in trees; very wide-spread.	Likely
western small-footed bat	*Myotis ciliolabrum*		Found in mesic conifer forest, also riparian woodland; roosts in rock outcrops, clay banks, loose bark, buildings, bridges, caves, and mines.	Probable
little brown bat	*Myotis lucifugus*		Commonly forages over water; roosts in attics, barns, bridges, snags, and loose bark; hibernacula in caves and mines.	Probable

[a]Status from SDGFP 2015
PE = Proposed Endangered
[b]Status from SDGFP 2014
S4 = Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long term concern.
FT = Federally Endangered

Potential roosting habitat (i.e. trees and buildings) exists within the Project as there are many abandoned structures scattered throughout the area. No caves or mines have been reported in the literature, and none were observed by a WEST biologist during the site visit. However, karst formations (characterized by sinkholes, caves, and underground drainage systems; Encyclopædia Britannica 2015) have been found within the Project according to the USGS National Atlas of the US (Tobin and Weary 2004).

Bats generally forage over water and open spaces, such as agricultural fields, grasslands, streams, and wetlands/ponds. Bats may prey on insects that are likely to concentrate over water in wetlands and streams, thus these types of areas found in the Project are most likely to attract foraging bats. Bats may forage over the entire Project, although the extent of use is not known.

Bat casualties have been reported from most wind energy faculties where post-construction fatality data are publicly available. Reported estimates of bat mortality at wind energy facilities have ranged from 0.01 – 47.5 fatalities per turbine per year (0.9 – 43.2 bats per MW per year) in the US, with an average of 3.4 per turbine or 4.6 per MW (NWCC 2004). The majority of the bat casualties at wind energy facilities to date are migratory species that undertake long migrations between summer roosts and wintering areas. The species most commonly found as fatalities at wind energy facilities include hoary bats, silver-haired bats, and eastern red bats (Johnson 2005). The highest numbers of bat fatalities found at wind energy facilities to date have occurred in eastern North America on ridge tops dominated by deciduous forest (NWCC 2004). However, Gruver et al. (2009), BHE Environmental (2010, 2011), Barclay et al. (2007), and Jain (2005) reported relatively high fatality rates from facilities in Wisconsin, Iowa, and Canada that were located in grassland and agricultural habitats. Unlike the eastern US wind energy facilities that reported higher bat fatality rates, the Wisconsin, Alberta, and Iowa facilities are in open grasslands and crop fields.

Construction of the proposed Project will likely result in the mortality of some bats. The magnitude of these fatalities and the degree to which bat species will be affected is difficult to determine, but they should be within the average range of bat mortalities found throughout the US based on general vegetation and landscape characteristics.

CONCLUSIONS

A summary of the potential for wildlife and habitat conflicts in the proposed wind energy facility development area is presented in Table 8.

Table 8. A summary of the potential (VH=Very High, H=High, M=Medium, and L=Low) for wildlife and habitat conflicts at the Prevailing Winds Wind Project.

Issue	VH	H	M	L	Notes
Potential for raptor nest sites			✓		Few tree rows and woodlots exist on the Project; few very small forests
Concentrated raptor flight potential			✓		The slightly steep slopes in the western half of the Project Area increases the potential for raptor use along the north/south ridges in the western half of the Project Area.
Potential for migratory pathway		✓			The Project is close to the Missouri River, thereby increasing potential for migratory pathway. The Project is close to the whooping crane migration corridor.
Potential for raptor prey species			✓		Suitable habitat for small mammals exists.
Potential for protected species to occur		✓			Protected species may occur in the area (e.g., bald eagle); There is concern about grassland fragmentation for prairie grouse and grassland birds.
Potential for State Issues		✓			Protection of native grasslands; likely state species issues exist as well
Uniqueness of habitat at wind energy facility			✓		Grasslands and shrublands found in the region. Displacement of grassland animals and plants may occur.
Potential for rare plants to occur			✓		Grasslands make up a moderate proportion of the Project; there is some likelihood that rare plants are present in grasslands that occur in the Project Area but impacts would depend on turbine siting.
Potential for use by bats			✓		The Project has scattered trees, buildings, and wetlands.

Seven animal species listed as federally-endangered, threatened, or proposed species have the potential to occur in Bon Homme and/or Charles Mix counties. These include the federally-endangered pallid sturgeon, Topeka shiner, interior least tern, and whooping crane; federally-threatened piping plover, red knot; and northern long-eared bat. Five of the seven species (interior least tern, whooping crane, piping plover, red knot, and northern long-eared bat) could potentially occur in the Project.

WEST conducted a preliminary review of the birds listed as threatened or endangered by the state of South Dakota and found four bird species with the potential to occur in or near the Project: interior least tern, whooping crane, piping plover, and bald eagle. Additionally, the northern long-eared bat is listed as a Species of Concern by SDGFP.

In general, native land cover, including wetlands, in most of the Project is not unique in the region, but their presence raises concerns regarding loss of native prairie. As the land cover is not unique to the region, these characteristics are not likely to attract or concentrate bird or bat

species compared to surrounding areas. Habitat suitability may decrease for grassland birds in terms of increased habitat fragmentation and behavior modification (avoidance) if areas of intact grassland are impacted by construction. Greater prairie chickens and sharp-tailed grouse are of particular conservation interest to SDGFP, may be found in the Project, and may be susceptible to grassland fragmentation. Large areas of intact grassland should be avoided to minimize impacts to grassland dependent species.

Several raptor and vulture species could potentially breed in or near the Project as well as occur outside of the breeding season (migration, winter, or post-breeding dispersal Small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides are present in the Project that could provide raptor nesting habitat for species such as the red-tailed hawk, bald eagle, and Swainson's hawk. Grassland areas could provide nesting habitats for ground-nesting raptors, such as the northern harrier and burrowing owl.

Deciduous trees and buildings in the Project may provide potential roosting habitat and hibernacula for bats. Research to date on the impacts of wind energy facilities on bats has shown that species that conduct long distance migrations usually make up the vast majority of bat fatalities at wind energy facilities. Additionally, the timing of bat fatalities at wind energy facilities indicates that most bats are killed by turbines during the migration season (Johnson 2005, Arnett et al. 2008). Relatively few bat fatalities have been recorded at most wind energy facilities during spring or summer, although bat use at wind energy facilities has been recorded during those seasons. Risk of collision of resident bat species that may breed near wind energy facilities is not known. The Project is on the western edge of the range for the federally-threatened northern long-eared bat. Because it is possible that northern long-eared bat occupies the Project given the amount of trees, ponds, and lakes in the Project, acoustic surveys to investigate presence/absence are recommended. Further the northern long-eared bat is currently covered by a 4(d) rule determination as it pertains to wind energy development. An additional six bat species are likely to occur in the Project, including big brown bat, eastern red bat, hoary bat, silver-haired bat, little brown bat, and western small-footed bat (IUCN 2014).

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Appendix A. Photographs of the Prevailing Winds Wind Project

Photo 1. Typical cropland habitat with a small woodlot in the distance in the Prevailing Winds Wind Project.

Photo 2. Typical hay field and wooded draw within the Prevailing Winds Wind Project.

Photo 3. Typical wooded hillside in southwestern portion of the Prevailing Winds Wind Project.

Photo 4. Typical grassland with scattered deciduous trees in the Prevailing Winds Wind Project.

Photo 5. Typical grassland in the Prevailing Winds Wind Project.

Photo 6. Mixed species grassland in the Prevailing Winds Wind Project.

Appendix B. Bird Species of Conservation Concern within the Prairie Potholes Region

Appendix B. US Fish and Wildlife Service (USFWS) Birds Conservation Concern (BCC) within the Bird Conservation Region (BCR) 11 (Prairie Potholes) and their presence/absence in the vicinity of the Prevailing Winds Wind Project (Pardieck et al. 2014, USFWS 2008).

Species	Recorded from 2011 to 2014 on Tripp Breeding Bird Survey Route?	Recorded in 2011 and 2013 on Sparta Breeding Bird Survey Route?
horned grebe	No	No
American bittern	No	No
least bittern	No	No
bald eagle	No	No
Swainson's hawk	No	No
peregrine falcon	No	No
yellow rail	No	No
mountain plover	No	No
solitary sandpiper	No	No
upland sandpiper	No	Yes
long-billed curlew	No	No
Hudsonian godwit	No	No
marbled godwit	No	No
buff-breasted sandpiper	No	No
short-billed dowitcher	No	No
black tern	No	No
black-billed cuckoo	No	No
short-eared owl	No	No
red-headed woodpecker	Yes	Yes
Sprague's pipit	No	No
grasshopper sparrow	Yes	Yes
Baird's sparrow	No	No
Nelson's sharp-tailed sparrow	No	No
McCown's longspur	No	No
Smith's longspur	No	No
chestnut-collared longspur	No	No
dickcissel	Yes	Yes

Appendix C. Summary of Publicly Available Reports from North American Wind Energy Facilities that have Reported Bat Fatalities

Appendix C. Summary of publicly available reports from North American wind energy facilities that have reported bat fatalities (Table 6).

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Alite, CA (09-10)	Chatfield et al. 2010	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Lempster, NH (09)	Tidhar et al. 2010
Barton I & II, IA (10-11)	Derby et al. 2011a	Lempster, NH (10)	Tidhar et al. 2011
Barton Chapel, TX (09-10)	WEST 2011	Linden Ranch, WA (10-11)	Enz and Bay 2011
Beech Ridge, WV (12)	Tidhar et al. 2013b	Locust Ridge, PA (Phase II; 09)	Arnett et al. 2011
Big Horn, WA (06-07)	Kronner et al. 2008	Locust Ridge, PA (Phase II; 10)	Arnett et al. 2011
Big Smile, OK (12-13)	Derby et al. 2013b	Madison, NY (01-02)	Kerlinger 2002b
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Maple Ridge, NY (06)	Jain et al. 2007
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Maple Ridge, NY (07)	Jain et al. 2009a
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Maple Ridge, NY (07-08)	Jain et al. 2009d
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Maple Ridge, NY (12)	Tidhar et al. 2013a
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Marengo I, WA (09-10)	URS Corporation 2010b
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Marengo II, WA (09-10)	URS Corporation 2010c
Buena Vista, CA (08-09)	Insignia Environmental 2009	Mars Hill, ME (07)	Stantec 2008
Buffalo Gap I, TX (06)	Tierney 2007	Mars Hill, ME (08)	Stantec 2009a
Buffalo Gap II, TX (07-08)	Tierney 2009	McBride, Alb (04)	Brown and Hamilton 2004
Buffalo Mountain, TN (00-03)	Nicholson et al. 2005	Melancthon, Ont (Phase I; 07)	Stantec Ltd. 2008
Buffalo Mountain, TN (05)	Fiedler et al. 2007	Meyersdale, PA (04)	Arnett et al. 2005
Buffalo Ridge, MN (94-95)	Osborn et al. 1996, 2000	Moraine II, MN (09)	Derby et al. 2010d
Buffalo Ridge, MN (00)	Krenz and McMillan 2000	Mount Storm, WV (Fall 08)	Young et al. 2009b
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000a	Mount Storm, WV (09)	Young et al. 2009a, 2010b
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000a	Mount Storm, WV (10)	Young et al. 2010a, 2011b
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000a	Mount Storm, WV (11)	Young et al. 2011a, 2012b
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000a	Mountaineer, WV (03)	Kerns and Kerlinger 2004
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000a	Mountaineer, WV (04)	Arnett et al. 2005
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000a	Munnsville, NY (08)	Stantec 2009b
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Nine Canyon, WA (02-03)	Erickson et al. 2003
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Noble Altona, NY (10)	Jain et al. 2011b
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000a	Noble Bliss, NY (08)	Jain et al.2009e
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Noble Bliss, NY (09)	Jain et al. 2010a
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Noble Bliss/Wethersfield, NY (11)	Kerlinger et al. 2011
Buffalo Ridge I, SD (09-10)	Derby et al. 2010b	Noble Chateaugay, NY (10)	Jain et al. 2011c
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Noble Clinton, NY (08)	Jain et al. 2009c
Casselman, PA (08)	Arnett et al. 2009	Noble Clinton, NY (09)	Jain et al. 2010b
Casselman, PA (09)	Arnett et al. 2010	Noble Ellenburg, NY (08)	Jain et al. 2009b
Castle River, Alb. (01)	Brown and Hamilton 2006a	Noble Ellenburg, NY (09)	Jain et al. 2010c
Castle River, Alb. (02)	Brown and Hamilton 2006a	Noble Wethersfield, NY (10)	Jain et al. 2011a
Cedar Ridge, WI (09)	BHE Environmental 2010	NPPD Ainsworth, NE (06)	Derby et al. 2007
Cedar Ridge, WI (10)	BHE Environmental 2011	Oklahoma Wind Energy Center, OK (04; 05)	Piorkowski and O'Connell 2010
Cohocton/Dutch Hill, NY (09)	Stantec 2010	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Cohocton/Dutch Hills, NY (10)	Stantec 2011	PGC site 6-3 (07)	Capouillez and Librandi-Mumma 2008, Librandi-Mumma and Capouillez 2011
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pine Tree, CA (09-10)	BioResource Consultants 2010
Combine Hills, OR (11)	Enz et al. 2012	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Condon, OR	Fishman Ecological Services 2003	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011c
Crescent Ridge, IL (05-06)	Kerlinger et al. 2007	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012c
Criterion, MD (11)	Young et al. 2012a	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012d
Criterion, MD (12)	Young et al. 2013	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013a
Crystal Lake II, IA (09)	Derby et al. 2010a	Prince Wind Farm, Ont (06)	Natural Resource Solutions 2008
Diablo Winds, CA (05-07)	WEST 2006, 2008	Prince Wind Farm, Ont (07)	Natural Resource Solutions 2009
Dillon, CA (08-09)	Chatfield et al. 2009	Prince Wind Farm, Ont (08)	Natural Resource Solutions 2009
Dry Lake I, AZ (09-10)	Thompson et al. 2011	Red Canyon, TX (06-07)	Miller 2008
Dry Lake II, AZ (11-12)	Thompson and Bay 2012	Red Hills, OK (12-13)	Derby et al. 2013c
Elkhorn, OR (08)	Jeffrey et a. 2009b	Ripley, Ont (08)	Jacques Whitford 2009
Elkhorn, OR (10)	Enk et al. 2011b	Ripley, Ont (08-09)	Golder Associates 2010
Elm Creek, MN (09-10)	Derby et al. 2010c	Rugby, ND (10-11)	Derby et al. 2011b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Searsburg, VT (97)	Kerlinger 2002a

Appendix C. Summary of publicly available reports from North American wind energy facilities that have reported bat fatalities (Table 6).

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Foote Creek Rim, WY (Phase I; 99)	Young et al. 2003	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Foote Creek Rim, WY (Phase I; 00)	Young et al. 2003	Shiloh II, CA (09-10)	Kerlinger et al. 2010
Foote Creek Rim, WY (Phase I; 01-02)	Young et al. 2003	SMUD Solano, CA (04-05)	Erickson and Sharp 2005
Forward Energy Center, WI (08-10)	Grodsky and Drake 2011	Stateline, OR/WA (01-02)	Erickson et al. 2004
Fowler I, IN (09)	Johnson et al. 2010a	Stateline, OR/WA (03)	Erickson et al. 2004
Fowler III, IN (09)	Johnson et al. 2010b	Stateline, OR/WA (06)	Erickson et al. 2007
Fowler I, II, III, IN (10)	Good et al. 2011	Steel Winds I, NY (07)	Grehan 2008
Fowler I, II, III, IN (11)	Good et al. 2012	Stetson Mountain I, ME (09)	Stantec 2009c
Fowler I, II, III, IN (12)	Good et al. 2013	Stetson Mountain I, ME (11)	Normandeau Associates 2011
Goodnoe, WA (09-10)	URS Corporation 2010a	Stetson Mountain II, ME (10)	Normandeau Associates 2010
Grand Ridge I, IL (09-10)	Derby et al. 2010g	Summerview, Alb (05-06)	Brown and Hamilton 2006b
Harrow, Ont (10)	Natural Resource Solutions 2011	Summerview, Alb (06; 07)	Baerwald 2008
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Top of Iowa, IA (03)	Jain 2005
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Top of Iowa, IA (04)	Jain 2005
High Sheldon, NY (10)	Tidhar et al. 2012a	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
High Sheldon, NY (11)	Tidhar et al. 2012b	Vansycle, OR (99)	Erickson et al. 2000
High Winds, CA (03-04)	Kerlinger et al. 2006	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
High Winds, CA (04-05)	Kerlinger et al. 2006	Wessington Springs, SD (09)	Derby et al. 2010f
Hopkins Ridge, WA (06)	Young et al. 2007	Wessington Springs, SD (10)	Derby et al. 2011d
Hopkins Ridge, WA (08)	Young et al. 2009c	White Creek, WA (07-11)	Downes and Gritski 2012b
Jersey Atlantic, NJ (08)	NJAS 2008a, 2008b, 2009	Wild Horse, WA (07)	Erickson et al. 2008
Judith Gap, MT (06-07)	TRC 2008	Windy Flats, WA (10-11)	Enz et al. 2011
Judith Gap, MT (09)	Poulton and Erickson 2010	Winnebago, IA (09-10)	Derby et al. 2010e
Kewaunee County, WI (99-01)	Howe et al. 2002	Wolfe Island, Ont (May-June 09)	Stantec Ltd. 2010a
Kibby, ME (11)	Stantec 2012	Wolfe Island, Ont (July-December 09)	Stantec Ltd. 2010b
Kittitas Valley, WA (11-12)	Stantec Consulting 2012	Wolfe Island, Ont (January-June 10)	Stantec Ltd. 2011a
Klondike, OR (02-03)	Johnson et al. 2003	Wolfe Island, Ont (July-December 10)	Stantec Ltd. 2011b
Klondike II, OR (05-06)	NWC and WEST 2007	Wolfe Island, Ont (January-June 11)	Stantec Ltd. 2011c
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Wolfe Island, Ont (July-December 11)	Stantec Ltd. 2012

Two Indiana bat fatalities are reported by USFWS (2010, 2011c), among other reports. Three additional Indiana bat fatalities have been reported (2011b, 2012a, 2012c), but are not included in this list of public reports. One incidental long-eared bat (*Myotis evotis*) was recorded at Tehachapi, California (Anderson et al. 2004), but is not included in this list of public reports. Additional bat fatalities (evening bat, eastern red bat, hoary bat, tri-colored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species was not reported.