Appendix A. Avian Use Surveys for the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota – Final Report January 2017 to May 2017 and September 2017 to August 2018

Avian Use Surveys

Dakota Range III Wind Project

Grant and Roberts Counties, South Dakota

January 2017 to May 2017 September 2017 to August 2018

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December 19, 2018



EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. completed avian use surveys for the proposed Dakota Range III Wind Project (Project) in Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018. The objectives of the surveys were to: 1) provide estimates of eagle, large bird, and small bird use; and 2) evaluate species composition and seasonal and spatial use by birds, including special status species. Survey methods were consistent with recommendations outlined within the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines*, the USFWS *Eagle Conservation Plan Guidance*, as well as South Dakota Game, Fish, and Parks recommendations.

Avian use surveys were completed approximately monthly at 14 survey points established throughout the Project from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018. Surveys consisted of 5-minute (min) counts for small birds within 100-meter (m; 328-foot [ft]) radius plots, followed by 60-min counts within 800-m (2,625 ft) radius plots, where raptors and large birds were counted in the first 20 min and only eagles were recorded for the remaining 40 min. Federally and state-listed species and eagles were recorded as incidental observations while in-transit between survey points to document occurrence, but were excluded from quantitative analysis of use.

A total of 29 species (656 individual observations) were recorded during 16.8 hours (hrs) of small bird surveys. Twenty-nine species (1,772 observations) were recorded during 66.3 hrs of large bird surveys, of which six were diurnal raptor species (five identified and one unidentified category called other raptors). Diurnal raptor use was similar in summer (0.29 bird/800-m plot/20-min survey), fall (0.26), and spring (0.21); winter raptor use was relatively low (0.06). Diurnal raptor use was low overall when compared to other projects with publicly available data, where diurnal raptor use ranged from 0.06–2.34 raptors/800-m plot/20-min survey.

One bald eagle observation was recorded in summer during 199 hrs of eagle use surveys. No federally listed threatened or endangered species were observed during the surveys. In addition to the bald eagle, three other Species of Greatest Conservation Need were observed during avian surveys: American white pelican (30 observations), chestnut-collared longspur (100), and marbled godwit (one).

Overall, bird species composition and seasonal and spatial use patterns at the Project were typical for the region and the Project is not likely to cause significant impacts to bird populations, including diurnal raptors and special-status species.

STUDY PARTICIPANTS

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TABLE OF CONTENTS

EXECUTIVE SUMMARYi
INTRODUCTION 1
PROJECT AREA 1
METHODS
Field Surveys
Statistical Analysis
Fixed-Point Avian Use Surveys6
Bird Diversity and Species Richness6
Mean Use, Seasonal Variations, and Frequency of Occurrence
Bird Flight Height and Behavior6
Spatial Use and Mapping6
RESULTS
Small Bird Use
Large Bird Use
Diurnal Raptors
Large Bird Flight Height and Behavior10
Eagles10
Sensitive Species10
DISCUSSION13
Small Birds13
Large Birds13
Diurnal Raptors
Eagles13
Sensitive Species13
CONCLUSIONS14
REFERENCES

LIST OF TABLES

Table 1. Land cover and use categories within the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota.	. 1
Table 2. Mean small bird use (number of birds/100-meter plot/5-minute survey), percent of	
total use, and frequency of occurrence by bird type and species, by season, observed during small bird use surveys at the proposed Dakota Bange III Wind	
Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017	
and September 11, 2017 – August 26, 2018	. 9

- Table 4. Flight height characteristics by large bird type and raptor subtype observed in the first 20 minutes and within 800 meters of the large bird use surveys at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018......10

LIST OF FIGURES

Figure	1.	Land cover	and use	e within th	e propos	sed Da	kota	Range	: \	Wind P	roject, (Grant	
	an	d Roberts co	ounties,	South Dak	kota (Sou	irces: L	JS G	eologic	al S	urvey N	ational	Land	
	Сс	over Databas	e 2011,	Homer et	al. 2015))							2
Figure	2.	Fixed-point	survey	locations	(survey	point)	and	avian	use	survey	plots a	t the	

LIST OF APPENDICES

- Appendix A. All Bird Types, Raptor Subtypes, and Species Observed During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017, and September 11, 2017 – August 26, 2018.
- Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Birds Observed During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017, and September 11, 2017 – August 26, 2018.
- Appendix C. Mean Use by Survey Point for Large Bird Types During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.
- Appendix D. Comparison of Diurnal Raptor Use at North American Wind Energy Facilities.

Appendix E. Wind Energy Facilities in the Midwest Region of North America with Publicly Available and Comparable Use and Fatality Data for Raptors.

INTRODUCTION

This report presents the results of the 2017–2018 avian use surveys completed by Western EcoSystems Technology, Inc. (WEST) at the proposed Dakota Range III Wind Project (Project) located in Grant and Roberts counties, South Dakota. Survey methods were consistent with recommendations outlined within the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012), the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), as well as South Dakota Game, Fish, and Parks (SDGFP) recommendations. The objectives of the surveys were to: 1) provide estimates of eagle, large bird, and small bird use (eagles in accordance with the ECPG); and 2) evaluate species composition and seasonal and spatial use by birds, including sensitive species.

PROJECT AREA

The proposed Project is located in the Big Sioux Basin Level IV Ecoregion within the Northern Glaciated Plains Level III Ecoregion (US Environmental Protection Agency 2017). The predominant land cover/use types within the Project area consist of approximately 55.6% cultivated crops and 34.7% herbaceous (grassland; US Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015; Table 1, Figure 1). The remaining land cover/use types individually account for less than 6.0% of the Project area and include developed areas (5.4%), emergent herbaceous wetlands (1.4%), hay/pasture (1.2%), open water (0.8%), deciduous forest (0.6%), barren land (0.3%), and shrub scrub (less than 0.1%; USGS NLCD 2011, Homer et al. 2015). The most common cultivated croplands in 2017 were corn (*Zea mays*) and soybeans (*Glycine max*; US Department of Agriculture National Agricultural Statistics Service 2018).

Land Cover and Use	Acres	% Composition
Cultivated Crops	10,422.6	55.6
Herbaceous (Grassland)	6,496.4	34.7
Developed	1,007.3	5.4
Emergent Herbaceous Wetlands	258.0	1.4
Hay/Pasture	233.1	1.2
Open Water	156.0	0.8
Deciduous Forest	107.9	0.6
Barren Land	51.8	0.3
Shrub/Scrub	11.6	<0.1
Total	18,744.7	100

 Table 1. Land cover and use categories within the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota.

Sources: US Geological Survey National Land Cover Database 2011, Homer et al. 2015.

Note: Totals may not add up precisely due to rounding of numbers.



Figure 1. Land cover and use within the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota (Sources: US Geological Survey National Land Cover Database 2011, Homer et al. 2015).

METHODS

Field Surveys

Avian use surveys were completed approximately monthly at 14 fixed-point survey locations (survey points) established throughout the Project from January 1 – May 29, 2017, and September 11, 2017 – August 26, 2018, in accordance with methods described by Reynolds et al. (1980; Figure 2). Due to a number of boundary revisions, the number of survey points and number of times each survey point was surveyed varied. Of the 14 total fixed-point survey locations, five were surveyed during a 17-month period (18 visits; January 1 – May 29, 2017, and September 11, 2017 to August 26, 2018); two during a 14-month period (14 visits; April 11 – May 29, 2017, and September 11, 2017 – August 26, 2018); five during a 12-month period (12 visits; September 11, 2017 – August 26, 2018); and two during an 11-month period (11 visits; October 27, 2017 – August 26, 2018).

Each survey point included an 800-meter (m; 2,625-foot [ft]) radius avian use survey plot (plot) centered on the survey point (Figure 2). Each survey point was located to maximize viewshed for the observer and to enable evaluation of representative habitats covering approximately 30.0% of the Project area. Surveys were completed for 65 minutes (min), with small birds recorded within 100 m (328 ft) for the first five min; all raptors and large birds (including eagles) recorded out to 800 m for the next 20 min; and only eagles, federally or state-listed species were recorded for the remaining 40 min of each 65-min survey.

For purposes of this study, small birds were defined as woodpeckers and passerines; large birds were defined as waterbirds, waterfowl, shorebirds, gulls and terns, diurnal raptors (buteos, eagles, harriers, and other raptors), upland game birds, doves and pigeons, and large corvids. The 20-min portion of the survey allowed for standardization and comparison of data with other wind energy facilities throughout the region, while the 60-min eagle counts allowed for more robust evaluation of bald eagle (*Haliaeetus leucocephalus*) use of the site in accordance with the ECPG (USFWS 2013).

Observations of sensitive species (defined as species afforded protection under the Endangered Species Act [1973] or Bald and Golden Eagle Protection Act [BGEPA; 1940], species listed as threatened or endangered by the state of South Dakota [SDGFP] 2018], or bird Species of Greatest Conservation Need [SGCN; SDGFP 2014]) were recorded throughout the surveys. Observations of sensitive species beyond the 800-m radius plot and in transit were recorded as incidental observations to document occurrence, but were excluded from statistical analyses.

At each survey point, the date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, flight height or altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Approximate

flight height and distance from plot center at first observation were recorded to the nearest 5.0m (16.4-ft) interval. Flight paths of eagles were recorded on aerial maps and labeled by the unique observation number corresponding to the mapped individual.



Figure 2. Fixed-point survey locations (survey point) and avian use survey plots at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

Statistical Analysis

Fixed-Point Avian Use Surveys

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once within the Project. Seasons were defined as spring (March 1 – May 31), summer (June 1 – August 30), fall (September 1 – November 30), and winter (December 1 – February 28).

Bird Diversity and Species Richness

Bird diversity for all large bird surveys was illustrated by the total number of species identified. Species lists and counts, with the number of observations and the number of groups, were generated by season and included all observations of birds detected within 800 m. In some cases, the tally of observations may represent repeated sightings of the same individual. Species richness was calculated as the mean number of species observed per plot per survey, and was compared between seasons.

Mean Use, Seasonal Variations, and Frequency of Occurrence

Small birds detected within the 100-m radius plots and during the 5-min small bird surveys were used to calculate mean use (i.e., birds/100-m plot/5-min survey) and frequency of occurrence of small birds. Large bird observations detected within the 800-m radius plots and during the 20-min surveys were used to calculate mean use (i.e., birds/800-m plot/20-min survey) and frequency of occurrence of large birds Seasonal mean use was calculated by first averaging the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Frequency of occurrence provides a relative measure of species exposure to the proposed facility and was calculated as the percent of surveys in which a particular bird type or species was observed.

Bird Flight Height and Behavior

The flight height recorded during the initial observation was used to calculate the percentage of birds flying within the rotor-swept heights (RSH; estimated to be between 25–200 m [82–656 ft] above ground level) and mean flight height during the large bird use surveys. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight heights recorded. Auditory only observations were excluded from flight height calculations.

Spatial Use and Mapping

Spatial use by large birds in the Project was evaluated by comparing mean use by survey point and a qualitative review of flight paths. Flight paths of all eagles were digitized and mapped in order to examine spatial patterns of use within the Project.

RESULTS

A total of 201 small bird surveys were completed from January 1 – May 29, 2017 and September 11, 2017 to August 26, 2018, resulting in 16.8 hours (hrs) of survey effort for small birds. A total of 66.3 hrs of survey effort for large birds and 199 hrs of ECPG-level eagle use surveys were completed during the same time period. Details on the number of observations and groups recorded by species within the plots are presented in Appendix A. Details on mean use, percent of use, and frequency of occurrence are presented in Appendix B while bird use by survey point is presented in Appendix C.

Small Bird Use

Twenty-nine species (656 individual observations) were recorded during the small bird surveys (Appendix A1). The most frequently recorded small bird species recorded were horned lark (*Eremophila alpestris*; 20.7% of small bird observations), snow bunting (*Plectrophenax nivalis*; 19.1%), chestnut-collared longspur (*Calcarius ornatus*; 15.2%), and red-winged blackbird (*Agelaius phoeniceus*; 14.6%).

Mean small bird use was slightly higher during fall (4.31 birds/100-m plot/5-min survey) compared to spring (3.79), winter (3.37), and summer (2.52; Table 2, Appendix B1). Higher use in the fall was attributed to red-winged blackbird (45.1% of fall small bird use) and snow bunting (41.4%). The number of unique small bird species recorded was higher in summer (19) and spring (17), compared to fall (seven) and winter (two). Average small bird species richness (bird species/100-m plot/5-min survey) was higher in the summer (1.71) and spring (1.05), compared to fall (0.23) and winter (0.13). Overall small bird species richness was 0.79 bird species/100-m plot/5-min survey.

Large Bird Use

Twenty-nine unique species (1,772 observations) were recorded during large bird surveys (Appendix A2). Waterfowl accounted for 88.0% of all large bird observations (1,560 observations), comprised primarily of greater white-fronted geese (*Anser albifrons*; 650 observations) and snow geese (*Chen caerulescens*; 505 observations). The next most commonly observed group was of gulls/terns (80 observations), largely comprised of ring-billed gulls (*Larus delawarensis* 75 observations; Appendix A2).

Mean large bird use was higher during spring (29.84 birds/800-m plot/20-min survey) compared to fall (5.42), summer (2.00) and winter (0.09; Table 3, Appendix B2). Higher use in the spring was attributed to higher waterfowl use (94.2% of spring large bird use). The number of unique species of large birds recorded was higher in spring (21), compared to summer (9), fall (8), and winter (3). Average large bird species richness (bird species/800-m plot/20-min survey) was higher in the spring (0.83) and summer (0.71), compared to fall (0.38) and winter (0.07). Overall large bird species richness was 0.50 bird species/800-m plot/20-min survey.

Diurnal Raptors

Five identified and one unidentified category called other raptors of diurnal raptor species (43 observations) were documented over the course of the 20-min large bird surveys (Appendix A2). Diurnal raptor use was similar in summer (0.29 bird/800-m plot/20-min survey), fall (0.26), and spring (0.21), while winter raptor use was lower (0.06; Table 3). Diurnal raptor use in summer, fall, and spring was primarily attributable to use of the area by red-tailed hawk (*Buteo jamaicensis*), which had the highest use of any diurnal raptor in those seasons (Appendix B2). Diurnal raptors accounted for 64.1% of large bird use in winter, but only 0.7% in spring, 4.8% in fall, and 14.3% in summer.

Diurnal raptors were recorded at 12 survey points, with use ranging from 0.07–0.67 birds/800-m plot/20-min survey. Use was relatively evenly distributed, with the highest use recorded at survey Point 76 (Figure 2, Appendix C).

Table 2. Mean small bird use (number of birds/100-meter plot/5-minute survey), percent of total use, and frequency of occurrence by bird type and species, by season, observed during small bird use surveys at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	-	Mear	ı Use		F	Percent of	Total L	Jse	Frequency of Occurrence (%)				
Туре	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	
Passerines	3.37	3.79	4.31	2.48	100	100	100	98.1	9.3	64.3	23.0	81.0	
Woodpeckers	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8	
Small Birds Overall	3.37	3.79	4.31	2.52	100	100	100	100					

Note: Totals may not add up precisely due to rounding of numbers.

Table 3. Mean large bird use (number of birds/800-meter plot/20-minute survey), percent of total use, and frequency of occurrence by bird type and raptor subtype, by season, observed during large bird use surveys at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

		Mear	n Use		F	Percent of	Total U	lse	Frequency of Occurrence (%)				
Type/Subtype	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	
Waterbirds	0	0.08	0	0.71	0	0.3	0	35.7	0	1.2	0	7.1	
Waterfowl	0	28.11	5.13	0.21	0	94.2	94.7	10.7	0	28.0	14.7	9.5	
Shorebirds	0	0.07	0	0.14	0	0.2	0	7.1	0	2.4	0	9.5	
Gulls/Terns	0	0.82	0	0.60	0	2.7	0	29.8	0	11.0	0	11.9	
Diurnal Raptors	0.06	0.21	0.26	0.29	64.1	0.7	4.8	14.3	3.6	16.7	15.5	26.2	
<u>Buteos</u>	0.05	0.17	0.19	0.26	51.3	0.6	3.4	13.1	2.4	14.4	13.1	23.8	
<u>Northern Harrier</u>	0.01	0.02	0.08	0.02	12.8	<0.1	1.4	1.2	1.2	2.5	5.2	2.4	
<u>Other Raptors</u>	0	0.01	0	0	0	<0.1	0	0	0	1.2	0	0	
Upland Game Birds	0	0.55	0.02	0	0	1.9	0.4	0	0	6.8	2.4	0	
Doves/Pigeons	0	0	0	0.05	0	0	0	2.4	0	0	0	4.8	
Large Corvids	0.03	0	0	0	35.9	0	0	0	3.3	0	0	0	
Large Birds Overall	0.09	29.84	5.42	2.00	100	100	100	100					

Note: Totals may not add up precisely due to rounding of numbers.

Large Bird Flight Height and Behavior

During the large bird surveys, 1,589 large bird observations in 76 groups were recorded as flying (Table 4). The majority (96.5%)were within the RSH3.5% were below the RSH, and none were above the RSH. Waterfowl had the highest percentage of observations recorded within the RSH (98.2%), followed by gulls/terns (92.6%) and waterbirds (81.1%). Diurnal raptors were recorded within the RSH 42.3% of the time during 800-m plot/20-min surveys (Table 4).

Table 4. Flight height characteristics by large bird type and raptor subtype observed in the first
20 minutes and within 800 meters of the large bird use surveys at the proposed Dakota
Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May
29, 2017 and September 11, 2017 – August 26, 2018.

	Number of	Number of	Mean	Deveent	Percent	Within Fligh	nt Height
Type/Subtype	Groups	Individuals	Height	Observed	0-25	25-200	> 200
	Flying	Flying	(meters)	Flying	meters	meters ^a	meters
Waterbirds	5	37	93.00	100	18.9	81.1	0
Waterfowl	27	1,494	77.04	95.8	1.8	98.2	0
Shorebirds	1	1	5.00	8.3	100	0	0
Gulls/Terns	14	27	48.21	33.8	7.4	92.6	0
Diurnal Raptors	26	26	31.65	60.5	57.7	42.3	0
Buteos	21	21	38.19	60.0	47.6	52.4	0
Northern Harrier	5	5	4.20	71.4	100	0	0
Other Raptors	0	0	NA	0	NA	NA	NA
Upland Game Birds	2	3	1.00	8.1	100	0	0
Doves/Pigeons	1	1	5.00	50.0	100	0	0
Large Corvids	0	0	NA	0	NA	NA	NA
Large Birds Overall	76	1,589	53.36	89.7	3.5	96.5	0

^{a.} The likely rotor-swept height for potential collision with a turbine blade

Note: Totals may not add up precisely due to rounding of numbers.

Eagles

One bald eagle observation was recorded within 800 m of survey locations during 199 hrs of eagle use surveys. The one bald eagle observation was recorded on June 29, 2018, at survey Point 42 (Figure 3).

Sensitive Species

No federal or state threatened or endangered species were recorded during the surveys. Four SGCN were observed during surveys: American white pelican (*Pelecanus erythrorhynchos;* 30 observations), bald eagle (one observation), chestnut-collared longspur (100 observations), and marbled godwit (*Limosa fedoa;* one observation); the bald eagle was also observed incidentally (six observations; Table 5).



Figure 3. Bald eagle flight path recorded during avian use surveys at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

 Table 5. Sensitive species observed during all avian use surveys and incidentally at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

			Avian Use Survey		Incidental	Observation	Total		
Species	Scientific Name	Status	Number of Groups	Number of Observations	Number of Groups	Number of Observations	Number of Groups	Number of Observations	
American white pelican	Pelecanus erythrorhynchos	SGCN	4	30	0	0	4	30	
bald eagle*	Haliaeetus leucocephalus	BGEPA, SGCN	1	1	6	6	7	7	
chestnut-collared longspur	Calcarius ornatus	SGCN	1	100	0	0	1	100	
marbled godwit	Limosa fedoa	SGCN	1	1	0	0	1	1	
Total	4 species		7	132	6	6	13	138	

SGCN = South Dakota Species of Greatest Conservation Need (South Dakota Game, Fish and Parks 2014)

BGEPA = Bald and Golden Eagle Protection Act (1940)

*Not observed during 20-minute survey but observed during 60-minute survey

DISCUSSION

Small Birds

Small bird use was highest in fall (Table 2). The most abundant small bird species recorded were horned lark, snow bunting, chestnut-collared longspur, and red-winged blackbird (Appendix A1). The species composition of small birds observed during the surveys is typical of grasslands and cultivated cropland in South Dakota. No state-listed small bird species were observed during the surveys.

Large Birds

The most abundant large bird species recorded during large bird use surveys were greater white-fronted goose and snow goose (Appendix A2). These goose species are common (USFWS 2017) and all waterfowl have been shown to be at low risk of impact during operations of wind projects (Erickson et al. 2014) and therefore population level impacts are not anticipated from the Project.

Diurnal Raptors

Annual mean diurnal raptor use at the Project (0.20 raptor/800-m plot/20-minute survey) was considered to be low based on a comparison with 48 other wind energy facilities that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these 48 wind energy facilities ranged from 0.06–2.34 raptors/800-m plot/20-min survey (Appendix D), for which a general ranking of annual mean raptor use was developed as low (0– 0.5 raptors/800-m plot/20-min survey), low to moderate (0.5–1.0 raptors/800-m plot/20-min survey), moderate (1.0–2.0 raptors/800-m plot/20-min survey), high (2.0–3.0 raptors/800-m plot/20-min survey), and very high (more than 3.0 raptors/800-m plot/20-min survey). Under this ranking, annual mean diurnal raptor use at the Project is considered to be low.

Eagles

No concentrated eagle use was documented on the Project site. The one bald eagle observed during the 199 hrs of eagle surveys was recorded on the northern boundary of the Project, likely away from areas where turbine installation is proposed. An additional six bald eagles were observed incidentally (Table 5). Overall, the risk of mortality to bald eagles is considered low for this Project.

Sensitive Species

No federally or state threatened or endangered species were recorded during the surveys. Four SGCN were observed during avian use surveys at low numbers: American white pelican, bald eagle, chestnut-collared longspur, and marbled godwit (Table 5), suggesting low risk of adverse impact.

CONCLUSIONS

Analysis of the data collected during the avian use surveys generally suggests that development of the Project is not likely to cause significant impacts to bird populations, including diurnal raptors or sensitive species. The majority of species observed during surveys are widespread and abundant, suggesting low risk of adverse impacts to bird populations.

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Appendix A. All Bird Types, Raptor Subtypes, and Species Observed During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017, and September 11, 2017 – August 26, 2018.

Appendix A1. Number of groups (# Grps) and observations (# Obs) by bird type and species, by season, within 100 meters observed during 5-minute small bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	••••••••••••••••••••••••••••••••••••••	Winter		Spr	ing	Fa	ll	Summer		То	tal
Type/Species	Scientific Name	# Grps	# Obs								
Passerines		7	139	72	242	9	169	82	104	170	654
<u>Blackbirds/Orioles</u>		0	0	35	60	4	73	30	37	69	170
red-winged blackbird	Agelaius phoeniceus	0	0	6	14	1	70	7	12	14	96
bobolink	Dolichonyx oryzivorus	0	0	3	3	0	0	4	4	7	7
Brewer's blackbird	Euphagus cyanocephalus	0	0	0	0	0	0	1	1	1	1
orchard oriole	lcterus spurius	0	0	0	0	0	0	1	1	1	1
brown-headed cowbird	Molothrus ater	0	0	7	23	0	0	7	9	14	32
western meadowlark	Sturnella neglecta	0	0	19	20	2	2	10	10	31	32
European starling	Sturnus vulgaris	0	0	0	0	1	1	0	0	1	1
Creepers/Nuthatches		0	0	0	0	0	0	1	1	1	1
white-breasted nuthatch	Sitta carolinensis	0	0	0	0	0	0	1	1	1	1
<u>Finches/Crossbills</u>		0	0	0	0	0	0	4	4	4	4
American goldfinch	Spinus tristis	0	0	0	0	0	0	4	4	4	4
<u>Flycatchers</u>		0	0	0	0	0	0	2	2	2	2
eastern kingbird	Tyrannus tyrannus	0	0	0	0	0	0	2	2	2	2
Grassland/Sparrows		7	139	30	172	5	96	30	30	72	437
grasshopper sparrow	Ammodramus savannarum	0	0	1	1	0	0	1	1	2	2
chestnut-collared longspur	Calcarius ornatus	0	0	1	100	0	0	0	0	1	100
horned lark	Eremophila alpestris	6	89	18	46	1	1	0	0	25	136
dark-eyed junco	Junco hyemalis	0	0	1	1	2	19	0	0	3	20
song sparrow	Melospiza melodia	0	0	0	0	0	0	2	2	2	2
	Passerculus	0	0	2	4	0	0	0	c	0	10
Savannan sparrow	sandwichensis	0	0	3	4	0	0	0	0	9	10
snow bunting	Plectrophenax nivalis	1	50	0	0	1	75	0	0	2	125
vesper sparrow	Pooecetes gramineus	0	0	2	3	0	0	0	0	2	3
dickcissel	Spiza americana	0	0	0	0	0	0	18	18	18	18
clay-colored sparrow	Spizella pallida	0	0	0	0	0	0	1	1	1	1
field sparrow	Spizella pusilla	0	0	1	1	0	0	0	0	1	1
white-crowned sparrow	Zonotrichia leucophrys	0	0	1	10	0	0	0	0	1	10
Harris' sparrow	Zonotrichia querula	0	0	1	5	0	0	0	0	1	5
unidentified sparrow	NA	0	0	1	1	1	1	2	2	4	4
<u>Swallows</u>		0	0	2	2	0	0	11	26	13	28
barn swallow	Hirundo rustica	0	0	2	2	0	0	7	19	9	21
cliff swallow	Petrochelidon pyrrhonota	0	0	0	0	0	0	4	7	4	7

Appendix A1. Number of groups (# Grps) and observations (# Obs) by bird type and species, by season, within 100 meters observed during 5-minute small bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	· · · · · · · · · · · · · · · · · · ·	Wir	nter	Spring		Fall		Summer		То	tal
Type/Species	Scientific Name	# Grps	# Obs								
Thrushes		0	0	4	7	0	0	4	4	8	11
American robin	Turdus migratorius	0	0	4	7	0	0	4	4	8	11
<u>Corvids</u>		0	0	1	1	0	0	0	0	1	1
blue jay	Cyanocitta cristata	0	0	1	1	0	0	0	0	1	1
Woodpeckers		0	0	0	0	0	0	2	2	2	2
unidentified woodpecker	NA	0	0	0	0	0	0	2	2	2	2
Small Bird Overall		7	139	72	242	9	169	84	106	172	656

Winter Fall Spring Summer Total Type/Subtype/Species **#Grps #Obs #Grps #Obs #Grps #Obs #Grps Scientific Name** # Grps # Obs # Obs Waterbirds Pelecanus American white pelican erythrorhynchos double-crested cormorant Phalacrocorax auritus Waterfowl 1.343 1.560 wood duck Aix sponsa northern pintail Anas acuta northern shoveler Anas clvpeata blue-winged teal Anas discors mallard Anas platyrhynchos dadwall Anas strepera greater white-fronted Anser albifrons qoose Canada goose Branta canadensis snow goose Chen caerulescens tundra swan Cygnus columbianus Shorebirds upland sandpiper Bartramia longicauda killdeer Charadrius vociferus marbled godwit Limosa fedoa Hudsonian godwit Limosa haemastica Gulls/Terns rina-billed aull Larus delawarensis Franklin's gull Leucophaeus pipixcan **Diurnal Raptors** Buteos red-tailed hawk Buteo jamaicensis rough-legged hawk Buteo lagopus Buteo platypterus broad-winged hawk Swainson's hawk Buteo swainsoni Northern Harrier northern harrier Circus cyaneus Other Raptors unidentified raptor NA

Appendix A2. Number of groups (# Grps) and observations (# Obs) by bird type, raptor subtype, and species, by season, within 800 meters observed during 20-minute large bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

Appendix A2. Number of groups (# Grps) and observations (# Obs) by bird type, raptor subtype, and species, by season, within 800 meters observed during 20-minute large bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

		Wir	nter	Spri	ing	Fa	ıll	Sum	mer	То	tal
Type/Subtype/Species	Scientific Name	# Grps	# Obs								
Upland Game Birds		0	0	7	36	1	1	0	0	8	37
wild turkey	Meleagris gallopavo	0	0	4	31	0	0	0	0	4	31
ring-necked pheasant	Phasianus colchicus	0	0	1	1	0	0	0	0	1	1
sharp-tailed grouse	Tympanuchus phasianellus	0	0	2	4	1	1	0	0	3	5
Doves/Pigeons		0	0	0	0	0	0	2	2	2	2
mourning dove	Zenaida macroura	0	0	0	0	0	0	2	2	2	2
Large Corvids		1	1	0	0	0	0	0	0	1	1
American crow	Corvus brachyrhynchos	1	1	0	0	0	0	0	0	1	1
Large Birds Overall		6	6	66	1,463	18	219	35	84	125	1,772

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Birds Observed During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017, and September 11, 2017 – August 26, 2018.

Appendix B1. Mean small bird use (number of small bird observations/100-meter plot/5-minute survey), percent of total use, and frequency of occurrence by small bird type and species, by season, observed during bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	-	Mean	Use			Percent	of Use		Frequency of Occurrence (%)			
Type/Species	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer
Passerines	3.37	3.79	4.31	2.48	100	100	100	98.1	9.3	64.3	23.0	81.0
<u>Blackbirds/Orioles</u>	0	0.82	2.02	0.88	0	21.7	46.9	34.9	0	37.9	10.7	47.6
red-winged blackbird	0	0.18	1.94	0.29	0	4.6	45.1	11.3	0	8.0	2.8	14.3
bobolink	0	0.05	0	0.10	0	1.4	0	3.8	0	5.4	0	9.5
Brewer's blackbird	0	0	0	0.02	0	0	0	0.9	0	0	0	2.4
orchard oriole	0	0	0	0.02	0	0	0	0.9	0	0	0	2.4
brown-headed cowbird	0	0.29	0	0.21	0	7.7	0	8.5	0	10.1	0	16.7
western meadowlark	0	0.30	0.06	0.24	0	7.9	1.3	9.4	0	27.8	5.6	19.0
European starling	0	0	0.02	0	0	0	0.6	0	0	0	2.4	0
<u>Creepers/Nuthatches</u>	0	0	0	0.02	0	0	0	0.9	0	0	0	2.4
white-breasted nuthatch	0	0	0	0.02	0	0	0	0.9	0	0	0	2.4
<u>Finches/Crossbills</u>	0	0	0	0.10	0	0	0	3.8	0	0	0	9.5
American goldfinch	0	0	0	0.10	0	0	0	3.8	0	0	0	9.5
Flycatchers	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8
eastern kingbird	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8
<u>Grassland/Sparrows</u>	3.37	2.83	2.29	0.71	100	74.7	53.1	28.3	9.3	39.5	12.3	52.4
grasshopper sparrow	0	0.02	0	0.02	0	0.5	0	0.9	0	2.1	0	2.4
chestnut-collared longspur	0	1.28	0	0	0	33.8	0	0	0	1.3	0	0
horned lark	1.70	1.20	0.02	0	50.5	31.6	0.6	0	9.3	26.0	2.4	0
dark-eyed junco	0	0.02	0.45	0	0	0.5	10.5	0	0	2.1	4.8	0
song sparrow	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8
Savannah sparrow	0	0.06	0	0.14	0	1.5	0	5.7	0	4.5	0	14.3
snow bunting	1.67	0	1.79	0	49.5	0	41.4	0	3.3	0	2.4	0
vesper sparrow	0	0.05	0	0	0	1.4	0	0	0	3.3	0	0
dickcissel	0	0	0	0.43	0	0	0	17.0	0	0	0	31.0
clay-colored sparrow	0	0	0	0.02	0	0	0	0.9	0	0	0	2.4
field sparrow	0	0.01	0	0	0	0.3	0	0	0	1.2	0	0
white-crowned sparrow	0	0.12	0	0	0	3.1	0	0	0	1.2	0	0
Harris' sparrow	0	0.06	0	0	0	1.6	0	0	0	1.2	0	0
unidentified sparrow	0	0.01	0.03	0.05	0	0.3	0.6	1.9	0	1.2	2.8	4.8
<u>Swallows</u>	0	0.04	0	0.62	0	1.1	0	24.5	0	4.2	0	14.3
barn swallow	0	0.04	0	0.45	0	1.1	0	17.9	0	4.2	0	9.5
cliff swallow	0	0	0	0.17	0	0	0	6.6	0	0	0	7.1

Appendix B1. Mean small bird use (number of small bird observations/100-meter plot/5-minute survey), percent of total use, and frequency of occurrence by small bird type and species, by season, observed during bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

		Mean	Use		Percent of Use				Frequency of Occurrence (%)			
Type/Species	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer
<u>Thrushes</u>	0	0.08	0	0.10	0	2.2	0	3.8	0	4.8	0	9.5
American robin	0	0.08	0	0.10	0	2.2	0	3.8	0	4.8	0	9.5
<u>Small Corvids</u>	0	0.01	0	0	0	0.3	0	0	0	1.2	0	0
blue jay	0	0.01	0	0	0	0.3	0	0	0	1.2	0	0
Woodpeckers	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8
unidentified woodpecker	0	0	0	0.05	0	0	0	1.9	0	0	0	4.8
Small Birds Overall	3.37	3.79	4.31	2.52	100	100	100	100				

Note: Totals may not add up precisely due to rounding of numbers.

Appendix B2. Mean large bird use (number of large birds/800-meter plot/20-minute survey), percent of total use, and frequency of occurrence by large bird type, raptor subtype, and species, by season, observed during bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	-	Mean	Use			Percent	of Use	-	Frequency of Occurrence (%)			
Type/Subtype/Species	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer
Waterbirds	0	0.08	0	0.71	0	0.3	0	35.7	0	1.2	0	7.1
American white pelican	0	0	0	0.71	0	0	0	35.7	0	0	0	7.1
double-crested cormorant	0	0.08	0	0	0	0.3	0	0	0	1.2	0	0
Waterfowl	0	28.11	5.13	0.21	0	94.2	94.7	10.7	0	28.0	14.7	9.5
wood duck	0	0.02	0	0	0	<0.1	0	0	0	1.2	0	0
northern pintail	0	0.04	0	0	0	0.1	0	0	0	2.4	0	0
northern shoveler	0	0.08	0	0	0	0.3	0	0	0	4.5	0	0
blue-winged teal	0	0.28	0	0	0	0.9	0	0	0	3.3	0	0
mallard	0	0.13	0	0.21	0	0.4	0	10.7	0	6.0	0	9.5
gadwall	0	0	0.14	0	0	0	2.6	0	0	0	2.4	0
greater white-fronted	0	9.16	0	0	0	30.7	0	0	0	7.0	0	0
Canada doose	0	3 79	4 51	0	0	12 7	83.3	0	0	10.5	٩q	0
snow doose	0	14 61	01	0	0 0	49.0	00.0	Ő	Ő	5.8	0.0	Ő
tundra swan	Ő	0	0 48	Ő	Õ		88	õ	Ő	0.0	24	Õ
Shorebirds	ŏ	0.07	0.10	0.14	ŏ	0.2	0.0	7.1	õ	2.4	0	9.5
upland sandpiper	0	0	0	0.02	0	0	0	1.2	0	0	0	2.4
killdeer	0	0	0	0.12	0	0	0	6.0	Õ	0	0	7.1
marbled godwit	0	0.01	0	0	0	< 0.1	0	0	Õ	1.2	0	0
Hudsonian godwit	0	0.06	0	0	0	0.2	0	0	0	1.2	0	0
Gulls/Terns	Ō	0.82	Ō	0.60	Ō	2.7	Ō	29.8	Ō	11.0	Ō	11.9
rina-billed aull	0	0.71	0	0.60	0	2.4	0	29.8	0	11.0	0	11.9
Franklin's gull	0	0.10	0	0	0	0.3	0	0	0	2.1	0	0
Diurnal Raptors	0.06	0.21	0.26	0.29	64.1	0.7	4.8	14.3	3.6	16.7	15.5	26.2
Buteos	0.05	0.17	0.19	0.26	51.3	0.6	3.4	13.1	2.4	14.4	13.1	23.8
red-tailed hawk	0	0.11	0.11	0.24	0	0.4	2.0	11.9	0	8.5	10.7	23.8
rough-legged hawk	0.05	0.04	0.02	0	51.3	0.1	0.4	0	2.4	3.8	2.4	0
broad-winged hawk	0	0.02	0	0	0	<0.1	0	0	0	2.1	0	0
Swainson's hawk	0	0	0.06	0.02	0	0	1.0	1.2	0	0	2.8	2.4
Northern Harrier	0.01	0.02	0.08	0.02	12.8	<0.1	1.4	1.2	1.2	2.5	5.2	2.4
northern harrier	0.01	0.02	0.08	0.02	12.8	<0.1	1.4	1.2	1.2	2.5	5.2	2.4
<u>Other Raptors</u>	0	0.01	0	0	0	<0.1	0	0	0	1.2	0	0
unidentified raptor	0	0.01	0	0	0	<0.1	0	0	0	1.2	0	0

Appendix B2. Mean large bird use (number of large birds/800-meter plot/20-minute survey), percent of total use, and frequency of occurrence by large bird type, raptor subtype, and species, by season, observed during bird use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	-	Mean	Use			Percent of Use				Frequency of Occurrence (%)			
Type/Subtype/Species	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	
Upland Game Birds	0	0.55	0.02	0	0	1.9	0.4	0	0	6.8	2.4	0	
wild turkey	0	0.49	0	0	0	1.7	0	0	0	5.7	0	0	
ring-necked pheasant	0	0.01	0	0	0	<0.1	0	0	0	1.2	0	0	
sharp-tailed grouse	0	0.05	0.02	0	0	0.2	0.4	0	0	1.2	2.4	0	
Doves/Pigeons	0	0	0	0.05	0	0	0	2.4	0	0	0	4.8	
mourning dove	0	0	0	0.05	0	0	0	2.4	0	0	0	4.8	
Large Corvids	0.03	0	0	0	35.9	0	0	0	3.3	0	0	0	
American crow	0.03	0	0	0	35.9	0	0	0	3.3	0	0	0	
Large Birds Overall	0.09	29.84	5.42	2.00	100	100	100	100					

Note: Totals may not add up precisely due to rounding of numbers.

Appendix C. Mean Use by Survey Point for Large Bird Types During Avian Use Surveys at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

	Survey Point													
Type/Subtype	42	76	77	78	79	82	83	84	96	99	101	103	105	118
Waterbirds	0	0.39	0.11	0	0	1.43	0	0	0	0	0.67	0	0	0
Waterfowl	3.89	0.94	9.00	25.82	0	3.07	1.21	0.15	25.50	5.42	1.58	6.25	1.67	32.50
Shorebirds	0	0	0	0	0	0.07	0	0	0.08	0.25	0.08	0.42	0	0.10
Gulls/Terns	0	0	0.06	0.29	0.06	3.29	0.50	0.15	0	1.42	0	0.08	0	0
Diurnal Raptors	0.11	0.67	0.28	0	0.12	0	0.07	0.31	0.17	0.25	0.42	0.33	0.08	0.20
<u>Buteos</u>	0.11	0.56	0.11	0	0.12	0	0.07	0.31	0.08	0.25	0.42	0.17	0.08	0.20
Northern Harrier	0	0.11	0.11	0	0	0	0	0	0.08	0	0	0.17	0	0
Other Raptors	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0.06	0	0	0	0.36	0	1.08	0.08	0	0	1.25	0	0.10
Doves/Pigeons	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0.10
Large Corvids	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0
Large Birds Overall	4.00	2.11	9.50	26.12	0.18	8.21	1.79	1.69	25.83	7.33	2.75	8.33	1.75	33.00

Appendix C. Mean use for large birds (number of observations/800-meter plot/20-minute survey) by survey point for major bird types and raptor subtypes observed during avian use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

Appendix D. Comparison of Diurnal Raptor Use at North American Wind Energy Facilities.



Wind Energy Facility

Appendix D. Annual diurnal raptor use (number of raptors/20-minute survey) for raptors as reported in publically available results from studies conducted at wind energy facilities in North America and observed at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota.

Appendix D (*continued*). Annual diurnal raptor use (number of raptors/20-minute survey) for raptors as reported in publically available results from studies conducted at wind energy facilities in North America and observed at the Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota.

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference						
Dakota Range III	This Study										
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Wild Horse, WA	Erickson et al. 2003d						
Diablo Winds, CA	WEST 2006	Roosevelt, WA	NWC and WEST 2004	Biglow Canyon, OR	WEST 2005c						
Altamont Pass, CA	Orloff and Flannery 1992	Leaning Juniper, OR	Kronner et al. 2005	North Sky River, CA	Erickson et al. 2011						
Elkhorn, OR	WEST 2005a	Dunlap, WY	Johnson et al. 2009a	AOCM (CPC Proper), CA	Chatfield et al. 2010						
Big Smile (Dempsey), OK	Derby et al. 2010b	Klondike, OR	Johnson et al. 2002	Biglow Reference, OR	WEST 2005c						
Cotterel Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003b	Simpson Ridge, WY	Johnson et al. 2000b						
Swauk Ridge, WA	Erickson et al. 2003c	Antelope Ridge, OR	WEST 2009	Prairie Winds SD1, SD	Derby et al. 2014a						
Golden Hills, OR	Jeffrey et al. 2008	Condon, OR	Erickson et al. 2002b	Vantage, WA	Jeffrey et al. 2007						
Windy Flats, WA	Johnson et al. 2007	High Plains, WY	Johnson et al. 2009b	Grand Ridge, IL	Derby et al. 2009						
Combine Hills OP	Vound at al. 2003a	Supflower ND	Dorby and Thorn 2014	Tohachani Bass, CA	Anderson et al. 2000,						
Combine mills, OK	Tourig et al. 2005a		Derby and morn 2014	l ellacitapi Fass, CA	Erickson et al. 2002b						
Desert Claim, WA	Young et al. 2003b	Zintel Canyon, WA	Erickson et al. 2002a, 2003a	Sunshine, AZ	WEST and the CPRS 2006						
Hopkins Ridge, WA	Young et al. 2003c	Nine Canyon, WA	Erickson et al. 2001	Dry Lake, AZ	Young et al. 2007a						
Reardon, WA	WEST 2005b	Maiden, WA	Young et al. 2002	Alta East (2011), CA	Chatfield et al. 2011						
Stateline Reference, OR	URS et al. 2001	Hatchet Ridge, CA	Young et al. 2007b	Alta East (2010), CA	Chatfield et al. 2011						
Ruffalo Pidgo MN	Johnson et al. 2000a	Bittor Poot MN	Darby and Dabl 2000	San Corgonia, CA	Anderson et al. 2000,						
Bullalo Ruge, MIN	Johnson et al. 2000a		Derby and Daill 2009	San Gorgonio, CA	Erickson et al. 2002b						
White Creek, WA	NWC and WEST 2005	Timber Road (Phase II), OH	Good et al. 2010	AOCM (CPC East), CA	Chatfield et al. 2010						

Appendix E. Wind Energy Facilities in the Midwest Region of North America with Publicly Available and Comparable Use and Fatality Data for Raptors. Appendix E. Wind energy facilities in the Midwest region of North America with comparable use (number of raptors/plot/20-minute survey) and fatality (number of fatalities/megawatt/year) data for raptors.

	Raptor	Raptor	Total	Total	*	-
Project Name	Use	Fatality	Number of	Megawatts	Use Reference	Fatality Reference
	Estimate	Estimate	Turbines		This Ofersla	NA
Dakota Range III, SD (2017-2018)	0.20	<u>NA</u>	<u> </u>	<u>NA</u>	Inis Study	<u>NA</u>
Buffalo Ridge, MN (Phase I; 1999)	NA	0.47	73	25.0	NA	Johnson et al. 2000a
Moraine II, MN (2009)	NA	0.37	33	49.5	NA	Derby et al. 2010f
Winnebago, IA (2009-2010)	NA	0.27	10	20.0	NA	Derby et al. 2010g
Buffalo Ridge I, SD (2009-2010)	NA	0.20	24	50.4	NA	Derby et al. 2010d
Cedar Ridge, WI (2009)	NA	0.18	41	67.6	NA	BHE Environmental 2010
Thunder Spirit, ND (2016-2017)	NA	0.18	43	108.0		Derby et al. 2018
Prairie Winds SD1, SD (2013-2014)	NA	0.17	108	162.0	NA	Derby et al. 2014b
Top of Iowa, IA (2004)	NA	0.17	89	80.0	NA	Jain 2005
Cedar Ridge, WI (2010)	NA	0.13	41	68.0	NA	BHE Environmental 2011
Ripley, Ont (2008)	NA	0.10	38	76.0	NA	Jacques Whitford 2009
Prairie Rose, MN (2014)	NA	0.08	119	200.0		Chodachek et al. 2015
Wessington Springs, SD (2010)	0.23	0.07	34	51.0	Derby et al. 2008	Derby et al. 2011a
NPPD Ainsworth, NE (2006)	NA	0.06	36	20.5	NA	Derby et al. 2007
Rugby, ND (2010-2011)	NA	0.06	71	149.0	NA	Derby et al. 2011c
Wessington Springs, SD (2009)	0.23	0.06	34	51.0	Derby et al. 2008	Derby et al. 2010c
Prairie Winds ND1 (Minot), ND (2010)	NA	0.05	80	116.0	NA	Derby et al. 2011d
Prairie Winds ND1 (Minot), ND (2011)	NA	0.05	80	116.0	NA	Derby et al. 2012d
Prairie Winds SD1, SD (2012-2013)	NA	0.03	108	162.0	NA	Derby et al. 2013
Barton I & II, IA (2010-2011)	NA	0.00	80	160.0	NA	Derby et al. 2011b
Big Blue, MN (2013)	NA	0.00	18	36.0	NA	Fagen Engineering 2014
Big Blue, MN (2014)	NA	0.00	18	36.0	NA	Fagen Engineering 2015
Blue Sky Green Field, WI (2008; 2009)	NA	0.00	88	145.0	NA	Gruver et al. 2009
Buffalo Ridge II, SD (2011-2012)	NA	0.00	105	210.0	NA	Derby et al. 2012a
Buffalo Ridge, MN (Phase I; 1996)	NA	0.00	73	25.0	NA	Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1997)	NA	0.00	73	25.0	NA	Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1998)	NA	0.00	73	25.0	NA	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1998)	NA	0.00	143	107.0	NA	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1999)	NA	0.00	143	107.0	NA	Johnson et al. 2000a
Buffalo Ridge, MN (Phase III; 1999)	NA	0.00	138	104.0	NA	Johnson et al. 2000a
Elm Creek II, MN (2011-2012)	NA	0.00	62	149.0	NA	Derby et al. 2012b
Elm Creek, MN (2009-2010)	NA	0.00	67	100.0	NA	Derby et al. 2010e
Fowler I, IN (2009)	NA	0.00	162	301.0	NA	Johnson et al. 2010
Grand Ridge I, IL (2009-2010)	0.20	0.00	66	99.0	Derby et al. 2009	Derby et al. 2010a
Kewaunee County, WI (1999-2001)	NA	0.00	31	20.5	NA	Howe et al. 2002

Appendix E. Wind energy facilities in the Midwest region of North America with comparable use (number of raptors/plot/20-minute survey) and fatality (number of fatalities/megawatt/year) data for raptors.

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total Number of Turbines	Total Megawatts	Use Reference	Fatality Reference
Pioneer Prairie II, IA (2011-2012)	NA	0.00	62	102.0	NA	Chodachek et al. 2012
Prairie Winds SD1, SD (2011-2012)	NA	0.00	108	162.0	NA	Derby et al. 2012c
Rail Splitter, IL (2012-2013)	NA	0.00	67	101.0	NA	Good et al. 2013
Top of Iowa, IA (2003)	NA	0.00	89	80.0	NA	_ Jain 2005