

**Avian Use Surveys**  
**Dakota Range III Wind Project**  
**Grant and Roberts Counties, South Dakota**

---

**January 2017 to May 2017**  
**September 2017 to August 2018**

**Prepared by:**

Western EcoSystems Technology, Inc.  
2007 State Street, Suite 109  
Bismarck, North Dakota 58503

**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

### **Western EcoSystems Technology, Inc.**

Clayton Derby	Senior Project Manager
Ann Dahl	Report Writer
Mandy Kauffman	Lead Client Analyst
Carmen Boyd	Data and Report Manager
David Kline	Technical Editor Manager
Katie Wynne	Technical Editing Coordinator
Diem Pham	Data Analyst
Ann Dahl	GIS Specialist
Sofía Agudelo	Technical Editor
Karen Seginak	Field Biologist
Katherine Moratz	Field Biologist

## REPORT REFERENCE

Western EcoSystems Technology, Inc. (WEST). 2018. Avian Use Surveys, Dakota Range III Wind Project, Grant and Roberts Counties, South Dakota. January 2017 – May 2017 and September 2017 – August 2018. Draft Report. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. December 19, 2018.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
INTRODUCTION .....	1
PROJECT AREA .....	1
METHODS.....	3
Field Surveys .....	3
Statistical Analysis .....	6
Fixed-Point Avian Use Surveys .....	6
Bird Diversity and Species Richness .....	6
Mean Use, Seasonal Variations, and Frequency of Occurrence.....	6
Bird Flight Height and Behavior .....	6
Spatial Use and Mapping .....	6
RESULTS .....	7
Small Bird Use .....	7
Large Bird Use .....	7
Diurnal Raptors .....	8
Large Bird Flight Height and Behavior.....	10
Eagles.....	10
Sensitive Species.....	10
DISCUSSION.....	13
Small Birds.....	13
Large Birds .....	13
Diurnal Raptors .....	13
Eagles.....	13
Sensitive Species.....	13
CONCLUSIONS.....	14
REFERENCES .....	15

## 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 Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.....	9

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..... 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

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.....12

**LIST OF FIGURES**

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). ..... 2

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..... 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. ....11

**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).

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

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
<b>Total</b>	<b>18,744.7</b>	<b>100</b>

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.

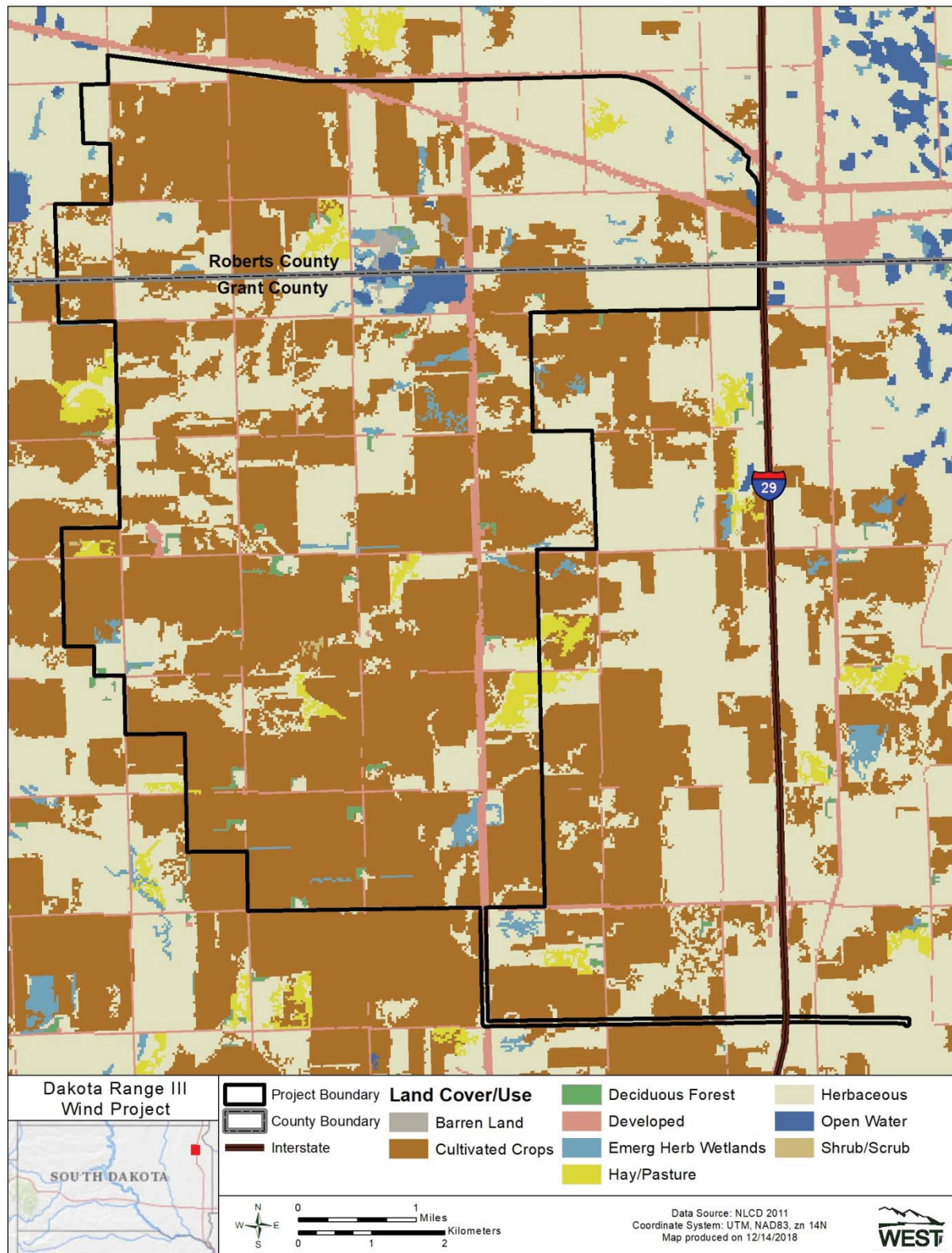


Figure 1. Land cover and use within the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota (Sources: US Geological Survey National Land Cover Database 2011, Homer et al. 2015).



## 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 5.0-m (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.

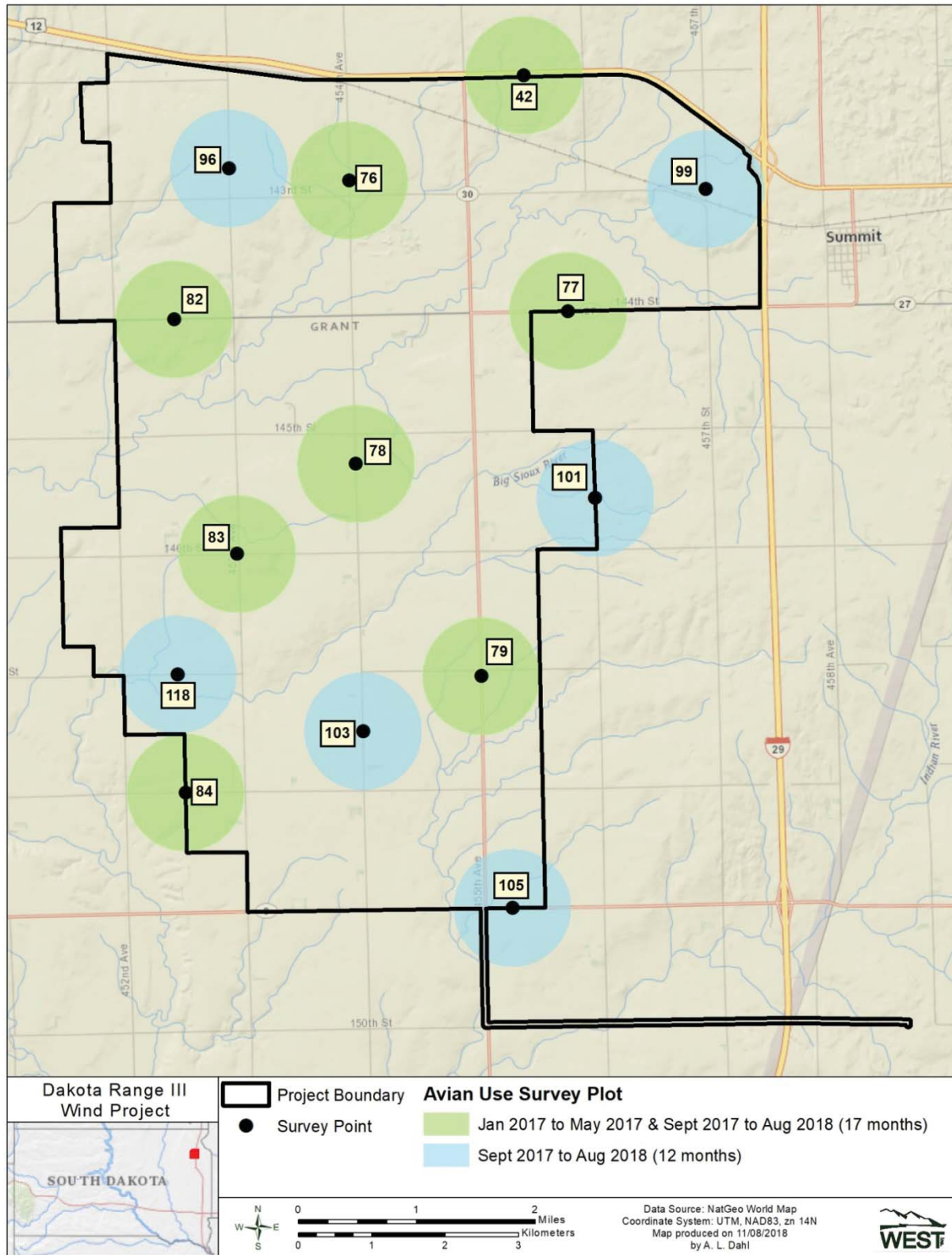


Figure 2. Fixed-point survey locations (survey point) and avian use survey plots at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

## **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.**

Type	Mean Use			Percent of Total Use			Frequency of Occurrence (%)			
	Winter	Spring	Fall	Winter	Spring	Fall	Winter	Spring	Fall	Summer
Passerines	3.37	3.79	4.31	100	100	100	98.1	64.3	23.0	81.0
Woodpeckers	0	0	0	0	0	0	1.9	0	0	4.8
<b>Small Birds Overall</b>	<b>3.37</b>	<b>3.79</b>	<b>4.31</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>

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.**

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

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 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.**

Type/Subtype	Number of Groups Flying	Number of Individuals Flying	Mean Flight Height (meters)	Percent Observed Flying	Percent Within Flight Height Categories		
					0-25 meters	25-200 meters <sup>a</sup>	> 200 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
<i>Buteos</i>	21	21	38.19	60.0	47.6	52.4	0
<i>Northern Harrier</i>	5	5	4.20	71.4	100	0	0
<i>Other Raptors</i>	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
<b>Large Birds Overall</b>	<b>76</b>	<b>1,589</b>	<b>53.36</b>	<b>89.7</b>	<b>3.5</b>	<b>96.5</b>	<b>0</b>

<sup>a</sup> 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).



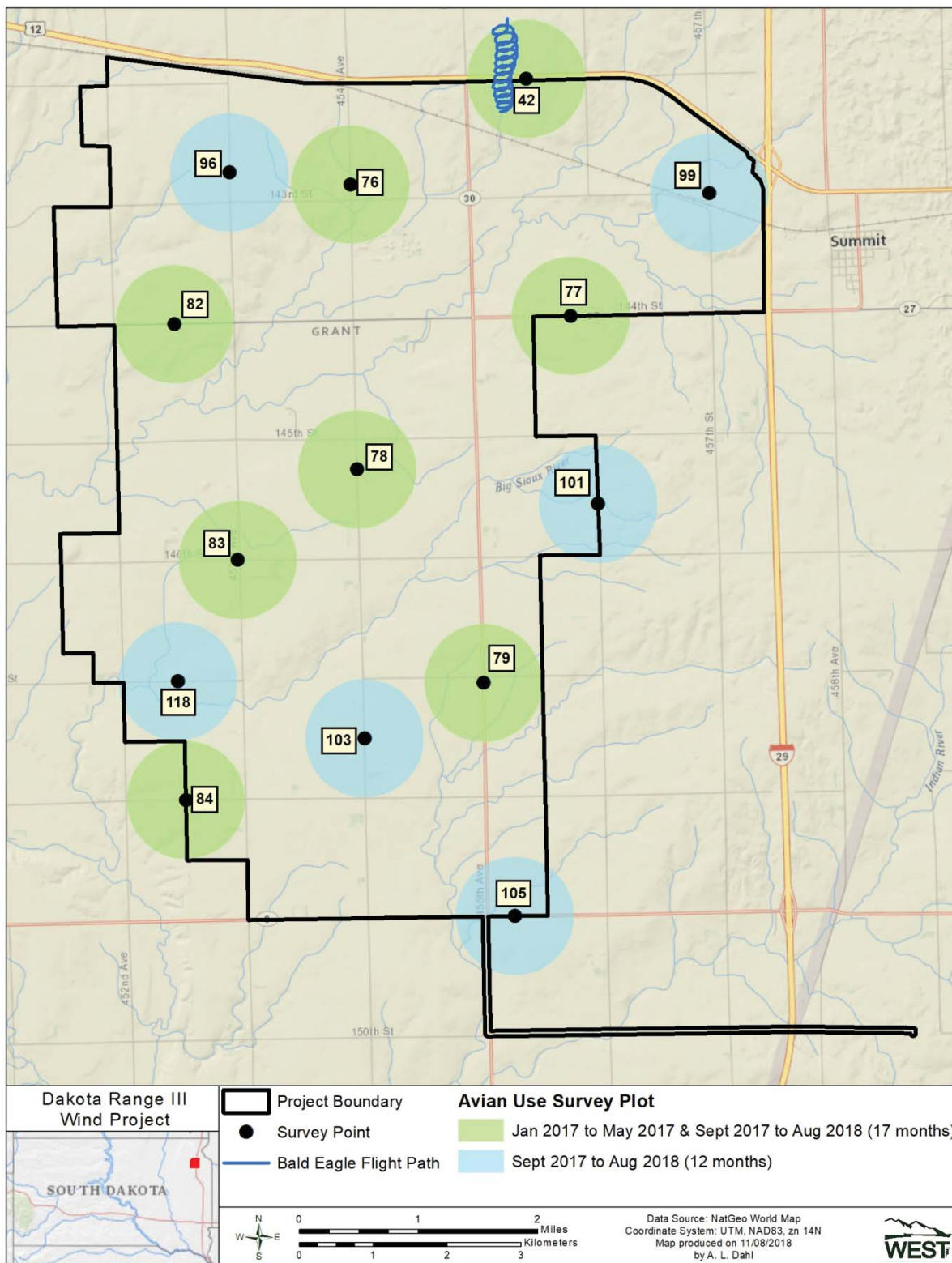


Figure 3. Bald eagle flight path recorded during avian use surveys at the proposed Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September 11, 2017 – August 26, 2018.

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.

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

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.

## REFERENCES

- Anderson, R., D. Strickland, J. Tom, N. Neumann, W. Erickson, J. Cleckler, G. Mayorga, G. Nuhn, A. Leuders, J. Schneider, L. Backus, P. Becker, and N. Flagg. 2000. Avian Monitoring and Risk Assessment at Tehachapi Pass and San Gorgonio Pass Wind Resource Areas, California: Phase 1 Preliminary Results. In: Proceedings of the National Avian Wind Power Planning Meeting III (PNAWPPM-III), May 1998, San Diego, California. National Wind Coordinating Collaborative (NWCC)/RESOLVE, Washington, D.C. Pp 31-46.
- Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Section (§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].
- BHE Environmental, Inc. (BHE). 2010. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2010.
- BHE Environmental, Inc. (BHE). 2011. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Final Report. Prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2011. 6000.
- Bureau of Land Management (BLM). 2006. Final Environmental Impact Statement for the Proposed Cotterel Wind Power Project and Proposed Resource Management Plan Amendment. FES 06-07. Serial No. IDI-33676. Prepared for the US Department of the Interior (USDOI), BLM, Twin Falls District, Burley Field Office, Cassia County, Idaho, on behalf of Windland, Inc., Boise, Idaho, and Shell WindEnergy Inc., Houston, Texas. March 2006.
- Chatfield, A., W. P. Erickson, and K. Bay. 2010. Avian Baseline Studies at the Sun Creek Wind Resource Area, Kern County, California. Final Report: May 2009 - May 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming. September 30, 2010.
- Chatfield, A., W. P. Erickson, and K. Bay. 2011. Avian Baseline Studies at the Alta East Wind Resource Area, Kern County, California. Final Report: July 10, 2010 - June 1, 2011. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming. July 13, 2011. Appendix D-8. In: Bureau of Land Management (BLM). 2013. Alta East Wind Project: Proposed Plan Amendment and Final Environmental Impact Statement. CACA #0052537. US Department of the Interior BLM. February 2013. Available online: [http://www.blm.gov/ca/st/en/fo/ridgecrest/alta\\_east\\_wind\\_project.html](http://www.blm.gov/ca/st/en/fo/ridgecrest/alta_east_wind_project.html); 2011 Avian Baseline Report (Appendix D-8) available online at: [http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/ridgecrest/alta\\_east\\_wind.Par.22191.File.dat/D8%20Avian%20Baseline%20Studies%202011.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/ridgecrest/alta_east_wind.Par.22191.File.dat/D8%20Avian%20Baseline%20Studies%202011.pdf)
- Chodachek, K., C. Derby, M. Sonnenberg, and T. Thorn. 2012. Post-Construction Fatality Surveys for the Pioneer Prairie Wind Farm I Llc Phase Ii, Mitchell County, Iowa: April 4, 2011 – March 31, 2012. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 27, 2012.

- Chodachek, K., K. Adachi, and G. DiDonato. 2015. Post Construction Fatality Surveys for the Prairie Rose Wind Energy Facility, Rock County, Minnesota. Final Report: April 15 to June 13, 2014, and August 15 to October 29, 2014. Prepared for Enel Green Power, North America, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. January 23, 2015. Available online: <https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BF38C2FEC-ED84-4813-AF3E-5A397A954A34%7D&documentTitle=20152-107006-01>
- Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the Nppd Ainsworth Wind Farm. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for the Nebraska Public Power District.
- Derby, C., A. Dahl, K. Taylor, K. Bay, and K. Seginak. 2008. Wildlife Baseline Studies for the Wessington Springs Wind Resource Area, Jerauld County, South Dakota, March 2007-November 2007. Technical report prepared for Power Engineers, Inc. and Babcock and Brown Renewable Holdings, Inc. by Western EcoSystems Technology, Inc. (WEST).
- Derby, C. and A. Dahl. 2009. Wildlife Studies for the Bitter Root Wind Resource Area, Yellow, Medicine, and Lincoln Counties, Minnesota. Annual Report: March 25, 2008 - October 8, 2008. Prepared for Buffalo Ridge Power Partners, Argyle, New York. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. April 16, 2009. In: Minnesota Department of Commerce, Office of Energy Security. 2010. Bitter Root Wind Farm Project, Environmental Report. Site Permit Application, Appendix F. Minnesota Public Utilities Commission, Docket 25538. March 2010. April 16, 2009. Available online: [http://www.calco.state.mn.us/commerce/energyfacilities/documents/25538/Appendix\\_%20F\\_Wildlife\\_Studies.pdf](http://www.calco.state.mn.us/commerce/energyfacilities/documents/25538/Appendix_%20F_Wildlife_Studies.pdf)
- Derby, C., K. Bay, and J. Ritzert. 2009. Bird Use Monitoring, Grand Ridge Wind Resource Area, La Salle County, Illinois. Year One Final Report, March 2008 - February 2009. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 29, 2009.
- Derby, C., J. Ritzert, and K. Bay. 2010a. Bird and Bat Fatality Study, Grand Ridge Wind Resource Area, LaSalle County, Illinois. January 2009 - January 2010. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. July 13, 2010. Revised January 2011.
- Derby, C., K. Bay, and A. Dahl. 2010b. Wildlife Baseline Studies for the Dempsey Wind Resource Area, Roger Mills County, Oklahoma. Final Report: March 2008 – February 2009. Prepared for HDR Engineering, Minneapolis, Minnesota, and Dempsey Ridge Wind Farm, LLC, a wholly owned subsidiary of Acciona Wind Energy USA LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. February 10, 2010.
- Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010c. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.
- Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010d. Post-Construction Fatality Survey for the Buffalo Ridge I Wind Project. May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc., Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

- Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010e. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.
- Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010f. Post-Construction Fatality Surveys for the Moraine li Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.
- Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010g. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.
- Derby, C., A. Dahl, K. Bay, and L. McManus. 2011a. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.
- Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011b. Post-Construction Fatality Surveys for the Barton I and li Wind Project: Iri. March 2010 - February 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: September 28, 2011.
- Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011c. Post-Construction Fatality Surveys for the Rugby Wind Project: Iberdrola Renewables, Inc. March 2010 - March 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: October 14, 2011.
- Derby, C., K. Chodachek, T. Thorn, K. Bay, and S. Nomani. 2011d. Post-Construction Fatality Surveys for the Prairiewinds Nd1 Wind Facility, Basin Electric Power Cooperative, March - November 2010. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 2, 2011.
- Derby, C., K. Chodachek, and M. Sonnenberg. 2012a. Post-Construction Casualty Surveys for the Buffalo Ridge li Wind Project. Iberdrola Renewables: March 2011- February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.
- Derby, C., K. Chodachek, and M. Sonnenberg. 2012b. Post-Construction Fatality Surveys for the Elm Creek li Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.
- Derby, C., A. Dahl, and A. Merrill. 2012c. Post-Construction Monitoring Results for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2011 - February 2012. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 27, 2012.
- Derby, C., K. Chodachek, T. Thorn, and A. Merrill. 2012d. Post-Construction Surveys for the Prairiewinds Nd1 (2011) Wind Facility Basin Electric Power Cooperative: March - October 2011. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western Ecosystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

- Derby, C., A. Dahl, and D. Fox. 2013. Post-Construction Fatality Monitoring Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2012 - February 2013. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 13, 2013.
- Derby, C. and T. Thorn. 2014. Avian Use Surveys for the Sunflower Wind Project, Morton and Stark Counties, North Dakota. Final Report: March 2013 through February 2014. Prepared for Sunflower Wind Project, LLC, Santa Barbara, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. May 22, 2014.
- Derby, C., A. Dahl, and T. Rintz. 2014a. Avian Use Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2013 - March 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.
- Derby, C., A. Dahl, and G. DiDonato. 2014b. Post-Construction Fatality Monitoring Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2013 - February 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.
- Derby, C., D. Klostermeier, R. Tupling, and K. Moratz. 2018. Post-Construction Bird and Bat Fatality Monitoring for the Thunder Spirit Wind Energy Facility, Adams County, North Dakota. Final Fatality Report. Prepared for Thunder Spirit Wind, LLC, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. March 1, 2018.
- Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 et seq.]; 50 Code of Federal Regulations (CFR) 402.
- Erickson, W. P., E. Lack, M. Bourassa, K. Sernka, and K. Kronner. 2001. Wildlife Baseline Study for the Nine Canyon Wind Project, Final Report May 2000-October 2001. Technical report prepared for Energy Northwest, Richland, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon.
- Erickson, W. P., G. D. Johnson, K. Bay, and K. Kronner. 2002a. Ecological Baseline Study for the Zintel Canyon Wind Project. Final Report April 2001 – June 2002. Technical report prepared for Energy Northwest. Prepared for Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. June 2002.
- Erickson, W. P., G. D. Johnson, D. P. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002b. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared for Bonneville Power Administration, Portland, Oregon by WEST, Inc., Cheyenne, Wyoming. December 2002. [http://www.bpa.gov/Power/pgc/wind/Avian\\_and\\_Bat\\_Study\\_12-2002.pdf](http://www.bpa.gov/Power/pgc/wind/Avian_and_Bat_Study_12-2002.pdf)
- Erickson, W. P., K. Kronner, and R. Gritski. 2003a. Nine Canyon Wind Power Project Avian and Bat Monitoring Report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. Available online at: [http://www.west-inc.com/reports/nine\\_canyon\\_monitoring\\_final.pdf](http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf)



- Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2003b. Stateline Wind Project Wildlife Monitoring Annual Report, Results for the Period July 2001 - December 2002. Technical report submitted to FPL Energy, the Oregon Office of Energy, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc., Cheyenne, Wyoming. May 2003.
- Erickson, W. P., J. Jeffrey, D. P. Young, K. Bay, R. Good, K. Sernka, and K. Kronner. 2003c. Wildlife Baseline Study for the Kittitas Valley Wind Project: Summary of Results from 2002 Wildlife Surveys. Final Report: February 2002– November 2002. Prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. January 2003.
- Erickson, W. P., D. P. Young, G. D. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003d. Wildlife Baseline Study for the Wild Horse Wind Project. Summary of Results from 2002-2003 Wildlife Surveys May 10, 2002- May 22, 2003. Prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 2003. Available online: [http://www.efsec.wa.gov/wildhorse/apl/Exhibits%20PDF/E14-Ecological%20Baseline%20Study-%2011\\_20\\_03.pdf](http://www.efsec.wa.gov/wildhorse/apl/Exhibits%20PDF/E14-Ecological%20Baseline%20Study-%2011_20_03.pdf)
- Erickson, W. P., A. Chatfield, and K. Bay. 2011. Avian Baseline Studies for the North Sky River Wind Energy Project, Kern County, California. Final Report: May 18, 2010 – May 26, 2011. Final Report. Prepared for CH2M HILL, Portland Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 7, 2011.
- Erickson W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, J.L Gehring 2014 A Comprehensive Analysis of Small-Passerine Fatalities from Collision with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi:10.1371/journal.pone.0107491
- Fagen Engineering, LLC. 2014. 2013 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC. May 2014.
- Fagen Engineering, LLC. 2015. 2014 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC.
- Good, R. E., M. Ritzert, and K. Bay. 2010. Wildlife Baseline Studies for the Timber Road Phase II Wind Resource Area, Paulding County, Ohio. Final Report: September 2, 2008 - August 19, 2009. Prepared for Horizon Wind Energy, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. April 28, 2010.
- Good, R. E., M. L. Ritzert, and K. Adachi. 2013. Post-Construction Monitoring at the Rail Splitter Wind Farm, Tazwell and Logan Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. December 16, 2013.
- Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.
- Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online: <http://www.mrlc.gov/nlcd2011.php>

- Howe, R. W., W. Evans, and A. T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.
- Jacques Whitford Stantec Limited (Jacques Whitford). 2009. Ripley Wind Power Project Postconstruction Monitoring Report. Project No. 1037529.01. Report to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Energy Products Inc., Calgary, Alberta. Prepared for the Ripley Wind Power Project Post-Construction Monitoring Program. Prepared by Jacques Whitford, Markham, Ontario. April 30, 2009.
- Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. Iowa State University, Ames, Iowa.
- Jeffrey, J. D., V. K. Poulton, K. J. Bay, K. F. Flaig, C. C. Roderick, W. P. Erickson, and J. E. Baker. 2007. Wildlife and Habitat Baseline Study for the Proposed Vantage Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Invenegy. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. August 2007. Available online: [https://www.co.kittitas.wa.us/uploads/cds/land-use/Wind%20Farm/WSA-07-01%20Vantage%20Wind%20%20Power%20Project%20Application/VANTAGE\\_WILDLIFE\\_BASELINE%20REPORT\\_8.27.07.pdf](https://www.co.kittitas.wa.us/uploads/cds/land-use/Wind%20Farm/WSA-07-01%20Vantage%20Wind%20%20Power%20Project%20Application/VANTAGE_WILDLIFE_BASELINE%20REPORT_8.27.07.pdf)
- Jeffrey, J. D., W. P. Erickson, K. J. Bay, V. K. Poulton, W. L. Tidhar, and J. E. Baker. 2008. Wildlife Baseline Studies for the Golden Hills Wind Resource Area, Sherman County, Oregon. Final Report May 2006 – October 2007. Prepared for BP Alternative Energy North America Inc., Houston, Texas, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.
- Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000a. Final Report: Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp.
- Johnson, G. D., D. P. Young, W. P. Erickson, C. E. Derby, M. D. Strickland, R. E. Good, and J. W. Kern. 2000b. Final Report: Wildlife Monitoring Studies, Seawest Windpower Project, Carbon County, Wyoming, 1995-1999. Final report prepared for SeaWest Energy Corporation, San Diego, California, and the Bureau of Land Management, Rawlins, Wyoming, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 9, 2000.
- Johnson, G. D., W. P. Erickson, K. Bay, and K. Kronner. 2002. Baseline Ecological Studies for the Klondike Wind Project, Sherman County, Oregon. Final report prepared for Northwestern Wind Power, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. May 29, 2002. Available online: <http://wind.nrel.gov/public/library/johnson5.pdf>
- Johnson, G. D., J. Jeffrey, J. Baker, and K. Bay. 2007. Baseline Avian Studies for the Windy Flats Wind Energy Project, Klickitat County, Washington. Prepared for Windy Point Partners, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. May 29, 2007. Available online: <https://pdfs.semanticscholar.org/5b65/93c1ceb967d11600031493d3d2f6a8d3abc8.pdf>

- Johnson, G. D., K. Bay, and J. Eddy. 2009a. Wildlife Baseline Studies for the Dunlap Ranch Wind Resource Area, Carbon and Albany Counties, Wyoming. June 4, 2008 - May 27, 2009. Prepared for CH2M HILL, Englewood, Colorado. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 25, 2009. Available online at: <http://amlportal.state.wy.us/out/downloads/Dunlap%20Addendum4.pdf>
- Johnson, G. D., K. Bay, and J. Eddy. 2009b. Wildlife Baseline Studies for the High Plains Wind Resource Area, Carbon and Albany Counties, Wyoming. Prepared for CH2M HILL. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.
- Johnson, G. D., M. Ritzert, S. Nomani, and K. Bay. 2010. Bird and Bat Fatality Studies, Fowler Ridge I Wind-Energy Facility Benton County, Indiana. Unpublished report prepared for British Petroleum Wind Energy North America Inc. (BPWENA) by Western EcoSystems Technology, Inc. (WEST).
- Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Year One Report. Prepared for High Winds, LLC and FPL Energy.
- Kronner, K., R. Gritski, J. Baker, V. Marr, G. Johnson, and K. Bay. 2005. Wildlife Baseline Study for the Leaning Juniper Wind Power Project, Gilliam County, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). Prepared for PPM Energy, Portland, Oregon and CH2M HILL, Portland, Oregon by NWC, Pendleton, Oregon, and WEST, Cheyenne, Wyoming. November 3, 2005.
- National Geographic Society (National Geographic). 2018. World Maps. Digital topographic map. PDF topographic map quads. Accessed November 2018. Available online: <http://www.natgeomaps.com/trail-maps/pdf-quads>
- Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2004. Ecological Baseline Studies for the Roosevelt Wind Project, Klickitat County, Washington. Final Report. Prepared by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. September 2004.
- Northwest Wildlife Consultants, Inc. (NWC), and Western EcoSystems Technology, Inc. (WEST). 2005. Ecological Baseline Studies and Wildlife Impact Assessment for the White Creek Wind Power Project, Klickitat County, Washington. Prepared for Last Mile Electric Cooperative, Goldendale, Washington. Prepared by K. Kronner, R. Gritski, and J. Baker, NWC, Goldendale, Washington, and G.D. Johnson, K. Bay, R. Good, and E. Lack, WEST, Cheyenne Wyoming. January 12, 2005.
- Orloff, S. and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report P700-92-001 to Alameda, Contra Costa, and Solano Counties, and the California Energy Commission, Sacramento, California, by Biosystems Analysis, Inc., Tiburon, California. March 1992.
- Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. *Condor* 82(3): 309-313.
- South Dakota Department of Game, Fish and Parks (SDGFP). 2014. South Dakota Wildlife Action Plan. SDGFP, Pierre, South Dakota. Available online at: <http://gfp.sd.gov/images/WebMaps/Viewer/WAP/Website/PlanSections/SD%20Wildlife%20Action%20Plan%20Revision%20Final.pdf>
- South Dakota Game, Fish and Parks (SDGFP). 2018. Threatened and Endangered Species. Wildlife Diversity Program. Available Online: <https://gfp.sd.gov/threatened-endangered/>

- URS Corporation, Western EcoSystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. (NWC). 2001. Avian Baseline Study for the Stateline Project. Prepared for FPL Energy Vansycle, LLC, Juno Beach, Florida.
- US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). 2018. Cropscape - Cropland Data Layer. 2018 South Dakota Data. Accessed November 2018. USDA NASS homepage at: <http://www.nass.usda.gov/>; Cropscape CDL program data available online at: <http://nassgeodata.gmu.edu/CropScape/>
- US Environmental Protection Agency (USEPA). 2017. Level Iii and Level Iv Ecoregions of the Continental United States. Ecosystems Research, USEPA. Last updated February 8, 2017. Information and maps online: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>
- US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: [http://www.fws.gov/cno/pdf/Energy/2012\\_Wind\\_Energy\\_Guidelines\\_final.pdf](http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf)
- US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online: <https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf>
- U.S. Fish and Wildlife Service. 2017. Waterfowl population status, 2017. U.S. Department of the Interior, Washington, D.C. USA.
- US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (NLCD 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Available online: <http://www.mrlc.gov/nlcd2011.php>; Legend: [http://www.mrlc.gov/nlcd11\\_leg.php](http://www.mrlc.gov/nlcd11_leg.php)
- Western EcoSystems Technology, Inc. (WEST). 2005a. Ecological Baseline Study at the Elkhorn Wind Power Project. Exhibit A. Final report prepared for Zilkha Renewable Energy, LLC, Portland, Oregon, by WEST, Cheyenne, Wyoming. June 2005.
- Western EcoSystems Technology, Inc. (WEST). 2005b. Ecological Baseline Study for the Proposed Reardan Wind Project, Lincoln County, Washington. Draft Final Report. Prepared for Energy Northwest, Richland, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 2005.
- Western EcoSystems Technology, Inc. (WEST). 2005c. Wildlife and Habitat Baseline Study for the Proposed Biglow Canyon Wind Power Project, Sherman County, Oregon. March 2004 - August 2005. Prepared for Orion Energy LLC., Oakland, California. WEST, Cheyenne, Wyoming. October, 2005.
- Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST, Cheyenne, Wyoming.
- Western EcoSystems Technology, Inc. (WEST) and the Colorado Plateau Research Station (CPRS). 2006. Avian Studies for the Proposed Sunshine Wind Park, Coconino County, Arizona. Prepared for Sunshine Arizona Wind Energy, LLC., Flagstaff, Arizona, by WEST, Cheyenne, Wyoming, and the CPRS. Ecological Monitoring and Assessment Program, Northern Arizona University, Flagstaff, Arizona. May 2006.

- Western EcoSystems Technology, Inc. (WEST). 2009. Wildlife Baseline Studies for the Antelope Ridge Wind Resource Area, Union County, Oregon. August 28, 2008 - August 12, 2009. Draft final report prepared for Horizon Wind Energy, Houston, Texas. Prepared by WEST, Cheyenne, Wyoming.
- Young, D.P., Jr., W. P. Erickson, K. Bay, and R. Good. 2002. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report, April 2001-April 2002. Prepared for Bonneville Power Administration, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. November 20, 2002. Available online at: [http://west-inc.com/reports/maiden\\_final\\_technical.pdf](http://west-inc.com/reports/maiden_final_technical.pdf)
- Young, D.P., Jr., W. P. Erickson, J. Jeffrey, K. Bay, R. E. Good, and E. G. Lack. 2003a. Avian and Sensitive Species Baseline Study Plan and Final Report. Eurus Combine Hills Turbine Ranch, Umatilla County, Oregon. Technical report prepared for Eurus Energy America Corporation, San Diego, California and Aeropower Services, Inc., Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 10, 2003.
- Young, D.P., Jr., W. P. Erickson, K. Bay, J. Jeffrey, E. G. Lack, and H. H. Sawyer. 2003b. Baseline Avian Studies for the Proposed Desert Claim Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Desert Claim Wind Power, LLC, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 2003.
- Young, D.P., Jr., W. P. Erickson, K. Bay, J. Jeffrey, E. G. Lack, R. E. Good, and H. H. Sawyer. 2003c. Baseline Avian Studies for the Proposed Hopkins Ridge Wind Project, Columbia County, Washington. Final Report: March 2002 - March 2003. Prepared for RES North America, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. April 30, 2003. Available online at: <http://wind.nrel.gov/public/library/young5.pdf>
- Young, D.P., Jr., V. K. Poulton, and K. Bay. 2007a. Ecological Baseline Studies Report. Proposed Dry Lake Wind Project, Navajo County, Arizona. Prepared for PPM Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 1, 2007. Available online at: [http://www.blm.gov/style/medialib/blm/az/pdfs/energy/dry-lake.Par.83529.File.dat/AppC-eco\\_baseline\\_study.pdf](http://www.blm.gov/style/medialib/blm/az/pdfs/energy/dry-lake.Par.83529.File.dat/AppC-eco_baseline_study.pdf)
- Young, D.P., Jr., G. D. Johnson, V. K. Poulton, and K. Bay. 2007b. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 31, 2007. Available online from: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentVersionID=41939>

**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.

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

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



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.

Type/Subtype/Species	Scientific Name	Winter			Spring			Fall			Summer			Total	
		# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs
<b>Waterbirds</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>30</b>	<b>5</b>	<b>37</b>				
American white pelican	<i>Pelecanus erythrorhynchos</i>	0	0	0	0	0	0	4	30	4	30				
double-crested cormorant	<i>Phalacrocorax auritus</i>	0	0	1	7	0	0	0	0	1	7				
<b>Waterfowl</b>		<b>0</b>	<b>0</b>	<b>31</b>	<b>1,343</b>	<b>7</b>	<b>208</b>	<b>5</b>	<b>9</b>	<b>43</b>	<b>1,560</b>				
wood duck	<i>Aix sponsa</i>	0	0	1	2	0	0	0	0	1	2				
northern pintail	<i>Anas acuta</i>	0	0	2	3	0	0	0	0	2	3				
northern shoveler	<i>Anas clypeata</i>	0	0	3	5	0	0	0	0	3	5				
blue-winged teal	<i>Anas discors</i>	0	0	2	20	0	0	0	0	2	20				
mallard	<i>Anas platyrhynchos</i>	0	0	7	11	0	0	5	9	12	20				
gadwall	<i>Anas strepera</i>	0	0	0	0	1	6	0	0	1	6				
greater white-fronted goose	<i>Anser albifrons</i>	0	0	4	650	0	0	0	0	4	650				
Canada goose	<i>Branta canadensis</i>	0	0	9	147	5	182	0	0	14	329				
snow goose	<i>Chen caerulescens</i>	0	0	3	505	0	0	0	0	3	505				
tundra swan	<i>Cygnus columbianus</i>	0	0	0	0	1	20	0	0	1	20				
<b>Shorebirds</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>6</b>	<b>6</b>	<b>12</b>				
upland sandpiper	<i>Bartramia longicauda</i>	0	0	0	0	0	0	1	1	1	1				
killdeer	<i>Charadrius vociferus</i>	0	0	0	0	0	0	3	5	3	5				
marbled godwit	<i>Limosa fedoa</i>	0	0	1	1	0	0	0	0	1	1				
Hudsonian godwit	<i>Limosa haemastica</i>	0	0	1	5	0	0	0	0	1	5				
<b>Gulls/Terns</b>		<b>0</b>	<b>0</b>	<b>9</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>25</b>	<b>17</b>	<b>80</b>				
ring-billed gull	<i>Larus delawarensis</i>	0	0	8	50	0	0	8	25	16	75				
Franklin's gull	<i>Leucophaeus pipixcan</i>	0	0	1	5	0	0	0	0	1	5				
<b>Diurnal Raptors</b>		<b>5</b>	<b>5</b>	<b>16</b>	<b>16</b>	<b>10</b>	<b>10</b>	<b>12</b>	<b>12</b>	<b>43</b>	<b>43</b>				
<b>Buteos</b>		<b>4</b>	<b>4</b>	<b>13</b>	<b>13</b>	<b>7</b>	<b>7</b>	<b>11</b>	<b>11</b>	<b>35</b>	<b>35</b>				
red-tailed hawk	<i>Buteo jamaicensis</i>	0	0	9	9	4	4	10	10	23	23				
rough-legged hawk	<i>Buteo lagopus</i>	4	4	3	3	1	1	0	0	8	8				
broad-winged hawk	<i>Buteo platypterus</i>	0	0	1	1	0	0	0	0	1	1				
Swainson's hawk	<i>Buteo swainsoni</i>	0	0	0	0	2	2	1	1	3	3				
<i>Northern Harrier</i>		1	1	2	2	3	3	1	1	7	7				
northern harrier	<i>Circus cyaneus</i>	1	1	2	2	3	3	1	1	7	7				
<i>Other Raptors</i>		0	0	1	1	0	0	0	0	1	1				
unidentified raptor	NA	0	0	1	1	0	0	0	0	1	1				

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.

Type/Subtype/Species	Scientific Name	Winter			Spring			Fall			Summer			Total	
		# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs
<b>Upland Game Birds</b>		<b>0</b>	<b>0</b>	<b>7</b>	<b>36</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>37</b>	
wild turkey	<i>Meleagris gallopavo</i>	0	0	4	31	0	0	0	0	0	0	0	4	31	
ring-necked pheasant	<i>Phasianus colchicus</i>	0	0	1	1	0	0	0	0	0	0	0	1	1	
sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	0	0	2	4	1	1	0	0	0	0	0	3	5	
<b>Doves/Pigeons</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	
mourning dove	<i>Zenaida macroura</i>	0	0	0	0	0	0	2	2	2	2	2	2	2	
<b>Large Corvids</b>		<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	
American crow	<i>Corvus brachyrhynchos</i>	1	1	0	0	0	0	0	0	0	0	0	1	1	
<b>Large Birds Overall</b>		<b>6</b>	<b>6</b>	<b>66</b>	<b>1,463</b>	<b>18</b>	<b>219</b>	<b>35</b>	<b>84</b>	<b>125</b>	<b>1,772</b>				

**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.**

Type/Species	Mean Use				Percent of Use				Frequency of Occurrence (%)			
	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer
<b>Passerines</b>	<b>3.37</b>	<b>3.79</b>	<b>4.31</b>	<b>2.48</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>98.1</b>	<b>9.3</b>	<b>64.3</b>	<b>23.0</b>	<b>81.0</b>
<i>Blackbirds/Orioles</i>	0	0.82	2.02	0.88	0	0	46.9	34.9	0	37.9	10.7	47.6
red-winged blackbird	0	0.18	1.94	0.29	0	0	45.1	11.3	0	8.0	2.8	14.3
bobolink	0	0.05	0	0.10	0	0	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	0	0	8.5	0	10.1	0	16.7
western meadowlark	0	0.30	0.06	0.24	0	0	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
<i>Creepers/Nuthatches</i>	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
<i>Finches/Crossbills</i>	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
<i>Flycatchers</i>	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
<i>Grassland/Sparrows</i>	<b>3.37</b>	<b>2.83</b>	<b>2.29</b>	<b>0.71</b>	<b>100</b>	<b>74.7</b>	<b>53.1</b>	<b>28.3</b>	<b>9.3</b>	<b>39.5</b>	<b>12.3</b>	<b>52.4</b>
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
<i>Swallows</i>	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.**

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

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.**

Type/Subtype/Species	Mean Use				Percent of Use				Frequency of Occurrence (%)			
	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer	Winter	Spring	Fall	Summer
<b>Waterbirds</b>	<b>0</b>	<b>0.08</b>	<b>0</b>	<b>0.71</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>35.7</b>	<b>0</b>	<b>1.2</b>	<b>0</b>	<b>7.1</b>
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	0.3	0	0	0	0	1.2	0	0
<b>Waterfowl</b>	<b>0</b>	<b>28.11</b>	<b>5.13</b>	<b>0.21</b>	<b>0</b>	<b>94.2</b>	<b>94.7</b>	<b>10.7</b>	<b>0</b>	<b>28.0</b>	<b>14.7</b>	<b>9.5</b>
wood duck	0	0.02	0	0	<0.1	0	0	0	0	1.2	0	0
northern pintail	0	0.04	0	0	0.1	0	0	0	0	2.4	0	0
northern shoveler	0	0.08	0	0	0.3	0	0	0	0	4.5	0	0
blue-winged teal	0	0.28	0	0	0.9	0	0	0	0	3.3	0	0
mallard	0	0.13	0	0.21	0.4	0	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 goose	0	9.16	0	0	30.7	0	0	0	0	7.0	0	0
Canada goose	0	3.79	4.51	0	12.7	83.3	0	0	0	10.5	9.9	0
snow goose	0	14.61	0	0	49.0	0	0	0	0	5.8	0	0
tundra swan	0	0	0.48	0	0	8.8	0	0	0	0	2.4	0
<b>Shorebirds</b>	<b>0</b>	<b>0.07</b>	<b>0</b>	<b>0.14</b>	<b>0</b>	<b>0.2</b>	<b>0</b>	<b>7.1</b>	<b>0</b>	<b>2.4</b>	<b>0</b>	<b>9.5</b>
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	0	0	0	7.1
marbled godwit	0	0.01	0	0	<0.1	0	0	0	0	1.2	0	0
Hudsonian godwit	0	0.06	0	0	0.2	0	0	0	0	1.2	0	0
<b>Gulls/Terns</b>	<b>0</b>	<b>0.82</b>	<b>0</b>	<b>0.60</b>	<b>0</b>	<b>2.7</b>	<b>0</b>	<b>29.8</b>	<b>0</b>	<b>11.0</b>	<b>0</b>	<b>11.9</b>
ring-billed gull	0	0.71	0	0.60	2.4	0	0	29.8	0	11.0	0	11.9
Franklin's gull	0	0.10	0	0	0.3	0	0	0	0	2.1	0	0
<b>Diurnal Raptors</b>	<b>0.06</b>	<b>0.21</b>	<b>0.26</b>	<b>0.29</b>	<b>64.1</b>	<b>0.7</b>	<b>4.8</b>	<b>14.3</b>	<b>3.6</b>	<b>16.7</b>	<b>15.5</b>	<b>26.2</b>
<i>Buteos</i>	<i>0.05</i>	<i>0.17</i>	<i>0.19</i>	<i>0.26</i>	<i>51.3</i>	<i>0.6</i>	<i>3.4</i>	<i>13.1</i>	<i>2.4</i>	<i>14.4</i>	<i>13.1</i>	<i>23.8</i>
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	<0.1	0	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
<i>Northern Harrier</i>	<i>0.01</i>	<i>0.02</i>	<i>0.08</i>	<i>0.02</i>	<i>12.8</i>	<i>&lt;0.1</i>	<i>1.4</i>	<i>1.2</i>	<i>1.2</i>	<i>2.5</i>	<i>5.2</i>	<i>2.4</i>
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
<i>Other Raptors</i>	<i>0</i>	<i>0.01</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>&lt;0.1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1.2</i>	<i>0</i>	<i>0</i>
unidentified raptor	0	0.01	0	0	<0.1	0	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.**

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

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.**

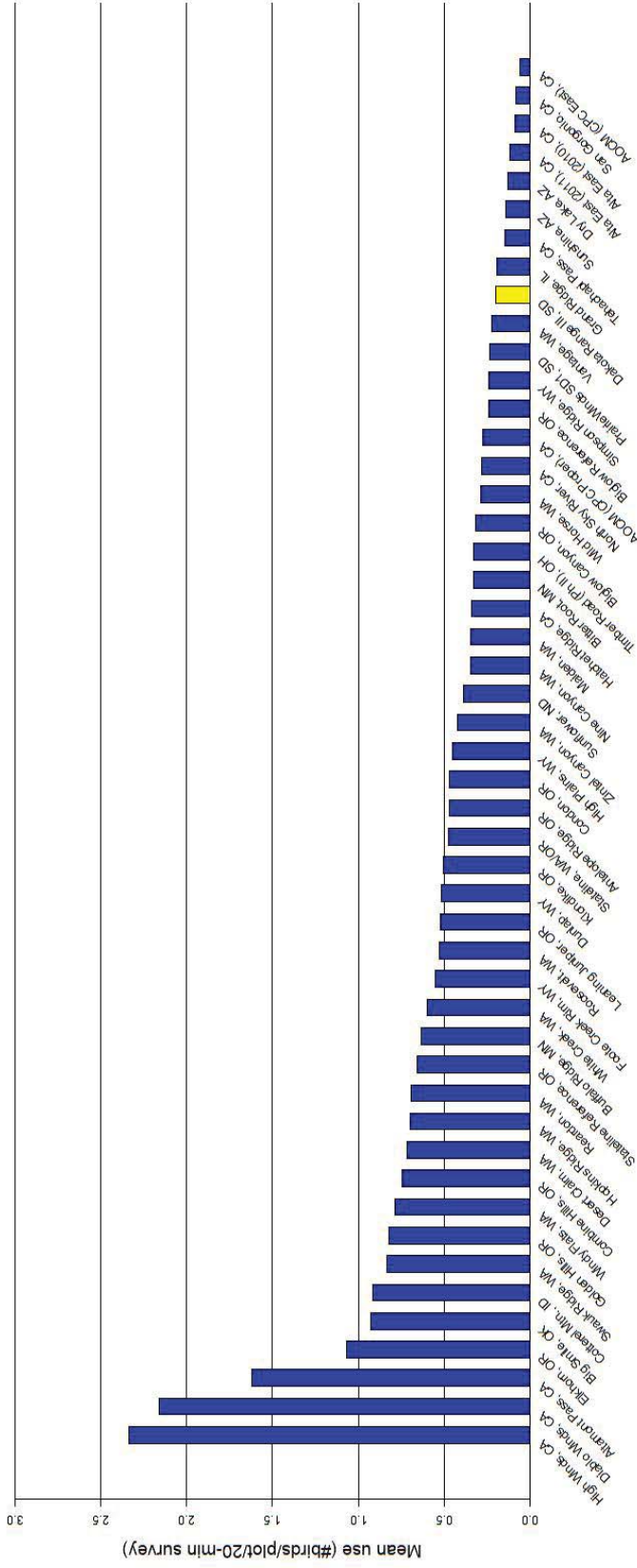


Appendix C. Mean use for large birds (number of observations/800-meter plot/20-minute survey) by survey point for major bird types and raptor subtypes observed during avian use surveys at the Dakota Range III Wind Project, Grant and Roberts counties, South Dakota, from January 1 – May 29, 2017 and September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

Type/Subtype	Survey Point													
	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
<i>Buteos</i>	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
<i>Northern Harrier</i>	0	0.11	0.11	0	0	0	0	0	0.08	0	0	0.17	0	0
<i>Other Raptors</i>	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
<b>Large Birds Overall</b>	<b>4.00</b>	<b>2.11</b>	<b>9.50</b>	<b>26.12</b>	<b>0.18</b>	<b>8.21</b>	<b>1.79</b>	<b>1.69</b>	<b>25.83</b>	<b>7.33</b>	<b>2.75</b>	<b>8.33</b>	<b>1.75</b>	<b>33.00</b>

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

Diurnal Raptors



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.**

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
<b>Dakota Range III</b>	<b>This Study</b>				
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
Cottrell Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003b	Simpson Ridge, WY	Johnson et al. 2000b
Swaak 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, OR	Young et al. 2003a	Sunflower, ND	Derby and Thorn 2014	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Desert Claim, WA	Young et al. 2003b	Zintel Canyon, WA	Erickson et al. 2002a, 2003a	Sunshine, AZ	WEST and the CFRS 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	Malden, 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
Buffalo Ridge, MN	Johnson et al. 2000a	Bitter Root, MN	Derby and Dahl 2009	San Geronio, CA	Anderson et al. 2000, Erickson et al. 2002b
White Creek, WA	NWC and WEST 2005	Timber Road (Phase II), OH	Good et al. 2010	AOCM (CPC East), CA	Erickson et al. 2002b 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.**

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total Number of Turbines	Total Megawatts	Use Reference	Fatality Reference
	0.20	NA	xx	NA	This Study	NA
Dakota Range III, SD (2017-2018)						
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	NA	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	NA	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.**

<b>Project Name</b>	<b>Raptor Use Estimate</b>	<b>Raptor Fatality Estimate</b>	<b>Total Number of Turbines</b>	<b>Total Megawatts</b>	<b>Use Reference</b>	<b>Fatality Reference</b>
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