Appendix L

2023-2024 Avian Use Report

Avian Use Study
Philip Wind Project
Haakon County, South Dakota

Final Report
April 3, 2023 – August 25, 2024

Prepared for:

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1 INTRODUCTION

Philip Wind Partners LLC (Philip Wind) is proposing development of the Philip Wind Project (Project) in Haakon County, South Dakota (Figure 1.1). To support development of the Project, Philip Wind contracted Western EcoSystems Technology, Inc. (WEST), to conduct a second-year pre-construction avian use study within the August 2022 Project Area (Figure 1.1). Study methodology was based upon the recommendations in the U.S. Fish and Wildlife Service's (USFWS) 2012 *Land-Based Wind Energy Guidelines* (WEG), Appendix C(1)(a) of the 2013 USFWS *Eagle Conservation Plan Guidance* (ECPG), and the South Dakota Game Fish and Parks (SDGFP) *Siting Guidelines for Wind Power Projects in South Dakota* (2012).

The objective of the study was to assess the temporal and spatial use of the Project Area by large birds, including eagles and species of concern (USFWS 2012). This report summarizes results from the second year (April 2023-August 2024; Year 2) of avian use surveys at the Project.

2 PROJECT AREA

The Project is located approximately 14 miles north of the city of Philip in Haakon County, South Dakota (Figure 1.1). The Project Area encompasses approximately 68,318 acres within two level IV ecoregions: the Sub-humid Pierre Shale Plains and the Rivers Breaks (U.S. Environmental Protection Agency [USEPA] 2012). These ecoregions, historically dominated by grasslands have been extensively converted for agricultural use (e.g., row crops and livestock grazing; USEPA 2013), and contain semi-permanent and seasonal wetlands, often referred to as prairie potholes. Topography within the Project Area is gently rolling to flat.

According to the National Land Cover Database (2021), the majority (51%) of the Project Area is herbaceous (Table 2.1, Figure .1). Other land covers in the Project Area include cultivated crops (43%) and hay/pasture (3%; Table 2.1, Figure .1).

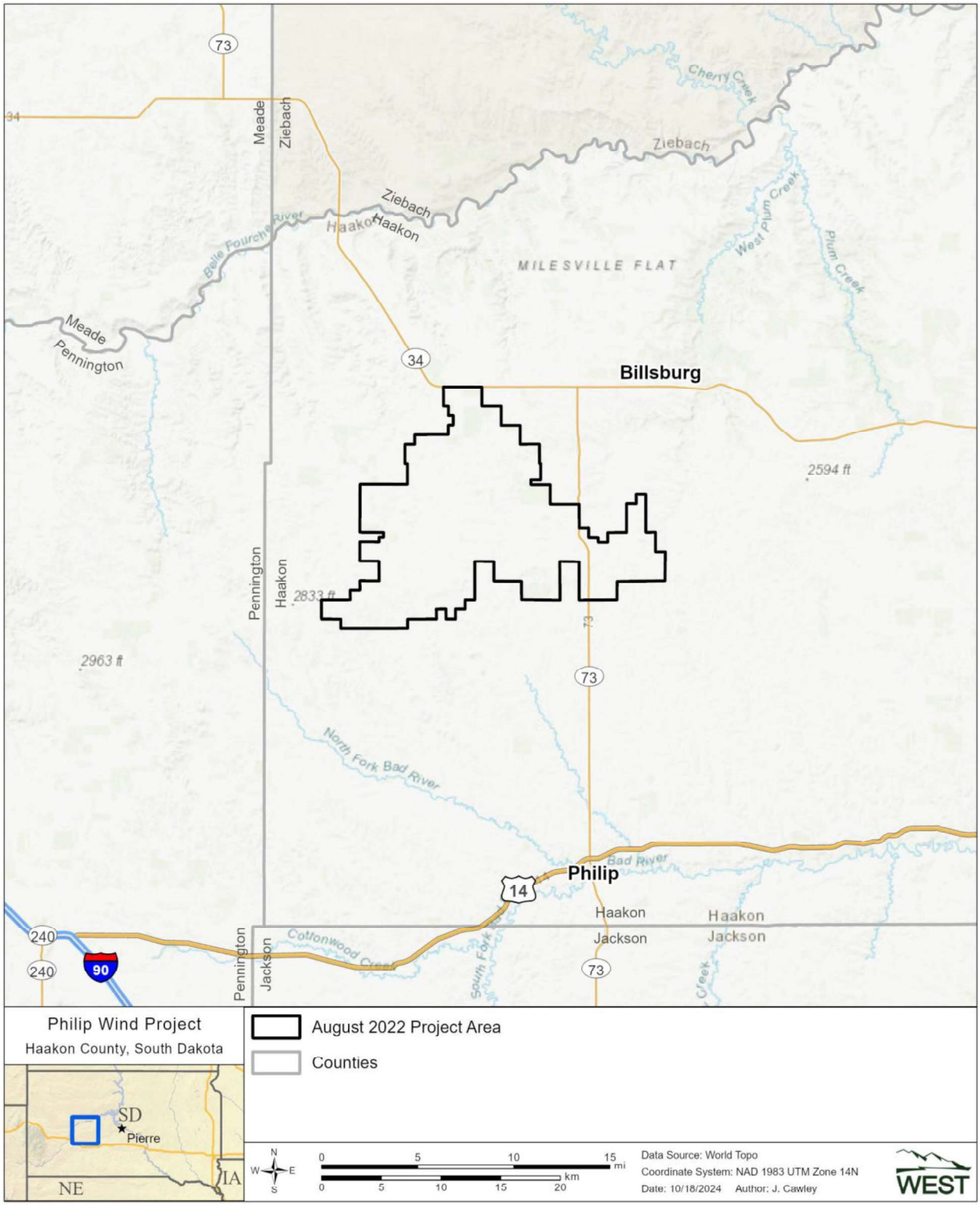

Figure 1.1. Location of the Philip Wind Project, Haakon County, South Dakota, 2024.

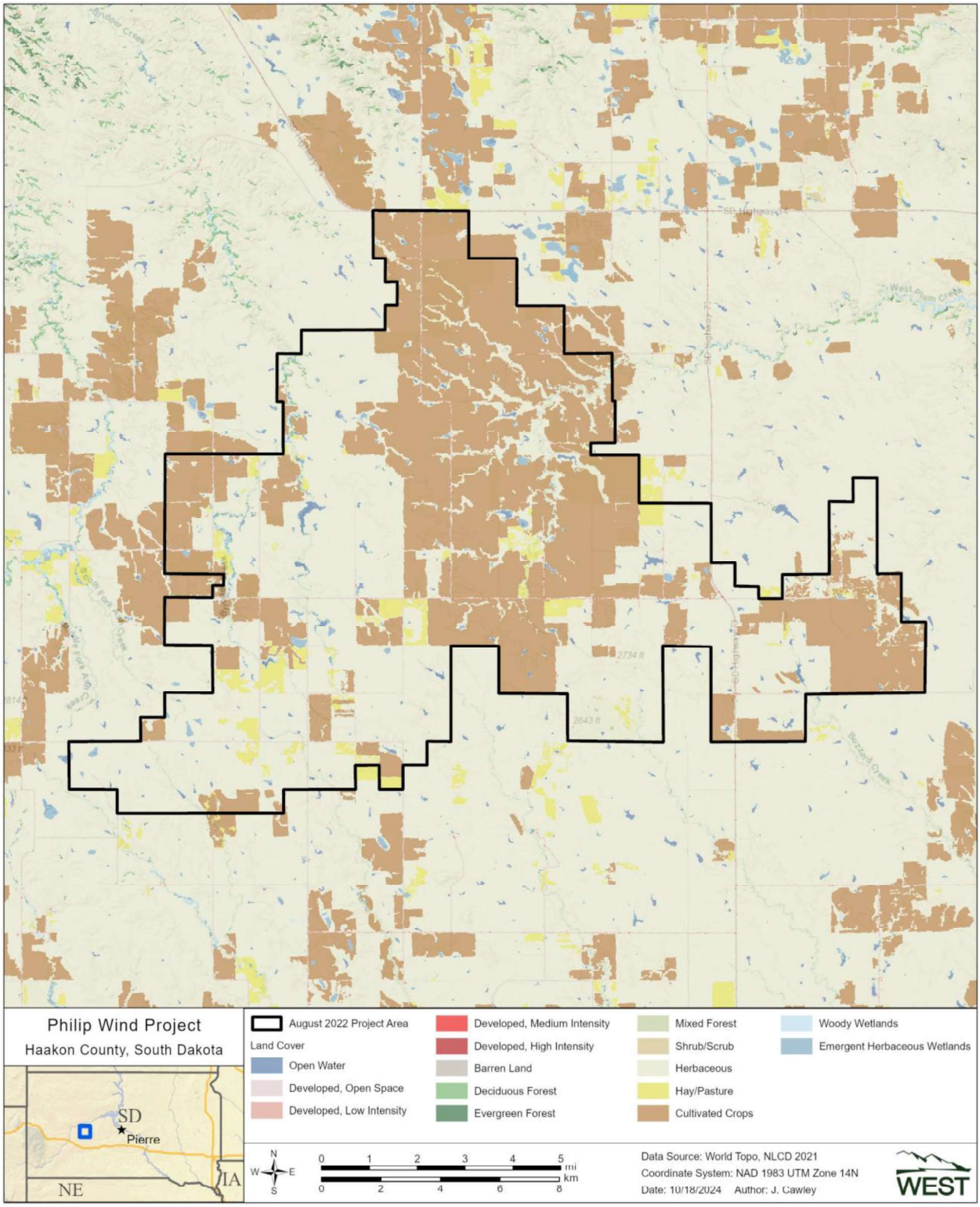

Figure 2.1. Land cover at the Philip Wind Project, Haakon County, South Dakota, 2024.

Table 2.1. Land cover, coverage, and percent (%) composition within the Philip Wind Project Area, Haakon County, South Dakota.

Cover Type	Acres	% Composition
Herbaceous	34,690	51
Cultivated Crops	29,477	43
Hay/Pasture	2,036	3
Developed, Open Space	708	1
Emergent Herbaceous Wetlands	597	1
Open Water	494	1
Developed, Low Intensity	148	<1
Woody Wetlands	69	<1
Deciduous Forest	54	<1
Developed, Medium Intensity	23	<1
Shrub/Scrub	14	<1
Barren Land	4	<1
Developed, High Intensity	1	<1
Mixed Forest	<1	<1
Total[a]	**68,318**	**100**

[a.] Sums of values may not add to total value shown, due to rounding.

Source: National Land Cover Database 2021

3 METHODS

Methods in Year 2 followed those used in Year 1. Surveys for large birds (including eagles) were conducted at 50 randomly selected points that collectively provided 33% coverage of the Project Area based on 800-meter (m) survey radii at each point (ECPG; Figure .1).

Initially 38 points were surveyed starting in January 2022 with an additional seven survey points added in May 2022, and five additional survey points added in September 2022 totaling 50 survey points (Figure 3.1). This resulted in a staggered approach to surveys for the initial 38 points ending in December 2023 followed by the additional seven points ending in April 2024, and finally the last five points ending in August 2024. Surveys continued for a total of 24 consecutive months at each survey point following the ECPG. Year 2 surveys were conducted once per month from April 3, 2023 – August 25, 2024. Seasons followed the first year and were defined as spring (March 1 – May 30), summer (May 31 – August 31), fall (September 1 – November 30), and winter (December 1 – February 29). Surveys were conducted during daylight hours as specified in the ECPG and survey times at survey points were randomized to cover all daylight hours during a season. Surveys were conducted under all weather conditions except when visibility was less than 800 m horizontally and 220 m vertically or when access to survey locations was inaccessible due to road conditions or safety concerns.

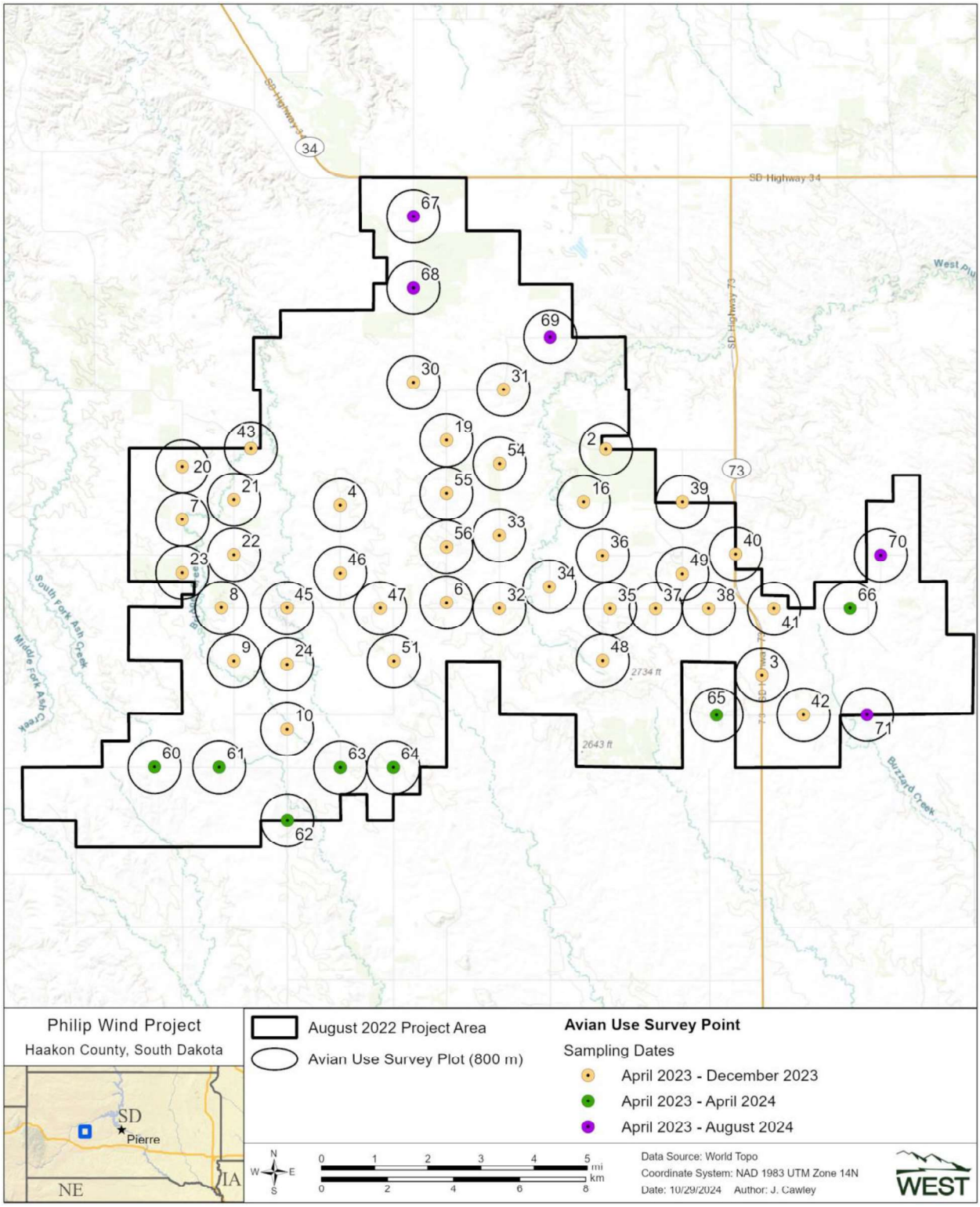

Figure 3.1. Avian use survey points and plots at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Species of concern in this report are defined per the WEG as any species that 1) is either a) listed as an endangered, threatened or candidate species under the Endangered Species Act, subject to the Migratory Bird Treaty Act of 1918 or Bald and Golden Eagle Protection Act of 1940 (BGEPA); b) is designated by law, regulation, or other formal process for protection and/or management by the relevant agency or other authority; or c) has been shown to be significantly adversely affected by wind energy development, and 2) is determined to be possibly affected by the Project (USFWS 2012). These species include both species of eagles, USFWS Birds of Conservation Concern (BCC), and SDGFP Species of Greatest Conservation Concern (SGCN).

Biologists recorded the following information for each survey: date, observer, start and end time, and weather (i.e., temperature, wind speed, wind direction, precipitation, maximum visibility, and percent cloud cover). Additionally, the following data were recorded for each bird or group of birds observed:

- Observation number
- Species (or best possible identification)
- Number of individuals
- Sex and age class (if possible)
- Distance from survey plot center to the nearest 5-m interval (first & closest)
- Flight height above ground level (AGL) to the nearest 5-m interval (first, lowest, and highest)
- Flight direction (first observed)
- Activity (e.g., flying, perched)
- Observation type (visual or aural)

3.1 Large Birds

Large birds are defined as waterbirds, loons/grebes, waterfowl, shorebirds, gulls/terns, diurnal raptors (i.e., kites, accipiters, buteos, eagles, falcons, northern harrier, and osprey [*Pandion haliaetus*]), owls, vultures, upland game birds, doves/pigeons, nightjar, and large corvids. Large birds, including eagles, were recorded for 60 minutes (min) within an 800-m survey plot (Figure .1). Large bird species of concern were also recorded as incidental observations (see Sections 3.2.5 and 4.2).

3.1.1 Eagles

Data were collected based on the recommendations in the ECPG if a golden eagle or bald eagle or unidentified eagle was observed during the large bird survey period. In addition to recording data on each bird group observed in Section 0, biologists recorded eagle behavior (i.e., flight height, distance from observer, activity) at the top of each minute an eagle was in view. Biologists also recorded an eagle minute, defined as an eagle flying below 220 m AGL (25 m above the maximum blade tip height) and within the 800-m survey plot at any time during each individual minute following recommendations in the ECPG. Total bald and golden eagle minutes were the

sum of each individual eagle minute defined above, separated by species. Flight paths and perch locations of eagles were also recorded.

3.2 Statistical Analysis

A *survey* was defined as a single 60-min count for large birds. In some cases, a count of bird observations may represent repeated observations of the same individual. Only observations within the survey plot were included in analysis.

A *visit* was defined as one sequential survey of all survey plots once within the Project Area and could occur across multiple dates but completed in a single season. Subsequent visits did not overlap, and each full visit was completed within a single season (e.g., spring). If unforeseen conditions prevented all plots from being surveyed during a visit, then a visit may not include a complete survey of all plots.

An *observation* was defined as a unique sighting or call of a single bird from within or as it enters the survey plot; if the bird exits and re-enters the survey plot, and the biologist is not able to maintain line of sight, it will be recorded as another observation; each unique sighting or call of a single bird will be counted as a single observation (i.e., a group of four birds will be considered one group and four observations). The biologist used their judgment to assess whether repeated calls likely from a single or multiple birds. Only observations within the 800-m survey plot were included for statistical analysis for large bird surveys.

A *group* is a unique sighting or call of one or more single birds observed together. Each observation was reported as one group. Any group of two or more individuals observed together was reported as one group.

Species composition was defined as a list of species observed within the survey plots. The total number of observations by species (grouped by bird type), by season and overall was summarized across all visits. In addition, *species richness*, the total number of unique species observed within the 800- m survey plot during avian use surveys was summarized by season and overall.

3.2.1 Mean Use

Mean use was the average number of large bird observations/60-min survey/800-m survey plot. Mean use was calculated by 1) summing bird observations within the survey plot (regardless of flight height) per survey per visit, 2) averaging the number of bird observations over surveys within a visit, and 3) averaging the number of bird observations across visits within a season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season.

The top six bird groups were depicted graphically to show the dominant patterns in mean use. All other species groups were classified as “Other.”

3.2.2 Flight Height

Flight heights are important metrics to assess relative potential exposure to turbine blades and were used to calculate the percentage of large birds (including eagles) observed flying within the rotor-swept area (RSA) of proposed turbines. A RSA of 30–195 m AGL was assumed for the purpose of the analysis. Flight height recorded during the initial observation was used to calculate the percentage of birds flying within the RSA and mean flight height.

3.2.3 Spatial Variation

Mean use was calculated for large birds and eagles to make spatial comparisons among the survey points. Additionally, flight paths and perched locations of eagles were mapped during large bird use surveys to qualitatively look for potential areas of concentration and consistent flight patterns within the Project Area compared to Project Area characteristics (e.g., land cover types, topographic features).

3.2.4 Eagles

Eagle observations during surveys were mapped to depict flight path density (number of flight paths within the 800-m survey plot). Only eagle observations within the 800-m survey plot were included in the total eagle observations.

Eagle minutes, defined as the total bald and golden eagle flight minutes (separated by species) within an 800-m circular plot to 220 m in height, were summarized by survey point, month, overall, and by survey hour. The summary information on eagle minutes allowed for examination of spatial and temporal patterns of eagle minutes in the Project Area. Data collected on perched eagles and those outside of survey plots were not considered eagle minutes. The perch locations and flight paths of all eagles were mapped to qualitatively assess areas of eagle use within the Project Area.

3.2.5 Incidental Observations

Incidental observations were recorded throughout the Project Area. These included all observations of species of concern made outside of the 800-m survey plot during surveys (i.e., beyond 800 m) and all observations of species of concern made between survey plots.

3.3 Data Management

3.3.1 Quality Assurance and Quality Control

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the study, including in the field, during data entry and analysis, and report writing. Following surveys, biologists were responsible for inspecting data forms for completeness, accuracy, and legibility. If errors or anomalies were found within the data, follow-up measures were implemented including discussions and review of field data with field technicians and/or Project Managers. If any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data forms where appropriate changes and measures were implemented, no matter what stage of analysis. Multiple reviews were conducted as QA/QC measures.

3.3.2 Data Compilation and Storage

A Microsoft® SQL Server database was specifically developed to store, organize, and retrieve survey data. Project data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. WEST retained all data forms and electronic data files for reference.

4 RESULTS

Overall, 514 avian use surveys were conducted over 17 visits for large birds within the Project Area (Table 4.1). Four surveys were not able to be completed due to inaccessible locations primarily during the winter months (Table 4.1). Fifty-two species of large birds were observed during surveys. Species observed incidentally were also recorded during surveys. Study results are summarized below, supplemented by appendices, which present species-level detail on the following: scientific names and numbers of groups and observations seen during surveys (Appendix A), mean use by season (Appendix B), and mean use by survey point (Appendix C), eagle minutes per survey hour by survey point (Appendix D).

Table 4.1. Summary of survey effort and species richness by season for large birds at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Season[a]	# Visits[b]	# Surveys[c]	Species Richness[d]
Spring	5	128 (1)	44
Summer	6	165 (0)	31
Fall	3	150 (0)	32
Winter	3	71 (3)	13
Overall	**17**	**514 (4)**	**52**

a. Season dates: Spring (March 1 – May 30), Summer (May 31 – August 31), Fall (September 1 – November 30), and Winter (December 1 – February 29).

b. A visit was defined as surveying all survey plots once within the Project Area and could occur across multiple dates but had to be completed in a single season.

c. A survey was defined as a single 60-minute count of large birds. Numbers in parentheses are the total number of inaccessible surveys during each season.

d. Species richness: The total number of unique species observed within the survey plot during avian use surveys.

4.1 Large Birds

The number of visits varied due to the 17-month survey effort, ranging from three visits during the winter and fall months to six visits during the summer months. Large bird species richness was highest during spring (44 species) followed by fall (32), summer (31), and winter (13).

4.1.1 Mean Use

Mean use was calculated by season for large bird types and species (Figure 4.1; Appendix B). Large bird mean use (observations/60-min survey/800-m survey plot) ranged from 5.25 to 16.50 among seasons and was highest during winter (16.50) followed by spring (10.02), fall (8.31), and summer (5.25). Overall large bird mean use was 9.99 observations/60-min survey/800-m survey plot for the 17-month study (Appendix B). The species group with the highest mean use was

waterfowl (5.71) followed by doves/pigeons (1.53), upland game birds (0.77), diurnal raptors (0.73), shorebirds (0.64), and waterbirds (0.32; Figure 4.1).

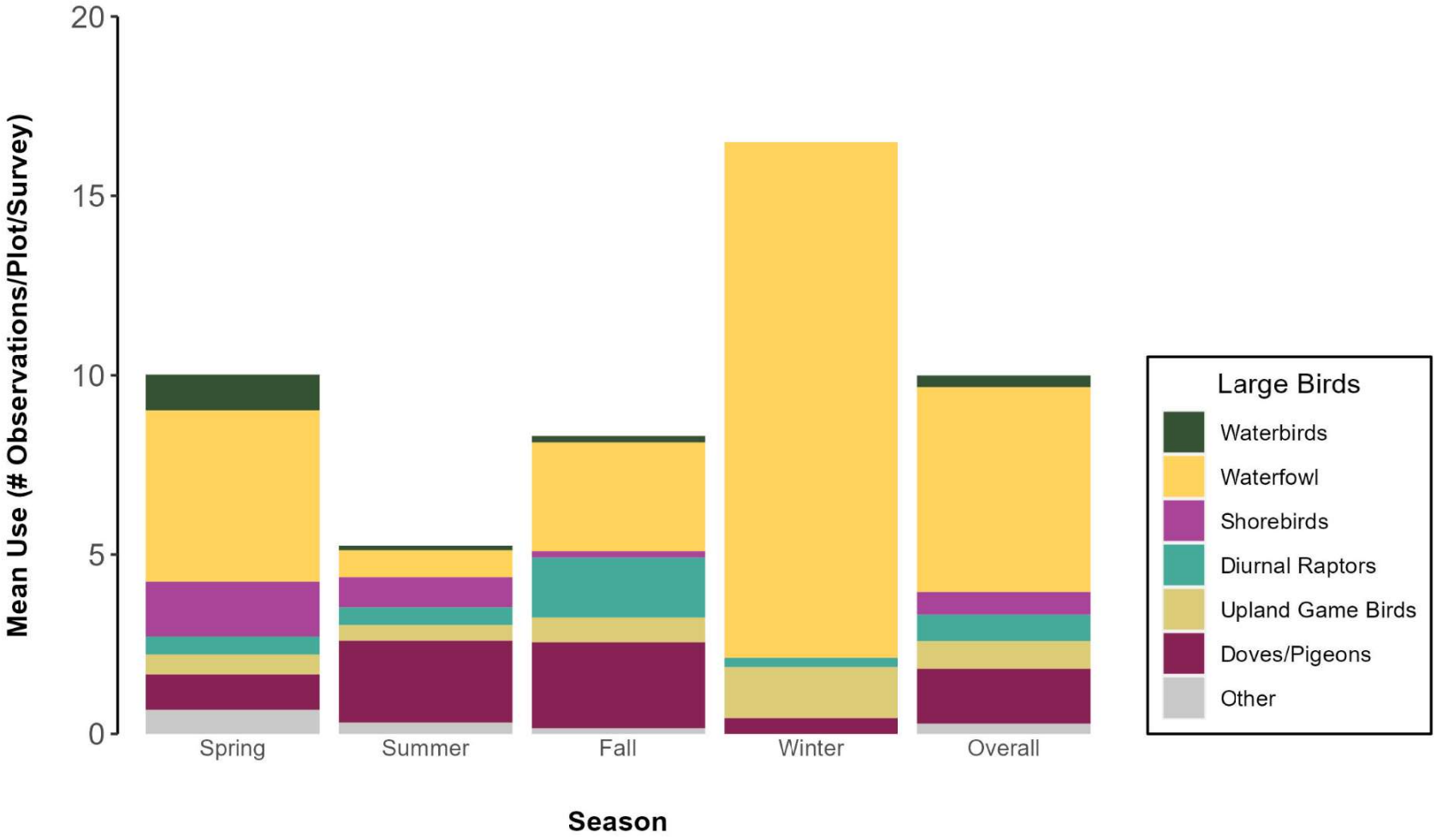

Figure 4.1. Large bird mean use (observations/60-minute survey/800-meter survey plot) by season and bird type at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

4.1.2 Flight Height

Large bird mean flight heights ranged from approximately 4 m for upland gamebirds to 148 m for accipiters (Table 4.24.2). Large birds were mainly observed below the RSA (56.8%), although there was variation by bird type. Doves/pigeons (91.7%), large corvids (98.0%), nightjars (57.7%), shorebirds (91.5%), and upland game birds (100%) were mainly observed below the RSA. Diurnal raptors (47.4%), vultures (67.2%), waterbirds (90.7), and waterfowl (54.9%) were most frequently recorded within the RSA (Table 4.2).

Table 4.2. Flight height characteristics by large bird type and raptor subtype during 60-minute use surveys[a] in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	# Groups Flying	# Obs Flying	% Obs Flying	Mean Flight Height (m)[b]	% within Flight Height Categories		
					<30 m	30–195 m[c]	>195 m
Diurnal Raptors	**277**	**378**	**83.1**	**51**	**46.0**	**47.4**	**6.6**
Accipiters	*5*	*6*	*100*	*148*	*16.7*	*66.7*	*16.7*
Buteos	*125*	*217*	*78.6*	*74*	*25.3*	*66.4*	*8.3*
Eagles	*30*	*30*	*90.9*	*70*	*40.0*	*46.7*	*13.3*
Falcons	*35*	*39*	*78.0*	*35*	*69.2*	*28.2*	*2.6*
Northern Harrier	*82*	*86*	*95.6*	*11*	*91.9*	*7.0*	*1.2*
Doves/Pigeons	**157**	**783**	**78.1**	**6**	**91.7**	**8.3**	**0**
Gulls/Terns	**0**	**0**	**0**	**NA**	**NA**	**NA**	**NA**
Large Corvids	**6**	**147**	**99.3**	**20**	**98.0**	**2.0**	**0**
Loons/Grebes	**0**	**0**	**0**	**NA**	**NA**	**NA**	**NA**
Nightjars	**16**	**26**	**86.7**	**27**	**57.7**	**42.3**	**0**
Owls	**0**	**0**	**0**	**NA**	**NA**	**NA**	**NA**
Rails/Coots	**0**	**0**	**0**	**NA**	**NA**	**NA**	**NA**
Shorebirds	**123**	**211**	**61.0**	**14**	**91.5**	**8.5**	**0**
Upland Game Birds	**41**	**204**	**54.3**	**4**	**100**	**0**	**0**
Vultures	**49**	**67**	**91.8**	**77**	**25.4**	**67.2**	**7.5**
Waterbirds	**14**	**237**	**77.7**	**79**	**8.9**	**90.7**	**0.4**
Waterfowl	**133**	**1,226**	**61.0**	**29**	**30.8**	**54.9**	**14.3**
Large Birds Overall	**816**	**3,279**	**69.0**	**32**	**56.8**	**36.9**	**6.3**

[a.] 800-meter (m) radius survey plot for large birds.

[b.] Mean flight height above ground level.

[c.] The assumed rotor-swept area of 30 to 195 m above ground level.

Zeroes and NA values throughout a row indicate that the species was observed but was not flying.

obs = observations.

4.1.3 Spatial Variation

4.1.3.1 Mean Use by Point

Large bird use ranged from 1.89 observations/60-minute survey/800-m survey plot to 36.22 across points (Figure 4.2). The highest use values were from dove/pigeons at Point 19 (33.89), followed by waterfowl at Point 34 (22.89), Point 63 (25.38), Point 37 (18.44), and Point 71 (16.43; Figure 4.2; Appendix C).

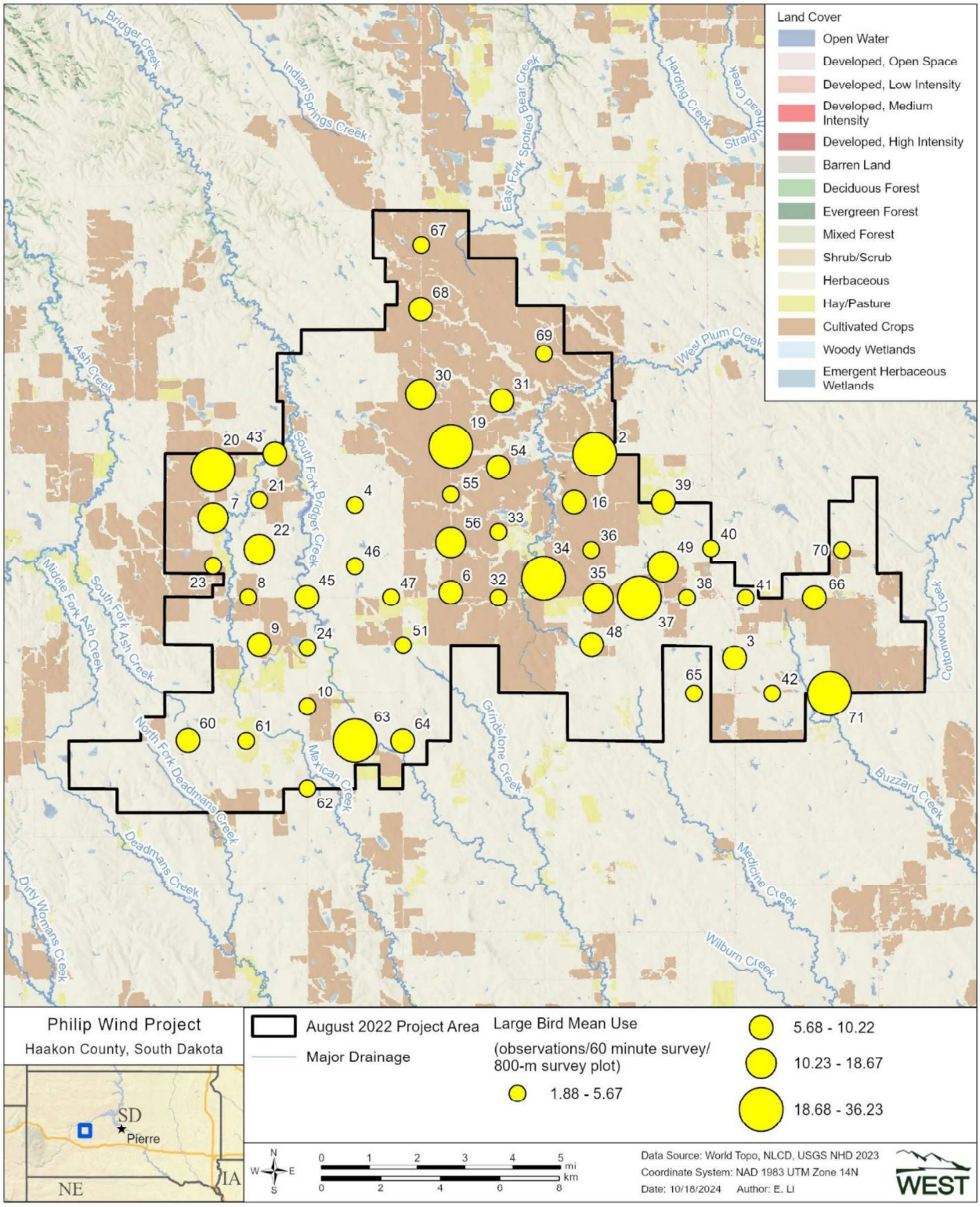

Figure 4.2. Large bird mean use (observations/60-minute survey/800-meter survey plot) by point at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

4.1.4 Species of Concern

No federal- or state-endangered or threatened species were recorded within the Project Area. Eleven species of concern observed during the study included three species designated as USFWS BCC (2021), five species designated as South Dakota SGCN (SDGFP 2023, 2024), one species designated as both BCC and SGCN, and two species protected under the BGEPA and SGCN (Table 4.3).

Table 4.3. Groups and observations of species of concern observed during surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Species	Scientific Name	Status[a]	Surveys	
			# grps	# obs
American white pelican	*Pelecanus erythrorhynchos*	SGCN	6	64
Bald eagle	*Haliaeetus leucocephalus*	BGEPA; SGCN	18	18
Ferruginous hawk	*Buteo regalis*	SGCN	15	15
Golden eagle	*Aquila chrysaetos*	BGEPA; SGCN	15	15
Greater prairie-chicken	*Tympanuchus cupido*	SGCN	6	46
Long-billed curlew	*Numenius americanus*	SGCN	23	29
Marbled godwit	*Limosa fedoa*	BCC; SGCN	22	30
Northern harrier	*Circus hudsonius*	BCC	86	90
Prairie falcon	*Falco mexicanus*	BCC	15	16
Western grebe	*Aechmophorus occidentalis*	BCC	1	1
Wilson's phalarope	*Phalaropus tricolor*	SGCN	2	3
Total	**11 species**		**209**	**327**

[a] SGCN = South Dakota Species of Greatest Conservation Need; BCC = U.S. Fish and Wildlife Service Birds of Conservation Concern (Bird Conservation Region 17); BGEPA = Bald and Golden Eagle Protection Act.

grps = groups; obs = observations.

4.1.4.1 Eagles

4.1.4.1.1 Mean Use

Bald eagle mean use ranged from 0.01 observations/60-min survey/800-m survey plot to 0.07 among seasons and was highest during fall (0.07) followed by winter (0.05), spring (0.01), and summer (0.01; Appendix B). Overall bald eagle mean use was 0.03 observations/60-min survey/800-m survey plot.

Golden eagle mean use ranged from 0.01 observations/60-min survey/800-m survey plot to 0.05 among seasons and was highest during winter (0.05) followed by spring (0.02) and fall (0.02), and summer (0.01; Appendix B). Overall golden eagle mean use was 0.02 observations/60-min survey/800-m survey plot.

4.1.4.1.2 Eagle Minutes

Forty-two bald eagle minutes from 16 bald eagle observations were recorded during 514 survey hours (Table 4.4a) following the ECPG. Across months, bald eagle minutes per survey hour were recorded during 6 of 17 months and ranged from 0.08 during July 2023 and December 2023, to 0.32 during September 2023 (Table 4.4a). Bald eagle minutes per survey hour were highest at survey Point 54 (Figure 4.3a; Appendix D).

There were 87 golden eagle minutes from 13 golden eagle observations recorded during 514 survey hours (Table 4.4b) following the ECPG. Across months, golden eagle minutes per survey hour were recorded during 9 of 17 months and ranged from 0.10 during November and December 2023, to 0.46

during May 2023 (Table 4.4b). Golden eagle minutes per survey hour were highest at survey Point 60 (Figure 4.3b; Appendix D).

Table 4.4a. Bald eagle minutes and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Month/Year	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
April 2023	5	2	2	50	0.10
May 2023	0	0	0	50	0
June 2023	0	0	0	50	0
July 2023	4	2	2	50	0.08
August 2023	0	0	1	50	0
September 2023	16	5	6	50	0.32
October 2023	0	0	0	50	0
November 2023	12	4	4	50	0.24
December 2023	4	2	2	50	0.08
January 2024	1	1	1	10	0.10
February 2024	0	0	0	11	0
March 2024	0	0	0	12	0
April 2024	0	0	0	11	0
May 2024	0	0	0	5	0
June 2024	0	0	0	5	0
July 2024	0	0	0	5	0
August 2024	0	0	0	5	0
Total	**42**	**16**	**18**	**514**	**0.08**

a. Minutes within 800-meter (m) radius survey plot and 220 m above ground level.

b. Total = observations within 800-m radius survey plot, regardless of flight height, and regardless of activity (including perched birds).

Table 4.4b. Golden eagle minutes and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Month/Year	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
April 2023	11	3	3	50	0.22
May 2023	23	2	2	50	0.46
June 2023	13	1	1	50	0.26
July 2023	6	1	1	50	0.12
August 2023	8	1	2	50	0.16
September 2023	14	1	1	50	0.28
October 2023	0	0	0	50	0
November 2023	5	2	2	50	0.10
December 2023	5	1	2	50	0.10
January 2024	2	1	1	10	0.20
February 2024	0	0	0	11	0
March 2024	0	0	0	12	0
April 2024	0	0	0	11	0
May 2024	0	0	0	5	0
June 2024	0	0	0	5	0
July 2024	0	0	0	5	0
August 2024	0	0	0	5	0
Total	**87**	**13**	**15**	**514**	**0.17**

a. Minutes within 800-meter (m) survey radius and 220 m above ground level.

b. Total = observations within 800-m survey radius, regardless of flight height, and regardless of activity (including perched birds).

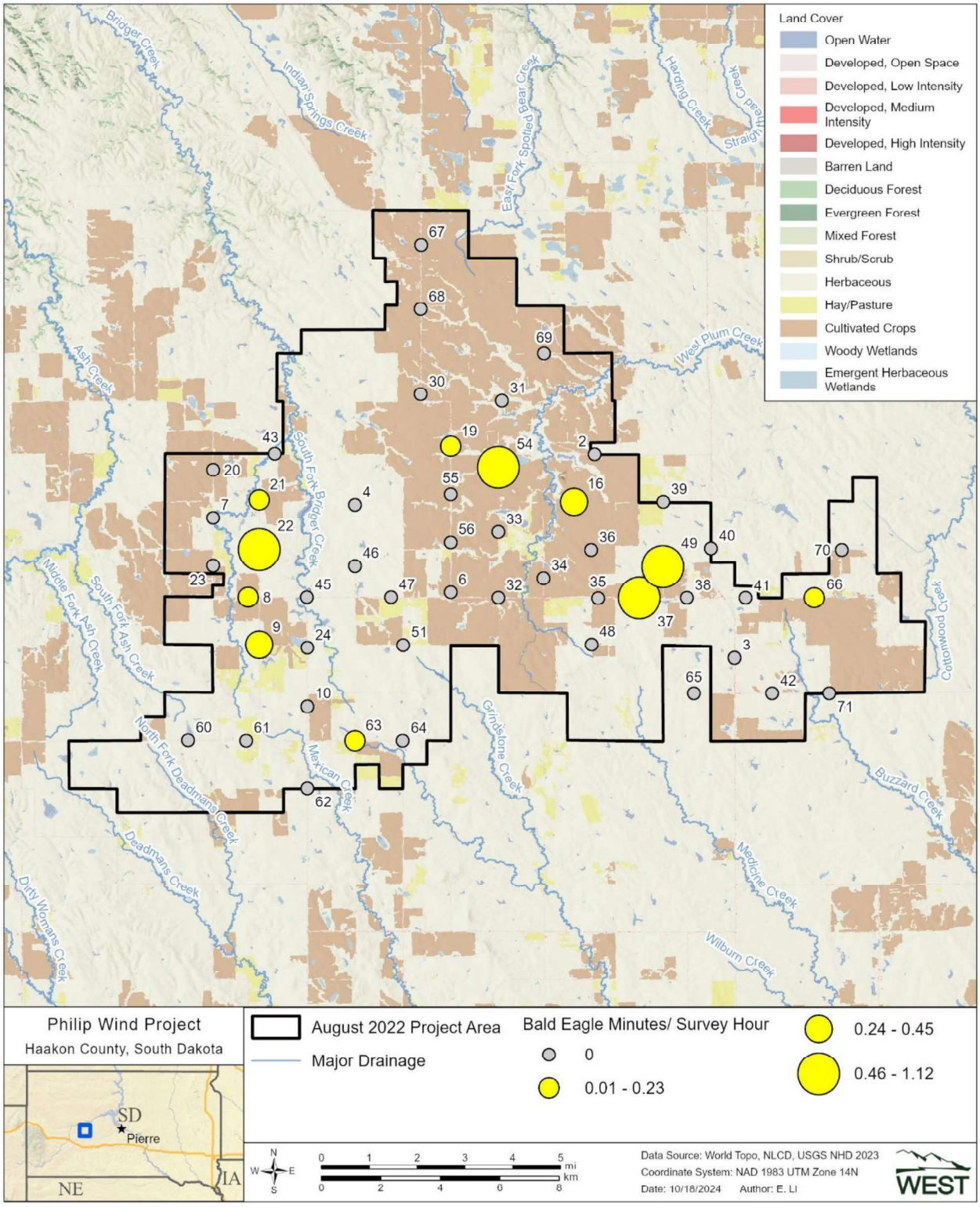

Figure 4.3a. Bald eagle minutes per survey hour at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

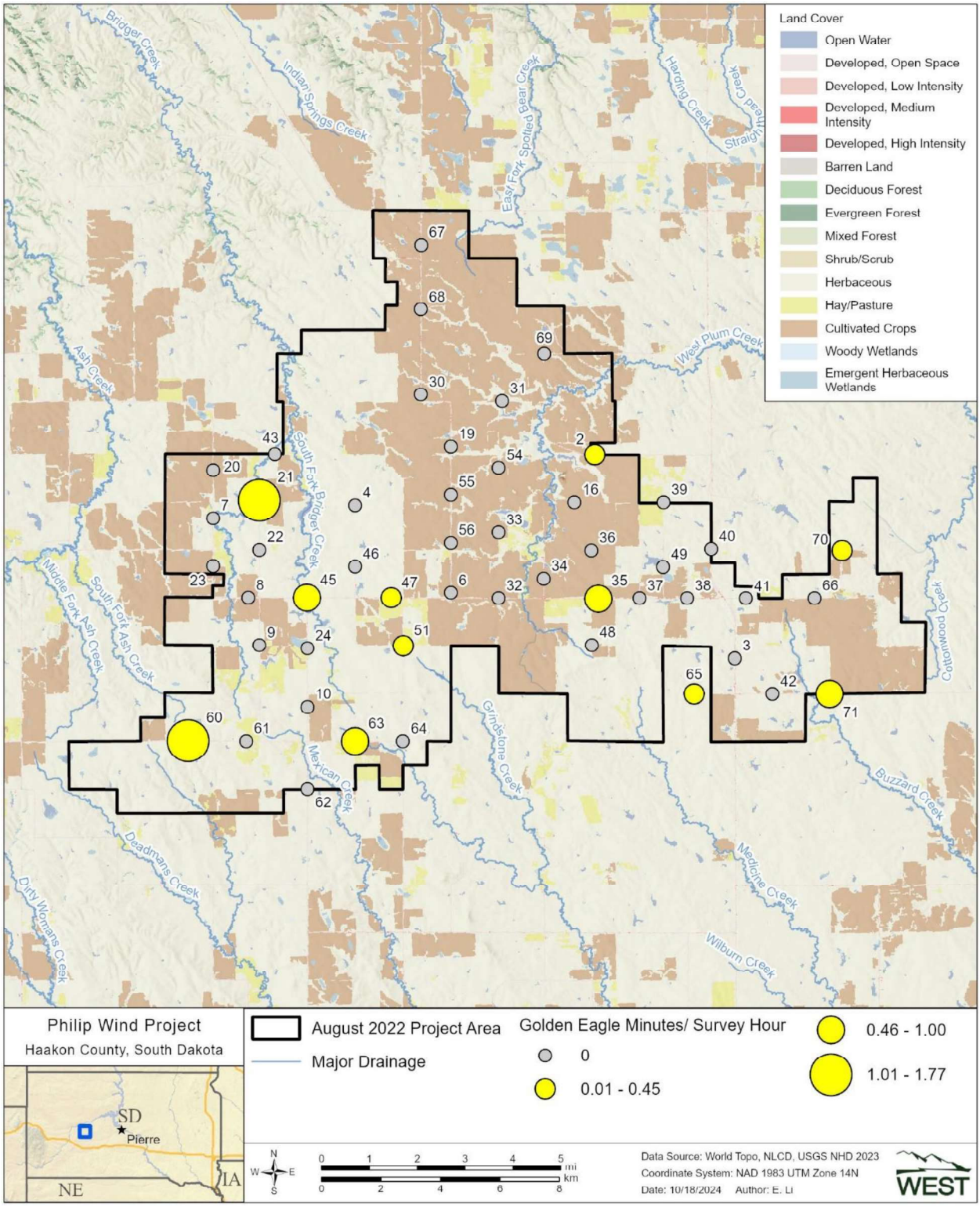

Figure 4.3b. Golden eagle minutes per survey hour at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

4.1.4.1.3 Eagle Flight Height

Eagle flights were recorded most frequently (46.7%) within the RSA (30–195 m) with fewer flights below (40.0%) and above (13.3%) the RSA (Table 4.5).

Table 4.5. Flight height characteristics by eagle species during 60-minute use surveys[a] in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Eagle Species	# Groups Flying	# Obs Flying	% Obs Flying	Mean Flight Height (m)[b]	% within Flight Height Categories		
					<30 m	30–195 m[c]	>195 m
Bald eagle	16	16	88.9	61.9	50	37.5	12.5
Golden eagle	14	14	93.3	79.0	28.6	57.1	14.3
Eagles Overall	**30**	**30**	**90.9**	**70**	**40.0**	**46.7**	**13.3**

[a.] 800-meter (m) radius survey plot for eagles.

[b.] Mean flight height above ground level.

[c.] The assumed rotor-swept area of 30 to 195 m above ground level.

obs = observations.

4.1.4.1.4 Spatial Variation

Eagle Minutes per Survey Hour by Point

Bald and golden eagle minutes per survey hour by point were described in Section 4.1.4.1.2 *Eagle Minutes* and were depicted in Figure 4.3a and 4.3b. Bald eagles occurred at 11 points, with the highest activity (1.11 eagle minutes/survey hour) at Point 54 (Figure 4.3a; Appendix D). Golden eagles occurred at 11 points, with the highest activity (1.77 eagle minutes/survey hour) at Point 60 (Figure 4.3b; Appendix D).

Flight Paths

All bald and golden eagle flight paths were mapped when they intersected survey plots (Figure 4.4a and 4.4b). Points 60 and 71 had the highest number of golden eagle flight paths recorded (two; Figure 4.4b). For bald eagles, Point 37 and Point 49 had the highest number of flight paths recorded (three), followed by Point 54 (two; Figure 4.4a). Bald and golden eagle flight paths were recorded throughout the Project Area with no discernable area of concentration.

4.2 Incidental Observations

All avian species observed incidentally were also observed during standardized surveys. Incidental observations of species of concern are summarized in Table 4.6.

Table 4.6. Species of concern observed incidentally at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Taxon/Species	Scientific Name	# grps	# obs
Bald eagle[a]	*Haliaeetus leucocephalus*	15	15
Golden eagle[a]	*Aquila chrysaetos*	22	22
Unidentified eagle	–	1	1
Total	**2 species**	**38**	**38**

[a.] Species protected under the Bald and Golden Eagle Protection Act of 1940.

grps = groups; obs = observations.

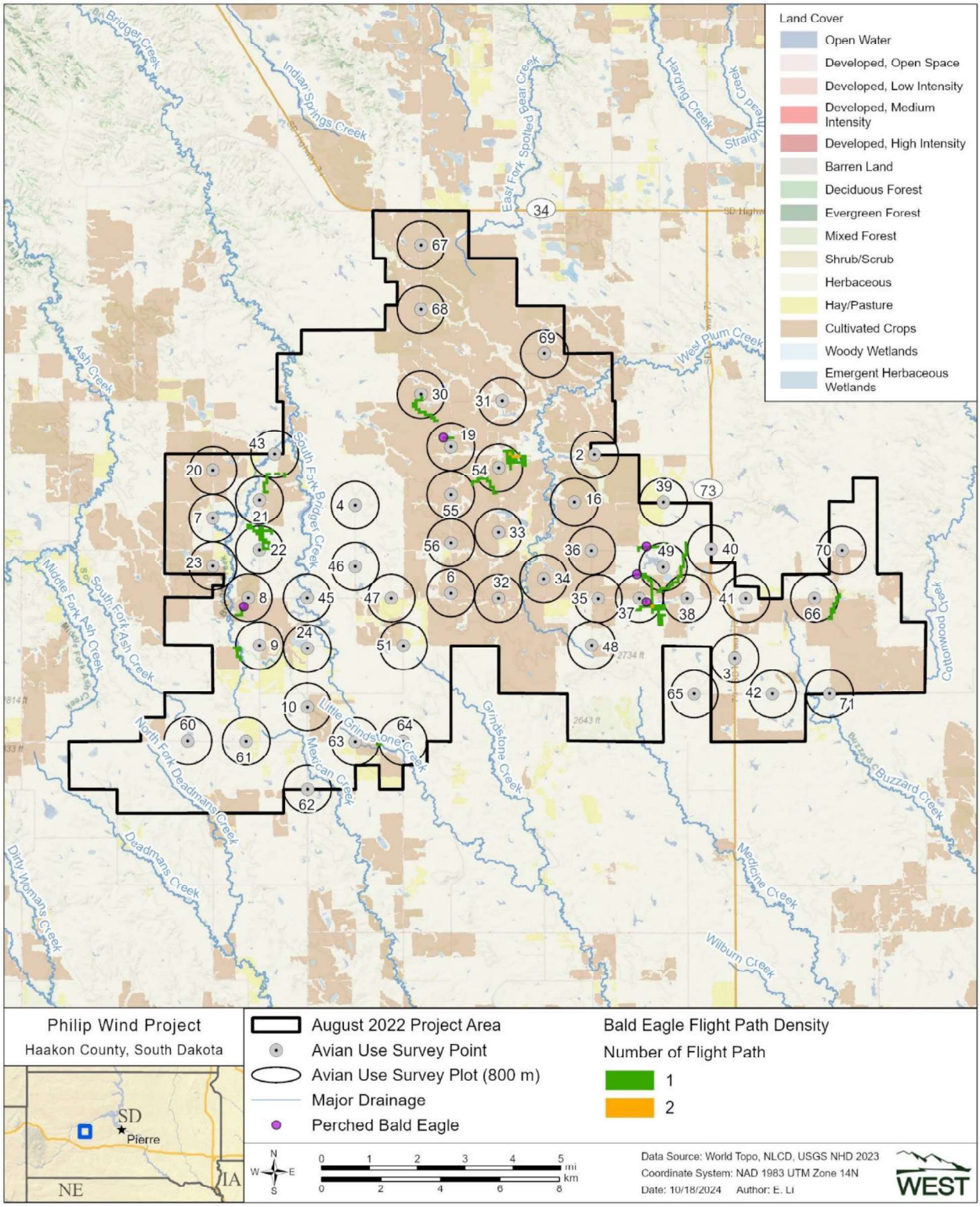

Figure 4.4a. Bald eagle flight path density at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

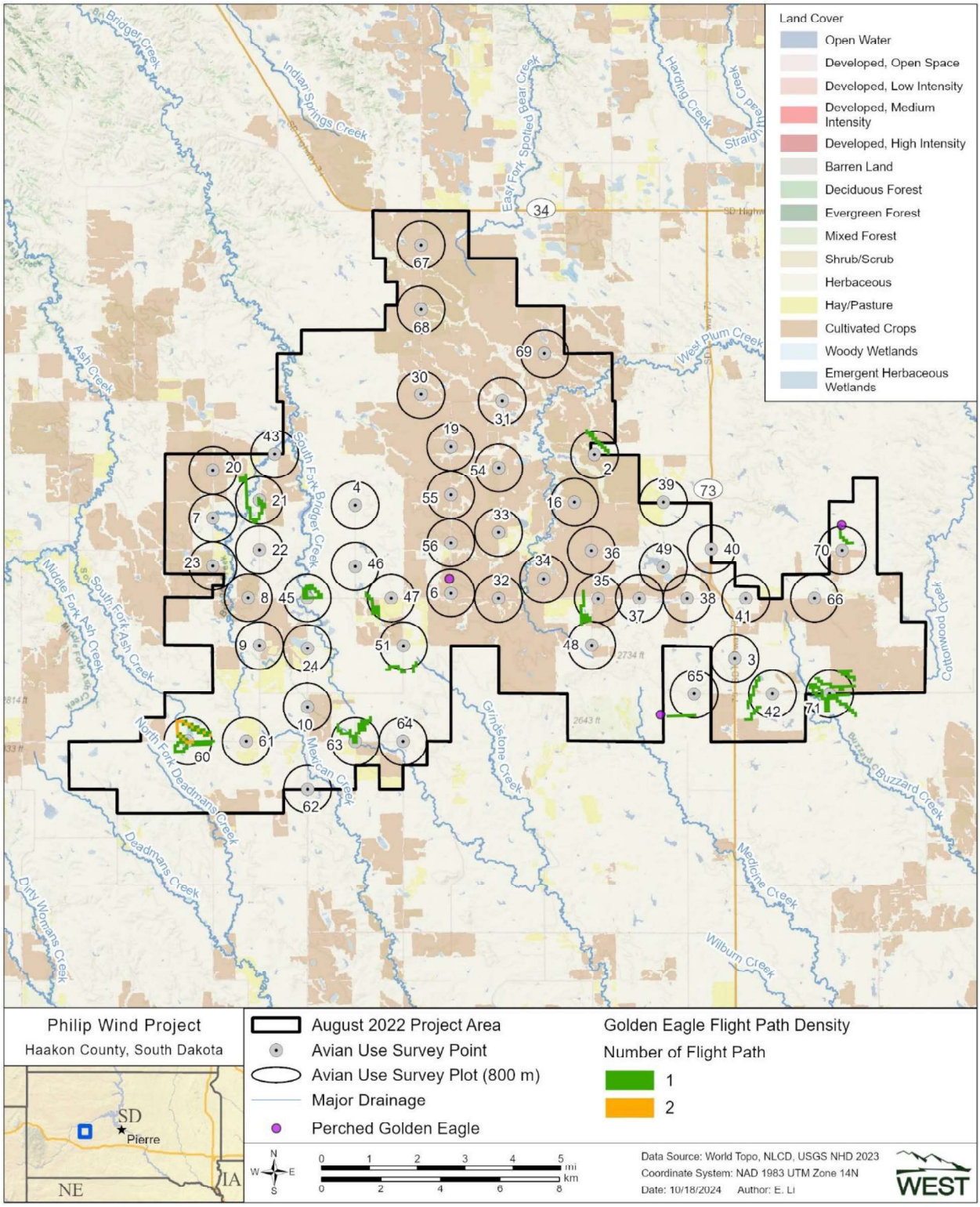

Figure 4.4b. Golden Eagle flight path density at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

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Appendix A. Avian Species Composition at the Philip Wind Project, Haakon County, South Dakota, during Avian Use Surveys from April 3, 2023 – August 25, 2024.

Appendix A. Avian species observations within the 800-meter radius survey plot during 60-minute large bird use surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Type/Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Diurnal Raptors		**72**	**82**	**89**	**104**	**169**	**250**	**19**	**19**	**349**	**455**
Accipiters		*1*	*1*	*1*	*1*	*3*	*4*	*0*	*0*	*5*	*6*
Cooper's hawk	*Accipiter cooperii*	1	1	1	1	1	1	0	0	3	3
Sharp-shinned hawk	*Accipiter striatus*	0	0	0	0	2	3	0	0	2	3
Buteos		*31*	*37*	*65*	*80*	*74*	*149*	*10*	*10*	*180*	*276*
Ferruginous hawk	*Buteo regalis*	1	1	3	3	9	9	2	2	15	15
Red-tailed hawk	*Buteo jamaicensis*	17	18	34	35	44	45	1	1	96	99
Rough-legged hawk	*Buteo lagopus*	5	5	0	0	8	8	7	7	20	20
Swainson's hawk	*Buteo swainsoni*	5	7	25	39	11	85	0	0	41	131
Unidentified buteo	–	3	6	3	3	2	2	0	0	8	11
Eagles		*7*	*7*	*7*	*7*	*13*	*13*	*6*	*6*	*33*	*33*
Bald eagle	*Haliaeetus leucocephalus*	2	2	3	3	10	10	3	3	18	18
Golden eagle	*Aquila chrysaetos*	5	5	4	4	3	3	3	3	15	15
Falcons		*10*	*13*	*5*	*5*	*28*	*30*	*2*	*2*	*45*	*50*
American kestrel	*Falco sparverius*	8	11	3	3	9	10	1	1	21	25
Merlin	*Falco columbarius*	2	2	0	0	6	6	0	0	8	8
Prairie falcon	*Falco mexicanus*	0	0	2	2	12	13	1	1	15	16
Unidentified falcon	–	0	0	0	0	1	1	0	0	1	1
Northern Harrier		*23*	*24*	*11*	*11*	*51*	*54*	*1*	*1*	*86*	*90*
Northern harrier	*Circus hudsonius*	23	24	11	11	51	54	1	1	86	90
Doves/Pigeons		**54**	**134**	**137**	**478**	**33**	**359**	**5**	**31**	**229**	**1,002**
Eurasian collared-dove	*Streptopelia decaocto*	0	0	1	1	0	0	0	0	1	1
Mourning dove	*Zenaida macroura*	45	72	117	325	18	160	0	0	180	557
Rock pigeon	*Columba livia*	9	62	18	151	15	199	5	31	47	443
Unidentified dove	–	0	0	1	1	0	0	0	0	1	1
Gulls/Terns	–	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids		**7**	**148**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**148**
American crow	*Corvus brachyrhynchos*	7	148	0	0	0	0	0	0	7	148
Loons/Grebes		**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**2**	**2**
Pied-billed grebe	*Podilymbus podiceps*	0	0	0	0	1	1	0	0	1	1
Western grebe	*Aechmophorus occidentalis*	1	1	0	0	0	0	0	0	1	1
Nightjars		**1**	**1**	**19**	**29**	**0**	**0**	**0**	**0**	**20**	**30**
Common nighthawk	*Chordeiles minor*	1	1	19	29	0	0	0	0	20	30
Owls		**2**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**3**
Great horned owl	*Bubo virginianus*	2	3	0	0	0	0	0	0	2	3

Appendix A. Avian species observations within the 800-meter radius survey plot during 60-minute large bird use surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Type/Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Rails/Coots		**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**1**	**4**
American coot	*Fulica americana*	0	0	0	0	1	4	0	0	1	4
Shorebirds		**112**	**149**	**119**	**170**	**8**	**27**	**0**	**0**	**239**	**346**
Killdeer	*Charadrius vociferus*	39	53	37	47	6	24	0	0	82	124
Lesser yellowlegs	*Tringa flavipes*	0	0	0	0	1	2	0	0	1	2
Long-billed curlew	*Numenius americanus*	21	27	2	2	0	0	0	0	23	29
Marbled godwit	*Limosa fedoa*	8	9	14	21	0	0	0	0	22	30
Solitary sandpiper	*Tringa solitaria*	0	0	2	2	0	0	0	0	2	2
Unidentified dowitcher	–	0	0	1	2	0	0	0	0	1	2
Unidentified sandpiper	–	2	6	0	0	0	0	0	0	2	6
Unidentified shorebird	–	1	1	3	22	0	0	0	0	4	23
Upland sandpiper	*Bartramia longicauda*	39	50	60	74	0	0	0	0	99	124
Wilson's phalarope	*Phalaropus tricolor*	1	2	0	0	1	1	0	0	2	3
Wilson's snipe	*Gallinago delicata*	1	1	0	0	0	0	0	0	1	1
Upland Game Birds		**63**	**83**	**44**	**68**	**37**	**104**	**19**	**121**	**163**	**376**
Greater prairie-chicken	*Tympanuchus cupido*	2	6	0	0	3	15	1	25	6	46
Ring-necked pheasant	*Phasianus colchicus*	43	51	40	52	22	26	11	15	116	144
Sharp-tailed grouse	*Tympanuchus phasianellus*	13	16	3	15	10	52	6	78	32	161
Unidentified grouse	–	5	10	1	1	2	11	1	3	9	25
Vultures		**12**	**15**	**24**	**39**	**15**	**19**	**0**	**0**	**51**	**73**
Turkey vulture	*Cathartes aura*	12	15	24	39	15	19	0	0	51	73
Waterbirds		**18**	**239**	**7**	**39**	**3**	**27**	**0**	**0**	**28**	**305**
American white pelican	*Pelecanus erythrorhynchos*	2	4	3	35	1	25	0	0	6	64
Double-crested cormorant	*Nannopterum auritum*	6	26	0	0	1	1	0	0	7	27
Great blue heron	*Ardea herodias*	3	3	4	4	1	1	0	0	8	8
Sandhill crane	*Antigone canadensis*	7	206	0	0	0	0	0	0	7	206
Waterfowl		**149**	**874**	**52**	**225**	**24**	**455**	**8**	**457**	**233**	**2,011**
American wigeon	*Mareca americana*	4	8	2	4	0	0	0	0	6	12
Blue-winged teal	*Spatula discors*	5	8	2	17	1	3	0	0	8	28
Cackling goose	*Branta hutchinsii*	2	103	0	0	0	0	0	0	2	103
Canada goose	*Branta canadensis*	34	401	5	54	5	83	8	457	52	995
Canvasback	*Aythya valisineria*	1	2	0	0	0	0	0	0	1	2
Common merganser	*Mergus merganser*	2	11	0	0	0	0	0	0	2	11
Gadwall	*Mareca strepera*	2	3	12	80	4	73	0	0	18	156
Green-winged teal	*Anas crecca*	2	6	1	1	0	0	0	0	3	7
Hooded merganser	*Lophodytes cucullatus*	1	5	0	0	0	0	0	0	1	5

Appendix A. Avian species observations within the 800-meter radius survey plot during 60-minute large bird use surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Type/Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Lesser scaup	*Aythya affinis*	2	5	0	0	0	0	0	0	2	5
Mallard	*Anas platyrhynchos*	52	173	14	28	6	173	0	0	72	374
Northern pintail	*Anas acuta*	23	77	5	7	2	26	0	0	30	110
Northern shoveler	*Spatula clypeata*	5	8	1	2	0	0	0	0	6	10
Redhead	*Aythya americana*	2	15	0	0	0	0	0	0	2	15
Ruddy duck	*Oxyura jamaicensis*	0	0	0	0	1	33	0	0	1	33
Unidentified duck	–	12	49	10	32	5	64	0	0	27	145
Overall		**491**	**1,729**	**491**	**1,152**	**291**	**1,246**	**51**	**628**	**1,324**	**4,755**

grps = groups; obs = observations.

Appendix B. Mean Use by Season for Large Birds Observed during Avian Use Surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024

Appendix B. Mean use (number of observations/60-minute survey/800-meter survey plot) for each large bird type and species by season during the avian use surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Type/Subtype/Species	Mean Use			
	Spring	Summer	Fall	Winter
Diurnal Raptors	**0.50**	**0.50**	**1.67**	**0.26**
Accipiters	*<0.01*	*<0.01*	*0.03*	*0*
Cooper's hawk	<0.01	<0.01	0.01	0
Sharp-shinned hawk	0	0	0.02	0
Buteos	*0.18*	*0.39*	*0.99*	*0.12*
Ferruginous hawk	<0.01	0.01	0.06	0.01
Red-tailed hawk	0.07	0.24	0.30	0.01
Rough-legged hawk	0.02	0	0.05	0.10
Swainson's hawk	0.03	0.13	0.57	0
Unidentified buteo	0.06	0.01	0.01	0
Eagles	*0.03*	*0.02*	*0.09*	*0.09*
Bald eagle	0.01	0.01	0.07	0.05
Golden eagle	0.02	0.01	0.02	0.05
Falcons	*0.05*	*0.02*	*0.20*	*0.04*
American kestrel	0.04	0.01	0.07	0.03
Merlin	0.01	0	0.04	0
Prairie falcon	0	0.01	0.09	0.01
Unidentified falcon	0	0	0.01	0
Northern Harrier	*0.23*	*0.07*	*0.36*	*0.01*
Northern harrier	0.23	0.07	0.36	0.01
Doves/Pigeons	**0.99**	**2.28**	**2.39**	**0.44**
Eurasian collared-dove	0	<0.01	0	0
Mourning dove	0.50	1.53	1.07	0
Rock pigeon	0.48	0.74	1.33	0.44
Unidentified dove	0	<0.01	0	0
Gulls/Terns	**0**	**0**	**0**	**0**
Large Corvids	**0.59**	**0**	**0**	**0**
American crow	0.59	0	0	0
Loons/Grebes	**<0.01**	**0**	**0.01**	**0**
Pied-billed grebe	0	0	0.01	0
Western grebe	<0.01	0	0	0
Nightjars	**<0.01**	**0.10**	**0**	**0**
Common nighthawk	<0.01	0.10	0	0
Owls	**0.01**	**0**	**0**	**0**
Great horned owl	0.01	0	0	0
Rails/Coots	**0**	**0**	**0.03**	**0**
American coot	0	0	0.03	0
Shorebirds	**1.53**	**0.84**	**0.18**	**0**
Killdeer	0.49	0.25	0.16	0
Lesser yellowlegs	0	0	0.01	0
Long-billed curlew	0.15	0.01	0	0
Marbled godwit	0.04	0.07	0	0
Solitary sandpiper	0	0.01	0	0
Unidentified dowitcher	0	0.01	0	0
Unidentified sandpiper	0.02	0	0	0
Unidentified shorebird	0.04	0.07	0	0
Upland sandpiper	0.78	0.43	0	0
Wilson's phalarope	0.01	0	0.01	0
Wilson's snipe	<0.01	0	0	0

Appendix B. Mean use (number of observations/60-minute survey/800-meter survey plot) for each large bird type and species by season during the avian use surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Type/Subtype/Species	Mean Use			
	Spring	Summer	Fall	Winter
Upland Game Birds	**0.56**	**0.44**	**0.69**	**1.42**
Greater prairie-chicken	0.02	0	0.10	0.17
Ring-necked pheasant	0.39	0.29	0.17	0.21
Sharp-tailed grouse	0.10	0.14	0.35	0.95
Unidentified grouse	0.04	<0.01	0.07	0.10
Vultures	**0.06**	**0.22**	**0.13**	**0**
Turkey vulture	0.06	0.22	0.13	0
Waterbirds	**0.99**	**0.13**	**0.18**	**0**
American white pelican	0.02	0.12	0.17	0
Double-crested cormorant	0.10	0	0.01	0
Great blue heron	0.05	0.01	0.01	0
Sandhill crane	0.82	0	0	0
Waterfowl	**4.78**	**0.75**	**3.03**	**14.38**
American wigeon	0.03	0.01	0	0
Blue-winged teal	0.14	0.06	0.02	0
Cackling goose	0.41	0	0	0
Canada goose	1.98	0.18	0.55	14.38
Canvasback	0.01	0	0	0
Common merganser	0.04	0	0	0
Gadwall	0.01	0.27	0.49	0
Green-winged teal	0.02	<0.01	0	0
Hooded merganser	0.09	0	0	0
Lesser scaup	0.02	0	0	0
Mallard	1.22	0.09	1.15	0
Northern pintail	0.40	0.02	0.17	0
Northern shoveler	0.03	0.01	0	0
Redhead	0.17	0	0	0
Ruddy duck	0	0	0.22	0
Unidentified duck	0.20	0.11	0.43	0
Overall	**10.02**	**5.25**	**8.31**	**16.50**

Season dates: Spring (March 1 – May 30), Summer (May 31 – August 31), Fall (September 1 – November 30), and Winter (December 1 – February 29).

Sums of values may not equal totals shown due to rounding.

Appendix C. Mean Use by Survey Point for All Birds, Bird Types, and Diurnal Raptor Subtypes during Avian Use Surveys at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024

Appendix C. Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	2	3	4	6	7	8	9	10	16	19
Diurnal Raptors	**0.67**	**0.78**	**0.33**	**0.56**	**0.11**	**0.78**	**0.44**	**0.44**	**1.00**	**0.44**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0.22*	*0*	*0*	*0.11*	*0*
Buteos	*0.22*	*0.44*	*0.11*	*0.33*	*0.11*	*0.44*	*0.22*	*0.33*	*0.56*	*0*
Eagles	*0.11*	*0*	*0*	*0.11*	*0*	*0.11*	*0.11*	*0*	*0.11*	*0.11*
Bald eagle	0	0	0	0	0	0.11	0.11	0	0.11	0.11
Golden eagle	0.11	0	0	0.11	0	0	0	0	0	0
Falcons	*0*	*0.11*	*0.11*	*0*	*0*	*0*	*0*	*0*	*0*	*0.22*
Northern Harrier	*0.33*	*0.22*	*0.11*	*0.11*	*0*	*0*	*0.11*	*0.11*	*0.22*	*0.11*
Doves/Pigeons	**4.67**	**0.11**	**0.22**	**1.00**	**8.33**	**1.11**	**2.89**	**0.44**	**0.78**	**33.89**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids	**0.11**	**0**	**0**	**0.11**	**0**	**0.22**	**0**	**0**	**0**	**0**
Loons/Grebes	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Nightjars	**0**	**0**	**0**	**0**	**0.67**	**0**	**0.22**	**0**	**0**	**0.11**
Owls	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.11**	**0**
Rails/Coots	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorebirds	**1.00**	**0.33**	**0.78**	**1.33**	**0.89**	**0.33**	**0.89**	**0.44**	**1.11**	**0.78**
Upland Game Birds	**1.78**	**0**	**0.11**	**0.11**	**0.56**	**1.33**	**1.22**	**0.78**	**0.44**	**0.22**
Vultures	**0**	**0.22**	**0.11**	**0.22**	**0**	**0.67**	**0.44**	**0.11**	**0.11**	**0**
Waterbirds	**4.00**	**0.11**	**0**	**6.67**	**0.56**	**0.78**	**0**	**0**	**2.78**	**0.11**
Waterfowl	**9.22**	**6.22**	**4.11**	**0.22**	**4.67**	**0.22**	**0.22**	**3.00**	**0.33**	**0.67**
All Large Birds	**21.44**	**7.78**	**5.67**	**10.22**	**15.78**	**5.44**	**6.33**	**5.22**	**6.67**	**36.22**

Sums of values may not equal totals shown due to rounding.

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	20	21	22	23	24	30	31	32	33	34
Diurnal Raptors	**0.44**	**1.33**	**0.89**	**0.22**	**0.56**	**0.89**	**1.00**	**0.22**	**0.44**	**0.33**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Buteos	*0.44*	*0.56*	*0.44*	*0.22*	*0.44*	*0.56*	*0.56*	*0*	*0.11*	*0.11*
Eagles	*0*	*0.22*	*0.11*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Bald eagle	0	0.11	0.11	0	0	0	0	0	0	0
Golden eagle	0	0.11	0	0	0	0	0	0	0	0
Falcons	*0*	*0.33*	*0.33*	*0*	*0*	*0.22*	*0*	*0.11*	*0.11*	*0*
Northern Harrier	*0*	*0.22*	*0*	*0*	*0.11*	*0.11*	*0.44*	*0.11*	*0.22*	*0.22*
Doves/Pigeons	**1.89**	**0.67**	**0.67**	**2.11**	**0.56**	**1.22**	**1.89**	**0.78**	**1.11**	**0.33**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids	**0**	**0**	**0**	**0**	**0**	**4.67**	**0**	**0**	**0.11**	**11.11**
Loons/Grebes	**0**	**0**	**0**	**0**	**0**	**0**	**0.11**	**0**	**0**	**0**
Nightjars	**0.11**	**0**	**0**	**0**	**0**	**0.11**	**0**	**0.11**	**0**	**0**
Owls	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rails/Coots	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorebirds	**0.33**	**0.44**	**0.44**	**0.11**	**0.67**	**0.11**	**0.44**	**0.56**	**0.33**	**0.44**
Upland Game Birds	**0.22**	**0.22**	**0.11**	**0**	**0.11**	**0.78**	**0.33**	**0.89**	**0.33**	**1.00**
Vultures	**0.11**	**0.11**	**0.11**	**0.33**	**0**	**0.44**	**0.22**	**0.22**	**0.22**	**0.11**
Waterbirds	**0**	**0.11**	**11.11**	**0**	**0**	**0**	**0.22**	**0**	**0.22**	**0**
Waterfowl	**17.89**	**1.89**	**0.33**	**0.78**	**0.33**	**3.22**	**4.33**	**0.44**	**2.67**	**22.89**

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	20	21	22	23	24	30	31	32	33	34
All Large Birds	**21.00**	**4.78**	**13.67**	**3.56**	**2.22**	**11.44**	**8.56**	**3.22**	**5.44**	**36.22**

Sums of values may not equal totals shown due to rounding.

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	35	36	37	38	39	40	41	42	43	45
Diurnal Raptors	**0.56**	**0.56**	**1.00**	**0.56**	**0.78**	**1.44**	**1.00**	**1.56**	**1.89**	**0.78**
Accipiters	*0*	*0.11*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Buteos	*0.33*	*0.22*	*0.33*	*0.33*	*0.67*	*1.33*	*0.22*	*0.89*	*1.67*	*0.56*
Eagles	*0.11*	*0*	*0.33*	*0*	*0*	*0*	*0*	*0.11*	*0*	*0.11*
Bald eagle	0	0	0.33	0	0	0	0	0	0	0
Golden eagle	0.11	0	0	0	0	0	0	0.11	0	0.11
Falcons	*0*	*0.11*	*0*	*0.22*	*0.11*	*0.11*	*0*	*0*	*0.11*	*0*
Northern Harrier	*0.11*	*0.11*	*0.33*	*0*	*0*	*0*	*0.78*	*0.56*	*0.11*	*0.11*
Doves/Pigeons	**9.78**	**0.78**	**0.89**	**2.33**	**0.44**	**0.44**	**0.33**	**0.11**	**4.89**	**0.78**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Loons/Grebes	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Nightjars	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.78**
Owls	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.22**	**0**
Rails/Coots	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorebirds	**2.22**	**0.22**	**0.56**	**0.89**	**0.44**	**0.33**	**0.22**	**2.44**	**0.22**	**0.56**
Upland Game Birds	**0.11**	**0.67**	**0.67**	**0**	**6.33**	**0.11**	**0.78**	**0.11**	**0.67**	**0.78**
Vultures	**0**	**0**	**0**	**0.33**	**0.11**	**0**	**0.11**	**0.11**	**0**	**0**
Waterbirds	**0**	**0**	**0.11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Waterfowl	**0.33**	**0.11**	**18.44**	**0.56**	**0**	**0.78**	**0.67**	**1.22**	**1.33**	**3.22**
All Large Birds	**13.00**	**2.33**	**21.67**	**4.67**	**8.11**	**3.11**	**3.11**	**5.56**	**9.22**	**6.89**

Sums of values may not equal totals shown due to rounding.

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	46	47	48	49	51	54	55	56	60	61
Diurnal Raptors	**0.33**	**0.33**	**0.56**	**0.89**	**1.00**	**1.78**	**0.78**	**0.67**	**0.85**	**0.62**
Accipiters	*0*	*0*	*0.11*	*0*	*0*	*0.11*	*0*	*0*	*0*	*0*
Buteos	*0.22*	*0.11*	*0*	*0.44*	*0.44*	*0.67*	*0.67*	*0*	*0.31*	*0.23*
Eagles	*0*	*0.11*	*0*	*0.33*	*0.11*	*0.44*	*0*	*0*	*0.15*	*0*
Bald eagle	0	0	0	0.33	0	0.44	0	0	0	0
Golden eagle	0	0.11	0	0	0.11	0	0	0	0.15	0
Falcons	*0.11*	*0*	*0.11*	*0*	*0.22*	*0.56*	*0*	*0.22*	*0.23*	*0.31*
Northern Harrier	*0*	*0.11*	*0.33*	*0.11*	*0.22*	*0*	*0.11*	*0.44*	*0.15*	*0.08*
Doves/Pigeons	**2.22**	**1.89**	**0.44**	**1.11**	**0.33**	**0.44**	**0.33**	**0.44**	**0.31**	**0.31**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Loons/Grebes	**0**	**0**	**0**	**0.11**	**0**	**0**	**0**	**0**	**0**	**0**
Nightjars	**0.22**	**0**	**0**	**0.11**	**0**	**0.11**	**0**	**0.11**	**0**	**0**
Owls	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rails/Coots	**0**	**0**	**0**	**0.44**	**0**	**0**	**0**	**0**	**0**	**0**
Shorebirds	**0.89**	**0.56**	**0.22**	**1.44**	**0.78**	**0.56**	**0.33**	**0.89**	**0.69**	**0.92**
Upland Game Birds	**0.56**	**0.56**	**3.00**	**1.22**	**1.44**	**0.56**	**0.22**	**0.78**	**1.54**	**0**
Vultures	**0**	**0.11**	**0.33**	**0**	**0.56**	**0.67**	**0**	**0.11**	**0**	**0.08**
Waterbirds	**0.11**	**0**	**1.78**	**3.11**	**0**	**0**	**0**	**0**	**0**	**0**
Waterfowl	**0.33**	**0.11**	**0.22**	**10.22**	**0.22**	**2.78**	**0.22**	**9.78**	**4.31**	**0.54**

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	46	47	48	49	51	54	55	56	60	61
All Large Birds	**4.67**	**3.56**	**6.56**	**18.67**	**4.33**	**6.89**	**1.89**	**12.78**	**7.69**	**2.46**

Sums of values may not equal totals shown due to rounding.

Appendix C (*continued*). Mean use (number of observations/60-minute survey/800-meter survey plot) by survey point for large bird types observed at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Bird Type	Survey Point									
	62	63	64	65	66	67	68	69	70	71
Diurnal Raptors	**0.69**	**0.85**	**1.08**	**0.92**	**1.00**	**0.35**	**4.71**	**0.71**	**0.47**	**1.21**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Buteos	*0.62*	*0.38*	*0.58*	*0.15*	*0.38*	*0.24*	*4.59*	*0.41*	*0.24*	*0.79*
Eagles	*0*	*0.15*	*0*	*0.08*	*0.08*	*0*	*0*	*0*	*0.06*	*0.14*
Bald eagle	0	0.08	0	0	0.08	0	0	0	0	0
Golden eagle	0	0.08	0	0.08	0	0	0	0	0.06	0.14
Falcons	*0*	*0.15*	*0.17*	*0.08*	*0.15*	*0*	*0*	*0.12*	*0.06*	*0.14*
Northern Harrier	*0.08*	*0.15*	*0.33*	*0.62*	*0.38*	*0.12*	*0.12*	*0.18*	*0.12*	*0.14*
Doves/Pigeons	**0.23**	**0.15**	**0.08**	**1.38**	**6.46**	**0.76**	**0.88**	**0.06**	**1.12**	**0.29**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Large Corvids	**0**	**0**	**0**	**0**	**0**	**0.06**	**0**	**0**	**0**	**0**
Loons/Grebes	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Nightjars	**0.08**	**0**	**0.08**	**0**	**0**	**0**	**0.12**	**0.06**	**0.06**	**0**
Owls	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rails/Coots	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shorebirds	**0.85**	**0.23**	**0.67**	**0**	**0.38**	**0.24**	**0.65**	**1.00**	**0.06**	**2.50**
Upland Game Birds	**0.31**	**0**	**0.17**	**0.31**	**0.77**	**0.35**	**0.35**	**2.76**	**0**	**1.07**
Vultures	**0.08**	**0**	**0**	**0**	**0.23**	**0.06**	**0.24**	**0.06**	**0.18**	**0.21**
Waterbirds	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.29**
Waterfowl	**2.54**	**25.38**	**6.75**	**2.46**	**1.15**	**0.12**	**0.76**	**0**	**0.24**	**16.43**
All Large Birds	**4.85**	**26.62**	**8.83**	**5.08**	**10.00**	**1.94**	**7.71**	**4.65**	**2.12**	**23.00**

Sums of values may not equal totals shown due to rounding.

Appendix D. Eagle Minutes per Survey Hour by Survey Point at the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Appendix D1. Bald eagle minutes per survey hour and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Survey Point	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
2	0	0	0	9	0
3	0	0	0	9	0
4	0	0	0	9	0
6	0	0	0	9	0
7	0	0	0	9	0
8	2	1	1	9	0.22
9	4	1	1	9	0.44
10	0	0	0	9	0
16	3	1	1	9	0.33
19	1	1	1	9	0.11
20	0	0	0	9	0
21	1	1	1	9	0.11
22	7	1	1	9	0.78
23	0	0	0	9	0
24	0	0	0	9	0
30	0	0	0	9	0
31	0	0	0	9	0
32	0	0	0	9	0
33	0	0	0	9	0
34	0	0	0	9	0
35	0	0	0	9	0
36	0	0	0	9	0
37	6	3	3	9	0.67
38	0	0	0	9	0
39	0	0	0	9	0
40	0	0	0	9	0
41	0	0	0	9	0
42	0	0	0	9	0
43	0	0	0	9	0
45	0	0	0	9	0
46	0	0	0	9	0
47	0	0	0	9	0
48	0	0	0	9	0
49	6	3	3	9	0.67
51	0	0	0	9	0
54	10	2	4	9	1.11
55	0	0	0	9	0
56	0	0	0	9	0
60	0	0	0	13	0
61	0	0	0	13	0
62	0	0	0	13	0
63	1	1	1	13	0.08
64	0	0	0	12	0
65	0	0	0	13	0
66	1	1	1	13	0.08
67	0	0	0	17	0
68	0	0	0	17	0

Appendix D1. Bald eagle minutes per survey hour and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Survey Point	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
69	0	0	0	17	0
70	0	0	0	17	0
71	0	0	0	14	0
Total	**42**	**16**	**18**	**514**	**0.08**

a. Minutes within 800-meter (m) radius survey plot and 220 m above ground level.

b. Total = observations within 800-m radius survey plot, regardless of flight height, and regardless of activity (including perched birds).

Appendix D2. Golden eagle minutes per survey hour and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Survey Point	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
2	4	1	1	9	0.44
3	0	0	0	9	0
4	0	0	0	9	0
6	0	0	1	9	0
7	0	0	0	9	0
8	0	0	0	9	0
9	0	0	0	9	0
10	0	0	0	9	0
16	0	0	0	9	0
19	0	0	0	9	0
20	0	0	0	9	0
21	14	1	1	9	1.56
22	0	0	0	9	0
23	0	0	0	9	0
24	0	0	0	9	0
30	0	0	0	9	0
31	0	0	0	9	0
32	0	0	0	9	0
33	0	0	0	9	0
34	0	0	0	9	0
35	6	1	1	9	0.67
36	0	0	0	9	0
37	0	0	0	9	0
38	0	0	0	9	0
39	0	0	0	9	0
40	0	0	0	9	0
41	0	0	0	9	0
42	0	0	1	9	0
43	0	0	0	9	0
45	7	1	1	9	0.78
46	0	0	0	9	0
47	3	1	1	9	0.33
48	0	0	0	9	0
49	0	0	0	9	0
51	1	1	1	9	0.11

Appendix D2. Golden eagle minutes per survey hour and observations recorded during large bird use surveys in the Philip Wind Project, Haakon County, South Dakota, from April 3, 2023 – August 25, 2024.

Survey Point	Eagle Minutes	Eagle Observations		Survey Hours	Eagle Minutes/ Survey Hour
	Within Cylinder[a]	Within Cylinder	Total[b]		
54	0	0	0	9	0
55	0	0	0	9	0
56	0	0	0	9	0
60	23	2	2	13	1.77
61	0	0	0	13	0
62	0	0	0	13	0
63	13	1	1	13	1.00
64	0	0	0	12	0
65	1	1	1	13	0.08
66	0	0	0	13	0
67	0	0	0	17	0
68	0	0	0	17	0
69	0	0	0	17	0
70	2	1	1	17	0.12
71	13	2	2	14	0.93
Total	**87**	**13**	**15**	**514**	**0.17**

a. Minutes within 800-meter (m) radius survey plot and 220 m above ground level.

b. Total = observations within 800-m radius survey plot, regardless of flight height, and regardless of activity (including perched birds).