



**Pre-Construction Eagle and Avian Use Study
April 2017 through March 2018**

for the

**BURKE COUNTY WIND PROJECT
Burke County, North Dakota**

Prepared for

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ABBREVIATIONS AND ACRONYMS

Atwell	Atwell, LLC
ECPG	<i>Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2</i>
MW	megawatt
NDGFD	North Dakota Game and Fish Department
RSZ	rotor-swept zone
SCP	Species of Conservation Priority
SD	standard deviation

EXECUTIVE SUMMARY

This report summarizes one year of pre-construction eagle and avian use surveys conducted by Atwell, LLC on behalf of Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, at the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. Eagle and raptor use surveys were conducted biweekly from April 2017 through March 2018. Avian use surveys were conducted biweekly during the spring migration period (April through May 2017) and the fall migration period (mid-August through November 2017). All surveys were conducted within the Avian Use Study Area, defined as the original 300-megawatt (MW) Project plus a 1-mile (1.6 km) boundary area. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. Results of the eagle use and avian use studies are presented in this report for both the Avian Use Study Area (300 MW configuration plus boundary area) and the Project (200 MW configuration).

The 2012 *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* recommend various studies to document avian use. This information can also be used to assess potential risk to avian species from wind energy development. One year of eagle and raptor use studies and spring and fall avian use surveys were completed to document vertical and horizontal use of the Project and Avian Use Study Area. Specific focus was directed on documenting avian activity within the 115 to 492 ft (35 to 150 m) rotor-swept zone (RSZ). Eagle and raptor use surveys were also conducted in accordance with recommendations provided by the 2013 *U.S. Fish and Wildlife Service Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2*.

Key Results

- Twenty-four Bald Eagle detections were recorded as part of standardized eagle use surveys in the Avian Use Study Area. An additional 26 Bald Eagle detections were recorded incidental to the surveys. Of the 24 standardized Bald Eagle detections, six occurred at points within the Project. Of the 26 incidental detections, seven occurred within the Project.
- Bald Eagle mean use rates were higher in the fall than the spring. Bald Eagles were not observed during standardized surveys in the summer or winter.
- No Bald Eagle concentration areas were found within the Avian Use Study Area, including the Project. There was also no evidence from the pattern of observations of eagles that physiographic features such as ridgelines were concentrating eagle use within specific areas of the Project. This lack of a spatial pattern in the spring and fall suggests that Bald Eagles migrate through the Avian Use Study Area in a broad front.
- Two Golden Eagle detections occurred during standardized eagle use surveys. An additional six Golden Eagles were detected incidental to the surveys. Of the two standardized detections, one occurred within the Project. Of the six incidental detections, three occurred within the Project.

- No federal threatened/endangered avian species were observed using habitat in the Avian Use Study Area during standardized avian use point count surveys. Three Whooping Cranes were incidentally observed flying over the Project, well above the RSZ, during northbound spring migration (early April 2017).
- With some exceptions, avian use rates tended to be higher in the fall than in the spring, an expected pattern in North America. Seasonal use rates for Sandhill Cranes were lower within the Project than across the larger Avian Use Study Area, and observations of the highest Sandhill Crane concentrations occurred east of the current 200 MW turbine configuration. Mean use rates for grassland species such as the Bobolink and Western Meadowlark were also lower within the Project than across the Avian Use Study Area.

1.0 INTRODUCTION

Atwell was contracted in 2017 by Burke Wind, LLC, a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, to conduct pre-construction eagle use and avian use studies for the proposed Burke County Wind Project (the Project) in Burke County, North Dakota. All surveys were conducted within the Avian Use Study Area, defined as the original 300-megawatt (MW) Project plus an additional 1-mile (1.6 km) boundary area. In late 2018, the Project was reduced in size to 200 MW, and all subsequent references to the Project refer to this 200 MW configuration. In Figure 1 (**Appendix I**), the Avian Use Study Area is shown with a dashed line around the 200 MW Project, which is delineated with a solid black line.

The objective of the studies summarized in this report was to document eagle and avian use within the proposed Project. Survey protocols described herein were designed to adhere to Tier 3 of the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (USFWS 2012) and Stage 2 assessments described in the *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2* (ECPG) (USFWS 2013). These two documents provide wind energy developers and operators guidance for adhering to the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act, respectively. Additionally, Atwell utilized industry standard approaches for avian use studies as promoted by the National Wind Wildlife Collaborative (e.g., Strickland et al. 2011).

2.0 METHODS

The avian resource survey methods summarized in this section were originally described in an avian resources study plan (Atwell 2017b) submitted to the North Dakota Game and Fish Department (NDGFD) and the U.S. Fish and Wildlife Service for review and comment on October 11, 2017. Feedback on the plan was received from NDGFD on November 16, 2017; the comments referenced breeding bird assessment protocols described in Atwell (2018) and did not address eagle/raptor use or the avian use study design and protocols described in this report.

This report adheres to taxonomy outlined in the American Ornithological Society's online *Checklist of North and Middle American Birds*, 59th supplement (Chesser et al. 2018).

2.1 Project Setting

The Project is situated on approximately 22,933 acres (9,281 hectares) in Burke County, northwest North Dakota (Figure 1, **Appendix I**). The Project land area is predominantly agricultural cropland and grassland within a regional prairie pothole wetland system. The general topography of the Project slopes along a ridgeline that is oriented southeast-northwest. Elevations within the Project range from approximately 2,159 to 2,502 ft (658 to 762 m) above mean sea level.

According to the 2011 National Land Cover Database – Land Use Land Cover data set, approximately 54.1% of the Project land area is grassland-type habitat (approximately 12,400 acres [5,018 hectares] of herbaceous and hay/pasture land cover types), and 32.0% is classified as cultivated crops (7,346 acres [2,973 hectares]) (Homer et al. 2015). Additional cover classifications found within the Project include open water (4.7%), emergent herbaceous wetlands (4.1%), aggregated development classifications (3.4%), deciduous forest (1.5%), and woody wetlands (0.2%).

2.2 Eagle Use Surveys

Eagle use surveys followed a fixed-point protocol to document activity and behavior of individual eagle detections (e.g., minutes of flight within a cylindrical air-space plot). The surveys were conducted in accordance with the ECPG (USFWS 2013), a protocol based on a 2,625 ft (800 m) fixed-radius circular plot approach (Strickland et al. 2011). Eagle surveys were conducted year-round during the spring (March through May), summer (June through July), fall (August through November), and winter (December through February). The survey period began in April 2017 and continued through March 2018. Raptor species detections were also recorded during eagle use surveys.

The study plan established 34 roadside point count stations across the Avian Use Study Area, with the goal of having survey coverage for 30% of the originally planned 300 MW configuration (Figure 1, **Appendix I**). At the time when the original point count station locations were established, the project layout was in the early stages of development, and it was anticipated to evolve over time. Therefore, the objective for establishing point count station locations was to achieve as much

coverage of the 300 MW area as possible, given land access restrictions. Locations were selected so the 2,625 ft (800 m)–radius survey cylinder for each station had the greatest possible extent of overlap with the Avian Use Study Area. Point count stations were located along roads with low traffic levels and where reasonable survey vantages of the surrounding landscape were obtainable. Because land acquisition was in the early stages at the time of study plan development, point count stations were restricted to roadside locations.

The only way to obtain survey coverage of some portions of the Avian Use Study Area and/or have adequate visibility was to locate point count stations outside of, but adjacent to, the originally planned 300 MW area. As much as possible of each point count station’s survey area coincided with the 300 MW configuration. Ground-truthing for these factors in April 2017 shifted eight of the 34 point count stations to locations that did not fully overlap with the 300 MW area but did provide sufficient visibility.

The collective survey area coverage for the original 34 point count station locations comprised 16.55% (11,373 acres [4,602 hectares]) of the Avian Use Study Area. In June 2017, six additional point count stations (stations #50–55 in Figure 1, **Appendix I**) were added to increase sampling effort and spatial coverage during the summer survey period. These six stations were placed following the guidelines described above, on unimproved roadways in portions of the Project that lacked year-round accessibility (Atwell 2017b). The addition of these six points increased the sampling size to 40 and increased survey coverage of the Avian Use Study Area to 20.79% (14,285 acres [5,781 hectares]).

In late 2018, the Project was reconfigured to 200 MW (Figure 1, **Appendix I**). Fifteen of the original 34 point count stations’ 2,625 ft (800 m)–radius survey cylinders intersect the 200 MW Project, covering 19.87% (4,557 acres [1,844 hectares]). Twelve of these 15 points are within the current Project (Table 1); the remaining three are located outside the Project but have survey areas that overlap the Project.

The ECPG recommends obtaining 30% coverage of an area that encompasses all wind turbines plus a 3,281 ft (1 km) buffer around each wind turbine. However, it is not uncommon for the 30% goal to not be achieved for final project layouts because of land access restrictions, inadequate visibility, and changes to project layout during the development period, which can result in significant changes. In this case, the coverage achieved for eagle use surveys, calculated for the current 200 MW Project, was 20.97% (5,511 acres [2,230 hectares]), including the wind turbine 3,281 ft (1 km) buffer area.

The 34 point count stations initially surveyed in accordance with the study plan were divided into two subgroups of 17 each; the two subgroups were surveyed on alternating weeks. Each point count station was surveyed for 60 minutes twice monthly over a one-year period. The six additional point count stations (stations #50–55; Figure 1, **Appendix I**) added in June 2017, increased the

sampling effort and spatial coverage during the summer. Surveys were conducted between dawn and dusk. The eagle use survey effort at each point count station is summarized by season in Table 1.

Table 1. Total Standardized Survey Effort by Point Count Station, April 2017 through March 2018—Burke County Wind Project (Burke County, North Dakota)

Point Count Station	Eagle Use Survey Standardized Effort (hours)					Avian Use Survey Effort (hours)		
	Winter	Spring	Summer	Fall	Total Hours	Spring	Fall	Total Hours
10	6	6	4	8	24	2	2.67	4.67
11*	6	6	4	8	24	2	2.67	4.67
12**	6	6	4	8	24	2	2.67	4.67
13*	6	6	4	8	24	2	2.67	4.67
14*	6	6	4	8	24	2	2.67	4.67
15*	6	7^	4	8	25	2.33^	2.67	5
16*	6	6	4	8	24	2	2.67	4.67
17*	6	5^	4	8	23	1.67^	2.67	4.33
18**	6	6	4	8	24	2	2.67	4.67
19*	6	6	4	8	24	2	2.67	4.67
20	6	6	4	8	24	2	2.67	4.67
21	6	6	4	8	24	2	2.67	4.67
22*	6	6	4	8	24	2	2.67	4.67
23*	6	6	4	8	24	2	2.67	4.67
24	6	6	4	8	24	2	2.67	4.67
25*	6	6	4	8	24	2	2.67	4.67
26*	6	6	4	8	24	2	2.67	4.67
27**	6	6	4	8	24	2	2.67	4.67
28	6	6	4	8	24	2	2.67	4.67
29	6	6	4	8	24	2	2.67	4.67
31*	6	6	4	8	24	2	2.67	4.67
32	6	6	4	8	24	2	2.67	4.67
33	6	6	4	8	24	2	2.67	4.67
34	6	6	4	8	24	2	2.67	4.67
35	6	6	4	8	24	2	2.67	4.67

Table 1. Total Standardized Survey Effort by Point Count Station, April 2017 through March 2018—Burke County Wind Project (Burke County, North Dakota)

Point Count Station	Eagle Use Survey Standardized Effort (hours)					Avian Use Survey Effort (hours)		
	Winter	Spring	Summer	Fall	Total Hours	Spring	Fall	Total Hours
36	6	6	4	8	24	2	2.67	4.67
39	6	6	4	8	24	2	2.67	4.67
40	6	6	4	8	24	2	2.67	4.67
41	6	6	4	8	24	2	2.67	4.67
42	6	6	4	8	24	2	2.67	4.67
43	6	6	4	8	24	2	2.67	4.67
44	6	6	4	8	24	2	2.67	4.67
45	6	6	4	8	24	2	2.67	4.67
46	6	6	4	8	24	2	2.67	4.67
50	0	0	4	0	4	0	0	0
51	0	0	4	0	4	0	0	0
52	0	0	4	0	4	0	0	0
53	0	0	4	0	4	0	0	0
54	0	0	4	0	4	0	0	0
55	0	0	4	0	4	0	0	0
Grand Total	204	204	160	272	840	68	90.67	158.67

All point count stations in this table coincided with the original 300 MW project configuration.
 * Point count survey area coincides with the 200 MW Project (using layout dated December 2018).
 ** Point count survey area coincides with the 200 MW Project (using layout dated December 2018), but survey station outside of 200 MW Project.
 ^ Point #17 was inaccessible on March 7, 2018 due to inclement weather. Following winter storm protocols described in Atwell (2017b), point #15 was surveyed in point #17's place.
 Points #50–55 were added to the sample in June 2017 and were only surveyed during the summer period because of seasonal accessibility (see Section 2.2).
 Point numbering began at #10 to avoid single-digit identifiers.

A total of 840 standardized eagle use survey hours were completed as part the one-year eagle use survey (Table 1) for the Avian Use Study Area. A total of 360 standardized eagle use survey hours were completed at 15 points within 2,625 ft (800 m) of the 200 MW Project, and 288 standardized eagle use survey hours were completed at 12 points within the Project boundary.

For each raptor observation, including eagles, the following information was recorded:

- Raptor species
- Age
- Times at first and final observation
- Duration of the raptor observation (rounded to the nearest minute)
- Behavior
- Height of flight at first detection, and minimum and maximum flight height during observation within the standardized survey cylinder.

Additional data were recorded for each eagle observed during the standardized surveys, including the distance to initial eagle detection, closest distance to the detection, time of detection, duration of flight within the rotor-swept zone (RSZ) to the nearest 0.1 minute, and duration of flight within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder to the nearest full minute, rounded upward for fractions of a minute (e.g., eagle-minutes; USFWS 2013). Eagle flight paths were also mapped to document eagles’ directional movements within the survey area. While not part of the standardized survey protocol, these data were also recorded for incidental eagle observations where feasible.

At the conclusion of each eagle survey event, biologists confirmed that the data sheet was complete and legible and then proceeded to the next survey station.

2.3 Avian Use Surveys

Point count methodologies adhered to typical industry standard recommendations (National Wind Coordinating Committee 1999, Strickland et al. 2011) and those targeted specifically at providing collision risk due diligence. The same point count stations that were established for eagle use surveys were also used for the avian use surveys. However, the avian use surveys were conducted during the spring (March to May) and fall (August to November) migration periods. Avian point count surveys during the spring migration period were conducted between April 1 and May 31, 2017, and between March 1 and March 31, 2018. The fall migration avian point count surveys were conducted between August 1 and November 30, 2017. As with the timing of eagle use surveys (Section 2.2), points were divided into two subgroups; each subgroup was surveyed on alternating weeks, and each point was visited twice per month.

These survey periods coincide with the periods of highest expected avian use during the year. Point count methodology followed the ECPG but with minor adaptations to accommodate the capture of baseline avian use data for a wider array of avian taxa.

The point count protocol was designed to document diurnal horizontal and vertical bird movements through the Avian Use Study Area. For each point count station monitoring event, biologists conducted a 20-minute point count, recording all avian species detected during that period. Large-bodied birds detected within a 2,625 ft (800 m)–radius survey cylinder (0.77 square miles [2 km²]) and small-bodied birds detected within a 984 ft (300 m)–radius survey cylinder (0.11 square miles [0.28 km²]) were recorded. Small-bodied species include the passerine group (perching birds except large-bodied crows and ravens) and most non-passerine species (woodpeckers, doves, hummingbirds, swifts). Large-bodied species include all waterfowl, waterbirds (gulls, terns, cormorants, pelicans), wading birds (herons, cranes, ibises), shorebirds, upland gamebirds (pheasants, grouse, partridges), and some non-passerines and passerines (nightjars, Rock Pigeons [*Columba livia*], Pileated Woodpeckers [*Dryocopus pileatus*], and large-bodied corvids such as crows and ravens).

In total, avian use surveys were conducted over 68 cumulative hours during the spring survey periods in 2017 and 2018 and over 90.7 cumulative hours during the fall survey period in 2017. The surveys occurred over 30 cumulative hours during the spring survey periods in 2017 and 2018 at 15 points within 2,625 ft (800 m) of the Project, and over 24 cumulative hours at 12 points within the Project boundary. Avian use surveys occurred over 40 cumulative hours during the 2017 fall survey period at 15 points within 2,625 ft (800 m) of the Project, and over 32 cumulative hours during the fall 2017 survey period at 12 points within the Project boundary. Avian use survey effort for each point is summarized in Table 1.

The start and end times of the 20-minute observation period were recorded for each survey event. Surveys were conducted between dawn and dusk. For each bird observation (visual and auditory), biologists recorded the following information:

- Species
- Time at which the bird was first observed
- Number of associated individuals (where birds are observed as part of a pair or flock)
- Behavior
- Height of flight
- Distance from observer
- Habitat in which the bird was first observed.

At the conclusion of each 20-minute observation period/survey event, biologists confirmed that the data sheet was complete and legible and then proceeded to the next survey station.

2.4 Incidental Observations

Outside of standardized surveys, incidental avian data were recorded for raptors, eagles, and bird species of concern that were observed within the Avian Use Study Area. Attention was given to habitats that may act as local concentration points for a variety of avian taxa and potential habitat for bird species of concern. All observation locations were marked with a global positioning system (i.e., GPS), and species, number of individuals, and behaviors were recorded. Incidental detections included observations recorded while en route to surveys, birds observed outside the 2,625 ft (800 m)–radius, 656 ft (200 m)–high standardized survey cylinder during point count surveys, birds observed immediately outside the beginning and end of the point count survey’s duration, and birds observed during nonstandardized breeding bird surveys.

2.5 Data Management

The survey protocols described above were performed by five avian biologists over the course of the study. All completed data forms were proofread and photocopied, with data subsequently entered into an electronic database and proofread as part of a quality assurance/quality control program.

2.6 Data Analysis

2.6.1 Eagle Use Surveys

Eagle and avian use survey data were organized and analyzed with Microsoft Excel and Program R (R Core Team 2018). The following metrics were recorded in the field or calculated later using data collected from the eagle use surveys:

- *Seasonal mean use rate* for eagles and other raptors is the total number of individuals detected during standardized surveys per 2,625 ft (800 m)–radius plot per 20-minute survey segment. All three consecutive 20-minute segments of each point visit’s 60-minute count were used to calculate mean use rates. Reported as detections/800 m plot/20-minute point count segment, seasonal mean use rates are summarized for each individual point count station and averaged across all point count stations. Data were summarized in 20-minute segments rather than for the entire 60-minute visit for ease of data management and to allow comparison with avian use data that were also collected over 20-minute segments, if desired.
- *Raptor occurrence frequency* is the number of 20-minute survey segments during which a species was detected, divided by the total number of 20-minute survey segments conducted. Occurrence frequency is summarized by month and season. All three 20-minute

segments of each point visit's 60-minute count were used to calculate occurrence frequencies. Incidental detections are not included in occurrence frequency calculations.

- *Flight time* was recorded to the nearest 0.1 minute for duration of bird flight within the RSZ and less than 2,625 ft (800 m) from the survey point for all raptors. Following ECPG (USFWS 2013), eagle-minutes were also recorded for all Bald Eagle (*Haliaeetus leucocephalus*) and Golden Eagle (*Aquila chrysaetos*) detections. Eagle-minutes represent the duration of flight (to the nearest minute, rounded up for fractions) within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder.
- *Direction of movement* was recorded during the surveys to analyze seasonal patterns in movement. All Bald Eagle and Golden Eagle detections within the survey cylinder were also plotted on 328 x 328 ft (100 x 100 m) gridded maps to document flight paths through the survey cylinder.
- *Raptor species percent composition* is the total number of observed individuals of the taxon divided by the total number of raptors observed during the survey period. Incidental detections are not included in percent composition calculations.

2.6.2 Avian Use Surveys

For data collected during the avian use surveys, the seasonal mean use rate represents the total number of individuals detected during standardized surveys per 2,625 ft (800 m)–radius plot per 20-minute survey for large-bodied species, and the total number of individuals detected per 984 ft (300 m)–radius plot per 20-minute survey for small-bodied species. Reported as detections/800 m plot/20-minute count segment for large-bodied species and detections/300 m plot/20-minute count segment for small-bodied species, seasonal mean use rates are summarized for each individual point count station and averaged across all point count stations. Flight heights are likewise reported for flights recorded within the 2,625 ft (800 m)–radius plot for large-bodied species and within the 984 ft (300 m)–radius plot for small-bodied species.

2.6.3 North Dakota Species of Conservation Priority

The North Dakota State Wildlife Action Plan (Dyke et al. 2015) lists Species of Conservation Priority (SCP), including avian SCP species. Under this plan, species are classified according to their conservation priority. Level I species have a high conservation priority because of declining status in North Dakota or across their range, or because North Dakota represents a core segment of their breeding range. Level II species have moderate conservation priority or may hold a high conservation priority, but a substantial level of non-State Wildlife Grant funding may be available for their conservation. Level III species have moderate conservation priority but are peripheral or nonbreeding in North Dakota.

3.0 RESULTS AND DISCUSSION

Eagle use survey results, along with discussion regarding annual and seasonal patterns, spatial distribution (where sample size allowed), directional movements, and flight heights are presented in Sections 3.1 and 3.2. Monthly occurrences, frequencies, and flight heights for all spring and fall avian use are discussed in Section 3.3. All survey results are presented for the 200 MW Project as well as for the entire Avian Use Study Area.

3.1 Bald Eagle Use

3.1.1 Overall Detections

Across the Avian Use Study Area, 24 Bald Eagles were detected over 840 hours of standardized eagle use survey effort (Table 2). This total includes several detections that were the same individual counted twice in concurrent 20-minute count segments. Accounting for this potential duplication, 21 discrete Bald Eagle observations that occurred within the standardized survey cylinder during point count surveys are mapped on Figure 2 (**Appendix I**). While these totals only include eagles observed within the 2,625 ft (800 m)–radius, 656 ft (200 m)–high survey cylinder, an additional 26 incidental detections were documented across the Avian Use Study Area during the one-year survey period, including detections outside the survey cylinder during point count surveys and detections recorded while en route to point count stations.

Six of the 24 standardized Bald Eagle detections occurred over 360 hours of standardized eagle use survey effort at the 15 point count stations with survey cylinders that intersected the Project (Table 3). Seven incidental Bald Eagle detections occurred within the Project. Bald Eagle totals are depicted by season, separated by detection type (standardized survey or incidental) within the Project and the Avian Use Study Area, in Figure 3 (**Appendix I**).

3.1.2 Seasonality

Bald Eagles were only recorded as standardized detections during the spring and fall surveys. Surveyors did not observe Bald Eagles during summer surveys, and Bald Eagles were only recorded as incidental detections during winter surveys. Within the Avian Use Study Area, standardized mean use was 0.013 Bald Eagle detections/800 m plot/20-minute survey segment (standard deviation [SD] = 0.114) during the spring survey period and 0.020 Bald Eagle detections/800 m plot/20-minute survey segment (SD = 0.170) during the fall period (Table 2). Within the Project, spring standardized mean use was 0.016 Bald Eagle detections/800 m plot/20-minute survey segment (SD = 0.105) and fall standardized mean use was 0.010 Bald Eagle detections/800 m plot/20-minute count segment (Table 3). Monthly species-specific occurrence frequencies, depicted in Figure 4 (**Appendix I**), provide additional seasonal context for raptor use of the Avian Use Study Area by charting frequency of occurrence for the most common raptor species across the year.

Accounting for the total eagle use survey effort across the Avian Use Study Area during the spring survey period, the equivalent of one Bald Eagle was detected for every 25.6 hours of standardized eagle use survey effort. During the fall survey period, the equivalent of one Bald Eagle was detected for every 16.7 hours of standardized eagle use survey effort.

Accounting for total eagle use survey effort across the Project (15 points with survey cylinders intersecting the Project, 90 spring survey hours, and 120 fall hours) one Bald Eagle was detected within the Project for every 30 hours of standardized eagle use survey effort during the spring. One Bald Eagle was detected within the Project for every 40 hours of standardized eagle use surveys during the fall.

3.1.3 Other Raptor Use

Observed Bald Eagle seasonal use patterns indicated slightly higher eagle use in the fall than the spring and low levels of eagle use in the summer and winter. These use patterns generally paralleled the seasonal use patterns for the raptor guild (hawks, eagles, falcons, and owls) (Tables 2 and 3). Mean raptor use was:

- *highest* during the fall period (Project: 0.861 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.787 raptors/800 m plot/20-minute survey segment; SD = 1.451),
- *similar* during the spring (Project: 0.700 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.760 raptors/800 m plot/20-minute survey segment; SD = 1.266),
- *low* in the summer (Project: 0.411 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.452 raptors/800 m plot/20-minute survey segment; SD = 0.803), and
- *very low* during the winter period (Project: 0.56 raptors/800 m plot/20-minute survey segment; Avian Use Study Area: mean use = 0.039 raptors/800 m plot/20-minute survey segment; SD = 0.203).

A total of 24 raptors were observed over 204 hours of standardized eagle use surveys across the Avian Use Study Area during the winter.

Among the raptor guild as a whole, Red-tailed Hawks (*Buteo jamaicensis*) and Northern Harriers (*Circus cyaneus*) comprised much of the raptor use during the spring and fall (Tables 2 and 3). Swainson's Hawks (*Buteo swainsoni*), which arrived in migration later in the spring, comprised much of the summer raptor use. Rough-legged Hawks (*Buteo lagopus*), which arrived in fall migration, comprised much of the winter use. Winter raptor use of the Project was minimal once wintering Rough-legged Hawks moved south of the Project, during the coldest part of the season.

3.1.4 Spatial Distribution of Detections

Bald Eagle mean use rates were uniformly low across the Avian Use Study Area and the 200 MW Project. There was not a clear spatial pattern to eagle detections within the spring or fall, the seasons in which they were detected during standardized surveys. There was no evidence from the pattern of observations of eagles that physiographic features such as ridgelines were concentrating eagle use within specific areas of the Project; this lack of a spatial pattern in the spring and fall suggests that Bald Eagles migrate through the Avian Use Study Area in a broad front. Bald Eagle mean use in the spring and fall is graphically depicted in the Bald Eagle Mean Use Map (Figure 5a, **Appendix I**).

For additional context, a review of the raptor guild's larger sample size shows that raptors as a whole did not exhibit strong inter-seasonal patterns of spatial use within the Avian Use Study Area that might suggest local concentrations of use. However, point count stations with the highest spring and summer raptor use rates tended to be in the portion of the Avian Use Study Area to the east of the Project (Figure 5b, **Appendix I**). In contrast, the four point count stations (stations #25, 16, 11, and 27) with the highest observed mean use rates during the fall were within the western portion of the Avian Use Study Area, within or adjacent to the Project.

Table 2. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/ Species Name	Spring					Summer					Fall					Winter				
	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD.	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot/ 20 min)	SD	Occur. Freq.
American Kestrel ^b	10	0.022	0.016	0.127	0.016	2	0.009	0.004	0.064	0.004	14	0.022	0.017	0.148	0.015	-	-	-	-	-
Bald Eagle ^b	8	0.017	0.013	0.114	0.013	-	-	-	-	-	16	0.025	0.020	0.170	0.015	-	-	-	-	-
Broad-winged Hawk	1	0.002	0.002	0.040	0.002	-	-	-	-	-	25	0.039	0.031	0.584	0.007	-	-	-	-	-
Cooper's Hawk	5	0.011	0.008	0.090	0.008	4	0.018	0.008	0.091	0.008	12	0.019	0.015	0.130	0.013	-	-	-	-	-
Ferruginous Hawk ^a	-	-	-	-	-	-	-	-	-	-	4	0.006	0.005	0.070	0.005	-	-	-	-	-
Golden Eagle ^b	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	1	0.042	0.002	0.040	0.002
Great Horned Owl	5	0.011	0.008	0.090	0.008	1	0.005	0.002	0.046	0.002	3	0.005	0.004	0.078	0.002	-	-	-	-	-
Merlin	4	0.009	0.007	0.081	0.007	-	-	-	-	-	6	0.009	0.007	0.085	0.007	-	-	-	-	-
Northern Goshawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.042	0.002	0.040	0.002
Northern Harrier ^b	171	0.368	0.279	0.686	0.186	26	0.120	0.054	0.236	0.052	154	0.240	0.189	0.484	0.158	-	-	-	-	-
Osprey	1	0.002	0.002	0.040	0.002	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Peregrine Falcon ^c	3	0.006	0.005	0.070	0.005	1	0.005	0.002	0.046	0.002	-	-	-	-	-	-	-	-	-	-
Prairie Falcon ^b	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Red-tailed Hawk	201	0.432	0.328	0.808	0.203	136	0.627	0.283	0.655	0.219	296	0.461	0.363	0.802	0.234	-	-	-	-	-
Rough-legged Hawk	2	0.004	0.003	0.057	0.003	-	-	-	-	-	54	0.084	0.066	0.344	0.047	11	0.458	0.018	0.145	0.016
Sharp-shinned Hawk	6	0.013	0.010	0.099	0.010	-	-	-	-	-	15	0.023	0.018	0.152	0.016	-	-	-	-	-
Short-eared Owl ^b	1	0.002	0.002	0.040	0.002	-	-	-	-	-	-	-	-	-	-	3	0.125	0.005	0.070	0.005
Snowy Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.167	0.007	0.081	0.007
Swainson's Hawk ^a	34	0.073	0.056	0.263	0.049	44	0.203	0.092	0.329	0.079	28	0.044	0.034	0.235	0.025	-	-	-	-	-
Turkey Vulture	10	0.022	0.016	0.161	0.011	3	0.014	0.006	0.079	0.006	10	0.016	0.012	0.140	0.009	-	-	-	-	-
Unknown Accipiter	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	-	-	-	-	-
Unknown Eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.125	0.005	0.070	0.005
Unknown Falcon	-	-	-	-	-	-	-	-	-	-	1	0.002	0.001	0.035	0.001	1	0.042	0.002	0.040	0.002
Unknown Owl Species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown Raptor	3	0.006	0.005	0.070	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Raptors	465	1.000	0.760	1.266	0.389	217	1.000	0.452	0.803	0.327	642	1.000	0.787	1.451	0.420	24	1.000	0.039	0.203	0.038

Seasonal mean use statistics by species

- *Total Standard Detections* = total number of detections occurring within the 800 m-radius survey cylinder during standardized use surveys
- Detection totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point.
- *Composition* = fraction of species composition using total standardized detections
- *Mean Use* = total standardized detections divided by number of point count segments conducted within the season, with standard deviation (SD)
- *Occurrence Frequency* = the number of segments at which the taxon was detected divided by the total number of segments conducted during that season
- North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table 3. Raptor Survey Seasonal Use Summary Statistics within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Summer					Fall					Winter				
	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20-min)	SD	Occur. Freq.	Total Std. Detections	Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.	Total Std. Detections	%Comp.	Mean Use (birds/ 800 m plot /20 min)	SD	Occur. Freq.
American Kestrel b	2	0.011	0.007	0.086	0.007	-	-	-	-	-	7	0.023	0.019	0.157	0.017	-	-	-	-	-
Bald Eagle b	3	0.016	0.011	0.105	0.011	-	-	-	-	-	3	0.010	0.008	0.118	0.006	-	-	-	-	-
Broad-winged Hawk	-	-	-	-	-	-	-	-	-	-	18	0.058	0.050	0.846	0.008	-	-	-	-	-
Cooper's Hawk	3	0.016	0.011	0.105	0.011	2	0.027	0.011	0.105	0.011	7	0.023	0.019	0.157	0.017	-	-	-	-	-
Ferruginous Hawk a	-	-	-	-	-	-	-	-	-	-	2	0.006	0.006	0.074	0.006	-	-	-	-	-
Golden Eagle b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
Great Horned Owl	2	0.011	0.007	0.086	0.007	-	-	-	-	-	3	0.010	0.008	0.118	0.006	-	-	-	-	-
Merlin	1	0.005	0.004	0.061	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Goshawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
Northern Harrier b	69	0.365	0.256	0.683	0.174	8	0.108	0.044	0.232	0.039	76	0.245	0.211	0.528	0.175	-	-	-	-	-
Osprey	-	-	-	-	-	-	-	-	-	-	1	0.003	0.003	0.053	0.003	-	-	-	-	-
Peregrine Falcon c	1	0.005	0.004	0.061	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rough-legged Hawk	2	0.011	0.007	0.086	0.007	-	-	-	-	-	26	0.084	0.072	0.395	0.047	6	0.400	0.022	0.148	0.022
Red-tailed Hawk	82	0.434	0.304	0.779	0.189	53	0.716	0.294	0.536	0.256	135	0.435	0.375	0.773	0.247	-	-	-	-	-
Sharp-shinned Hawk	4	0.021	0.015	0.121	0.015	-	-	-	-	-	8	0.026	0.022	0.181	0.017	-	-	-	-	-
Short-eared Owl b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.133	0.007	0.086	0.007
Snowy Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.267	0.015	0.121	0.015
Swainson's Hawk a	16	0.085	0.059	0.266	0.052	11	0.149	0.061	0.262	0.056	19	0.061	0.053	0.308	0.033	-	-	-	-	-
Turkey Vulture	4	0.021	0.015	0.149	0.011	-	-	-	-	-	5	0.016	0.014	0.158	0.008	-	-	-	-	-
Falcon sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.067	0.004	0.061	0.004
All Raptors	189	-	0.700	1.205	0.378	74	--	0.411	0.641	0.333	310	-	0.861	1.730	0.444	15	-	0.056	0.229	0.056

Seasonal mean use statistics by species

- *Total Standard Detections* = total number of detections occurring within the 800 m-radius survey cylinder during standardized use surveys
- Detection totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point.
- *Composition* = fraction of species composition using total standardized detections
- *Mean Use* = total standardized detections divided by number of point count segments conducted within the season, with standard deviation (SD)
- *Occurrence Frequency* = the number of segments at which the taxon was detected divided by the total number of segments conducted during that season
- North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

3.1.5 Directional Movements

Rose plots provide a broad-scale view of directional movement patterns throughout the Avian Use Study Area (Figures 6a and 6b [Appendix I]). These figures plot frequencies of directional movement among eagles observed during standardized surveys by season. Green-shaded ‘petals’ provide an illustrated assessment of each cardinal direction’s relative dominance among movements captured in the sample. The strongest trends were for Bald Eagle movements—north-northwestward in the spring and southward in the fall. These patterns are expected for individuals encountered during their migrations, suggesting that the Bald Eagles observed during the standardized surveys were migratory, not wintering or breeding within or near the Avian Use Study Area. Directional movement plots are only provided for the Avian Use Study Area because of low sample sizes recorded within the 200 MW Project.

3.1.6 Flight Heights

Tables 4 and 5 summarize the mean distributions of minimum and maximum flight heights for raptor species with the largest sample sizes detected during standardized eagle use surveys. These two tables detail seasonal flight heights within the Avian Use Study Area and at 15 points with survey cylinders that intersect the Project, respectively. The following is a summary of flight height results.

- Spring – Mean flight heights within the Project and the larger Avian Use Study Area were highest during the spring survey period for Bald Eagles and most other raptor species (Tables 4 and 5). Bald Eagle mean minimum and maximum flight heights were within the RSZ during the spring period, within both the Project and the larger Avian Use Study Area. Within the Project, minimum and maximum mean flight heights were within the RSZ for Cooper’s Hawk (*Accipiter cooperii*), the Red-tailed Hawk, and the Rough-legged Hawk. Mean maximum flight height was within the RSZ for the Swainson’s Hawk. Mean minimum and maximum flight heights were below the RSZ for the American Kestrel (*Falco sparverius*) and Northern Harrier.
- Summer – Bald Eagles were not recorded during standardized surveys in the summer. Within the Project, both minimum and maximum mean flight heights were within the RSZ for Swainson’s Hawk (Table 5). Swainson’s Hawk flight heights were lower across the greater Avian Use Study Area (Table 4), and mean minimum flight height was below the RSZ. Mean maximum flight height was within the RSZ for the Red-tailed Hawk in both the Project and the Avian Use Study Area. Mean flight heights were below the RSZ for Cooper’s Hawk and the Northern Harrier.
- Fall – Within the Project, Bald Eagle minimum and maximum mean flight heights were below the RSZ. Mean minimum and maximum flight heights were within the RSZ for the Broad-winged Hawk (*Buteo platypterus*), and mean maximum flight height was within the

RSZ for the Red-tailed Hawk and Cooper's Hawk. Mean minimum and maximum flight heights were below the RSZ for the American Kestrel, Ferruginous Hawk (*Buteo regalis*), Northern Harrier, and Rough-legged Hawk. A lone Golden Eagle that was observed during standardized surveys outside the Project but within the Avian Use Study Area was recorded within the RSZ.

- Winter – There were no standardized detections of Bald Eagles during the winter period. Mean maximum flight heights were within the RSZ for the Golden Eagle and Rough-legged Hawk within both the Project and the greater Avian Use Study Area.
- Within the Project, Bald Eagle mean maximum flight height was 191.37 ft (58.33 m). Bald Eagle mean minimum flight height was 76.02 ft (23.17 m). Within the Avian Use Study Area, Bald Eagle mean maximum flight height was 201.15 ft (61.31 m). Bald Eagle mean minimum flight height was 91.57 ft (27.91 m).

Table 4. Raptor Mean Flight Heights within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species	Flight Height	Spring					Summer					Fall					Winter					Year				
		Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound
American Kestrel ^b	Min	3	10.00	8.66	-11.51	31.51	1	2.00	-	2.00	2.00	8	17.13	29.72	-7.71	41.97	-	-	-	-	-	12	14.08	24.50	-1.49	29.65
	Max	10	13.20	3.16	10.94	15.46	2	6.00	-	6.00	6.00	14	16.93	22.98	3.66	30.20	-	-	-	-	-	26	14.65	16.97	7.79	21.51
Bald Eagle ^b	Min	8	51.25	29.97	26.19	77.44	-	-	-	-	-	14	14.57	15.40	5.68	23.46	-	-	-	-	-	22	27.91	27.79	15.59	40.23
	Max	8	110.63	64.72	45.91	164.74	-	-	-	-	-	15	35.00	22.07	22.78	47.22	-	-	-	-	-	23	61.31	54.76	37.63	84.99
Broad-winged Hawk	Min	-	-	-	-	-	-	-	-	-	-	9	53.89	48.78	16.39	91.39	-	-	-	-	-	9	53.89	48.78	16.39	91.39
	Max	1	12.00	-	12.00	12.00	-	-	-	-	-	9	73.89	63.82	24.83	122.95	-	-	-	-	-	10	67.70	63.28	22.43	112.97
Cooper's Hawk	Min	5	54.40	69.47	-15.07	140.66	4	15.00	14.63	-8.28	38.28	12	45.75	82.51	-6.68	98.18	-	-	-	-	-	21	41.95	70.25	9.97	73.93
	Max	5	69.20	61.48	7.72	145.53	4	23.00	19.70	-8.34	54.34	12	57.33	81.04	5.84	108.82	-	-	-	-	-	21	53.62	68.43	22.47	84.77
Ferruginous Hawk ^a	Min	-	-	-	-	-	-	-	-	-	-	4	15.75	16.30	-10.18	41.68	-	-	-	-	-	4	15.75	16.30	-10.18	41.68
	Max	-	-	-	-	-	-	-	-	-	-	4	31.25	16.52	4.97	57.53	-	-	-	-	-	4	31.25	16.52	4.97	57.53
Golden Eagle ^b	Min	-	-	-	-	-	-	-	-	-	-	1	45.00	0.00	45.00	45.00	1	15.00	-	15.00	15.00	2	30.00	21.21	-160.59	220.59
	Max	-	-	-	-	-	-	-	-	-	-	1	80.00	0.00	80.00	80.00	1	60.00	-	60.00	60.00	2	70.00	14.14	-57.06	197.06
Northern Harrier ^b	Min	149	11.34	25.08	7.28	15.40	24	4.54	7.84	1.23	7.85	145	4.55	17.81	1.63	7.47	-	-	-	-	-	318	7.73	21.30	5.38	10.08
	Max	170	23.04	35.81	17.62	28.46	26	10.92	11.56	6.25	15.59	153	10.35	23.76	6.55	14.15	-	-	-	-	-	349	16.58	30.31	13.39	19.77
Red-tailed Hawk	Min	162	40.85	47.71	33.45	48.25	91	25.65	22.92	20.88	30.42	230	33.04	40.40	27.79	38.29	-	-	-	-	-	483	34.27	40.78	30.62	37.92
	Max	186	55.95	54.69	48.04	63.86	113	36.40	24.43	31.85	40.95	279	41.42	41.24	36.56	46.28	-	-	-	-	-	578	45.11	44.20	41.50	48.72
Rough-legged Hawk	Min	2	67.50	60.10	-472.51	607.51	-	-	-	-	-	39	14.23	10.93	10.69	17.77	4	26.25	18.87	-3.78	56.28	45	17.67	18.43	12.14	23.20
	Max	2	90.00	70.71	-545.30	725.30	-	-	-	-	-	51	28.41	13.75	24.54	32.28	7	45.00	22.91	23.81	66.19	60	32.40	21.06	26.96	37.84
Swainson's Hawk ^a	Min	32	27.00	24.56	35.86	18.14	36	27.17	30.73	37.57	16.77	22	28.64	30.28	22.07	42.07	-	-	-	-	-	90	27.47	28.25	33.39	21.55
	Max	34	45.50	28.62	55.49	35.51	41	39.54	35.66	50.79	28.29	25	57.40	65.36	84.20	30.60	-	-	-	-	-	100	46.03	43.27	54.62	37.44

Seasonal mean flight height statistics by raptor species. Flight heights recorded within the 800 m-radius survey cylinder during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Sample size totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III. CI = confidence interval; SD = standard deviation

Table 5. Raptor Mean Flight Heights within the Burke County Wind Project (Burke County, North Dakota)

Species	Flight Height	Spring					Summer					Fall					Winter					Year				
		Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	Upper 95% CI Bound	Lower 95% CI Bound
American Kestrel ^b	Min	2	12.50	10.61	107.80	-82.80	-	-	-	-	-	5	26.00	35.78	70.42	-18.42	-	-	-	-	-	7	22.14	30.26	50.13	-5.84
	Max	2	17.50	3.54	49.27	-14.27	-	-	-	-	-	7	26.29	30.52	54.51	-1.94	-	-	-	-	-	9	24.33	26.74	44.89	3.78
Bald Eagle ^b	Min	3	41.67	2.89	48.84	34.50	-	-	-	-	-	3	4.67	4.73	16.41	-7.07	-	-	-	-	6	23.17	20.57	44.75	1.58	
	Max	3	93.33	83.86	301.67	-115.00	-	-	-	-	-	3	23.33	2.89	30.50	16.16	-	-	-	-	6	58.33	65.47	127.04	-10.38	
Broad-winged Hawk	Min	-	-	-	-	-	-	-	-	-	-	4	86.25	49.56	165.11	7.39	-	-	-	-	4	86.25	49.56	165.11	7.39	
	Max	-	-	-	-	-	-	-	-	-	-	4	117.50	71.36	231.04	3.96	-	-	-	-	4	117.50	71.36	231.04	3.96	
Cooper's Hawk	Min	3	47.33	80.25	246.69	-152.02	2	13.00	16.97	165.47	-139.47	7	28.14	21.57	48.10	8.19	-	-	-	-	12	30.42	39.84	55.73	5.10	
	Max	3	52.00	76.32	241.58	-137.58	2	22.00	25.46	250.71	-206.71	7	38.43	29.11	65.35	11.50	-	-	-	-	12	39.08	40.98	65.12	13.05	
Ferruginous Hawk ^a	Min	-	-	-	-	-	-	-	-	-	-	2	25.00	21.21	215.59	-165.59	-	-	-	-	2	25.00	21.21	215.59	-165.59	
	Max	-	-	-	-	-	-	-	-	-	-	2	32.50	24.75	254.86	-189.86	-	-	-	-	2	32.50	24.75	254.86	-189.86	
Golden Eagle ^b	Min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	15.00	-	15.00	15.00	1	15.00	-	15.00	15.00
	Max	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	60.00	-	60.00	60.00	1	60.00	-	60.00	60.00
Northern Harrier ^b	Min	59	9.00	11.60	12.02	5.98	8	1.13	0.35	1.42	0.83	71	6.37	25.00	12.28	0.45	-	-	-	-	138	7.19	19.50	10.47	3.91	
	Max	69	26.52	34.67	34.85	18.19	8	6.63	3.02	9.15	4.10	76	11.88	31.95	19.18	4.58	-	-	-	-	153	18.21	33.17	23.51	12.91	
Red-tailed Hawk	Min	73	37.42	35.12	45.62	29.23	35	29.91	26.21	38.92	20.91	103	34.61	36.40	41.73	27.50	-	-	-	-	211	34.81	34.41	39.48	30.14	
	Max	80	58.36	46.67	68.75	47.98	44	41.27	27.65	49.68	32.87	126	43.63	39.88	50.67	36.60	-	-	-	-	250	47.93	40.91	53.03	42.84	
Rough-legged Hawk	Min	2	67.50	60.10	607.51	-472.51	-	-	-	-	-	16	15.44	14.06	22.93	7.94	3	33.33	15.28	71.28	-4.61	21	22.95	24.74	34.21	11.69
	Max	2	90.00	70.71	725.31	-545.31	-	-	-	-	-	24	28.75	14.55	34.89	22.61	5	50.00	25.50	81.66	18.34	31	36.13	26.17	45.73	26.53
Swainson's Hawk ^a	Min	16	28.75	23.27	41.15	16.35	11	45.91	37.20	70.90	20.92	14	33.93	34.98	54.13	13.73	-	-	-	-	41	35.12	31.55	45.08	25.16	
	Max	16	49.50	28.57	64.72	34.28	11	61.36	44.11	91.00	31.73	17	66.47	77.69	106.41	26.53	-	-	-	-	44	59.02	55.13	75.79	42.26	

Seasonal mean flight height statistics by raptor species. Flight heights recorded within 800 m-radius survey cylinder during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Sample size totals are cumulative and occasionally may double-count individuals across concurrent 20-minute segments at the point. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III. CI = confidence interval; SD = standard deviation

3.2 Golden Eagles

Overall, two Golden Eagles were detected during 840 hours of eagle use surveys within the Avian Use Study Area, and one was observed during 360 hours of eagle use surveys at 15 points within or immediately adjacent to the Project (Figure 2, **Appendix I**). Within the Avian Use Study Area, standardized mean use was 0.001 Golden Eagles/800 m plot/20-minute count segment (SD = 0.035) during the fall and 0.002 Golden Eagles/800 m plot/20-minute count segment (SD = 0.040) during the winter. Within the Project, mean use was 0.004 Golden Eagles/800 m plot/20-minute count segment during the winter, the only season they were encountered within the Project on standardized surveys. The single Golden Eagle observed during the fall spent 2.4 minutes within the RSZ, and the Golden Eagle observed during the winter spent 2.1 minutes within the RSZ. An additional six Golden Eagles were incidentally detected within the Avian Use Study Area. Four of these incidental detections were recorded within the Project or immediately adjacent to the Project boundary (Figure 2, **Appendix I**).

The following is a summary of seasonal Golden Eagle observations, as depicted in Figure 2:

- Spring – Three Golden Eagles were observed during the spring survey period; however, each Golden Eagle was observed incidental to standardized use surveys, either outside the 2,625 ft (800 m)–radius survey cylinders or recorded while en route to survey locations within the Avian Use Study Area. One of these incidental spring detections was recorded near the Project boundary—an adult flying northward in May.
- Summer – No Golden Eagles were observed during the summer.
- Fall – Four Golden Eagles were detected during the fall migration survey period. One immature individual was observed during standardized eagle use surveys outside the Project, heading northward. The other three individuals were observed incidentally within the Project; the observations were made either outside the 2,625 ft (800 m)–radius survey cylinders or recorded while en route between point count stations.
- One adult Golden Eagle was observed during the winter period, during standardized eagle use surveys within the Project.

In total, two adults, two immatures, and four unaged Golden Eagles were observed within the Avian Use Study Area. Two adults, one immature, and two unaged individuals were observed within the Project. In contrast to Bald Eagles, Golden Eagles observed during the study period did not generally follow expected directional movements (e.g., northbound in the spring and southbound in the fall [Atwell data]). While sample sizes are small, this pattern suggests that the Golden Eagles seen during the study period were not migrating at the time of observation.

3.3 Avian Use

The following sections summarize the results of the avian use studies.

3.3.1 Federally Listed Threatened and Endangered Species

Standardized spring and fall avian use surveys did not detect the presence of any federal threatened/endangered species using Project habitats during migration. An incidental observation of three Whooping Cranes (*Grus americana*) migrating northbound over the Project occurred on April 10, 2017, in Leaf Mountain Township, Burke County (Atwell 2017a). These cranes were not observed flying through the RSZ, nor were they observed as a standing flock within Project stopover habitat.

3.3.2 General Avian Use

Standardized mean use and avian point count data for all 142 species observed during 20-minute avian use point count surveys in the spring and fall are presented in **Appendix II**. A list of all species observed during the avian use studies is included in **Appendix III**. Data are grouped into four broad groups: waterfowl; waterbirds (pelicans, grebes, waders, coots and rails, cranes, shorebirds, gulls); raptors (hawks, eagles, vultures, owls, falcons); and land birds (upland gamebirds, non-passerines such as kingfishers and woodpeckers, and passerines).

The following is a summary of observed avian use:

- Avian use tended to be higher during the fall season than during the spring, an expected pattern in North America (Dokter et al. 2018). Exceptions included the Laughing Gull (*Leucophaeus pipixcan*) and Black Tern (*Chlidonias niger*).
- During the spring migration avian use surveys, 7,798 total individuals were detected across the Avian Use Study Area, at a rate of approximately 38.2 birds/800 m plot/20-minute count segment. Across the Project, 3,831 total individuals were detected, at a rate of approximately 42.6 birds/800 m plot/20-minute point count segment. This does not include the raptor guild, discussed in Section 3.1.3.
- During the fall migration avian use surveys, 15,149 total individuals were detected, at a rate of approximately 55.7 birds/800 m plot/20-minute count segment. Across the Project, 8,711 total individuals were detected at a rate of 72.59 birds/800 m plot/20-minute point count segment. This does not include the raptor guild, discussed in Section 3.1.3.

Comparing avian mean use rates drawn from the Project area with the larger Avian Use Study Area, mean use rates for pothole and wetland-associated species (groups including waterfowl, wading birds such as herons and cranes, shorebirds, and other waterbirds such as gulls, coots, and cormorants) were generally similar across the Project and the Avian Use Study Area in the spring and fall, suggesting that pothole and wetland habitat availability was similar within the Project in comparison to the larger Avian Use Study Area. Sandhill Crane (*Grus canadensis*) mean use rates

were notably lower outside the Project. The 10 largest observed congregations of cranes (21–170 individuals) were migrating flocks observed in flight from point count station #31 on the edge of the Project and eastward.

Sharp-tailed Grouse (*Tympanuchus phasianellus*; SCP) were rarely seen during avian use surveys and were observed at similar rates within the Project and the Avian Use Study Area. Among other SCP associated with grassland habitats, mean use rates tended to be lower in the Project than in the Avian Use Study Area, suggesting that the Project is avoiding higher-quality grassland habitats found within the larger Avian Use Study Area. Sprague's Pipits (*Anthus spragueii*) were only observed within the Avian Use Study Area and not within the Project during avian use surveys, and Western Meadowlarks (*Sturnella neglecta*) and Bobolinks (*Dolichonyx oryzivorus*) were observed at lower rates in the Project than in the Avian Use Study Area (Appendix II).

Passerine mean use rates were higher in the Project than the larger Avian Use Study Area, particularly in the fall. Large concentrations of common passerine species (e.g., Common Grackle [*Quiscalus quiscula*] and Red-winged Blackbirds [*Agelaius phoeniceus*]) observed near or in agricultural habitats within the Project accounted for much of this difference.

The waterfowl and passerine guilds comprised the largest proportions of non-raptor detections in the spring and fall. Within the Project, passerines accounted for 50.6% of all non-raptor detections in the spring and 60.3% in the fall. Within the Avian Use Study Area, passerines accounted for 44.5% of all non-raptor detections in the spring and 45.5% during the fall. Within the Project, waterfowl accounted for 30.1% of all non-raptor detections during the fall and 26.4% during the spring. Within the Avian Use Study Area, waterfowl accounted for 33.1% of all non-raptor detections during the spring and 36.3% during the fall.

The following guild summaries describe mean use statistics, also presented in Tables A through H (Appendix II).

Large-Bodied Corvids

Large-bodied corvid (i.e., crows and ravens) mean use rates within the Avian Use Study Area were similar between the spring (0.377 detections/800 m plot/20-minute count segment) and the fall (0.294 detections/800 m plot/20-minute count segment). Large-bodied corvid mean use rates were lower within the Project (0.289 detections/800 m plot/20-minute count segment during the spring and 0.108 detections/800 m plot/20-minute count segment in the fall). This guild represented 1.0% of all non-raptor spring detections and 0.6% of all non-raptor fall detections in the Avian Use Study Area and 0.7% of all non-raptor spring detections and 0.1% of all non-raptor fall detections within the Project. Most corvid detections (Project: 80.8% of spring corvid detections and 61.5% of fall corvid detections; Avian Use Study Area: 86.8% of spring corvid detections and 70.9% of fall corvid detections) were American Crows (*Corvus brachyrhynchos*).

Non-Passerines

Non-passerines include woodpeckers, doves, pigeons, and swifts. Rock Pigeons (*Columba livia*) were classified as large-bodied passerines and detections were recorded to 800 m from the point count station. Other non-passerine species were classified as small-bodied, with detections recorded up to 300 m from the point count station. Rock Pigeon mean use detection rates were higher in the fall (Project: 0.850 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.787 detections/800 m plot/20-minute count segment) than in the spring (Project: 0.589 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.417 detections/800 m plot/20-minute count segment). Non-passerines represented 1.6% of spring non-raptor detections and 2.2% of fall non-raptor detections. Most non-passerine detections (66.4% of spring non-passerine detections and 62.9% of fall non-passerine detections) were Rock Pigeons.

Passerines Including Small-Bodied Corvids

Small-bodied passerine species (perching birds) accounted for a large portion of non-raptor detections both in the spring (Project: 50.6%; Avian Use Study Area: 44.5%) and in the fall (Project: 60.3%; Avian Use Study Area: 45.5%). Observers recorded mean use rates of 21.544 small-bodied passerines/800 m plot/20-minute count segment during the spring and 43.742 small-bodied passerines/800 m plot/20-minute count segment in the fall within the Project. Within the Avian Use Study Area, observers recorded mean use rates of 17.020 small-bodied passerines/800 m plot/20-minute count segment in the spring and 25.324 small-bodied passerines/800 m plot/20-minute count segment in the fall.

Sixty small-bodied passerine species were recorded during standardized avian use surveys. Common Grackles (Project: 8.5% of spring passerine detections and 51.5% of fall passerine detections; Avian Use Study Area: 7.8% of spring passerine detections and 43.4% of fall passerine detections) and Red-winged Blackbirds (Project: 19.5% of spring passerine detections and 19.6% of fall passerine detections; Avian Use Study Area: 22.1% of spring passerine detections and 20.8% of fall passerine detections) accounted for large proportions of passerine detections in the spring and fall.

Large congregations of Common Grackles, Red-winged Blackbirds, and longspurs played an important role in an observed pattern of higher passerine mean use rates within the Project relative to the Avian Use Study Area, particularly during the fall season. In September 2017, 2,500 Common Grackles were recorded during one visit at point #31, and 325 Red-winged Blackbirds were recorded during one visit at point #27. In October, a flock of 600 longspurs (observed at distance and only assessed to the generic level rather than species) were recorded during one visit at point #11. These three survey events combined to represent 65% of the cumulative total all fall passerine detections within the Project.

Shorebirds

Shorebirds were observed at similar mean use rates in the spring (Project: 1.600 spring detections/800 m plot/20-minute count segment; Avian Use Study Area: 1.475 spring detections/800 m plot/20-minute count segment) and in the fall (Project: 2.392 fall detections/800 m plot/20-minute count segment; Avian Use Study Area: 1.574 spring detections/20-minute count segment). Shorebirds accounted for 7.4% of non-raptor detections within the Project in the spring and 5.5% in the fall, and 3.9% of non-raptor detections within the Avian Use Study Area in the spring and 2.8% in the fall.

Upland Gamebirds

Upland gamebirds were uncommon during avian use surveys, with observed mean use rates of 0.178 detections/800 m plot/20-minute count segment in the spring and 0.075 detections/800 m plot/20-minute count segment in the fall within the Project, and 0.113 detections/800 m plot/20-minute count segment in the spring and 0.107 detections/800 m plot/20-minute count segment in the fall within the Avian Use Study Area. Ring-necked Pheasants (*Phasianus colchicus*) accounted for the majority (Project: 87.5%; Avian Use Study Area: 82.6%) of upland gamebird detections in the spring, and Sharp-tailed Grouse accounted for the majority (Project: 77.8%; Avian Use Study Area: 55.2%) of upland gamebird detections in the fall. The Sharp-tailed Grouse is a Level II SCP in North Dakota (Dyke et al. 2015).

Waders

Waders include herons and cranes. Waders were detected much more frequently in the fall (mean use rate in the Project: 2.717 detections/800 m plot/20-minute count segment; Avian Use Study Area: 3.493 detections/800 m plot/20-minute count segment) than in the spring (mean use rate in the Project: 0.500 detections/800 m plot/20-minute count segment; Avian Use Study Area: 0.917 detections/800 m plot/20-minute count segment). Waders accounted for 2.3% of all non-raptor detections in the spring and 6.2% in the fall within the Project, and within the Avian Use Study Area, 2.4% of all non-raptor detections in the spring and 6.3% in the fall. The large majority of fall wader detections were the Sandhill Crane and White-faced Ibis (*Plegadis chihi*).

Waterbirds

The waterbird group includes loons, grebes, cormorants, and gulls. Waterbirds represented 11.4% of spring non-raptor detections and 4.2% of all fall non-raptor detections within the Project, and 13.2% of all spring non-raptor detections and 6.1% of all fall non-raptor detections within the Avian Use Study Area. Spring mean use for the waterbird guild was 4.856 detections/800 m plot/20-minute count segment within the Project and 5.064 detections/800 m plot/20-minute count segment within the Avian Use Study Area. This use rate was mainly influenced by Franklin's Gulls, which accounted for 76.2% of spring waterbird detections within the Project and 74.3% within the Avian Use Study Area. Waterbird mean use rates were lower during fall migration (Project: 3.058 detections/800 m plot/20-minute count segment; Avian Use Study Area: 3.412

detections/800 m plot/20-minute count segment) and was again influenced by Franklin's Gull detections (28.1% of all fall waterbird detections within the Project, 35.7% of fall waterbird detections within the Avian Use Study Area). Franklin's Gull is a Level I North Dakota SCP (Dyke et al. 2015).

Waterfowl

Waterfowl mean use rates were higher in the fall (Project: 19.200 detections/800 m plot/20-minute count segment; Avian Use Study Area: 20.221 detections/800 m plot/20-minute count segment) than in the spring (Project: 12.811/800 m plot/20-minute count segment; Avian Use Study Area: 12.637 detections/800 m plot/20-minute count segment). In the spring, the Lesser Scaup (*Aythya affinis*), Mallard (*Anas platyrhynchos*), and Canada Goose (*Branta canadensis*) accounted for 26.6%, 19.9%, and 8.8% of spring waterfowl detections, respectively within the Project, and accounted for 24.5%, 20.4%, 17.0% of spring waterfowl detections, respectively within the Avian Use Study Area. In the fall, the Mallard (18.5% Project, 28.2% Avian Use Study Area), Canada Goose (20.3% Project, 12.5% Avian Use Study Area), and Gadwall (*Anas strepera*) (11.4% Project, 10.7% Avian Use Study Area) accounted for the most relative detections among the waterfowl guild. The Lesser Scaup is a Level II North Dakota SCP (Dyke et al. 2015).

3.3.3 Mean Flight Heights during Spring and Fall Migration

Tables 6 and 7 detail the mean flight height statistics for the non-raptor guilds detected during avian use surveys within the Avian Use Study Area (Table 6) and at the 15 points either within the Project or with survey cylinders intersecting the Project (Table 7). Mean minimum and maximum flight heights are summarized for the spring survey period, the fall survey period, and for spring and fall observations combined. Mean flight heights were within the RSZ for the waders group and below the RSZ for all other guilds consistently across the Project and across the large Avian Use Study Area.

Table 6. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Guild	Flight Height	Spring						Fall						Spring and Fall Migration Combined					
		Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound
Corvids	Min	28	17.86	29.67	11.50	6.36	29.36	22	14.55	29.72	24.84	-10.29	39.39	50	16.40	24.20	6.88	9.52	23.28
	Max	39	21.64	25.64	8.31	13.33	29.95	30	19.23	16.70	6.23	13.00	25.46	69	20.59	22.09	5.31	15.28	25.90
Non-Passerines (Large)	Min	12	8.25	5.51	3.50	4.75	11.75	24	14.71	12.77	5.39	9.31	20.10	36	12.56	11.24	3.80	8.75	16.36
	Max	22	15.27	8.89	3.94	11.33	19.22	35	18.51	10.86	3.73	14.78	22.25	57	17.26	10.19	2.70	14.56	19.97
Non-Passerines (Small)	Min	14	3.21	2.67	1.54	1.68	4.75	18	3.67	2.33	1.16	2.51	4.82	32	3.47	2.45	0.88	2.59	4.35
	Max	29	5.41	3.05	1.16	4.25	6.58	41	6.56	3.70	1.17	5.39	7.73	70	6.09	3.47	0.83	5.26	6.91
Passerines	Min	301	8.88	11.72	1.33	7.55	10.21	342	11.43	12.16	1.29	10.13	12.72	643	10.23	12.01	0.93	9.30	11.16
	Max	980	7.42	9.24	0.58	6.84	7.99	696	10.63	10.47	0.78	9.85	11.41	1676	8.75	9.89	0.47	8.27	9.22
Shorebirds	Min	37	14.49	14.48	4.83	9.66	19.32	55	14.95	14.61	3.95	11.00	18.90	21	41.95	70.25	31.98	9.97	73.93
	Max	128	13.71	14.62	2.56	11.15	16.27	87	15.55	13.39	2.85	12.70	18.40	92	14.77	14.48	3.00	11.77	17.77
Upland Gamebird	Min	1	2.00	0.00	0.00	2.00	2.00	-	-	-	-	-	-	1	2.00	0.00	0.00	2.00	2.00
	Max	3	16.67	10.41	25.86	-9.19	42.53	7	5.00	3.56	3.29	1.71	8.29	10	8.50	8.02	5.74	2.76	14.24
Waders	Min	13	110.15	73.46	44.39	65.76	154.54	39	83.10	142.64	46.24	36.86	129.34	52	89.87	128.73	35.84	54.03	125.71
	Max	13	132.69	76.09	45.98	86.71	178.67	45	89.20	136.22	40.93	48.27	130.13	58	98.95	126.01	33.13	65.82	132.08
Waterbirds	Min	148	21.11	22.37	3.63	17.48	24.74	121	24.69	43.73	7.81	16.88	32.50	269	22.72	33.47	4.02	18.70	26.74
	Max	172	27.88	23.32	3.51	24.37	31.39	156	27.36	38.84	6.14	21.22	33.50	328	27.63	31.62	3.43	24.20	31.06
Waterfowl	Min	168	14.46	14.34	2.18	12.28	16.64	206	30.94	35.71	4.91	26.03	35.85	374	23.54	29.33	2.98	20.56	26.52
	Max	399	18.65	15.94	1.57	17.08	20.22	263	35.71	32.96	4.00	31.71	39.71	662	25.43	25.56	1.95	23.48	27.38

Seasonal migration and total migration mean flight height statistics by species guild. Flight heights recorded within the 300 m-radius survey cylinder for small-bodied detections and within the 800 m-radius survey cylinder for large-bodied detections during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Some guilds have mean maximum heights that are slightly lower than mean minimum heights. This occurs due to large numbers of low-flying, occasionally perching birds (e.g., sparrows or blackbirds) with minimum heights (0 m) not included in calculation of the mean. Raptor guild flight heights are presented in Table 4.
 CI = confidence interval; SD = standard deviation

Table 7. Mean Flight Heights during Spring and Fall Migration within the Burke County Wind Project (Burke County, North Dakota)

Species Guild	Flight Height	Spring						Fall						Spring and Fall Migration Combined					
		Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound	Sample Size	Mean Minimum or Maximum Flight Height (m)	SD	95% CI	Upper Bound	Lower Bound
Corvids	Min	14	14.50	11.14	6.43	20.93	8.07	5	10.00	8.34	10.35	20.35	-0.35	19	13.32	10.45	5.04	18.35	8.28
	Max	19	21.37	13.83	6.67	28.03	14.70	7	15.00	7.35	6.80	21.80	8.20	26	19.65	12.61	5.09	24.75	14.56
Non-Passerines (Large)	Min	10	8.30	6.09	4.36	12.66	3.94	13	15.77	14.48	8.75	24.52	7.02	23	12.52	11.99	5.19	17.71	7.34
	Max	14	15.29	8.44	4.88	20.16	10.41	18	19.17	12.59	6.26	25.43	12.90	32	17.47	10.99	3.96	21.43	13.51
Non-Passerines (Small)	Min	7	4.86	2.91	2.69	2.16	7.55	12	2.75	1.29	0.82	1.93	3.57	19	3.53	2.22	1.07	2.46	4.60
	Max	14	5.79	3.58	2.07	3.72	7.85	22	6.00	3.21	1.42	4.58	7.42	36	5.92	3.31	1.12	4.80	7.04
Passerines	Min	125	8.26	9.48	1.68	6.59	9.94	150	13.15	15.47	2.50	10.65	15.64	275	10.93	13.29	1.58	9.35	12.51
	Max	449	6.89	8.86	0.82	6.07	7.71	315	11.60	12.52	1.39	10.22	12.99	764	8.83	10.77	0.76	8.07	9.60
Shorebirds	Min	17	11.47	13.47	6.92	18.40	4.55	29	14.90	12.12	4.61	19.51	10.29	46	13.63	12.60	3.74	17.37	9.89
	Max	54	14.09	13.46	3.67	17.77	10.42	48	15.25	12.41	3.60	18.85	11.65	102	14.64	12.92	2.54	17.18	12.10
Upland Gamebird	Min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max	1	5.00	-	-	5.00	5.00	3	3.33	1.53	3.79	7.13	-0.46	4	3.75	1.50	2.39	6.14	1.36
Waders	Min	6	102.00	86.58	90.86	192.86	11.14	17	48.41	33.70	17.32	65.74	31.09	23	62.39	55.75	24.11	86.50	38.28
	Max	6	120.83	92.06	96.61	217.44	24.23	20	52.35	35.47	16.60	68.95	35.75	26	68.15	59.30	23.95	92.11	44.20
Waterbirds	Min	65	25.06	26.12	6.47	31.53	18.59	50	22.66	32.01	9.10	31.76	13.56	115	24.02	28.72	5.31	29.32	18.71
	Max	74	31.42	26.82	6.21	37.63	25.21	63	27.27	30.97	7.80	35.07	19.47	137	29.51	28.77	4.86	34.37	24.65
Waterfowl	Min	92	15.74	15.66	3.24	18.98	12.50	103	28.97	21.97	4.29	33.26	24.68	195	22.73	20.32	2.87	25.60	19.86
	Max	209	18.75	16.24	2.21	20.97	16.54	130	34.38	21.97	3.81	38.20	30.57	339	24.75	20.11	2.15	26.89	22.60

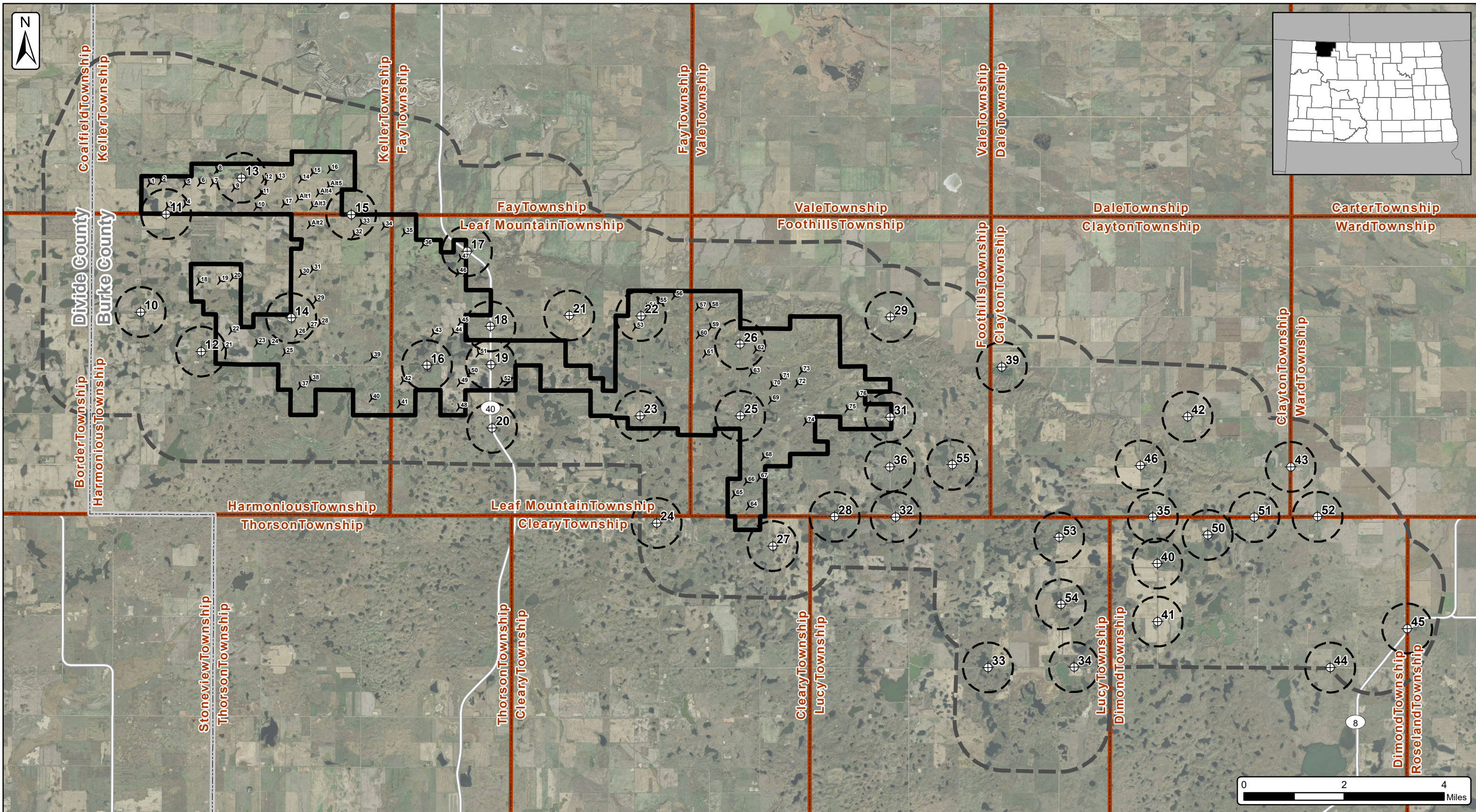
Seasonal migration and total migration mean flight height statistics by species guild. Flight heights recorded within the 300 m–radius survey cylinder for small-bodied detections and within the 800 m–radius survey cylinder for large-bodied detections during standardized use surveys. Zero-value heights (i.e., perched) not included in calculation of means; a bird perched throughout the count period would have both minimum and maximum flight heights of 0 m. Some guilds have mean maximum heights that are slightly lower than mean minimum heights. This occurs due to large numbers of low-flying, occasionally perching birds (e.g., sparrows or blackbirds) with minimum heights (0 m) not included in calculation of the mean. Raptor guild flight heights are presented in Table 5.
 CI = confidence interval; SD = standard deviation

4.0 REFERENCES

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APPENDIX I

Report Figures



Burke County Wind Project
Figure 1. Avian and Raptor Use Point Count Schematic
 Burke County, North Dakota
 Date: 1/30/2019

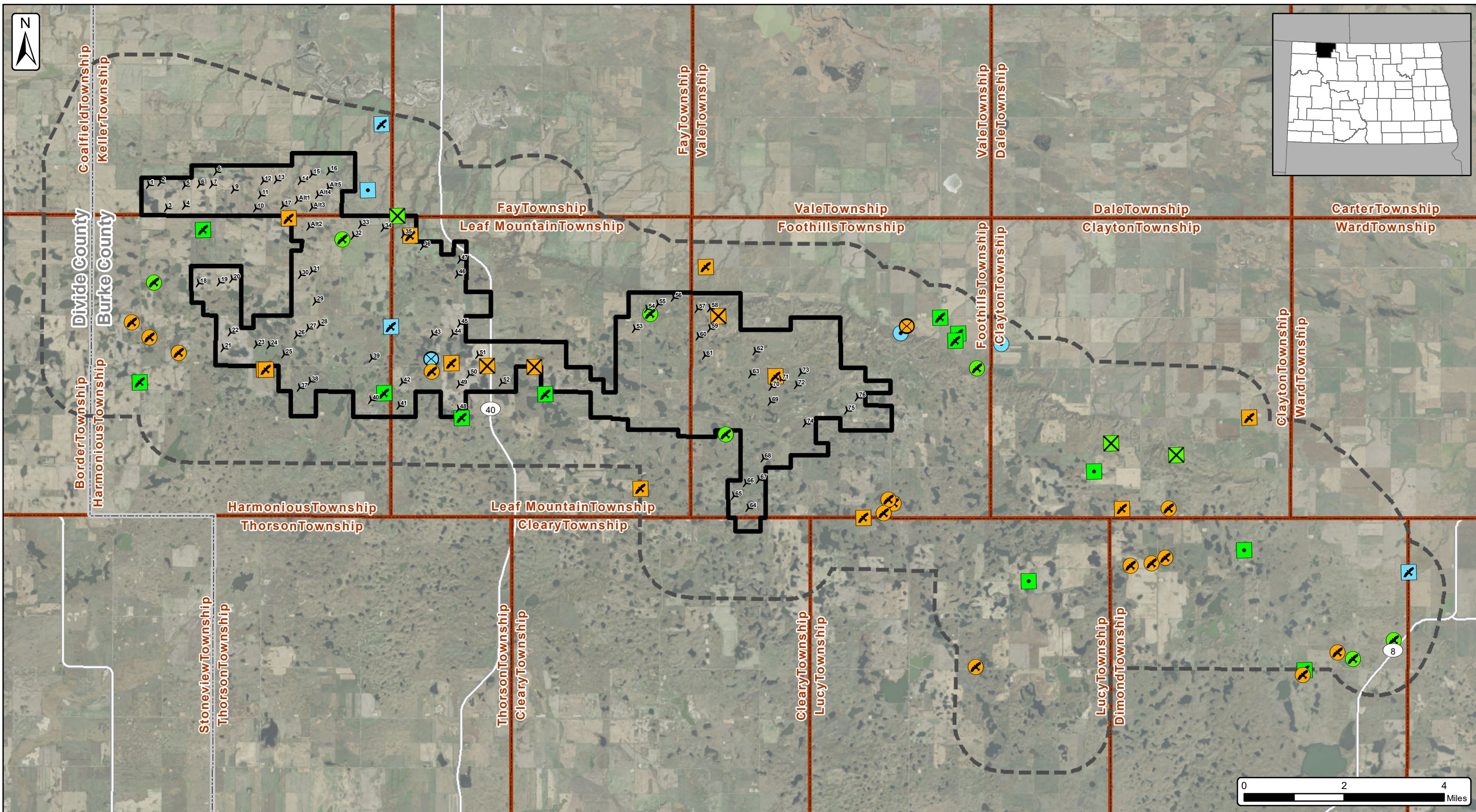
Client:
Burke Wind, LLC
Atwell, LLC Project: 16000947

- Turbine Layout (10/08/2018)
- Avian Study Points
- 800 m Study Point Buffer (±19,797 Ac.)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties



The information contained on this map is proprietary and confidential. The use or disclosure of this information by you to third parties is prohibited by law and may give rise to civil or criminal liability.

SOURCE: USDA NAIP 2017 IMAGERY




Burke County Wind Project
Figure 2. Eagle Observation Map
 April 2017 through March 2018
 Burke County, North Dakota
 Date: 1/8/2019

Client:
Burke Wind, LLC
 Atwell, LLC Project:16000947

<p>Species</p> <ul style="list-style-type: none"> Bald Eagle - Standardized Bald Eagle - Incidental Golden Eagle - Standardized Golden Eagle - Incidental Unknown Eagle Species - Standardized Unknown Eagle Species - Incidental 	<p>Season</p> <ul style="list-style-type: none"> Fall Spring Winter 	<p> Turbine Layout (10/08/2018)</p> <p> Project 10/23/2018 (±22,933 Ac.)</p> <p> Avian Use Study Area (01/25/2017)</p> <p> Townships</p> <p> Counties</p>
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SOURCE: USDA NAIP 2017 IMAGERY



ATWELL

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Figure 3. Seasonal Bald Eagle Detection Totals within the Burke County Wind Project and the Avian Use Study Area – Burke County Wind Project (Burke County, North Dakota)

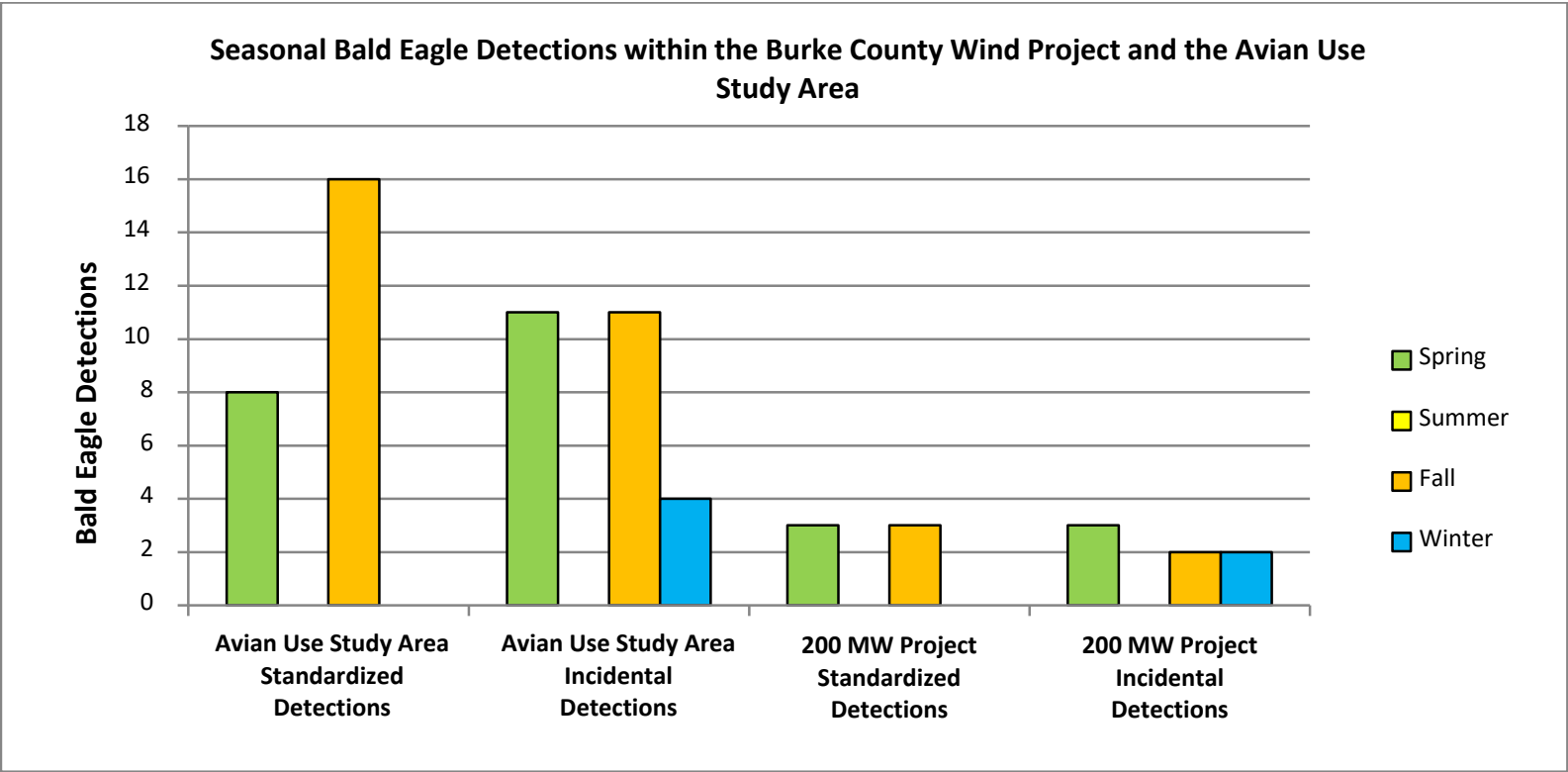
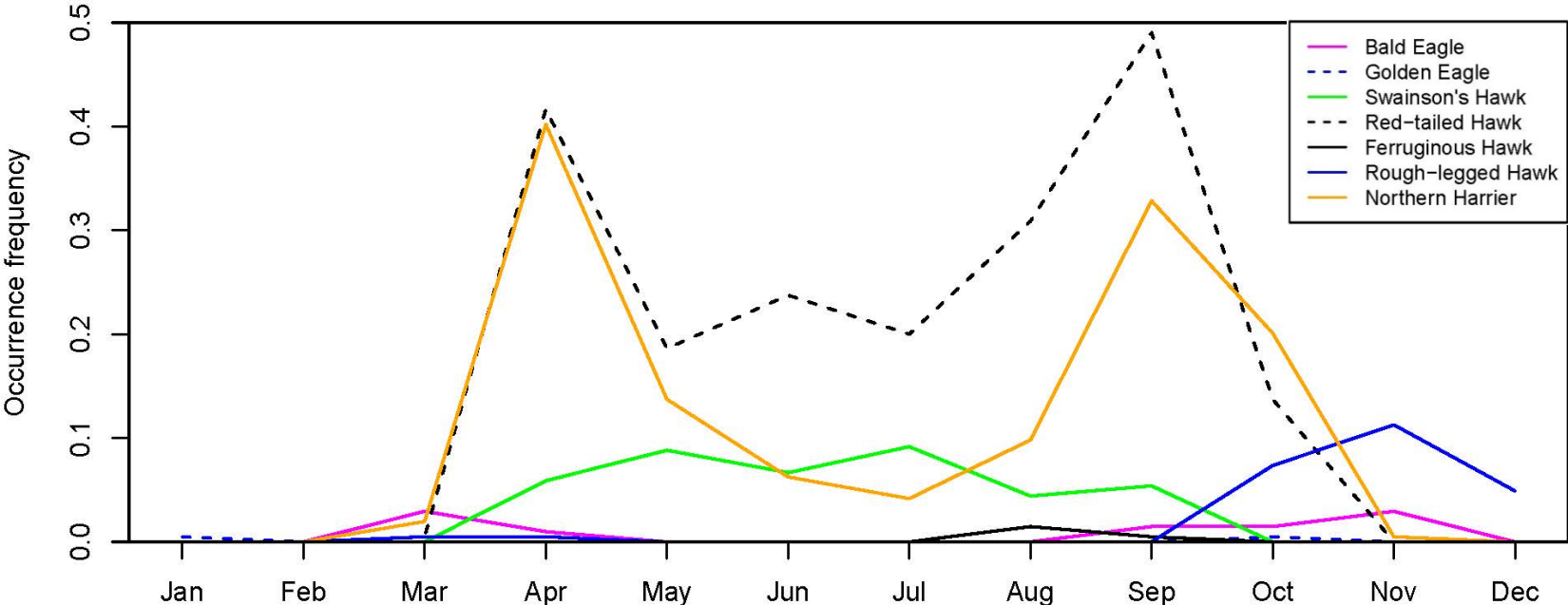
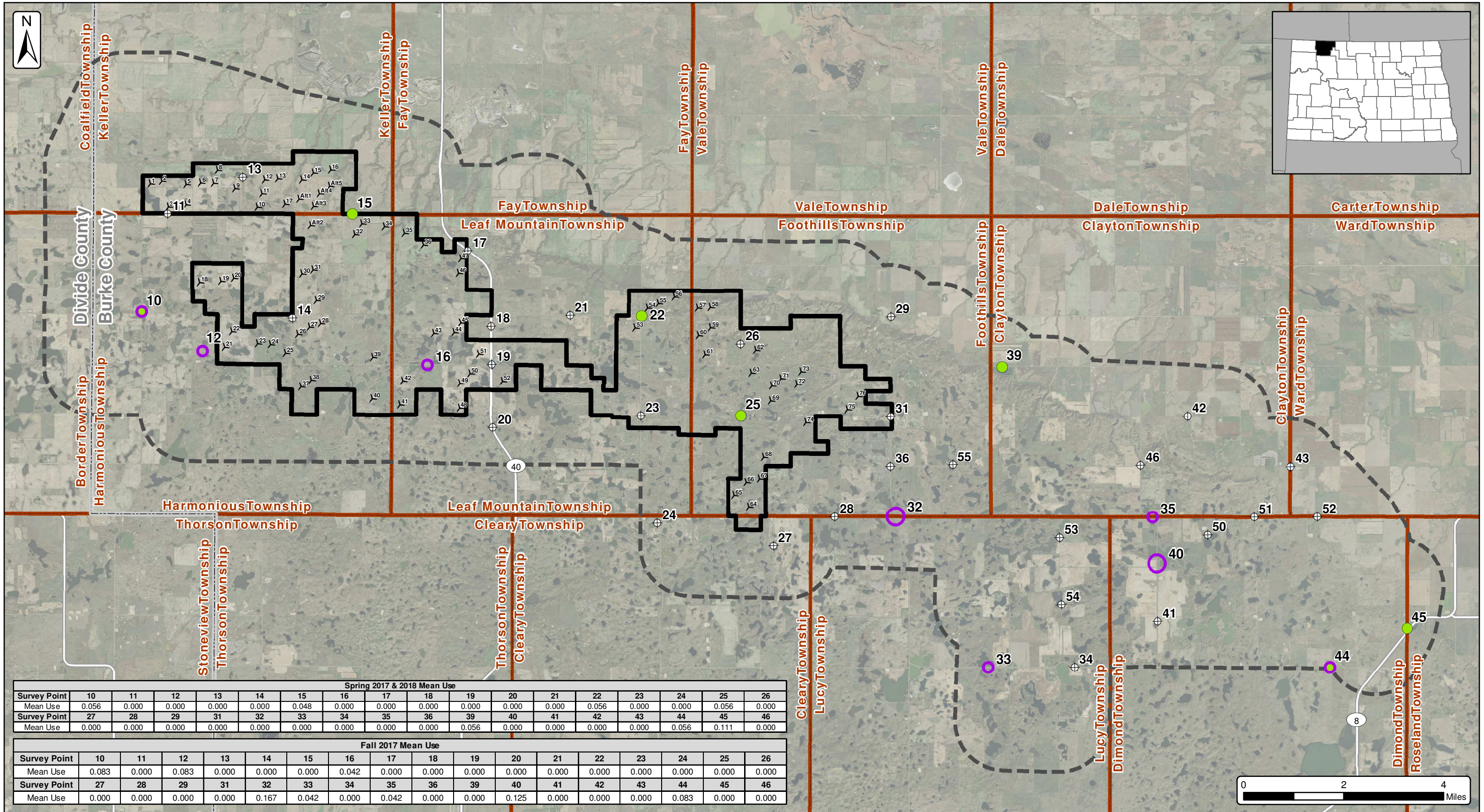
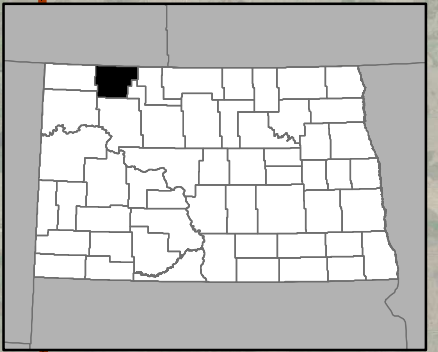


Figure 4. Raptor Species Monthly Occurrence Frequency – Burke County Wind Project (Burke County, North Dakota)





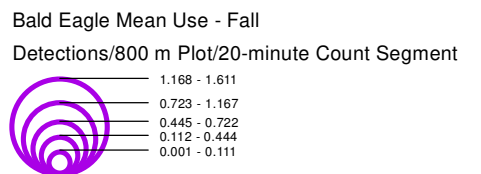
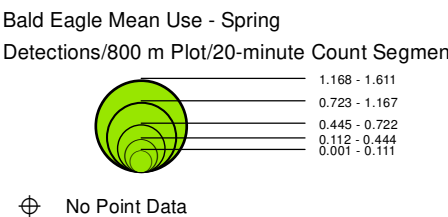
		Spring 2017 & 2018 Mean Use															
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.056	0.000	0.000	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.056	0.000
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.000	0.056	0.111	0.000	

		Fall 2017 Mean Use															
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mean Use	0.083	0.000	0.083	0.000	0.000	0.000	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	0.000	0.000	0.000	0.000	0.167	0.042	0.000	0.042	0.000	0.000	0.125	0.000	0.000	0.000	0.083	0.000	

Burke County Wind Project
Figure 5a. Seasonal Bald Eagle Mean Use April 2017 through March 2018
 Spring and fall only, no standardized detections during winter and summer periods
 Burke County, North Dakota
 Date: 1/14/2019

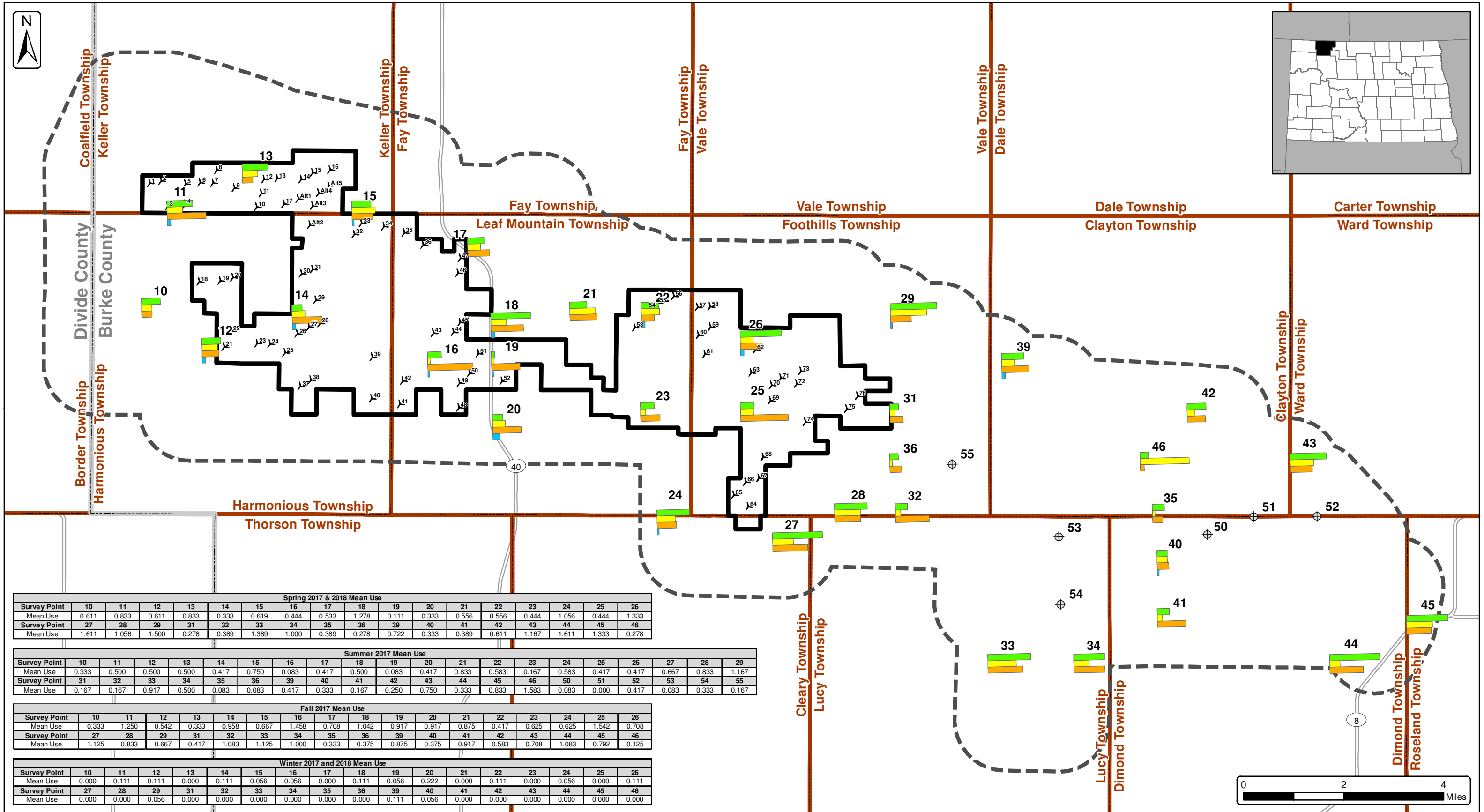
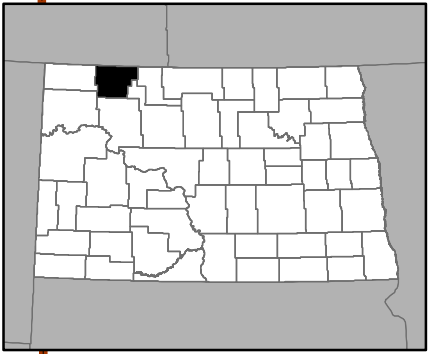
Client:
Burke Wind, LLC
Atwell, LLC Project:16000947

- Turbine Layout (10/08/2018)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties



SOURCE: USDA NAIP 2017 IMAGERY

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Spring 2017 & 2018 Mean Use																																			
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	39	40	41	42	43	44	45	46
Mean Use	0.611	0.833	0.611	0.833	0.333	0.619	0.444	0.533	1.278	0.111	0.333	0.556	0.556	0.444	1.056	0.444	1.333	0.167	0.167	0.917	0.500	0.083	0.083	0.417	0.333	0.833	1.583	0.083	0.000	0.417	0.083	0.333	0.167		
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46	53	54	55															
Mean Use	1.611	1.056	1.500	0.278	0.389	1.389	1.000	0.389	0.278	0.722	0.333	0.389	0.611	1.167	1.611	1.333	0.278	0.000	0.000	0.000															

Summer 2017 Mean Use																										
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29						
Mean Use	0.333	0.500	0.500	0.500	0.417	0.750	0.083	0.417	0.500	0.083	0.417	0.833	0.583	0.167	0.583	0.417	0.417	0.667	0.833	1.167						
Survey Point	31	32	33	34	35	36	39	40	41	42	43	44	45	46	50	51	52	53	54	55						
Mean Use	0.167	0.167	0.917	0.500	0.083	0.083	0.417	0.333	0.167	0.250	0.750	0.333	0.833	1.583	0.083	0.000	0.417	0.083	0.333	0.167						

Fall 2017 Mean Use																										
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26									
Mean Use	0.333	1.250	0.542	0.333	0.958	0.667	1.458	0.708	1.042	0.917	0.917	0.875	0.417	0.625	0.625	1.542	0.708									
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46									
Mean Use	1.125	0.833	0.667	0.417	1.083	1.125	1.000	0.333	0.375	0.875	0.375	0.917	0.583	0.708	1.083	0.792	0.125									

Winter 2017 and 2018 Mean Use																										
Survey Point	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26									
Mean Use	0.000	0.111	0.111	0.000	0.111	0.056	0.056	0.000	0.111	0.056	0.222	0.000	0.111	0.000	0.056	0.000	0.111									
Survey Point	27	28	29	31	32	33	34	35	36	39	40	41	42	43	44	45	46									
Mean Use	0.000	0.000	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.056	0.000	0.000	0.000	0.000	0.000	0.111									

Burke County Wind Project
Figure 5b. Seasonal Raptor Mean Use
All Raptor Species
 April 2017 through March 2018
 Burke County, North Dakota
 Date: 1/14/2019

Client:
Burke Wind, LLC
Atwell, LLC Project:16000947

- Turbine Layout (10/08/2018)
- Project 10/23/2018 (±22,933 Ac.)
- Avian Use Study Area (01/25/2017)
- Townships
- Counties
- Raptor Mean Use- Detections/800 m Plot/20-minute Count Segment
 - Spring Mean
 - Summer Mean
 - Fall Mean
 - Winter Mean
- Points Surveyed during Summer Period Only

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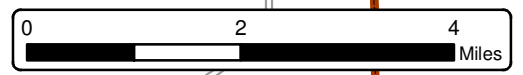


Figure 6a. Bald Eagle Flight Direction Rose Plot for Spring Migration Observations – Burke County Wind Project (Burke County, North Dakota)

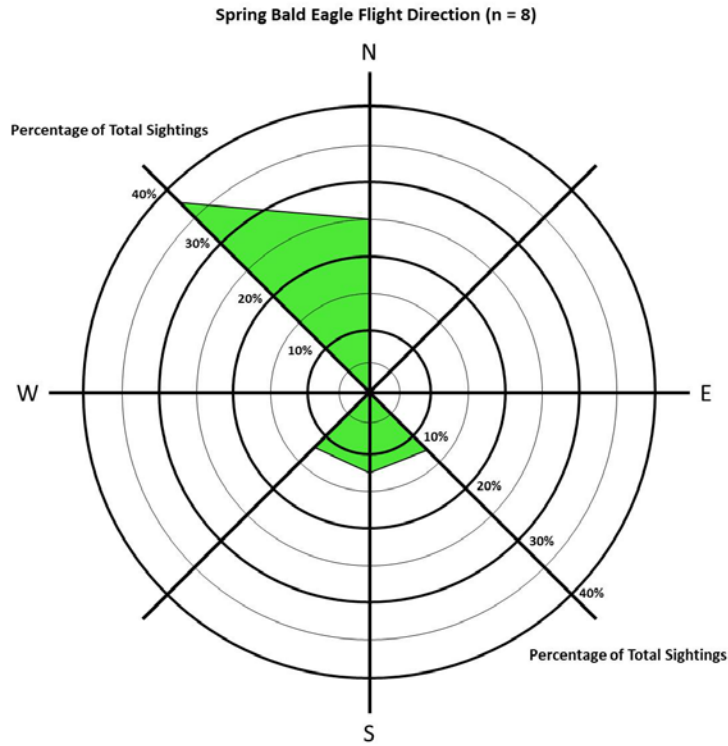
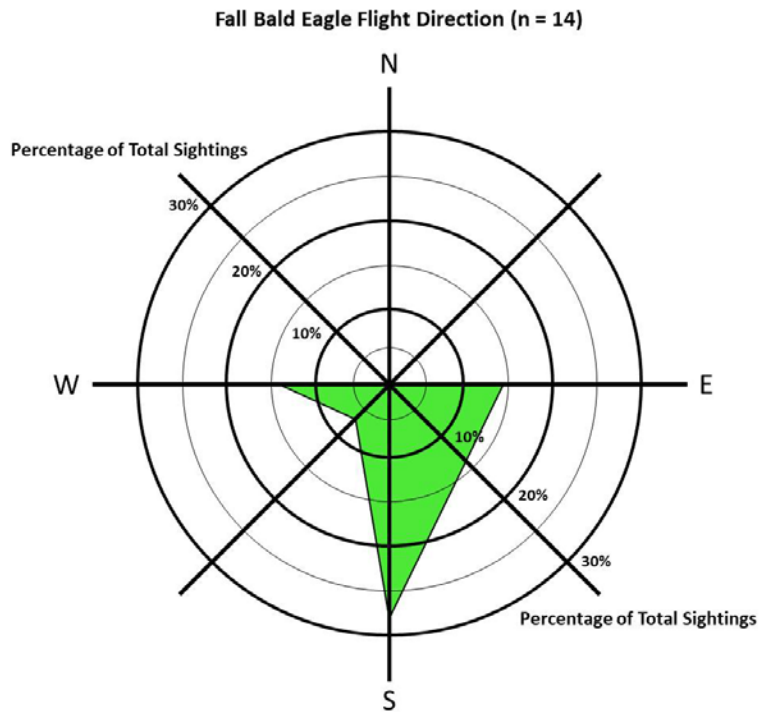


Figure 6b. Bald Eagle Flight Direction Rose Plot for Fall Migration Observations – Burke County Wind Project (Burke County, North Dakota)



APPENDIX II

Spring and Fall Avian Use Survey – Summary Statistics Tables

Table A. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Wigeon	58	27	0.644	1.275	0.267	53	17	0.442	1.823	0.100
Blue-winged Teal	117	42	1.300	2.429	0.344	308	52	2.567	6.509	0.233
Bufflehead	2	1	0.022	0.211	0.011	-	-	-	-	-
Cackling Goose	1	1	0.011	0.105	0.011	68	7	0.567	3.023	0.058
Canada Goose	102	43	1.133	2.876	0.367	467	30	3.892	16.336	0.167
Canvasback (b)	16	11	0.178	0.532	0.122	9	2	0.075	0.663	0.017
Gadwall	85	38	0.944	1.826	0.300	262	33	2.183	11.953	0.217
Green-winged Teal	18	9	0.200	0.674	0.100	10	2	0.083	0.751	0.017
Lesser Scaup (b)	307	59	3.411	8.250	0.333	56	8	0.467	2.351	0.050
Mallard	230	104	2.556	3.592	0.556	427	57	3.558	10.120	0.308
Northern Pintail (b)	35	16	0.389	1.013	0.167	73	8	0.608	3.628	0.058
Northern Shoveler	119	47	1.322	3.082	0.333	64	14	0.533	2.021	0.100
Redhead	36	10	0.400	1.889	0.100	21	3	0.175	1.591	0.017
Ring-necked Duck	25	6	0.278	1.290	0.056	38	4	0.317	2.867	0.025
Ross's Goose	-	-	-	-	-	49	2	0.408	3.736	0.017
Ruddy Duck	2	1	0.022	0.211	0.011	7	2	0.058	0.555	0.017
Snow Goose	-	-	-	-	-	35	1	0.292	3.195	0.008
Unknown Duck	-	-	-	-	-	115	7	0.958	6.412	0.050
Unknown Goose	-	-	-	-	-	242	7	2.017	11.317	0.042
Waterfowl	1153	415	12.811	17.315	0.700	2304	256	19.200	39.496	0.558

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table B. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Wigeon	109	50	0.534	1.237	0.211	70	22	0.257	1.350	0.059
Blue-winged Teal	224	95	1.098	2.300	0.279	833	117	3.063	9.348	0.188
Bufflehead	5	3	0.025	0.209	0.015	-	-	-	-	-
Cackling Goose	6	2	0.029	0.357	0.010	90	9	0.331	2.326	0.033
Canada Goose	437	100	2.142	15.372	0.353	688	60	2.529	11.747	0.158
Canvasback (b)	75	28	0.368	1.838	0.127	14	3	0.051	0.534	0.011
Common Merganser	1	1	0.005	0.070	0.005	-	-	-	-	-
Gadwall	181	81	0.887	1.961	0.289	587	71	2.158	10.398	0.176
Greater White-fronted Goose	-	-	-	-	-	35	2	0.129	1.599	0.007
Green-winged Teal	35	19	0.172	0.677	0.078	12	4	0.044	0.506	0.015
Hooded Merganser	1	1	0.005	0.070	0.005	-	-	-	-	-
Lesser Scaup (b)	631	126	3.093	10.202	0.284	252	19	0.926	8.017	0.051
Mallard	525	225	2.574	3.557	0.554	1552	163	5.706	20.608	0.316
Northern Pintail (b)	71	33	0.348	1.065	0.127	78	10	0.287	2.434	0.033
Northern Shoveler	181	74	0.887	2.422	0.230	129	23	0.474	2.311	0.074
Redhead	52	16	0.255	1.359	0.074	38	8	0.140	1.201	0.026
Ring-necked Duck	34	12	0.167	0.927	0.044	131	11	0.482	3.694	0.033
Ross's Goose	-	-	-	-	-	52	3	0.191	2.490	0.011
Ruddy Duck	2	1	0.010	0.140	0.005	11	4	0.040	0.405	0.015
Snow Goose	-	-	-	-	-	261	4	0.960	9.554	0.015
Tundra Swan	-	-	-	-	-	2	1	0.007	0.121	0.004

Table B. Seasonal Use Summary Statistics for Waterfowl within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
Unknown Duck	8	1	0.039	0.560	0.005	359	14	1.320	11.058	0.048
Unknown Goose	-	-	-	-	-	306	9	1.125	8.303	0.026
Waterfowl	2578	868	12.637	23.227	0.662	5500	557	20.221	44.057	0.518

Seasonal mean use statistics by species within the Burke County Wind Project’s Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table C. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Avocet (b)	3	2	0.033	0.235	0.022	4	1	0.033	0.365	0.008
American Coot	12	8	0.133	0.455	0.089	120	13	1.000	6.954	0.083
American White Pelican (b)	-	-	-	-	-	39	2	0.325	3.381	0.017
Black-crowned Night-Heron	4	4	0.044	0.207	0.044	-	-	-	-	-
Black Tern (a)	49	6	0.544	2.418	0.067	33	7	0.275	1.749	0.042
California Gull	1	1	0.011	0.105	0.011	-	-	-	-	-
Double-crested Cormorant	7	6	0.078	0.308	0.067	22	17	0.183	0.565	0.117
Franklin's Gull (a)	333	51	3.700	8.090	0.400	103	23	0.858	3.136	0.125
Great Blue Heron	-	-	-	-	-	2	2	0.017	0.129	0.017
Greater Yellowlegs	1	1	0.011	0.105	0.011	82	18	0.683	3.945	0.117
Horned Grebe (a)	1	1	0.011	0.105	0.011	-	-	-	-	-
Killdeer	34	25	0.378	0.680	0.267	64	34	0.533	1.639	0.258
Least Sandpiper	2	1	0.022	0.211	0.011	-	-	-	-	-
Lesser Yellowlegs	35	7	0.389	2.520	0.056	31	12	0.258	1.041	0.083
Long-billed Dowitcher	-	-	-	-	-	92	5	0.767	6.135	0.042
Pectoral Sandpiper	-	-	-	-	-	4	2	0.033	0.365	0.008
Pied-billed Grebe	3	3	0.033	0.235	0.022	25	12	0.208	0.961	0.092
Red-necked Grebe	-	-	-	-	-	1	1	0.008	0.091	0.008
Ring-billed Gull	18	10	0.200	0.722	0.089	24	19	0.200	0.528	0.150
Sandhill Crane	41	4	0.456	3.226	0.033	105	5	0.875	8.346	0.025
Solitary Sandpiper	1	1	0.011	0.105	0.011	-	-	-	-	-
Sora	12	12	0.133	0.455	0.100	-	-	-	-	-

Table C. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
Spotted Sandpiper	-	-	-	-	-	2	2	0.017	0.129	0.017
Unknown Shorebird	4	1	0.044	0.422	0.011	7	2	0.058	0.455	0.017
Upland Sandpiper (b)	11	8	0.122	0.419	0.089	-	-	-	-	-
Virginia Rail	1	1	0.011	0.105	0.011	-	-	-	-	-
White-faced Ibis	-	-	-	-	-	219	15	1.825	14.163	0.067
Willet (b)	10	8	0.111	0.381	0.089	-	-	-	-	-
Wilson's Phalarope (a)	30	7	0.333	1.543	0.078	1	1	0.008	0.091	0.008
Wilson's Snipe	13	12	0.144	0.439	0.111	-	-	-	-	-
Shorebird	144	73	1.600	3.280	0.467	287	77	2.392	10.613	0.350
Wader	45	8	0.500	3.226	0.078	326	22	2.717	16.340	0.100
Waterbird	437	99	4.856	9.577	0.522	367	94	3.058	9.226	0.350

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table D. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Avocet (b)	3	2	0.015	0.156	0.010	4	1	0.015	0.243	0.004
American Coot	14	10	0.069	0.322	0.049	138	16	0.507	4.719	0.048
American White Pelican (b)	23	2	0.113	1.610	0.005	74	6	0.272	2.666	0.018
Baird's Sandpiper (a)	2	1	0.010	0.140	0.005	-	-	-	-	-
Black Tern (a)	79	17	0.387	1.879	0.064	57	15	0.210	1.567	0.037
Black-crowned Night-Heron	5	5	0.025	0.155	0.025	3	3	0.011	0.135	0.007
Buff-breasted Sandpiper	1	1	0.005	0.070	0.005	-	-	-	-	-
California Gull	3	3	0.015	0.121	0.015	-	-	-	-	-
Double-crested Cormorant	39	12	0.191	1.660	0.059	159	48	0.585	3.897	0.129
Forster's Tern	5	3	0.025	0.231	0.015	-	-	-	-	-
Franklin's Gull (a)	769	102	3.770	9.432	0.338	331	43	1.217	7.426	0.110
Great Blue Heron	-	-	-	-	-	8	8	0.029	0.169	0.029
Greater Yellowlegs	2	2	0.010	0.099	0.010	99	29	0.364	2.658	0.088
Horned Grebe (a)	1	1	0.005	0.070	0.005	-	-	-	-	-
Killdeer	83	65	0.407	0.747	0.284	109	63	0.401	1.302	0.195
Least Sandpiper	2	1	0.010	0.140	0.005	-	-	-	-	-
Lesser Yellowlegs	56	11	0.275	1.913	0.044	62	22	0.228	0.979	0.074
Long-billed Dowitcher	-	-	-	-	-	120	9	0.441	4.176	0.033
Pectoral Sandpiper	-	-	-	-	-	11	7	0.040	0.357	0.018
Pied-billed Grebe	7	6	0.034	0.230	0.025	38	24	0.140	0.689	0.077
Red-necked Grebe	3	2	0.015	0.156	0.010	1	1	0.004	0.061	0.004
Red-necked Phalarope	-	-	-	-	-	4	1	0.015	0.243	0.004

Table D. Seasonal Use Summary Statistics for Shorebirds, Waders, and Waterbirds (Shorebirds, Cranes, Herons, Pelicans, Grebes, Coots, Gulls, Terns) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
Ring-billed Gull	70	34	0.343	1.346	0.113	123	57	0.452	2.829	0.180
Sandhill Crane	182	10	0.892	6.011	0.039	606	17	2.228	15.204	0.048
Semipalmated Plover	-	-	-	-	-	1	1	0.004	0.061	0.004
Solitary Sandpiper	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Sora	17	17	0.083	0.341	0.069	-	-	-	-	-
Spotted Sandpiper	2	2	0.010	0.099	0.010	4	4	0.015	0.121	0.015
Unknown Gull	2	1	0.010	0.140	0.005	5	1	0.018	0.303	0.004
Unknown Shorebird	39	4	0.191	2.265	0.015	9	4	0.033	0.314	0.015
Upland Sandpiper (b)	22	18	0.108	0.369	0.088	-	-	-	-	-
Virginia Rail	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Western Grebe	-	-	-	-	-	1	1	0.004	0.061	0.004
White-faced Ibis	-	-	-	-	-	333	29	1.224	10.203	0.059
Willet (b)	18	14	0.088	0.347	0.069	-	-	-	-	-
Wilson's Phalarope (a)	45	14	0.221	1.125	0.064	1	1	0.004	0.061	0.004
Wilson's Snipe	24	23	0.118	0.379	0.098	3	2	0.011	0.135	0.007
Shorebird	301	160	1.475	3.539	0.446	428	145	1.574	7.318	0.287
Wader	187	15	0.917	6.009	0.064	950	57	3.493	18.167	0.136
Waterbird	1033	211	5.064	10.631	0.475	928	213	3.412	10.982	0.346

Seasonal mean use statistics by species within the Burke County Wind Project's Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table E. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Crow	21	16	0.233	0.654	0.144	8	5	0.067	0.361	0.042
Common Raven	2	2	0.022	0.148	0.022	5	4	0.042	0.239	0.033
Gray Partridge	1	1	0.011	0.105	0.011	-	-	-	-	-
Ring-necked Pheasant	14	12	0.156	0.447	0.122	2	1	0.017	0.183	0.008
Rock Pigeon	53	14	0.589	2.883	0.111	102	19	0.850	3.180	0.117
Sharp-tailed Grouse (b)	1	1	0.011	0.105	0.011	7	3	0.058	0.395	0.025
Unknown Corvid	3	2	0.033	0.316	0.011	-	-	-	-	-
Large-Bodied Corvid	26	20	0.289	0.890	0.167	13	9	0.108	0.426	0.075
Large-Bodied Non-Passerines	53	14	0.589	2.883	0.111	102	19	0.850	3.180	0.117
Upland Game	16	14	0.178	0.464	0.144	9	4	0.075	0.433	0.033

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table F. Seasonal Use Summary Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/800 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Crow	66	34	0.324	1.265	0.142	61	11	0.224	2.746	0.040
Common Raven	7	7	0.034	0.182	0.034	19	17	0.070	0.296	0.059
Gray Partridge	1	1	0.005	0.070	0.005	9	1	0.033	0.546	0.004
Ring-necked Pheasant	19	17	0.093	0.338	0.078	4	3	0.015	0.148	0.011
Rock Pigeon	85	22	0.417	2.302	0.078	214	36	0.787	3.205	0.103
Sharp-tailed Grouse (b)	3	3	0.015	0.121	0.015	16	7	0.059	0.408	0.026
Unknown Corvid	4	3	0.020	0.221	0.010	-	-	-	-	-
Large-Bodied Corvid	77	44	0.377	1.335	0.176	80	28	0.294	2.763	0.103
Large-Bodied Non-Passerines	85	22	0.417	2.302	0.078	214	36	0.787	3.205	0.103
Upland Gamebird	23	21	0.113	0.361	0.098	29	11	0.107	0.692	0.040

Seasonal mean use statistics by species within the Burke County Wind Project’s Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 2,625 ft. (800 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 800 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
American Goldfinch	7	5	0.078	0.343	0.056	64	40	0.533	1.100	0.267
American Pipit	-	-	-	-	-	1	1	0.008	0.091	0.008
American Robin	20	16	0.222	0.632	0.144	44	16	0.367	2.204	0.100
American Tree Sparrow	1	1	0.011	0.105	0.011	-	-	-	-	-
Baltimore Oriole	2	1	0.022	0.211	0.011	-	-	-	-	-
Bank Swallow	-	-	-	-	-	3	2	0.025	0.203	0.017
Barn Swallow	27	14	0.300	0.800	0.156	96	24	0.800	2.595	0.183
Black-billed Magpie	-	-	-	-	-	3	3	0.025	0.157	0.025
Bobolink (b)	11	9	0.122	0.470	0.078	1	1	0.008	0.091	0.008
Brewer's Blackbird	58	15	0.644	2.842	0.156	5	1	0.042	0.456	0.008
Brown Thrasher	1	1	0.011	0.105	0.011	-	-	-	-	-
Brown-headed Cowbird	80	29	0.889	1.969	0.278	7	2	0.058	0.490	0.017
Cedar Waxwing	-	-	-	-	-	17	11	0.142	0.569	0.075
Chestnut-collared Longspur (a)	1	1	0.011	0.105	0.011	6	1	0.050	0.548	0.008
Chipping Sparrow	1	1	0.011	0.105	0.011	1	1	0.008	0.091	0.008
Clay-colored Sparrow	26	24	0.289	0.546	0.244	29	9	0.242	1.438	0.075
Cliff Swallow	13	3	0.144	0.919	0.033	19	6	0.158	0.879	0.050
Common Grackle	164	22	1.822	8.774	0.200	2703	19	22.525	228.869	0.092
Common Redpoll	53	4	0.589	3.711	0.044	53	5	0.442	2.418	0.042
Common Yellowthroat	4	4	0.044	0.207	0.044	5	5	0.042	0.239	0.033
Downy Woodpecker	1	1	0.011	0.105	0.011	-	-	-	-	-
Eastern Kingbird	8	8	0.089	0.286	0.089	24	17	0.200	0.544	0.142

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
European Starling	16	4	0.178	1.045	0.044	26	4	0.217	1.769	0.033
Gray Catbird	-	-	-	-	-	4	4	0.033	0.180	0.033
Harris's Sparrow	-	-	-	-	-	2	1	0.017	0.183	0.008
Horned Lark	125	57	1.389	3.354	0.344	75	19	0.625	2.603	0.150
Lapland Longspur	637	12	7.078	34.128	0.122	111	7	0.925	4.981	0.042
Lark Sparrow	1	1	0.011	0.105	0.011	1	1	0.008	0.091	0.008
Least Flycatcher	2	2	0.022	0.148	0.022	2	1	0.017	0.183	0.008
Marsh Wren	3	3	0.033	0.181	0.033	3	3	0.025	0.157	0.025
Mountain Bluebird	-	-	-	-	-	2	1	0.017	0.183	0.008
Mourning Dove	15	13	0.167	0.431	0.144	52	25	0.433	1.419	0.175
Northern Flicker	2	2	0.022	0.148	0.022	2	2	0.017	0.129	0.017
Northern Rough-winged Swallow	1	1	0.011	0.105	0.011	-	-	-	-	-
Orchard Oriole	-	-	-	-	-	2	2	0.017	0.129	0.017
Red-winged Blackbird	378	173	4.200	8.995	0.611	1031	68	8.592	35.429	0.308
Rusty Blackbird	-	-	-	-	-	8	2	0.067	0.576	0.017
Savannah Sparrow	16	14	0.178	0.488	0.133	18	8	0.150	0.644	0.067
Smith's Longspur	-	-	-	-	-	10	1	0.083	0.913	0.008
Snow Bunting	48	4	0.533	4.106	0.033	34	4	0.283	1.701	0.033
Song Sparrow	32	32	0.356	0.659	0.278	15	15	0.125	0.401	0.108
Tennessee Warbler	1	1	0.011	0.105	0.011	-	-	-	-	-
Tree Swallow	22	11	0.244	0.708	0.122	3	2	0.025	0.203	0.017
Unknown Longspur	-	-	-	-	-	655	2	5.458	54.960	0.017
Unknown Passerine	2	2	0.022	0.148	0.022	2	2	0.017	0.129	0.017

Table G. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Unknown Sparrow	-	-	-	-	-	4	4	0.033	0.180	0.033
Vesper Sparrow	4	4	0.044	0.207	0.044	14	11	0.117	0.471	0.083
Western Kingbird	2	2	0.022	0.148	0.022	1	1	0.008	0.091	0.008
Western Meadowlark (b)	36	36	0.400	0.700	0.300	13	11	0.108	0.384	0.083
Yellow Warbler	5	5	0.056	0.230	0.056	4	3	0.033	0.222	0.025
Yellow-headed Blackbird	131	57	1.456	6.521	0.278	123	9	1.025	7.568	0.067
Yellow-rumped Warbler	-	-	-	-	-	5	3	0.042	0.272	0.025
Small-Bodied Non-Passerines	18	16	0.200	0.479	0.167	54	27	0.450	1.419	0.192
Passerines and Small-Bodied Corvids	1939	579	21.544	40.112	0.878	5249	353	43.742	238.218	0.775

Seasonal mean use statistics by species within the Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 300 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Alder Flycatcher	1	1	0.005	0.070	0.005	-	-	-	-	-
American Goldfinch	31	14	0.152	0.789	0.059	155	95	0.570	1.147	0.257
American Pipit	-	-	-	-	-	1	1	0.004	0.061	0.004
American Robin	45	35	0.221	0.624	0.147	63	28	0.232	1.518	0.081
American Tree Sparrow	3	2	0.015	0.156	0.010	12	3	0.044	0.514	0.011
Baltimore Oriole	3	2	0.015	0.156	0.010	-	-	-	-	-
Bank Swallow	5	2	0.025	0.252	0.010	4	3	0.015	0.148	0.011
Barn Swallow	53	26	0.260	0.891	0.127	253	61	0.930	2.876	0.202
Belted Kingfisher	-	-	-	-	-	1	1	0.004	0.061	0.004
Black-billed Magpie	-	-	-	-	-	6	6	0.022	0.170	0.018
Blackpoll Warbler	-	-	-	-	-	1	1	0.004	0.061	0.004
Bobolink (b)	34	23	0.167	0.703	0.088	4	4	0.015	0.121	0.015
Bohemian Waxwing	-	-	-	-	-	14	1	0.051	0.849	0.004
Brewer's Blackbird	134	40	0.657	2.475	0.181	25	4	0.092	1.043	0.011
Brown Thrasher	2	2	0.010	0.099	0.010	-	-	-	-	-
Brown-headed Cowbird	188	66	0.922	2.529	0.275	7	2	0.026	0.326	0.007
Cedar Waxwing	-	-	-	-	-	54	24	0.199	0.853	0.081
Chestnut-collared Longspur (a)	1	1	0.005	0.070	0.005	6	1	0.022	0.364	0.004
Chipping Sparrow	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Clay-colored Sparrow	48	43	0.235	0.510	0.196	38	15	0.140	0.996	0.055
Cliff Swallow	40	12	0.196	0.921	0.059	44	13	0.162	0.911	0.044
Common Grackle	270	51	1.324	6.239	0.186	2992	42	11.000	152.597	0.110

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Common Redpoll	76	11	0.373	2.613	0.044	118	15	0.434	2.490	0.051
Common Yellowthroat	5	5	0.025	0.155	0.025	7	7	0.026	0.180	0.022
Downy Woodpecker	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Eastern Bluebird	-	-	-	-	-	9	1	0.033	0.546	0.004
Eastern Kingbird	12	11	0.059	0.256	0.054	65	43	0.239	0.707	0.140
European Starling	56	14	0.275	1.691	0.064	48	10	0.176	1.371	0.037
Gray Catbird	-	-	-	-	-	10	10	0.037	0.189	0.037
Harris's Sparrow	1	1	0.005	0.070	0.005	2	1	0.007	0.121	0.004
Horned Lark	264	135	1.294	3.034	0.368	158	51	0.581	2.078	0.162
House Sparrow	1	1	0.005	0.070	0.005	6	3	0.022	0.309	0.007
House Wren	1	1	0.005	0.070	0.005	1	1	0.004	0.061	0.004
Lapland Longspur	863	26	4.230	23.733	0.118	161	14	0.592	3.618	0.044
Lark Sparrow	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Least Flycatcher	5	5	0.025	0.155	0.025	3	2	0.011	0.135	0.007
Marsh Wren	3	3	0.015	0.121	0.015	3	3	0.011	0.105	0.011
Mountain Bluebird	-	-	-	-	-	2	1	0.007	0.121	0.004
Mourning Dove	38	29	0.186	0.520	0.142	119	44	0.438	2.128	0.136
Northern Flicker	4	4	0.020	0.139	0.020	5	4	0.018	0.201	0.011
Northern Rough-winged Swallow	1	1	0.005	0.070	0.005	-	-	-	-	-
Orange-crowned Warbler	-	-	-	-	-	2	2	0.007	0.086	0.007
Orchard Oriole	-	-	-	-	-	2	2	0.007	0.086	0.007
Purple Martin	1	1	0.005	0.070	0.005	-	-	-	-	-
Red-eyed Vireo	-	-	-	-	-	1	1	0.004	0.061	0.004

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Red-winged Blackbird	768	338	3.765	7.824	0.569	1430	132	5.257	24.436	0.272
Rusty Blackbird	-	-	-	-	-	51	4	0.188	2.574	0.015
Savannah Sparrow	40	30	0.196	0.620	0.132	38	25	0.140	0.552	0.077
Smith's Longspur	-	-	-	-	-	10	1	0.037	0.606	0.004
Snow Bunting	88	10	0.431	3.659	0.044	45	6	0.165	1.226	0.022
Song Sparrow	54	54	0.265	0.569	0.211	29	29	0.107	0.374	0.092
Sprague's Pipit (a)	2	2	0.010	0.099	0.010	1	1	0.004	0.061	0.004
Tennessee Warbler	1	1	0.005	0.070	0.005	-	-	-	-	-
Tree Swallow	51	27	0.250	0.674	0.132	11	4	0.040	0.405	0.015
Unknown Blackbird	-	-	-	-	-	4	1	0.015	0.243	0.004
Unknown Longspur	-	-	-	-	-	667	3	2.452	36.525	0.011
Unknown Passerine	12	5	0.059	0.576	0.025	34	6	0.125	1.168	0.022
Unknown Sparrow	-	-	-	-	-	8	7	0.029	0.190	0.026
Unknown Swallow	2	1	0.010	0.140	0.005	4	1	0.015	0.243	0.004
Unknown Warbler	-	-	-	-	-	1	1	0.004	0.061	0.004
Vesper Sparrow	18	15	0.088	0.347	0.074	25	20	0.092	0.406	0.066
Warbling Vireo	1	1	0.005	0.070	0.005	2	2	0.007	0.086	0.007
Western Kingbird	4	4	0.020	0.139	0.020	3	2	0.011	0.135	0.007
Western Meadowlark (b)	101	98	0.495	0.772	0.368	59	40	0.217	0.889	0.107
White-breasted Nuthatch	-	-	-	-	-	1	1	0.004	0.061	0.004
White-crowned Sparrow	4	2	0.020	0.198	0.010	-	-	-	-	-
Yellow Warbler	10	10	0.049	0.216	0.049	7	6	0.026	0.180	0.022

Table H. Seasonal Use Summary Statistics for Small-Bodied Non-Passerines (Woodpeckers and Doves) and Passerines (Including Small-Bodied Corvids such as Jays and Magpies) within the Burke County Wind Project Avian Use Study Area (Burke County, North Dakota)

Species Group/Species Name	Spring					Fall				
	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	Total Flocks	Mean Use (birds/300 m plot/20 min)	Stan. Dev.	Occur. Freq.
Yellow-headed Blackbird	166	83	0.814	4.387	0.230	179	15	0.658	5.732	0.048
Yellow-rumped Warbler	-	-	-	-	-	6	4	0.022	0.191	0.015
Small-Bodied Non-Passerines	43	34	0.211	0.552	0.157	128	52	0.471	2.137	0.158
Passerines and Small-Bodied Corvids	3473	1222	17.025	29.592	0.877	6897	787	25.357	159.592	0.772

Seasonal mean use statistics by species within the Burke County Wind Project’s Avian Use Study Area. The Avian Use Study Area described a 1-mile boundary around the original 300 MW Burke County Wind Project. *Total Std. Detections* = Total number of detections occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Total Flocks* = total number of flocks occurring within the 984 ft. (300 m)-radius survey cylinder during standardized use surveys; *Mean Use* = Mean detections per 300 m plot/20 minute count segment, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season. North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) denoted by subscripted letters after species name: (a) = Level I; (b) = Level II; (c) = Level III.

APPENDIX III

Species Observed during Standardized Avian Use Surveys

Appendix III. Species Observed during Standardized Avian Use Surveys—Burke County Wind Project (Burke County, North Dakota)

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Alder Flycatcher	<i>Empidonax alnorum</i>	X*	N/A	-	N/A		
American Avocet	<i>Recurvirostra americana</i>	X	N/A	X	N/A	SCP II	
American Coot	<i>Fulica americana</i>	X	N/A	X	N/A		
American Crow	<i>Corvus brachyrhynchos</i>	X	N/A	X	N/A		
American Goldfinch	<i>Spinus tristis</i>	X	N/A	X	N/A		
American Kestrel	<i>Falco sparverius</i>	X	X*	X	-	SCP II	
American Pipit	<i>Anthus rubescens</i>	-	N/A	X	N/A		
American Robin	<i>Turdus migratorius</i>	X	N/A	X	N/A		
American Tree Sparrow	<i>Spizelloides arborea</i>	X	N/A	X*	N/A		
American White Pelican	<i>Pelecanus erythrorhynchos</i>	X*	N/A	X	N/A	SCP II	
American Wigeon	<i>Mareca americana</i>	X	N/A	X	N/A		
Baird's Sandpiper	<i>Calidris bairdii</i>	X*	N/A	-	N/A	SCP I	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	-	X	-	SCP II	BGEPA
Baltimore Oriole	<i>Icterus galbula</i>	X	N/A	-	N/A		
Bank Swallow	<i>Riparia riparia</i>	X*	N/A	X	N/A		
Barn Swallow	<i>Hirundo rustica</i>	X	N/A	X	N/A		
Belted Kingfisher	<i>Megaceryle alcyon</i>	-	N/A	X*	N/A		
Black Tern	<i>Chlidonias niger</i>	X	N/A	X	N/A	SCP I	
Black-billed Magpie	<i>Pica hudsonia</i>	-	N/A	X	N/A		
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	X	N/A	X*	N/A		
Blackpoll Warbler	<i>Setophaga striata</i>	-	N/A	X*	N/A		
Blue-winged Teal	<i>Spatula discors</i>	X	N/A	X	N/A		
Bobolink	<i>Dolichonyx oryzivorus</i>	X	N/A	X	N/A	SCP II	
Bohemian Waxwing	<i>Bombycilla garrulus</i>	-	N/A	X*	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	X	N/A	X	N/A		
Broad-winged Hawk	<i>Buteo platypterus</i>	X*	-	X	-		
Brown Thrasher	<i>Toxostoma rufum</i>	X	N/A	-	N/A		
Brown-headed Cowbird	<i>Molothrus ater</i>	X	N/A	X	N/A		
Buff-breasted Sandpiper	<i>Calidris subruficollis</i>	X*	N/A	-	N/A		
Bufflehead	<i>Bucephala albeola</i>	X	N/A	-	N/A		
Cackling Goose	<i>Branta hutchinsii</i>	X	N/A	X	N/A		
California Gull	<i>Larus californicus</i>	X	N/A	-	N/A		
Canada Goose	<i>Branta canadensis</i>	X	N/A	X	N/A		
Canvasback	<i>Aythya valisineria</i>	X	N/A	X	N/A	SCP II	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	-	N/A	X	N/A		
Chestnut-collared Longspur	<i>Calcarius ornatus</i>	X	N/A	X	N/A	SCP I	
Chipping Sparrow	<i>Spizella passerina</i>	X	N/A	X	N/A		
Clay-colored Sparrow	<i>Spizella pallida</i>	X	N/A	X	N/A		
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X	N/A	X	N/A		
Common Grackle	<i>Quiscalus quiscula</i>	X	N/A	X	N/A		
Common Merganser	<i>Mergus merganser</i>	X*	N/A	-	N/A		
Common Raven	<i>Corvus corax</i>	X	N/A	X	N/A		
Common Redpoll	<i>Acanthis flammea</i>	X	N/A	X	N/A		
Common Yellowthroat	<i>Geothlypis trichas</i>	X	N/A	X	N/A		
Cooper's Hawk	<i>Accipiter cooperii</i>	X	X	X	-		
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	X	N/A	X	N/A		
Downy Woodpecker	<i>Dryobates pubescens</i>	X	N/A	X*	N/A		
Eastern Bluebird	<i>Sialia sialis</i>	-	N/A	X*	N/A		
Eastern Kingbird	<i>Tyrannus tyrannus</i>	X	N/A	X	N/A		
European Starling	<i>Sturnus vulgaris</i>	X	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Ferruginous Hawk	<i>Buteo regalis</i>	-	-	X	-	SCP I	
Forster's Tern	<i>Sterna forsteri</i>	X*	N/A	-	N/A		
Franklin's Gull	<i>Leucophaeus pipixcan</i>	X	N/A	X	N/A	SCP I	
Gadwall	<i>Mareca strepera</i>	X	N/A	X	N/A		
Golden Eagle	<i>Aquila chrysaetos</i>	-	-	X*	X	SCP II	BGEPA
Gray Catbird	<i>Dumetella carolinensis</i>	-	N/A	X	N/A		
Gray Partridge	<i>Perdix perdix</i>	X	N/A	X*	N/A		
Great Blue Heron	<i>Ardea herodias</i>	-	N/A	X	N/A		
Great Horned Owl	<i>Bubo virginianus</i>	X	X*	X	-		
Greater White-fronted Goose	<i>Anser albifrons</i>	-	N/A	X*	N/A		
Greater Yellowlegs	<i>Tringa melanoleuca</i>	X	N/A	X	N/A		
Green-winged Teal	<i>Anas crecca</i>	X	N/A	X	N/A		
Harris's Sparrow	<i>Zonotrichia querula</i>	X*	N/A	X	N/A		
Hooded Merganser	<i>Lophodytes cucullatus</i>	X*	N/A	-	N/A		
Horned Grebe	<i>Podiceps auritus</i>	X	N/A	-	N/A	SCP I	
Horned Lark	<i>Eremophila alpestris</i>	X	N/A	X	N/A		
House Sparrow	<i>Passer domesticus</i>	X*	N/A	X*	N/A		
House Wren	<i>Troglodytes aedon</i>	X*	N/A	-	N/A		
Killdeer	<i>Charadrius vociferus</i>	X	N/A	X	N/A		
Lapland Longspur	<i>Calcarius lapponicus</i>	X	N/A	X	N/A		
Lark Sparrow	<i>Chondestes grammacus</i>	X	N/A	X	N/A		
Least Flycatcher	<i>Empidonax minimus</i>	X	N/A	X	N/A		
Least Sandpiper	<i>Calidris minutilla</i>	X	N/A	-	N/A		
Lesser Scaup	<i>Aythya affinis</i>	X	N/A	X	N/A	SCP II	
Lesser Yellowlegs	<i>Tringa flavipes</i>	X	N/A	X	N/A		
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	-	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Mallard	<i>Anas platyrhynchos</i>	X	N/A	X	N/A		
Marsh Wren	<i>Cistothorus palustris</i>	X	N/A	X	N/A		
Merlin	<i>Falco columbarius</i>	X	-	X*	-		
Mountain Bluebird	<i>Sialia currucoides</i>	-	N/A	X	N/A		
Mourning Dove	<i>Zenaidura macroura</i>	X	N/A	X	N/A		
Northern Flicker	<i>Colaptes auratus</i>	X	N/A	X	N/A		
Northern Goshawk	<i>Accipiter gentilis</i>	-	-	-	X		
Northern Harrier	<i>Circus hudsonius</i>	X	X	X	-	SCP II	
Northern Pintail	<i>Anas acuta</i>	X	N/A	X	N/A	SCP II	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	N/A	-	N/A		
Northern Shoveler	<i>Spatula clypeata</i>	X	N/A	X	N/A		
Orange-crowned Warbler	<i>Oreothlypis celata</i>	-	N/A	X*	N/A		
Orchard Oriole	<i>Icterus spurius</i>	-	N/A	X	N/A		
Osprey	<i>Pandion haliaetus</i>	X*	-	X	-		
Pectoral Sandpiper	<i>Calidris melanotos</i>	-	N/A	X	N/A		
Peregrine Falcon	<i>Falco peregrinus</i>	X	X*	-	-	SCP III	
Pied-billed Grebe	<i>Podilymbus podiceps</i>	X	N/A	X	N/A		
Prairie Falcon	<i>Falco mexicanus</i>	-	-	X*	-	SCP II	
Purple Martin	<i>Progne subis</i>	X*	N/A	-	N/A		
Red-eyed Vireo	<i>Vireo olivaceus</i>	-	N/A	X*	N/A		
Redhead	<i>Aythya americana</i>	X	N/A	X	N/A		
Red-necked Grebe	<i>Podiceps grisegena</i>	X*	N/A	X	N/A		
Red-necked Phalarope	<i>Phalaropus lobatus</i>	-	N/A	X*	N/A		
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	X	X	-		
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	N/A	X	N/A		
Ring-billed Gull	<i>Larus delawarensis</i>	X	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Ring-necked Duck	<i>Aythya collaris</i>	X	N/A	X	N/A		
Ring-necked Pheasant	<i>Phasianus colchicus</i>	X	N/A	X	N/A		
Rock Pigeon	<i>Columba livia</i>	X	N/A	X	N/A		
Ross's Goose	<i>Anser rossii</i>	-	N/A	X	N/A		
Rough-legged Hawk	<i>Buteo lagopus</i>	X	-	X	X		
Ruddy Duck	<i>Oxyura jamaicensis</i>	X	N/A	X	N/A		
Rusty Blackbird	<i>Euphagus carolinus</i>	-	N/A	X	N/A		
Sandhill Crane	<i>Antigone canadensis</i>	X	N/A	X	N/A		
Savannah Sparrow	<i>Passerculus sandwichensis</i>	X	N/A	X	N/A		
Semipalmated Plover	<i>Charadrius semipalmatus</i>	-	N/A	X*	N/A		
Sharp-shinned Hawk	<i>Accipiter striatus</i>	X	-	X	-		
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>	X	N/A	X	N/A	SCP II	
Short-eared Owl	<i>Asio flammeus</i>	X*	-	-	X	SCP II	
Smith's Longspur	<i>Calcarius pictus</i>	-	N/A	X	N/A		
Snow Bunting	<i>Plectrophenax nivalis</i>	X	N/A	X	N/A		
Snow Goose	<i>Anser caerulescens</i>	-	N/A	X	N/A		
Snowy Owl	<i>Bubo scandiacus</i>	-	-	-	X		
Solitary Sandpiper	<i>Tringa solitaria</i>	X	N/A	X*	N/A		
Song Sparrow	<i>Melospiza melodia</i>	X	N/A	X	N/A		
Sora	<i>Porzana carolina</i>	X	N/A	-	N/A		
Spotted Sandpiper	<i>Actitis macularius</i>	X*	N/A	X	N/A		
Sprague's Pipit	<i>Anthus spragueii</i>	X*	N/A	X*	N/A	SCP I	
Swainson's Hawk	<i>Buteo swainsoni</i>	X	X	X	-	SCP I	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	X	N/A	-	N/A		
Tree Swallow	<i>Tachycineta bicolor</i>	X	N/A	X	N/A		
Tundra Swan	<i>Cygnus columbianus</i>	-	N/A	X*	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Turkey Vulture	<i>Cathartes aura</i>	X	X*	X	-	SCP II	
Unknown Accipiter	<i>Accipiter</i>	-	-	X*	-		
Unknown Blackbird	<i>Icteridae</i>	-	N/A	X*	N/A		
Unknown Corvid	<i>Corvidae</i>	X	N/A	-	N/A		
Unknown Duck	<i>Anatinae</i>	X*	N/A	X	N/A		
Unknown Eagle	<i>Aquila chrysaetos/Haliaeetus leucocephalus</i>	-	-	-	X*		
Unknown Falcon	<i>Falco</i>	-	-	X*	X		
Unknown Goose	<i>Anser/Branta</i>	-	N/A	X	N/A		
Unknown Gull	<i>Larinae sp.</i>	X	N/A	X	N/A		
Unknown Longspur	<i>Calcariidae</i>	-	N/A	X	N/A		
Unknown Passerine	<i>Passeriformes</i>	X	N/A	X	N/A		
Unknown Raptor	<i>Accipitriformes/Falconiformes</i>	X*	-	-	-		
Unknown Shorebird	<i>Charadriiformes</i>	X	N/A	X	N/A		
Unknown Sparrow	<i>Passerellidae</i>	-	N/A	X	N/A		
Unknown Swallow	<i>Hirundinidae</i>	X	N/A	X*	N/A		
Unknown Warbler	<i>Parulidae</i>	-	N/A	X*	N/A		
Upland Sandpiper	<i>Bartramia longicauda</i>	X	N/A	-	N/A		
Vesper Sparrow	<i>Poocetes gramineus</i>	X	N/A	X	N/A		
Virginia Rail	<i>Rallus limicola</i>	X	N/A	X*	N/A		
Warbling Vireo	<i>Vireo gilvus</i>	X*	N/A	X*	N/A		
Western Grebe	<i>Aechmophorus occidentalis</i>	-	N/A	X*	N/A		
Western Kingbird	<i>Tyrannus verticalis</i>	X	N/A	X	N/A		
Western Meadowlark	<i>Sturnella neglecta</i>	X	N/A	X	N/A		
White-breasted Nuthatch	<i>Sitta carolinensis</i>	-	N/A	X*	N/A		
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	X*	N/A	-	N/A		
White-faced Ibis	<i>Plegadis chihi</i>	-	N/A	X	N/A		

Common Name	Scientific Name	Season				Conservation Listing Status	
		Spring	Summer	Fall	Winter	State Status	Federal Status
Willet	<i>Tringa semipalmata</i>	X	N/A	-	N/A	SCP II	
Wilson's Phalarope	<i>Phalaropus tricolor</i>	X	N/A	X	N/A	SCP I	
Wilson's Snipe	<i>Gallinago delicata</i>	X	N/A	X*	N/A		
Yellow Warbler	<i>Setophaga petechia</i>	X	N/A	X	N/A		
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	X	N/A	X	N/A		
Yellow-rumped Warbler	<i>Setophaga coronata</i>	-	N/A	X	N/A		

Seasons Detected: An "X" within a particular seasonal column indicates that species has been detected at least once within the Project Area over the course of field studies. An asterisk (*) indicates that the species was detected outside the Project but within the Avian Use Study Area.

State conservation listing status indicates North Dakota State Wildlife Action Plan (Dyke et al. 2015) Species of Conservation Priority (SCP) Level I, II, or III

Federal Status Codes: BGEPA=Bald and Golden Eagle Protection Act

This list only includes species detected during standardized surveys. All non-raptor species receive an "N/A" in summer and winter as standardized surveys were only conducted for raptors during these seasons.

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