Avian Use Study North Deuel Area
Deuel County Wind Energy Project
Deuel County, South Dakota

Final Report
April 2016 – March 2017

Prepared for:

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1 INTRODUCTION

Deuel Wind Energy, LLC (Deuel) is proposing to develop the North Deuel Area (Project) of the Deuel County Wind Energy Project in Deuel County, South Dakota (Figure 1.1). Deuel contracted Western EcoSystems Technology, Inc. (WEST) to conduct pre-construction avian surveys within the Project area. The methods for this study were consistent with the U.S. Fish and Wildlife Service's (USFWS) *Eagle Conservation Plan Guidance, Module 1 – Land-Based Wind Energy Guidance* (ECPG; USFWS 2013) and the USFWS' *Final Land-Based Wind Energy Guidelines* (USFWS 2012). The study was conducted from April 3, 2016 – March 24, 2017.

Study objectives were to assess the following for large birds (including eagles) and small birds: 1) species composition, relative abundance, and diversity; 2) overall use, percent of use, and frequency of occurrence; 3) flight height; and 4) spatial use. Additional objectives were to document use of the Project area by federally or state-listed threatened, endangered, and sensitive avian species and to record number of minutes eagles were present within the Project area. The following report describes the results of the avian use study conducted in the Project area from April 3, 2016 – March 24, 2017.

2 PROJECT AREA

The original Project area was 15,399 hectares (ha; 38,052 acres [ac]), but was expanded in January 2017 to the current size of 21,428 ha (52,950 ac; Figure 1.1). The Project occurs within the Prairie Couteau of the Northern Glaciated Plains Ecoregion, which encompasses the eastern edge of South Dakota (U.S. Environmental Protection Agency 2016). Historically, this ecoregion supported both tallgrass and shortgrass prairies; however, these native grasslands have been predominantly converted to cultivated croplands (Bryce et al. 1996), with corn (*Zea mays*) and soybeans (*Glycine max*) as the dominant crops (Miller 1997).

Several named streams are present within the Project area and include portions of Caine Creek, Crow Timber Creek, Crow Creek, Lost Creek, Monighan Creek, and Mud Creek (Figure 1.1). Two named lakes, Lone Tree Lake and Lake Francis, and several small unnamed lakes are present within Project area (Figure 1.1). Topography is flat to gently rolling, with elevations ranging from 366-550 meters (m; 1,201-1,804 feet [ft]; U.S. Geological Survey [USGS] 2014).

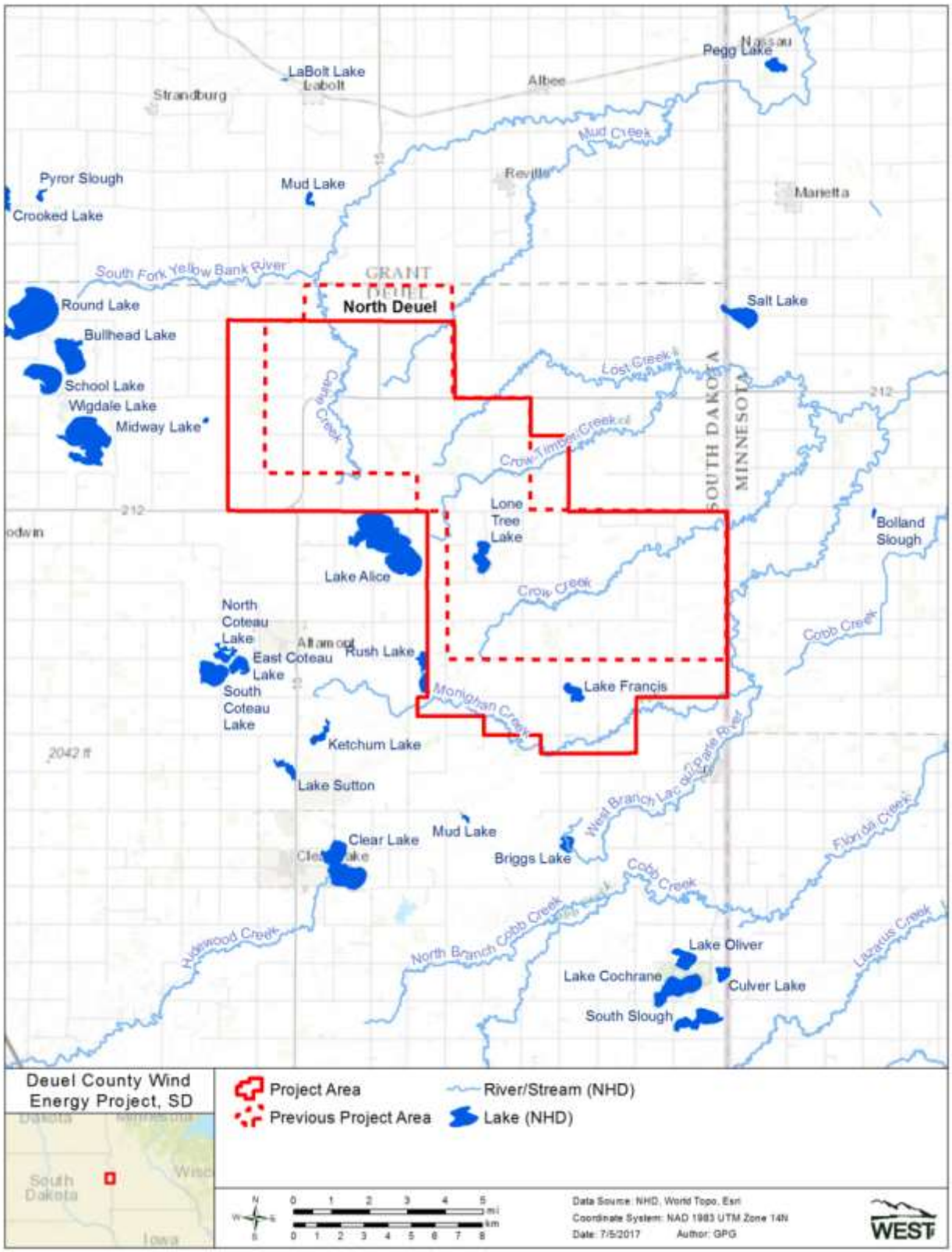

Figure 1.1. Location of the North Deuel Area of the Deuel County Wind Energy Project and National Hydrology Data in Deuel County, South Dakota.

As part of the site characterization process and to confirm the 2011 National Land Cover Database (NLCD) classifications (USGS NLCD 2011; Homer et al. 2015), a site reconnaissance and grassland reconnaissance (NLCD defines grassland as herbaceous) were conducted in 2016. Land cover (e.g., herbaceous [including native and introduced planted grassland], cropland), surface features, and land use practices in the Project area were visually evaluated from public roads and on foot in areas with land access (WEST 2017). Based on these data sources (i.e., 2011 NLCD site reconnaissance and grassland reconnaissance), cultivated crops (48%), herbaceous (22%), and hay/pasture (17%) were the prominent land cover types in the Project area (Table 2.1; Figure 2.1). The remaining land cover types include emergent herbaceous wetlands, developed, deciduous forest, open water, shrub/scrub, and woody wetlands (Table 2.1; Figure 2.1).

Table 2.1. Land cover types within the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, based on the National Land Cover Database, site reconnaissance, and grassland reconnaissance.

Cover Type	Hectares	Acres	Percent (%)
Cultivated crops	10,364	25,609	48
Herbaceous	4,672	11,545	22
Hay/Pasture	3,707	9,161	17
Emergent herbaceous wetlands	1,121	2,769	5
Developed, open space	825	2,039	4
Deciduous forest	354	875	2
Open water	342	845	2
Shrub/scrub	24	60	<1
Developed, low intensity	11	27	<1
Woody wetlands	5	13	<1
Developed, medium intensity	2	5	<1
Developed high intensity	1	1	<1
Total[1]	**21,428**	**52,950**	**100**

Sources: USGS NLCD 2011; Homer et al. 2015; WEST 2017
[1]Sums of values may not add to total value shown, due to rounding

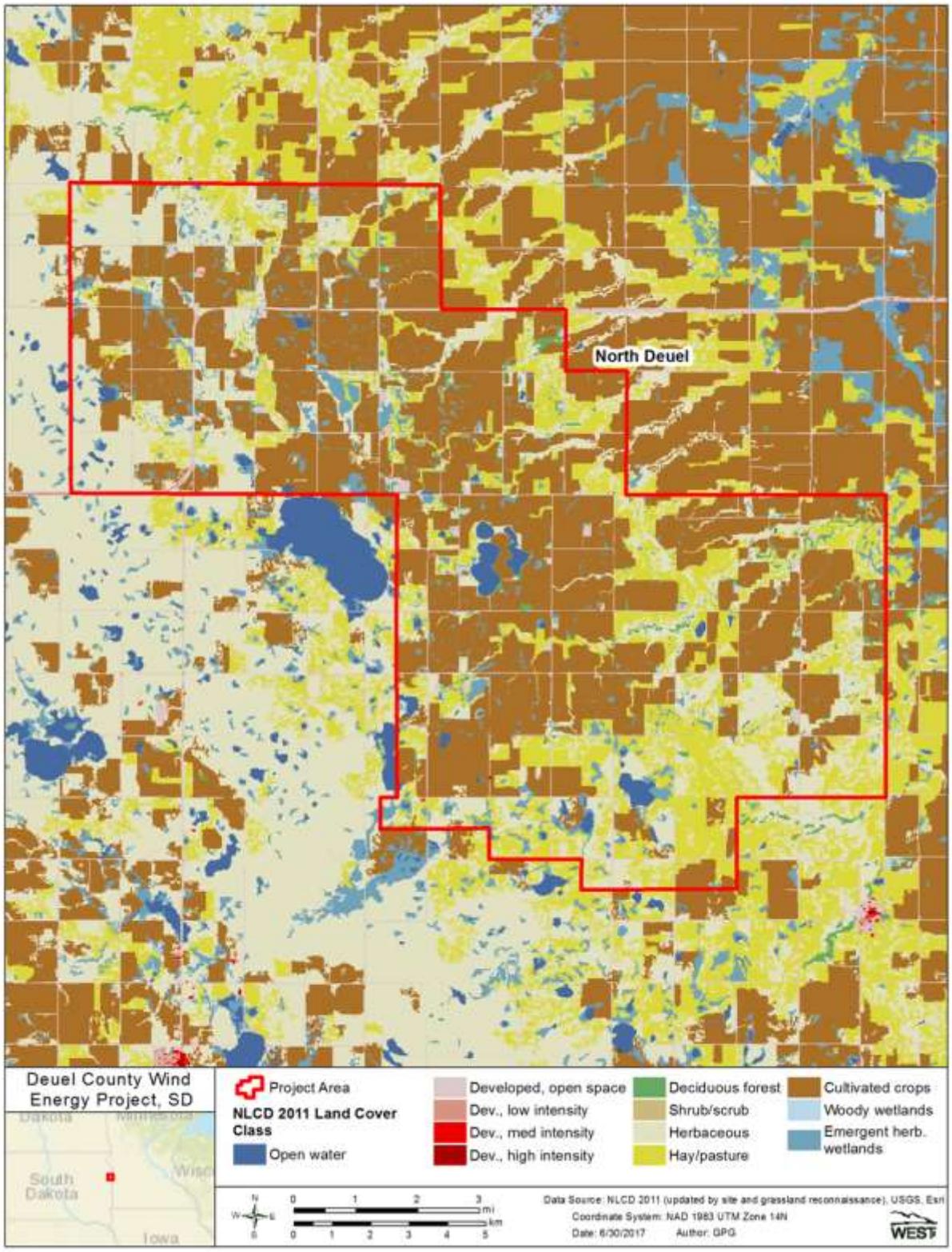

Figure 2.1. Land cover types within and adjacent to the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, based on the National Land Cover Database, site reconnaissance, and grassland reconnaissance.

3 METHODS

3.1 Survey Methods

3.1.1 Large Birds

Large bird use surveys were conducted using methods described by Reynolds et al. (1980). These surveys were conducted from April 3, 2016 – March 24, 2017. At the initiation of the study on April 3, 2016, 24 survey points consisting of 800-m (2,625-ft) radius circular plots were established along public roads throughout the Project area (Figure 3.1). The Project area was expanded in January 2017, and an additional 10 survey points were established to provide coverage of the expansion area, resulting in a total of 34 survey points for the remainder of the study. Circular plots covered approximately 30% of the Project area.

Surveys were conducted for 1 year by surveying each plot for 60 minutes (min) approximately once per month. To ensure surveys encompassed more days throughout the calendar year and better account for natural variation in bird use, rather than visiting all of the points once per month, surveys were conducted at half of the survey points approximately every 2 weeks, rotating between odd– and even–numbered points. This approach resulted in 13, rather than 12, total survey visits in the Project area over the survey year. While this schedule is generally preferable for documenting avian use, as compared to visiting all points only once per month, the schedule resulted in two large bird use surveys being conducted at half (12) of the points in June and December 2016, while only one survey being conducted at 24 points from April through December 2016 and 34 points January through March 2017.

Seasons were defined as spring (April 3 – May 29, 2016; March 1 – March 24, 2017), summer (May 30 – September 9, 2016), fall (September 10 – November 14, 2016), and winter (November 15, 2016 – February 28, 2017). Surveys were conducted during daylight hours and the order for surveying points was rotated to ensure each plot was surveyed at various times of the day and the same number of times over the study period. Some surveys were missed due to inclement weather (e.g., poor visibility) or site access issues (e.g., muddy roads, snow drifts).

The following information was recorded during each large bird use survey: date, start and end time, and weather (i.e., temperature, wind speed, wind direction, precipitation, and cloud cover). Additionally, the following data were recorded for each observation:

- Species (or best possible identification)
- Number of individuals (i.e., in a flock, or individual observations)
- Distance from plot center when first observed
- Closest distance observed
- Flight height above ground
- Flight direction
- Activity (e.g., flying, perched)

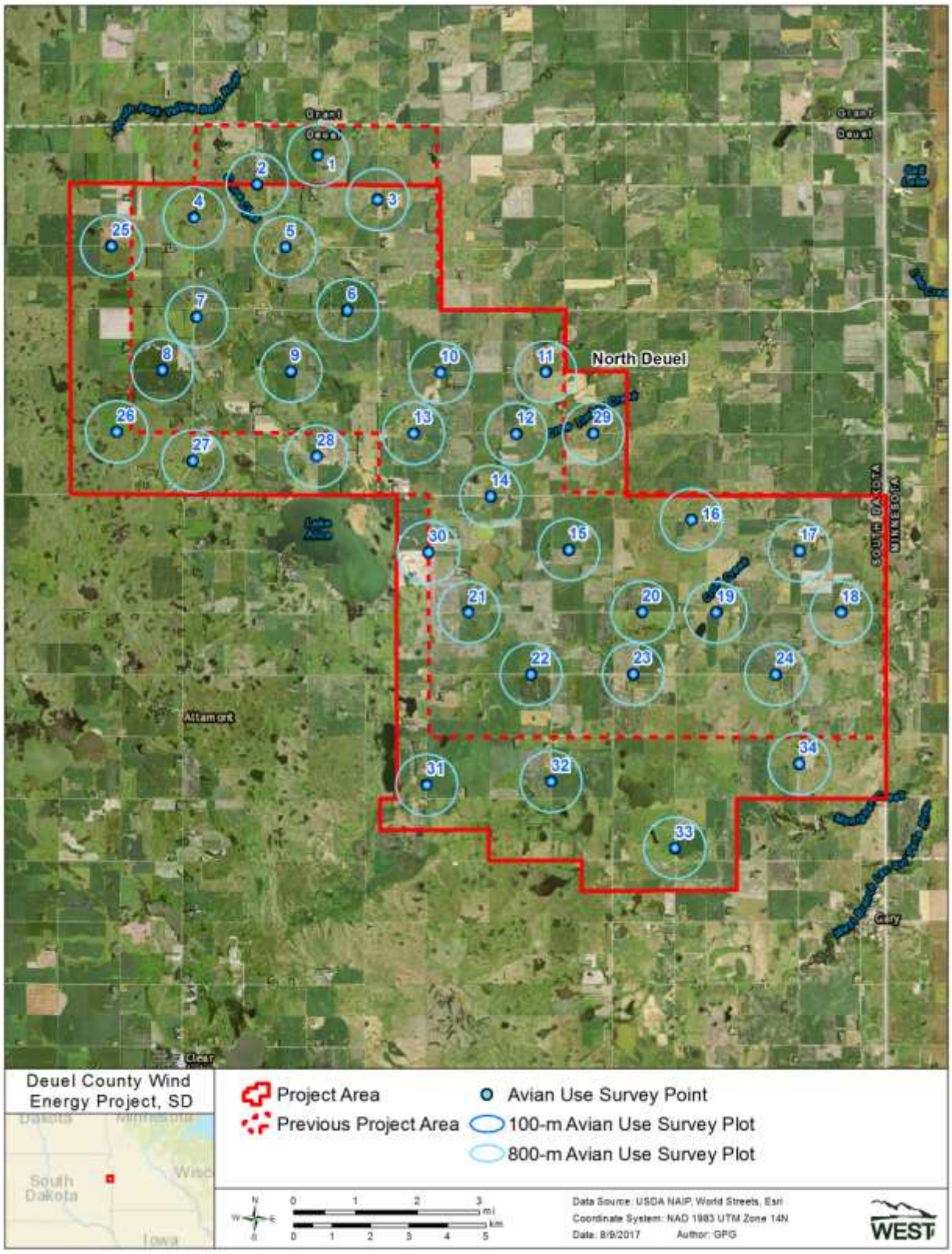

Figure 3.1. Location of large bird and small bird use survey points and survey plots within the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Large birds included the subtypes waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids, and goatsuckers. Large birds seen or heard during the standardized 60-min surveys were recorded using a unique observation number, relative to the location of the observer and whether the observations occurred inside or outside the 800-m (2,625-ft) plots. Observations of large birds outside the 800-m (2,625-ft) plot were included in the development of species composition, relative abundance, and species diversity metrics, but were not included in analyses of avian use and flight heights. Approximate flight height, flight direction, and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval; the approximate lowest and highest heights also were recorded.

Bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) observations were recorded at 1-min intervals documenting when an eagle was within the 800-m (2,625-ft) plot and at or below 200 m (656 ft) above ground level (AGL), per the ECPG (i.e., eagle minutes). Flight height, distance, and activity (e.g., flying or perched) also were recorded during each 1-min interval. Eagles observed outside of the 800-m (2,625-ft) plot or at heights >200 m (656 ft) were recorded; however, eagle observations outside of the 800-m (2,625-ft) plot were not included in the statistical analyses for eagle use. For eagle minutes, only observations of eagles flying within the 800-m (2,625-ft) plot x 200-m (656-ft) high cylinder were included. The perch locations and flight paths of eagles were mapped to qualitatively assess areas of eagle use within the Project area. USGS topographic maps were used to record locations of observations as accurately as possible (USGS 2017).

Incidental bird observations were recorded when in transit between the standardized survey plots, focusing on sensitive species or large flocks of individuals. Sensitive species included species protected under the federal Endangered Species Act (1973), federal Bald and Golden Eagle Protection Act (BGEPA; 1940), state Endangered and Threatened Species Law (South Dakota Legislature), and state Species of Greatest Conservation Need as identified by the South Dakota Game, Fish and Parks (SDGFP) Wildlife Action Plan (WAP; SDGFP 2014). If sensitive species were observed, their approximate location was recorded.

3.1.2 Small Birds

Small bird use surveys also were conducted using methods described by Reynolds et al. (1980). The same survey points used for large bird surveys were used for the small bird surveys, but the plot size was reduced from an 800-m (2,625-ft) to a 100-m (328-ft) radius. Each survey plot was surveyed for 8 min approximately once per month during the general survey periods that extended from April 1, 2016 – December 2, 2016 and from March 7, 2017 – March 22, 2017. As with the large bird surveys, small bird surveys were conducted at half of the survey points approximately every 2 weeks, rotating between odd– and even–numbered points, to better account for natural variation in bird use. This approach resulted in 10, rather than nine total survey visits. Ultimately, an additional survey of 12 points each (i.e. half of the 24 survey points) occurred in both June and early December 2016.

Seasons were defined as spring (April 3 – May 29, 2016; March 7 – March 22, 2017), summer (May 30 – September 9, 2016), and fall (September 10 – December 2, 2016). Surveys were conducted from dawn until 11:00 a.m. The order in which plots were surveyed was rotated to ensure each plot was surveyed at various times of the morning over the study period.

The following information was recorded during each small bird use survey: date, start and end time, and weather (i.e., temperature, wind speed, wind direction, precipitation, and cloud cover). Additionally, the following data were recorded for each observation:

- Species (or best possible identification)
- Number of individuals (i.e., in a flock, or individual observations)
- Distance from plot center when first observed
- Closest distance observed
- Flight height above ground
- Flight direction
- Activity (e.g., flying, perched)

Small birds included passerines, swifts/hummingbirds, and woodpeckers. Small birds seen or heard during the 8-min observation period were recorded, identifying which observations occurred within or outside the 100-m (328-ft) plot. Small birds observed outside the plots were included in the development of species composition, relative abundance, and species diversity metrics, but were not included in analyses of avian use and flight heights. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval; the approximate lowest and highest heights also were recorded.

Similar to large birds observed, incidental bird observations of small birds were recorded when in transit between the standardized survey plots, focusing on sensitive species or large flocks of individuals. If sensitive species were observed, the approximate location of the observation was recorded by UTM coordinates using a hand-held GPS unit.

3.2 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and during report writing. Following field surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. A data technician then compared a sample of records from an electronic database to the raw data forms and corrected any errors. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes were made and tracked, accordingly.

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

QA/QC measurements implemented for report writing included review of the final document by a statistician, peer (research biologist), project manager, technical editor, and senior manager.

3.3 Data Analysis

Data for each type of survey were analyzed separately (i.e., data were not combined among all studies). Data analysis for the large bird use surveys and small bird use surveys were consistent among both studies, but data for each study were presented independently, based on target species groups and plot size.

3.3.1 Species Composition, Relative Abundance, and Diversity

For both large and small bird surveys, species composition (i.e., species and bird types observed during the standardized surveys), relative abundance (i.e., number of observations and groups of each species and bird type by season), and diversity (i.e., total number of species observed within each season) were compiled for all birds observed during point count surveys, irrespective of distance from observer (i.e., including birds observed beyond the 800-m [2,625-ft] or 100-m [328-ft] plot radius). In addition, percent composition for each bird type was calculated by total percent of bird observations and total percent of bird observations by season to assess percent composition of bird types based on all bird observations, regardless of distance from observer (i.e., birds observed within and outside the survey plots).

3.3.2 Bird Use, Percent of Use, and Frequency of Occurrence

Bird use was calculated as the number of birds per 800-m (2,625-ft) plot per 60-min survey for large bird use surveys, or 100-m (328-ft) plot per 8-min survey for small bird use surveys. Bird use by season was calculated in two steps: 1) the sum of the number of bird observations divided by the number of plots surveyed for each survey event (i.e. number of observations per survey event) and 2) the sum of the number of observations per survey event divided by the number of survey events in that season. Overall bird use was calculated as a weighted average of seasonal values by the number of calendar days in each season (as defined by the season dates). Percent of use was calculated as the proportion of large or small bird use that was attributable to a particular bird type or species, and frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species was observed.

3.3.3 Flight Height Characteristics

Flight height data were used to identify the bird species and estimated bird use within an estimated rotor-swept height (RSH) ranging from 25 - 150 m (82 - 492 ft) AGL. The group's (i.e., a single bird or a flock of two or more birds) flight height when first observed was used to calculate the percentage of the different groups flying at different height categories: below the RSH at 0 - 25 m (0 - 82 ft), at RSH at 25 - 150 m (82 - 492 ft), and greater than the RSH at >150 m (>492 ft).

3.3.4 Spatial Use

Large bird spatial use was evaluated by comparing large bird use among plots for large bird type groups (i.e., waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids, and

goatsuckers). Large bird use was calculated as the number of birds per 800-m (2,625-ft) plot per 60-min survey. Eagle flight paths were mapped during large bird use surveys and digitized to qualitatively show flight locations and flight direction (north/south, east/west) within survey plots. Spatial use of small birds was evaluated by comparing use among plots for small bird type groups (i.e., passerines, swifts/hummingbirds, and woodpeckers). Small bird use was calculated as the number of birds per 100-m (328-ft) plot per 8-min survey.

3.3.5 Eagle Minutes

Following survey protocols described in the ECPG, eagle minutes were calculated within three-dimensional plots (i.e., cylinders) that included the area within the 800-m (2,625-ft) survey plots and up to 200 m (656 ft) AGL. Eagle minutes were defined as the number of minutes an eagle was observed in flight within these three-dimensional cylinders during the 60-min survey periods (observations of perched eagles do not apply to eagle minutes). Eagle minutes were then summed and mapped to document the number of eagle minutes per plot. Eagle minutes also were summed by season and divided by the number of survey minutes per season to standardize the sum by level of effort. Temporal variation was evaluated by calculating eagle minutes per month over the 12-month study. Spatial variation was evaluated by calculating eagle minutes per plot, averaged across the 12-month study period, and mapped accordingly.

4 RESULTS

4.1 Large Bird Use Surveys

4.1.1 Large Bird Species Composition, Relative Abundance, and Diversity

During the large bird surveys, a total of 30,640 large bird observations in 1,039 separate groups were recorded (Appendix A), including birds observed both within and outside the 800-m (2,625-ft) plot. Forty-four species were observed within the Project area (Appendix A). In general, more birds were observed in spring (80.4% of all observations) than any other season, which is attributed to large groups of waterfowl observed (Appendix A).

Waterfowl accounted for 95.7% of all large bird observations over the entire study period, with the majority of observations recorded during spring (24,462 observations; 83.4% of all waterfowl observations; Appendix A). The most frequently observed waterfowl species was unidentified goose (mixed flocks of snow goose [*Chen caerulescens*], greater white-fronted goose [*Anser albifrons*], Canada goose [*Branta canadensis*], and Ross's goose [*Chen rosii*]); with 12,484 observations (Appendix A).

Diurnal raptor species accounted for 0.7% of large bird observations (209 observations; Appendix A). Eight diurnal raptors were identified to species. The most common diurnal raptor species observed were red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*). Bald eagle and unidentified eagle accounted for 19.6% of the diurnal raptor observations (39 and 2 observations, respectively) and 0.1% of all large bird observations (Appendix A). Eagles were observed more often during spring (20 observations; 48.8% of all eagle observations) and winter surveys (12 observations; 29.3% of all eagle observations,) than

during summer (5 observations; 12.2% of all eagle observations) or fall (4 observations; 9.8% of all eagle observations; Appendix A).

4.1.2 Large Bird Seasonal Use, Percent of Use, and Frequency of Occurrence

Overall large bird use over the study period was 78.9 observations/800-m (2,625-ft) plot/60-min survey, with the highest use recorded during the spring (250.3; largely influenced by waterfowl observations), as compared to fall (34.9), winter (30.7), and summer (7.0; Table 4.1; Appendix B).

Waterfowl

Waterfowl use over the study period averaged 74.5 observations/800-m (2,625-ft) plot/60-min survey, with the highest use recorded during spring (248.2), followed by winter (29.1), fall (21.9), and summer (3.2; Table 4.1; Appendix B). High spring use was attributed to unidentified goose (125.5 observations/800-m [2,625-ft] plot/60-min survey; Appendix B), which was discussed above for large mixed flocks of geese observed. Waterfowl accounted for 99.2% of all large bird use in spring, 94.8% in winter, 62.8% in fall, and 46.6% in summer. Waterfowl were observed during 62.0% of spring, 18.8% of winter, 38.3% of fall, and 12.5% of summer surveys (Table 4.1; Appendix B).

Diurnal Raptors

Diurnal raptor use over the study period was 0.7 observation/800-m (2,625-ft) plot/60-min survey, with highest use recorded during fall (1.6), followed by spring (0.9), summer (0.5), and winter (0.2; Table 4.1; Appendix B). Most use in fall was by red-tailed hawk (0.6 observation/800-m [2,625-ft] plot/60-min survey) and northern harrier (0.5 observation/800-m [2,625-ft] plot/60-min survey; Appendix B). Diurnal raptors accounted for 7.2% of all large bird use in summer, 4.5% in fall, 0.5% in winter, and 0.3% in spring. Diurnal raptors were observed during 64.6% of fall surveys, 49.2% of spring surveys, 27.1% of summer surveys, and 13.4% of spring surveys (Table 4.1; Appendix B).

Eagle use over the study period was 0.1 observation/800-m (2,625-ft) plot/60-min survey, with highest use recorded during the spring (0.2 observation/800-m [2,625-ft] plot/60-min survey), followed by winter (0.1), fall (<0.1), and summer (<0.1; Table 4.1, Appendix B). Eagles accounted for 0.4% of large bird use in winter and summer, 0.2% in fall, and <0.1% in spring. Eagles were observed during 14.6% of spring surveys, 10.9% of winter surveys, 5.0% of fall surveys, and 3.1% of summer surveys (Table 4.1; Appendix B).

Table 4.1. Large bird use, percent of total use (%), and frequency of occurrence (%), for each large bird type by season, observed during the large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Type/*Subtype*	Mean Use[1]				Percent of Total Use (%)				Frequency of Occurrence (%)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Waterbirds	<0.1	0.8	0.5	0.0	<0.1	12.0	1.5	0.0	2.9	18.8	9.6	0.0
Waterfowl	248.2	3.2	21.9	29.1	99.2	46.6	62.8	94.8	62.0	12.5	38.3	18.8
Shorebirds	0.2	0.4	0.9	0.0	<0.1	5.8	2.5	0.0	10.0	11.5	14.2	0.0
Gulls/Terns	0.1	1.3	7.7	0.0	<0.1	18.7	21.9	0.0	8.6	8.3	10.0	0.0
Rails/Coots	<0.1	<0.1	0.0	0.0	<0.1	0.3	0.0	0.0	1.4	1.0	0.0	0.0
Diurnal Raptors	0.9	0.5	1.6	0.2	0.3	7.2	4.5	0.5	49.2	27.1	64.6	13.4
Accipiters	<0.1	<0.1	*0.0*	*0.0*	*<0.1*	*0.4*	*0.0*	*0.0*	*1.0*	*2.1*	*0.0*	*0.0*
Buteos	*0.4*	*0.3*	*0.8*	<0.1	*0.2*	*4.6*	*2.3*	*0.1*	*29.0*	*18.8*	*38.8*	*3.5*
Harrier	*0.2*	*0.1*	*0.5*	*0.0*	*<0.1*	*1.0*	*1.5*	*0.0*	*14.0*	*5.2*	*32.5*	*0.0*
Eagles	*0.2*	<0.1	*<0.1*	*0.1*	*<0.1*	*0.4*	*0.2*	*0.4*	*14.6*	*3.1*	*5.0*	*10.9*
Falcons	<0.1	<0.1	<0.1	*0.0*	*<0.1*	*0.4*	*<0.1*	*0.0*	*3.5*	*2.1*	*2.5*	*0.0*
Other Raptors	<0.1	<0.1	*0.2*	<0.1	*<0.1*	*0.1*	*0.5*	*<0.1*	*1.0*	*1.0*	*12.5*	*1.0*
Vultures	<0.1	0.4	0.2	0.0	<0.1	5.2	0.6	0.0	1.4	13.5	15.0	0.0
Upland Game Birds	0.3	0.2	0.4	0.2	0.1	2.4	1.3	0.5	20.6	14.6	24.2	9.6
Doves/Pigeons	0.2	0.0	1.3	1.0	<0.1	0.0	3.8	3.1	6.8	0.0	13.8	13.2
Large Corvids	0.3	<0.1	0.4	0.3	0.1	0.3	1.1	1.0	23.4	2.1	22.9	15.9
Goatsuckers	0.0	0.1	0.0	0.0	0.0	1.5	0.0	0.0	0.0	4.2	0.0	0.0
Overall[2]	**250.3**	**7.0**	**34.9**	**30.7**	**100**	**100**	**100**	**100**				

[1] Mean number of observations/800-meter (2,625-foot) plot/survey
[2] Sums of values may not add to total value shown, due to rounding

4.1.3 Large Bird Flight Height Characteristics

Throughout the study period, 819 groups of large birds were observed flying within the 800 m (2,625-ft) radius plots, totaling 29,787 observations, with 51.5% recorded in the estimated RSH (Table 4.2). Of these, 178 groups of 192 diurnal raptors observations were recorded, with 34.9% of flights recorded within the estimated RSH (Table 4.2). Of all the diurnal raptor observations within the 800 m (2,625-ft) radius plots, other raptors (i.e., unidentified raptors) were observed most frequently in the estimated RSH (60.0%), followed by eagles (50.0%), and buteos (41.9%; Table 4.2).

4.1.1 Large Bird Spatial Use

For all large bird species combined over the 34 observation points, bird use was highest at Point 32 (2,758.0 observations/800-m [2,625-ft] plot/60-min survey), largely due to waterfowl observed at that location (2,756.0 observations/800-m [2,625-ft] plot/60-min survey). Large bird use ranged from 1.5 - 2,023.0 observations/800-m (2,625-ft) plot/60-min survey among the other points with recorded use (Appendix C).

Waterfowl

Waterfowl were observed at 33 of the 34 observation points. Waterfowl use was highest at Point 32 (2,756.0 observations/800-m [2,625-ft] plot/60-min survey), followed by Point 28 (2,022.0). Waterfowl use ranged from 0.3 - 1,680.3 observations/800-m [2,625-ft] plot/60-min survey among the other 31 survey points with recorded use (Appendix C).

Diurnal Raptors

Diurnal raptor use was observed at 31 of the 34 observation points. Use was highest at Point 32 (2.0 observations/800-m [2,625-ft] plot/60-min survey each) and ranged from 0.3 - 1.7 observations/800-m [2,625-ft] plot/60-min survey among the remaining 30 survey points where raptors were observed (Appendix C). Of diurnal raptors, buteos were observed at 25 points, with the highest use at Point 11 (1.0 observation/800-m [2,625-ft] plot/60-min surveys; Appendix C). Eagles were observed within the 800-m (2,625-ft) radius at 23 survey points, with highest use observed at Point 32 (2.0 observations/800-m [2,625-ft] plot/60-min survey), followed by Point 26 (1.0 observation/800-m [2,626-ft] plot/60-min survey; Figure 4.1; Appendix C). Eagle use ranged from to 0.1 - 0.7 observation/800-m (2,625-ft) plot/60-min survey at the remaining 21 survey points (Figure 4.1, Appendix C).

Regardless of distance observed (i.e., within or outside the 800-m [2,625-ft] plot), bald eagles and unidentified eagles were observed at 24 survey points, either while flying or perched (Figure 4.2). Flight paths and perched locations on Figure 4.2 may represent more than one eagle using the same flight path or perch location. No obvious concentrations of eagles were documented in the Project area; eagle use was documented relatively evenly throughout the Project area (Figure 4.2). One bald eagle was observed perched near Point 7 in the northwest region of the Project area and a second bald eagle was observed perched near Point 12 in the central region of the Project area on a different date (Figure 4.2). Overall, no consistent eagle flight patterns were observed based on direction of flight paths (Figure 4.2).

Table 4.2. Flight height characteristics by each bird type and raptor subtype during large bird use surveys[1] conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 - March 24, 2017.

Bird Type	Number of Groups Flying	Number Observed Flying	Mean Flight Height of Groups		% of Total Observed Flying	% of Groups within Flight Height Categories		
			Meters	Feet		0 - 25 Meters	25 - 150 Meters[2]	>150 Meters
Waterbirds	38	107	98.0	321.4	100.0	22.4	60.7	16.8
Waterfowl	452	28,723	54.3	178.2	98.5	24.8	51.9	23.3
Shorebirds	10	66	6.5	21.3	74.2	100.0	0.0	0.0
Gulls/Terns	32	438	64.9	212.9	99.1	49.3	50.0	0.7
Rails/Coots	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Diurnal Raptors	178	192	66.4	217.7	94.1	54.7	34.9	10.4
Accipiters	*4*	*4*	*9.3*	*30.4*	*100.0*	*75.0*	*25.0*	*0.0*
Buteos	*81*	*93*	*85.8*	*281.5*	*92.1*	*45.2*	*41.9*	*12.9*
Northern Harrier	*43*	*43*	*5.8*	*19.1*	*97.7*	*97.7*	*2.3*	*0.0*
Eagles	*38*	*38*	*105.3*	*345.5*	*100.0*	*28.9*	*50.0*	*21.1*
Falcons	*4*	*4*	*27.3*	*89.4*	*57.1*	*75.0*	*25.0*	*0.0*
Other Raptors	*8*	*10*	*58.0*	*190.3*	*100.0*	*40.0*	*60.0*	*0.0*
Vultures	38	45	96.4	316.2	100.0	24.4	57.8	17.8
Upland Game Birds	3	7	3.0	9.8	9.6	100.0	0.0	0.0
Doves/Pigeons	32	161	20.3	66.6	89.0	82.6	17.4	0.0
Large Corvids	30	42	21.2	69.6	51.9	73.8	26.2	0.0
Goatsuckers	6	6	46.7	153.1	60.0	33.3	66.7	0.0
Overall	**819**	**29,787**	**57.9**	**190.1**	**98.0**	**25.9**	**51.5**	**22.7**

[1] 800-meter (2,625-foot) plot for large birds
[2] The estimated rotor-swept height (25 - 150 meter [82 - 492 foot]) above ground level

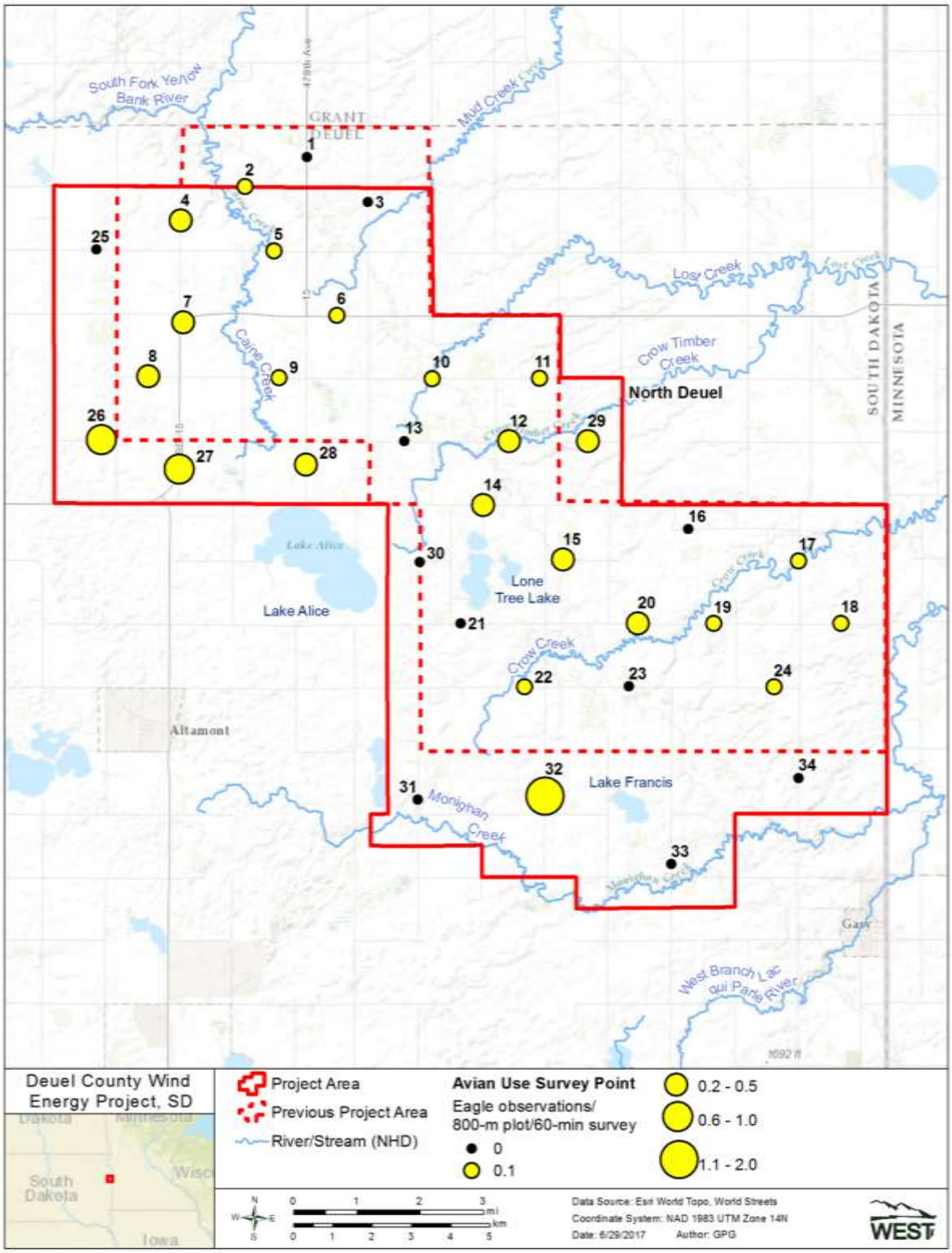

Figure 4.1. Eagle use by observation point during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

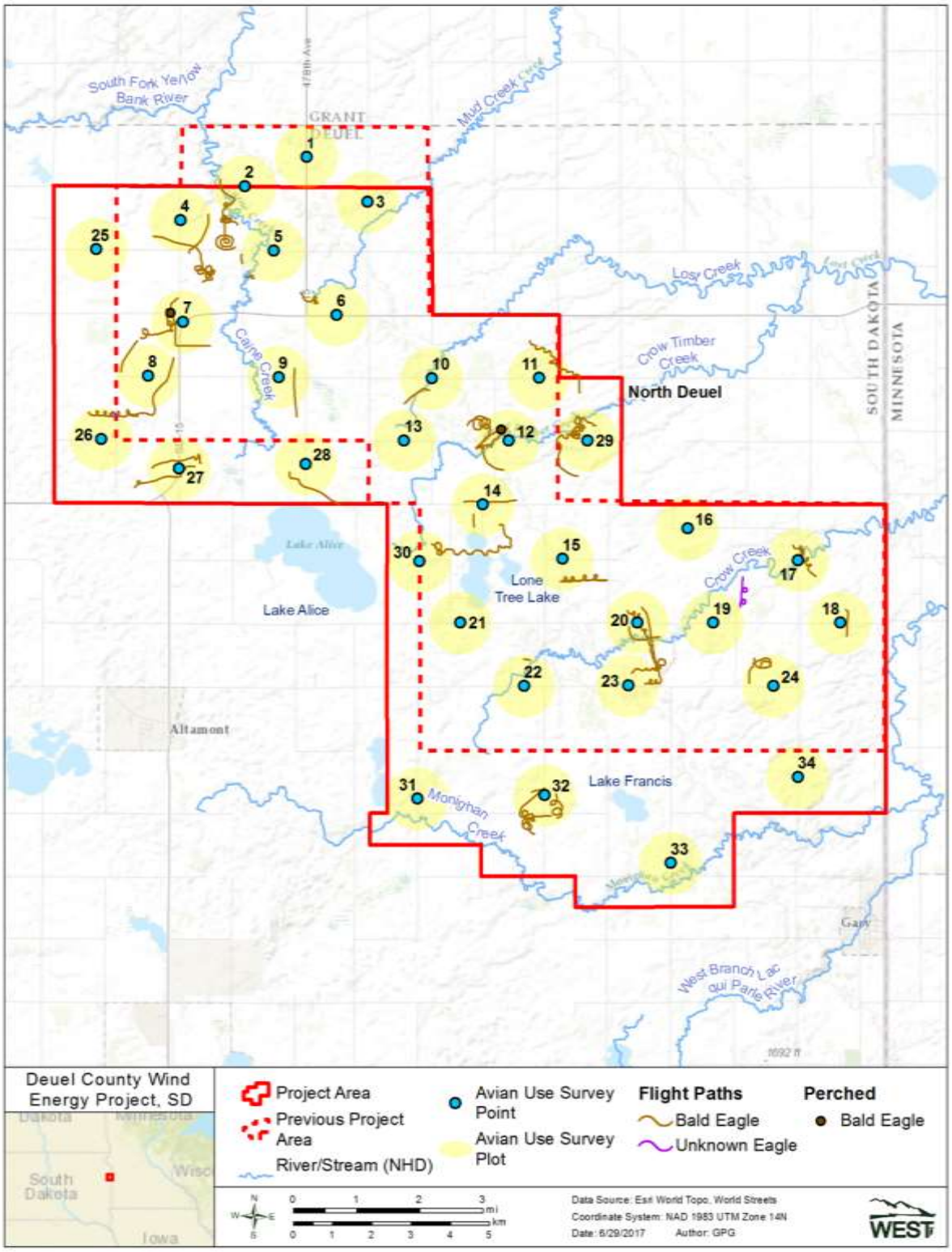

Figure 4.2. Bald and unidentified eagle flight paths and perch locations recorded during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

4.1.2 Eagle Minutes

A total of 114 eagle min were documented within the 800-m (2,625-ft) survey plot by 200-m (656-ft) high cylinder during 327 large bird use survey observation hours. Eagle min per min of surveys were highest during spring (0.009 min), followed by winter (0.007 min), fall (0.006), and summer (0.002; Table 4.3). The highest number of eagle min were recorded during March 2017 (37 min), followed by December 2016 (29 min; Table 4.4; Figure 4.3). Eagle minutes were recorded during five other observation periods and ranged from 7 to 16 eagle minutes. No eagles were observed during May - August 2016 or January 2017 (Table 4.4; Figure 4.3).

Table 4.3. Eagle minutes[1] documented during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Season	Eagle Minutes	Survey Effort (hours)	Survey Effort (minutes)	Eagle Minutes per Minute Survey
Spring (4/3/16 - 5/29/16; 3/1/17 – 3/24/17)	44	79	4,740	0.009
Summer (5/29/16 - 9/10/16)	9	96	5,760	0.002
Fall (9/11/16 - 11/12/16)	15	44	2,640	0.006
Winter (11/13/16 - 2/25/17)	46	108	6,480	0.007
Total	**114**	**327**	**19,620**	**0.0058**

[1] Observations of eagles flying within 800-meter (2,625-foot) plot x 200-meter (656-foot) high cylinder

Table 4.4. Number of flying eagle observations[1] with a duration of 1 minute or more and eagle minutes by month during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Month/Year[2]	Eagle Observations	Eagle Minutes
April 2016	4	7
May 2016	0	0
June 2016	0	0
July 2016	0	0
August 2016	0	0
September 2016	2	16
October 2016	2	8
November 2016	1	9
December 2016	9	29
January 2017	0	0
February 2017	2	8
March 2017	13	37
Total	**33**	**114**

[1] Observations of eagles flying within 800-meter (2,625-foot) plot x 200-meter (656-foot) high cylinder
[2] 12 additional points surveyed in June and December 2016

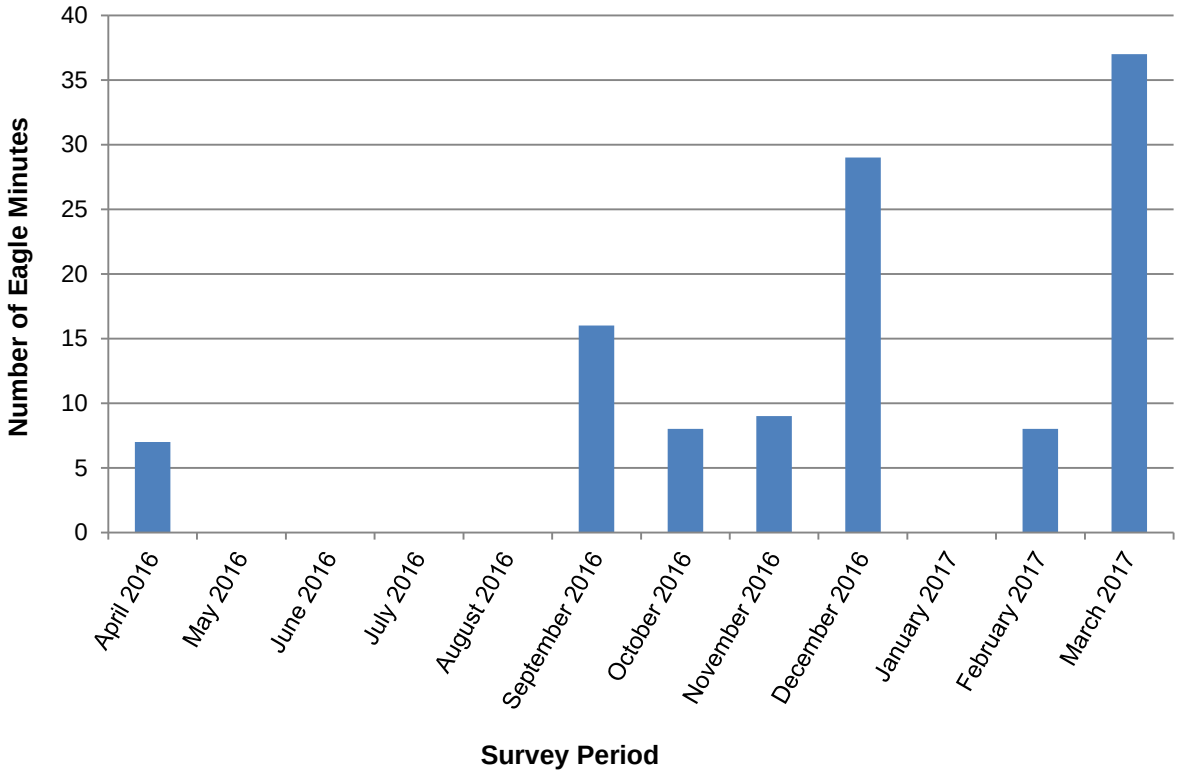

Figure 4.3. Number of eagle minutes recorded by month[1] during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

[1] 12 additional points surveyed in June and December 2016

Eagle minutes (observations of eagles flying within the 800-m (2,625-ft) plot by 200-m (656-ft) high cylinder) were documented at 20 of the 34 survey plots (Figure 4.4). Point 7 in the northwest portion of the Project area had the highest eagle minutes (12 min), followed by Point 20 (10 min), Point 12 (9 min), and Point 32 (9 min, Figure 4.4). The remaining survey plots with eagle minutes had from 1 and 8 eagle minutes (Figure 4.4).

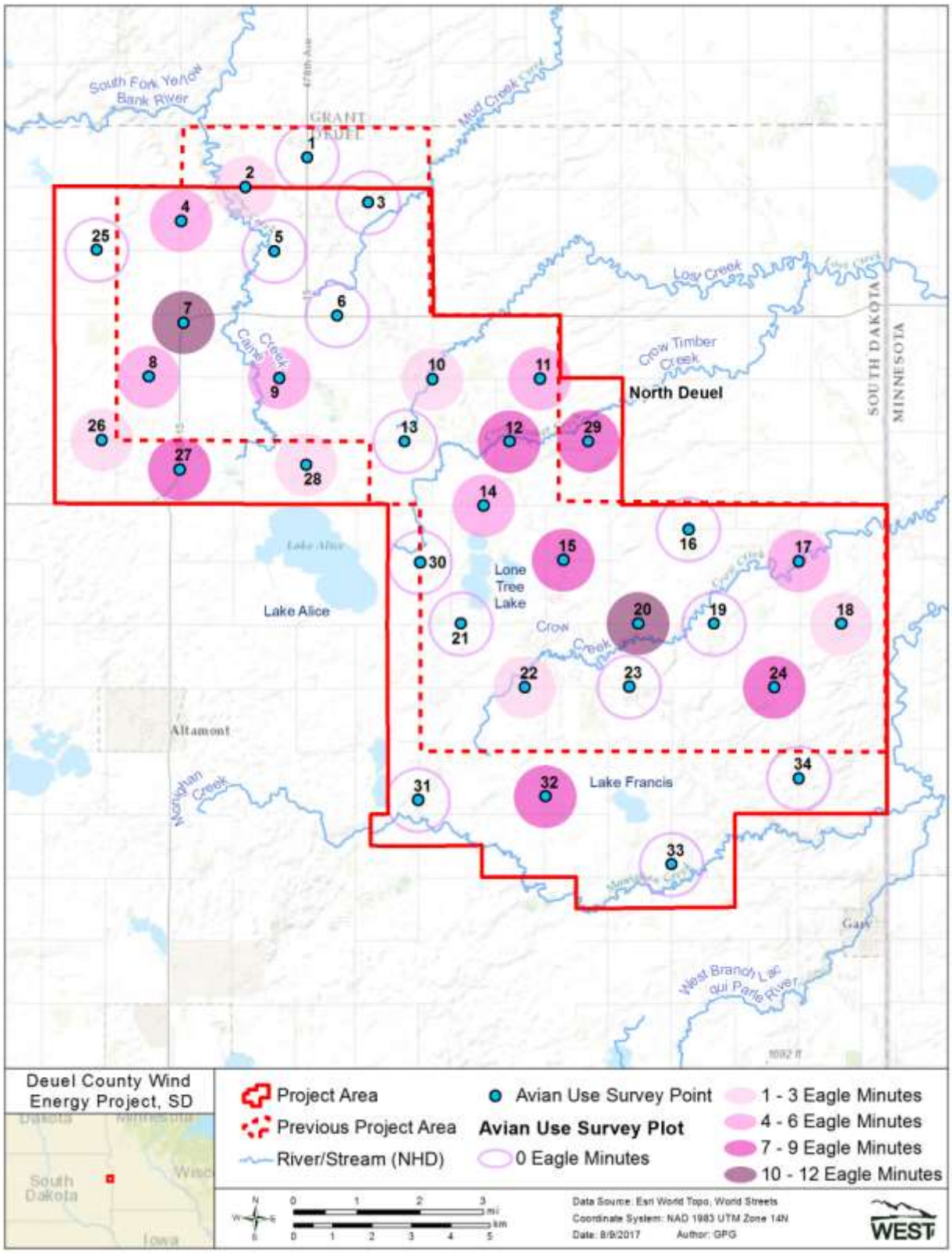

Figure 4.4. Number of eagle minutes recorded within 800-meter (2,625-foot) by 200-meter (656-foot plot during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

4.2 Small Bird Use Surveys

4.2.1 Small Bird Species Composition, Relative Abundance, and Diversity

Table 4.5 summarizes the small bird species composition, relative abundance, and species diversity recorded during small bird use surveys. During these surveys, 2,715 birds in 1,073 separate groups were recorded, based on birds observed both within and outside the 100-m (328-ft) plot (Table 4.5). Forty-nine species were observed within the Project area.

Passerines accounted for 96.2% of all small bird observations over the entire study period (Table 4.5). The most abundant passerine species observed was horned lark (*Eremophila alpestris*; 397 observations), followed by brown-headed cowbird (*Molothrus ater*; 298 observations), and unidentified blackbird (245 observations; Table 4.5). Woodpeckers, kingfishers, and unidentified birds combined accounted for 3.8% of small bird observations (Table 4.5). Since only one belted kingfisher (*Megaceryle alcyon*) was observed during small bird use surveys, this bird species has been excluded from the remaining results for small birds.

Table 4.5. Small bird observations[1] by bird type, species, and season for small bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3 – December 2, 2016 and March 7 – March 22, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs
Passerines		**344**	**991**	**95.1**	**585**	**1,099**	**99.9**	**116**	**521**	**90.9**	**1,045**	**2,611**	**96.2**
American goldfinch	*Spinus tristis*	1	1	0.1	47	60	5.5	9	24	4.2	57	85	3.1
American robin	*Turdus migratorius*	25	28	2.7	19	19	1.7	1	1	0.2	45	48	1.8
Bank swallow	*Riparia riparia*	1	1	0.1	1	2	0.2	0	0	0.0	2	3	0.1
Barn swallow	*Hirundo rustica*	5	6	0.6	18	24	2.2	2	3	0.5	25	33	1.2
Blue jay	*Cyanocitta cristata*	1	1	0.1	2	4	0.4	6	11	1.9	9	16	0.6
Bobolink	*Dolichonyx oryzivorus*	7	11	1.1	21	29	2.6	0	0	0.0	28	40	1.5
Brown-headed cowbird	*Molothrus ater*	34	46	4.4	37	203	18.5	4	49	8.6	75	298	11.0
Brown thrasher	*Toxostoma rufum*	4	4	0.4	3	3	0.3	0	0	0.0	7	7	0.3
Cedar waxwing	*Bombycilla cedrorum*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Chipping sparrow	*Spizella passerina*	1	1	0.1	2	2	0.2	0	0	0.0	3	3	0.1
Clay-colored sparrow	*Spizella pallida*	1	1	0.1	24	26	2.4	0	0	0.0	25	27	1.0
Cliff swallow	*Petrochelidon pyrrhonota*	1	100	9.6	25	97	8.8	0	0	0.0	26	197	7.3
Common grackle	*Quiscalus quiscula*	37	80	7.7	33	63	5.7	1	30	5.2	71	173	6.4
Common yellowthroat	*Geothlypis trichas*	0	0	0.0	17	17	1.5	0	0	0.0	17	17	0.6
Dark-eyed junco	*Junco hyemalis*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Dickcissel	*Spiza americana*	0	0	0.0	36	47	4.3	0	0	0.0	36	47	1.7
Eastern bluebird	*Sialia sialis*	1	1	0.1	0	0	0.0	1	1	0.2	2	2	0.1
Eastern kingbird	*Tyrannus tyrannus*	1	2	0.2	19	22	2.0	0	0	0.0	20	24	0.9
Eastern meadowlark	*Sturnella magna*	0	0	0.0	2	2	0.2	0	0	0.0	2	2	0.1
European starling	*Sturnus vulgaris*	2	8	0.8	1	2	0.2	6	19	3.3	9	29	1.1
Field sparrow	*Spizella pusilla*	0	0	0.0	4	4	0.4	0	0	0.0	4	4	0.1
Grasshopper sparrow	*Ammodramus savannarum*	0	0	0.0	17	18	1.6	0	0	0.0	17	18	0.7
Gray catbird	*Dumetella carolinensis*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Horned lark	*Eremophila alpestris*	25	297	28.5	11	15	1.4	10	85	14.8	46	397	14.6
House sparrow	*Passer domesticus*	2	7	0.7	7	31	2.8	1	3	0.5	10	41	1.5
House wren	*Troglodytes aedon*	0	0	0.0	1	1	0.1	0	0	0.0	1	1	0.0
Indigo bunting	*Passerina cyanea*	0	0	0.0	1	1	0.1	0	0	0.0	1	1	0.0
Lapland longspur	*Calcarius lapponicus*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Orchard oriole	*Icterus spurius*	0	0	0.0	1	1	0.1	0	0	0.0	1	1	0.0
Red-winged blackbird	*Agelaius phoeniceus*	60	124	11.9	50	75	6.8	0	0	0.0	110	199	7.3
Rusty blackbird	*Euphagus carolinus*	0	0	0.0	0	0	0.0	1	15	2.6	1	15	0.6
Savannah sparrow	*Passerculus sandwichensis*	7	7	0.7	12	12	1.1	0	0	0.0	19	19	0.7
Sedge wren	*Cistothorus platensis*	0	0	0.0	10	10	0.9	0	0	0.0	10	10	0.4
Snow bunting	*Plectrophenax nivalis*	0	0	0.0	0	0	0.0	8	65	11.3	8	65	2.4
Song sparrow	*Melospiza melodia*	15	16	1.5	18	19	1.7	0	0	0.0	33	35	1.3

Table 4.5. Small bird observations[1] by bird type, species, and season for small bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3 – December 2, 2016 and March 7 – March 22, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs
Tree swallow	*Tachycineta bicolor*	6	12	1.2	4	4	0.4	0	0	0.0	10	16	0.6
Unidentified blackbird		3	103	9.9	10	29	2.6	12	113	19.7	25	245	9.0
Unidentified passerine		2	13	1.2	9	104	9.5	0	0	0.0	11	117	4.3
Unidentified sparrow		7	8	0.8	16	22	2.0	32	70	12.2	55	100	3.7
Unidentified swallow		0	0	0.0	2	6	0.5	0	0	0.0	2	6	0.2
Vesper sparrow	*Pooecetes gramineus*	21	21	2.0	25	26	2.4	0	0	0.0	46	47	1.7
Warbling vireo	*Vireo gilvus*	0	0	0.0	4	4	0.4	0	0	0.0	4	4	0.1
Western kingbird	*Tyrannus verticalis*	1	1	0.1	3	3	0.3	0	0	0.0	4	4	0.1
Western meadowlark	*Sturnella neglecta*	71	81	7.8	59	71	6.5	14	23	4.0	144	175	6.4
White-breasted nuthatch	*Sitta carolinensis*	0	0	0.0	3	3	0.3	3	4	0.7	6	7	0.3
White-throated sparrow	*Zonotrichia albicollis*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Willow flycatcher	*Empidonax traillii*	0	0	0.0	2	2	0.2	0	0	0.0	2	2	0.1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	2	10	1.0	4	11	1.0	0	0	0.0	6	21	0.8
Yellow warbler	*Setophaga petechia*	0	0	0.0	5	5	0.5	0	0	0.0	5	5	0.2
Woodpeckers		**2**	**2**	**0.2**	**0**	**0**	0.0	**6**	**6**	**1.0**	**8**	**8**	**0.3**
Downy woodpecker	*Picoides pubescens*	0	0	0.0	0	0	0.0	1	1	0.2	1	1	0.0
Hairy woodpecker	*Picoides villosus*	1	1	0.1	0	0	0.0	0	0	0.0	1	1	0.0
Northern flicker	*Colaptes auratus*	1	1	0.1	0	0	0.0	5	5	0.9	6	6	0.2
Kingfishers		**1**	**1**	0.1	**0**	**0**	0.0	**0**	**0**	0.0	**1**	**1**	**0.0**
Belted kingfisher	*Megaceryle alcyon*	1	1	0.1	0	0	0.0	0	0	0.0	1	1	0.0
Unidentified Birds		**8**	**48**	**4.6**	**1**	**1**	0.1	**10**	**46**	**8.0**	**19**	**95**	**3.5**
Unidentified bird (small)		8	48	4.6	1	1	0.1	10	46	8.0	19	95	3.5
Overall		**355**	**1,042**	**100**	**586**	**1,100**	**100**	**132**	**573**	**100**	**1,073**	**2,715**	**100**

grps = groups; obs= observations

[1] Small bird observations recorded within and outside of 100-meter (328-foot) plot

4.2.2 Small Bird Seasonal Use, Percent of Use, and Frequency of Occurrence

Overall small bird use was highest in spring (9.5 observations/100-m [328-ft] plot/8-min survey) followed by fall (8.5) and summer (6.9; Table 4.6). Passerines were observed during all three seasons, while woodpeckers were only observed in fall and unidentified birds were only recorded in spring and fall.

Table 4.6. Small bird use, percent of total use (%), and frequency of occurrence (%) for each small bird type by season, observed during the small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3 – December 2, 2016 and March 7 – March 22, 2017.

Type/Species	Mean Use[1]			Percent of Total Use (%)			Frequency of Occurrence (%)		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Passerines	8.8	6.9	7.8	93.1	99.8	91.3	80.1	96.9	71.9
Woodpeckers	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	8.1
Unidentified Birds	0.7	0.0	0.6	6.9	0.2	7.6	9.6	1.0	14.2
Overall[2]	**9.5**	**6.9**	**8.5**	**100**	**100**	**100**			

[1] Mean number of small bird observations recorded within and outside of 100-meter (328-foot) plot.
[2] Sums of values may not add to total value shown, due to rounding

Passerines

Passerine use was highest during spring (8.8 observations/100-m [328-ft] radius plot/8-min survey) followed by fall (7.8) and summer (6.9; Table 4.6; Appendix D). Passerines accounted for 99.8% of all small bird use in summer, 93.1% in spring, and 91.3% in fall. Passerines were observed during 96.9% of summer surveys, 80.1% of spring surveys, and 71.9% of fall surveys (Table 4.6; Appendix D). Horned lark had the highest overall use of passerines (1.4 observations/100-m [328-ft] plot/8-min survey; Appendix D).

4.2.3 Small Bird Flight Height Characteristics

During the study, 336 groups totaling 1,279 individual small birds were observed flying within the 100-m (328-ft) plots, of which 2.7% were recorded in the estimated RSH (Table 4.7). Of these, 329 groups totaling 1,213 passerines were recorded, of which 2.8% were recorded flying within the estimated RSH (Table 4.7). The majority of small birds (97.3%) were observed below the estimated RSH (Table 4.7).

Table 4.7. Flight height characteristics by bird type during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3 – December 2, 2016 and March 7 – March 22, 2017.

Bird Type	Number of Groups Flying	Number Observed Flying	Mean Flight Height of Groups		% of Total Observed Flying	% of Groups within Flight Height Categories		
			Meter	Feet		0 - 25 meter	25 - 150 meter[2]	>150 meter
Passerines	329	1,213	63.0	6.1	20	97.2	2.8	0.0
Woodpeckers	2	2	33.3	11.0	36.1	100	0.0	0.0
Unidentified small birds	5	64	67.4	1.8	5.9	100	0.0	0.0
Small Birds Overall	**336**	**1,279**	**63.2**	**6.0**	**19.7**	**97.3**	**2.7**	**0.0**

[1] 100-meter (328-foot) radius plot for small birds
[2] The estimated rotor-swept height (25-150 meter [82-492 foot]) above ground level

4.2.4 Small Bird Spatial Use

Small birds were recorded at 32 of the 34 survey plots, with the highest level of use observed at Point 29 (105.0 observations/100-m [328-ft] plot/8-min survey), followed by Point 34 (102.0; Figure 4.5; Appendix E). Small bird use at the remaining 30 points with recorded use ranged from 1.0 to 17.5 observations/100-m [328-ft] plot/8-min survey and was dominated by passerines (Appendix E).

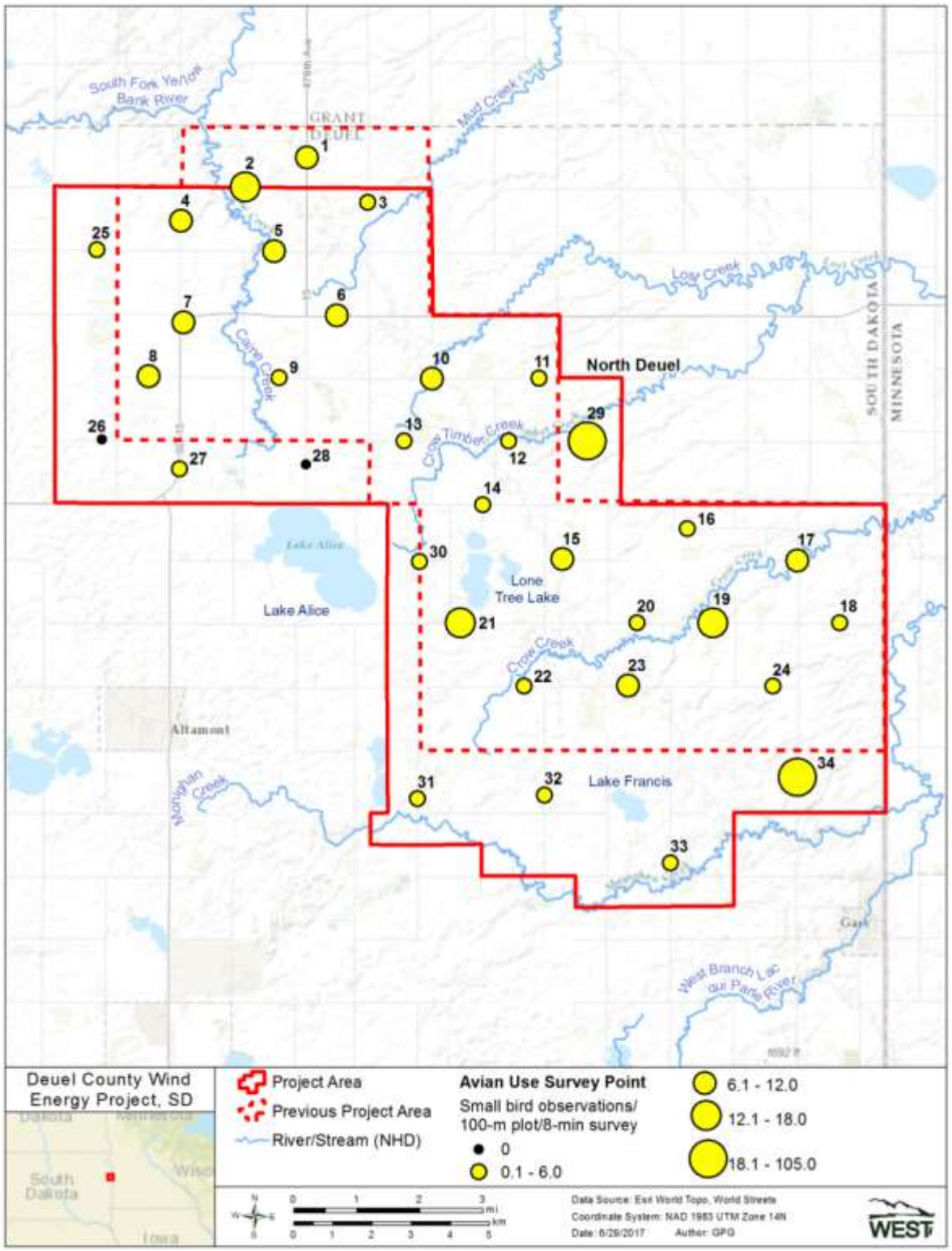

Figure 4.5 Small bird use by observation point during small bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3 – December 2, 2016 and March 7 – March 22, 2017.

4.3 Threatened, Endangered, and Sensitive Species Observations

No federal or state-listed threatened or endangered species were observed during the large bird use surveys, small bird use surveys, or incidentally in the Project area. However, three observed species are considered SGCN by the SDGFP WAP (SDGFP 2014). This includes American white pelican (*Pelecanus erythrorhynchos*; 104 observations in 24 groups), marbled godwit (*Limosa fedoa*; six observations in three groups), and willet (*Tringa semipalmata*; two observation in two groups; Table 4.8). Additionally, bald eagle (65 observations in 59 groups), protected by the BGEPA (1940) were observed during surveys and incidentally within the Project area (Table 4.8).

Table 4.8. Summary of sensitive species observed in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, during large bird (LB) and small bird (SB) use surveys, and incidentally (INC), from April 3, 2016 – March 24, 2017.

Species	Scientific Name	Status[1]	LB		SB		INC		Total	
			# of grps	# of obs	# of grps	# of obs	# of grps	# of obs	# of grps	# of obs
American white pelican	*Pelecanus erythrorhynchos*	SGCN	23	101	0	0	2	3	25	104
Bald eagle	*Haliaeetus leucocephalus*	BGEPA, SGCN	39	39	0	0	20	26	59	65
Marbled godwit	*Limosa fedoa*	SGCN	3	6	0	0	0	0	3	6
Willet	*Tringa semipalmata*	SGCN	0	0	0	0	2	2	2	2
Overall	**4 Species**		**62**	**146**	**0**	**0**	**24**	**31**	**89**	**177**

Sources: BGEPA 1940; SDGFP 2014
grps. = groups; obs. = observations
[1] BGEPA = Bald and Golden Eagle Protection Act; SGCN = State Species of Greatest Conservation Need

4.4 Incidental Observations

Based on incidental observations recorded by the surveyor when in transit between the standardized survey plots, 41 species totaling 2,681 birds in 457 separate groups were recorded (Table 4.9). Incidental observations included 26 bald eagles. Other diurnal raptors recorded incidentally included red-tailed hawk (84 observations), American kestrel (*Falco sparverius*; 35 observations), northern harrier (34 observations), Swainson's hawk (*Buteo swainsoni*; five observations), Cooper's hawk (*Accipiter cooperii*; four observations); sharp-shinned hawk (*Accipiter striatus*; three observations), and rough-legged hawk (*Buteo lagopus*; two observations). Canada goose and ring-billed gull (*Larus delawarensis*) had the greatest number of birds observed incidentally, with surveyors recording 602 observations within 35 groups and 501 observations in two groups, respectively (Table 4.9).

Table 4.9. Birds observed incidentally while in transit between standardized 60-minute point count survey plots in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Species	Scientific Name	Large Birds		Small Birds		Overall	
		# grps	# obs	# grps	# obs	# grps	# obs
Pied-billed grebe	*Podilymbus podiceps*	1	5	0	0	1	5
American white pelican	*Pelecanus erythrorhynchos*	2	3	0	0	2	3
Double-crested cormorant	*Phalacrocorax auritus*	2	91	0	0	2	91
Great blue heron	*Ardea herodias*	6	6	0	0	6	6
Great egret	*Ardea alba*	1	2	0	0	1	2
Sandhill crane	*Grus canadensis*	1	15	0	0	1	15
Unidentified waterbird		0	0	1	3	1	3
American wigeon	*Anas americana*	1	2	0	0	1	2
Blue-winged teal	*Anas discors*	5	10	0	0	5	10
Canada goose	*Branta canadensis*	35	602	0	0	35	602
Common merganser	*Mergus merganser*	1	3	0	0	1	3
Greater white-fronted goose	*Anser albifrons*	3	210	0	0	3	210
Green-winged teal	*Anas crecca*	1	2	0	0	1	2
Mallard	*Anas platyrhynchos*	23	426	0	0	23	426
Northern pintail	*Anas acuta*	3	28	0	0	3	28
Northern shoveler	*Anas clypeata*	1	20	0	0	1	20
Ring-necked duck	*Aythya collaris*	1	8	0	0	1	8
Snow goose	*Chen caerulescens*	1	2	0	0	1	2
Unidentified duck		2	3	0	0	2	3
Unidentified goose		1	10	0	0	1	10
Unidentified scaup	*Aythya spp*	1	2	0	0	1	2
Unidentified waterfowl		2	205	0	0	2	205
Wood duck	*Aix sponsa*	1	2	0	0	1	2
Common snipe	*Gallinago gallinago*	0	0	1	2	1	2
Killdeer	*Charadrius vociferous*	0	0	63	79	63	79
Upland sandpiper	*Bartramia longicauda*	7	9	1	1	8	10
Willet	*Tringa semipalmata*	2	2	2	2	4	4
Wilson's snipe	*Gallinago delicata*	2	2	0	0	2	2
Franklin's gull	*Leucophaeus pipixcan*	1	20	0	0	1	20
Ring-billed gull	*Larus delawarensis*	2	501	1	23	3	524
American coot	*Fulica americana*	1	2	0	0	0	0
Sora	*Porzana carolina*	0	0	3	4	3	4
Virginia rail	*Rallus limicola*	0	0	3	3	3	3
American kestrel	*Falco sparverius*	29	35	0	0	29	35
Bald eagle	*Haliaeetus leucocephalus*	20	26	0	0	20	26
Cooper's hawk	*Accipiter cooperii*	4	4	0	0	4	4

Table 4.9. Birds observed incidentally while in transit between standardized 60-minute point count survey plots in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Species	Scientific Name	Large Birds		Small Birds		Overall	
		# grps	# obs	# grps	# obs	# grps	# obs
Northern harrier	*Circus cyaneus*	34	34	0	0	34	34
Rough-legged hawk	*Buteo lagopus*	2	2	0	0	2	2
Red-tailed hawk	*Buteo jamaicensis*	82	84	0	0	82	84
Sharp-shinned hawk	*Accipiter striatus*	3	3	0	0	3	3
Swainson's hawk	*Buteo swainsoni*	5	5	0	0	5	5
Unidentified buteo	*Buteo spp*	1	1	0	0	1	1
Unidentified raptor		13	14	0	0	13	14
Turkey vulture	*Cathartes aura*	5	7	0	0	5	7
Gray partridge	*Perdix perdix*	1	5	0	0	1	5
Ring-necked pheasant	*Phasianus colchicus*	25	41	1	1	26	42
Sharp-tailed grouse	*Tympanuchus phasianellus*	1	2	0	0	1	2
Wild turkey	*Meleagris gallopavo*	1	15	0	0	1	15
Mourning dove	*Zenaida macroura*	0	0	40	72	40	72
American crow	*Corvus brachyrhynchos*	2	2	0	0	2	2
Common nighthawk	*Chordeiles minor*	1	3	0	0	1	3
Northern flicker	*Colaptes auratus*	2	2	0	0	2	2
Unidentified large bird		1	15	0	0	1	15
Bird Subtotal		**342**	**2,493**	**116**	**190**	**457**	**2,681**

grps = groups; obs = observations

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Appendix A. Summary of Observations by Bird Type and Species for Large Bird Use Surveys Conducted at the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3, 2016 – March 24, 2017.

Appendix A. Summary of observations[1] by bird type and species for the large bird use surveys conducted in the North Deuel Wind Energy Project area, from April 3, 2016 – March 24, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Winter			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs.	# grps	# obs	% obs
Waterbirds		**2**	**2**	**<0.1**	**35**	**94**	**13.3**	**4**	**25**	**1.5**	**0**	**0**	**0.0**	**41**	**121**	**0.4**
American white pelican	*Pelecanus erythrorhynchos*	1	1	<0.1	19	76	10.7	3	24	1.5	0.0	0.0	0.0	23	101	0.3
Double-crested cormorant	*Phalacrocorax auritus*	1	1	<0.1	3	3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	4	4	<0.1
Great blue heron	*Ardea herodias*	0.0	0.0	0.0	12	13	1.8	1	1	0.1	0.0	0.0	0.0	13	14	<0.1
Sandhill crane	*Grus canadensis*	0.0	0.0	0.0	1	2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1	2	<0.1
Waterfowl		**276**	**24,462**	**99.3**	**31**	**328**	**46.4**	**59**	**1,039**	**63.5**	**150**	**3,491**	**95.3**	**516**	**29,320**	**95.7**
American green-winged teal	*Anas crecca carolinensis*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	200	5.5	1	200	0.7
Blue-winged teal	*Anas discors*	6	26	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6	26	0.1
Cackling goose	*Branta hutchinsii*	15	192	0.8	0.0	0.0	0.0	0.0	0.0	0.0	16	724	19.8	31	916	3.0
Canada goose	*Branta canadensis*	73	321	1.3	25	320	45.3	48	738	45.1	91	1,004	27.4	237	2,383	7.8
Gadwall	*Anas strepera*	1	2	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	2	<0.1
Greater white-fronted goose	*Anser albifrons*	28	3,102	12.6	0.0	0.0	0.0	0.0	0.0	0.0	6	353	9.6	34	3,455	11.3
Hooded merganser	*Lophodytes cucullatus*	1	1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	1	<0.1
Mallard	*Anas platyrhynchos*	72	445	1.8	5	7	1.0	2	21	1.3	14	54	1.5	93	527	1.7
Northern shoveler	*Anas clypeata*	1	10	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	10	<0.1
Redhead	*Aythya americana*	1	100	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	100	0.3
Ross' goose	*Chen rossii*	11	2,300	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11	2,300	7.5
Snow goose	*Chen caerulescens*	19	2,911	11.8	0.0	0.0	0.0	0.0	0.0	0.0	6	657	17.9	25	3,568	11.6
Unidentified duck	*NA*	20	2,483	10.1	0.0	0.0	0.0	5	82	5.0	0	0	0.0	25	2,565	8.4
Unidentified Goose	*NA*	23	12,423	50.4	1	1	0.1	0.0	0.0	0.0	3	60	1.6	27	12,484	40.7

Appendix A. Summary of observations[1] by bird type and species for the large bird use surveys conducted in the North Deuel Wind Energy Project area, from April 3, 2016 – March 24, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Winter			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs.	# grps	# obs	% obs
Unidentified Waterfowl	*NA*	2	140	0.6	0.0	0.0	0.0	4	198	12.1	13	439	12.0	19	777	2.5
Wood duck	*Aix sponsa*	3	6	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3	6	<0.1
Shorebirds		**11**	**15**	**0.1**	**16**	**39**	**5.5**	**6**	**35**	**2.1**	**0.0**	**0.0**	**0.0**	**33**	**89**	**0.3**
Greater yellowlegs	*Tringa melanoleuca*	0.0	0.0	0.0	0.0	0.0	0.0	2	2	0.1	0.0	0.0	0.0	2	2	<0.1
Killdeer	*Charadrius vociferus*	3	7	<0.1	5	24	3.4	3	32	2.0	0.0	0.0	0.0	11	63	0.2
Lesser yellowlegs	*Tringa flavipes*	0.0	0.0	0.0	0.0	0.0	0.0	1	1	0.1	0.0	0.0	0.0	1	1	<0.1
Marbled godwit	*Limosa fedoa*	1	1	<0.1	2	5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3	6	<0.1
Unidentified sandpiper		0.0	0.0	0.0	2	3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	2	3	<0.1
Upland sandpiper	*Bartramia longicauda*	6	6	<0.1	2	2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	8	8	<0.1
Wilson's snipe	*Gallinago delicata*	1	1	<0.1	5	5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	6	6	<0.1
Gulls/Terns		**9**	**11**	**<0.1**	**19**	**125**	**17.7**	**8**	**306**	**18.7**	**0.0**	**0.0**	**0.0**	**36**	**442**	**1.4**
Bonaparte's gull	*Chroicocephalus philadelphia*	0.0	0.0	0.0	1	4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1	4	<0.1
Franklin's gull	*Leucophaeus pipixcan*	0.0	0.0	0.0	4	9	1.3	7	291	17.8	0.0	0.0	0.0	11	300	1.0
Herring gull	*Larus argentatus*	0.0	0.0	0.0	1	2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1	2	<0.1
Ring-billed gull	*Larus delawarensis*	9	11	<0.1	4	11	1.6	0.0	0.0	0.0	0.0	0.0	0.0	13	22	0.1
Unidentified gull		0.0	0.0	0.0	9	99	14.0	1	15	0.9	0.0	0.0	0.0	10	114	0.4
Rails/Coots		**2**	**2**	**<0.1**	**2**	**2**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4**	**4**	**<0.1**
Sora	*Porzana carolina*	2	2	<0.1	1	1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3	3	<0.1
Virginia rail	*Rallus limicola*	0.0	0.0	0.0	1	1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	<0.1
Diurnal Raptors		**68**	**72**	**<0.1**	**49**	**52**	**7.4**	**59**	**68**	**4.2**	**17**	**17**	**0.5**	**193**	**209**	**0.7**
Accipiters		*1*	*1*	*<0.1*	*3*	*3*	*0.4*	0.0	0.0	0.0	0.0	0.0	0.0	*4*	*4*	*<0.1*
Cooper's hawk	*Accipiter cooperii*	0.0	0.0	0.0	*3*	*3*	*0.4*	0.0	0.0	0.0	0.0	0.0	0.0	*3*	*3*	*<0.1*
Unidentified	*Accipiter spp*	*1*	*1*	*<0.1*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*1*	*1*	*<0.1*

Appendix A. Summary of observations[1] by bird type and species for the large bird use surveys conducted in the North Deuel Wind Energy Project area, from April 3, 2016 – March 24, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Winter			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs.	# grps	# obs	% obs
accipiter																
Buteos		*28*	*32*	*<0.1*	*30*	*31*	*4.4*	*27*	*34*	*2.1*	*4*	*4*	*0.1*	*89*	*101*	*0.3*
Red-tailed hawk	*Buteo jamaicensis*	*24*	*27*	*<0.1*	*25*	*26*	*3.7*	*22*	*27*	*1.6*	*2*	*2*	*0.1*	*73*	*82*	*0.3*
Rough-legged hawk	*Buteo lagopus*	0.0	0.0	0.0	0.0	0.0	0.0	*3*	*4*	*0.2*	*2*	*2*	*0.1*	*5*	*6*	*<0.1*
Swainson's hawk	*Buteo swainsoni*	0.0	0.0	0.0	*3*	*3*	*0.4*	0.0	0.0	0.0	0.0	0.0	0.0	*3*	*3*	*<0.1*
Unidentified buteo	*Buteo spp*	*4*	*5*	*<0.1*	*2*	*2*	*0.3*	*2*	*3*	*0.2*	*0*	*0*	*0*	*8*	*10*	*<0.1*
Northern Harrier		*15*	*15*	*<0.1*	*7*	*7*	*1.0*	*22*	*22*	*1.3*	*0*	*0*	*0*	*44*	*44*	*0.1*
Northern harrier	*Circus cyaneus*	*15*	*15*	*<0.1*	*7*	*7*	*1.0*	*22*	*22*	*1.3*	*0*	*0*	*0*	*44*	*44*	*0.1*
Eagles		*20*	*20*	*<0.1*	*5*	*5*	*0.7*	*4*	*4*	*0.2*	*12*	*12*	*0.3*	*41*	*41*	*0.1*
Bald eagle	*Haliaeetus leucocephalus*	*18*	*18*	*<0.1*	*5*	*5*	*0.7*	*4*	*4*	*0.2*	*12*	*12*	*0.3*	*39*	*39*	*0.1*
Unidentified eagle		*2*	*2*	*<0.1*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*2*	*2*	*<0.1*
Falcons		*3*	*3*	*<0.1*	*2*	*3*	*0.4*	*1*	*1*	*0.1*	0.0	0.0	0.0	*6*	*7*	*<0.1*
American kestrel	*Falco sparverius*	*3*	*3*	*<0.1*	*2*	*3*	*0.4*	0.0	0.0	0.0	0.0	0.0	0.0	*5*	*6*	*<0.1*
Merlin	*Falco columbarius*	0.0	0.0	0.0	0.0	0.0	0.0	*1*	*1*	*0.1*	0.0	0.0	0.0	*1*	*1*	*<0.1*
Other Raptors		*1*	*1*	*<0.1*	*2*	*3*	*0.4*	*5*	*7*	*0.4*	*1*	*1*	*<0.1*	*9*	*12*	*<0.1*
Unidentified raptor		*1*	*1*	*<0.1*	*2*	*3*	*0.4*	*5*	*7*	*0.4*	*1*	*1*	*<0.1*	*9*	*12*	*<0.1*
Vultures		**1**	**1**	**<0.1**	**31**	**39**	**5.5**	**8**	**9**	**0.5**	**0**	**0**	**0**	**40**	**49**	**0.2**
Turkey vulture	*Cathartes aura*	1	1	<0.1	31	39	5.5	8	9	0.5	0	0	0	40	49	0.2
Upland Game Birds		**20**	**21**	**<0.1**	**16**	**16**	**2.3**	**14**	**20**	**1.2**	**14**	**16**	**0.4**	**64**	**73**	**0.2**
Gray partridge	*Perdix perdix*	1	2	<0.1	0.0	0.0	0.0	1	5	0.3	0	0	0	2	7	<0.1
Ring-necked pheasant	*Phasianus colchicus*	19	19	<0.1	15	15	2.1	12	12	0.7	13	15	0.4	59	61	0.2
Wild turkey	*Meleagris gallopavo*	0.0	0.0	0.0	1	1	0.1	1	3	0.2	1	1	<0.1	3	5	<0.1
Doves/Pigeons		**8**	**18**	**<0.1**	**0.0**	**0.0**	**0.0**	**7**	**58**	**3.5**	**18**	**105**	**2.9**	**33**	**181**	**0.6**

Appendix A. Summary of observations[1] by bird type and species for the large bird use surveys conducted in the North Deuel Wind Energy Project area, from April 3, 2016 – March 24, 2017.

Type/Species	Scientific Name	Spring			Summer			Fall			Winter			Total		
		# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs	# grps	# obs	% obs.	# grps	# obs	% obs
Rock pigeon	*Columba livia*	8	18	<0.1	0.0	0.0	0.0	7	58	3.5	18	105	2.9	33	181	0.6
Large Corvids		**23**	**29**	**<0.1**	**2**	**2**	**0.3**	**15**	**16**	**1.0**	**26**	**34**	**0.9**	**66**	**81**	**0.3**
American crow	*Corvus brachyrhynchos*	23	29	<0.1	2	2	0.3	15	16	1.0	26	34	0.9	66	81	0.3
Goatsuckers		**0.0**	**0.0**	**0.0**	**10**	**10**	**1.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10**	**10**	**0.0**
Common nighthawk	*Chordeiles minor*	0.0	0.0	0.0	10	10	1.4	0.0	0.0	0.0	0.0	0.0	0.0	10	10	<0.1
Unidentified Birds		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3**	**61**	**3.7**	**0.0**	**0.0**	**0.0**	**3**	**61**	**0.2**
Unidentified large bird		0.0	0.0	0.0	0.0	0.0	0.0	3	61	3.7	0.0	0.0	0.0	3	61	0.2
Overall		**420**	**24,633**	**100.0**	**211**	**707**	**100.0**	**183**	**1,637**	**100.0**	**225**	**3,663**	**10.00**	**1,039**	**30,640**	**100.0**

[1] Regardless of distance from observer
grps = groups; obs= observations

Appendix B. Large Bird Use, Percent of Use, and Frequency of Occurrence during Large Bird Use Surveys at the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3, 2016 – March 24, 2017.

Appendix B. Mean large bird use percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season, observed during the large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Type/Species	Mean Use[1]					Percent of Total Use (%)				Frequency of Occurrence (5)%			
	Spring	Summer	Fall	Winter	Study Period	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Waterbirds	**<0.1**	**0.8**	**0.5**	**0.0**	**0.3**	**<0.1**	**12**	**1.5**	**0.0**	**2.9**	**18.8**	**9.6**	**0.0**
American white pelican	<0.1	0.7	0.5	0.0	0.3	<0.1	9.6	1.5	0.0	1.5	11.5	7.1	0.0
Double-crested cormorant	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.4	0.0	0.0	1.4	3.1	0.0	0.0
Great blue heron	0.0	0.1	<0.1	0.0	<0.1	0.0	1.6	<0.1	0.0	0.0	9.4	2.5	0.0
Sandhill crane	0.0	<0.1	0.0	0.0	<0.1	0.0	0.3	0.0	0.0	0.0	1.0	0.0	0.0
Waterfowl	**248.2**	**3.2**	**21.9**	**29.1**	**74.5**	**99.2**	**46.6**	**62.8**	**94.8**	**62.0**	**12.5**	**38.3**	**18.8**
American green-winged teal	0.0	0.0	0.0	2.1	0.6	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.0
Blue-winged teal	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	8.1	0.0	0.0	0.0
Cackling goose	1.9	0.0	0.0	5.7	2.1	0.8	0.0	0.0	18.4	10.1	0.0	0.0	4.7
Canada goose	3.5	3.2	17.5	8.9	7.5	1.4	45.5	50.2	29	31.3	10.4	32.1	15.1
Gadwall	<0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	1.4	0.0	0.0	0.0
Greater white-fronted goose	30.9	0.0	0.0	2.8	8.4	12.4	0.0	0.0	9.1	14.1	0.0	0.0	4.2
Hooded merganser	<0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Mallard	5.6	<0.1	0.5	0.4	1.6	2.2	1.0	1.5	1.4	38.6	3.1	2.5	6.5
Northern shoveler	0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Redhead	1.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Ross' goose	23.2	0.0	0.0	0.0	5.7	9.3	0.0	0.0	0.0	8.1	0.0	0.0	0.0
Snow goose	29.4	0.0	0.0	5.1	8.7	11.7	0.0	0.0	16.7	12.1	0.0	0.0	3.1
Unidentified duck	25.1	0.0	1.7	0.0	6.5	10	0.0	4.9	0.0	9.1	0.0	6.2	0.0
Unidentified goose	125.5	0.0	0.0	0.6	31.1	50.1	0.0	0.0	2.0	12.1	0.0	0.0	2.1
Unidentified waterfowl	1.4	0.0	2.2	3.5	1.7	0.6	0.0	6.2	11.3	2.0	0.0	4.6	6.5
Wood duck	<0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	2.9	0.0	0.0	0.0
Shorebirds	**0.2**	**0.4**	**0.9**	**0.0**	**0.3**	**<0.1**	**5.8**	**2.5**	**0.0**	**10**	**11.5**	**14.2**	**0.0**
Greater yellowlegs	0.0	0.0	<0.1	0.0	<0.1	0.0	0.0	0.1	0.0	0.0	0.0	4.2	0.0
Killdeer	<0.1	0.2	0.8	0.0	0.2	<0.1	3.6	2.3	0.0	3.0	5.2	7.5	0.0
Lesser yellowlegs	0.0	0.0	<0.1	0.0	<0.1	0.0	0.0	<0.1	0.0	0.0	0.0	2.5	0.0
Marbled godwit	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.7	0.0	0.0	1.4	2.1	0.0	0.0
Unidentified sandpiper	0.0	<0.1	0.0	0.0	<0.1	0.0	0.4	0.0	0.0	0.0	2.1	0.0	0.0
Upland sandpiper	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.3	0.0	0.0	5.6	1.0	0.0	0.0
Wilson's snipe	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.7	0.0	0.0	1.4	3.1	0.0	0.0
Gulls/Terns	**0.1**	**1.3**	**7.7**	**0.0**	**1.8**	**<0.1**	**18.7**	**21.9**	**0.0**	**8.6**	**8.3**	**10**	**0.0**
Bonaparte's gull	0.0	<0.1	0.0	0.0	<0.1	0.0	0.6	0.0	0.0	0.0	1.0	0.0	0.0
Franklin's gull	0.0	<0.1	7.3	0.0	1.3	0.0	1.3	20.9	0.0	0.0	2.1	10.0	0.0
Herring gull	0.0	<0.1	0.0	0.0	<0.1	0.0	0.3	0.0	0.0	0.0	1.0	0.0	0.0

Appendix B. Mean large bird use percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season, observed during the large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Type/Species	Mean Use[1]					Percent of Total Use (%)				Frequency of Occurrence (5)%			
	Spring	Summer	Fall	Winter	Study Period	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Ring-billed gull	0.1	0.1	0.0	0.0	0.1	<0.1	1.6	0.0	0.0	8.6	3.1	0.0	0.0
Unidentified gull	0.0	1.0	0.4	0.0	0.4	0.0	14.8	1.1	0.0	0.0	5.2	2.5	0.0
Rails/Coots	**<0.1**	**<0.1**	**0.0**	**0.0**	**<0.1**	**<0.1**	**0.3**	**0.0**	**0.0**	**1.4**	**1.0**	**0.0**	**0.0**
Sora	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.1	0.0	0.0	1.4	1.0	0.0	0.0
Virginia rail	0.0	<0.1	0.0	0.0	<0.1	0.0	0.1	0.0	0.0	0.0	1.0	0.0	0.0
Diurnal Raptors	**0.9**	**0.5**	**1.6**	**0.2**	**0.7**	**0.3**	**7.2**	**4.5**	**0.5**	**49.2**	**27.1**	**64.6**	**13.4**
Accipiters	*<0.1*	*<0.1*	0.0	0.0	*<0.1*	*<0.1*	*0.4*	0.0	0.0	*1.0*	*2.1*	0.0	0.0
Cooper's hawk	0.0	<0.1	0.0	0.0	<0.1	0.0	0.4	0.0	0.0	0.0	2.1	0.0	0.0
Unidentified accipiter	<0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Buteos	*0.4*	*0.3*	*0.8*	*<0.1*	*0.3*	*0.2*	*4.6*	*2.3*	*0.1*	*29.0*	*18.8*	*38.8*	*3.5*
Red-tailed hawk	0.3	0.3	0.6	<0.1	0.3	0.1	3.9	1.9	<0.1	24.5	16.7	32.5	1.6
Rough-legged hawk	0.0	0.0	<0.1	<0.1	<0.1	0.0	0.0	0.2	<0.1	0.0	0.0	4.2	1.9
Swainson's hawk	0.0	<0.1	0.0	0.0	<0.1	0.0	0.4	0.0	0.0	0.0	3.1	0.0	0.0
Unidentified buteo	<0.1	<0.1	<0.1	0.0	<0.1	<0.1	0.3	0.2	0.0	4.5	1.0	4.2	0.0
Northern Harrier	*0.2*	*<0.1*	*0.5*	0.0	*0.2*	*<0.1*	*1.0*	*1.5*	0.0	*14.0*	*5.2*	*32.5*	0.0
Northern harrier	0.2	<0.1	0.5	0.0	0.2	<0.1	1.0	1.5	0.0	14.0	5.2	32.5	0.0
Eagles	*0.2*	*<0.1*	*<0.1*	*0.1*	*0.1*	*<0.1*	*0.4*	*0.2*	*0.4*	*14.6*	*3.1*	*5.0*	*10.9*
Bald eagle	0.2	<0.1	<0.1	0.1	0.1	<0.1	0.4	0.2	0.4	13.6	3.1	5.0	10.9
Unidentified eagle	<0.1	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Falcons	*<0.1*	*<0.1*	*<0.1*	0.0	*<0.1*	*<0.1*	*0.4*	*<0.1*	0.0	*3.5*	*2.1*	*2.5*	0.0
American kestrel	<0.1	<0.1	0.0	0.0	<0.1	<0.1	0.4	0.0	0.0	3.5	2.1	0.0	0.0
Merlin	0.0	0.0	<0.1	0.0	<0.1	0.0	0.0	<0.1	0.0	0.0	0.0	2.5	0.0
Other Raptors	*<0.1*	*<0.1*	*0.2*	*<0.1*	*<0.1*	*<0.1*	*0.1*	*0.5*	*<0.1*	*1.0*	*1.0*	*12.5*	*1.0*
Unidentified raptor	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.5	<0.1	1.0	1.0	12.5	1.0
Vultures	**<0.1**	**0.4**	**0.2**	**0.0**	**0.1**	**<0.1**	**5.2**	**0.6**	**0.0**	**1.4**	**13.5**	**15**	**0.0**
Turkey vulture	<0.1	0.4	0.2	0.0	0.1	<0.1	5.2	0.6	0.0	1.4	13.5	15	0.0
Upland Game Birds	**0.3**	**0.2**	**0.4**	**0.2**	**0.2**	**0.1**	**2.4**	**1.3**	**0.5**	**20.6**	**14.6**	**24.2**	**9.6**
Gray partridge	<0.1	0.0	0.1	0.0	<0.1	<0.1	0.0	0.3	0.0	1.4	0.0	2.1	0.0
Ring-necked pheasant	0.3	0.2	0.3	0.1	0.2	0.1	2.2	0.8	0.5	20.6	13.5	22.1	9.6
Wild turkey	0.0	<0.1	<0.1	<0.1	<0.1	0.0	0.1	0.2	<0.1	0.0	1.0	2.1	1.0
Doves/Pigeons	**0.2**	**0.0**	**1.3**	**0.9**	**0.6**	**<0.1**	**0.0**	**3.8**	**3.1**	**6.8**	**0.0**	**13.8**	**13.2**
Rock pigeon	0.2	0.0	1.3	0.9	0.6	<0.1	0.0	3.8	3.1	6.8	0.0	13.8	13.2
Large Corvids	**0.3**	**<0.1**	**0.4**	**0.3**	**0.2**	**0.1**	**0.3**	**1.1**	**1.0**	**23.4**	**2.1**	**22.9**	**15.9**
American crow	0.3	<0.1	0.4	0.3	0.2	0.1	0.3	1.1	1.0	23.4	2.1	22.9	15.9

Appendix B. Mean large bird use percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season, observed during the large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Type/Species	Mean Use[1]					Percent of Total Use (%)				Frequency of Occurrence (5)%			
	Spring	Summer	Fall	Winter	Study Period	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Goatsuckers	**0.0**	**0.1**	**0.0**	**0.0**	**<0.1**	**0.0**	**1.5**	**0.0**	**0.0**	**0.0**	**4.2**	**0.0**	**0.0**
Common nighthawk	0.0	0.1	0.0	0.0	<0.1	0.0	1.5	0.0	0.0	0.0	4.2	0.0	0.0
Overall[2]	**250.3**	**7.0**	**34.9**	**30.7**	**78.9**	**100.0**	**100.0**	**100.0**	**100.0**				

[1] Mean number of observations/800-meter (2,625-foot) plot/survey
[2] Sums of values may not add to total value shown, due to rounding

Appendix C. Large Bird Use by Point for All Birds, Major Bird Types, and Diurnal Raptor Subtypes during Large Bird Use Surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Appendix C1. Large bird use (number of observations/800-m [2,625-foot] plot/60-minute survey) by point for all large bird, major bird types, and diurnal raptor subtypes observed at the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota from April 3, 2016 – March 24, 2017.

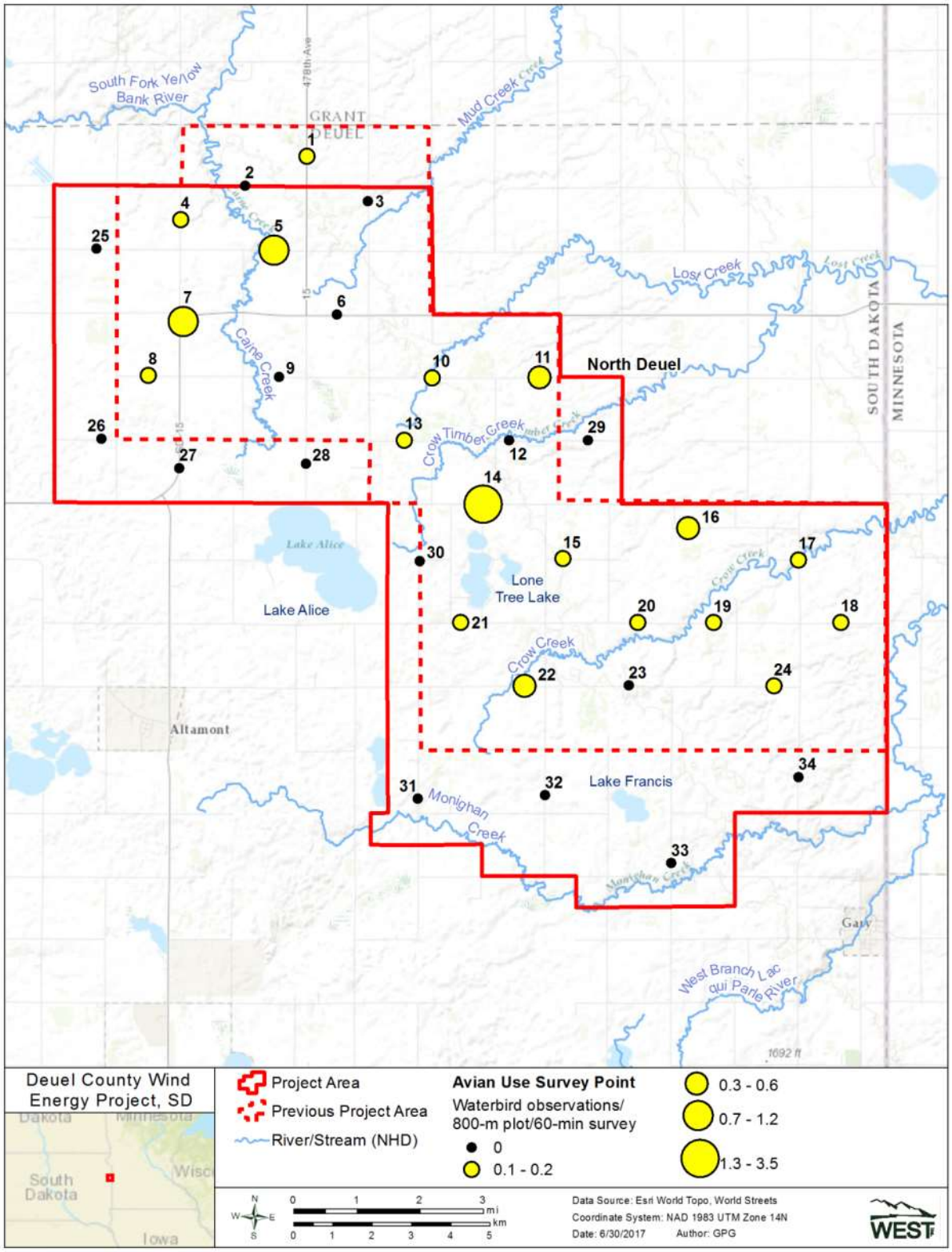
Bird Type	Survey Points																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Waterbirds	0.1	0.00	0.0	0.1	1.2	0.0	1.2	0.1	0.0	0.2	0.5	0.0	0.2	3.5	0.2	0.4	0.1
Waterfowl	24.4	68.1	0.3	25.3	14.9	76.0	21.2	26.5	150.8	68.5	9.9	62.6	68.9	40.9	22.2	11.4	21.8
Shorebirds	1.6	0.3	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.4	2.3	0.1	0.4
Gulls/Terns	2.1	0.0	0.0	0.9	2.7	0.0	17.3	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Rails/Coots	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0
Diurnal Raptors	0.2	0.3	0.6	0.6	1.3	0.8	0.3	0.5	0.6	0.9	1.4	0.3	0.6	0.8	0.3	0.5	0.9
Accipiters	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Buteos	*0.1*	*0.1*	*0.3*	*0.3*	*0.8*	*0.3*	*0.1*	*0.0*	*0.4*	*0.5*	*1.0*	*0.2*	*0.4*	*0.1*	*0.2*	*0.5*	*0.9*
Northern Harrier	*0.1*	*0.1*	*0.3*	*0.2*	*0.3*	*0.3*	*0.0*	*0.3*	*0.1*	*0.3*	*0.2*	*0.0*	*0.2*	*0.3*	*0.0*	*0.0*	*0.0*
Eagles	*0.0*	*0.1*	*0.0*	*0.2*	*0.1*	*0.1*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.2*	*0.0*	*0.3*	*0.2*	*0.0*	*0.1*
Falcons	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.2*	*0*	*0.0*	*0.0*
Other Raptors	*0.0*	*0.0*	*0.1*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Vultures	0.0	0.1	0.3	0.1	0.0	0.1	0.4	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.1	1.1	0.0
Upland Game Birds	0.1	0.8	0.1	1.1	0.3	0.0	0.1	0.0	0.2	0.2	0.1	0.6	0.2	0.2	0.0	0.2	0.3
Doves/Pigeons	0.2	0.0	1.1	0.0	0.8	0.0	0.0	0.0	0.0	0.8	0.4	0.4	6.2	0.0	1.2	0.0	0.5
Large Corvids	1.1	0.0	0.2	0.2	0.1	0.0	0.1	0.2	0.4	0.2	0.2	0.2	0.1	0.2	0.1	0.0	0.5
Goatsuckers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
All Large Birds	**29.7**	**69.6**	**2.6**	**28.8**	**21.3**	**76.8**	**40.5**	**27.2**	**152.0**	**71.0**	**12.4**	**64.3**	**76.4**	**46.3**	**26.3**	**13.5**	**24.8**

[1] 800-meter (2,625-foot) plot for large birds

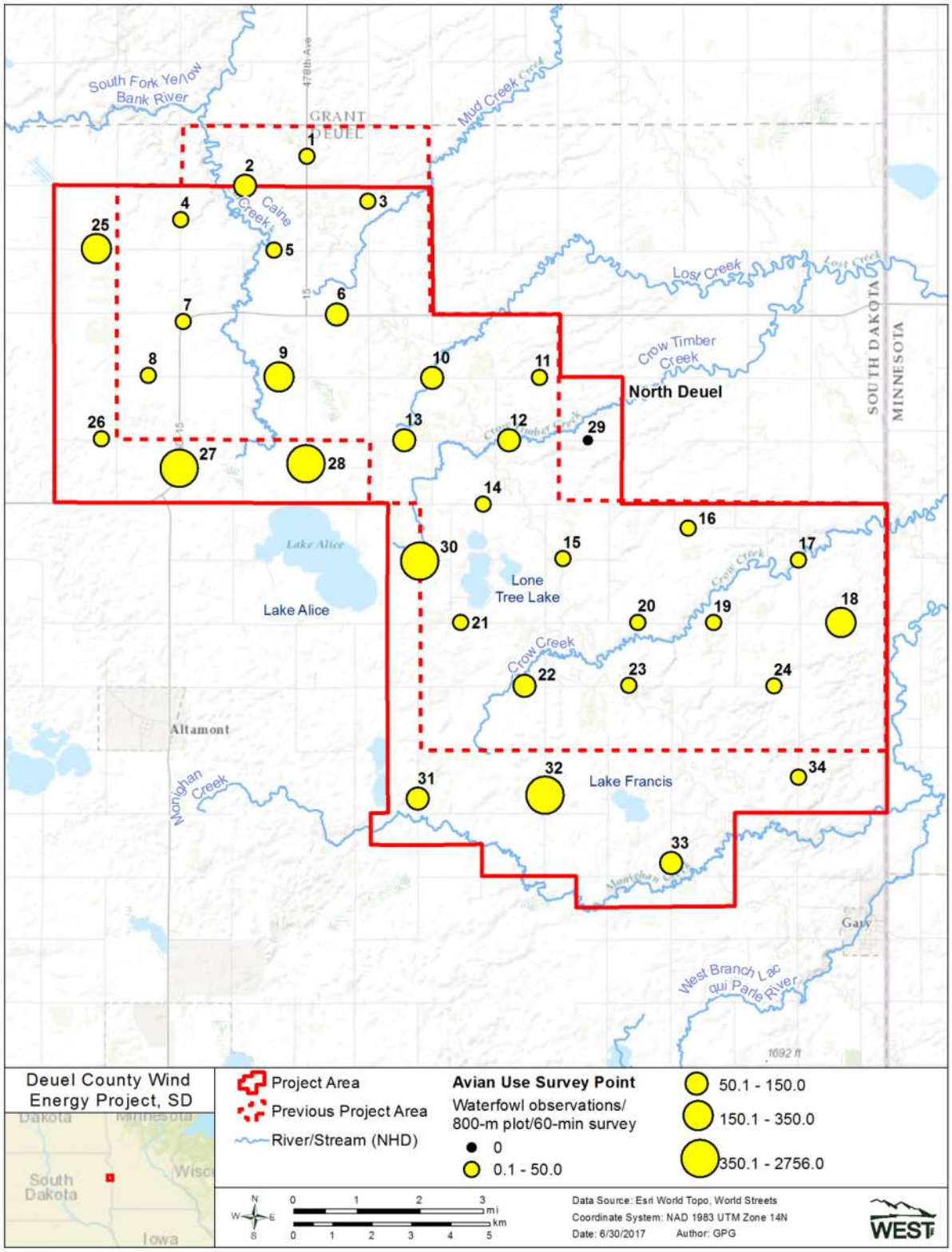
Appendix C1. Large bird use (number of observations/800-m [2,625-foot] plot/60-minute survey) by point for all large bird, major bird types, and diurnal raptor subtypes observed during large bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Bird Type	Survey Points																
	18	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**
Waterbirds	0.1	0.2	0.1	0.1	0.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waterfowl	159.2	14.5	5.0	31.3	82.5	0.8	2.0	249.7	16.5	1,680.3	2,022.0	0	366.0	53.0	2,756.0	51.7	1.0
Shorebirds	0.2	0.3	0.0	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
Gulls/Terns	0.0	5.5	0.2	0.1	2.4	3.9	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Rails/Coots	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diurnal Raptors	0.4	0.9	0.3	0.8	0.3	0.7	0.4	0.0	1.0	1.7	1.0	1.0	0.5	0.7	2.0	0.0	0.0
Accipiters	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Buteos	*0.2*	*0.5*	*0.0*	*0.2*	*0.2*	*0.5*	*0.2*	*0.0*	*0.0*	*0.7*	*0.0*	*0.7*	*0.5*	*0.0*	*0.0*	*0.0*	*0.0*
Northern Harrier	*0.0*	*0.3*	*0.1*	*0.3*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.7*	*0.0*	*0.0*	*0.0*
Eagles	*0.1*	*0.1*	*0.2*	*0.0*	*0.1*	*0.0*	*0.1*	*0.0*	*1.0*	*0.7*	*0.5*	*0.3*	*0.0*	*0.0*	*2.0*	*0.0*	*0.0*
Falcons	*0.0*	*0.1*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.3*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Other Raptors	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.2*	*0.1*	*0.0*	*0.0*	*0.0*	*0.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Vultures	0.2	0.2	0.2	0.0	0.2	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upland Game Birds	0.2	0.5	0.2	0.2	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Doves/Pigeons	0.0	0.5	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0
Large Corvids	0.1	0.4	0.2	0.4	0.2	0.2	0.4	0.0	1.0	0.0	0.0	0.7	3.0	0.0	0.0	0.3	0.5
Goatsuckers	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Large Birds	**160.3**	**22.9**	**6.2**	**33.1**	**86.3**	**6.4**	**3.9**	**249.7**	**18.5**	**1,682.0**	**2,023.0**	**2.3**	**369.5**	**62.3**	**2,758.0**	**52.0**	**1.5**

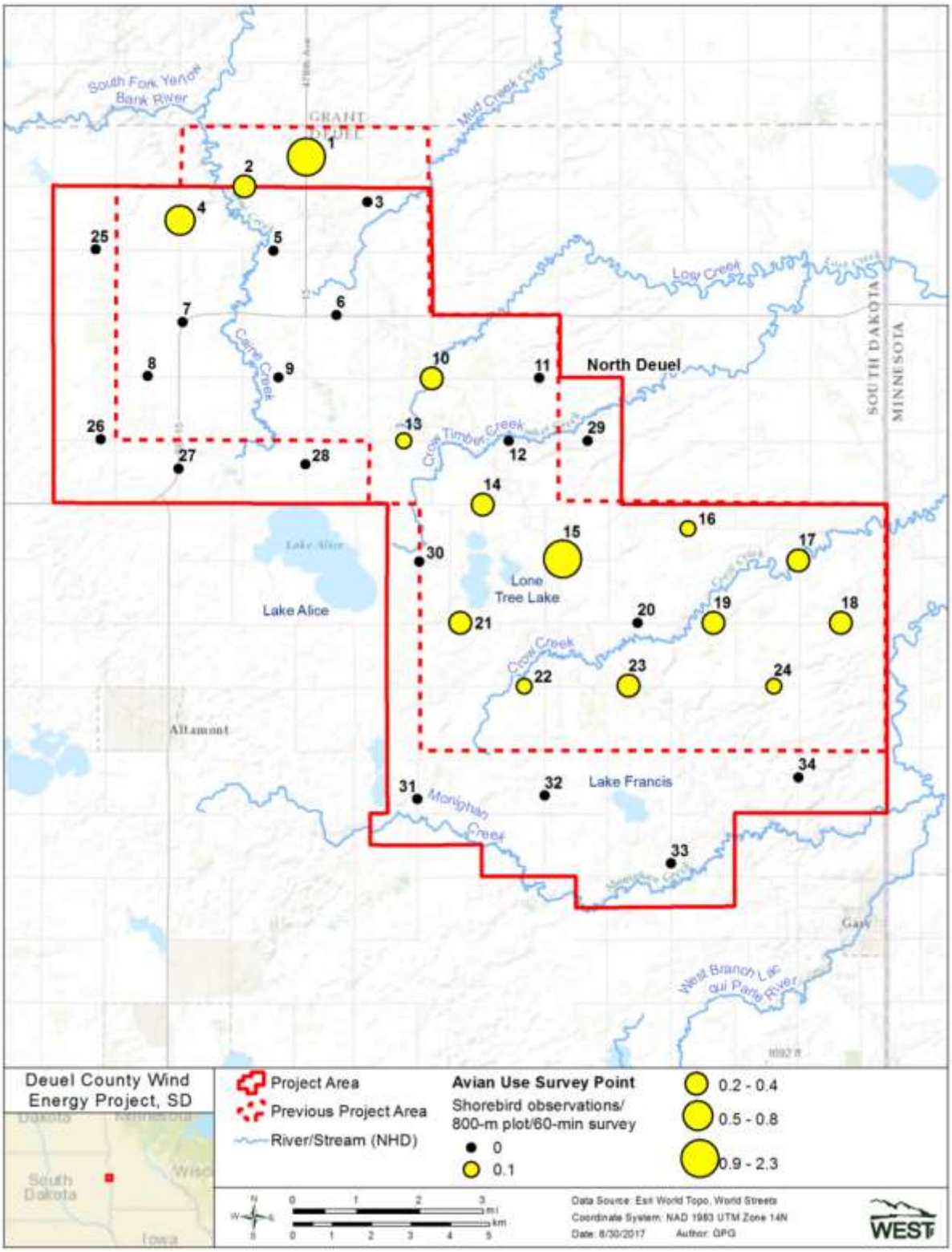
[1] 800-meter (2,625-foot) plot for large birds



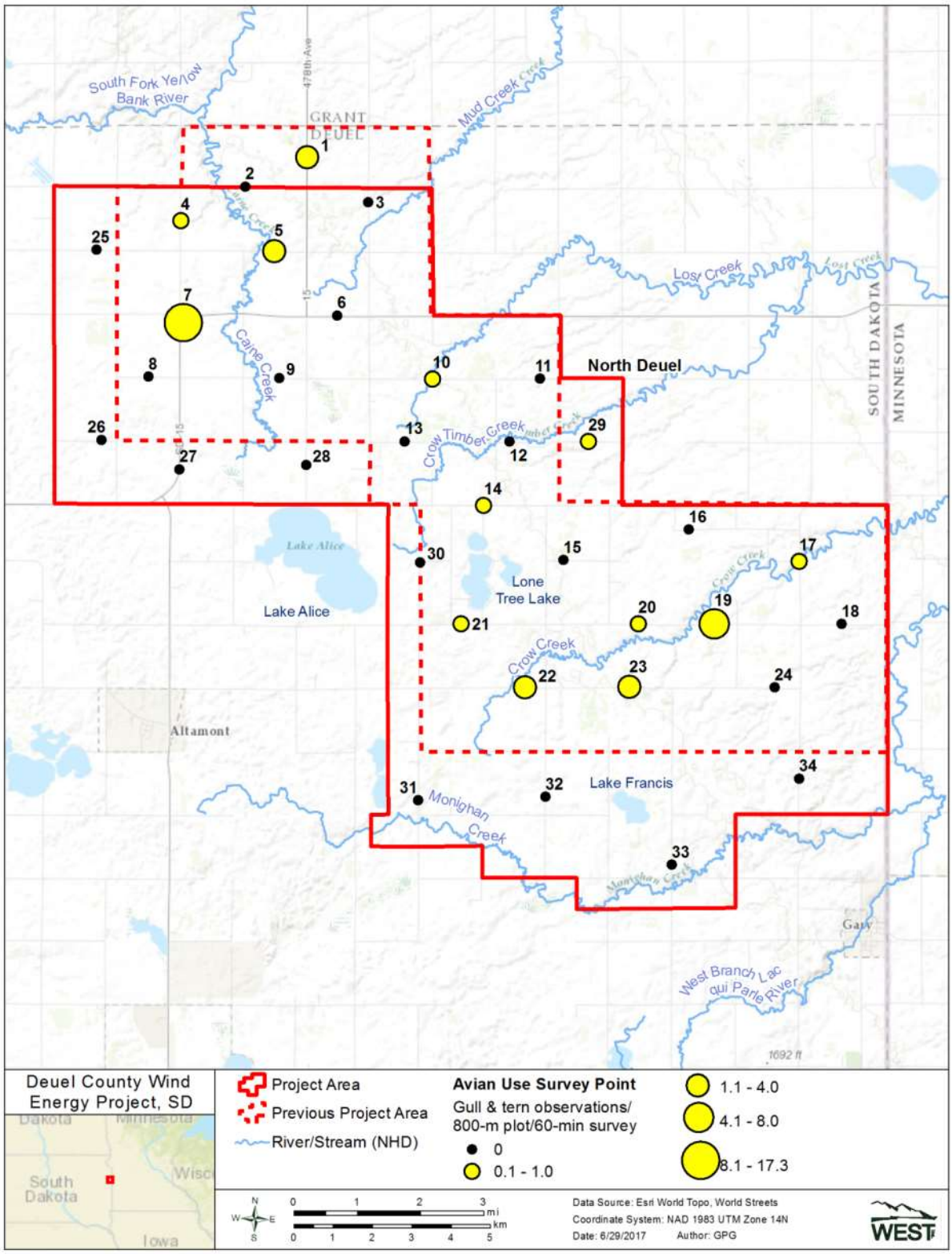
Appendix C2. Waterbird use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



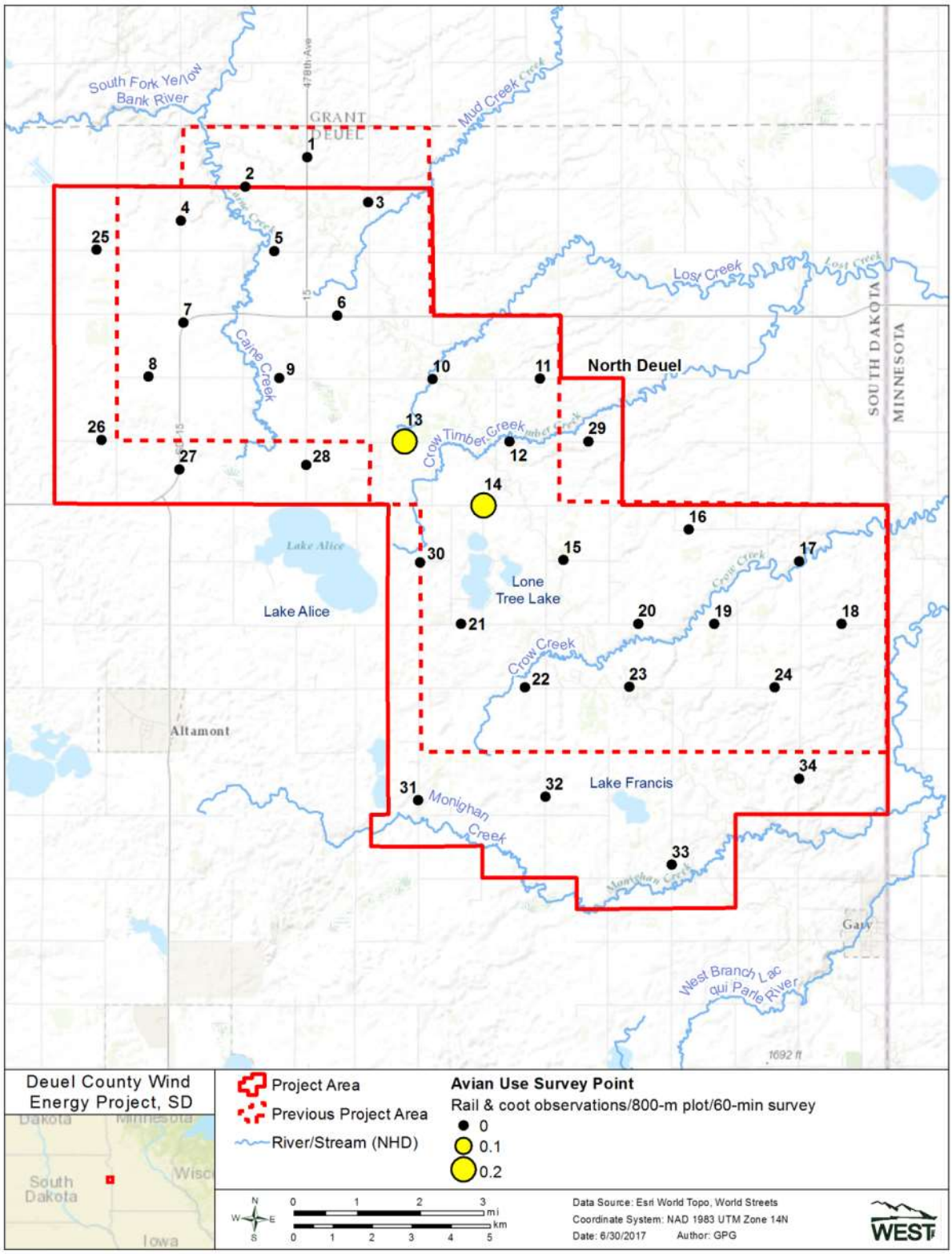
Appendix C2. Waterfowl use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



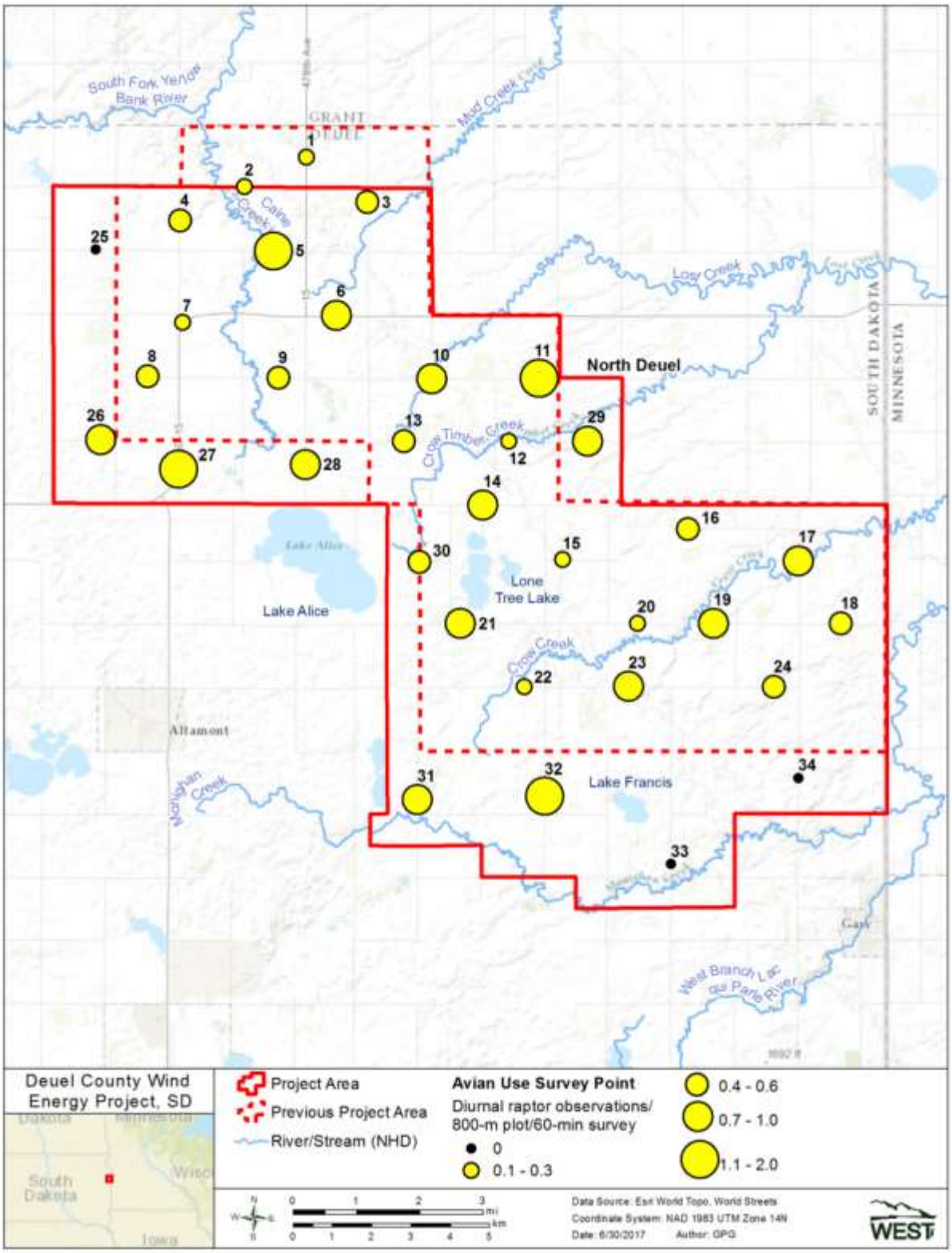
Appendix C2. Shorebird use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



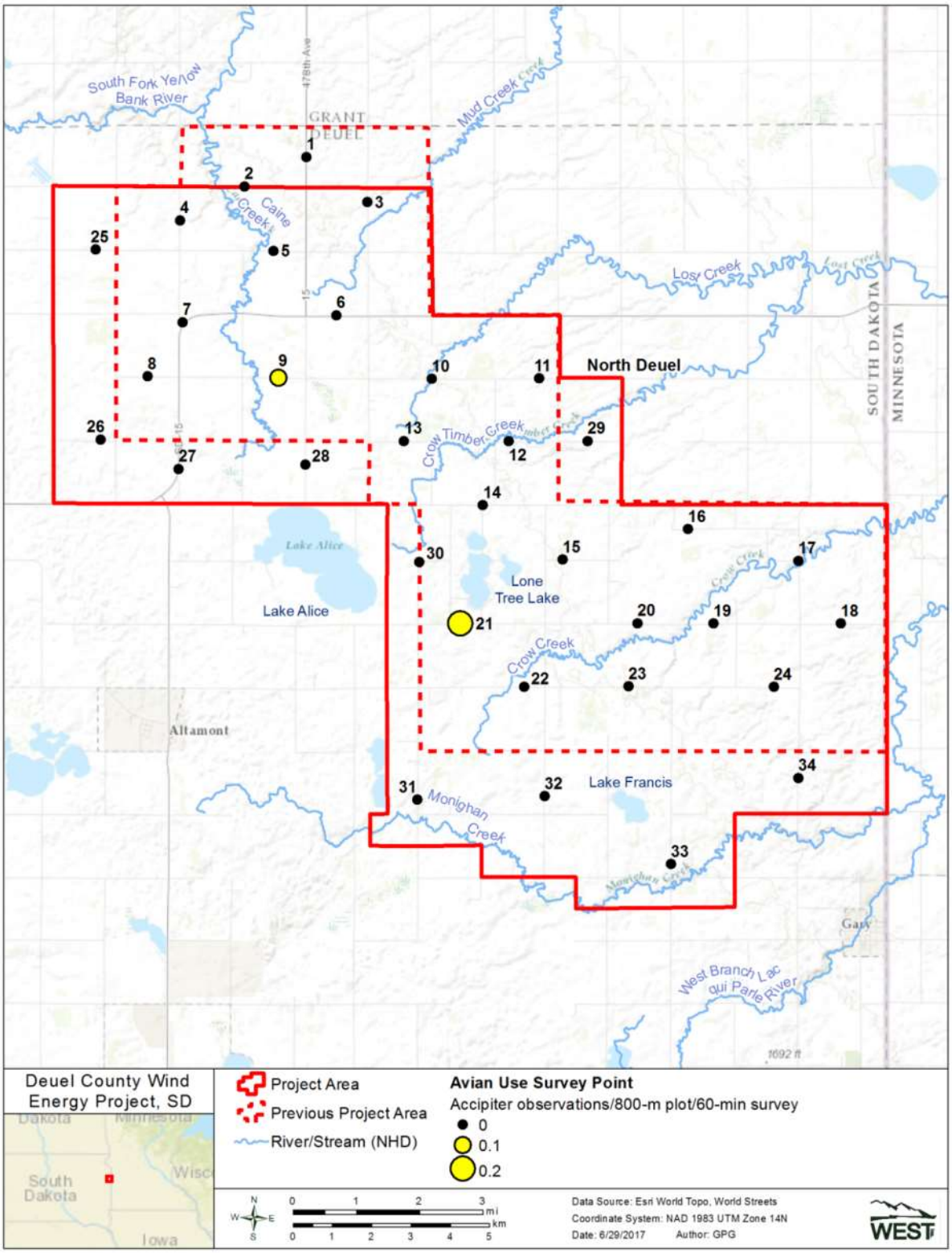
Appendix C2. Gulls/terns use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



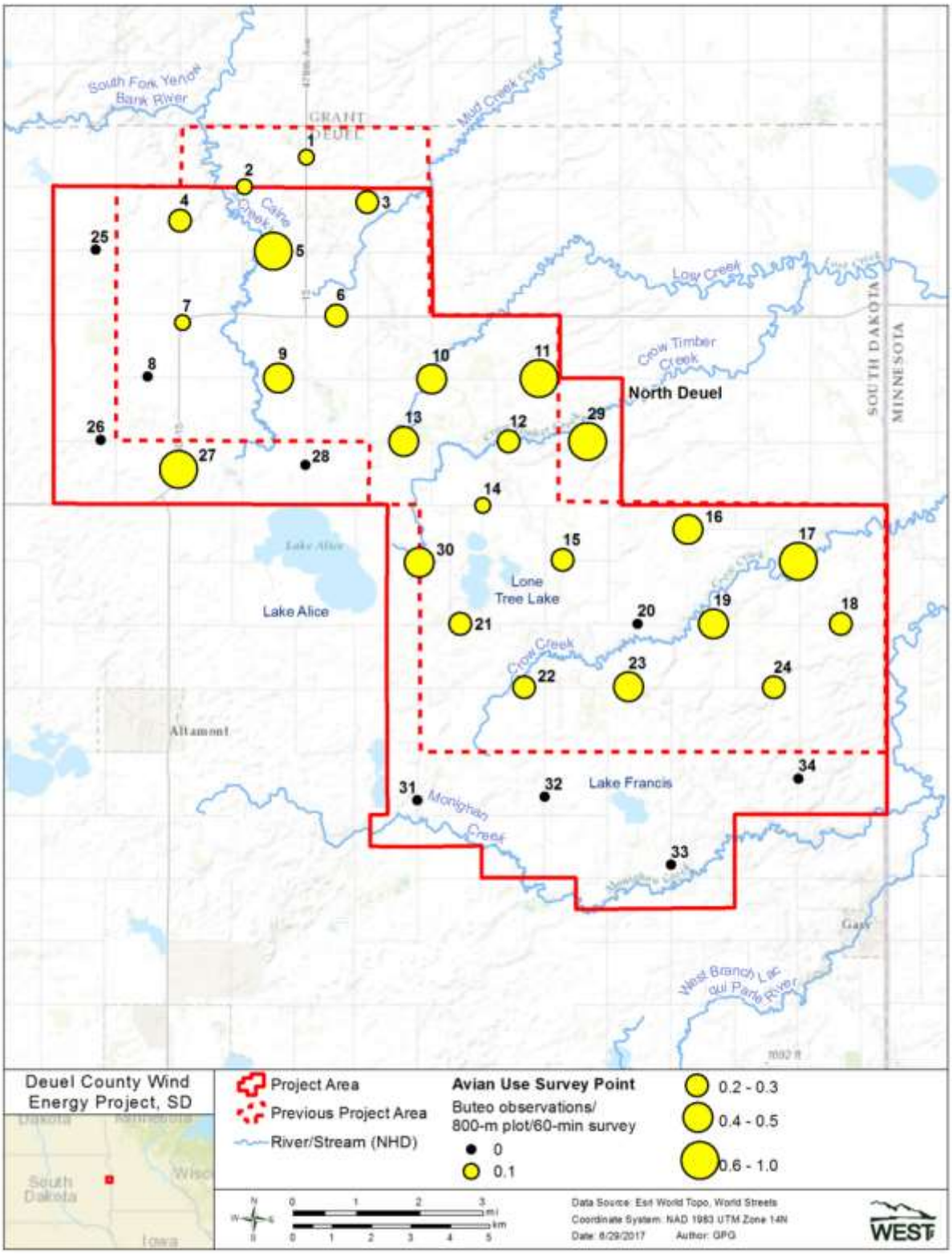
Appendix C2. Rails/Coots use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



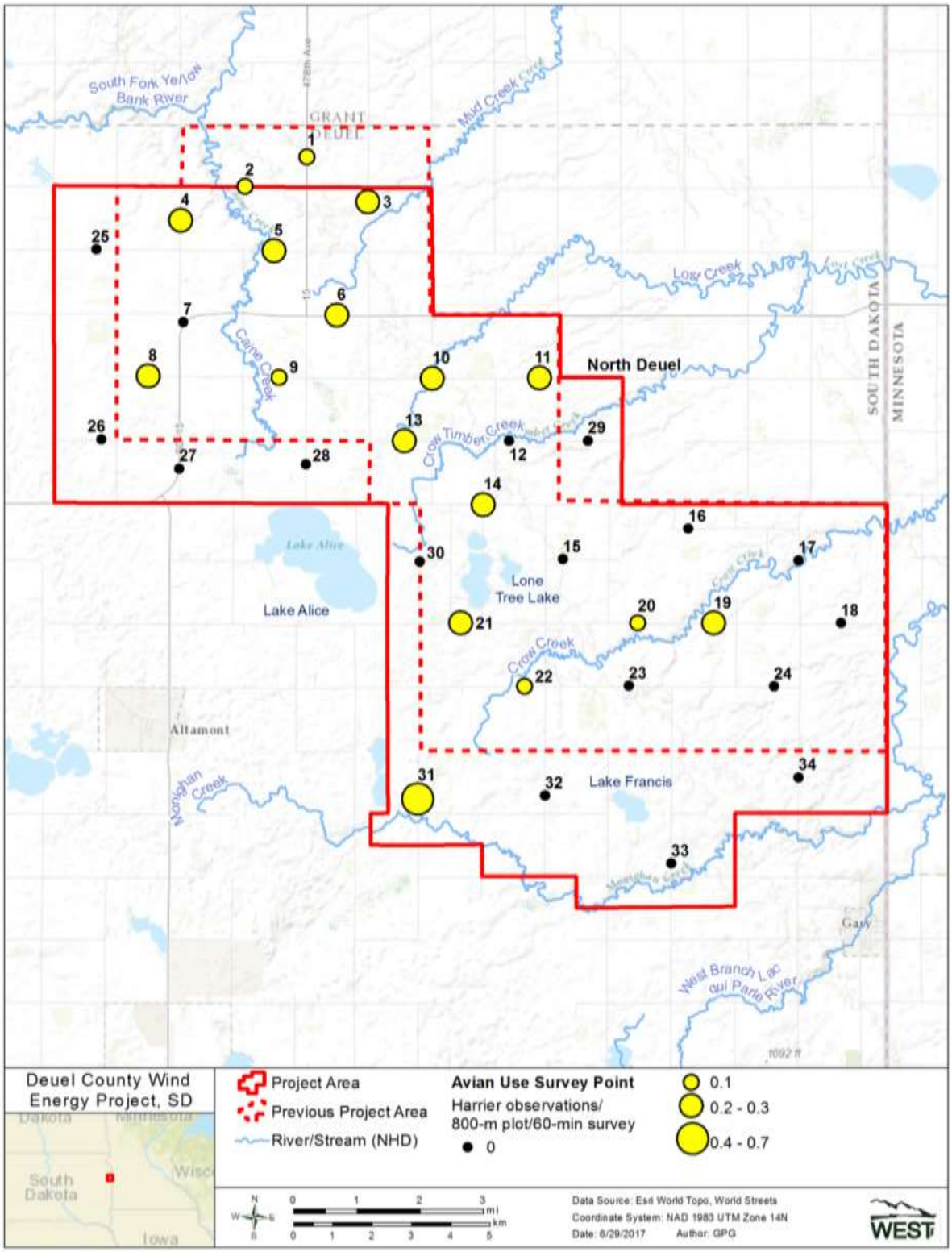
Appendix C2. Diurnal raptors use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



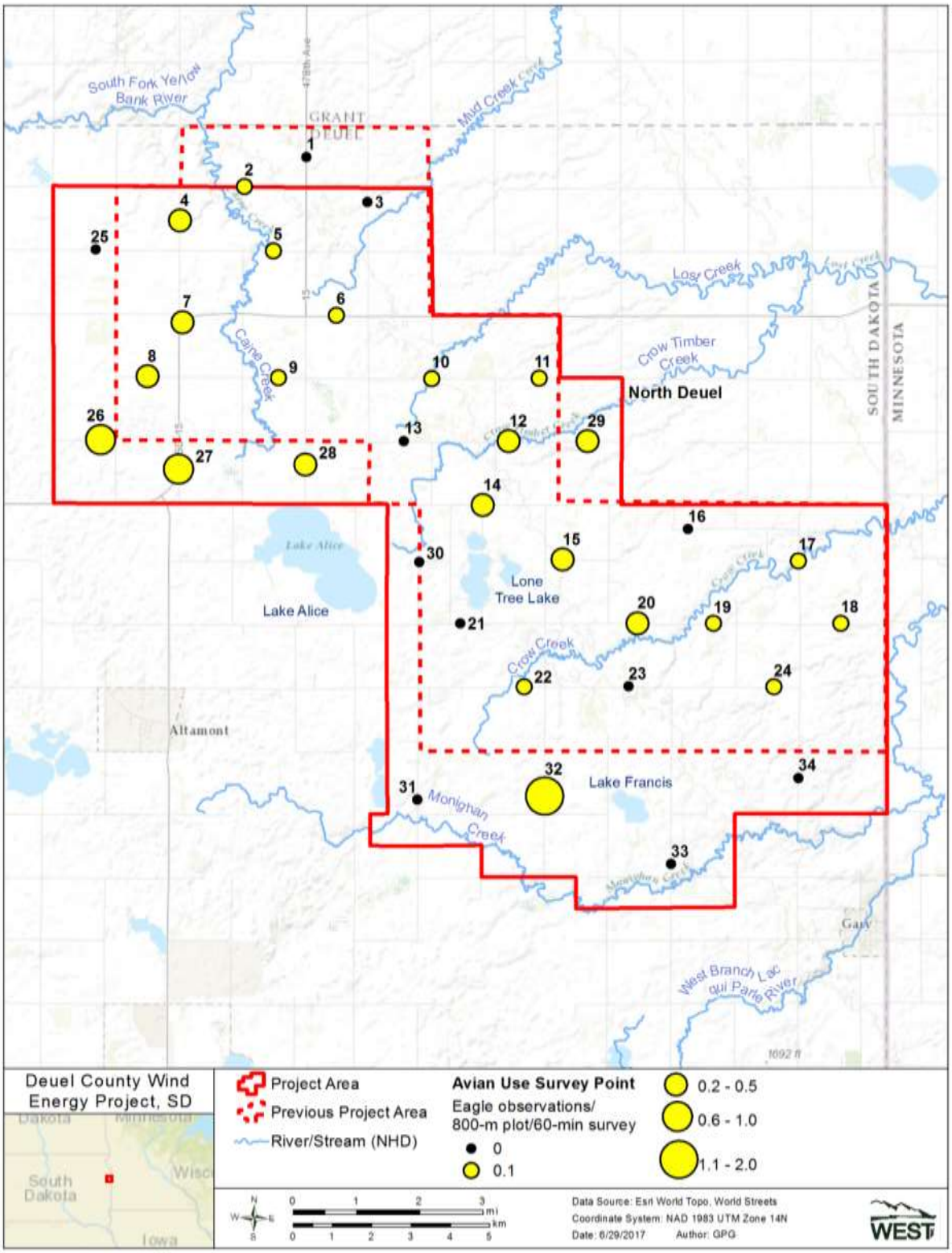
Appendix C2. Accipiters use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



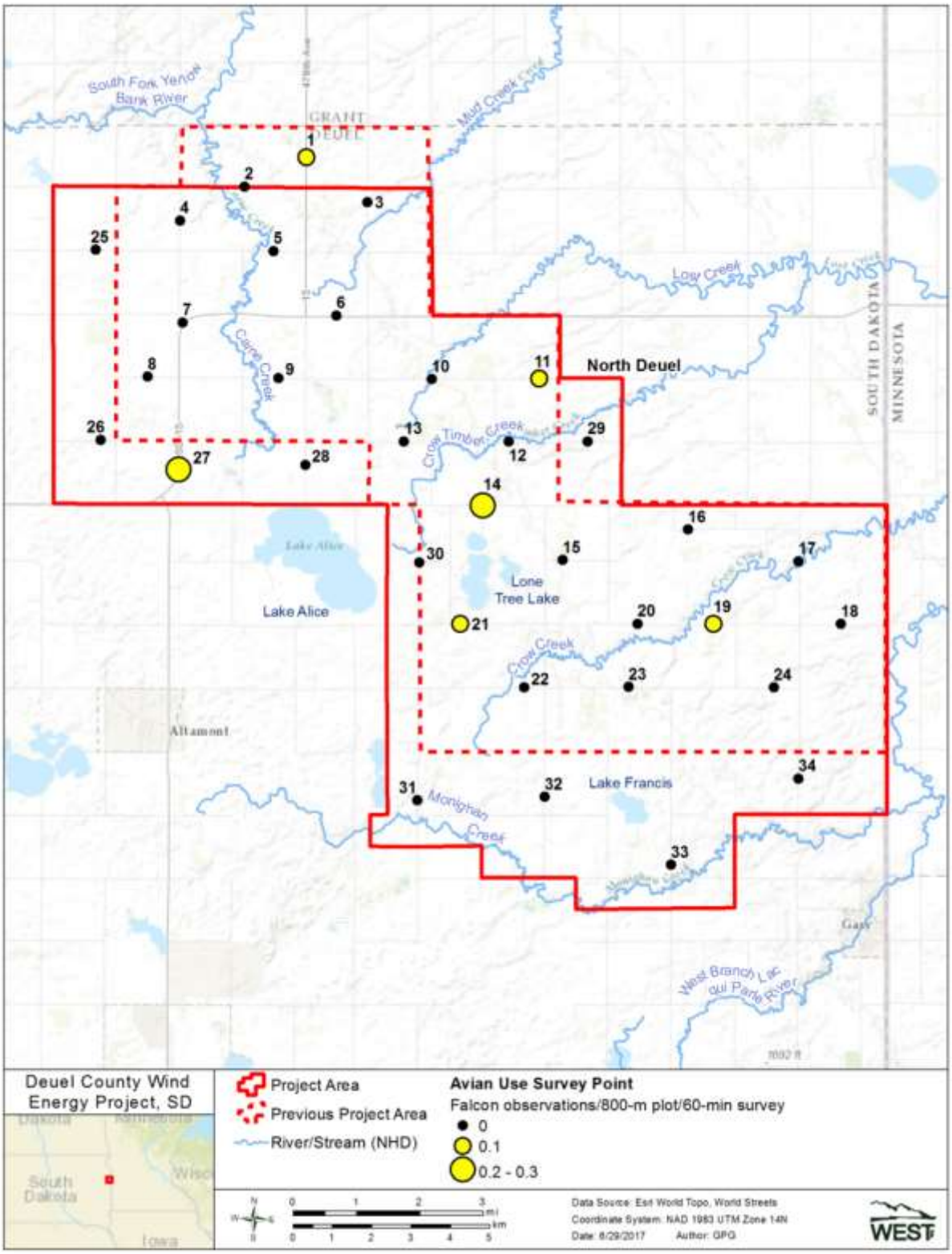
Appendix C2. Buteo use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



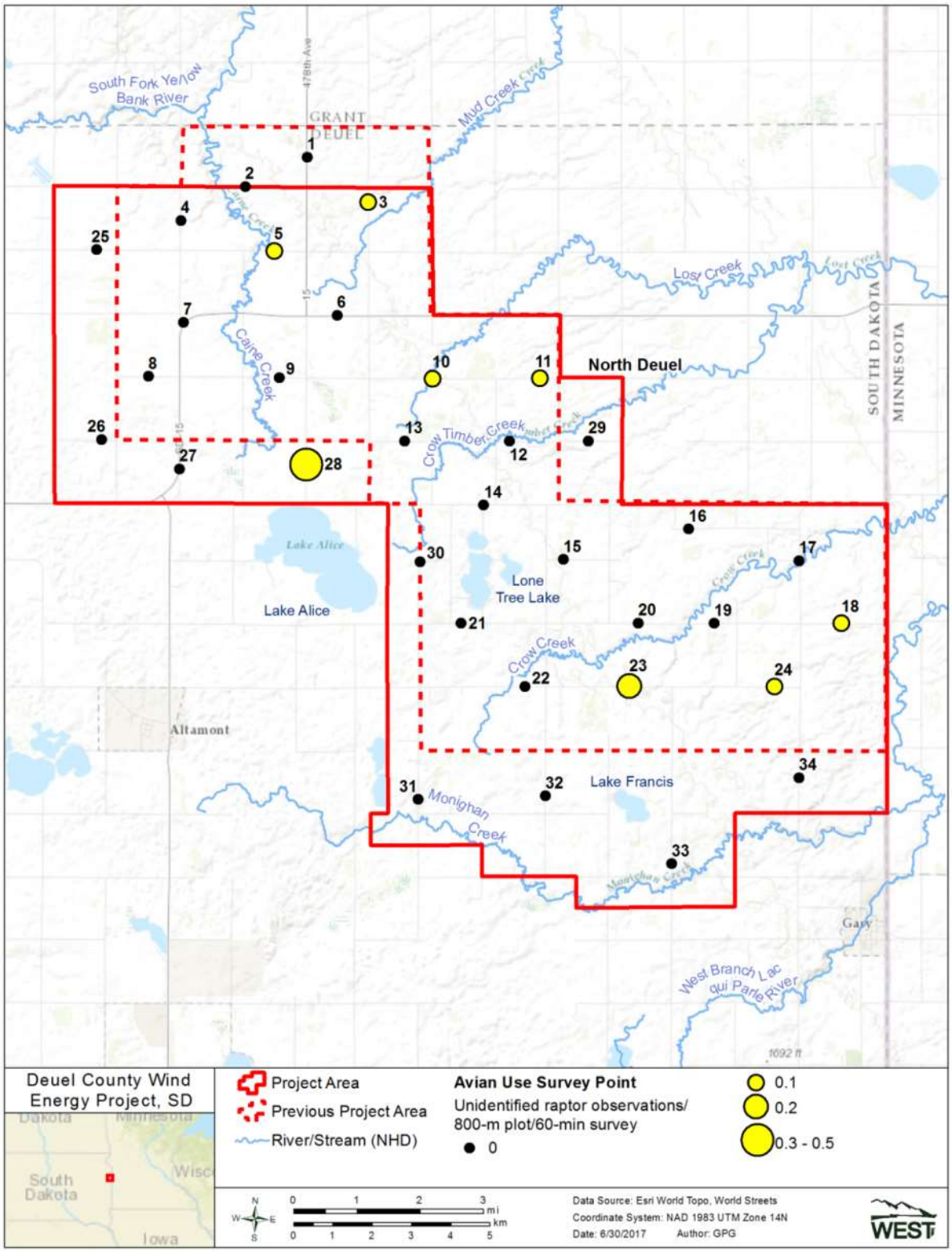
Appendix C2. Northern harrier use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



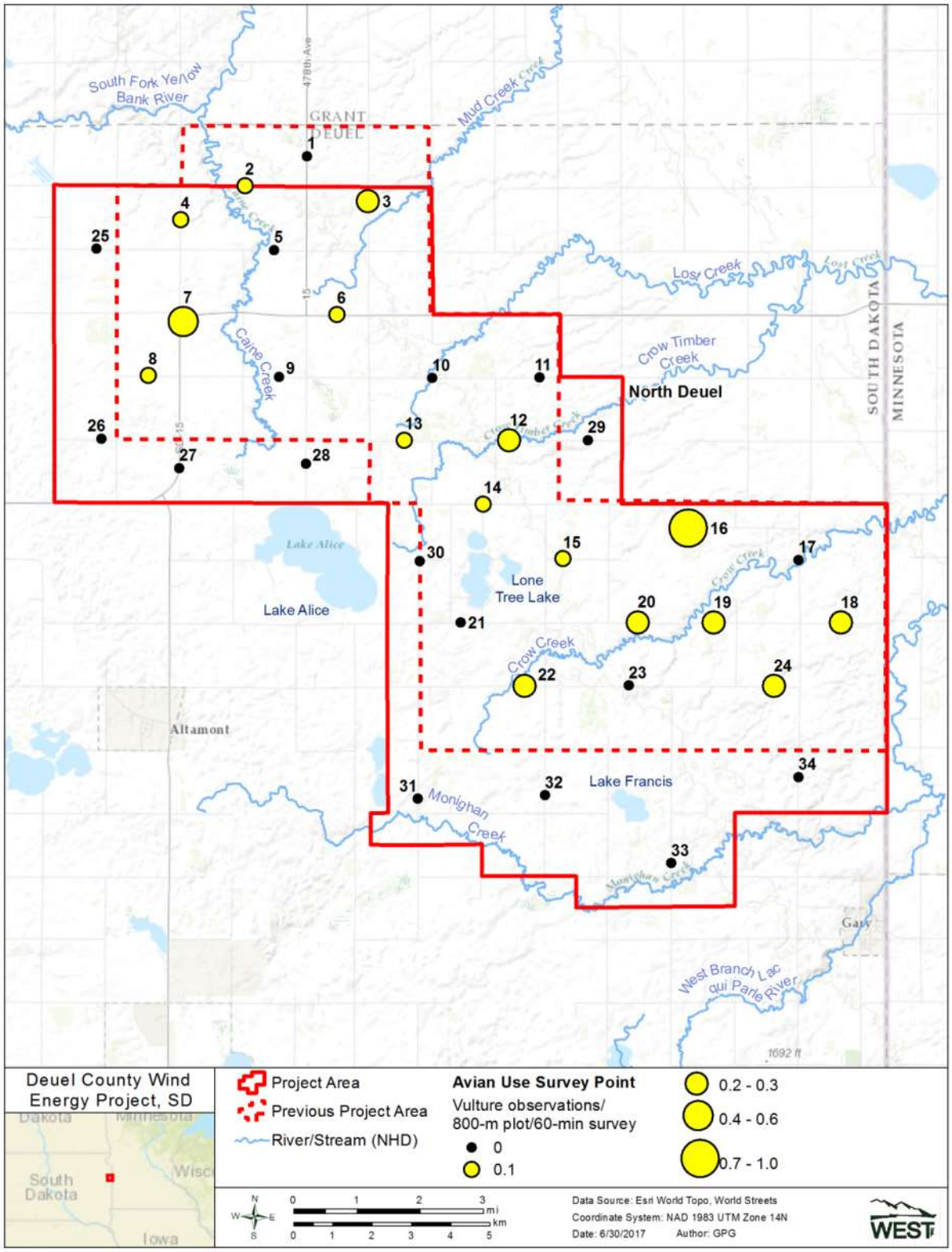
Appendix C2. Eagles use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



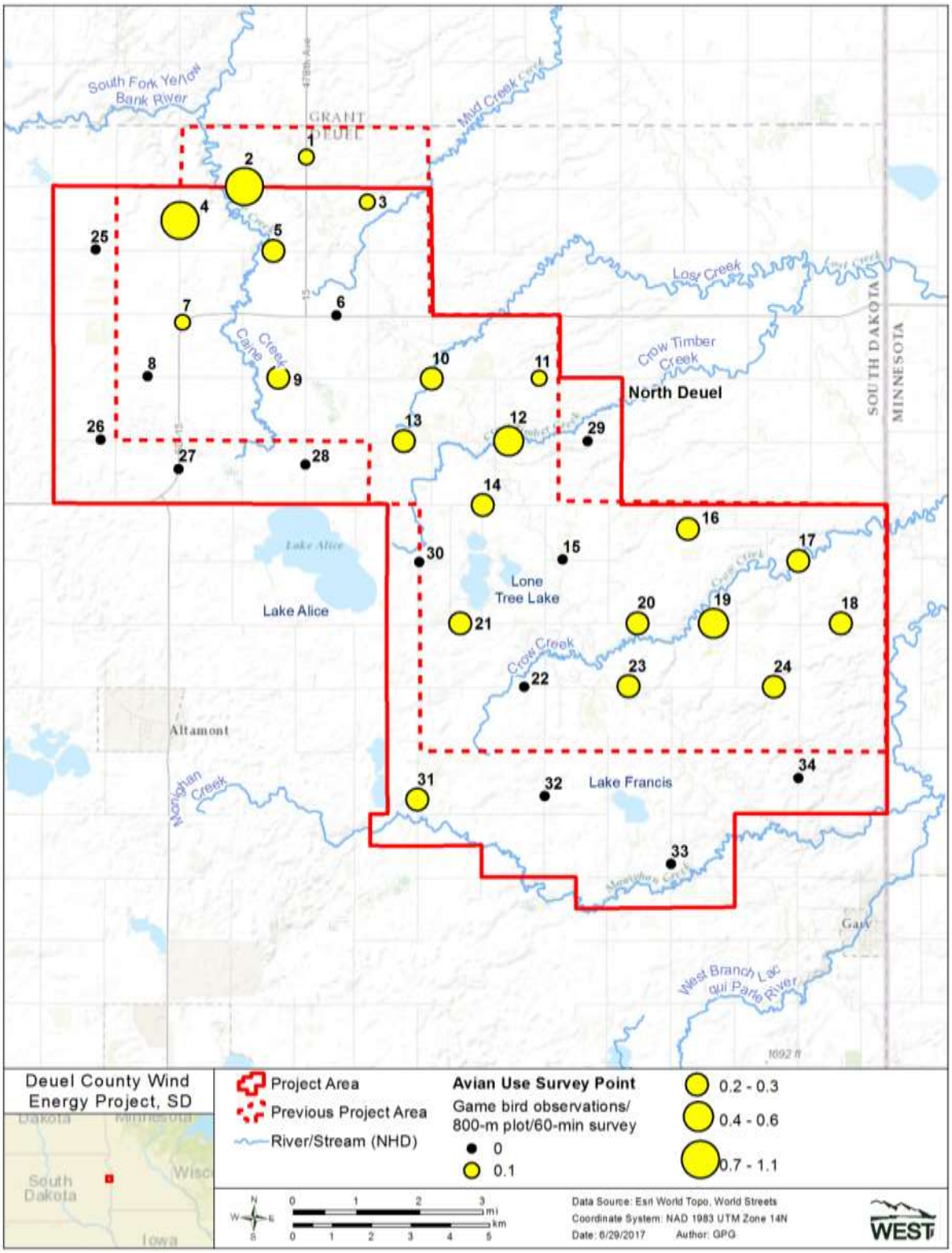
Appendix C2. Falcon use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



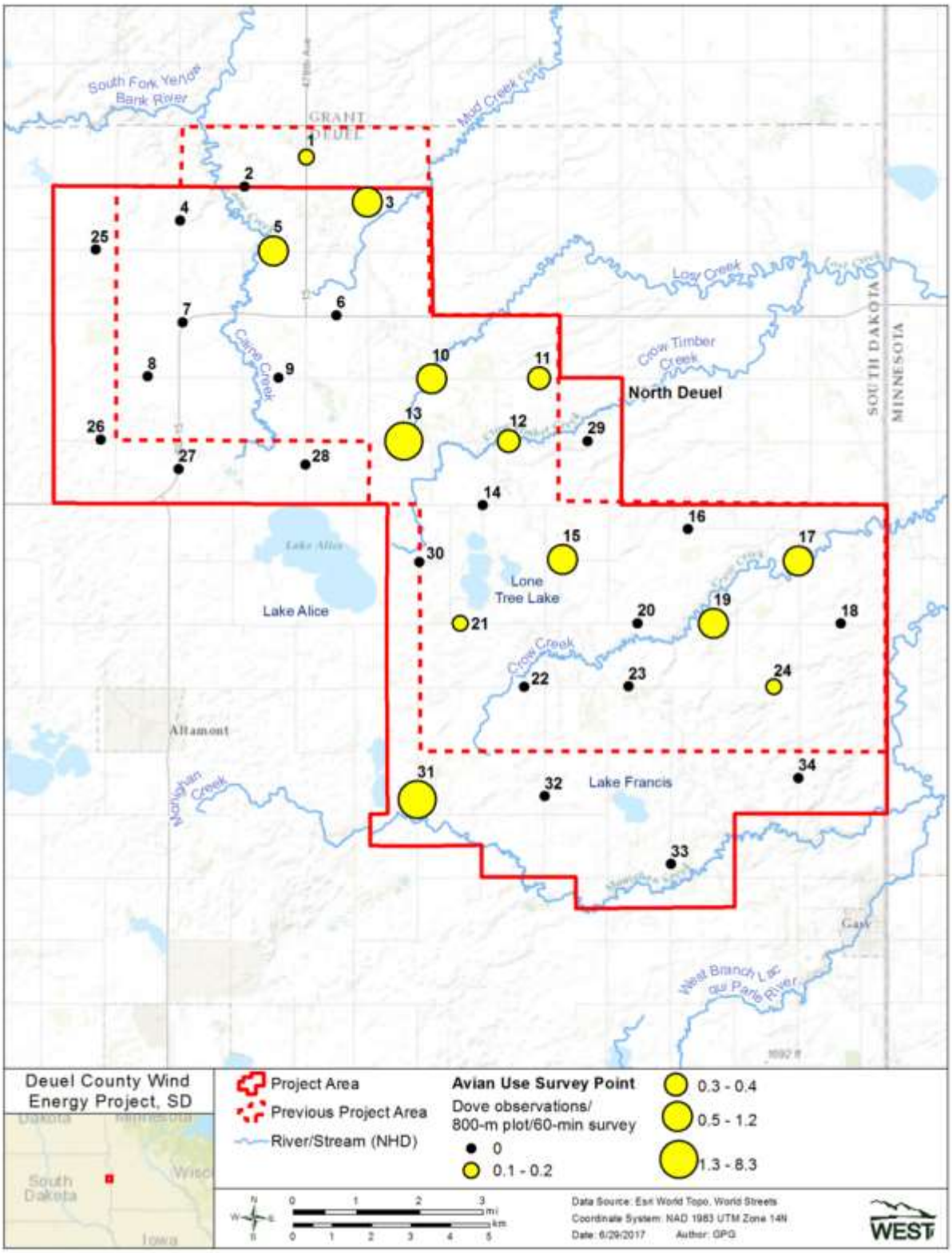
Appendix C2. Other raptor use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



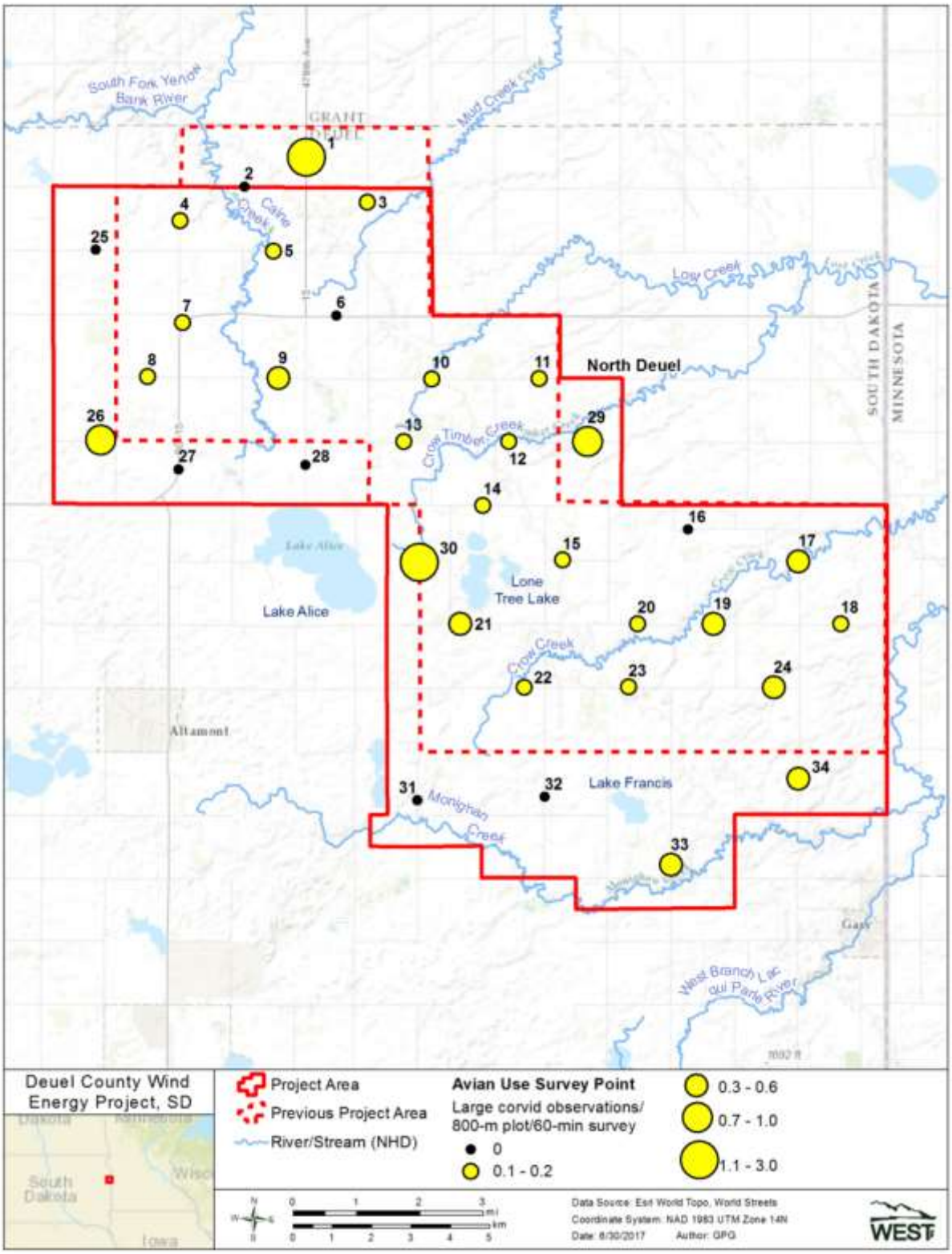
Appendix C2. Vulture use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



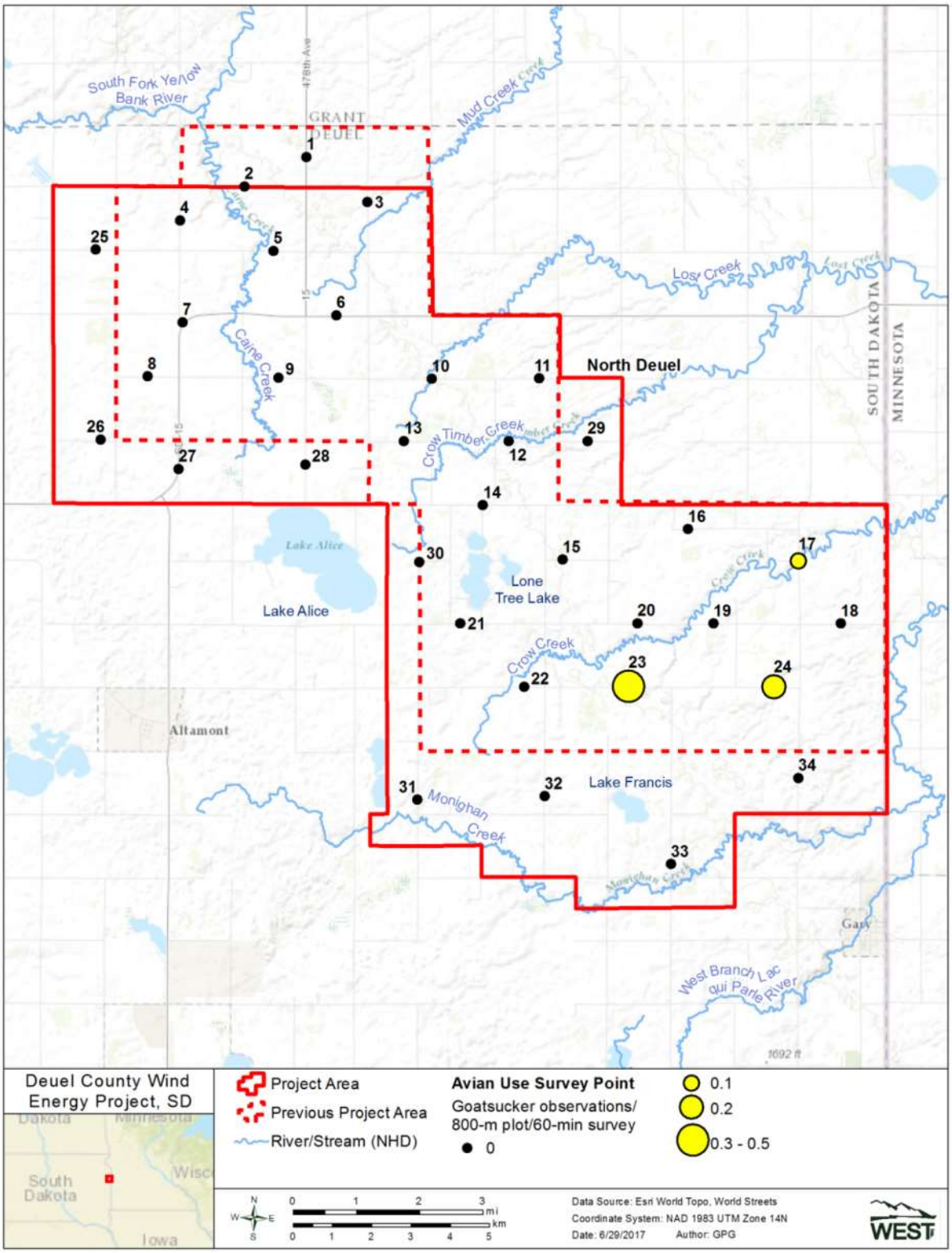
Appendix C2. Upland gamebird use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



Appendix C2. Doves/Pigeons use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



Appendix C2. Large corvids use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.



Appendix C2. Goatsucker use by observation point during large bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project, Deuel County, South Dakota, from April 3, 2016 – March 24, 2017.

Appendix D. Small Bird Use, Percent of Use, and Frequency of Occurrence during Small Bird Use Surveys at the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

Appendix D1. Mean small bird use, percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season, observed during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

	Mean Use[1]				Percent of Total Use (%)			Frequency of Occurrence (%)		
Type/Species	**Spring**	**Summer**	**Fall**	**Overall**	**Spring**	**Summer**	**Fall**	**Spring**	**Summer**	**Fall**
Passerines	**8.8**	**6.9**	**7.8**	**7.8**	**93.1**	**99.8**	**91.3**	**80.1**	**96.9**	**71.9**
American goldfinch	0.0	0.5	0.3	0.3	0.1	7.3	4.1	1.4	29.2	13.6
American robin	0.3	0.1	0.0	0.1	2.8	1.5	0.2	18.1	9.4	1.4
Bank swallow	0.0	0.0	0.0	<0.1	0.1	0.0	0.0	1.4	0.0	0.0
Barn swallow	0.1	0.2	0.1	0.1	0.7	2.9	0.6	5.6	12.5	3.3
Blue jay	0.0	0.0	0.2	0.1	0.0	0.6	1.9	0.0	2.1	7.8
Bobolink	0.1	0.2	0.0	0.1	0.6	3.2	0.0	2.8	7.3	0.0
Brown-headed cowbird	0.5	1.1	0.8	0.8	5.4	15.9	9.5	23.6	24.0	6.1
Brown thrasher	0.0	0.0	0.0	<0.1	0.1	0.5	0.0	1.4	3.1	0.0
Cedar waxwing	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.7
Chipping sparrow	0.0	0.0	0.0	<0.1	0.1	0.3	0.0	1.4	2.1	0.0
Clay-colored sparrow	0.0	0.2	0.0	0.1	0.1	3.0	0.0	1.4	17.7	0.0
Cliff swallow	0.0	0.8	0.0	0.3	0.0	11.7	0.0	0.0	18.8	0.0
Common grackle	0.7	0.2	0.4	0.4	7.3	3.5	4.9	19.4	15.6	1.4
Common yellowthroat	0.0	0.1	0.0	<0.1	0.0	1.4	0.0	0.0	9.4	0.0
Dark-eyed junco	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.4
Dickcissel	0.0	0.3	0.0	0.1	0.0	4.7	0.0	0.0	17.7	0.0
Eastern bluebird	0.0	0.0	0.0	<0.1	0.1	0.0	0.2	1.0	0.0	1.4
Eastern kingbird	0.0	0.2	0.0	0.1	0.3	3.2	0.0	1.4	14.6	0.0
Eastern meadowlark	0.0	0.0	0.0	<0.1	0.0	0.2	0.0	0.0	1.0	0.0
European starling	0.0	0.0	0.3	0.1	0.4	0.3	3.3	1.4	1.0	6.1
Field sparrow	0.0	0.0	0.0	<0.1	0.0	0.3	0.0	0.0	1.0	0.0
Grasshopper sparrow	0.0	0.2	0.0	0.1	0.0	2.7	0.0	0.0	12.5	0.0
Gray catbird	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.7
Horned lark	3.0	0.2	1.2	1.4	31.8	2.3	13.9	21.6	11.5	6.9
House sparrow	0.1	0.3	0.0	0.1	0.9	3.9	0.5	2.4	4.2	1.4
House wren	0.0	0.0	0.0	<0.1	0.0	0.2	0.0	0.0	1.0	0.0
Lapland longspur	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.4
Orchard oriole	0.0	0.0	0.0	<0.1	0.0	0.2	0.0	0.0	1.0	0.0
Red-winged blackbird	1.2	0.4	0.0	0.6	13.1	6.4	0.0	29.0	19.8	0.0
Rusty blackbird	0.0	0.0	0.2	0.1	0.0	0.0	2.5	0.0	0.0	1.4
Savannah sparrow	0.1	0.1	0.0	0.1	0.9	1.7	0.0	8.3	9.4	0.0
Sedge wren	0.0	0.0	0.0	<0.1	0.0	0.5	0.0	0.0	3.1	0.0
Snow bunting	0.0	0.0	0.9	0.3	0.0	0.0	10.6	0.0	0.0	6.9
Song sparrow	0.2	0.1	0.0	0.1	1.8	1.8	0.0	12.5	12.5	0.0

Appendix D1. Mean small bird use, percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season, observed during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

	Mean Use[1]				Percent of Total Use (%)			Frequency of Occurrence (%)		
Type/Species	**Spring**	**Summer**	**Fall**	**Overall**	**Spring**	**Summer**	**Fall**	**Spring**	**Summer**	**Fall**
Tree swallow	0.2	0.0	0.0	0.1	1.6	0.6	0.0	6.9	4.2	0.0
Unidentified blackbird	1.1	0.2	1.8	0.9	11.1	2.3	21.3	3.8	4.2	15.6
Unidentified passerine	0.2	0.1	0.0	0.1	1.9	1.2	0.0	2.8	5.2	0.0
Unidentified sparrow	0.1	0.2	1.0	0.4	1.1	2.4	11.8	9.3	13.5	39.7
Unidentified swallow	0.0	0.0	0.0	<0.1	0.0	0.2	0.0	0.0	1.0	0.0
Vesper sparrow	0.2	0.2	0.0	0.1	2.2	2.7	0.0	16.7	16.7	0.0
Warbling vireo	0.0	0.0	0.0	<0.1	0.0	0.5	0.0	0.0	3.1	0.0
Western kingbird	0.0	0.0	0.0	<0.1	0.1	0.5	0.0	1.4	3.1	0.0
Western meadowlark	0.8	0.5	0.4	0.5	8.3	7.0	4.5	40.2	24.0	17.8
White-breasted nuthatch	0.0	0.0	0.1	<0.1	0.0	0.5	0.7	0.0	1.0	3.1
White-throated sparrow	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.7
Willow flycatcher	0.0	0.0	0.0	<0.1	0.0	0.3	0.0	0.0	2.1	0.0
Yellow-headed blackbird	0.0	0.1	0.0	<0.1	0.0	1.1	0.0	0.0	2.1	0.0
Yellow warbler	0.0	0.1	0.0	<0.1	0.0	0.8	0.0	0.0	4.2	0.0
Woodpeckers	**0.0**	**0.0**	**0.1**	**<0.1**	**0.0**	**0.0**	**1.1**	**0.0**	**0.0**	**8.1**
Downy woodpecker	0.0	0.0	0.0	<0.1	0.0	0.0	0.2	0.0	0.0	1.4
Northern flicker	0.0	0.0	0.1	<0.1	0.0	0.0	1.0	0.0	0.0	6.7
Unidentified Small Birds	**0.7**	**0.0**	**0.6**	**0.4**	**6.9**	**0.2**	**7.6**	**9.6**	**1.0**	**14.2**
Unidentified bird (small)	0.7	0.0	0.6	0.4	6.9	0.2	7.6	9.6	1.0	14.2
Overall[2]	**9.5**	**6.9**	**8.5**	**8.2**	**93.1**	**99.8**	**91.3**			

[1] Mean number of observations/100-meter (328-foot) plot/survey

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

Appendix E. Small Bird Use by Point for each Small Bird Type Observed During Small Bird Use Surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

Appendix E1. Small bird use (mean number of observations/100-m [328-foot] plot/8-min survey) by point for each small bird type observed during small bird use surveys in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3 – December 2, 2016, and March 7 – March 22, 2017.

Survey Point	Group			
	Passerines	Woodpeckers	Unidentified Small Bird	Overall
1	7.9	0.0	0.5	8.4
2	13.8	0.0	2.0	15.8
3	5.0	0.0	0.4	5.4
4	5.1	0.0	2.7	7.8
5	10.9	0.0	1.0	11.9
6	7.4	0.0	0.1	7.6
7	8.6	0.0	0.1	8.7
8	8.1	0.0	0.0	8.1
9	3.6	0.0	0.2	3.8
10	7.3	0.1	0.0	7.4
11	5.2	0.0	0.0	5.2
12	4.9	0.2	0.1	5.2
13	4.8	0.0	0.0	4.8
14	5.1	0.0	0.0	5.1
15	6.4	0.0	2.0	8.4
16	3.8	0.0	0.1	3.9
17	11.0	0.1	0.0	11.1
18	4.3	0.1	0.1	4.5
19	17.5	0.0	0.0	17.5
20	4.9	0.0	0.0	4.9
21	13.9	0.0	0.1	14.0
22	2.4	0.0	0.3	2.7
23	7.1	0.0	0.1	7.2
24	5.9	0.1	0.0	6.0
25	1.0	0.0	0.0	1.0
26	0.0	0.0	0.0	0.0
27	2.0	0.0	1.0	3.0
28	0.0	0.0	0.0	0.0
29	105.0	0.0	0.0	105.0
30	0.0	0.0	1.0	1.0
31	1.0	0.0	0.0	1.0
32	2.0	0.0	0.0	2.0
33	1.0	0.0	0.0	1.0
34	102.0	0.0	0.0	102.0

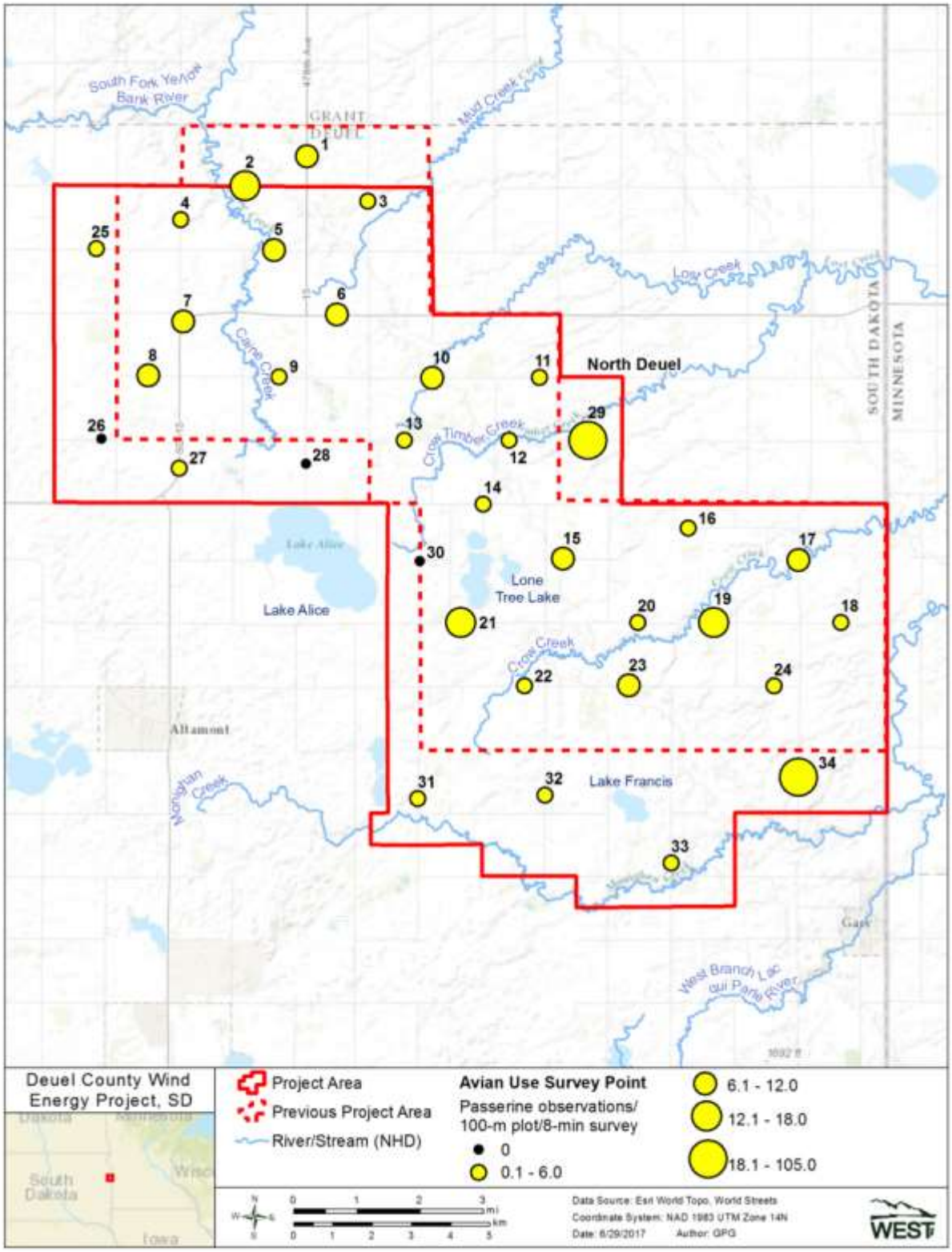


Figure E2. Passerine use by observation point during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

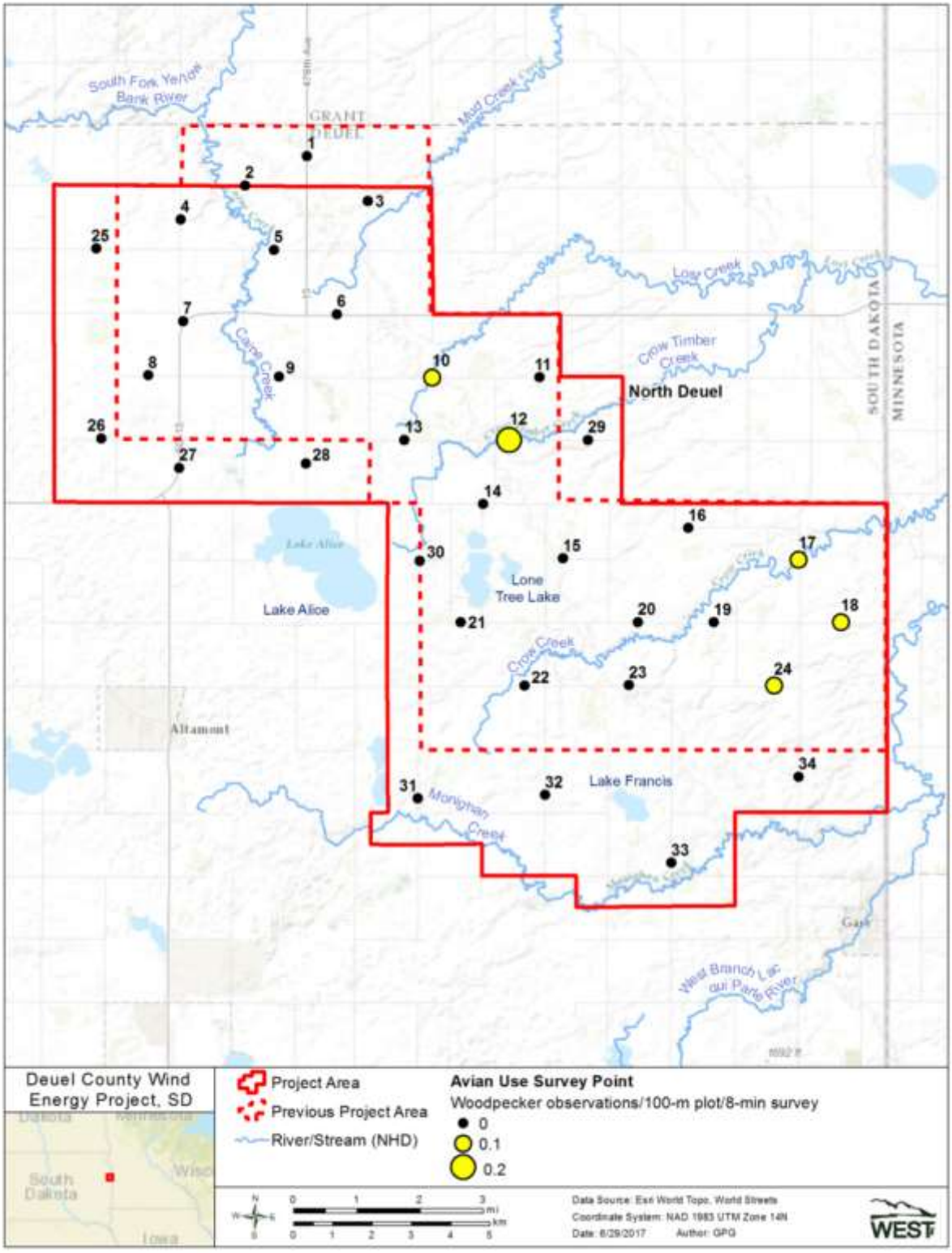


Figure D2. Woodpecker use by observation point during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.

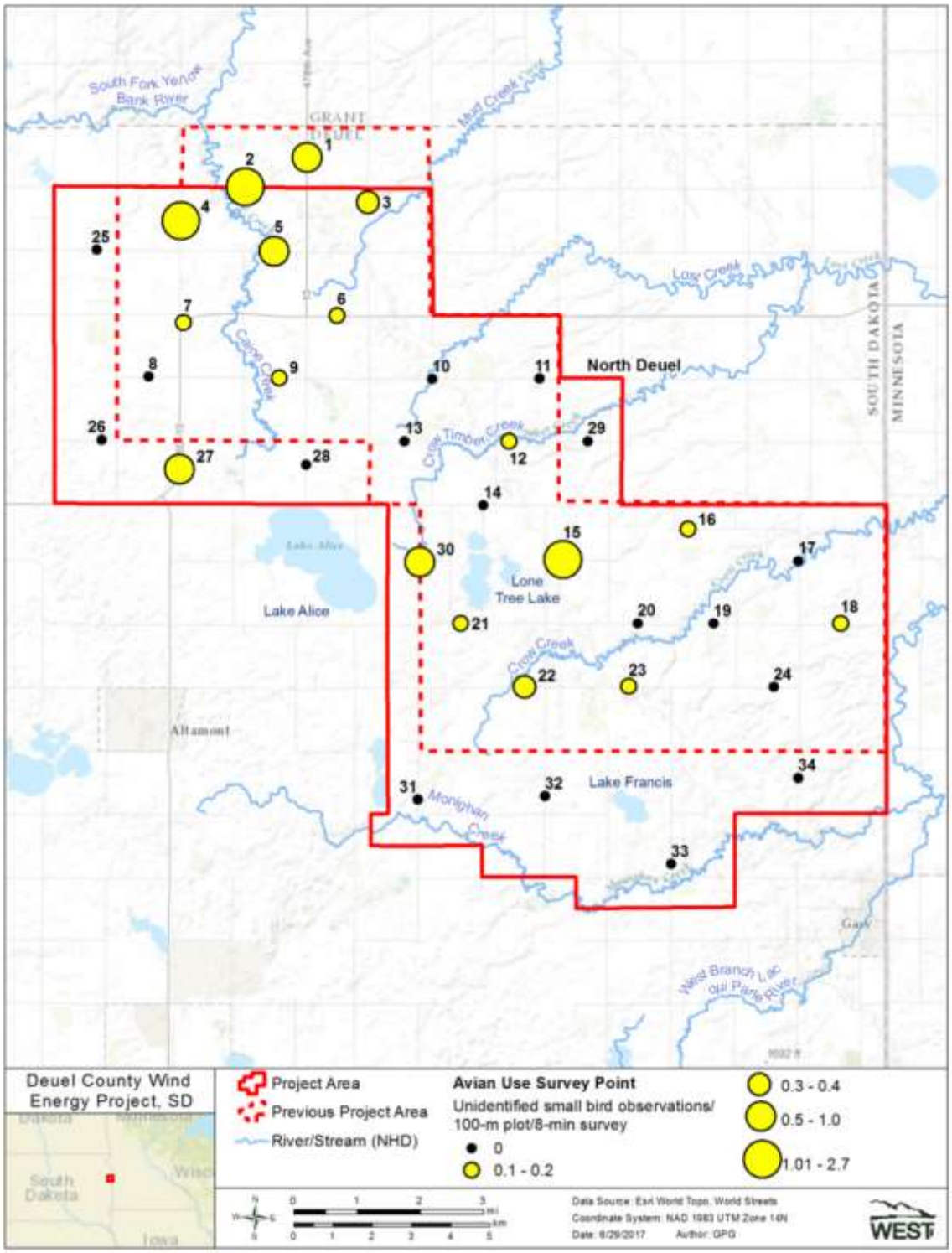


Figure E2. Unidentified small bird use by observation point during small bird use surveys conducted in the North Deuel Area of the Deuel County Wind Energy Project in Deuel County, South Dakota, from April 3, 2016 – December 2, 2016 and March 7 – March 22, 2017.