

**2021 Avian Use Survey Report**  
**Rose Creek Wind Project**  
**Mower County, Minnesota**

---

**January – December 2021**



**Prepared for:**

**Rose Creek Wind, LLC**  
**Consolidated Edison Development, Inc.**  
100 Summit Lake Drive, Suite 210  
Valhalla, New York 10595

---

**Prepared by:**

**Maggie Voth and Aaron Suehring**  
Western EcoSystems Technology, Inc.  
7575 Golden Valley Road, Suite 300  
Golden Valley, Minnesota

**June 23, 2022**



## EXECUTIVE SUMMARY

Consolidated Edison Development, Inc., a renewable energy development and operations company doing business as Rose Creek Wind, LLC., is planning to decommission and replace turbines as a part of the repowering effort at the proposed Rose Creek Wind Project (Project) in Mower County, Minnesota. On behalf of Rose Creek Wind, LLC., Western EcoSystems Technology, Inc. conducted avian use surveys to characterize spatial and temporal use of the Project by diurnal birds, with special attention given to eagles and federally listed species (protected by the Bald and Golden Eagle Protection Act of 1940 and Endangered Species Act of 1973, respectively), as well as birds designated as state-listed or Species of Greatest Conservation Need in Minnesota and U.S. Fish and Wildlife Service (USFWS)-designated Birds of Conservation Concern.

The fixed-point avian use survey methods were based upon recommendations in Tier 3 of the USFWS 2012 *Land-based Wind Energy Guidelines*, Appendix C of the 2013 USFWS *Eagle Conservation Plan Guidance*, the 2016 USFWS *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests*, and the Minnesota Department of Natural Resources and Minnesota Department of Commerce's *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota*.

The avian use surveys were conducted monthly from January to December, 2021 at nine survey points. At each point, a WEST biologist conducted a 70-minute survey, subdivided into two segments. During the initial 10-minute segment, all small birds observed within 100 meters (328 feet) of the survey point were recorded; during the remaining 60-minute segment, all eagles and other large birds within 800 meters (2,625 feet) of the survey point were recorded. Eagle observations were also recorded beyond the 800-meter survey area, when visible. A total of 126 avian use surveys hours were conducting during 2021, including 14 survey hours at each fixed-point survey location.

No federally or state-listed threatened or endangered species were observed during avian use surveys. Six species designated as Minnesota Species in Greatest Conservation Need were documented, including upland sandpiper (one observation; also federally designated as a Bird of Conservation Concern), northern harrier (two observations), American kestrel (five observations), American white pelican (two observations containing 23 and eight individuals; also a state-listed Species of Special Concern), sedge wren (two observations), and dickcissel (22 observations). A total of 28 bald eagle observations totaling 18 eagle exposure minutes were documented during surveys, and two additional observations were documented incidentally. No golden eagles were observed during surveys.

## **STUDY PARTICIPANTS**

Maggie Voth	Project Manager
Lindsey Dernovsek	Field Coordinator
Aaron Suehring	Report Writer
Cecily Foo	Report Reviewer
Joyce Pickle	Senior Reviewer
Guy DiDonato	Lead Client Analyst
Jared Swenson	Analyst
Elyse Coffey-Wick	GIS Technician
Carissa Goodman	Technical Editor
Tom Tustison	Field Biologist

## **REPORT REFERENCE**

Voth, M., and A. Suehring. 2021 Avian Use Survey Report, Rose Creek Wind Project, Mower County, Minnesota. January – December 2021. Prepared for Rose Creek Wind, LLC, Valhalla, New York. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. June 2022.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
INTRODUCTION .....	1
SURVEY AREA .....	1
METHODS .....	5
Study Design .....	5
Survey Methods .....	7
All Birds .....	7
Eagles .....	8
Incidental Observations .....	8
Statistical Analysis .....	8
Mean Use, Percent of Use, and Frequency of Occurrence .....	8
Flight Height .....	9
Spatial Variation .....	9
Eagles .....	9
Data Management .....	10
Quality Assurance and Quality Control .....	10
Data Compilation and Storage .....	10
RESULTS .....	10
Special Status Species .....	10
Eagles .....	11
Mean Use, Percent of Use, Frequency of Occurrence .....	12
Eagle Minutes .....	12
Eagle Mean Flight Height .....	13
Spatial Variation .....	13
Large Birds .....	13
Mean Use, Percent of Use, and Frequency of Occurrence .....	13
Large Bird Mean Flight Height .....	16
Spatial Variation .....	16
Small Birds .....	20
Mean Use, Percent of Use, and Frequency of Occurrence .....	20
Spatial Variation .....	22
DISCUSSION .....	24
Special Status Species .....	24
Eagles .....	24

Large Birds .....	24
Small Birds.....	25
REFERENCES .....	26

## **LIST OF TABLES**

Table 1. Land cover types present within the Rose Creek Wind Project.....	2
Table 2. Summary of avian use survey effort for the Rose Creek Wind Project from January to December, 2021.....	10
Table 3. Summary of group and individual sensitive species observations recorded during avian use surveys and incidentally for the Rose Creek Wind Project from January to December, 2021.....	11
Table 4. Bald eagle activity minutes and observations by season recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.....	12
Table 5. Bald eagle activity minutes and observations by survey location recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.....	12
Table 6. Flight height characteristics by bird type and diurnal raptor subtype observed during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.....	16

## **LIST OF FIGURES**

Figure 1. Location of the Rose Creek Wind Project.....	3
Figure 2. Land cover within and adjacent to the Rose Creek Wind Project.....	4
Figure 3. Avian use survey points at the Rose Creek Wind Project.....	6
Figure 4a. Large bird mean use (observations/800-meter radius plot/60 minute survey) by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	14
Figure 4b. Large bird percent of use by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.....	15
Figure 4c. Large bird frequency of occurrence by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	15
Figure 5. Large bird mean use (observations/60-minute survey) by point recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	17
Figure 6a. Diurnal raptor flight paths documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	18
Figure 6b. Non-raptor sensitive species flight paths documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.....	19

Figure 7a. Small bird mean use (observations/100-meter plot/10-minute survey) by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	21
Figure 7b. Small bird percent of use by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	21
Figure 7c. Small bird frequency of occurrence by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	22
Figure 8. Small bird mean use (observations/10-minute survey) by survey point recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021. ....	23

## **LIST OF APPENDICES**

Appendix A. All Bird Types and Species Observed during Avian Use Surveys for the Rose Creek Wind Project from January to December, 2021
Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds and Small Birds Observed during Avian Use Surveys for the Rose Creek Wind Project from January to December, 2021
Appendix C. Mean Use by Point for All Birds, Bird Types, and Diurnal Raptor Subtypes Observed during Avian Use Surveys for the Rose Creek Wind Project from January to December, 2021
Appendix D. Mean Use by Point for Sensitive Species Recorded during Avian Use Surveys for the Rose Creek Wind Project from January to December, 2021

## INTRODUCTION

Consolidated Edison Development, Inc. (“**CED**”), a renewable energy development and operations company doing business as Rose Creek Wind, LLC. (“**Rose Creek**”), is planning to decommission and replace turbines as a part of the repowering effort at the proposed Rose Creek Wind Project (“**Project**”) in Mower County, Minnesota (Figure 1). On behalf of Rose Creek, Western EcoSystems Technology, Inc. (WEST) conducted avian use surveys to characterize spatial and temporal use of the Project by diurnal birds, with special attention given to eagles and federally listed species (protected by the Bald and Golden Eagle Protection Act of 1940 [BGEPA] and the Endangered Species Act of 1973 [ESA], respectively), as well as birds designated as state-listed or Species of Greatest Conservation Need (SGCN) in Minnesota and U.S. Fish and Wildlife Service (USFWS)-designated Birds of Conservation Concern (BCC; collectively, special status species).

The fixed-point avian use survey methods were based upon recommendations in Tier 3 of the USFWS 2012 *Land-based Wind Energy Guidelines* (WEG), Appendix C of the 2013 USFWS *Eagle Conservation Plan Guidance* (ECPG), the 2016 USFWS *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests* (2016 Final Eagle Rule; 81 Federal Register 91494 [December 16, 2016]), and the Minnesota Department of Natural Resources (MNDNR) and Minnesota Department of Commerce (MNDOC) *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota* (Mixon et al. 2014).

The current Project area contains 11 currently operational turbines that will be decommissioned prior to constructing the Project (Figure 1). Since the existing turbines at the Project were operational during this avian use study, data collected is not directly analogous to pre-construction surveys designed to assess baseline wildlife activity prior to wind energy development. However, the baseline surveys still provide site-specific avian data that can be used to inform Project siting and other minimization and adaptive management measures during Project design, construction, and/or operation. This report summarizes the results of avian use surveys conducted from January to December, 2021.

## SURVEY AREA

The current Project boundary (“**current Project area**”) encompasses approximately 5,258 acres (2,128 hectares) and is located approximately 0.5 mile (0.8 kilometer) south of the City of Adams, Minnesota (Figure 1). The current Project area has been refined over time as part of the siting and design process, and all Project facilities (e.g., turbines and turbine pads, access roads, and underground electrical collection and communication systems) have been sited within this area. However, when avian use surveys were initiated, the Project boundary was larger, covering 12,745 acres (5,158 hectare); this larger Project area (“**original Project area**”) was utilized when designing avian use baseline surveys at the Project (Figure 1). The current Project area lies entirely within the larger original Project area.

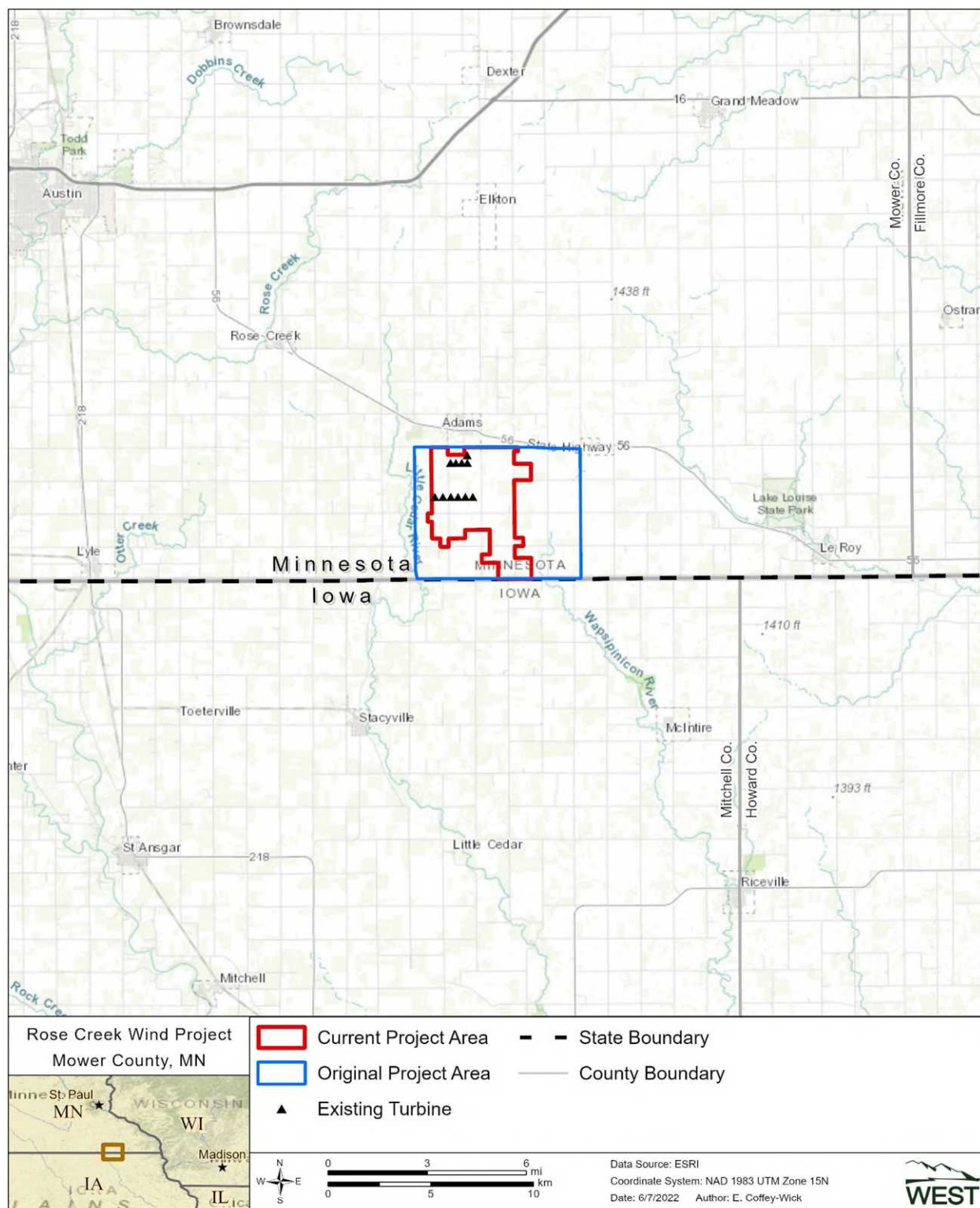
The Project lies within the Western Corn Belt Plains Level III Ecoregion and the Eastern Iowa and Minnesota Drift Plains Level IV Ecoregion (U.S. Environmental Protection Agency 2013), which are characterized by undulating to relatively flat topography. Historically, tallgrass prairies and oak (*Quercus* spp.) savannas were the primary land covers in the region, although the majority of the area has since been converted to row-crop agriculture (White 2020). The Project is also located in the Mississippi Flyway migration corridor (National Audubon Society 2021) and within the Eastern Tallgrass Prairie Bird Conservation Region (Birds Studies Canada and North American Bird Conservation Initiative 2014), which historically contained an abundance of grassland and woodland habitats suitable for migratory birds.

According to the National Land Cover Database (2016) the majority of land cover within both the current and original Project areas is cultivated crops (95.8% and 93.9%, respectively); land cover acreages and percentages within both the current and original Project areas are shown in Table 1. The original Project area also contains developed open space (2.7%) and hay/pasture (1.2%); all other land cover types each compose less than 1% of the original Project area (Table 1, Figure 2).

**Table 1. Land cover types present within the Rose Creek Wind Project.**

<b>Cover Type</b>	<b>Original Project Area</b>		<b>Current Project Area</b>	
	<b>Acres</b>	<b>Percent (%)</b>	<b>Acres</b>	<b>Percent (%)</b>
Cultivated Crops	11,970	93.9	5,038	95.8
Developed, Open Space	340	2.7	125	2.4
Developed, Low Intensity	106	0.8	45	0.9
Hay/Pasture	147	1.2	14	0.3
Herbaceous	80	0.6	13	0.3
Emergent Herbaceous Wetlands	40	0.3	10	0.2
Developed, Medium Intensity	25	0.2	10	0.2
Deciduous Forest	18	0.1	1	<0.1
Mixed Forest	5	<0.1	1	<0.1
Developed, High Intensity	4	<0.1	1	<0.1
Barren Land	10	0.1	<1	<0.1
<b>Total</b>	<b>12,745</b>	<b>100</b>	<b>5,258</b>	<b>100</b>

Source: National Land Cover Database 2016  
Values rounded and may not match the totals.



**Figure 1. Location of the Rose Creek Wind Project.**

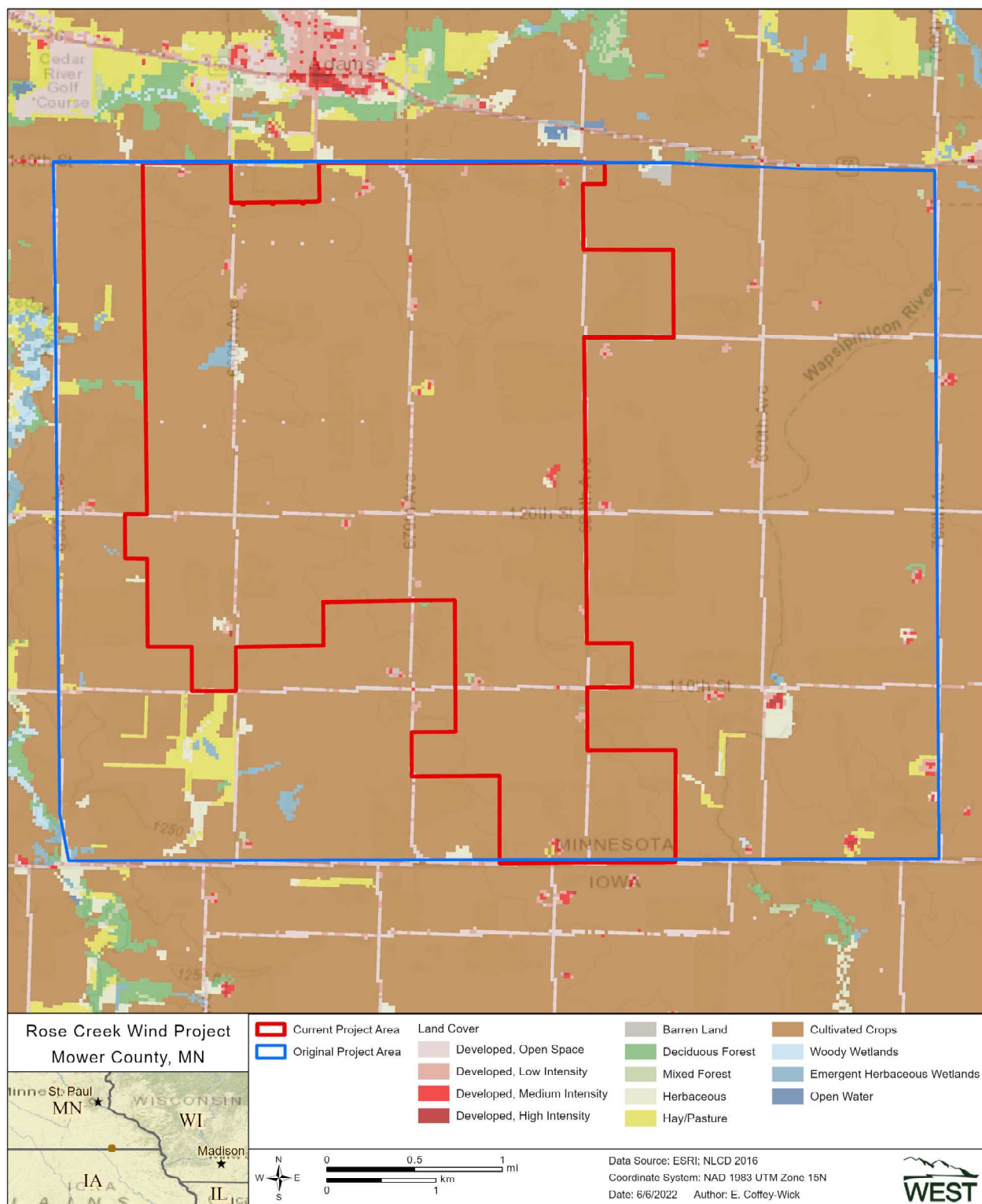


Figure 2. Land cover within and adjacent to the Rose Creek Wind Project.

## **METHODS**

WEST conducted one year of avian use surveys for the Project from January to December 2021. Separate surveys for large<sup>1</sup> and small<sup>2</sup> birds (collectively, bird types) followed a fixed-point count methodology (i.e., bird use counts conducted within variable-radius plots around fixed observation points) similar to Reynolds et al. (1980), and guidance from the WEG, ECPG, and 2016 Final Eagle Rule, as well as Mixon et al. (2014), as described below. This approach was discussed with the MNDNR and MNDOC and was approved on February 25, 2021, and March 4, 2021, respectively.

This study was designed to record all diurnal birds, with a particular focus on special status species, including eagles, federally listed species, birds designated as state-listed or SGCN in Minnesota, and species federally designated as BCC in the Eastern Tallgrass Prairie Bird Conservation Region (USFWS 2021).

### **Study Design**

To assess eagle use, the ECPG recommends that pre-construction eagle use surveys cover at least 30% of the area defined by the minimum convex polygon (MCP) of the Project layout. However, because the turbine layout was still in development when avian use surveys were initiated in January 2021, survey points were generated to achieve at least 30% coverage of the original Project area. As shown in Figure 3, nine survey points were established throughout the original Project area. The point locations were randomly sited along publicly accessible roads within the Project area; alternate points were selected where necessary to avoid survey area overlap and ensure spatially balanced coverage of the original Project area. The nine survey points provided 35% coverage of the original Project area (41% of the current Project area). Based on the current proposed turbine layout, the 2021 survey points also provided approximately 36% coverage of the proposed MCP.

---

<sup>1</sup> “Large” birds include waterbirds, waterfowl, shorebirds, gulls/terns, diurnal raptors (e.g., kites, accipiters, buteos, eagles, falcons, northern harrier, and osprey), owls, vultures, upland game birds, doves/pigeons, nightjars, and large corvids (e.g., crows, ravens).

<sup>2</sup> “Small” birds include cuckoos, swifts/hummingbirds, woodpeckers, kingfishers, small corvids (e.g., jays), and passerines.

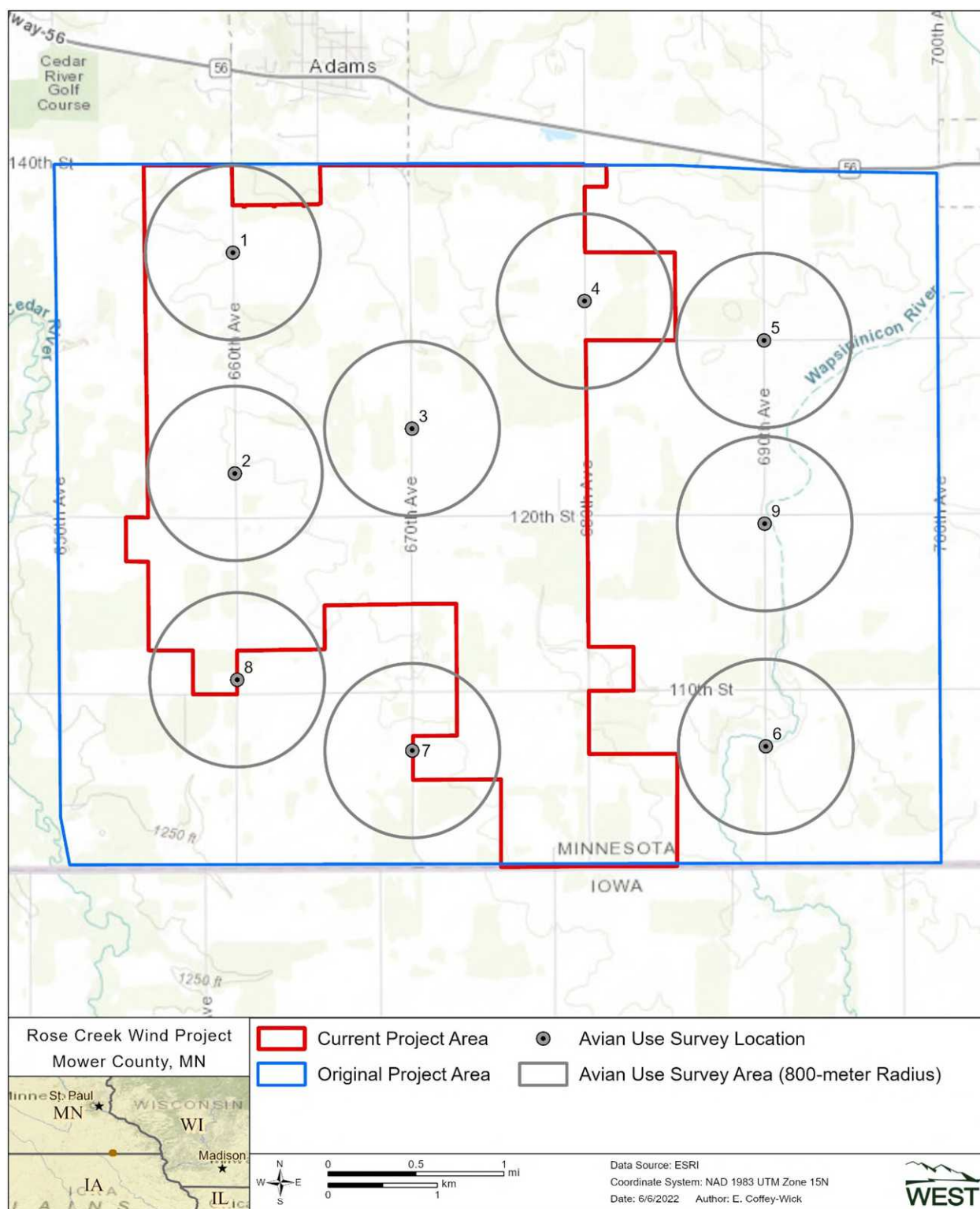


Figure 3. Avian use survey points at the Rose Creek Wind Project.

## **Survey Methods**

### *All Birds*

WEST conducted 70-minute surveys at each of the nine survey points for 12 consecutive months in 2021. Each survey was subdivided into two segments. During the initial 10-minute segment, all small birds observed within a 100-meter (m; 328-foot [ft]) radius of the survey point were recorded; during the subsequent 60-minute segment, all eagles and other large birds observed within an 800-m (2,625 ft) radius were recorded. Observations outside of survey plots were also recorded and included in the overall reported observations (Appendix A) to illustrate species composition, but were not included in statistical analyses. Surveys were conducted during daylight hours with start locations randomized to cover approximately all daylight hours over the course of the study.

During each survey, qualified avian biologists recorded the following information at each survey point:

- Date
- Time (start and end)
- Survey point number
- Observer
- Weather:
  - Temperature
  - Wind speed and direction
  - Percent cloud cover
  - Maximum visibility
  - Precipitation

Biologists recorded additional information, including bird behavior and habitat use, for each bird or flock (i.e., group of two or more birds) observed. Bird distances from the observer were estimated to the nearest 5 m (16 ft). Data recorded for each observation included:

- Species (or best possible identification)
- Number of individuals
- Sex and age class (if possible)
- Distance from the observer (when first observed)
- Closest distance to observer
- Flight height above ground level (AGL), if flying (first, lowest, and highest heights observed)
- Flight direction, if flying (when first observed)
- Habitat
- Activity (e.g., flying, perched)

- Observation type (visual or aural)

For all special status species (i.e., eagles, federally and state-listed species, Minnesota SGCN, and BCC) observed during their respective point count surveys, the flight path within the survey plot was hand drawn (as accurately as possible) by the observer on a map and subsequently digitized for analysis of movement patterns.

### *Eagles*

Additional minute-by-minute data were collected for eagle observations based on recommendations in the ECPG and the 2016 Final Eagle Rule. For each eagle observed during the survey period, biologists recorded behavior (i.e., distance from observer, flight height, activity) at the top of each minute (eagle minute) while the eagle was within view (i.e., extending beyond the 800-m large bird survey radius) to provide a continuous observation log for every eagle observed. During each eagle minute, the biologist also noted whether the eagle was flying within the turbine risk area, defined as the area at or below 200 m AGL and within 800 m of the survey point, at any time during the minute (exposure minute). Additionally, age class (juvenile, sub-adult, or adult) was recorded for each eagle observed.

### *Incidental Observations*

Incidental observations are observations recorded within the original Project area, but outside of scheduled avian use surveys. Incidental observations focused on special status species or unusually large congregations of individuals. Attributes recorded for incidentally observed species were similar to those recorded during scheduled surveys.

## **Statistical Analysis**

Each bird within a *group* (i.e., a single bird or a flock) was considered an *observation* (e.g., a flock of 10 birds was considered 10 observations in one group). In some cases, a count of observations may represent repeated sightings of the same individual.

A *survey* was defined as a single 10-minute or 60-minute count of birds at a single point. A *visit* was defined as a single survey of all survey points. A visit could occur across multiple dates, but visits could not overlap and had to be completed within the same month.

### *Mean Use, Percent of Use, and Frequency of Occurrence*

*Mean use* is the average number of bird observations per plot per survey. Mean use was calculated separately for large birds (including eagles) and small birds by:

- 1) summing observations per plot per visit,
- 2) averaging the number of observations across plots within a visit, then
- 3) averaging the number of observations across visits within the season.

Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Seasons, as defined in statistical analyses, included winter (January –

February 2021, and December 2021), spring (March – May 2021), summer (June – August 2021), and fall (September – November 2021).

*Percent of use* was calculated as the percentage of bird use attributable to a particular bird type or species. *Frequency of occurrence* was calculated as the percent of surveys in which a particular bird type or species was observed.

Mean use and frequency of occurrence describe different aspects of relative abundance, in that mean use is based on the number of bird observations (i.e., large groups can produce high estimates), whereas frequency of occurrence is based on the number of groups (i.e., it is not influenced by group size). Qualitative comparisons were made with these metrics among bird types, seasons, and survey points to help illustrate temporal and spatial bird use at the Project. The bird types with the greatest values, as well as diurnal raptors, are graphically depicted to illustrate patterns in mean use, percent of use, and frequency of occurrence.

### *Flight Height*

Avian flight heights were used to assess relative exposure to turbine blades. Flight height information was used to calculate the percentage of bird observations flying within the rotor-swept height (RSH) for turbines likely to be constructed. An RSH of 25–150 m (82–492 ft) AGL was assumed for analyses. Flight height recorded during each initial observation was used to calculate the overall mean flight height and the percentage of bird observations flying within the RSH by bird type.

### *Spatial Variation*

Mean use was calculated by survey point for eagles, large birds (including eagles), and small birds to make spatial comparisons among survey points. Additionally, flight paths were digitized to qualitatively evaluate potential high use areas or flight corridors relative to landscape characteristics (e.g., topographic features) within the original Project area.

### *Eagles*

Eagle observations recorded during surveys were summarized to provide flight heights (see *Flight Height*) and flight path maps (see *Spatial Variation*). Minute-by-minute eagle observation logs were examined to calculate eagle exposure minutes and total eagle minutes by survey point and season. Eagle exposure minutes were defined as the number of minutes an eagle was observed in flight within the turbine risk area (area within 800 m of the survey point and at or below 200 m AGL during the 60-min survey), and total minutes (eagle minutes) were defined as the amount of time eagles were observed inside and outside the turbine risk area. Eagle exposure minutes per observation hour were summarized by survey point and season to enable spatial and temporal assessments of eagle exposure minutes within the original Project area. Data collected on perched eagles and those outside of survey plots were not considered eagle exposure minutes; however, they were included in the total eagle minutes.

## Data Management

### *Quality Assurance and Quality Control*

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the study, including in the field, during data entry and analysis, and report writing. Following surveys, biologists were responsible for inspecting data forms for completeness, accuracy, and legibility. If errors or anomalies were found within the data, follow-up measures were implemented including discussions and review of field data with field biologists and/or Project Managers. If any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data forms, where appropriate changes and measures were implemented. Multiple reviews were conducted as QA/QC measures.

### *Data Compilation and Storage*

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

## RESULTS

Overall, 108 large bird and 108 small bird use surveys, totaling 14 survey hours per survey point or 126 total survey hours, were conducted for the Project from January to December 2021 (Table 2). Twenty-two unique large bird species, including five raptor species, and 17 unique small bird species were observed during surveys (Appendix A).

**Table 2. Summary of avian use survey effort for the Rose Creek Wind Project from January to December, 2021.**

Season	Large Bird Surveys		Small Bird Surveys	
	# Visits	# Surveys	# Visits	# Surveys
Winter	3	27	3	27
Spring	3	27	3	27
Summer	3	27	3	27
Fall	3	27	3	27
<b>Overall</b>	<b>12</b>	<b>108</b>	<b>12</b>	<b>108</b>

Survey results are summarized below and are supplemented by the appendices which present species-level detail including: scientific names, number of groups and observations by season (Appendix A); mean use, percent of use, and frequency of occurrence by season (Appendix B); and mean use by survey point (Appendices C and D).

### **Special Status Species**

No federally or state-listed threatened or endangered species were observed during the avian use surveys in 2021. Twenty-eight bald eagle observations were documented during surveys, with two additional bald eagles observed incidentally (Table 3); eagle use patterns are discussed in greater detail below. Two groups of American white pelicans, a state-listed Species of Special

Concern (SPC) and Minnesota SGCN, were observed during surveys (31 observations). The five remaining special status species included two small bird SGCN species, dickcissel (22 observations) and sedge wren (2 observations), and three large bird SGCN species, American kestrel (five observations), northern harrier (two observations), and upland sandpiper (one observation). Upland sandpiper is also federally designated as a BCC (USFWS 2021).

**Table 3. Summary of group and individual sensitive species observations recorded during avian use surveys and incidentally for the Rose Creek Wind Project from January to December, 2021.**

Common Name	Scientific Name	Status	Surveys		Incidental		Total	
			# grps	# obs	# grps	# obs	# grps	# obs
upland sandpiper	<i>Bartramia longicauda</i>	SGCN; BCC	1	1	0	0	1	1
northern harrier	<i>Circus hudsonius</i>	SGCN	2	2	0	0	2	2
American kestrel	<i>Falco sparverius</i>	SGCN	5	5	0	0	5	5
bald eagle	<i>Haliaeetus leucocephalus</i>	BGEPA	28	28	1	2	29	30
American white pelican	<i>Pelecanus erythrorhynchos</i>	SGCN; SPC	2	31	0	0	2	31
<b>Large Birds Overall</b>	<b>5 species</b>		<b>38</b>	<b>67</b>	<b>1</b>	<b>2</b>	<b>39</b>	<b>69</b>
sedge wren	<i>Cistothorus platensis</i>	SGCN	2	2	0	0	2	2
dickcissel	<i>Spiza americana</i>	SGCN	22	22	0	0	22	22
<b>Small Birds Overall</b>	<b>2 species</b>		<b>24</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>24</b>

BGEPA = Bald and Golden Eagle Protection Act of 1940

SGCN = Species in Greatest Conservation Need, as designated in the Minnesota Wildlife Action Plan (Minnesota Department of Natural Resources 2015)

BCC = Birds of Conservation Concern for Bird Conservation Region 22, Eastern Tallgrass Prairie (U.S. Fish and Wildlife Service 2021)

SPC = Species of Special Concern (Minnesota Department of Natural Resources 2013)

grps = groups; obs = observations

Special status species were not concentrated in any particular locations within the original Project area, and were primarily documented from March to November during spring, summer, and fall; bald eagle was the only special status species with use documented during winter (Appendix B). American white pelican use and upland sandpiper use were only documented during spring; American white pelican use was documented at Point 9 in the eastern portion of the Project, and upland sandpiper use was documented at Point 2 in the western portion of the Project. Dickcissel and American kestrel use were documented throughout the Project. American kestrel use was documented during spring, summer, and fall, whereas dickcissel use was only documented during summer and fall. Northern harrier use was documented during spring and fall at points 6 and 7 in the southern portion of the Project. Sedge wren use was only documented during summer at points 8 and 9.

## Eagles

Bald eagle was the only eagle species observed during Project surveys. Twenty-eight bald eagle observations were recorded (Appendix A1) over 108 survey hours (Table 4), and two bald eagle observations were recorded incidentally (Table 3).

*Mean Use, Percent of Use, Frequency of Occurrence*

Bald eagle use was only documented during winter and fall; mean use was calculated at 0.07 and 0.19 observation/800-m radius plot/60-min survey, respectively (Appendix B1). Bald eagles accounted for 1.0% of all large bird use in winter and 1.9% in fall. Bald eagle use was documented during 7.4% of winter surveys and 11.1% of fall surveys.

*Eagle Minutes*

Bald eagle minutes were documented in all seasons (104 total eagle minutes); however, exposure minutes were only documented during fall (14 exposure minutes) and winter (four exposure minutes; Table 4). Bald eagle exposure minutes per survey hour were higher in fall (0.5185) than in winter (0.1481). Although bald eagle minutes were documented during spring and summer, all bald eagle observations during that time were beyond the 800-m survey plots, so no eagle use was calculated.

Bald eagle minutes were documented at eight survey points, whereas bald eagle exposure minutes were only documented at five survey points (Table 5). Bald eagle exposure minutes per survey hour were highest at Point 1 (0.5833), followed by Point 7 (0.4167).

**Table 4. Bald eagle activity minutes and observations by season recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Season	Eagle Minutes		Eagle Observations		Survey Hours	Eagle Exposure Min/Survey Hour
	Exposure Min <sup>a</sup>	Total <sup>b</sup>	Exposure Obs <sup>a</sup>	Total <sup>b</sup>		
Winter	4	19	2	5	27	0.1481
Spring	0	19	0	4	27	0.0000
Summer	0	2	0	1	27	0.0000
Fall	14	64	5	18	27	0.5185
<b>Total</b>	<b>18</b>	<b>104</b>	<b>7</b>	<b>28</b>	<b>108</b>	<b>0.1667</b>

<sup>a</sup> Flying at or below 200 meters above ground level and within 800 meters of the survey point.

<sup>b</sup> Regardless of activity, flight height, or distance from observer.

Min = minutes, Obs = observations

**Table 5. Bald eagle activity minutes and observations by survey location recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Survey Location	Eagle Minutes		Eagle Observations		Survey Hours	Eagle Exposure Min/Survey Hour
	Exposure Min <sup>a</sup>	Total <sup>b</sup>	Exposure Obs <sup>a</sup>	Total <sup>b</sup>		
1	7	32	3	8	12	0.5833
2	2	9	1	4	12	0.1667
3	0	20	0	6	12	0.0000
4	0	2	0	1	12	0.0000
5	0	0	0	0	12	0.0000
6	2	8	1	2	12	0.1667
7	5	18	1	2	12	0.4167
8	0	8	0	3	12	0.0000
9	2	7	1	2	12	0.1667
<b>Total</b>	<b>18</b>	<b>104</b>	<b>7</b>	<b>28</b>	<b>108</b>	<b>0.1667</b>

<sup>a</sup> Flying at or below 200 meters above ground level and within 800 meters of the survey point.

<sup>b</sup> Regardless of activity, flight height, or distance from observer.

Min = minutes, Obs = observations

### *Eagle Mean Flight Height*

Each of the seven bald eagle observations recorded during surveys within the 800-m radius plots were flying at an average of 71 m AGL when first observed. In each of these observations, the eagles flew within the RSH (25–150 m AGL).

### *Spatial Variation*

Bald eagle use was highest at Point 1 (0.25 observation/60-min survey) in the northwest portion of the Project (Appendices C1 and D1). Bald eagle use was also documented throughout the Project at points 2, 6, 7, and 9 (0.08 observation/60-min survey). No major rivers or lakes expected to concentrate eagle use are located within the original Project area; however, the Little Cedar River flows approximately 0.2 mile (0.3 kilometer) west of the original Project area.

## **Large Birds**

During large bird use surveys for the Project, 918 large bird observations in 364 groups were documented, comprising 22 unique large bird species (Appendix A1). Doves/pigeons (469 observations) and large corvids (208 observations) were the most abundant large bird types observed. Large birds were most abundant in fall and spring (276 and 236 observations, respectively).

### *Mean Use, Percent of Use, and Frequency of Occurrence*

Mean use, percent of use, and frequency of occurrence were calculated by season for each bird type, diurnal raptor subtype, and species (Appendix B1; Figures 4a, 4b, 4c). Large bird mean use was relatively even over the year: 9.74 observations/800-m radius plot/60-min survey in fall, 8.30 in spring, 7.63 in summer, and 7.26 in winter (Appendix B1, Figure 4a). Doves/pigeons composed the majority of use during fall (49.0% of overall use in fall), summer (61.2%), and winter (74.0%), whereas waterbird use accounted for the most use in spring (31.7%; Appendix B1, Figure 4b). However, waterbird use was only documented during 14.8% of spring surveys. Large corvid use was documented during all seasons, and use was greatest during fall (35.7% of overall use in fall), winter (23.5%), spring (17.4%), and summer (14.1%; Figure 4b); large corvid use was the most frequently documented among large bird types during spring and winter (55.6% and 59.3%, respectively; Appendix B1, Figure 4c). Large corvid use and doves/pigeon use were most frequently documented large bird types during fall (55.6% of surveys, each), and dove/pigeon use was most frequently documented large bird type during summer (59.3%). Although diurnal raptor use accounted for relatively low overall use during fall (6.8%; Figure 4b), diurnal raptor use was documented relatively frequently (44.4% of surveys; Figure 4c).

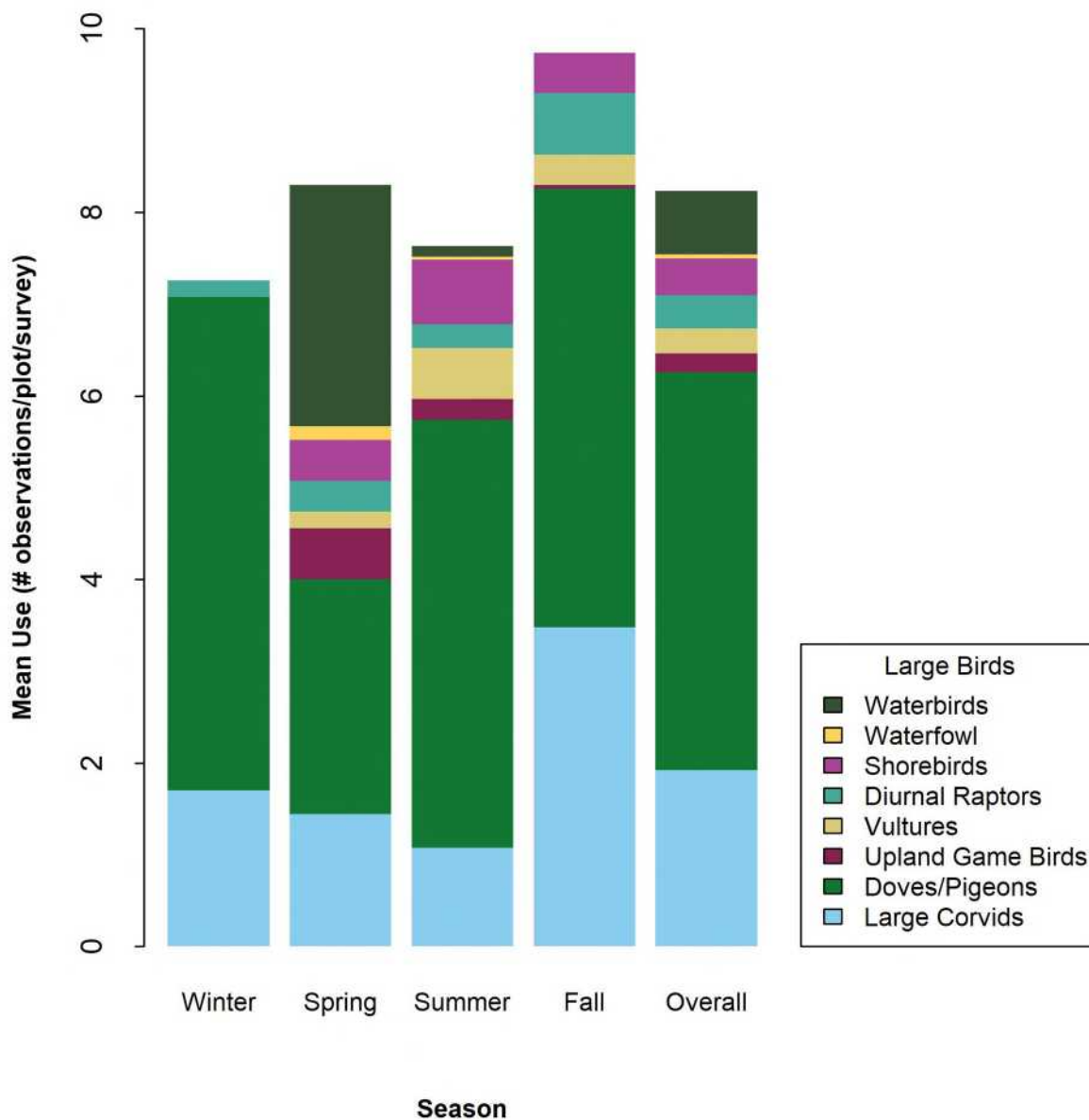


Figure 4a. Large bird mean use (observations/800-meter radius plot/60 minute survey) by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.

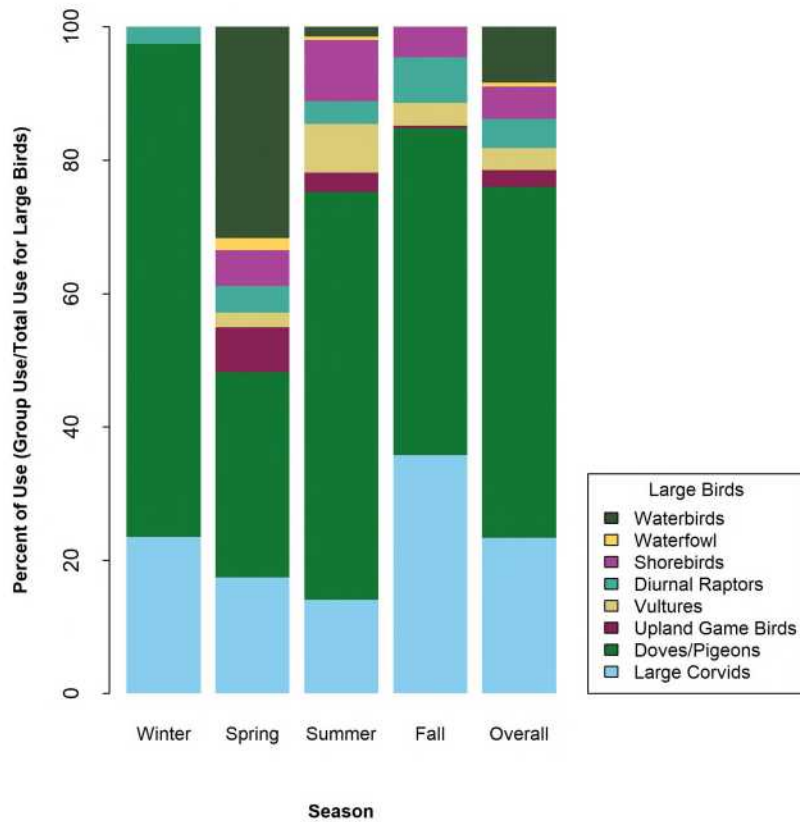


Figure 4b. Large bird percent of use by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.

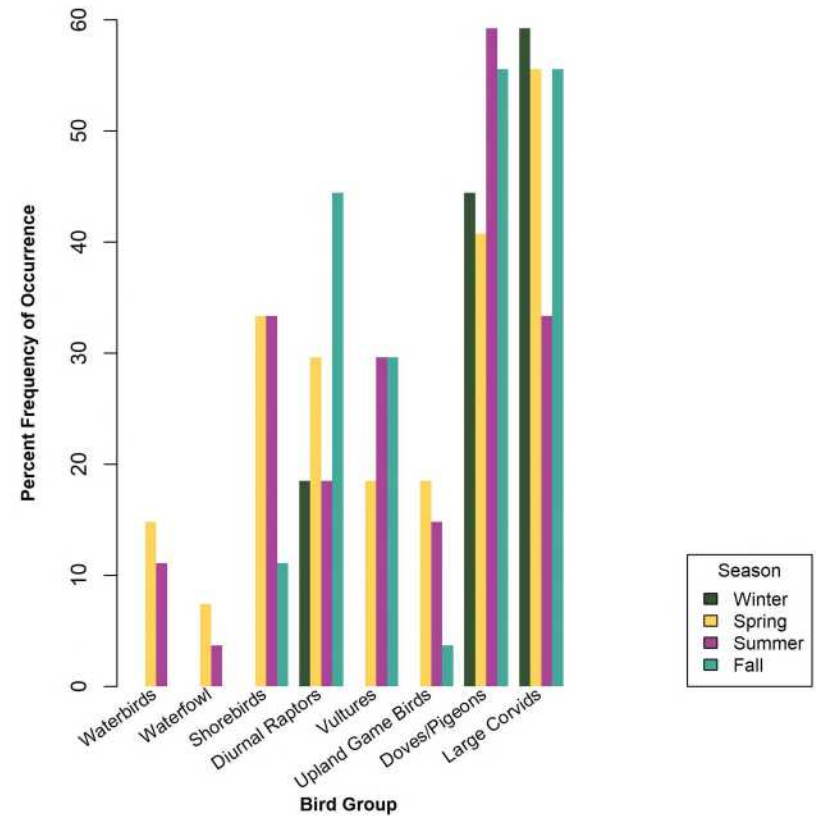


Figure 4c. Large bird frequency of occurrence by season and bird type recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.

### Large Bird Mean Flight Height

Mean large bird flight heights ranged from one m (three ft) for upland game birds to 82 m (269 ft) for waterbirds (Table 6). The majority of vultures (79.3%), diurnal raptors (77.8%), and waterbirds (66.2%) were observed flying within the RSH. The majority of flying upland game birds (100%), large corvids (83.3%), shorebirds (67.7%), waterfowl (60.0%), and doves/pigeons (51.0%) were observed below the RSH. Overall, 44.1% of large bird observations were flying within the RSH.

**Table 6. Flight height characteristics by bird type and diurnal raptor subtype observed during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Bird Type/Subtype	# Groups Flying	# Obs Flying	% Obs Flying	Mean Flight Height (m)	% within <25 m	Flight height Categories 25–150 m <sup>a</sup>	>150 m
<b>Waterbirds</b>	<b>7</b>	<b>74</b>	<b>100</b>	<b>82</b>	<b>2.7</b>	<b>66.2</b>	<b>31.1</b>
<b>Waterfowl</b>	<b>3</b>	<b>5</b>	<b>100</b>	<b>18</b>	<b>60.0</b>	<b>40.0</b>	<b>0</b>
<b>Shorebirds</b>	<b>24</b>	<b>31</b>	<b>72.1</b>	<b>16</b>	<b>67.7</b>	<b>32.3</b>	<b>0</b>
<b>Diurnal Raptors</b>	<b>27</b>	<b>27</b>	<b>69.2</b>	<b>61</b>	<b>22.2</b>	<b>77.8</b>	<b>0</b>
<i>Accipiters</i>	2	2	100	63	0	100	0
<i>Buteos</i>	13	13	59.1	73	15.4	84.6	0
<i>Northern Harrier</i>	2	2	100	5	100	0	0
<i>Eagles</i>	7	7	100	71	0	100	0
<i>Falcons</i>	2	2	40.0	30	50.0	50.0	0
<i>Other Raptors</i>	1	1	100	5	100	0	0
<b>Vultures</b>	<b>28</b>	<b>29</b>	<b>100</b>	<b>49</b>	<b>20.7</b>	<b>79.3</b>	<b>0</b>
<b>Upland Game Birds</b>	<b>4</b>	<b>6</b>	<b>27.3</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>
<b>Doves/Pigeons</b>	<b>74</b>	<b>345</b>	<b>73.6</b>	<b>18</b>	<b>51.0</b>	<b>49.0</b>	<b>0</b>
<b>Large Corvids</b>	<b>76</b>	<b>168</b>	<b>80.8</b>	<b>17</b>	<b>83.3</b>	<b>16.7</b>	<b>0</b>
<b>Large Birds Overall</b>	<b>243</b>	<b>685</b>	<b>77.1</b>	<b>27</b>	<b>52.6</b>	<b>44.1</b>	<b>3.4</b>

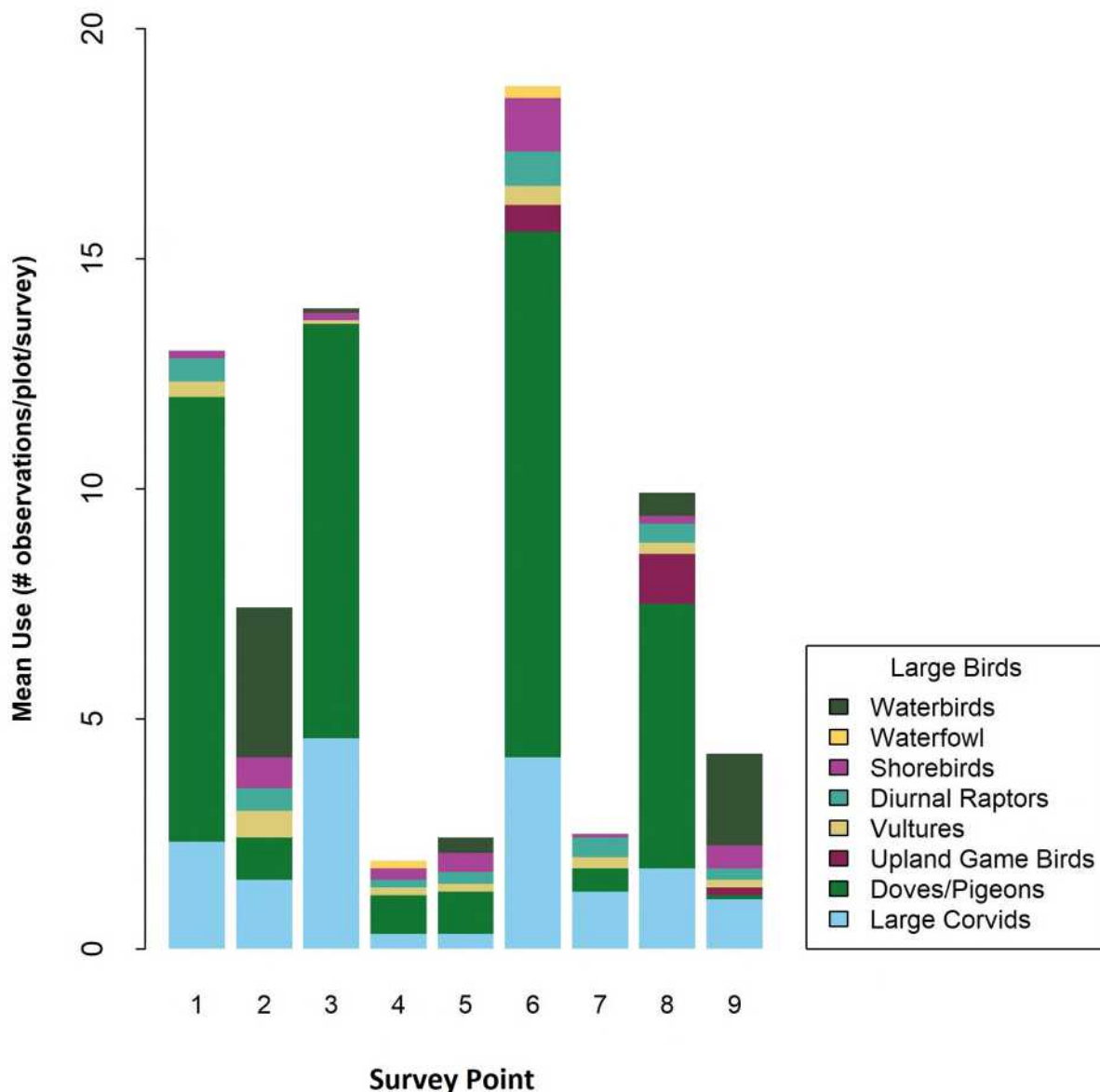
<sup>a</sup> The likely “rotor-swept height” for potential collision with a turbine blade, assumed here as 25 to 150 meters (m; 82 to 492 feet) above ground level.

All metrics were developed based on first activity and first flight height.

Obs = observations

### Spatial Variation

Large bird use was documented at each survey point (Appendix C1, Figure 5). Overall large bird use ranged from 1.92 observations/60-min survey at Point 4 to 18.75 at Point 6. Waterbirds composed the majority of use at points 2 and 9 (Appendix D8), whereas large corvids composed the majority of use at Point 7. The majority of use at all other points (points 1, 3, 4, 5, 6, and 8) was attributed to doves/pigeons. Diurnal raptor use ranged from 0 at Point 3, where no raptor use was documented, to 0.75 at Point 6 (Appendix D9).



**Figure 5. Large bird mean use (observations/60-minute survey) by point recorded during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Flight paths and perch locations of diurnal raptors (Figure 6a) and special status species documented during large bird surveys (Figure 6b) were mapped and digitized to illustrate spatial use across the Project. Diurnal raptor flight paths were generally documented throughout the Project (Figure 6a). Observations of other flying special status species were relatively uncommon during large bird surveys, but were documented in both the western portion of the Project (one upland sandpiper) and the eastern portion of the Project (one group of 23 American white pelicans; Figure 6b).

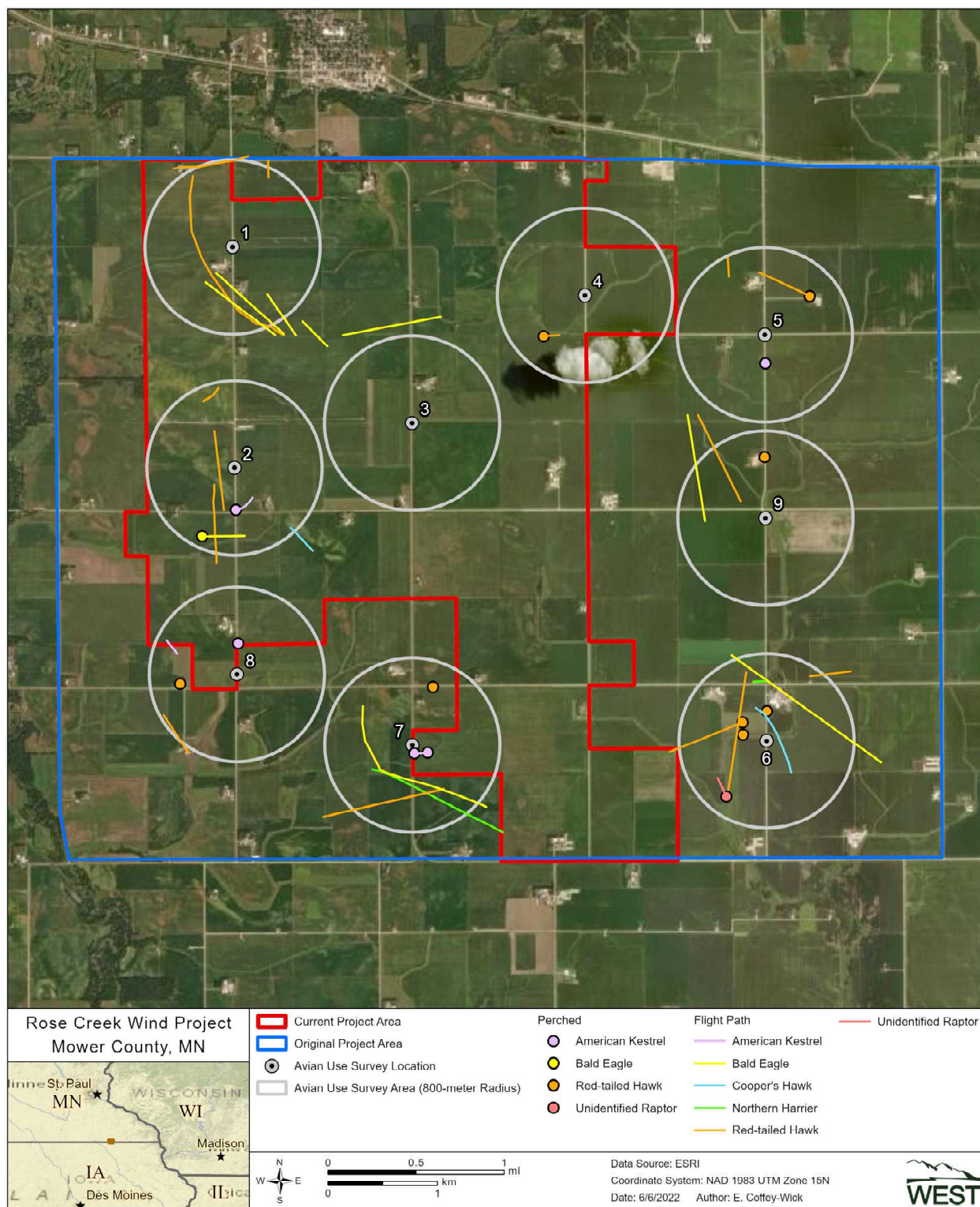


Figure 6a. Diurnal raptor flight paths documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.

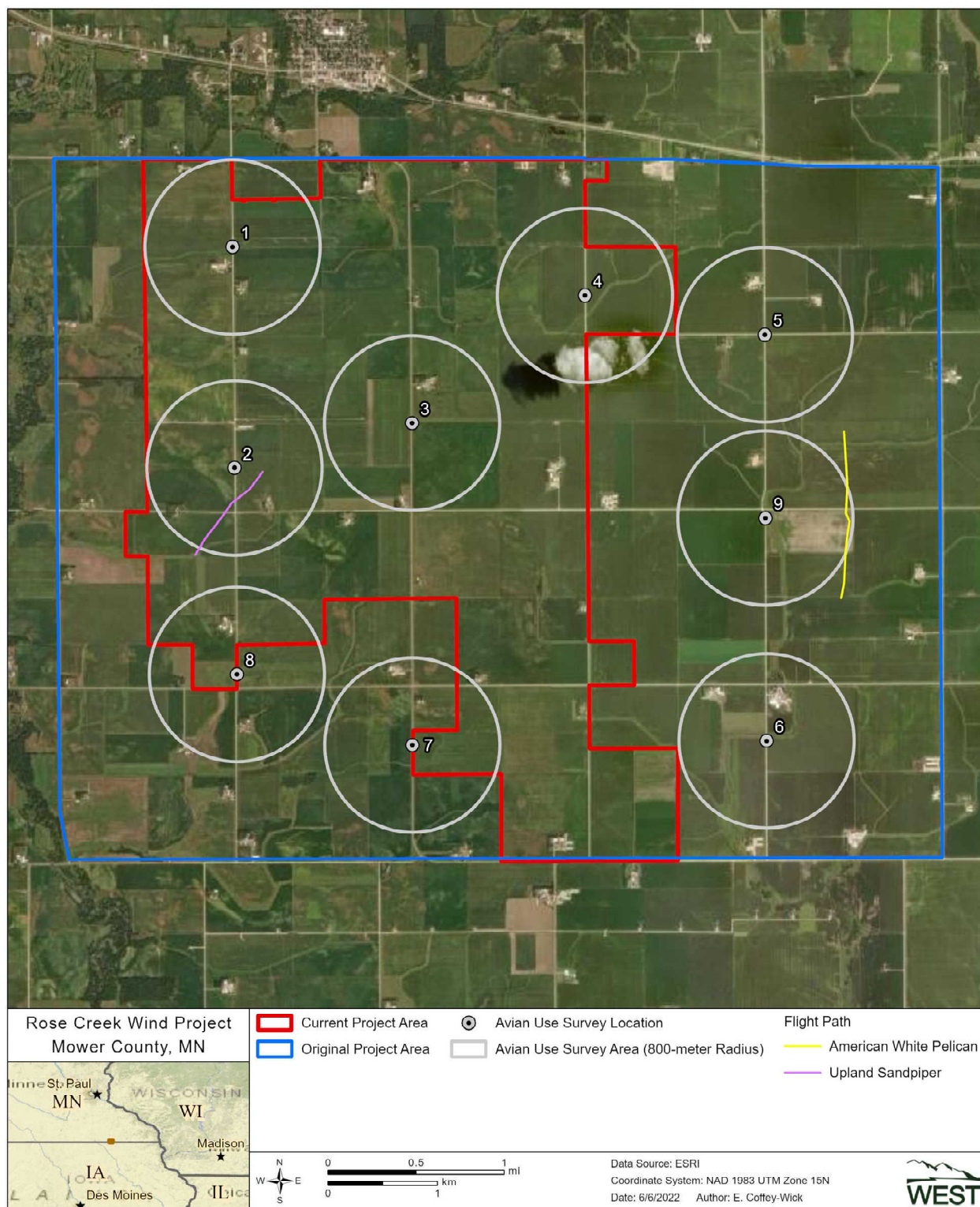


Figure 6b. Non-raptor sensitive species flight paths documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.

## **Small Birds**

During small bird use surveys for the Project, 367 small bird observations in 202 groups were documented, comprising 17 unique small bird species (Appendix A2). Passerines (358 observations), specifically blackbirds/orioles (164 observations) and grassland/sparrows (120 observations), were the most abundant small bird types observed. Small birds were most abundant in summer (181 observations) and spring (113 observations).

### *Mean Use, Percent of Use, and Frequency of Occurrence*

Mean use, percent of use, and frequency of occurrence were calculated by season for each bird type, passerine subtype, and species (Appendix B2). Small bird mean use varied widely by season, with the highest use documented in summer (6.70 observations/100-m radius plot/10-min survey), followed by spring (4.07), fall (2.44), and winter (0.26; Appendix B2, Figure 7a). Figures 7a, 7b, and 7c depict the small bird subtypes with the six highest values, where “other” on Figures 7a and 7b combines bird types with lower values. Passerines composed the majority of use during all seasons; woodpecker use and unidentified small bird use was documented during spring and fall, respectively. Among passerines, blackbirds/orioles composed the majority of use during summer and spring (48.6% and 64.5% of overall small bird use, respectively), whereas finches/crossbills accounted for the most use in fall (47.0%); grassland/sparrow use was the only small bird use documented during winter (Appendix B2, Figure 7b). Blackbirds/orioles were documented most frequently during summer and spring surveys among small bird subtypes (77.8% and 63.0%, respectively; Appendix B2, Figure 7c). Although finches/crossbills accounted for the most use in fall, finch/crossbill use was only documented during 7.4% of fall surveys; grassland/sparrow use was the most frequently documented among small bird subtypes during fall and winter (25.9% and 7.4%, respectively).

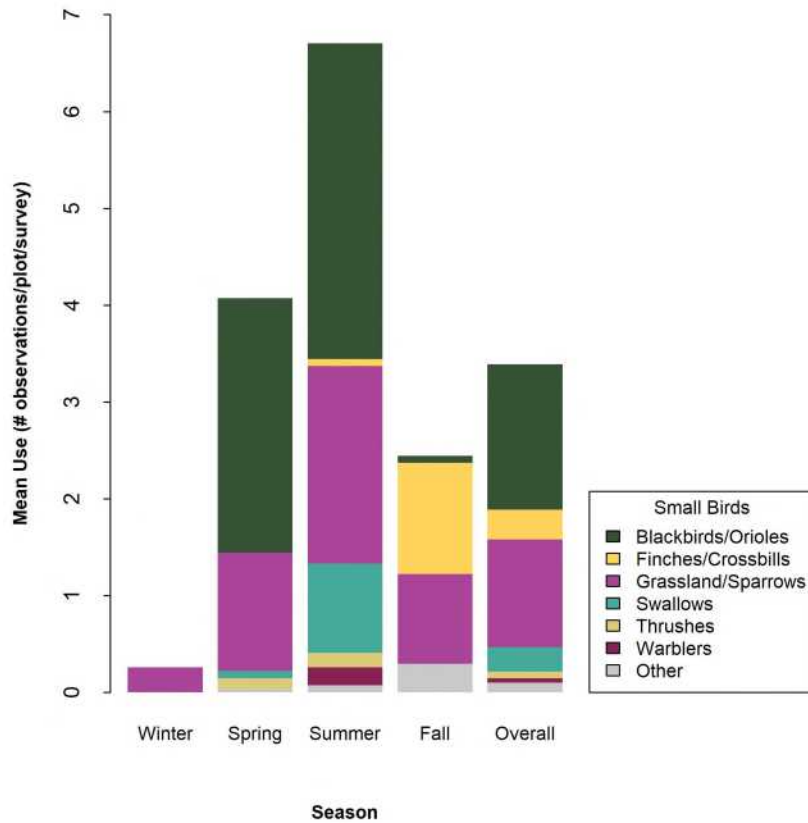


Figure 7a. Small bird mean use (observations/100-meter plot/10-minute survey) by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.

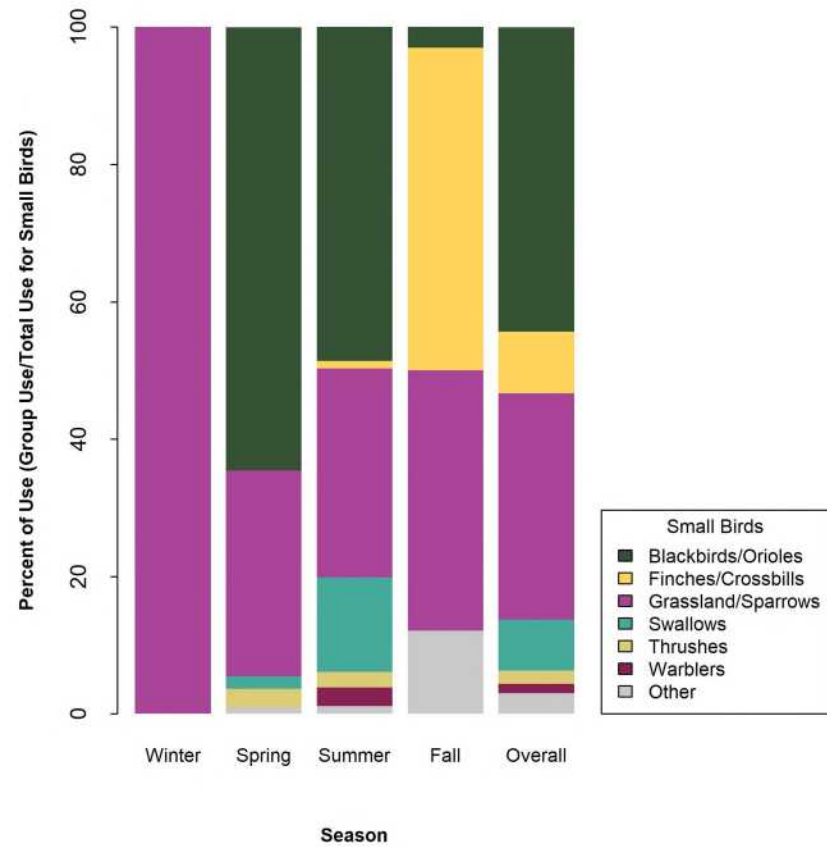
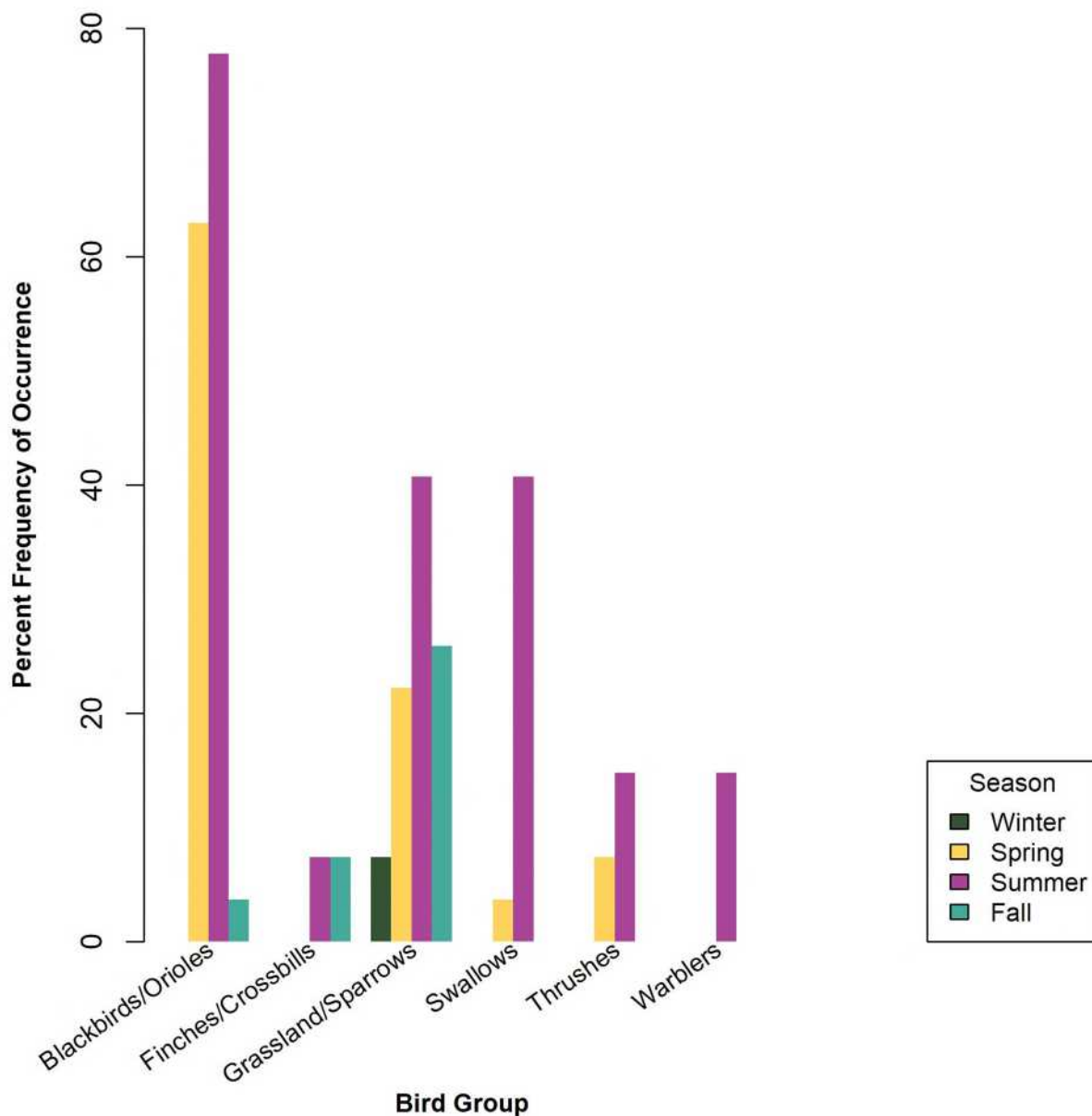


Figure 7b. Small bird percent of use by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.



**Figure 7c. Small bird frequency of occurrence by season and bird subtype recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

### *Spatial Variation*

Small bird use was documented at each survey point (Appendix C2.). Small bird use ranged from 0.42 observation/10-min survey at Point 7 to 8.25 at Point 8 (Figure 8). Passerines composed the majority of use at all survey points. Among passerines, grassland/sparrows accounted for the most use at points 2, 6, and 9; finches/crossbills accounted for the most use at Point 8; and the majority of use at all other points was attributed to blackbirds/orioles; (Appendix C2; Figure 8).

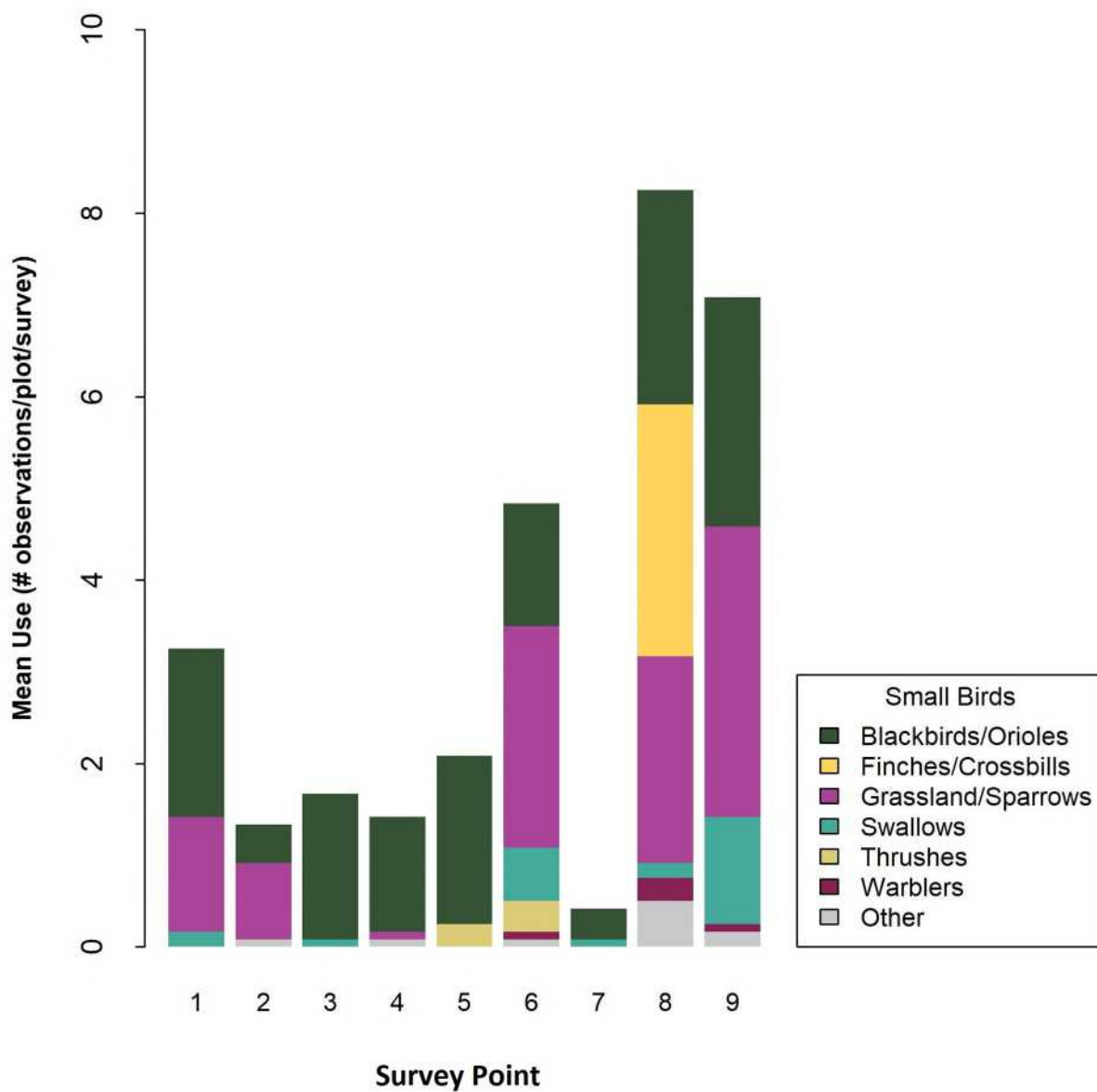


Figure 8. Small bird mean use (observations/10-minute survey) by survey point recorded during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.

## **DISCUSSION**

The objective of this avian use study was to characterize spatial use of the Project by diurnal birds across seasons, with special attention given to eagles and other special status species, including federally listed species, birds designated as state-listed or SGCN in Minnesota, and species federally designated as BCC in the Eastern Tallgrass Prairie Bird Conservation Region. As noted above, the original Project area contains 11 existing turbines, located in the northwest portion of the original Project area, that were operational during the avian use study. Therefore, while the data collected is not directly analogous to the pre-construction surveys designed to assess baseline wildlife activity prior to wind energy development, it is a useful indicator of current avian use patterns in the vicinity of operating wind turbines. Similar avian use activity would be expected to occur during operation of the repowered Project.

### **Special Status Species**

No federally or state-listed threatened or endangered species were observed during Project surveys. American white pelican was the only species state-listed as SPC documented. American white pelicans were documented relatively infrequently; 31 pelicans were observed in two groups during spring surveys at Point 9 (outside the current Project area) in the eastern portion of the Project, although only one of the two groups was observed within the survey plot. Given the absence of open water habitat within the current Project area, suitable habitat for American white pelican nesting and foraging is limited. The five remaining non-raptor special status species were designated as SGCN, including upland sandpiper (also designated as BCC), northern harrier, and American kestrel (discussed in *Large Birds*, below), and sedge wren and dickcissel (discussed in *Small Birds*, below).

### **Eagles**

No golden eagles were observed incidentally or during surveys at the Project. Bald eagle observations recorded during surveys were primarily documented during fall (18 of the 28 survey observations). Although the majority of bald eagle use was documented at Point 1 in the northwest corner of the Project, bald eagle use was documented throughout the original Project area. Despite recent bald eagle population expansion (MNDNR 2019), suitable habitat for bald eagle nesting and foraging is limited within the Project (Buehler 2020).

### **Large Birds**

The most commonly observed large bird group were doves/pigeons (primarily rock pigeon) and large corvids (American crow). Rock pigeon and American crow were widespread and abundant throughout the Project during all seasons. Overall, the large bird species documented at the Project are common in the region (eBird 2022). Although diurnal raptor species documented at the Project were observed relatively infrequently compared to most other large bird species, the diurnal raptor species documented during surveys are generally common in the region (eBird 2022).

## **Small Birds**

Passerines composed the majority of small bird use during all seasons; woodpecker use and unidentified small bird use was documented during spring and fall, respectively. The most commonly observed passerines were blackbirds/orioles (primarily red-winged blackbird) and grassland/sparrows (primarily Lapland longspur, almost entirely documented during spring). Both species are relatively widespread and abundant in the region (eBird 2022). Small bird sensitive species (sedge wren and dickcissel) were relatively uncommon, although both species are widespread in the region (eBird 2022).

## REFERENCES

- 81 Federal Register (FR) 242: 91494-91554. 2016. Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests; Final Rule. Department of the Interior Fish and Wildlife Service. 81 FR 91494. December 16, 2016. Available online: <https://www.gpo.gov/fdsys/pkg/FR-2016-12-16/pdf/2016-29908.pdf>
- Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Sections (§§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 250; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].
- Birds Studies Canada and North American Bird Conservation Initiative (NABCI). 2014. NABCI Bird Conservation Regions. Published by Bird Studies Canada on behalf of the NABCI. Accessed May 2021. Available online: <https://www.birdscanada.org/bird-science/nabci-bird-conservation-regions/>
- Brown, J. A., B. L. Robertson, and T. McDonald. 2015. Spatially Balanced Sampling: Application to Environmental Surveys. *Procedia Environmental Sciences* 27: 6-9. doi: 10.1016/j.proenv.2015.07.108.
- Buehler, D. A. 2020. Bald Eagle (*Haliaeetus leucocephalus*), Version 1.0. A. F. Poole and F. B. Gill, eds. *In: Birds of the World*. Cornell Lab of Ornithology, Ithaca, New York. Available online: <http://birdsoftheworld.org/bow/species/baleag/cur/>
- eBird. 2022. eBird: An Online Database of Bird Distribution and Abundance. eBird, Cornell Lab of Ornithology, Ithaca, New York. Accessed February 2022. Available online: <http://ebird.org/content/ebird/>
- Endangered Species Act (ESA). 1973. 16 United States Code (USC) Sections (§§) 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.
- Esri. 2022. World Imagery and Aerial Photos. ArcGIS Resource Center. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California. Accessed February 2022. Available online: <https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=10df2279f9684e4a9f6a7f08febac2a9>
- Herkert, J. R., D. E. Kroodsma, and J. P. Gibbs. 2020. Sedge Wren (*Cistothorus platensis*), Version 1.0. A. F. Poole and F. B. Gill, eds. *In: Birds of the World*. Cornell Lab of Ornithology, Ithaca, New York. Available online: <http://birdsoftheworld.org/bow/species/sedwre/cur/>
- Minnesota Administrative Rules Chapter 6134. 2008. Department of Natural Resources; Chapter 6134 - Endangered, Threatened, Special Concern Species. June 11, 2008. Available online: <https://www.revisor.mn.gov/rules/6134/>
- Minnesota Department of Natural Resources (MNDNR). 2013. Minnesota's List of Endangered, Threatened, and Special Concern Species. Effective August 19, 2013. 18 pp. Available online: [http://files.dnr.state.mn.us/natural\\_resources/ets/endlist.pdf](http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf)

- Minnesota Department of Natural Resources (MNDNR). 2015. Minnesota's Wildlife Action Plan: 2015-2025. Division of Ecological and Water Resources, MDNR, Saint Paul, Minnesota. Available online: <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/wildlife-action-plan-2015-2025.pdf>
- Minnesota Department of Natural Resources (MNDNR). 2019. *Haliaeetus leucocephalus*. Basis for Former Listing. State of Minnesota, Rare Species Guide. Accessed: February 2022. Available online: <https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC10010>
- Mixon, K. L., J. Schrenzel, D. Pile, R. Davis, R. Doneen, L. Joyal, N. Kestner, M. Doperalski, and J. Schadweiler. 2014. Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota. Minnesota Department of Natural Resources, New Ulm, Minnesota. 41 pp. Available online: <http://files.dnr.state.mn.us/eco/ereview/avian-bat-protocols.pdf>
- National Audubon Society (Audubon). 2021. Mississippi Flyway: A River of Birds. Accessed May 2021. Available online: <https://www.audubon.org/mississippi-flyway>
- National Land Cover Database. 2016. *As cited* includes:
- Yang, L., S. Jin, P. Danielson, C. Homer, L. Gass, S. M. Bender, A. Case, C. Costello, J. Dewitz, J. Fry, M. Funk, B. Granneman, G. C. Liknes, M. Rigge, and G. Xian. 2018. A New Generation of the United States National Land Cover Database: Requirements, Research Priorities, Design, and Implementation Strategies. ISPRS Journal of Photogrammetry and Remote Sensing 146: 108-123. doi: 10.1016/j.isprsjprs.2018.09.006.
- and
- Multi-Resolution Land Characteristics (MRLC). 2019. National Land Cover Database (NLCD) 2016. Multi-Resolution Land Characteristics (MRLC) Consortium. US Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, MRLC Project, Sioux Falls, South Dakota. May 10, 2019. Information online: <https://www.mrlc.gov/data>
- Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.
- Temple, S. A. 2020. Dickcissel (*Spiza americana*), Version 1.0. A. F. Poole and F. B. Gill, eds. *In*: Birds of the World. 2020. Cornell Lab of Ornithology, Ithaca, New York. Available online: <http://birdsoftheworld.org/bow/species/dickci/cur/>
- U.S. Environmental Protection Agency (USEPA). 2013. Level III and Level IV Ecoregions of the Continental United States. Ecosystems Research, USEPA. April 16, 2013. Accessed January 2022. Available online: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>
- U.S. Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: <https://www.fws.gov/sites/default/files/documents/land-based-wind-energy-guidelines.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. U.S. Department of the Interior, USFWS, Division of Migratory Bird Management. April 2013. 103 pp. + frontmatter. Available online: <https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2021. Birds of Conservation Concern 2021. USFWS Migratory Birds, Falls Church, Virginia. April 2021. Available online: <https://www.fws.gov/migratorybirds/pdf/management/birds-of-conservation-concern-2021.pdf>

White, D. 2020. Ecological Regions of Minnesota: Level III and IV Maps and Descriptions. U.S. Environmental Protection Agency. March 2020. Available online: [https://gaftp.epa.gov/EPA/DataCommons/ORD/Ecoregions/mn/mn\\_eco\\_desc.pdf](https://gaftp.epa.gov/EPA/DataCommons/ORD/Ecoregions/mn/mn_eco_desc.pdf)

**Appendix A. All Bird Types and Species Observed during Avian Use Surveys for the  
Rose Creek Wind Project from January to December, 2021**

Appendix A1. Number of groups and observations by bird type and species recorded during 60-minute large bird use surveys\* for the Rose Creek Wind Project from January to December, 2021.

Type/Species	Scientific Name	Winter		Spring		Summer		Fall		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
<b>Waterbirds</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>79</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>82</b>
sandhill crane	<i>Antigone canadensis</i>	0	0	1	3	0	0	0	0	1	3
great blue heron	<i>Ardea herodias</i>	0	0	0	0	3	3	0	0	3	3
American white pelican	<i>Pelecanus erythrorhynchos</i>	0	0	2	31	0	0	0	0	2	31
double-crested cormorant	<i>Phalacrocorax auritus</i>	0	0	2	45	0	0	0	0	2	45
<b>Waterfowl</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>5</b>
wood duck	<i>Aix sponsa</i>	0	0	0	0	1	1	0	0	1	1
mallard	<i>Anas platyrhynchos</i>	0	0	1	2	0	0	0	0	1	2
Canada goose	<i>Branta canadensis</i>	0	0	1	2	0	0	0	0	1	2
<b>Shorebirds</b>		<b>0</b>	<b>0</b>	<b>11</b>	<b>12</b>	<b>16</b>	<b>19</b>	<b>3</b>	<b>12</b>	<b>30</b>	<b>43</b>
upland sandpiper	<i>Bartramia longicauda</i>	0	0	1	1	0	0	0	0	1	1
killdeer	<i>Charadrius vociferus</i>	0	0	10	11	15	17	2	11	27	39
Wilson's snipe	<i>Gallinago delicata</i>	0	0	0	0	0	0	1	1	1	1
unidentified plover		0	0	0	0	1	2	0	0	1	2
<b>Diurnal Raptors</b>		<b>8</b>	<b>8</b>	<b>13</b>	<b>13</b>	<b>7</b>	<b>8</b>	<b>31</b>	<b>31</b>	<b>59</b>	<b>60</b>
<u>Accipiters</u>		0	0	1	1	1	1	0	0	2	2
Cooper's hawk	<i>Accipiter cooperii</i>	0	0	1	1	1	1	0	0	2	2
<u>Buteos</u>		3	3	5	5	3	4	10	10	21	22
red-tailed hawk	<i>Buteo jamaicensis</i>	3	3	5	5	3	4	10	10	21	22
<u>Northern Harrier</u>		0	0	1	1	0	0	1	1	2	2
northern harrier	<i>Circus hudsonius</i>	0	0	1	1	0	0	1	1	2	2
<u>Eagles</u>		5	5	4	4	1	1	18	18	28	28
bald eagle	<i>Haliaeetus leucocephalus</i>	5	5	4	4	1	1	18	18	28	28
<u>Falcons</u>		0	0	2	2	2	2	1	1	5	5
American kestrel	<i>Falco sparverius</i>	0	0	2	2	2	2	1	1	5	5
<u>Other Raptors</u>		0	0	0	0	0	0	1	1	1	1
unidentified raptor		0	0	0	0	0	0	1	1	1	1
<b>Vultures</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>14</b>	<b>15</b>	<b>9</b>	<b>9</b>	<b>28</b>	<b>29</b>
turkey vulture	<i>Cathartes aura</i>	0	0	5	5	14	15	9	9	28	29
<b>Upland Game Birds</b>		<b>0</b>	<b>0</b>	<b>13</b>	<b>15</b>	<b>6</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>20</b>	<b>22</b>
ring-necked pheasant	<i>Phasianus colchicus</i>	0	0	13	15	6	6	1	1	20	22
<b>Doves/Pigeons</b>		<b>20</b>	<b>145</b>	<b>26</b>	<b>69</b>	<b>35</b>	<b>126</b>	<b>34</b>	<b>129</b>	<b>115</b>	<b>469</b>
rock pigeon	<i>Columba livia</i>	18	137	24	65	21	107	31	126	94	435
Eurasian collared-dove	<i>Streptopelia decaocto</i>	2	8	0	0	1	2	1	1	4	11

**Appendix A1. Number of groups and observations by bird type and species recorded during 60-minute large bird use surveys\* for the Rose Creek Wind Project from January to December, 2021.**

Type/Species	Scientific Name	Winter		Spring		Summer		Fall		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
mourning dove	<i>Zenaida macroura</i>	0	0	2	4	13	17	2	2	17	23
<b>Large Corvids</b>		<b>31</b>	<b>46</b>	<b>31</b>	<b>39</b>	<b>13</b>	<b>29</b>	<b>26</b>	<b>94</b>	<b>101</b>	<b>208</b>
American crow	<i>Corvus brachyrhynchos</i>	31	46	31	39	13	29	26	94	101	208
<b>Overall</b>		<b>59</b>	<b>199</b>	<b>106</b>	<b>236</b>	<b>95</b>	<b>207</b>	<b>104</b>	<b>276</b>	<b>364</b>	<b>918</b>

\* Regardless of distance from observer

grps = groups; obs = observations

**Appendix A2. Numbers of groups and observations by bird type and species recorded during 10-minute small bird use surveys\* for the Rose Creek Wind Project from January to December, 2021.**

Type/Species	Scientific Name	Winter		Spring		Summer		Fall		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
<b>Passerines</b>		<b>5</b>	<b>7</b>	<b>57</b>	<b>112</b>	<b>120</b>	<b>181</b>	<b>15</b>	<b>58</b>	<b>197</b>	<b>358</b>
<u>Blackbirds/Orioles</u>		0	0	45	74	60	88	1	2	106	164
red-winged blackbird	<i>Agelaius phoeniceus</i>	0	0	28	36	45	57	1	2	74	95
brown-headed cowbird	<i>Molothrus ater</i>	0	0	8	22	4	6	0	0	12	28
common grackle	<i>Quiscalus quiscula</i>	0	0	9	16	9	23	0	0	18	39
European starling	<i>Sturnus vulgaris</i>	0	0	0	0	2	2	0	0	2	2
<u>Finches/Crossbills</u>		0	0	0	0	2	2	3	31	5	33
American goldfinch	<i>Spinus tristis</i>	0	0	0	0	2	2	3	31	5	33
<u>Grassland/Sparrows</u>		5	7	8	33	29	55	11	25	53	120
Lapland longspur	<i>Calcarius lapponicus</i>	0	0	2	26	0	0	1	6	3	32
horned lark	<i>Eremophila alpestris</i>	5	7	0	0	0	0	0	0	5	7
song sparrow	<i>Melospiza melodia</i>	0	0	3	3	5	18	2	4	10	25
house sparrow	<i>Passer domesticus</i>	0	0	1	1	6	19	2	8	9	28
vesper sparrow	<i>Pooecetes gramineus</i>	0	0	1	1	0	0	0	0	1	1
dickcissel	<i>Spiza americana</i>	0	0	0	0	18	18	4	4	22	22
unidentified sparrow		0	0	1	2	0	0	2	3	3	5
<u>Swallows</u>		0	0	2	2	18	25	0	0	20	27
barn swallow	<i>Hirundo rustica</i>	0	0	1	1	7	9	0	0	8	10
cliff swallow	<i>Petrochelidon pyrrhonota</i>	0	0	1	1	11	16	0	0	12	17
<u>Thrushes</u>		0	0	2	3	4	4	0	0	6	7
American robin	<i>Turdus migratorius</i>	0	0	2	3	4	4	0	0	6	7
<u>Warblers</u>		0	0	0	0	5	5	0	0	5	5
common yellowthroat	<i>Geothlypis trichas</i>	0	0	0	0	5	5	0	0	5	5
<u>Wrens</u>		0	0	0	0	2	2	0	0	2	2
sedge wren	<i>Cistothorus platensis</i>	0	0	0	0	2	2	0	0	2	2
<b>Woodpeckers</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
northern flicker	<i>Colaptes auratus</i>	0	0	1	1	0	0	0	0	1	1
<b>Unidentified Birds</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>8</b>
unidentified small bird		0	0	0	0	0	0	4	8	4	8
<b>Overall</b>		<b>5</b>	<b>7</b>	<b>58</b>	<b>113</b>	<b>120</b>	<b>181</b>	<b>19</b>	<b>66</b>	<b>202</b>	<b>367</b>

\* Regardless of distance from observer  
grps = groups; obs = observations.

**Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds  
and Small Birds Observed during Avian Use Surveys for the Rose Creek Wind Project  
from January to December, 2021**

**Appendix B1. Mean use (number of large birds/800-meter radius plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season observed during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
<b>Waterbirds</b>	<b>0</b>	<b>2.63</b>	<b>0.11</b>	<b>0</b>	<b>0</b>	<b>31.7</b>	<b>1.5</b>	<b>0</b>	<b>0</b>	<b>14.8</b>	<b>11.1</b>	<b>0</b>
sandhill crane	0	0.11	0	0	0	1.3	0	0	0	3.7	0	0
great blue heron	0	0	0.11	0	0	0	1.5	0	0	0	11.1	0
American white pelican	0	0.85	0	0	0	10.3	0	0	0	3.7	0	0
double-crested cormorant	0	1.67	0	0	0	20.1	0	0	0	7.4	0	0
<b>Waterfowl</b>	<b>0</b>	<b>0.15</b>	<b>0.04</b>	<b>0</b>	<b>0</b>	<b>1.8</b>	<b>0.5</b>	<b>0</b>	<b>0</b>	<b>7.4</b>	<b>3.7</b>	<b>0</b>
wood duck	0	0	0.04	0	0	0	0.5	0	0	0	3.7	0
mallard	0	0.07	0	0	0	0.9	0	0	0	3.7	0	0
Canada goose	0	0.07	0	0	0	0.9	0	0	0	3.7	0	0
<b>Shorebirds</b>	<b>0</b>	<b>0.44</b>	<b>0.70</b>	<b>0.44</b>	<b>0</b>	<b>5.4</b>	<b>9.2</b>	<b>4.6</b>	<b>0</b>	<b>33.3</b>	<b>33.3</b>	<b>11.1</b>
upland sandpiper	0	0.04	0	0	0	0.4	0	0	0	3.7	0	0
killdeer	0	0.41	0.63	0.41	0	4.9	8.3	4.2	0	33.3	29.6	7.4
Wilson's snipe	0	0	0	0.04	0	0	0	0.4	0	0	0	3.7
unidentified plover	0	0	0.07	0	0	0	1.0	0	0	0	3.7	0
<b>Diurnal Raptors</b>	<b>0.19</b>	<b>0.33</b>	<b>0.26</b>	<b>0.67</b>	<b>2.6</b>	<b>4.0</b>	<b>3.4</b>	<b>6.8</b>	<b>18.5</b>	<b>29.6</b>	<b>18.5</b>	<b>44.4</b>
<u>Accipiters</u>	0	0.04	0.04	0	0	0.4	0.5	0	0	3.7	3.7	0
Cooper's hawk	0	0.04	0.04	0	0	0.4	0.5	0	0	3.7	3.7	0
<u>Buteos</u>	0.11	0.19	0.15	0.37	1.5	2.2	1.9	3.8	11.1	18.5	11.1	25.9
red-tailed hawk	0.11	0.19	0.15	0.37	1.5	2.2	1.9	3.8	11.1	18.5	11.1	25.9
<u>Northern Harrier</u>	0	0.04	0	0.04	0	0.4	0	0.4	0	3.7	0	3.7
northern harrier	0	0.04	0	0.04	0	0.4	0	0.4	0	3.7	0	3.7
<u>Eagles</u>	0.07	0	0	0.19	1.0	0	0	1.9	7.4	0	0	11.1
bald eagle	0.07	0	0	0.19	1.0	0	0	1.9	7.4	0	0	11.1
<u>Falcons</u>	0	0.07	0.07	0.04	0	0.9	1.0	0.4	0	7.4	7.4	3.7
American kestrel	0	0.07	0.07	0.04	0	0.9	1.0	0.4	0	7.4	7.4	3.7
<u>Other Raptors</u>	0	0	0	0.04	0	0	0	0.4	0	0	0	3.7
unidentified raptor	0	0	0	0.04	0	0	0	0.4	0	0	0	3.7
<b>Vultures</b>	<b>0</b>	<b>0.19</b>	<b>0.56</b>	<b>0.33</b>	<b>0</b>	<b>2.2</b>	<b>7.3</b>	<b>3.4</b>	<b>0</b>	<b>18.5</b>	<b>29.6</b>	<b>29.6</b>
turkey vulture	0	0.19	0.56	0.33	0	2.2	7.3	3.4	0	18.5	29.6	29.6
<b>Upland Game Birds</b>	<b>0</b>	<b>0.56</b>	<b>0.22</b>	<b>0.04</b>	<b>0</b>	<b>6.7</b>	<b>2.9</b>	<b>0.4</b>	<b>0</b>	<b>18.5</b>	<b>14.8</b>	<b>3.7</b>
ring-necked pheasant	0	0.56	0.22	0.04	0	6.7	2.9	0.4	0	18.5	14.8	3.7
<b>Doves/Pigeons</b>	<b>5.37</b>	<b>2.56</b>	<b>4.67</b>	<b>4.78</b>	<b>74.0</b>	<b>30.8</b>	<b>61.2</b>	<b>49.0</b>	<b>44.4</b>	<b>40.7</b>	<b>59.3</b>	<b>55.6</b>
rock pigeon	5.07	2.41	3.96	4.67	69.9	29.0	51.9	47.9	40.7	40.7	48.1	51.9
Eurasian collared-dove	0.30	0	0.07	0.04	4.1	0	1.0	0.4	3.7	0	3.7	3.7

**Appendix B1. Mean use (number of large birds/800-meter radius plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season observed during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
mourning dove	0	0.15	0.63	0.07	0	1.8	8.3	0.8	0	7.4	29.6	7.4
<b>Large Corvids</b>	<b>1.70</b>	<b>1.44</b>	<b>1.07</b>	<b>3.48</b>	<b>23.5</b>	<b>17.4</b>	<b>14.1</b>	<b>35.7</b>	<b>59.3</b>	<b>55.6</b>	<b>33.3</b>	<b>55.6</b>
American crow	1.70	1.44	1.07	3.48	23.5	17.4	14.1	35.7	59.3	55.6	33.3	55.6
<b>Overall*</b>	<b>7.26</b>	<b>8.30</b>	<b>7.63</b>	<b>9.74</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>74.1</b>	<b>92.6</b>	<b>81.5</b>	<b>81.5</b>

\* Sums may differ from total values shown due to rounding.

**Appendix B2. Mean use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season observed during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
<b>Passerines</b>	<b>0.26</b>	<b>4.04</b>	<b>6.70</b>	<b>2.15</b>	<b>100</b>	<b>99.1</b>	<b>100</b>	<b>87.9</b>	<b>7.4</b>	<b>63.0</b>	<b>85.2</b>	<b>33.3</b>
<u>Blackbirds/Orioles</u>	0	2.63	3.26	0.07	0	64.5	48.6	3.0	0	63.0	77.8	3.7
red-winged blackbird	0	1.33	2.11	0.07	0	32.7	31.5	3.0	0	48.1	74.1	3.7
brown-headed cowbird	0	0.81	0.22	0	0	20.0	3.3	0	0	22.2	14.8	0
common grackle	0	0.48	0.85	0	0	11.8	12.7	0	0	22.2	22.2	0
European starling	0	0	0.07	0	0	0	1.1	0	0	0	7.4	0
<u>Finches/Crossbills</u>	0	0	0.07	1.15	0	0	1.1	47.0	0	0	7.4	7.4
American goldfinch	0	0	0.07	1.15	0	0	1.1	47.0	0	0	7.4	7.4
<u>Grassland/Sparrows</u>	0.26	1.22	2.04	0.93	100	30.0	30.4	37.9	7.4	22.2	40.7	25.9
Lapland longspur	0	0.96	0	0.22	0	23.6	0	9.1	0	7.4	0	3.7
horned lark	0.26	0	0	0	100	0	0	0	7.4	0	0	0
song sparrow	0	0.11	0.67	0.15	0	2.7	9.9	6.1	0	11.1	18.5	7.4
house sparrow	0	0.04	0.70	0.30	0	0.9	10.5	12.1	0	3.7	18.5	7.4
vesper sparrow	0	0.04	0	0	0	0.9	0	0	0	3.7	0	0
dickcissel	0	0	0.67	0.15	0	0	9.9	6.1	0	0	37.0	7.4
unidentified sparrow	0	0.07	0	0.11	0	1.8	0	4.5	0	3.7	0	7.4
<u>Swallows</u>	0	0.07	0.93	0	0	1.8	13.8	0	0	3.7	40.7	0
barn swallow	0	0.04	0.33	0	0	0.9	5.0	0	0	3.7	25.9	0
cliff swallow	0	0.04	0.59	0	0	0.9	8.8	0	0	3.7	25.9	0
<u>Thrushes</u>	0	0.11	0.15	0	0	2.7	2.2	0	0	7.4	14.8	0
American robin	0	0.11	0.15	0	0	2.7	2.2	0	0	7.4	14.8	0
<u>Warblers</u>	0	0	0.19	0	0	0	2.8	0	0	0	14.8	0
common yellowthroat	0	0	0.19	0	0	0	2.8	0	0	0	14.8	0
<u>Wrens</u>	0	0	0.07	0	0	0	1.1	0	0	0	7.4	0
sedge wren	0	0	0.07	0	0	0	1.1	0	0	0	7.4	0
<b>Woodpeckers</b>	<b>0</b>	<b>0.04</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3.7</b>	<b>0</b>	<b>0</b>
northern flicker	0	0.04	0	0	0	0.9	0	0	0	3.7	0	0
<b>Unidentified Birds</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.30</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12.1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14.8</b>
unidentified small bird	0	0	0	0.30	0	0	0	12.1	0	0	0	14.8
<b>Overall*</b>	<b>0.26</b>	<b>4.07</b>	<b>6.70</b>	<b>2.44</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>7.4</b>	<b>63.0</b>	<b>85.2</b>	<b>33.3</b>

\* Sums may differ from total values shown due to rounding.

**Appendix C. Mean Use by Point for All Birds, Bird Types, and Diurnal  
Raptor Subtypes Observed during Avian Use Surveys for the Rose Creek Wind Project  
from January to December, 2021**

**Appendix C1. Mean use by point (number of observations/60-minute survey)\* for all large bird types and diurnal raptor subtypes observed during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Bird Type/Subtype	Survey Point								
	1	2	3	4	5	6	7	8	9
<b>Waterbirds</b>	<b>0</b>	<b>3.25</b>	<b>0.08</b>	<b>0</b>	<b>0.33</b>	<b>0</b>	<b>0</b>	<b>0.50</b>	<b>2.00</b>
<b>Waterfowl</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.17</b>	<b>0</b>	<b>0.25</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Shorebirds</b>	<b>0.17</b>	<b>0.67</b>	<b>0.17</b>	<b>0.25</b>	<b>0.42</b>	<b>1.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.50</b>
<b>Diurnal Raptors</b>	<b>0.50</b>	<b>0.50</b>	<b>0</b>	<b>0.17</b>	<b>0.25</b>	<b>0.75</b>	<b>0.42</b>	<b>0.42</b>	<b>0.25</b>
<i>Accipiters</i>	0	0.08	0	0	0	0.08	0	0	0
<i>Buteos</i>	0.25	0.25	0	0.17	0.17	0.42	0.17	0.25	0.17
<i>Northern Harrier</i>	0	0	0	0	0	0.08	0.08	0	0
<i>Eagles</i>	0.25	0.08	0	0	0	0.08	0.08	0	0.08
<i>Falcons</i>	0	0.08	0	0	0.08	0	0.08	0.17	0
<i>Other Raptors</i>	0	0	0	0	0	0.08	0	0	0
<b>Vultures</b>	<b>0.33</b>	<b>0.58</b>	<b>0.08</b>	<b>0.17</b>	<b>0.17</b>	<b>0.42</b>	<b>0.25</b>	<b>0.25</b>	<b>0.17</b>
<b>Upland Game Birds</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.58</b>	<b>0</b>	<b>1.08</b>	<b>0.17</b>
<b>Doves/Pigeons</b>	<b>9.67</b>	<b>0.92</b>	<b>9.00</b>	<b>0.83</b>	<b>0.92</b>	<b>11.42</b>	<b>0.50</b>	<b>5.75</b>	<b>0.08</b>
<b>Large Corvids</b>	<b>2.33</b>	<b>1.50</b>	<b>4.58</b>	<b>0.33</b>	<b>0.33</b>	<b>4.17</b>	<b>1.25</b>	<b>1.75</b>	<b>1.08</b>
<b>All Large Birds**</b>	<b>13.00</b>	<b>7.42</b>	<b>13.92</b>	<b>1.92</b>	<b>2.42</b>	<b>18.75</b>	<b>2.50</b>	<b>9.92</b>	<b>4.25</b>

\* 800-meter radius plots

\*\* Sums may differ from total values shown due to rounding.

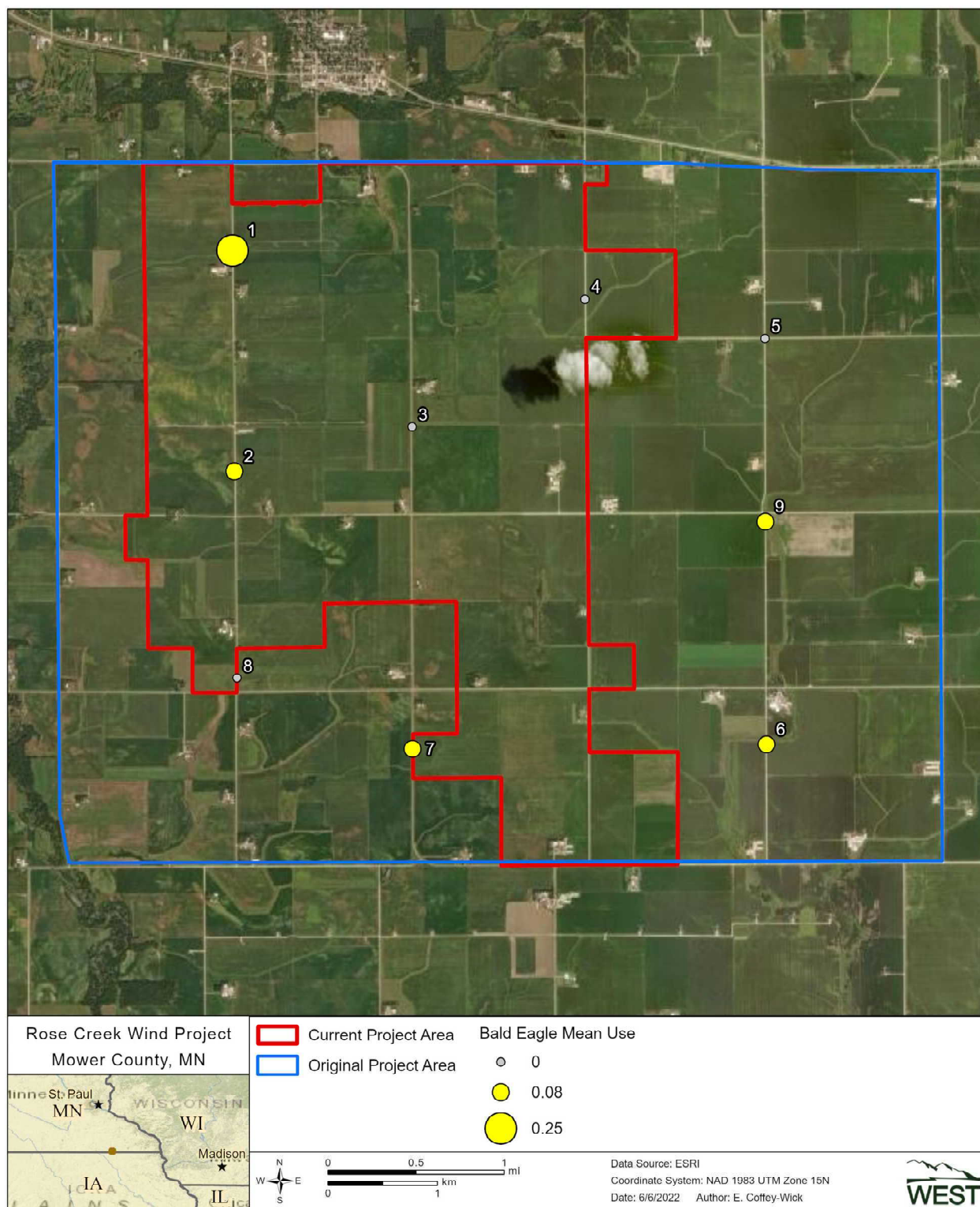
**Appendix C2. Mean use by point (number of observations/10-minute survey)\* for all small bird types observed during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.**

Bird Type	Survey Point								
	1	2	3	4	5	6	7	8	9
<b>Passerines</b>	<b>3.25</b>	<b>1.25</b>	<b>1.67</b>	<b>1.33</b>	<b>2.08</b>	<b>4.75</b>	<b>0.42</b>	<b>7.83</b>	<b>7.00</b>
<i>Blackbirds/Orioles</i>	1.83	0.42	1.58	1.25	1.83	1.33	0.33	2.33	2.50
<i>Finches/Crossbills</i>	0	0	0	0	0	0	0	2.75	0
<i>Grassland/Sparrows</i>	1.25	0.83	0	0.08	0	2.42	0	2.25	3.17
<i>Swallows</i>	0.17	0	0.08	0	0	0.58	0.08	0.17	1.17
<i>Thrushes</i>	0	0	0	0	0.25	0.33	0	0	0
<i>Warblers</i>	0	0	0	0	0	0.08	0	0.25	0.08
<i>Wrens</i>	0	0	0	0	0	0	0	0.08	0.08
<b>Woodpeckers</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.08</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Unidentified Birds</b>	<b>0</b>	<b>0.08</b>	<b>0</b>	<b>0.08</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.42</b>	<b>0.08</b>
<b>All Small Birds**</b>	<b>3.25</b>	<b>1.33</b>	<b>1.67</b>	<b>1.42</b>	<b>2.08</b>	<b>4.83</b>	<b>0.42</b>	<b>8.25</b>	<b>7.08</b>

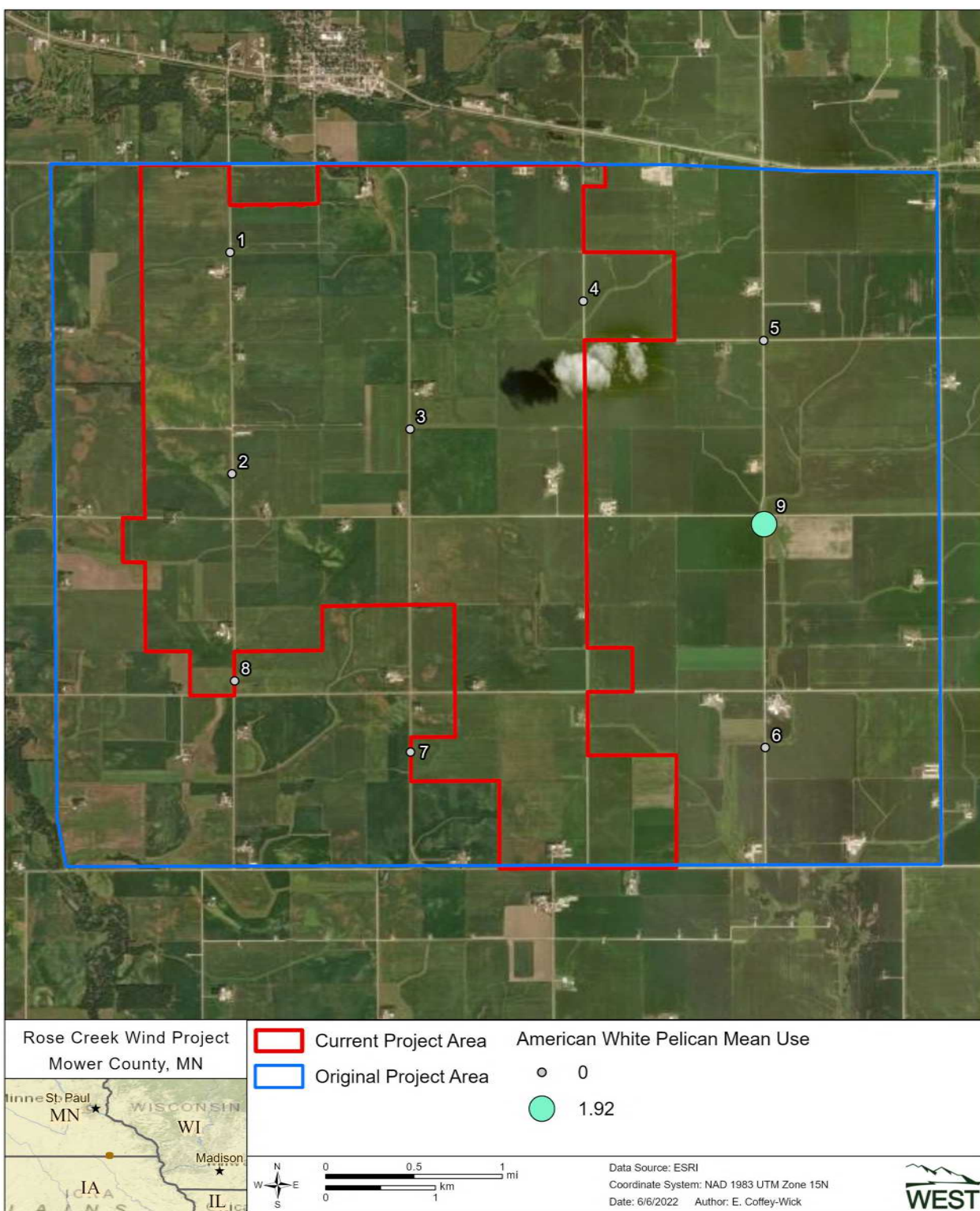
\* 100-meter radius plots

\*\* Sums may differ from total values shown due to rounding.

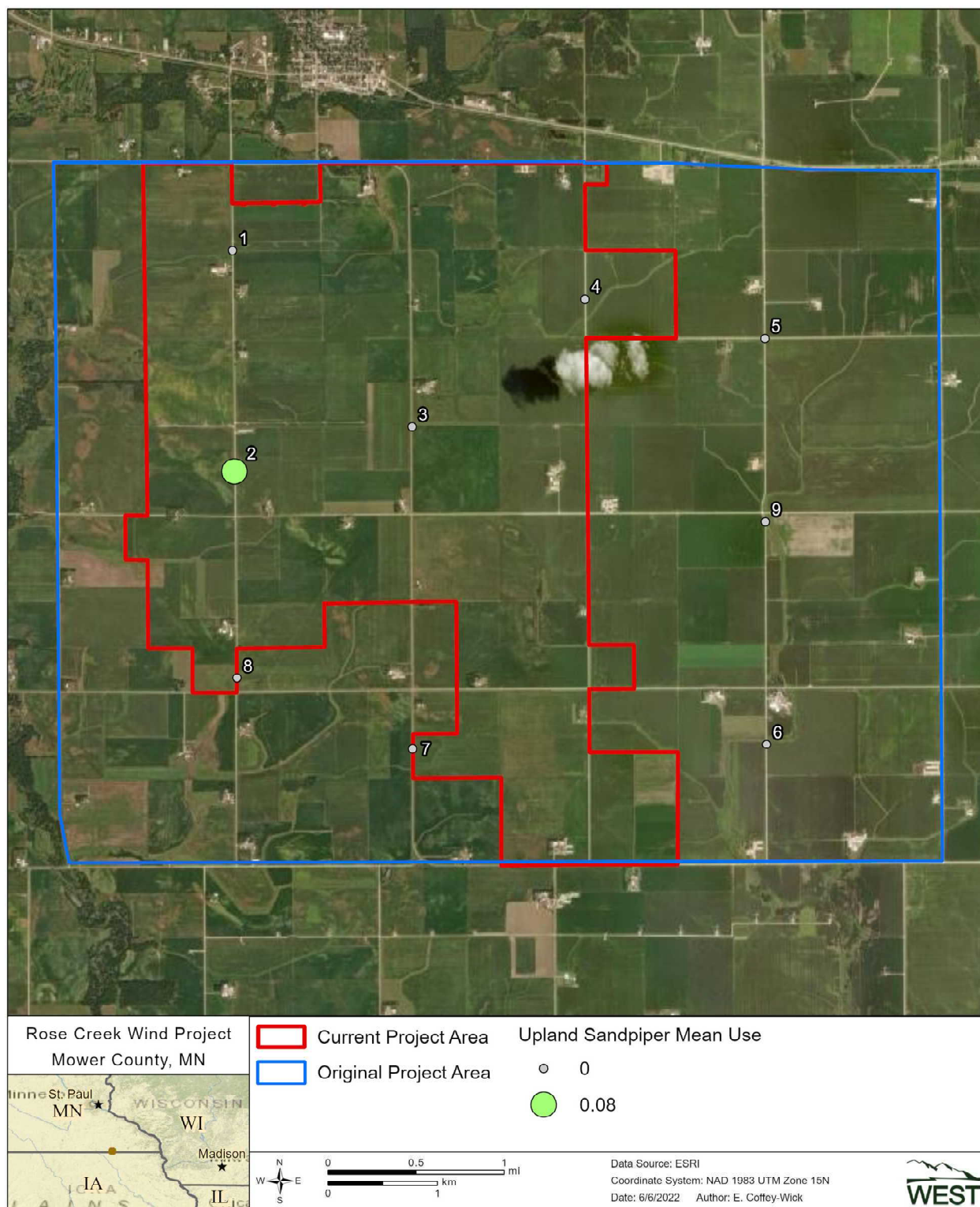
**Appendix D. Mean Use by Point for Sensitive Species Recorded during Avian Use  
Surveys for the Rose Creek Wind Project from January to December, 2021**



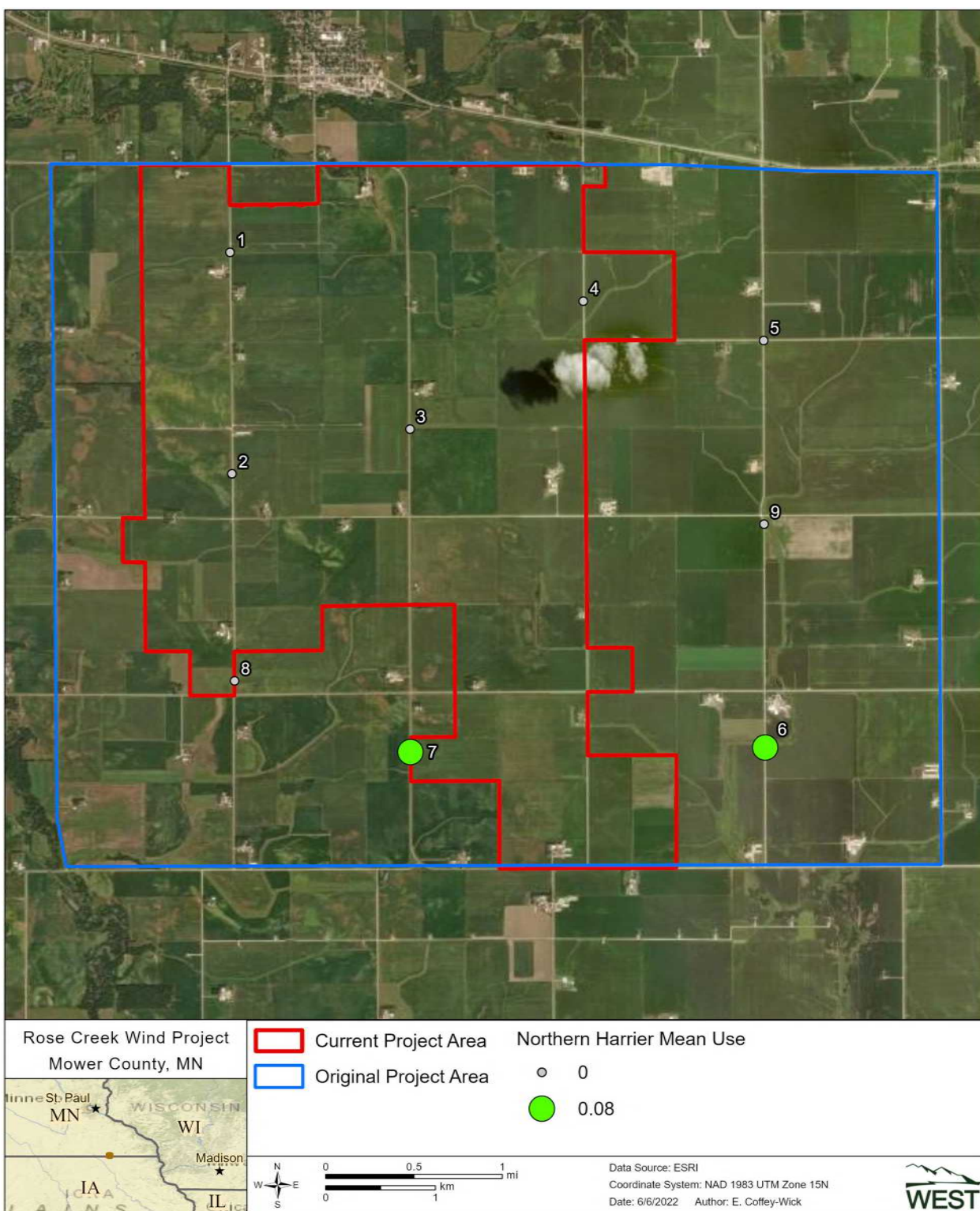
**Appendix D1. Bald eagle mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



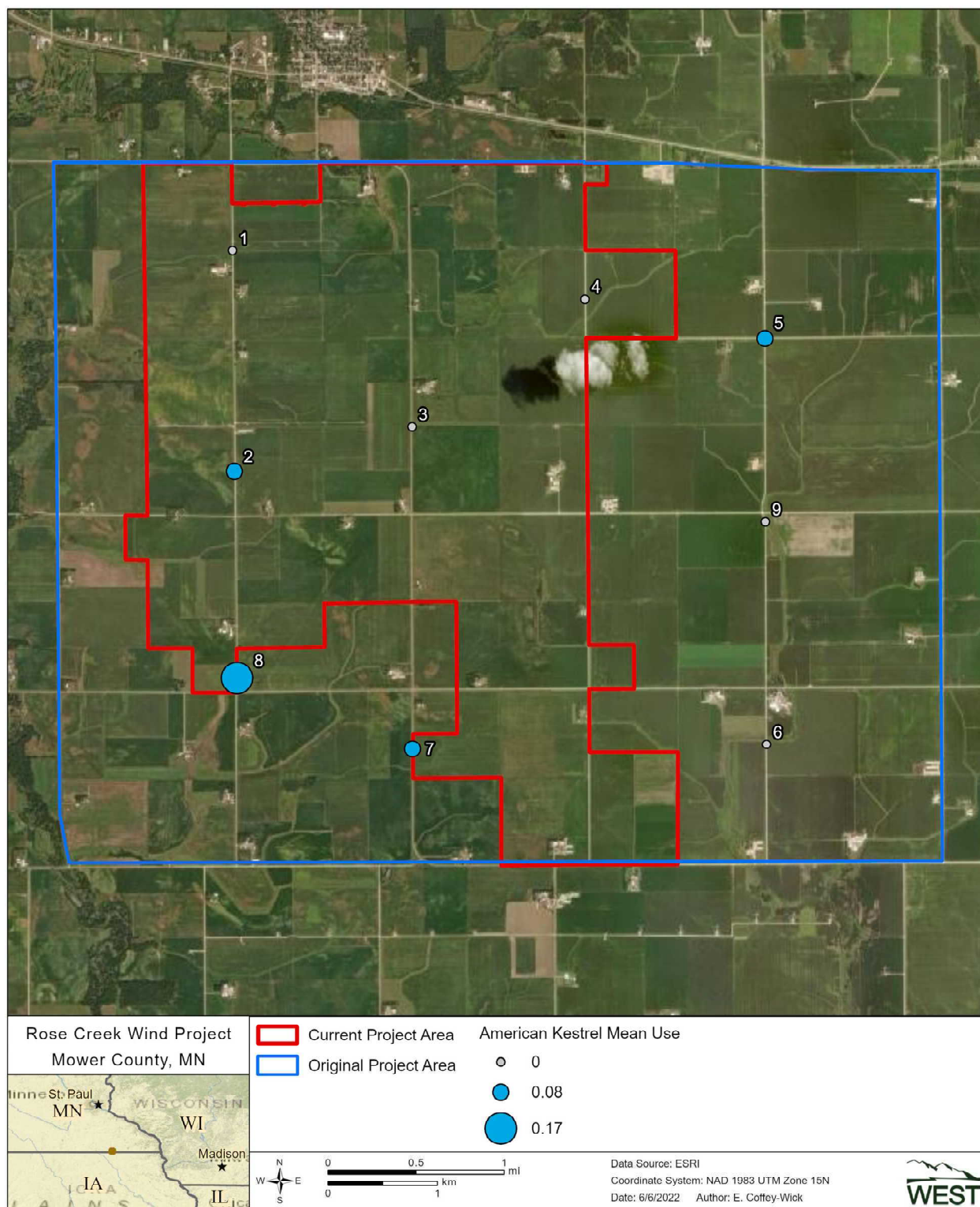
**Appendix D2. American white pelican mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



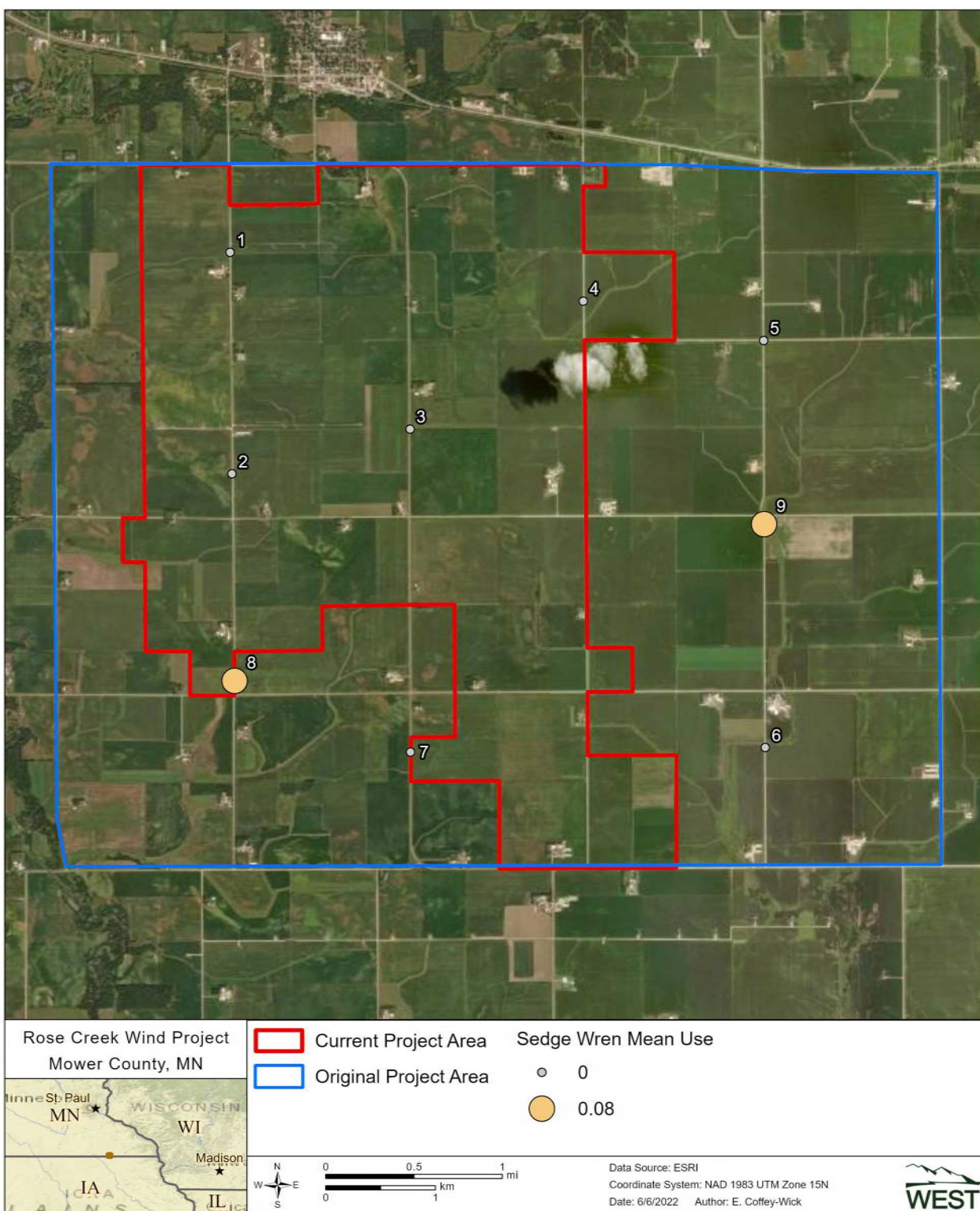
**Appendix D3. Upland sandpiper mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



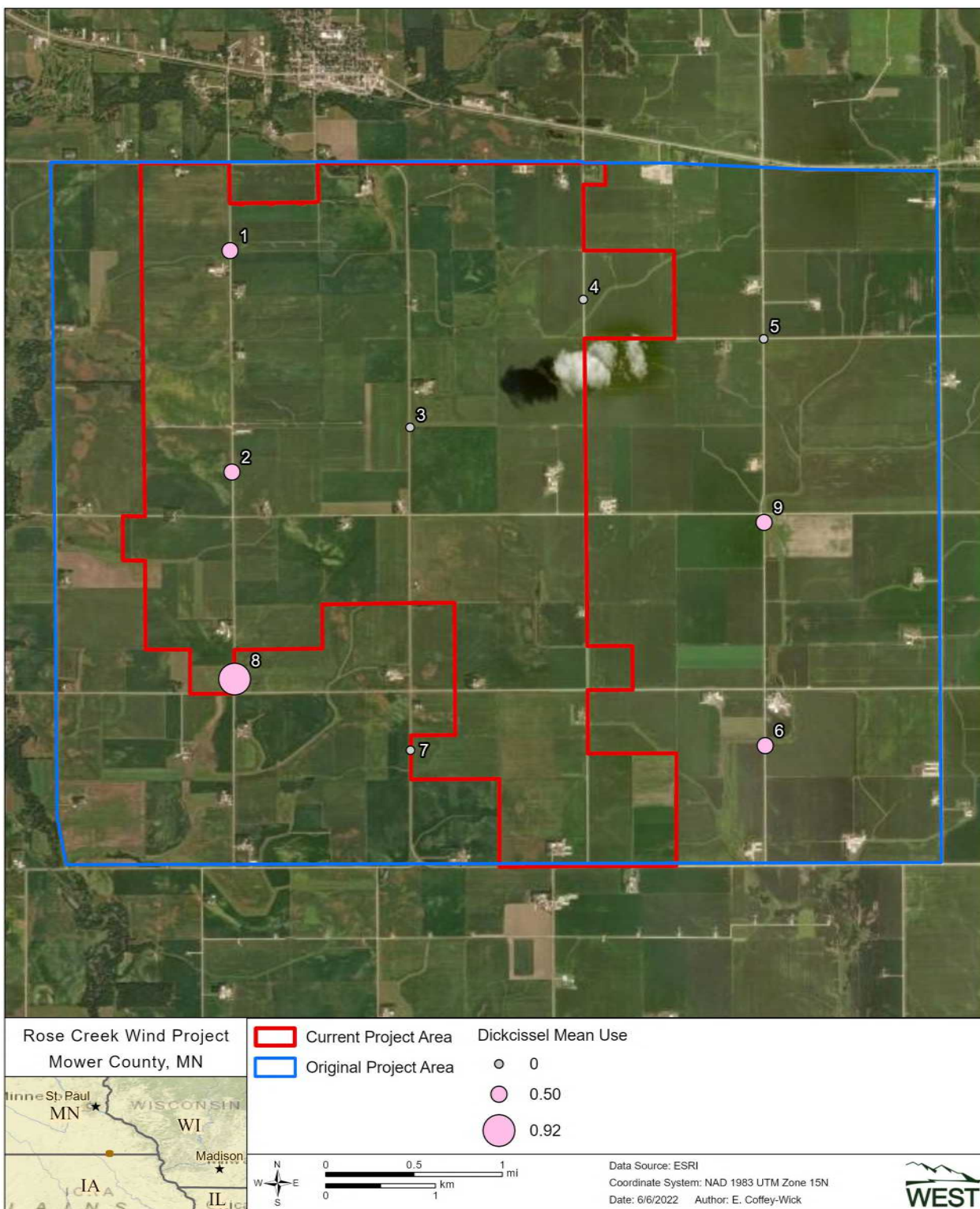
**Appendix D4. Northern harrier mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



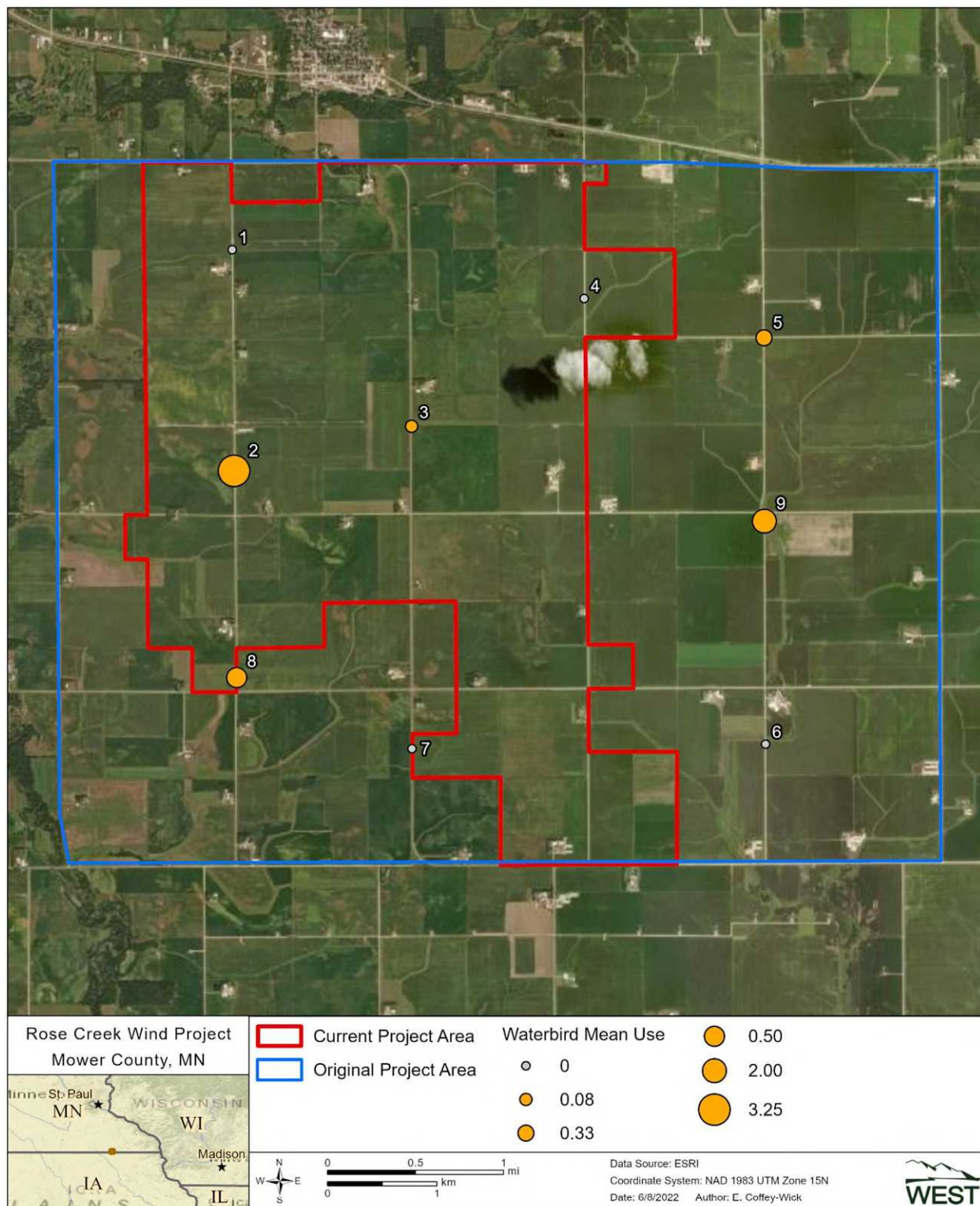
**Appendix D5. American kestrel mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



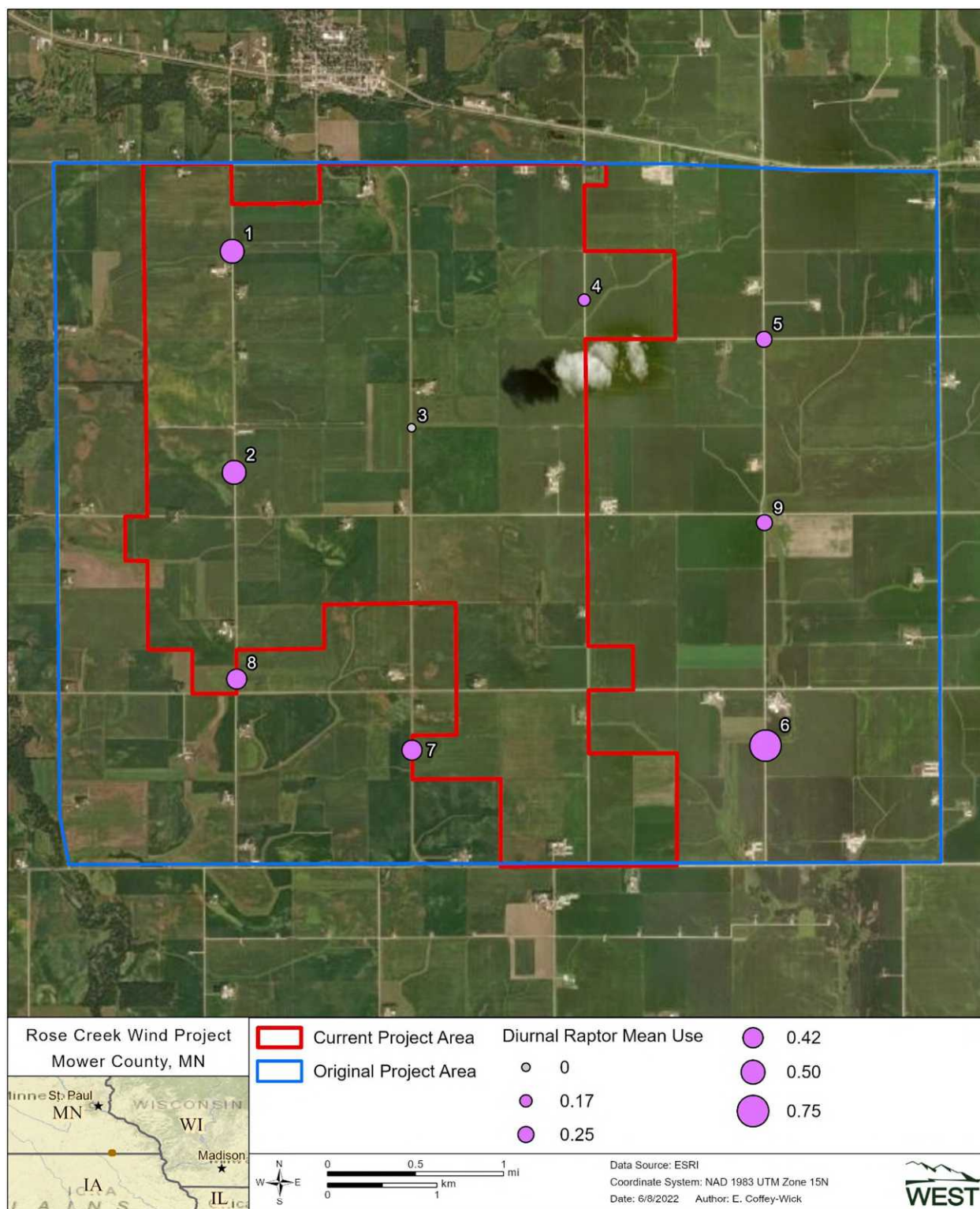
**Appendix D6. Sedge wren mean use by point (number of observations/100-meter plot/10-minute survey) documented during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



**Appendix D7. Dickcissel mean use by point (number of observations/100-meter plot/10-minute survey) documented during small bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



**Appendix D8. Waterbird mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**



**Appendix D9. Diurnal raptor mean use by point (number of observations/800-meter plot/60-minute survey) documented during large bird use surveys for the Rose Creek Wind Project from January to December, 2021.**