APPENDIX M – Wildlife Conservation Strategy / Avian and Bat Protection Plan

Wildlife Conservation Strategy

Dodge County Wind Energy Project

Steele and Dodge Counties, Minnesota

Prepared by:

Dodge County Wind, LLC

700 Universe Boulevard JES/JB
Juno Beach, Florida 33408

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ACRONYMS AND ABBREVIATIONS

ABPP	Avian and Bat Protection Plan
ABPDH	average bat passes per detector hour
ABPDN	average bat passes per detector night
ac	acre, acres
Audubon	The National Audubon Society
AWWI	American Wind Wildlife Institute
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CFR	Code of Federal Regulations
Dodge County	Dodge County Wind, LLC
ECPG	Eagle Conservation Plan Guidance
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE	Federally Endangered
ft	feet, foot
FT	Federally Threatened
GE	General Electric
GIS	geographic information systems
ha	hectares
HDR	HDR Engineering, Inc.
IBAs	Important Bird Areas
IPaC	Information for Planning and Consultation
km	kilometer, kilometers
LWECS	Large Wind Energy Conversion System
m	meter, meters
MBS	Minnesota Biological Survey
MBTA	Migratory Bird Treaty Act
met	Meteorological
mi	mile, miles
MNDOC	Minnesota Department of Commerce
MNDNR	Minnesota Department of Natural Resources
MRLC	Multi-Resolution Land Characteristics
NEER	NextEra Energy Resources, LLC
NHIS	Natural Heritage Information System
NLCD	National Land Cover Database
NLEB	Northern Long-eared bat
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PCMM	Post-Construction Monitoring and Management
PPMP	Prairie Protection and Management Plan
Project	Dodge County Wind Energy Project
PUC	Minnesota Public Utilities Commission
RD	rotor diameters
ReBAT	Remote Bat Acoustic Technology
SE	State Endangered
SPC	Species of Special Concern
SPCC	Spill Prevention, Control, and Countermeasure
ST	State Threatened

USC	United States Code
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WCS	Wildlife Conservation Strategy
WEG	Land-Based Wind Energy Guidelines
WEST	Western EcoSystems Technology
WMA	Wildlife Management Area
WPA	Waterfowl Production Area
WRRS	Wildlife Response & Reporting System

1 INTRODUCTION

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. DCW contracted Western EcoSystems Technology (WEST) to prepare a Wildlife Conservation Strategy (WCS), which will also serve as an Avian and Bat Protection Plan (ABPP). This WCS describes DCW's approach to avoid and/or minimize potential impacts to birds, bats, and species of concern that may result from construction and operation of the Project, outlines a post-construction monitoring program, and addresses adaptive management measures that will be implemented during operation if appropriate. This WCS has been prepared in accordance with the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) 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).

Specifically, this WCS document:

- Provides a framework for fulfilling the application requirements for a Large Wind Energy Conversion System (LWECS) Site Permit anticipated to be issued by the Minnesota Public Utilities Commission (PUC), in accordance with the Chapter 216F, Minnesota Statutes (2018).
- Follows recommendations in the USFWS WEG and state wind energy guidelines for completion of an ABPP (referred to in the WEG as a Bird and Bat Conservation Strategy [BBCS]) and a post-construction fatality monitoring protocol. The ABPP is required in Minnesota per the LWECS site permit application guidance.
- Consolidates documentation of actions already taken and planned efforts to avoid and minimize potential effects on birds, bats, and other sensitive biological and natural resources (e.g., native prairie, federally and state-listed species) during Project planning and development.
- Identifies and implements steps to further reduce the potential for bird and bat fatalities or other potential negative effects on birds and bats at the Project, including the plan for implementation of adaptive management measures, if determined to be appropriate.

Preparation of this WCS draws on Project-specific reports prepared and submitted to DCW, relevant scientific literature, and published reports from nearby wind energy projects. This WCS will be updated as pertinent reports and infrastructure details are finalized. This WCS will remain in effect throughout the Project's operational life; however, this document is subject to revisions at any time as deemed necessary by DCW based on biological, economical, or regulatory circumstances.

1.1 Dodge County Wind Energy Project Description

The Project is located in western Dodge County and eastern Steele County in southeastern Minnesota (Figure 1). In 2014, DCW began its evaluation of this area as a potential suitable site for a wind project. Over time, DCW has adjusted and reduced Project boundaries to minimize the potential impact on the environment and existing land use, as well as to reflect the participation of landowners in the Project.

The estimated size of the Project Area is 28,348 acres (ac; 44.3 square miles) of mostly agricultural land. The size of the Project Area allows some siting flexibility in the event turbine locations currently identified prove to be unsuitable and provides sufficient room for the required setbacks and buffering of sensitive features. The turbines, collector substations, collector lines, meteorological evaluation towers (MET), and Operations and Maintenance (O&M) facility will be sited within the Project Area (Figure 2). In addition, DCW is proposing the construction a 26.8-mile (mi) high voltage transmission line to deliver the output of the Project to the existing Pleasant Valley substation.

The rated capacity of the Project is anticipated to be up to 258.92 MW at the interconnection point. A maximum of 79 turbines are proposed for construction, using 11 General Electric (GE) 2.52 MW wind turbines, and 68 GE 3.4 MW wind turbines. Specifically, the Project will use eight GE 3.4 MW wind turbines with 140-meter (m; 459.3-foot [ft]) RD and 81-m (265.7-ft) hub height, 60 GE 3.4 MW wind turbines with 140-m (459.3-ft) RD and 98-m (321.5-ft) hub height, and 11 GE 2.52 MW wind turbines with 116-m (380.6-ft) RD and 90-m (295.3-ft) hub height.

1.2 Regulatory Framework

DCW has applied the principles of the following regulations and guidance documents in planning for the Project, which influenced decisions regarding siting of wind facility components.

1.2.1 Federal Endangered Species Act

The Endangered Species Act of 1973 (ESA) authorizes the USFWS (while working cooperatively with States) to identify, list, and monitor qualifying species as endangered and threatened. The process by which potential candidates are listed is determined by the vulnerability of the species population considering a number of different factors. Species that are designated as either endangered or threatened are afforded protection from possession, sale, transport, and take. The definition of take is “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” including “incidental take” or significant habitat modification. Take, however, can be permitted by the USFWS through the ESA Section 7 consultation process among federal agencies or by individual permit under ESA Section 10(a)(1)(B) and an accompanying habitat conservation plan.

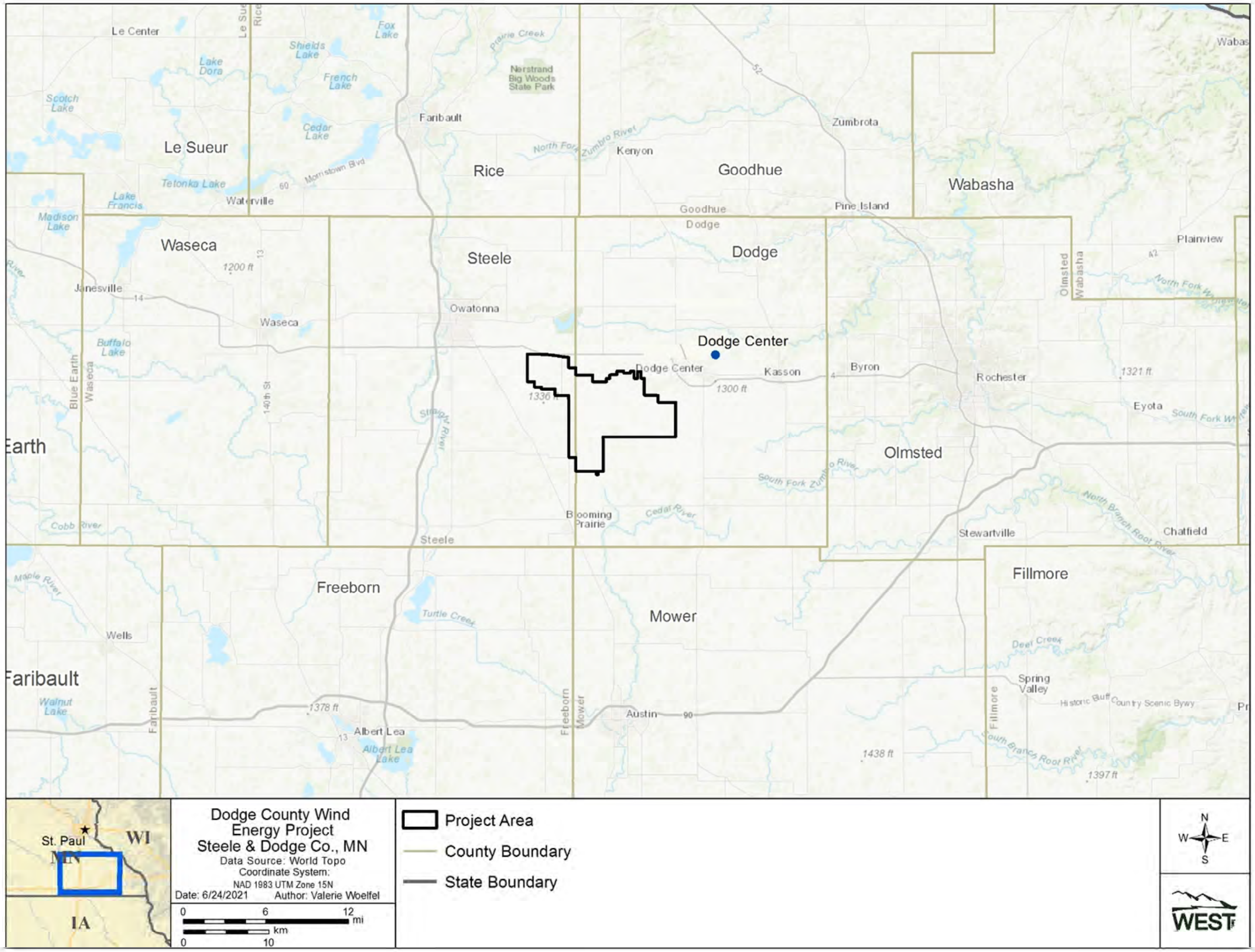

Figure 1. Location of the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

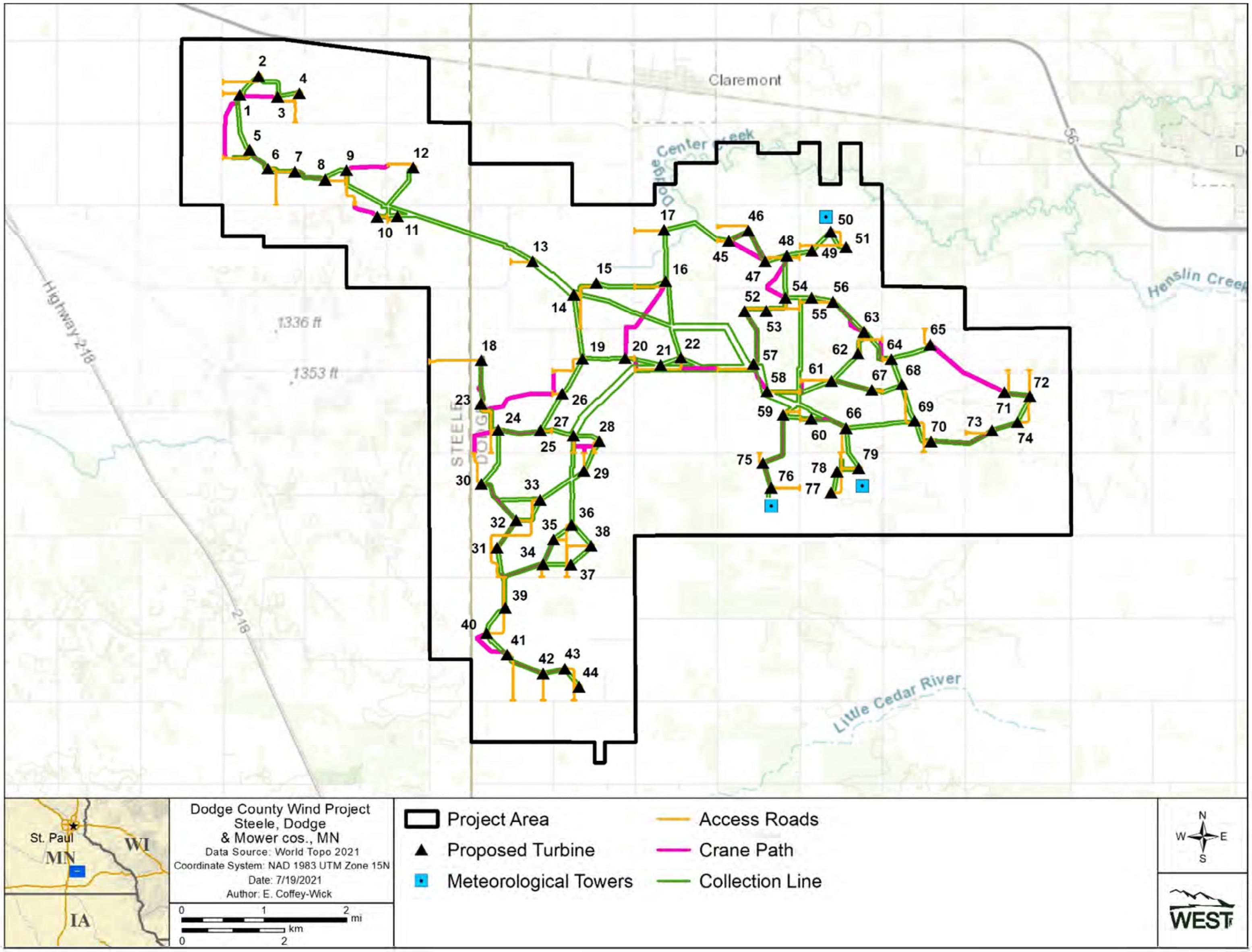

Figure 2. Proposed turbine layout of the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

1.2.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) integrates and implements four international treaties that provide for the protection of migratory birds against hunters and poachers. The MBTA prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." (16 USC § 703; 1918). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." (50 CFR § 10.12; 1973). The USFWS maintains a list of all species protected by the MBTA at 50 CFR § 10.13 (1973). This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

1.2.3 Bald and Golden Eagle Protection Act

Under authority of the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668–668d), bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are afforded legal protections in additional to the MBTA. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. The BGEPA also expands the common law scope of "take"—to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," 16 USC 668c, and includes criminal and civil penalties for violating the statute (see 16 USC 668). The USFWS further defined the term "disturb" as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. The BGEPA specifies that violations must occur "knowingly, or with wanton disregard for his act."

Although the USFWS has promulgated, at 50 CFR § 22.26, voluntary permit regulations that authorize eagle take "associated with, but not the purpose of, an activity," there is considerable legal support for the premise that, as with the MBTA, the BGEPA does not legally prohibit accidental injuries or deaths of eagles. If eagles are identified as a potential risk at a project site, wind energy developers are encouraged by the USFWS to follow the *Eagle Conservation Plan Guidance* (ECPG) (USFWS 2013). The ECPG describes recommended actions to develop wind energy projects while protecting eagles, including guidance for applicants seeking to obtain the above permits.

1.2.4 Minnesota Threatened and Endangered Species Laws

The 2020 Minnesota Statutes, specifically the Endangered Species Statute (Minnesota Statutes § 84.0895 [1981]), includes language protecting state-listed species in Minnesota: "Notwithstanding any other law, a person may not take, import, transport, or sell any portion of an endangered species of wild animal or plant, or sell or possess with intent to sell an article made with any part of the skin, hide, or parts of an endangered species of wild animal or plant, except as provided in subdivisions 2 and 7." The statute directs the Commissioner of the MNDNR to develop lists of endangered species, threatened species, and species of concern (Minnesota Rules, Chapter 6134). Minnesota Rules, Part 6212.2100, does allow for issuance of regulated take of threatened and endangered species in situations when the social and economic benefits of the proposed action outweigh the harm caused by it (Minnesota Statutes § 84.0895 [1981] § Subdiv. 7 [4]). While Minnesota also maintains a species of special concern (SPC) list, SPC are not afforded protection under Minnesota's Endangered Species Statute or the associated Rules.

1.2.5 US Fish and Wildlife Service and Minnesota Wind Energy Guidelines

Until 2012, the USFWS had recommended, and many wind energy companies had developed, ABPPs for wind energy projects. In Minnesota, an ABPP is a standard requirement of the LWECS site permit and documents compliance with the MNDNR and MNDOC wind energy guidelines. With publication of the final WEG, the USFWS began recommending development of a BBCS instead of an ABPP (USFWS 2012). This WCS aligns with recommendations included in both the state wind energy guidelines (Mixon et al. 2014) as well as the WEG guidelines (USFWS 2012) and the USFWS's ECPG (USFWS 2013), and is not limited to birds and bats, hence the WCS nomenclature.

2 US FISH AND WILDLIFE SERVICE'S WIND ENERGY GUIDELINES ASSESSMENT (TIERS 1–3)

The WEG (USFWS 2012) outlines a voluntary tiered approach for assessing risks to wildlife, specifically birds and bats, at a potential wind resource area. The "tiered approach" provides a decision-making process to quantify the possible risks of proposed wind projects to species of concern and their habitats. At each tier, potential issues associated with the development or operations of a project are identified and questions are formulated to guide the decision-making process. The following sections describe the efforts DCW has completed as part of Tiers 1 through 3.

2.1 Site Evaluation and Characterization (Tiers 1 and 2)

As described in the WEG, the Tier 1 and 2 assessments evaluate potential issues that may need to be considered prior to development or operation of a project. Tier 1 studies provide a preliminary evaluation or screening of public data from federal, state, and tribal entities and offer early guidance to project proponents about sensitive wildlife resources found within the site. Tier 2 studies provide an evaluation of effects of the proposed project on any federally listed, state-listed, and other sensitive species. The following section provides a review of the Tier 1 and 2 study evaluations for the Project.

Consistent with the WEG, Tier 1 and 2 Project analyses included a review of sensitive species information, including both private and publicly available geographic information systems (GIS) data, and state and federal agency input to identify environmental constraints near the Project:

- topographic and aerial maps
- state and nationwide land use data
- National Wetlands Inventory (NWI) mapping
- federal and state-listed species lists and databases (e.g., MNDNR Rare Species Guide)

- Minnesota Natural Heritage Information System (NHIS) biotics data
- information published by the USFWS and MNDNR (e.g., MNDNR native plant community data, MNDNR sites of biodiversity significance)
- communications with the agencies (included here as Appendix A)

2.1.1 Ecoregions and Land Cover Types

The Project Area is within the Great Plains Level I ecological region, which extends from the central prairies of Canada to the Gulf of Mexico coast in Texas (Commission for Environmental Cooperation 1997). The Project is located in the Eastern Iowa and Minnesota Drift Plains Level IV Ecoregion, which lies within the Western Corn Belt Plains Level III Ecoregion and is characterized by glaciated till plains and undulating loess plains (US Environmental Protection Agency 2017). The region was once primarily dominated by tallgrass prairie, much of which has been cleared for cropland and livestock (Chapman et al. 2002). According to the 2016 National Land Cover Database (NLCD), cultivated crops compose the majority (92.8%) of the land cover in the Project Area (Table 1, Figure 3). Other land cover types in the Project Area include developed/disturbed areas (3.2%), deciduous forest (1.2%), hay/pasture (1.1%), wetlands (0.9%), and herbaceous/grasslands (0.7%; Table 1, Figure 3). All other land cover types each compose less than 1.0% of the Project Area.

Table 1. Land cover types, coverage, and percent composition at the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Land Cover	Acres	Hectares	% Composition
Cultivated Crops	26,321.0	10,651.7	92.8
Disturbed/Developed	911.5	368.9	3.2
Deciduous Forest	338.4	136.9	1.2
Hay/ Pasture	322.6	130.6	1.1
Herbaceous	202.6	82.0	0.7
Woody wetlands	128.8	52.1	0.5
Emergent herbaceous wetland	106.8	43.2	0.4
Mixed forest	10.8	4.4	<0.1
Barren Land	5.3	2.1	<0.1
Open water	0.2	0.1	<0.1
Total	**28,348.1**	**11,472.1**	**100**

Source: National Land Cover Database 2016

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

2.1.2 Wetlands and Waterbodies

Because of limitations in satellite resolution used to generate NLCD data, (Table 1; NLCD 2016), the USFWS NWI estimates of wetland coverage within the Project Area are more reliable for large-scale project use, particularly for small or ephemeral wetlands. According to the NWI (NWI 2020), there are 676 ac (273 ha) of wetlands within the Project Area, with the majority classified as freshwater emergent wetland (66.6%; Table 2, Figure 4). All wetland types comprise 2.4% of the Project Area. No large lakes occur within the Project Area; however, Rice Lake is located approximately 1.9 mi (3.1 km) to the north (Figure 4).

Table 2. Wetland types present within the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

	Wetland Area		% Composition	
Wetland Type	**Acres**	**Hectares**	**Wetland**	**Project**
Freshwater Emergent Wetland	450	182	66.6%	1.6%
Freshwater Forested/Shrub Wetland	189	76	28.0%	0.7%
Riverine	24	10	3.6%	0.1%
Freshwater Pond	12	5	1.8%	<0.1%
Total	**676**	**273**	**100%**	**2.4%**

Source: US Fish and Wildlife Service National Wetlands Inventory 2020

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

2.1.3 Federal, State and Private Conservation Lands

The majority of the Project Area (99.9%) is located on privately owned lands. According to the US Geological Survey (USGS) Protected Areas Database of the US (2018), one federally owned Waterfowl Production Area (WPA), the Dodge Center Creek WPA, is present directly adjacent to the Project Area's western boundary (Figure 5). The state-owned Marsh Wren Wildlife Management Area (WMA) is located 0.5 mi from the Project's western boundary and Hythecker Prairie Scientific and Natural Area (SNA) is located within the northwestern portion of the Project Area (39.3 ac; Figure 5). In addition, the state-owned McMartin WMA partially overlaps the Project's northern border (0.5 ac; Figure 5). No mapped private conservation lands are located in or near the Project (USGS 2018, The Nature Conservancy 2020). No turbines are sited within any of the federal or state-owned lands. Non-participating landowners, including publicly held lands, are buffered from the Project turbines by a minimum of three RDs (1,141.7 – 1,377.9 ft [348.0 – 420.0 m]) in the non-prevailing wind direction and five RDs (1,902.9 – 2,296.6 ft [580.0 – 700.0 m]) in the prevailing wind direction, as required under Minnesota LWECS statutes. Based on the siting locations and setbacks, no impacts to federal and state-owned lands are expected from the construction or operation of the Project.

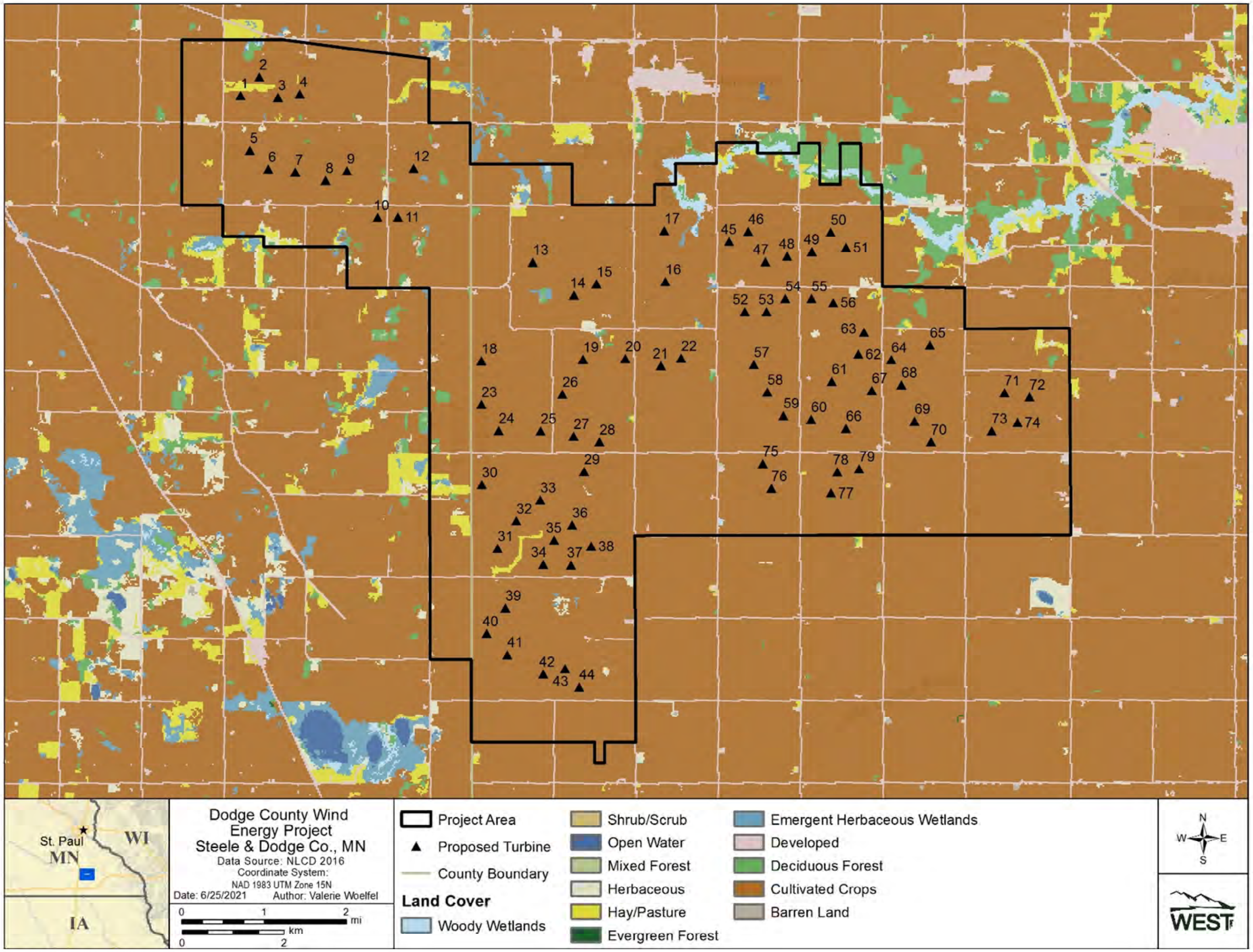

Figure 3. Land cover types in and near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

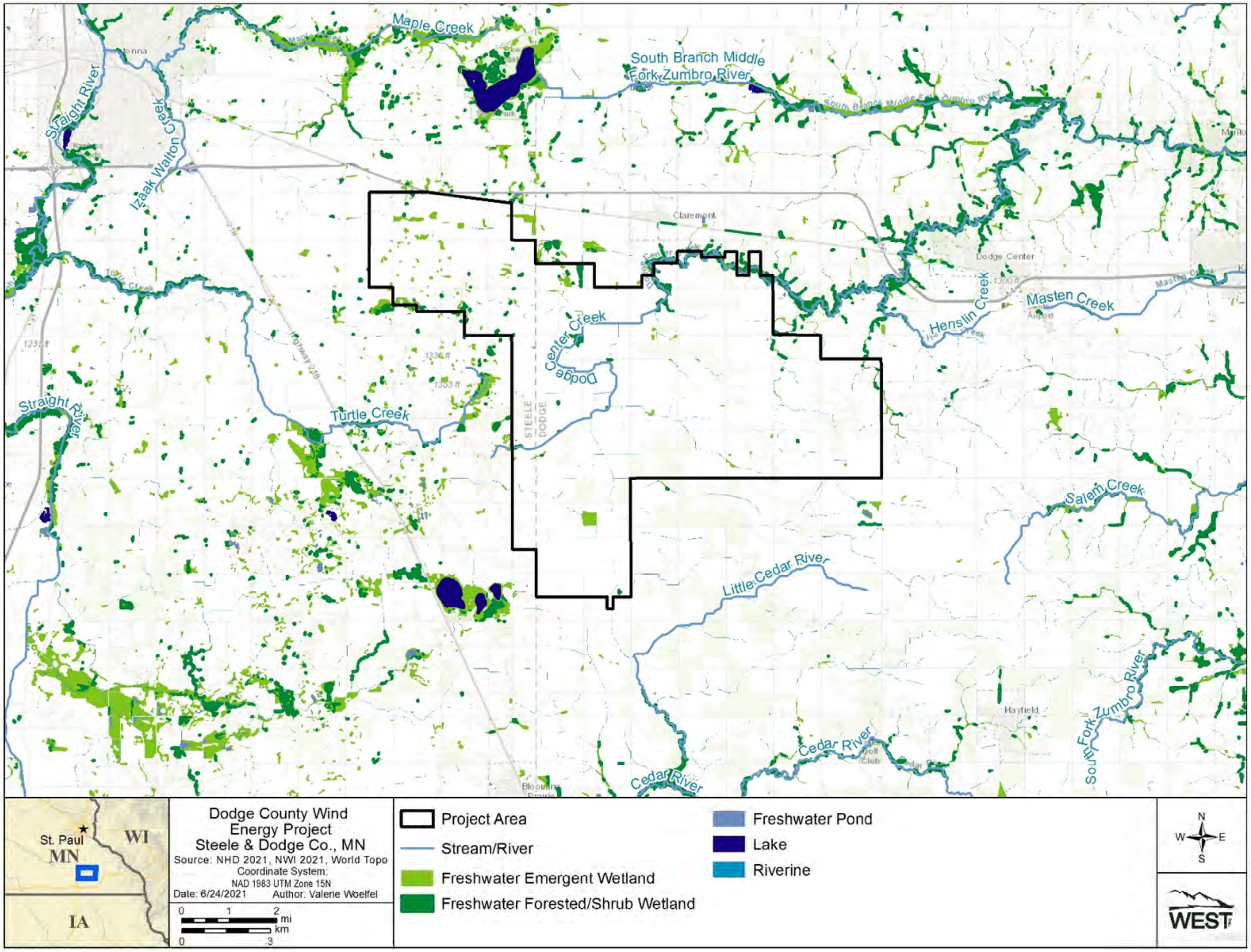

Figure 4. National Wetlands Inventory wetland types located in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

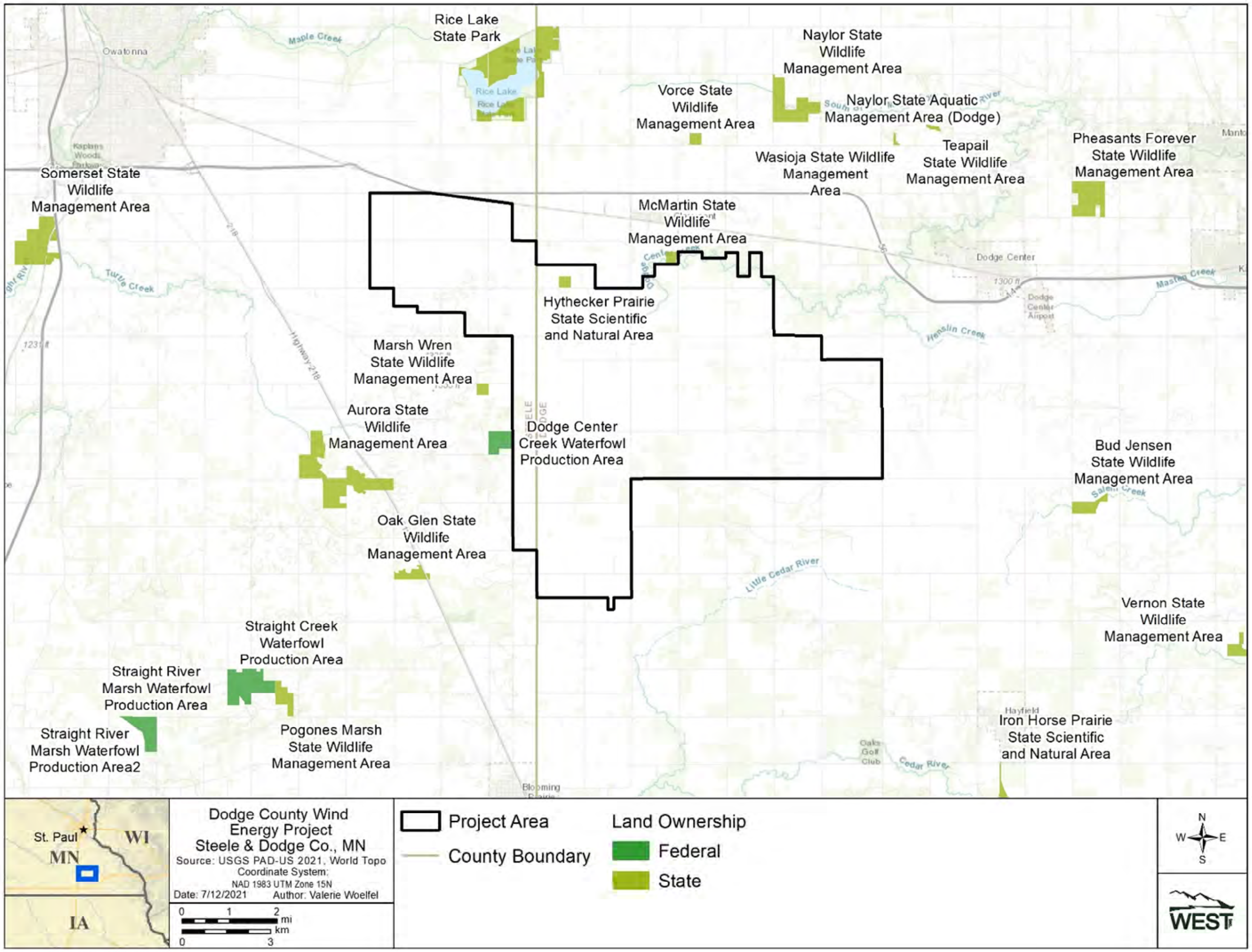

Figure 5. State- and federally owned conservation land located in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

2.1.4 Important Bird Areas

The National Audubon Society (Audubon) has identified Important Bird Areas (IBAs) that provide essential habitat for breeding, wintering, and/or migrating bird species and are important for the conservation of bird populations (Audubon 2019a). No IBAs are located within the Project Area (Figure 6). The closest IBA is the Blufflands-Root River state-priority IBA, located approximately 25 mi (40 km) southeast of the Project (Figure 6).

2.1.5 Native Plant Communities

Review of the MNDNR native plant community data and NHIS database identified 30 mapped native plant communities within one mi of the Project, 13 of which are located within the Project Area (Figure 7; MNDNR 2020a). Most, but not all, of the native plant communities coincide with areas of high biodiversity significance (see Section 2.1.6; Figure 8). Two native prairie remnants totaling 26.1 ac (10.6 ha) occur within the Project Area, both are southern wet prairies and overlap Hythecker Prairie SNA (Figure 7). These prairie remnants provide some of the last and best quality remaining native prairie habitat in Minnesota (MNDNR 2020a). Current Project layout has no turbines or associated infrastructure sited in areas identified by MNDNR as native prairie.

The remaining 11 native plant communities encompassing 220.5 ac (89.2 ha) within the Project Area are forest communities located along Dodge Center Creek, including Elm – Basswood – Black Ash – (Hackberry) Forest, Elm – Ash – Basswood Terrace Forest, and Sugar Maple – Basswood – (Bitternut Hickory) Forest (Figure 7). Current Project layouts have no turbines or associated infrastructure sited on areas identified by MNDNR as forested native plant communities.

2.1.6 Areas of Biodiversity Significance

The Minnesota Biological Survey (MBS) is an effort by the MNDNR that systematically maps and ranks the biodiversity significance of functional landscapes across the state. The survey has led to the development of geospatial databases that represent the highest quality native plant communities remaining in surveyed counties, and sites of biodiversity significance within Minnesota that can help with decision making when planning development and conservation efforts. Biodiversity significance ranks include outstanding, high, moderate, and below. Sites with a rank of “outstanding” contain the rarest species and examples of the rarest native plant communities and/or the largest, most ecologically intact or functional landscapes. Sites with a rank of “high” contain very good quality occurrences of the rarest species, high-quality native plant communities or important functional landscapes. Sites with a rank of “moderate” contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes. Sites ranked “below” lack occurrences of rare species or do not meet MBS standards for other rankings.

The Project Area contains six areas of biodiversity significance, encompassing 373.4 ac (151.1 ha; Figure 8; MNDNR 2020b). Two areas are classified as having “high” levels of biodiversity (Hythecker Prairie and the forest communities along Dodge Center Creek) and one site is classified as having a “moderate” level of biodiversity. Three sites are classified as “below” MBS standards (associated with the WPA, WMAs, wetland areas, and road swales). No areas classified as “outstanding” occur within the Project Area. Current Project layouts have no turbines or infrastructure sited in areas identified by MNDNR as sites of high or moderate biodiversity significance. One Project access road and a collection line cross one site ranked as below biodiversity significance near turbine 64. Approximately 0.5 ac will be temporarily impacted, and approximately 0.03 ac will be permanently impacted; review of recent aerials indicates that these proposed impacts all occur in previously disturbed areas (road ditches and cultivated fields) within the polygon ranked as below.

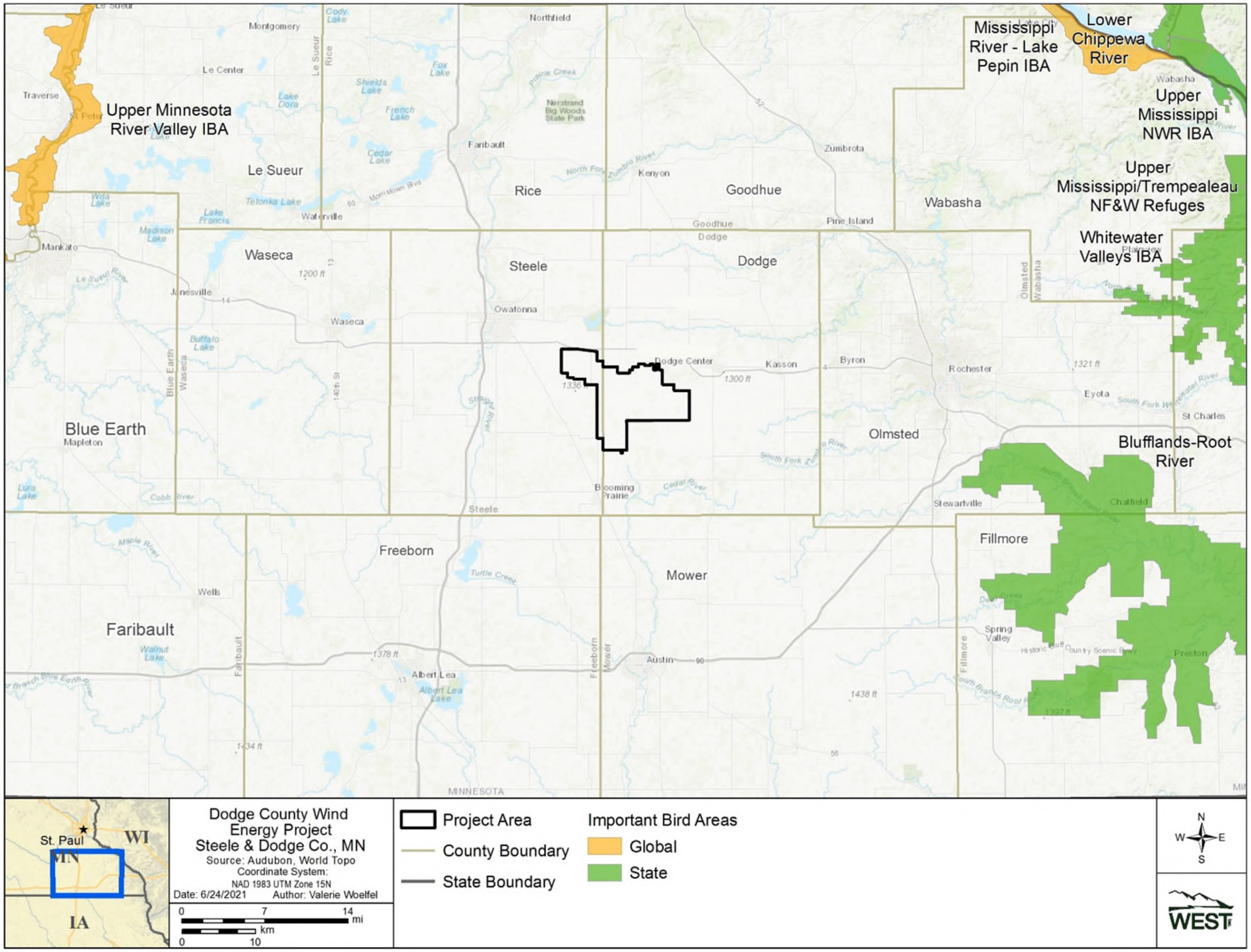

Figure 6. Important Bird Areas located in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

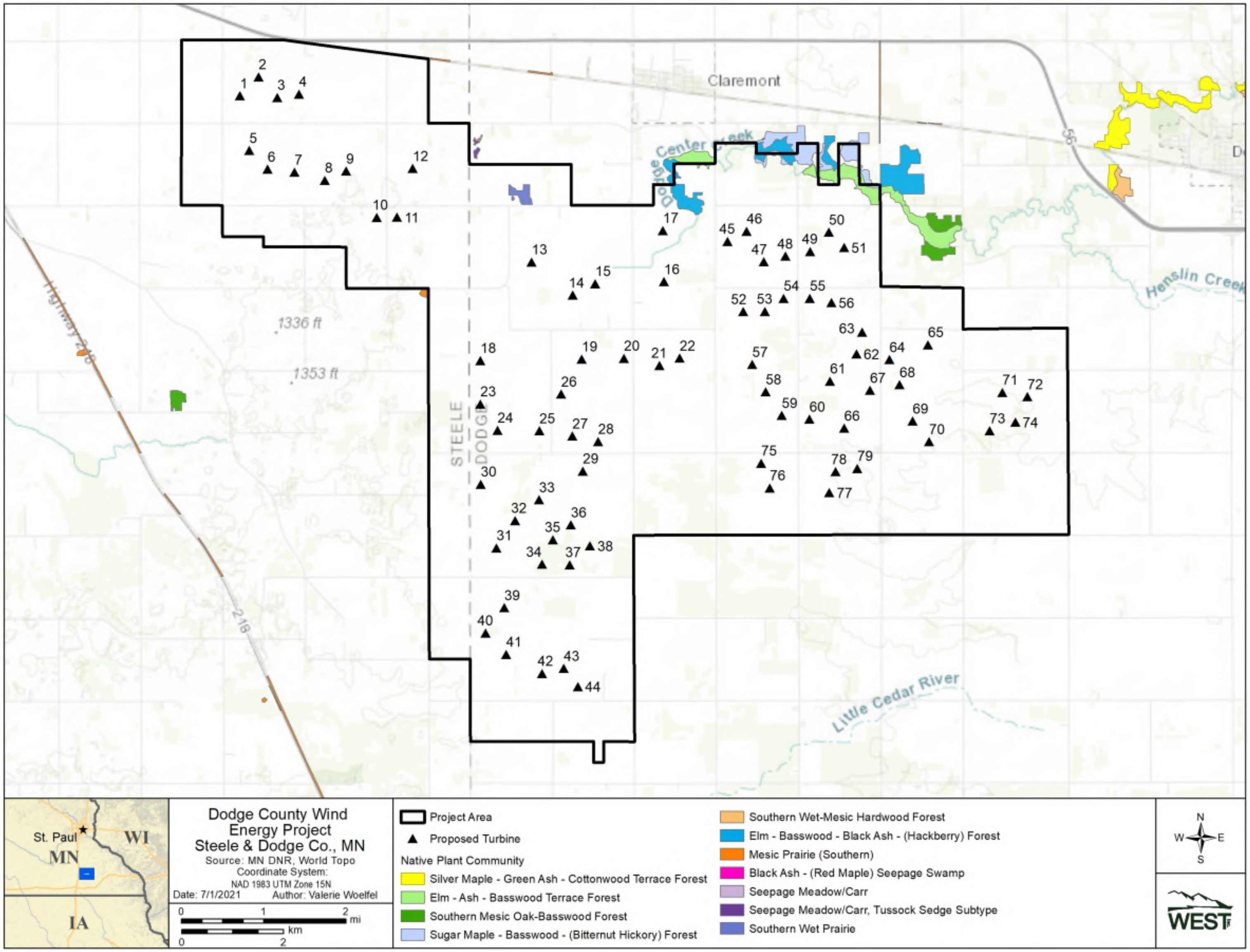

Figure 7. Native plant communities located in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

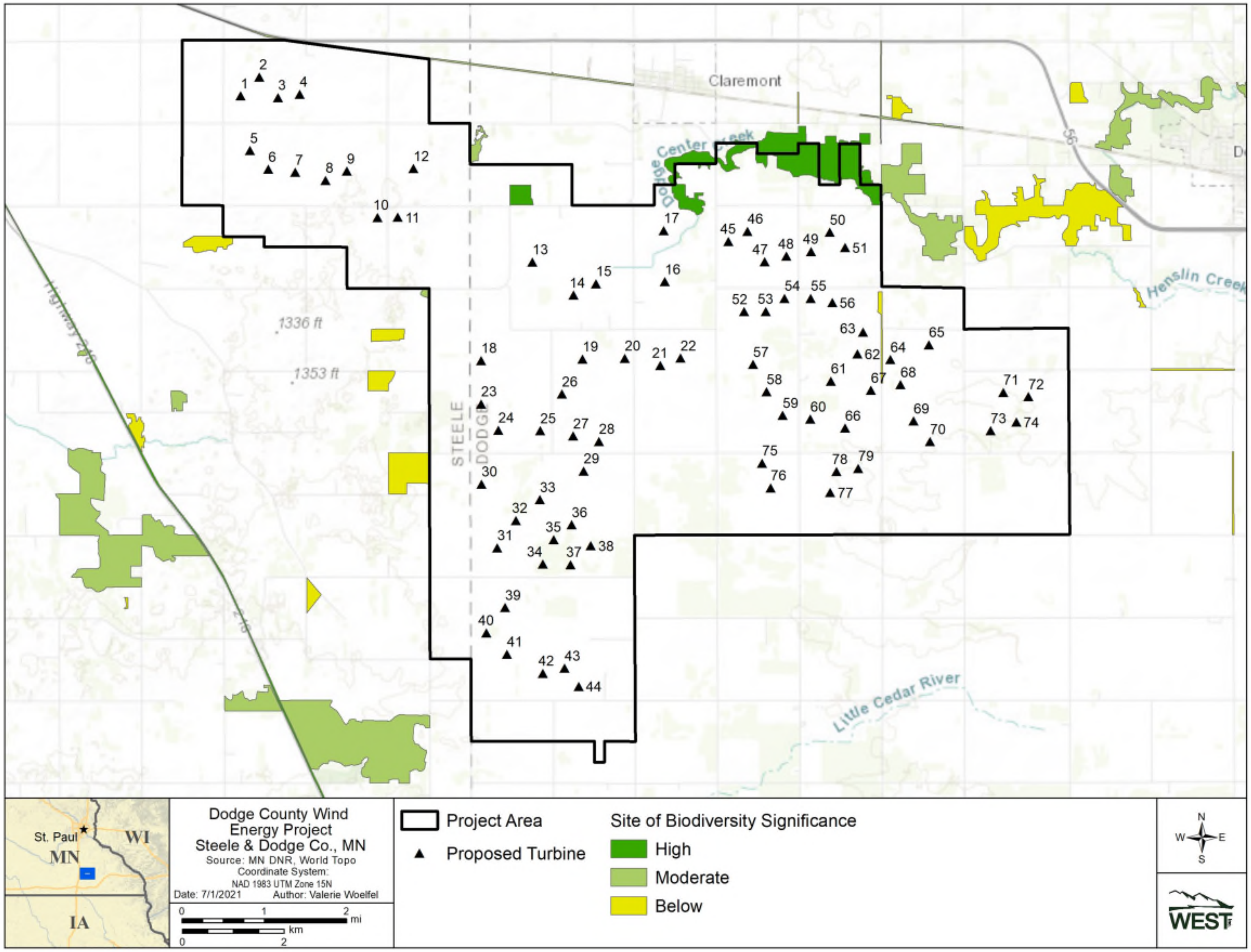

Figure 8. Areas of biodiversity significance located in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

2.1.7 Federally and State-listed Species

Based on a desktop review of the MNDNR Rare Species Guide, and the MNDNR NHIS review (2018 NHIS Review Letter [MNDNR 2018a], 2020 NHIS data review [MNDNR 2020aa], and 2020 NHIS Review email [MNDNR 2020ab]), 28 federal and/or state-listed threatened or endangered wildlife and plant species have the potential to occur in Steele and Dodge counties (MNDNR 2020c). Of these, only 10 species have potential to occur within the Project Area and a 1-mi buffer based on the USFWS Information for Planning and Consultation (IPaC) database (USFWS 2021a), records of occurrence from the MNDNR NHIS review and check of the NHIS database (MNDNR 2018a, MNDNR 2020a), or Project surveys (Table 3). Federally listed species include the northern long-eared bat (NLEB; *Myotis septentrionalis*; federally threatened) and the prairie bush clover (*Lespedeza leptostachya*; federally and state-listed threatened). Critical habitat has not been designated for either species. State-listed species include Henslow's sparrow (*Centronyx henslowii*), horned grebe (*Podiceps auritus*), loggerhead shrike (*Lanius ludovicianus*), butternut (*Juglans cinerea*), edible valerian (*Valeriana edulis* var. *ciliata*), Sullivant's milkweed (*Asclepias sullivantii*), tubercled rein orchid (*Platanthera flava* var. *herbiola*), and tuberous Indian plantain (*Arnoglossum plantagineum*). Table 3 below provides habitat information for each species and the potential for occurrence within the Project Area. It should be noted, many of the compiled NHIS records are greater than 20 years old, and as such, may represent a historic, not current distribution of these species within the state. The potential for these species to occur is low to moderate, as native habitats, sites of biodiversity significance, and protected areas are generally limited within the Project Area (approximately 439 ac (178 ha; 1.5% of the Project Area).

2.1.8 Bald Eagle

In Minnesota, bald eagles generally nest in large pine (*Pinus* spp.), cottonwood (*Populus deltoides*), or aspen (*Populus* spp.) trees near lakes and rivers, historically in remote areas (MNDNR 2019b). Bald eagles have expanded their nesting range from northern Minnesota and currently nest throughout much of the state (MNDNR 2019a). Winter bald eagle congregation areas generally occur along the Mississippi River near Red Wing and Wabash, Minnesota starting in November (MNDNR 2019c).

Due to population declines in the 1960s, bald eagles were listed as threatened in Minnesota when the state created its endangered species list in 1984 (MNDNR 2019d). In coordination with the USFWS, the MNDNR conducted eagle surveys in 2000 and 2005, prior to the federal delisting of the bald eagle in 2007. These surveys indicated a 20% increase in nesting bald eagles between survey years (MNDNR 2019e). While the 2005 survey did not detect any bald eagle nests in Steele or Dodge counties, the southeastern region of Minnesota showed a 5.0% increase in bald eagle nests from 2000 to 2005 (MNDNR 2006). This successful comeback resulted in the decision to end the MNDNR's statewide eagle nest surveys in Minnesota and contributed to the state and federal delisting of the species in 2007 (MNDNR 2019d); however, some USFWS nest monitoring continues across the state (MNDNR 2019e) and bald eagles are still protected under both the MBTA and BGEPA.

The eBird database provides an insight to bald eagle abundance; however, observations included in eBird by birders should be interpreted with caution. Within the past 10 years (2010 through 2020), bald eagle observations have been reported to eBird in and near the Project year-round, with most observations reported in the late fall, winter, and early spring (eBird 2020). Based on eBird data, bald eagle use of the area has the potential to be higher during spring and fall migration periods; however, bald eagle use is possible year-round.

Bald eagles are a possible but unlikely breeder within the Project Area due to limited preferred nesting habitat, which is primarily located along Dodge Center Creek. If bald eagle density continues increasing, and breeding expands into less suitable nesting areas, bald eagles may eventually utilize less suitable woodlot habitats to nest within the Project Area.

2.1.9 Minnesota Species of Special Concern

While not protected by Minnesota's Endangered Species Statute or associated Minnesota Rules, Minnesota SPC are extremely uncommon or have unique or highly specific habitat requirements and require special monitoring of their status in Minnesota (MNDNR 2020h). Species on the periphery of their range or species previously listed as threatened or endangered that now have stable populations may also be included in this category.

Based on a desktop review, 40 SPC have the potential to occur in Steele and Dodge counties (MNDNR 2020c). Of these, only 17 species have records of occurrence within the Project Area and a 1-mi buffer, were included in the 2018 NHIS Review Letter (MNDNR 2018a), or were observed during Tier 3 surveys for the Project (Table 4). As noted above, many of the NHIS records are greater than 20 years old, and as such, may represent a historic, rather than current distribution of these species within the state. Nine special concern bird species have been documented during Tier 3 avian use surveys at the Project and seven of these species were highlighted by the MNDNR in the 2018 NHIS Review Letter, discussed in Table 4 and Section 2.2 below.

Table 3. Federal and state-listed species known to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota. Observations of species in MNDNR Natural Heritage Information System (NHIS) are indicated by township-range-section and last documented occurrence

Species	Status	Habitat	Potential for Occurrence in the Project Area
Mammals			
Northern long-eared bat *Myotis septentrionalis*	FT, SPC	Hibernates in caves and underground mines in winter; mature upland forests and wooded riparian area used for roosting and foraging in summer. (USFWS 2021, MNDNR 2018y)	Low potential to occur within Project Area due to the presence of marginal suitable habitat during summer, and the lack of winter hibernacula (MNDNR and USFWS 2020; no NHIS records within 1-mile of the Project; however, this species was identified by the USFWS IPaC tool).
Birds			
Henslow's sparrow *Centronyx henslowii*	SE	Prefers large (over 247 acres [100 hectares]; MNDNR 2020n) and expansive reclaimed old fields, undisturbed grasslands, and areas with tall vegetation, plant stalks for perching and a substantial litter layer, but not areas with too much brush. (Cooper 2012)	Moderate potential to occur within the Project Area due to the presence of limited suitable habitat and recent observations; possible but low likelihood of breeding or nesting within the Project Area due to limited suitable habitat. (Henslow's sparrow was not included in the NHIS records query for the Project; however, Tier 3 studies [HDR 2017; Boone 2017] documented this species at three locations near the current Project Area and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.)
Horned grebe *Podiceps auritus*	SE	Prefers open fresh-water with emergent vegetation and marsh habitats during breeding season and marine waters in winter (MNDNR 2020m, Stedman 2020).	Low potential to occur within the Project Area due to limited open water (horned grebe was not included in the NHIS records query for the Project; however, Tier 3 studies [Atwell 2018 and HDR 2017] documented this species at the Oak Glen wetland complex within one mile of the Project).
Loggerhead shrike *Lanius ludovicianus*	SE	Found in grasslands with short grasses and scattered perching sites (e.g., hedgerows, shrubs, small trees). Native prairies, pastures, shelterbelts, cemeteries, grassy roadsides, farmyards, old fields, or orchards can all provide suitable habitat for this species (MNDNR 2018a).	Low potential to occur within the Project Area due to the presence of limited suitable habitat and recent observations (loggerhead shrike was not included in the NHIS records query for the Project; however, this species was observed in Tier 3 studies seven miles east of the Project Area [Boone 2017], and the MNDNR included discussion of this species in the 2018 NHIS Review Letter).

Table 3. Federal and state-listed species known to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota. Observations of species in MNDNR Natural Heritage Information System (NHIS) are indicated by township-range-section and last documented occurrence

Species	Status	Habitat	Potential for Occurrence in the Project Area
Plants			
Butternut *Juglans cinerea*	SE	Occurs in northern and central mesic hardwood forests and southern mesic hardwood forests, particularly on river terraces several feet above the active floodplain (MNDNR 2018b).	Low potential to occur within the Project Area due to lack of suitable habitat; suitable habitat (i.e., southern mesic oak-basswood forest [Figure 7]) is present within 1-mile of the Project Area (last NHIS observation in T107N R18W Section 34 in 2009, outside of the Project Area, but within one mile).
Edible valerian *Valeriana edulis var. ciliata*	ST	Moist, sunny, calcareous habitats including calcareous fens, wet meadows, and moist prairies; often found along railroad right-of-ways and co-occurring with species such as Sullivant's milkweed, small white lady's slipper, and tuberous Indian plantain (MNDNR 2020d).	Moderate potential to occur within the Project Area due to the presence of limited suitable habitat and records in Hythecker Prairie SNA. Outside of Hythecker Prairie, relatively potential of this species to occur – expected to be limited to the wet prairies located within the Project Area (Figure 7; last NHIS observation in T107N R18W Sections 29 and 30 in 2016 along a railroad right-of-way outside of the Project Area, but within one mile).
Prairie bush clover *Lespedeza leptostachya*	FT, ST	Mesic to dry tallgrass prairies on steep slopes with sandy and gravely soils (MNDNR 2020e, USFWS 2019).	Low potential to occur within the Project Area due to lack of suitable habitat (no NHIS records within 1-mile of the Project; however, this species was identified by the USFWS IPaC tool).
Sullivant's milkweed *Asclepias sullivantii*	ST	Undisturbed wet and mesic tallgrass prairies; often found co-occurring with tuberous Indian plantain (MNDNR 2020f).	Low potential to occur within the Project Area (last NHIS observation in T106N R18W Section 24 in 2009 within the Project Area). While limited suitable habitat is present (i.e., mapped MNDNR wet prairies within the Project Area [Figure 7]), the Sullivant's milkweed screening for the Project concluded that the potential for occurrence is low, despite prior NHIS records of its occurrence (see Section 2.2.5; Markhart 2021).

Table 3. Federal and state-listed species known to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota. Observations of species in MNDNR Natural Heritage Information System (NHIS) are indicated by township-range-section and last documented occurrence

Species	Status	Habitat	Potential for Occurrence in the Project Area
Tubercled rein orchid *Platanthera flava var. herbiola*	ST	Sunny moist to wet meadows or savannas with moist, acidic, sandy soil; most often found in high-quality prairie remnants (MNDNR 2018c).	Low potential to occur within the Project Area due to the presence of limited suitable habitat (i.e., the wet prairies located within the Project Area [Figure 7]) and the lack of recent NHIS records of occurrence (last NHIS observation in T107N R18W Sections 25 and 36 in 1999, outside of the Project Area, but within one mile).
Tuberous Indian plantain *Arnoglossum plantagineum*	ST	Undisturbed, moist prairies; often found along railroad right-of-ways co-occurring with Sullivant's milkweed (MNDNR 2020f).	Moderate potential to occur within the Project Area due to the presence of limited suitable habitat and records in Hythecker Prairie SNA. Outside of the Hythecker Prairie SNA, relatively low potential for this species – expected to be limited to the wet prairies located within the Project Area (Figure 7; last NHIS observation in T107N R19W Section 21 in 1978, outside of the Project Area, but within one mile). Known to occur within the Hythecker Prairie SNA.

FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened; SPC = State Special Concern

Source: US Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) database 2021a; Minnesota Department of Natural Resources (MNDNR) 2020h; MNDNR 2018a; MNDNR Natural Heritage Information System 2020aa.

Table 4. Minnesota Species of Special Concern know to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Species	Habitat	Potential for Occurrence in the Project Area
Birds		
Acadian flycatcher *Empidonax virescens*	Prefers large tracts of mature deciduous forest; often found near streams or wetlands (MNDNR 2020o).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (HDR 2017).
American white pelican *Pelecanus erythrorhynchos*	Large, shallow waterbodies with abundant fish communities for foraging; nesting sites are generally flat, bare, and isolated islands (MNDNR 2020p).	Moderate potential for occurrence within the Project Area as a regular seasonal migrant, despite apparent limited suitable nesting habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018, HDR 2017) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Bell's vireo *Vireo bellii*	Prefers shrub thickets bordering open habitats (e.g., grasslands or wetlands; MNDNR 2020q).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Boone 2017)
Forster's tern *Sterna forsteri*	Extensive marshes with emergent freshwater vegetation and open water (MNDNR 2020r).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018, HDR 2017) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Franklin's gull *Leucophaeus pipixcan*	Large prairie marshes with open water or low vegetation density are important for breeding; wet pastures and farm fields are used for foraging (MNDNR 2020s)	Moderate potential for occurrence within the Project Area as a regular seasonal migrant, despite apparent limited suitable nesting habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018, HDR 2017) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Peregrine falcon *Falco peregrinus*	Nests on cliff edges along rivers and lakes or on buildings and bridges; prefer non-forested areas for hunting (MNDNR 2020t).	Moderate potential for occurrence within the Project Area as a regular seasonal migrant, despite apparent limited suitable nesting habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018, HDR 2017) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.

Table 4. Minnesota Species of Special Concern know to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Species	Habitat	Potential for Occurrence in the Project Area
Purple martin *Progne subis*	Forage over developed areas, open fields, streams and rivers, and open water habitats; nest primarily in manmade structures (MNDNR 2020u).	Moderate potential for occurrence within the Project Area as a regular seasonal migrant, despite apparent limited suitable nesting habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Short-eared owl *Asio flammeus*	Found in open habitats such as prairie, pasture, grasslands, and sedge meadows; prefer large tracts of habitat (MNDNR 2020v).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Trumpeter swan *Cygnus buccinator*	Small ponds or lakes with extensive emergent vegetation (e.g., cattails; MNDNR 2020w).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat; possible but low likelihood of breeding or nesting within the Project Area due to limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Atwell 2018) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Bats		
Big brown bat *Eptesicus fuscus*	Caves and mines are used for winter roosting and hibernation; summer foraging areas are primarily comprised of forested habitats (MNDNR 2020x).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Normandeau Associates 2014, Hyzy et al. 2021) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Little brown bat *Myotis lucifugus*	Caves, tunnels, cellars, and mines are used for winter roosting and hibernation. Forested habitats are used for summer foraging and bridges, buildings, and attics are used for summer roosting (MNDNR 2020y).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Normandeau Associates 2014, Hyzy et al. 2021) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.

Table 4. Minnesota Species of Special Concern know to occur or with the potential to occur in or near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Species	Habitat	Potential for Occurrence in the Project Area
Tri-colored bat *Perimyotis subflavus*	Caves, mines, and tunnels are used for winter roosting and hibernation. Often roost singly in trees in the summer and use forested areas for summer foraging (MNDNR 2020z).	Moderate potential for occurrence within the Project Area due to the presence of limited suitable habitat. This species was not included in the NHIS query for the Project; however, this species was observed in Tier 3 surveys (Normandeau Associates 2014, Hyzy et al. 2021) and the MNDNR included discussion of this species in the 2018 NHIS Review Letter.
Invertebrates		
Creek heelsplitter *Lasmigona compressa*	Creeks, small rivers, and upstream segments of large rivers with sand, fine gravel, and mud substrates and swift currents (MNDNR 2020i).	Low potential for occurrence within the Project Area due to the presence of limited suitable habitat (i.e., Dodge Center Creek [Figure 7]) and a lack of recent known occurrences (last NHIS observation in 1988).
Plants		
Green dragon *Arisaema dracontium*	Wet and floodplain forests with canopies trees such as maple spp., cottonwood, elm spp., green ash, black walnut, and basswood (MNDNR 2018d).	Moderate potential for occurrence within the Project Area due to the presence of suitable habitat (i.e., the forest communities along Dodge Center Creek [Figure 7]; last NHIS observation in 2009).
Plains wild indigo *Baptisia bracteata* var. *glabrescens*	Dry to mesic prairies and savannas; often found along railroad right-of-ways, roads, and sometimes abandoned fields (MNDNR 2020j).	Low potential for occurrence within the Project Area due to the presence of limited suitable habitat (i.e., two mapped MNDNR mesic prairies just outside of the Project Area [Figure 7]; last NHIS observation in 2010).
Rattlesnake master *Eryngium yuccifolium*	Dry to mesic prairies with loam or gravel soils (MNDNR 2020k).	Low potential for occurrence within the Project Area due to the presence of limited suitable habitat (i.e., two mapped MNDNR mesic prairies just outside of the Project Area [Figure 7]; last NHIS observation in 2016).
Small white lady's-slipper *Cypripedium candidum*	Wet to mesic prairies with no history of livestock grazing or tilling (MNDNR 2020l).	Low potential to occur within the Project Area due to the presence of limited suitable habitat (i.e., the wet prairies located within the Project Area [Figure 7]) and a lack of recent known occurrences (last NHIS observation in 1981).

Source: Minnesota Department of Natural Resources (MNDNR) 2020h, MNDNR 2018a, MNDNR Natural Heritage Information System (NHIS) 2020aa, Atwell 2018, HDR 2017, Boone 2017, Normandeau Associates 2014, Hyzy et al. 2021.

2.1.10 Bats

Operation of wind projects causes direct mortality to bats from collisions with turbine blades. Twenty-seven North American bat species have been documented as fatalities at wind facilities (WEST 2019), with migratory tree-roosting bats (e.g., hoary bat [*Lasiurus cinereus*], eastern red bat [*Lasiurus borealis*], and silver-haired bat [*Lasionycteris noctivagans*]) being the most common species found as fatalities (American Wind Wildlife Institute [AWWI] 2018).

Eight species of bat could potentially occur in the Project Area (Table 5); four are listed by the MNDNR as SPC, including the federally threatened NLEB (Tables 3 and 4). The evening bat (*Nycticeius humeralis)* was not previously known to occur in Minnesota, but was documented in July 2016 by the MNDNR in Arden Hills, near Minneapolis, Minnesota (MNDNR 2016). Evening bats have been regularly expanding their range, including recent expansions within South Dakota, New York, Nebraska, Michigan, Kansas, and Texas (Munzer 2008). In general, bats primarily use forested habitats for migration and foraging. WEST conducted a desktop habitat assessment to determine potential summer NLEB habitat within the Project Area (see Section 2.1.11 below); this mapped resource can also more generally inform the amount of potential foraging and roosting habitat available to all bat species that may occur within the Project Area. The acoustic bat studies (see Section 2.2.1) provide more information on use levels, and seasonal patterns, as well as species composition within the Project Area.

Table 5. Bat species with potential to occur within the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Common Name	Scientific Name
eastern red bat	*Lasiurus borealis*
evening bat	*Nycticeius humeralis*
little brown bat[2]	*Myotis lucifugus*
northern long-eared bat[1,2]	*Myotis septentrionalis*
tri-colored bat[2]	*Perimyotis subflavus*
big brown bat[2]	*Eptesicus fuscus*
silver-haired bat	*Lasionycteris noctivagans*
hoary bat	*Lasiurus cinereus*

[1] Federally threatened species (US Fish and Wildlife Service 2016).

[2] Listed by Minnesota Department of Natural Resources as special concern species (MNDNR 2013).

Source: Harvey et al. 1999, Bat Conservation International 2015.

2.1.11 Northern Long-eared Bat Desktop Habitat Assessment

The NLEB is a federally threatened species, but take due to operation of wind projects is currently exempt under a 4(d) rule (81 FR 9: 1900-1922 [2016]). A desktop NLEB habitat assessment was conducted in 2020 (Hyzy and Stucker 2021; Appendix B), following recommendations found in the USFWS' *2020 Range-Wide Indiana Bat Summer Survey Guidelines* (Guidelines; USFWS 2020).

As forest-dependent species, NLEB tend to avoid open habitats and rely on forest features with adequate canopy closure for foraging and roosting in the summer months (Owen et al. 2003, Lausen 2009, USFWS 2017). One study indicated that NLEB do not travel more than 255.0 ft (77.7 m) from the edge of intact forest structure (Henderson and Broders 2008); however, in areas dominated by agriculture they can use woodlots and riparian areas with as little as 15.0 – 50.0 ac (6.0 – 20.2 ha) of forest cover (Foster and Kurta 1999, Henderson and Broders 2008). The habitat assessment considered potential NLEB summer habitat within the Project Area and a 2.5-mi (4.0-km) buffer, and quantified habitat patches that could serve as commuting/travel habitat (i.e., less than 10 ac [less than 4.0 ha] in size) or small roost/foraging habitat (i.e., greater than 10.0 ac in size). The more substantial areas of potential NLEB habitat include the southern shoreline of Rice Lake and the riparian corridors associated with Dodge Center Creek and Henslin Creek, all of which are primarily located outside of the Project Area, with the exception of small areas in the northeastern portion of the Project Area (Figure 9).

Based on the desktop habitat review of potential summer habitat for NLEB (Figure 9), there are 578.6 ac (234.2 ha; 2.0% of the Project Area) of potential bat habitat within the Project Area, and an additional 2,710.2 ac (1,096.8 ha) within the 2.5 mi buffer. The majority of the bat habitat is associated with isolated woodlots and shelterbelts, and located along semi-forested corridors to the west of the Project Area in association with conservation areas. The presence of wetlands, ponds, and livestock farm ponds may attract bats for foraging and drinking opportunities. There is potential for spring, summer, and fall use in the Project Area for this bat species, with the summer use expected to only occur within 1,000 ft (305 m) of the suitable habitat. There are no known bat hibernacula in Steele or Dodge counties, Minnesota (MNDNR and USFWS 2020). As shown on Figure 9 and described further in Section 3.1.1, no turbines are sited within 1,000 ft (305 m) of wooded patches 10 ac or greater in size.

2.1.12 Summary of Tier 1 and 2 Questions

1. *Tiers 1 and 2: Are there species of concern present on the potential site(s), or is habitat (including designated critical habitat) present for the species?*

   Ten federal and/or state-listed species are known to occur in or near the Project Area (Table 3). In addition, bald eagles have the potential to occur year-round; however, bald eagle use is more likely during spring and fall migration periods. Seventeen species identified by MNDNR as species of concern are known to occur in or near the Project Area (Table 4). No designated critical habitat is present within the Project Area.

2. *Tiers 1 and 2: Does the landscape contain areas where development is precluded by law or areas designated as sensitive according to scientifically credible information?*

   Limited amounts of federally and state-owned land occur in the Project Area. The majority of the Project Area is privately owned (99.9%), with cultivated cropland dominating the landscape (92.8%). There are currently no turbines sited on publicly held lands.

3. *Tier 2: Are plant communities or vegetation habitats of conservation concern present or likely to be present at the site?*

The Project Area contains mapped MNDNR native plant communities (including native prairie and native forest communities) and areas of biodiversity significance that may provide habitat for wildlife and plant species. Ten federally or state-listed threatened and endangered species, as well as the 17 SPC species, have the potential to occur in the native habitats found within the Project Area. Most of the special-status plant species that have known occurrences in or near the Project Area are associated with native prairie habitats. However, the potential for these species to occur is low to moderate, as native habitats, sites of biodiversity significance, and protected areas are generally limited within the Project Area (approximately 439 ac (178 ha; 1.5% of the Project Area). There are currently no turbines sited within native plant communities or sites of biodiversity significance.

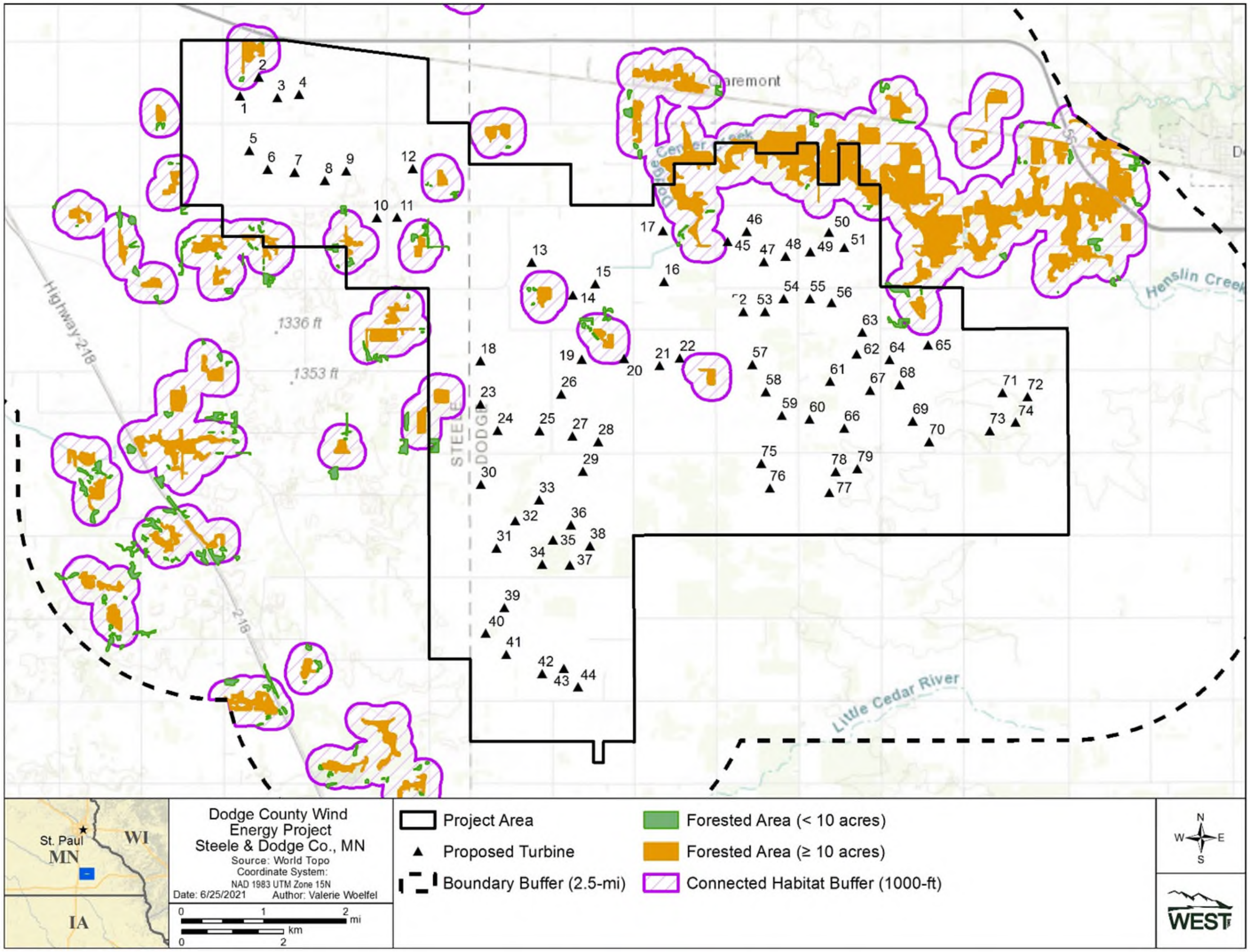

Figure 9. Northern long-eared bat habitat in and near the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

4. <u>Tier 1:</u> *Are there known critical areas of wildlife congregation, including maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks or other areas of seasonal importance?*

   <u>Tier 2:</u> *Are there known critical areas of congregation of species of concern, including maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?*

   The Project's topography is generally flat and there are no known wildlife congregation areas within the Project Area. Rice Lake is located approximately 1.9 mi (3.1 km) to the north (Figure 4); this area could provide habitat for migrating birds and bald eagles and may serve to concentrate some species of waterbirds and waterfowl during migration. The higher quality riparian areas of Dodge Center Creek along the northeastern border of the Project Area and the native prairies located within the Project Area could support high diversity plant assemblages, including species of concern; however, the current turbine layout avoids these habitats.

   No known NLEB hibernacula or roost trees have been documented in Steele or Dodge counties (MNDNR and USFWS 2020), and suitable summer NLEB habitat areas are limited to 2.0% of Project Area. Bat species, in general, have a moderate potential to occur within the Project Area, throughout the active season. There are no known occurrences of NLEB within the Project Area, and the potential for occurrence appears relatively low; see Section 2.2.1 for further discussion of bat species documented during Project-specific surveys.

5. <u>Tier 1</u>: *Are there large areas of intact habitat with the potential for fragmentation, with respect to species of habitat fragmentation concern needing large contiguous blocks of habitat?*

   <u>Tier 2:</u> *Using best available scientific information has the developer or relevant federal, state, tribal, and/or local agency identified the potential presence of a population of a species of habitat fragmentation concern?*

   While the Project Area contains mapped MNDNR native plant communities (including native prairie and native forest communities) and areas of biodiversity significance that may provide habitat for wildlife and plant species, these areas are already fragmented by cultivated croplands and only account for 1.5% of the Project Area. Therefore, these areas are unlikely to support species requiring large tracts of continuous habitat. The current turbine array avoids these habitats in order to minimize fragmentation impacts to the extent practicable.

6. _Tier 2:_ *Which species of birds and bats, especially those known to be at risk by wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?*

   Bald eagles are expected to use the Project Area year-round; however, use is expected to be relatively low, with peaks during spring and fall migration periods. Direct mortality to other migratory bird species, particularly passerines, is not anticipated to be of concern (see Tier 3 review below). Bats have the potential to use the Project Area; however, the NLEB bat habitat assessment indicates that only 2.0% of the Project Area provides higher quality (i.e., larger and/or connected wooded patches) bat habitat, and the forested habitats present are highly fragmented.

7. _Tier 2:_ *Is there potential for significant adverse impacts to those species of concern based on the answers to the questions above, and considering the design of the proposed project?*

   No potentially significant adverse impacts are expected due to the construction or operation of the proposed Project. DCW, to the extent practicable, intends to locate infrastructure including turbines, roads, and collection lines in areas that avoid and minimize potential impacts to wildlife and plant species and their habitats.

2.2 Field Studies (Tier 3)

To assist with planning of the Project, surveys consistent with the WEG recommendations were initiated in 2014 to evaluate potential direct and indirect impacts to wildlife and plants during construction and operation of Project. Surveys to date include:

- two years of acoustic bat survey (Normandeau Associates 2014, Hyzy et al. 2021)
- two years of avian use surveys (HDR Engineering, Inc. [HDR] 2017, Atwell 2018)
- two years of avian wetland utilization surveys (HDR 2017, Atwell 2018)
- five years of raptor and eagle nest surveys (HDR 2017, Atwell 2017, Foo 2021, Foo and Pickle 2021)
- one bald eagle roost survey (Atwell 2017)
- one targeted loggerhead shrike and Henslow's sparrow survey (Boone 2017)
- one desktop assessment and roadside survey for Sullivant's milkweed (Markhart 2021)

Table 6 summarizes the Tier 3 surveys conducted for the Project; copies of Tier 3 reports can be found in Appendix B.

Table 6. Summary of Tier 3 studies conducted for the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Study	Focus	Survey Type	Dates Conducted
Acoustic Bat [a, d]	Bat activity	2014: Acoustic monitoring (ReBAT) 2020: Acoustic monitoring (SM3), desktop habitat analysis	May – October 2014 July – October 2020
Avian Use			
Avian Use [b]	Spatial and temporal use of all birds	20 minute fixed-point counts	June 2015 – October 2016
Bald Eagle Point-Count [b, c]	Spatial and temporal use of eagles within the Project survey area [e]	60-minute fixed-point counts	March 2016 – February 2017 May 2017 – April 2018
Avian Wetland Utilization [b, c]	Waterfowl and waterbird use	2016: 10 – 15-minute counts at two wetland areas 2017/2018: 10 – 20-minute counts at three wetland areas	March 2016 – October 2016 May 2017 – November 2017, March – April 2018
Spring and Fall Migration [c]	Document diurnal bird migration movements	20-minute fixed-point counts	May 2017, August – November 2017, March – April 2018
Bald Eagle Nest [b, c, d]	2015: Identify raptor breeding sites within 5.0-mi (8.0-km) of the Project survey area [e] 2016: Document status of raptor nests identified in 2015 2017: Identify raptor breeding sites within 10-mi (16.1-km) of the Project survey area [e] and proposed transmission line corridor 2020: Identify raptor stick nests within 1.0-mi (1.6-km) of the Project survey area [e], and eagle nests within 5.0-mi 2021: Identify raptor and eagle stick nests within 2.0-mi (3.2-km) of the Project survey area [e]	2015: Ground-based 2016: Ground-based 2017: Aerial 2020: Aerial 2021: Ground-based	March 2015 June 2016 March 2017 April 2020 March 2021
Winter Bald Eagle Roost [c]	Document eagle concentrations/potential roost sites	Ground-based	March 2017, December 2017, March 2018, April 2018
Henslow's Sparrow and Loggerhead Shrike [c]	Targeted inventory of Henslow's sparrow and loggerhead shrike	10-minute fixed-point counts	June 2017
Sullivant's Milkweed Screening [d]	Determine presence of Sullivant's milkweed	Desktop assessment and windshield survey	August 2020

Table 6. Summary of Tier 3 studies conducted for the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Study	Focus	Survey Type	Dates Conducted

[a]Conducted by Normandeau Associates; [b] Conducted by HDR; [c] Conducted by Atwell; [d] Conducted by WEST

[e] Project survey area refers to the Project Area and survey buffers, as defined at the time surveys were conducted.

mi = miles, km = kilometers

2.2.1 Acoustic bat survey

2.2.1.1 2014 Acoustic Bat Surveys

From May 30 – October 15, 2014, acoustic bat monitoring was conducted for the Project (Normandeau Associates 2014; Appendix B). Two Remote Bat Acoustic Technology (ReBAT®) systems were deployed using two 30-m-tall permanent met towers within the Project Area at the time of surveys[1]. On each system, the upper receiver was attached to the met tower at approximately 30 m; sampling as high as 60 m. The lower receiver was attached to the tower at 15 m and sampled as high as 45 m. The systems were programmed to record acoustic bat data each night from one hour before sunset to one hour after sunrise. Analysis was based on data recorded during the spring and fall migratory periods (May 30 – June 15, 2014, and July 16 – October 15, 2014, respectively), as well as during summer (June 16 – July 15, 2014; Normandeau Associates 2014).

Bat activity at wind facilities is typically reported as average bat passes per detector night (ABPDN) and average bat passes per detector hour. A total of 108 detector-nights were analyzed at Dodge 01 (Met 4535) in 2014, including 20 detector-nights recorded during the spring migratory period, 30 during the summer period, and 58 during the fall migratory period (Table 7). At Dodge 02 (Met 4534), 110 detector-nights were analyzed, including 20 detector-nights recorded during the spring migratory period, 30 during the summer period, and 60 during the fall migratory period. A total of 2,370 bat passes were recorded over the 218 cumulative detector-nights. The recorded bat passes were classified into 11 species or species groups along with two unknown classifications. No federally threatened or endangered species were confirmed during the pre-construction surveys. However, bat passes were identified as belonging to the *Myotis* species group, which includes NLEB. Because of overlap in echolocation calls of free-flying *Myotis* species, echolocation passes attributable to this genus were classified to the *Myotis* species group, rather than to individual species (Normandeau Associates 2014).

Overall, bat activity detected for the Project was moderate (10.87 ABPDN; Table 7). Bat activity was relatively low at both towers during spring 2014 (6.55 and 6.85 ABPDN). There was a large difference in bat activity levels between the towers during the summer monitoring period, with Dodge 02 having about four times the activity of Dodge 01 (13.23 and 3.50 ABPDN, respectively). Fall 2014 activity was moderate at both towers (15.72 and 11.47 ABPDN). Activity was generally highest in fall 2014, as expected (Normandeau Associates 2014).

Myotis species (which include little brown bat and NLEB) made up a moderate proportion of activity, averaging 23% of detections for the study period. *Myotis* detections composed between 3.81 – 20.50% of seasonal detections at Dodge 01, and between 27.74 – 45.09% of seasonal detections at Dodge 02. *Myotis* species were detected most often at the lower detectors, which is consistent with the typical low flight altitude of these species. *Myotis* were influenced by multiple weather variables during the 2014 monitoring period, particularly temperature (Normandeau Associates 2014).

[1] Detector locations outside current Project Area.

Table 7. Summary of 2014 acoustic bat surveys conducted for the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Tower No.	Season	Species/Species Complexes Detected	Total Passes Detected	Analyzed Nights	No. of Detector-Nights	ABPDN[1]	ABPDH[2]
Met 4535	Spring	8	131	10	20	6.55	0.614
Met 4535	Summer	10	105	15	30	3.50	0.330
Met 4535	Fall	11	912	30	58	15.72	1.220
Met 4534	Spring	9	137	10	20	6.85	0.643
Met 4534	Summer	9	397	15	30	13.23	1.209
Met 4534	Fall	11	688	30	60	11.47	0.890
TOTAL			**2,370**				

[1]Average Bat Passes per Detector Night
[2]Average Bat Passes per Detector Hour

Note: The total number of recorded bat calls provided an index of activity, but does not necessarily constitute the number of bats present because a single bat could potentially have made several calls within a night and over many nights

The Normandeau (2014) bat study area encompassed a large portion of wooded riparian habitat to the north of the current Project Area, and therefore activity recorded at the northern 2014 survey station (Dodge 01 [Met 4535]) was associated with bats using forested landscapes. However, this wooded habitat area is no longer within the current Project Area. The Dodge 02 (Met 4535) survey station was located to the west outside the current Project Area, in an agricultural area with relatively similar land cover to that of the current Project Area.

2.2.1.2 2020 Acoustic Bat Survey

During summer and fall 2020, a second season of acoustic bat work was conducted for the Project to document current species composition and relative abundance during bat reproductive and migration periods (Hyzy et al 2021; Appendix B). Surveys were completed from June 24 – October 5, 2020. Wildlife Acoustics full-spectrum Song Meter SM3BAT ultrasonic detectors were installed at two met towers located in habitat representative of the turbine field. Paired microphones were at installed on each tower at a ground station 5 ft (1.5 m; DC2g and DC3g) high and a raised station 148 ft (45 m; DC2r, DC3r) high. A bat feature station (DC1g) was also surveyed; this station contained habitat features likely to attract bats, and included a woodlot edge with grassy margins, and a nearby pond and wetland. All stations were located within the Project Area.

Detectors were programmed to turn on 30 minutes before sunset and turn off 30 minutes after sunrise each night. The study was divided into two survey periods: summer (June 24 – July 31, 2020) and fall (August 1 – October 5, 2020). Mean bat activity was also calculated for a standardized Fall Migration Period (FMP), defined here as July 30 – October 14. WEST defined the FMP as a standard for comparison with activity from other wind projects.

Acoustic bat data were recorded at five stations for a total of 482 detector-nights from June 24 – October 5 (Hyzy et al. 2021; Appendix B). All detectors and microphones were operating for

93.5% of the sampling period for all stations. Activity was higher at the ground station at DC2g (63.45 ± 10.70 bat passes per detector-night) compared to the other three representative stations, which on average recorded nearly three times less activity than DC2g. During the FMP, overall bat activity was 23.31 ± 2.89 bat passes per detector-night at representative stations: 27.67 ± 3.69 at ground representative stations, and 18.95 ± 3.34 at raised representative stations. Activity at the bat feature station (DC1g) was nearly four times higher (159.06 ± 14.45 bat passes per detector-night) than at representative ground stations (41.40 ± 5.63; Hyzy et al. 2021; Appendix B).

Bat activity at representative stations was higher in the summer compared to the fall (Figure 10a; Hyzy et al. 2021; Appendix B). Activity at representative stations was comparatively lower from late-June to mid-July, but increased in mid-July and again in late-August, peaking from July 18 to July 24, 2020. Bat activity decreased at the beginning of September, and was comparatively low for the remainder of the study period. At the bat feature station, activity was relatively similar across both the summer and fall seasons (Figure 10b; Hyzy et al. 2021; Appendix B).

Of the total bat passes recorded at representative stations, 93.9% were classified as low-frequency (LF; e.g., big brown bats, hoary bats, and silver-haired bats; Table 8), and 6.1% of bat passes were classified as high-frequency (HF; e.g., tri-colored bats, eastern red bats, and *Myotis* species). The bat feature station showed a similar trend of higher activity by LF bats compared to HF species (Hyzy et al. 2021). Big brown bat and silver-haired bat were the primary species recorded; these species were each present on 93% of detector-nights. Hoary bat calls were present on 91% of detector-nights (Table 8). A qualified bat biologist manually reviewed all 15 bat calls Kaleidoscope Pro classified as potential NLEB at the bat feature station, along with 1,266 HF bat calls that were recorded on the same nights. After qualitative review was complete, none of the potential 15 NLEB calls were confirmed. No potential NLEB calls were recorded at any of the representative stations. No additional NLEB calls were found while reviewing HF calls (Hyzy et al. 2021; Appendix B).

Table 8. The number of nights and percent of detector-nights (in parentheses) per bat species detected between June 24 – October 5, 2020 for the Dodge County Wind Energy Project, Steele and Dodge counties, Minnesota.

Common Name	Bat Feature DC1g	Representative Stations DC2g	DC2r	DC3g	DC3r	Project Total[2]
High Frequency (>30 kHz)						
little brown bat	80 (82%)	40 (44%)	7 (8%)	45 (43%)	11 (11%)	88 (85%)
evening bat	78 (80%)	26 (29%)	7 (8%)	14 (13%)	7 (7%)	87 (84%)
eastern red bat	63 (64%)	35 (38%)	28 (33%)	42 (40%)	27 (26%)	79 (76%)
tri-colored bat	39 (40%)	4 (4%)	1 (1%)	4 (4%)	2 (2%)	44 (42%)
northern long-eared bat[1]	10 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	10 (10%)
Low Frequency (15–30 kHz)						
big brown bat	85 (87%)	79 (87%)	35 (41%)	76 (73%)	48 (46%)	97 (93%)
silver-haired bat	75 (77%)	77 (85%)	64 (75%)	59 (57%)	66 (63%)	97 (93%)
hoary bat	80 (82%)	76 (84%)	64 (75%)	78 (75%)	85 (82%)	95 (91%)

[1] These species were identified by Kaleidoscope Pro 5.1.0 but were not confirmed by a bat biologist.

g=ground; r=raised

[2] Project Total differs from detector-nights because a specific calendar night is only counted once regardless of the number stations deployed at the Project. For each species the percentage is based on whether that species was detected anywhere in the project on each given calendar night.

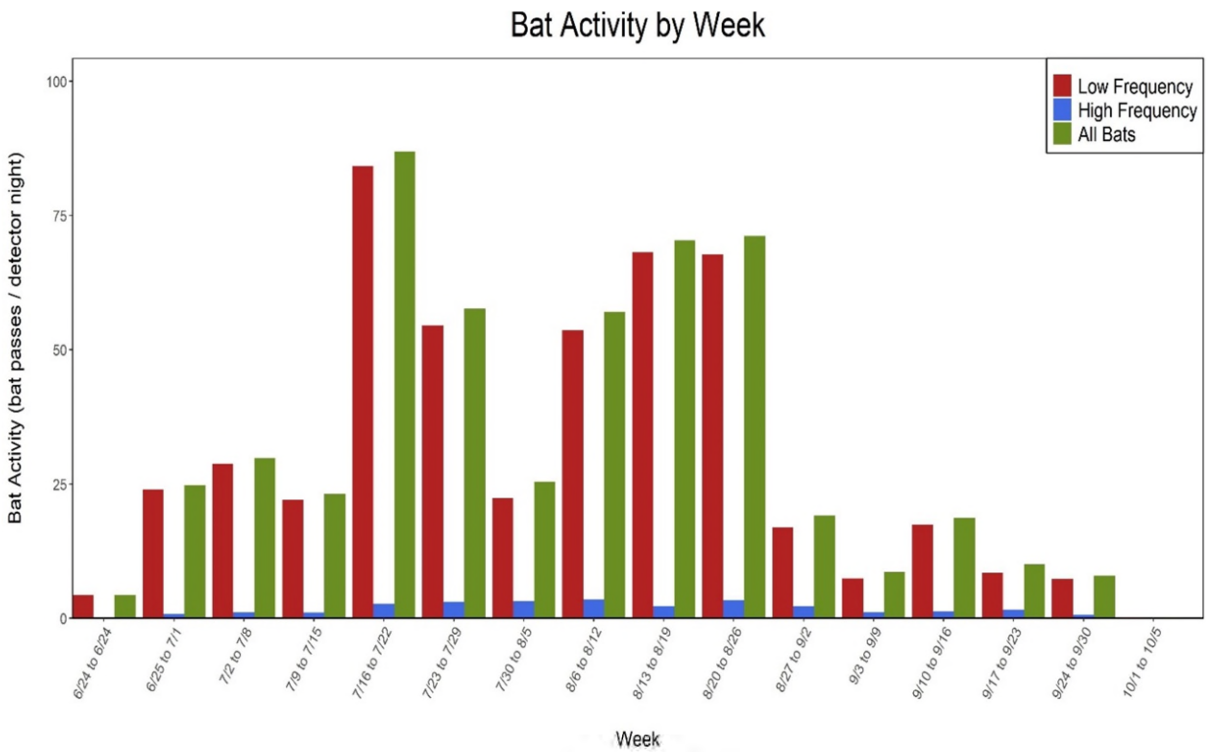

Figure 10a. Weekly patterns of bat activity by high-frequency (HF), low-frequency (LF), and all bats at representative stations at the Dodge County Wind Energy Project, Steele and Dodge counties, Minnesota from June 24 – October 5, 2020

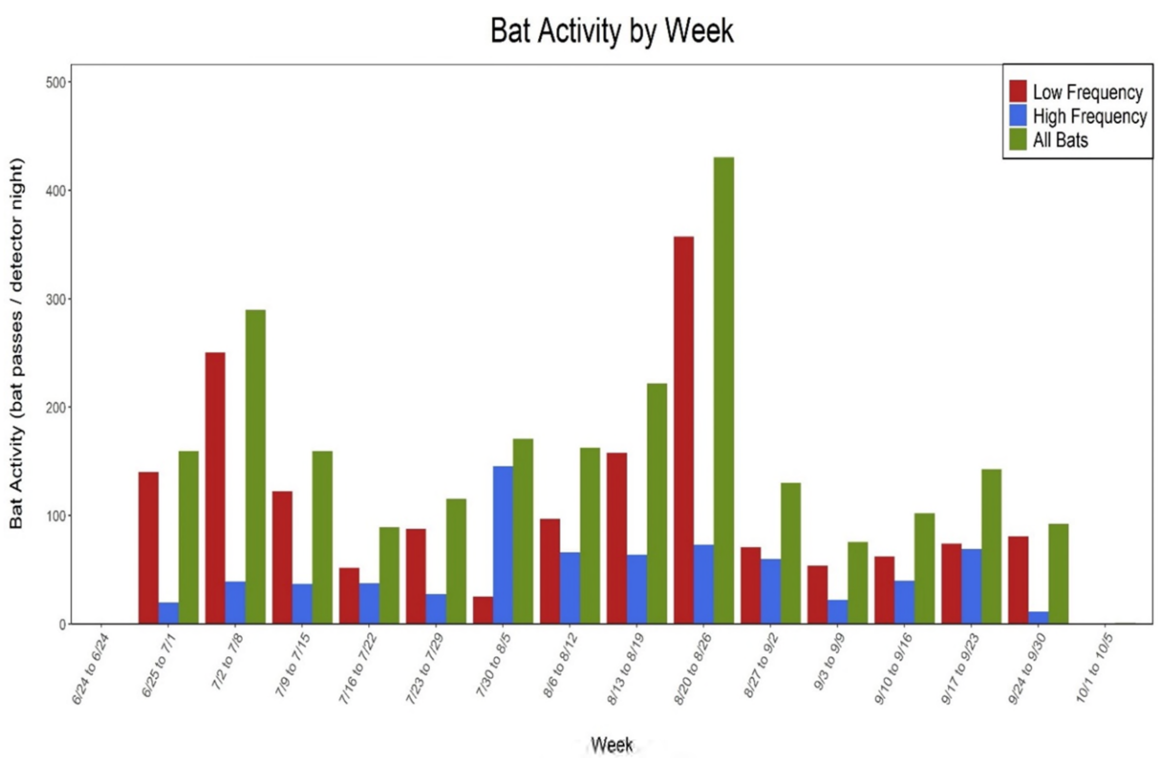

Figure 10b. Weekly patterns of bat activity by high-frequency (HF), low-frequency (LF), and all bats at the bat feature station at the Dodge County Wind Energy Project, Steele and Dodge counties, Minnesota from June 24 – October 5, 2020.

In 2020, the overall bat activity at representative stations was 23.31 bat passes per detector night during the Fall Migration Period (defined here as July 30 – October 14). This FMP is on the higher end of the range of activity rates recorded at other wind projects in Minnesota, but is in the same range as the activity rates recorded at the nearby (within eight mi) Pleasant Valley Wind project, where two years of pre-construction bat activity surveys recorded study period activity rates ranging between 21.81 – 63.3 bat passes/detector night (Derby et al. 2011, Chodachek et al. 2012). Bat mortality at any given wind project can be highly variable (Kunz et al. 2007), and has not been shown to correlate with pre-construction surveys (Solick and Howlin 2018). The Pleasant Valley PCM study documented relatively low bat mortality rates (1.80 bats/MW/study period; Tetratech 2017) compared to other Minnesota projects with publicly available PCM data (WEST 2019). DCW will conduct a project-specific PCM study in order to document direct collision impacts bat species at the Project (Section 4).

2.2.2 Avian Use Surveys

Two years of avian use surveys were conducted for the Project between 2015 and 2018 (Figures 11a and 11b; Appendix B). During the first year of avian use for the Project, 16,112 individual birds comprising 144 species were recorded (HDR 2017). Passerines were the most abundant species group recorded during surveys, accounting for more than 84% of all birds observed. Seven raptor species were observed and overall raptor use was low (0.4 birds per survey). Red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus hudsonius*) were the most frequently observed raptor species with 49 and 28 observations, respectively (HDR 2017). Over 216 hours of surveys, 63 bald eagle flight minutes were recorded, with 18 of these minutes occurring within the rotor swept zone (defined in the study as 20 – 150 m [66 – 492 ft] above ground level and within 800 m of the survey point; HDR 2017).

During the second year of surveys, 6,408 individual birds comprising 109 species were recorded during standardized spring and fall migration surveys (Atwell 2018). Passerines were the most abundant species group recorded during migration surveys, accounting for more than 61% and 71% of all birds observed in the spring and fall, respectively. Sixteen diurnal raptor species were observed during standardized surveys. Red-tailed hawk was the most frequently observed raptor species (182 observations), with occurrence frequencies of 17.1%, 10.5%, 7.0%, and 5.8% during the spring, summer, fall, and winter, respectively (Atwell 2018). Relatively low overall raptor use was documented in the spring (0.53 raptors/20-minute survey), summer (0.36), fall (0.93), and winter (0.16). Over 461 hours of survey, 141 bald eagle flight minutes and six golden eagle flight minutes were recorded. Approximately 81 of these bald eagle minutes occurred within the rotor swept zone, whereas all six golden eagle flight minutes were within the rotor swept zone (Atwell 2018).

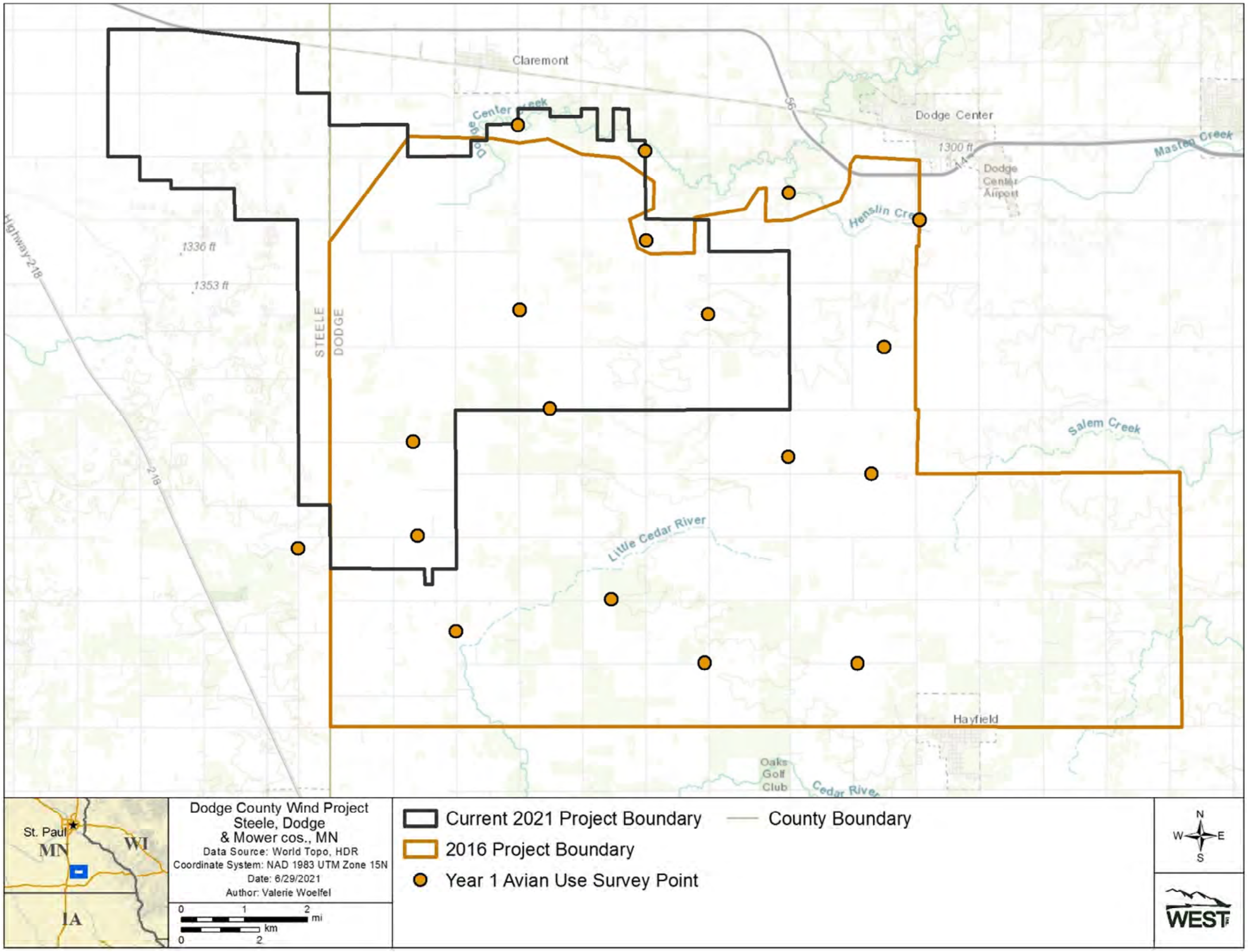

Figure 11a. Fixed point avian use survey points (Year 1: June 2015 – October 2016) at the Dodge County Wind Energy Project, Steele and Dodge counties, Minnesota.

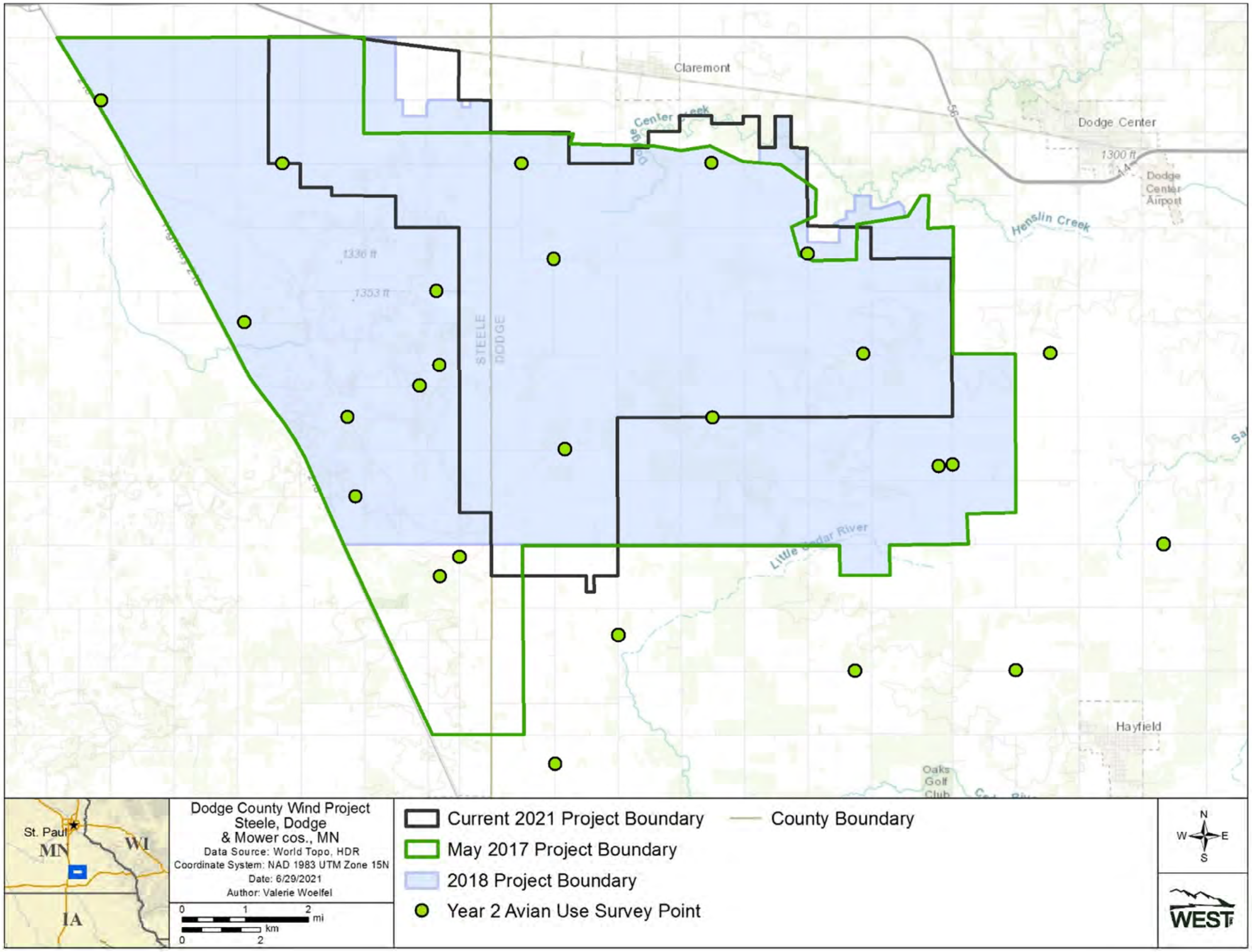

Figure 11b. Fixed point avian use survey points (Year 2: May 2017 – April 2018) at the Dodge County Wind Energy Project, Steele and Dodge counties, Minnesota.

No federally listed threatened or endangered species were observed during surveys for the Project; however, three state-listed endangered species were documented, including: Henslow's sparrow, horned grebe, and loggerhead shrike (Table 9). Henslow's sparrow was documented each year of surveys (HDR 2017; Atwell 2018). Eleven horned grebes were observed over the course of both survey years; however, these observations were outside of the Project Area. One loggerhead shrike observation was recorded approximately seven mi east of the Project Area during targeted loggerhead shrike surveys. Nine SPC were also documented, including: Acadian flycatcher (*Empidonax virescens*), American white pelican (*Pelecanus erythrorhynchos),* Bell's vireo (*Vireo bellii*), Forster's tern (*Sterna forsteri*)*,* Franklin's gull (*Leucophaeus pipixcan*), peregrine falcon (*Falco peregrinus*), purple martin (*Progne subis*), short-eared owl (*Asio flammeus*), and trumpeter swan (*Cygnus buccinators;* Table 9). Bald eagle and golden eagle were also observed (HDR 2017; Atwell 2018). With the exception of purple martin and bald eagle, these species were generally noted infrequently during migrations, with no observed evidence of breeding. American white pelican and Franklin's gull were occasionally observed in large numbers. SPC species observed during surveys for the Project that are also designated as Birds of Conservation Concern (BCC) for Bird Conservation Region 22 by the USFWS are also noted in Table 9. BCC species are those that have been identified as likely to become candidates for listing under the ESA if no additional conservation actions are taken (USFWS 2021b).

Two years of avian wetland utilization surveys were also conducted to document waterbird and waterfowl use at larger wetlands near the Project. (HDR 2017, Atwell 2018). During the first year of surveys, two wetland areas were surveyed. Both of the survey areas are now outside the current Project Area: Oak Glen WMA wetland is less than 1-mi southwest of the current Project Area, and the Ashland Township wetland is less than 1-mi southeast of the current Project Area. Surveys were conducted between March 16, 2016 and September 26, 2016, and 22,874 individual birds representing 18 different waterbird species were recorded. The most commonly observed species were redhead (*Aythya americana*) and ring-necked duck (*Aythya collaris*; 25% and 13% of all observations, respectively). No federally listed species were observed; however three SPC were documented, including: American white pelican, Forster's tern, and trumpeter swan. Thirty-two bald eagles were also detected (HDR 2017).

During the second year of wetland surveys, counts were conducted at three wetland areas: Oak Glen WMA, Ashland Township, and Dodge Center Creek WPA (Atwell 2018). Dodge Center Creek WPA is located directly adjacent to the current Project Area's western boundary. Commonly observed species include American white pelican (362 individuals), bobolink (*Dolichonyx oryzivorus*; 231), sedge wren (*Cistothorus platensis*; 142), and trumpeter swan (102). One Henslow's sparrow was observed in Dodge Center Creek WPA, and eight state-endangered horned grebes were observed at the Oak Glen WMA wetland. Thirty-two bald eagles were also observed (Atwell 2018). As described further in Section 3.1.1, turbines have been set back from the wetland areas studied in the wetland utilization surveys.

Table 9. Summary of species of concern observed during avian surveys conducted for the Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota.

Species	Scientific Name	Federal Status	State Status	Study
bald eagle	*Haliaeetus leucocephalus*	BGEPA		Atwell 2018; HDR 2017
golden eagle	*Aquila chrysaetos*	BGEPA		Atwell 2018
Henslow's sparrow	*Centronyx henslowii*	BCC	SE	Boone 2017; HDR 2017
horned grebe	*Podiceps auritus*		SE	Atwell 2018; HDR 2017
loggerhead shrike[1]	*Lanius ludovicianus*	BCC	SE	Boone 2017
Acadian flycatcher	*Empidonax virescens*		SPC	HDR 2017
American golden-plover	*Pluvialis dominica*	BCC		HDR 2017
American white pelican	*Pelecanus erythrorhynchos*		SPC	Atwell 2018; HDR 2017
Bell's vireo	*Vireo bellii*		SPC	Boone 2017
black-billed cuckoo	*Coccyzus erythropthalmus*	BCC		HDR 2017; Atwell 2018
bobolink	*Dolichonyx oryzivorus*	BCC		HDR 2017; Atwell 2018
chimney swift	*Chaetura pelagica*	BCC		HDR 2017; Atwell 2018
dunlin	*Calidris alpine*	BCC		HDR 2017
Forster's tern	*Sterna forsteri*		SPC	Atwell 2018; HDR 2017
Franklin's gull	*Leucophaeus pipixcan*		SPC	Atwell 2018; HDR 2017
grasshopper sparrow	*Ammodramus savannarum*	BCC		HDR 2017
Lesser yellowlegs	*Tringa flavipes*	BCC		HDR 2017
pectoral sandpiper	*Calidris melanotos*	BCC		HDR 2017; Atwell 2018
peregrine falcon	*Falco peregrinus*		SPC	Atwell 2018; HDR 2017
purple martin	*Progne subis*		SPC	Atwell 2018
red-headed woodpecker	*Melanerpes erythrocephalus*	BCC		Atwell 2018
rusty blackbird	*Euphagus carolinus*	BCC		Atwell 2018
short-billed dowitcher	*Limnodromus griseus*	BCC		HDR 2017
short-eared owl	*Asio flammeus*	BCC	SPC	Atwell 2018
trumpeter swan	*Cygnus buccinators*		SPC	Atwell 2018
upland sandpiper	*Bartamia longicauda*	BCC		HDR 2017; Atwell 2018

BGEPA = Bald and Golden Eagle Protection Act ; BCC = Birds of Conservation Concern ; SE = State Endangered ; SPC= Species of Special Concern

[1] Located seven miles east of Project Area

2.2.3 Raptor Nest Surveys

Raptor nest surveys were conducted in and near the Project Area (as defined at the time of each survey[2]) to record bald eagle and other raptor nests (HDR 2017, Atwell 2017, Foo 2021, Foo and Pickle 2021; Appendix B). Surveys were conducted in accordance with the guidance provided in the USFWS ECPG (USFWS 2013) and the USFWS *Interim Golden Eagle Technical Guidance* (Pagel et al. 2010). Ground-based surveys were conducted in March 2015 and June 2016 (HDR 2017), as well as March 25 – 26, 2021. Aerial surveys were conducted March 17 – 21, 2017 and April 13 – 15, 2020. Surveys in 2015 were conducted based on habitat modeling of the 2015 Project Area and a 5.0-mi (8.0-km) buffer to document all potential raptor nests, including bald eagles. Surveys in 2016 followed up on nests documented in 2015 (HDR 2017). Surveys in 2017 were conducted within the 2017 Project Area and a 10.0-mi (16.1-km) buffer (Atwell 2017), and surveys in 2020 were conducted within a 5.0 mi buffer (Foo 2021). The 2021 raptor nest surveys encompassed a 2.0-mi (3.2-km) buffer of the spring 2021 Project Area (Foo and Pickle 2021).

In 2015, three nesting pairs of bald eagles were identified inside or within five mi of the Study Area (HDR 2017; Figure 12a). One nest site was located along Dodge Center Creek, another was located at Oak Glen, and the third was located near Salem Creek east of the Study Area. Nest observations of these pairs throughout the 2016 breeding season indicated that the pair at the Oak Glen nest site successfully raised at least one young (HDR 2017).

In 2017, 79 potential raptor nests were located (Atwell 2017; Figure 12b). No bald eagle nests were found within the 2017 Project Area; however, 13 bald eagle nests were located within the 10-mi buffer (11 active and two inactive). Concentrations of bald eagles were noted in the late afternoon and evening at several locations within 10 mi of the 2017 Project Area. These observations prompted an additional targeted ground-based survey effort to document potential communal eagle roost locations. Two roost locations were identified:

- Rice Lake Roost – 10 bald eagles the night of March 20, 2017; approximately 2.5 mi (4.0 km) north of the current Project Area. No eagles were noted at this location on the evening of March 11, 2018 or on April 11, 2018; and
- Cedar River – 17 bald eagles the night of March 19, 2017; approximately 8.9 mi (14.3 km) south of the current Project Area. Follow-up effort on March 10, 2018 indicated five eagles utilizing this location and subsequently only one eagle was noted on this location the evening of April 12, 2018.

In 2020, 20 raptor nests representing three identifiable species and one great blue heron (*Ardea herodias*) colony were detected during the aerial surveys on April 13 – 15, 2020 (Foo 2021; Figure 12c). Five occupied and active bald eagle nests were documented within the 5.0-mi Project Area buffer (at the time of survey); one additional occupied and active bald eagle nest was documented outside of the 5.0-mi buffer. Additional raptor nests documented during the survey included two occupied and active red-tailed hawk nests, one occupied and active great-horned

[2] Over time, DCW has adjusted and reduced the Project boundaries to minimize the potential Project impacts on the environment. As a result, Project survey areas frequently differed by survey type and year. See the survey reports in Appendix B for more information on the survey coverage of each study.

owl (*Bubo virginianus*) nest, two occupied inactive unidentified raptor nests, and nine inactive unidentified raptor nests. One great blue heron colony was detected within the northeastern portion of the 5.0-mi buffer (Foo 2021).

In 2021, three occupied active bald eagle nests were identified (Foo and Pickle 2021; Figure 12d). These nests were also occupied active bald eagle nests in 2020. All three nests are at least 1.7 mi (2.7 km) from the current Project Area, and no turbines are proposed within 2.0 mi of any of these nests.

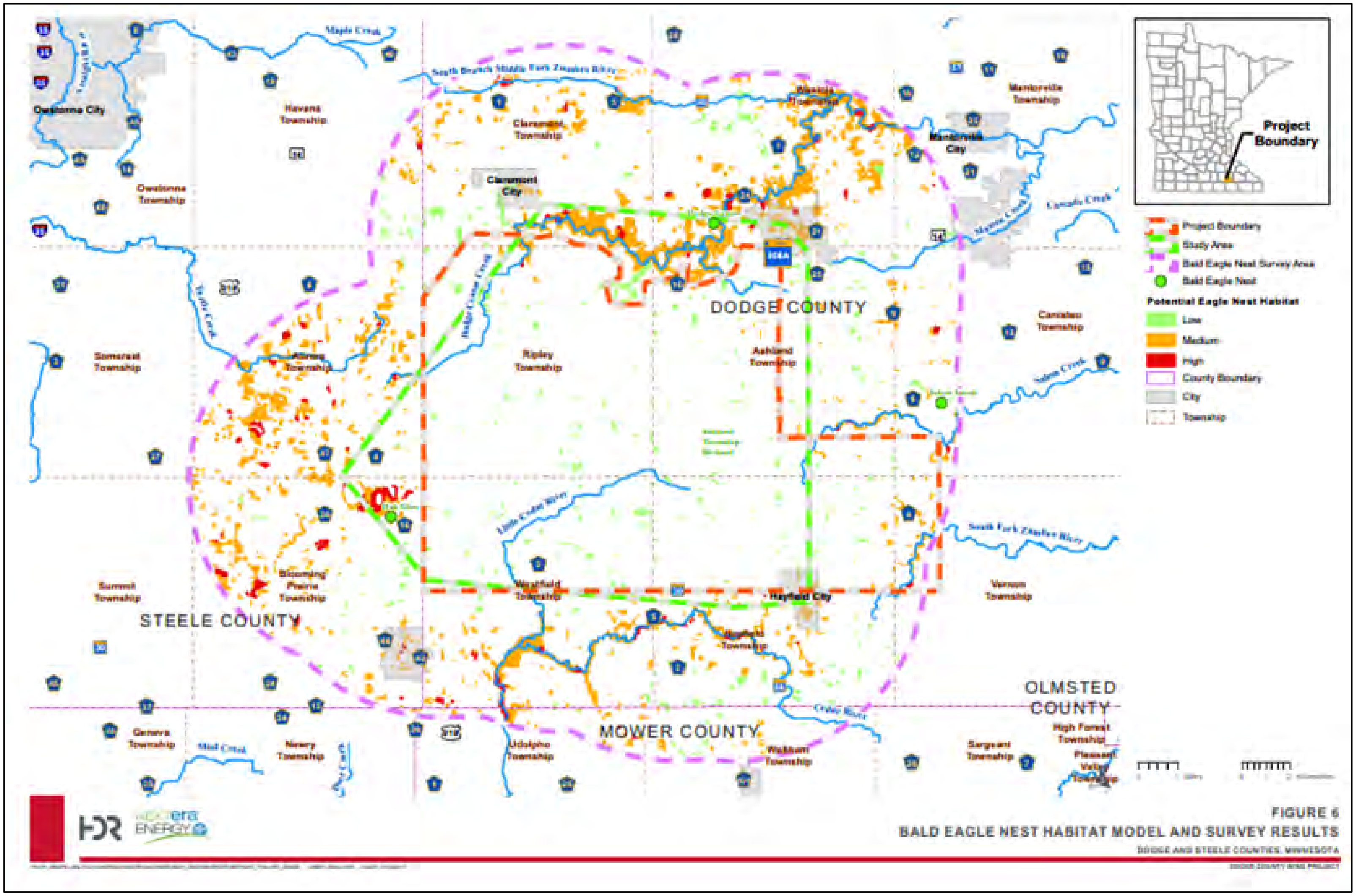

Figure 12a. Locations of raptor nests observed in 2015 and 2016 near the Dodge County Wind Energy Project in Dodge and Steele counties, Minnesota (HDR 2017).

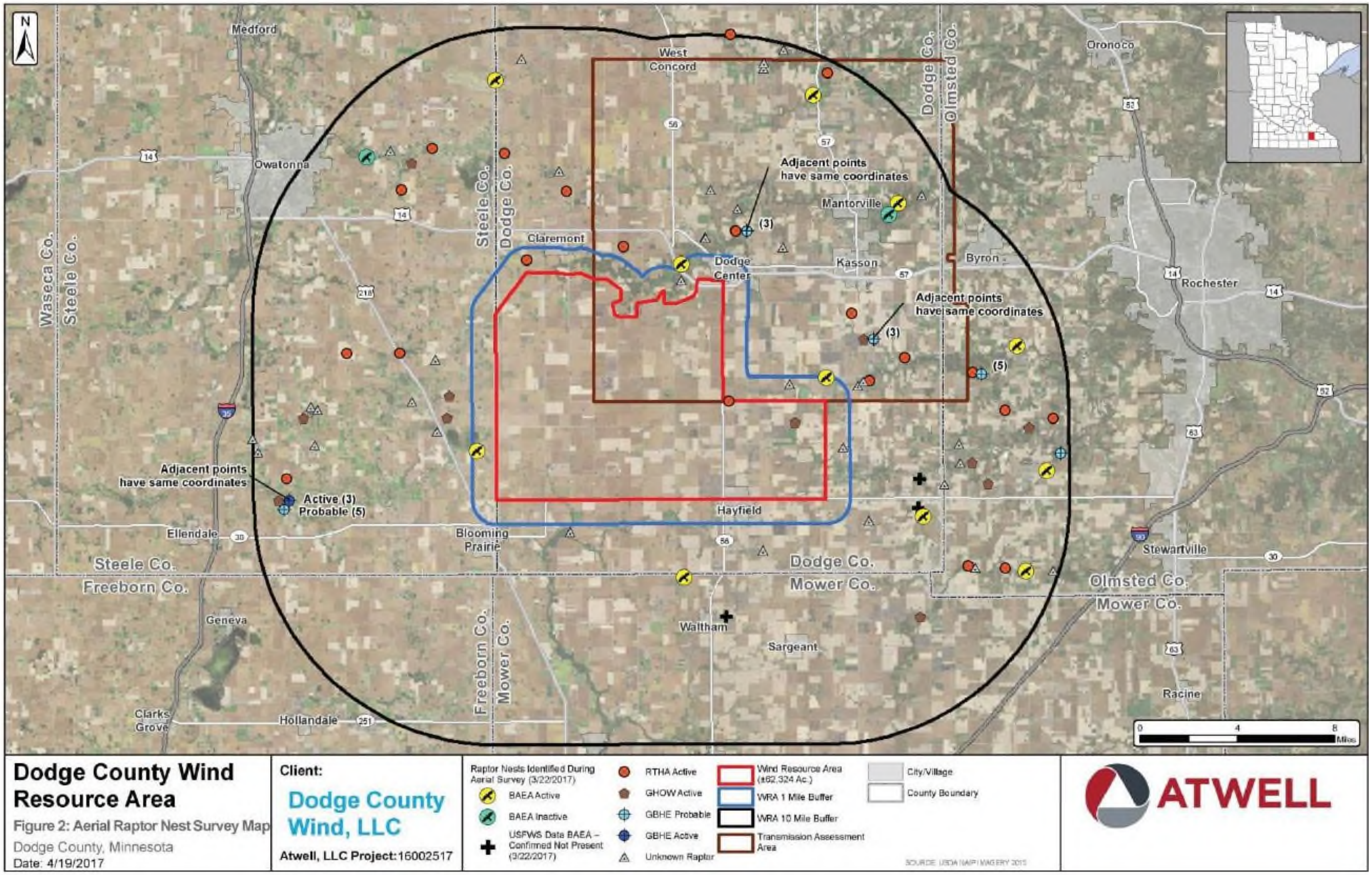

Figure 12b. Locations of raptor nests observed in 2017 near the Dodge County Wind Energy Project in Dodge and Steele counties, Minnesota (Atwell, 2017).

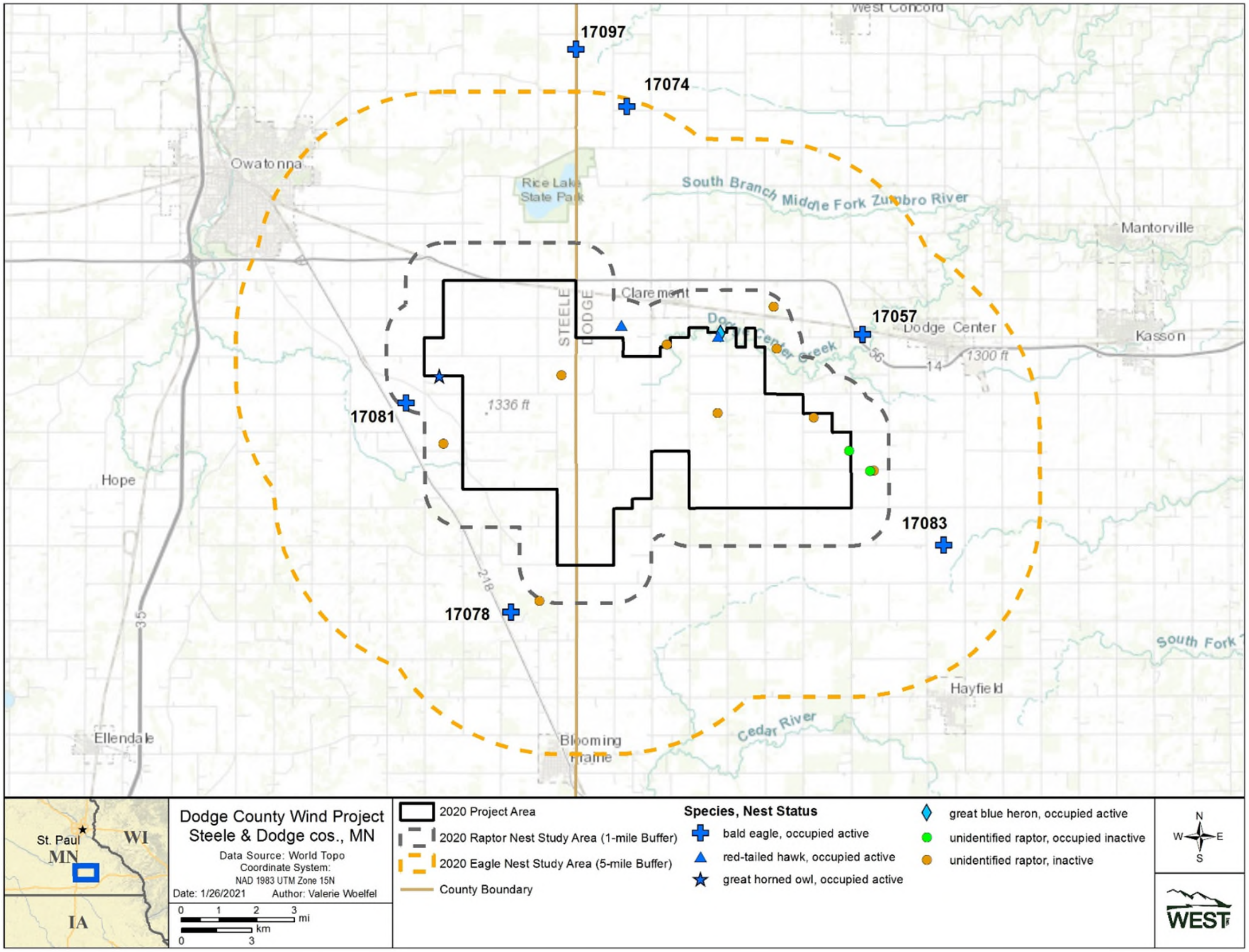

Figure 12c. Raptor nests documented April 13 – April 15, 2020, near the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota (Foo 2021).

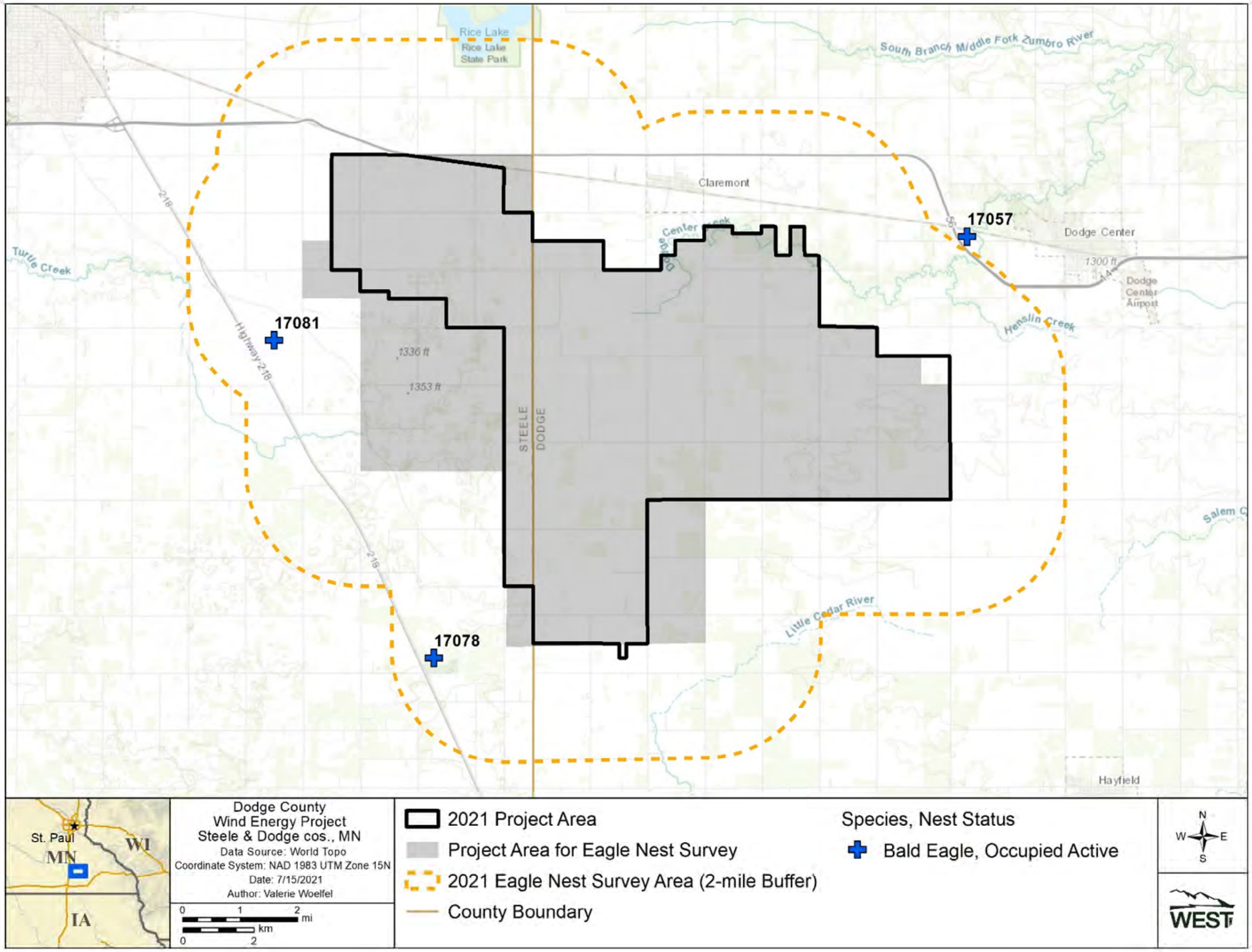

Figure 12d. Raptor nests documented March 25 – 26, 2021, near the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota (Foo and Pickle 2021).

2.2.4 Targeted Loggerhead Shrike and Henslow's Sparrow Survey

The Project Area (at the time of surveys) was assessed for evidence of breeding loggerhead shrike and Henslow's sparrow use during summer 2017 (Boone 2017; Appendix B). Targeted surveys for these species occurred over one site visit; however, data were supplemented by observations that occurred during summer eagle use point surveys, as well.

A comprehensive aerial review was conducted to locate all likely habitat on accessible roadsides. Point count locations were selected in order to provide maximum listening threshold coverage for available habitats. Each point was surveyed at least once during late June. All bird species were tallied for at least 10 minutes at each survey location. In the event that either of the target species were detected, that location was revisited to acquire more substantial evidence of local territory maintenance or evidence of confirmed nesting.

Loggerhead shrikes were not observed within the Project Area, but one adult was observed with at least two recently fledged young approximately seven mi east of current Project Area. Follow-up surveys to the area did not yield additional detections. Henslow's sparrows were detected at two locations, both west of the current Project Area (0.4 mi and 3.3 mi, respectively). Observations at both locations were auditory only, but the presence of territorial males in song suggests that active nesting activity near the Project Area is possible. However, follow-up visits did not yield additional detections (Boone 2017).

2.2.5 Sullivant's Milkweed Screening

In August 2020, WEST conducted a desktop habitat assessment and subsequent roadside survey for Sullivant's milkweed (Markhart 2021; Appendix B). Sullivant's milkweed is a state-listed threatened species in Minnesota. WEST used MNDNR NHIS database records to identify areas of documented Sullivant's milkweed and native prairie within and adjoining the Project Area. The desktop review was followed by roadside field observations at points corresponding to NHIS records.

On August 7, 2020, an MNDNR-authorized botanist familiar with Sullivant's milkweed conducted the field assessment. The botanist reviewed the desktop-derived locations (locations shown on Figure 1 of the report included in Appendix B), and additionally viewed roadside vegetated swales and adjoining uncultivated lands while in transit between these locations. No stems of Sullivant's milkweed were observed at any of the desktop-derived observation points. A similar species, common milkweed (*Asclepias syriaca*), was scattered throughout much of the Project Area.

Roadside vegetated swales were frequently hayed and cultivated cropland dominated the viewable areas. None of the locations that were identified as having previous NHIS records of Sullivant's milkweed appeared to harbor native prairie/Sullivant's milkweed habitat, and no Sullivant's milkweed stems were documented from the adjacent roadside observation points.

2.2.6 Summary of Tier 3 Questions

1. *Do field studies indicate that species of concern are present on, or likely to use the proposed site?*

   No federally listed species were observed during avian use surveys for the Project; however, three state-listed species were documented: Henslow's sparrow (endangered), loggerhead shrike (endangered), and horned grebe (endangered). Nine other SPC were also observed in or near the Project. No bald eagle nests are located within the Project Area; however, bald eagles were observed during avian use surveys and are expected to use the Project Area year-round. Based on the limited availability of preferred nesting habitat, bald eagles are currently unlikely to nest within the Project Area. If bald eagle density continues to increase, and breeding expands into less suitable nesting areas, bald eagles may nest within less suitable habitat (such as woodlots) in the Project Area.

   NLEB have the potential to occur in the Project Area based on acoustic signatures (Normandeau Associates 2014, Hyzy et al. 2021); however, no NLEB calls were definitively confirmed within the Project Area during the bat acoustic surveys.

2. *Do field studies indicate potential for significant adverse impacts on the affected populations of species of habitat fragmentation concern?*

   The Project Area is primarily cultivated cropland (92.8%), and current layout plans only place turbines in cultivated crops. The landscape is heavily fragmented, and Project infrastructure will avoid the limited areas of native grassland and forested habitats that do exist.

   Henslow's sparrow and loggerhead shrike have been identified as species of concern that are susceptible to habitat fragmentation and have been recorded near the Project Area (HDR 2017, Boone 2017). Some limited grassland habitat noted during Tier 2 site reconnaissance could support Henslow's sparrow or loggerhead shrike.

   While unfragmented forest habitat for the bats is limited within the Project Area, it is possible that bats such as NLEB could utilize trees within Project Area for roosting. Project infrastructure will not contribute to additional fragmentation of existing woodlot/woodland habitats.

3. *What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed project?*

   State-listed bird species and SPC have been observed during avian use surveys. The Project Area contains little herbaceous land cover (0.7%) which is typically either pasture or restored or native grassland that would be preferable for species of concern observed during Tier 3 surveys (i.e. Henslow's sparrow, loggerhead shrike, short-eared owl). Areas of open water are lacking within the Project Area; therefore, risks to species of concern such as horned grebe, trumpeter swan, Forster's tern, and American white pelican are expected to be low. Some SPC may occur infrequently during migration seasons (e.g. Franklin's gull, peregrine falcon). Bald eagles were observed within the Project Area during Tier 3 surveys; however, eagle use of the Project Area is expected to be relatively low compared to surrounding areas due to limited preferred habitat within the Project Area. Sullivant's milkweed was not observed during the August 2020 screening surveys and in general the assessment indicated limited habitat that would be likely to contain this species; however, native prairie near Salem Creek may support Sullivant's milkweed.

4. *What are the potential risks of adverse impacts of the proposed project to individuals and local populations of species of concern and their habitats?*

   No significant adverse impacts to individuals and local populations of species of concern are expected from the proposed Project, as the current turbine layout avoids preferred habitats.

5. *How can developers mitigate identified significant adverse impacts?*

   Developers have worked to identify habitats in which sensitive species are likely to be found (e.g., native prairies) and have worked to site Project infrastructure outside of those areas to minimize impacts to wildlife and plants to the extent practicable.

   Mitigation measures also consist of collaboration and communication with wildlife management agencies, adherence to federal and state mitigation guidance, using pre-construction studies to inform micro-siting of Project infrastructure, implementation of best management practices (BMPs) during construction and operations, and post-construction mortality monitoring to further assess potential impacts and validate the efficacy of avoidance, minimization, and mitigation measures.

6. *Are there studies that should be initiated at this stage that would be continued in either Tier 4 or Tier 5?*

   DCW will initiate Tier 4 post-construction monitoring after turbines are operational. Methodology for the Tier 4 survey work will be described in Appendix C after further coordination with the MNDNR and MNDOC. No surveys are anticipated at this time to continue in Tier 5.

2.3 Summary of Agency Coordination

Coordination with state and federal wildlife agencies is paramount early in the development process, as the developer gathers the information necessary for the tiered review process. DCW obtained input on the Project throughout the siting and development processes. Agency coordination is summarized in Appendix A.

In particular, DCW received a letter on May 27, 2014 from MNDNR, which documented two areas within a preliminary Project boundary that may have higher bat and avian use (specifically, a wetland complex near the Oak Glen WMA and a wooded riparian area associated with Dodge Center Creek). A May 26, 2017 letter from MNDNR commenting on an updated Project boundary outlined a portion of the Project Area that may have higher bat and avian use (specifically, the west-central portion of the Project Area in Steele County south of SE 48th Street, north of SE 103rd Street. and east of Trunk Highway 218), and MNDNR requested that turbines not be sited in this area. In response, DCW adjusted the final Project Area to completely exclude the Oak Glen WMA wetland complex, and re-sited turbines outside of the other two areas identified by MNDNR as areas of potential concern (Figure 13). As part of the LWECS Site Permit process, DCW will further coordinate with the USFWS, MNDOC, and MNDNR on the proposed layout. As additional recommendations and comments are received from the agencies, this WCS will be updated accordingly.

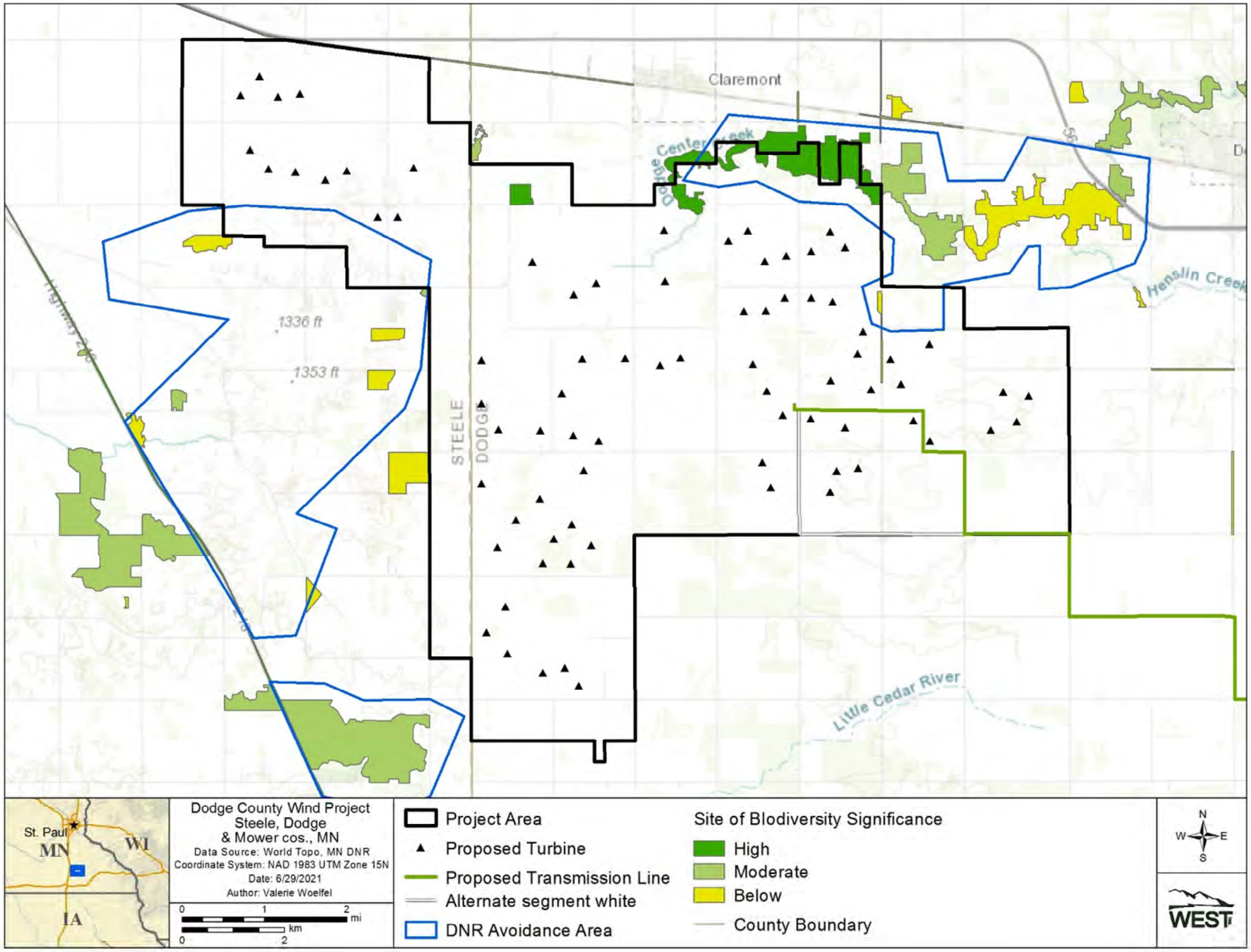

Figure 13. MNDNR Avoidance Areas in relation to the proposed turbine layout for the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

3 CONSERVATION MEASURES TO AVOID AND MINIMIZE ADVERSE IMPACTS

The design, siting, construction, operation, and decommissioning of the Project will incorporate the avoidance and minimization measures listed below based on the USFWS WEG, LWECS site permit application guidance, and industry BMPs. These measures demonstrate practical means to reduce impacts to wildlife and wildlife habitats. DCW will comply with all applicable local, state, and federal environmental laws and regulations.

3.1 Design and Siting Measures

3.1.1 Project Siting Measures Used to Reduce Impacts

- The Project was designed with standard setbacks for non-participating landowners, residences, state- and federally owned lands (i.e., five RD buffer in the prevailing wind direction and three RD buffer in the non-prevailing wind direction), and for factors such as sound and shadow.
- All turbines will be sited in agricultural fields to avoid or minimize impacts on natural areas (e.g., native prairie, wetlands), thereby reducing potential impacts to birds, bats, and SPC.
- All turbines will be sited to be outside of the recommended avoidance areas provided by the MNDNR as areas that may be of potential concern to birds and bats (Figure 13).
- Turbines will be sited more than 1,000 ft (305 m) from forested habitat patches of 10 ac or greater. For wooded patches smaller than 10 ac in size, turbines will be set back from these features as much as possible given other environmental, engineering and landowner constraints.
- Turbines will be set back from the larger wetland complexes studied in the wetland utilization surveys. The nearest turbines are more than 0.6 mi (1.0 km) from the Dodge Center Creek WPA, more than 1.25 mi (2.0 km) from the wetlands in the Oak Glen WMA wetland complex, and more than 2.5 mi (4.0 km) from the wetland in the Ashland Township area.
- Other Project infrastructure (e.g., collector lines, access roads) will be sited to avoid or minimize impacts to natural areas to the extent practicable. When possible, existing public roads and access roads will be used to avoid clearing natural habitats during construction.

3.1.2 Avoidance/Minimization of Impacts to Native Plant Communities and Wetlands

- Turbines will be sited in agricultural fields to the greatest extent practicable, thus avoiding impacts to natural areas and reducing potential impacts to birds, bats, and SPC. The current proposed turbine layout has sited all 79 turbines in agricultural fields.
- To the extent practicable, the Project layout will be developed to use the existing public and private roads to avoid clearing forests and natural habitats during Project construction.

- All Project infrastructure has been sited to avoid areas identified by MNDNR as native prairie. DCW will coordinate with the MNDNR on a Prairie Protection and Management Plan (PPMP) before construction. If design changes result in proposed impacts within potential areas of native prairie or wetland communities that may contain listed plant species, DCW will coordinate with the USFWS and MNDNR to determine the next steps.
- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction. Wetland delineations and micro-siting of turbines will be conducted prior to construction to identify wetland boundaries and to avoid placement of turbines in sensitive wildlife habitat.

3.1.3 Project Design Measures Used to Reduce Impacts

- Wind turbines designed with tubular towers and no external ladders or platforms on the towers or nacelles will be used to minimize bird perching and nesting opportunities.
- The number of turbines with visibility lighting will be minimized, within Federal Aviation Administration (FAA) requirements.
- DCW will use FAA-approved lighting with the shortest allowable flash duration, the minimum allowed flashes per minute, and ensure that all lights flash at the same time so that nocturnal migrating birds are not disoriented by lights.
- Lighting at the operations and maintenance facility, Project substation, and other installations will be minimized; required lights will hooded and directed downward (toward the access or work area) to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting will be used, where practicable.
- Up to two permanent met towers will be installed at the Project, and will remain operational for the duration of the Project. Any temporary met towers will be removed as soon as feasible after construction. Permanent met towers will be free-standing without guy wires.
- If additional operational or Supervisory Control and Data Acquisition System met towers are needed, the Project will utilize free-standing towers without guy wires.
- Electrical collection systems within the Project Area will be buried underground. Above ground electrical systems, including pad-mounted transformers, will follow applicable guidance by Avian Power Line Interaction Committee for minimizing the risks to birds.

3.2 Construction Measures

3.2.1 Construction Personnel Training and Safeguards

All construction personnel and contractors will be trained to identify sensitive resources, mitigate potential wildlife conflict situations, and provide proper responses. Additionally, training will include education on the standard measures to be followed during construction to minimize wildlife impacts, including:

- Industry-standard BMPs will be implemented to protect topsoil and adjacent resources to minimize soil erosion.
- All surface-disturbed areas will be restored to the approximate original contour and reclaimed, where applicable.
- Speed limits on Project access roads (25 miles per hour) will be followed to minimize wildlife mortality due to vehicle collisions.
- Travel will be restricted to designated roads. Off-road travel will be minimized where practicable.
- Construction activities will be performed using standard construction BMPs to minimize the potential for invasive species introductions and accidental spills of solid material, contaminants, debris, and other pollutants. Excavated material or other construction materials will not be stockpiled or deposited near or on stream banks. These practices also include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Because the creek heelsplitter, a state mussel species of special concern, has been documented within Dodge Center Creek, erosion prevention and sediment control practices will be implemented to minimize deterioration of water quality.
- Removal or disturbance of vegetation will be minimized through site management (e.g., by utilizing previously disturbed areas, designating limited equipment/materials storage yards and staging areas, scalping) and reclaiming all disturbed areas not required for operations.
- DCW will coordinate with local Natural Resources Conservation Service (NRCS) when determining native seed mixes for reclaiming disturbed areas.
- No burning or burying of waste materials will occur at the Project site. All contaminated soil and construction debris will be removed and disposed of in approved landfills in accordance with appropriate environmental regulations.
- All employees and contractors will follow federal and state measures for handling toxic substances to minimize contamination of water and wildlife resources.

3.2.2 Construction Safeguards

- While all Project infrastructure has been sited to avoid areas identified by MNDNR as native prairie, if any activities may disturb or impact native prairies, DCW must adhere to the PPMP. Specifics addressed in the PPMP include native prairie avoidance, pollution prevention, invasive species prevention, construction monitoring, and revegetation.
- If tree removal is unavoidable, tree removal will be conducted in accordance with the 4(d) rule for NLEB:
    - Tree removal can occur more than 0.25 mi (0.4 km) from a known, occupied hibernacula.

  - o Tree removal activities must avoid the area within 150 ft of known, occupied maternity roost trees during the pup season (June 1–July 31).

3.3 Operational Measures

3.3.1 Project Operational Measures Used to Reduce Impacts

- Avian and bat fatalities will be evaluated during standardized post-construction fatality monitoring (Appendix C).
- DCW will implement an Adaptive Management Program (Section 5) for avoidance, minimization, and mitigation of impacts to birds, bats, and other sensitive wildlife.
- A site-specific worker environmental training plan will be developed and implemented throughout the operating life of the Project to inform workers of the sensitive biological resources, restrictions, protection measures, and individual responsibilities on-site to minimize wildlife impacts. All employees and contractors working in the field will be required to attend the environmental training session prior to working on site.
- "Good housekeeping" procedures will be developed to keep the site clean of debris, garbage, carrion, fugitive trash or waste, and graffiti. Scrap heaps and dumps will not be permitted to avoid attracting potential food sources (i.e., rodents and other small mammals) for eagles and other predators to the Project Area.
- Vehicle speeds will be limited to 25 miles per hour on Project roads to minimize vehicle collisions with wildlife.
- Road-killed animals or other carcasses (excluding eagles and other migratory birds) detected by personnel on or near roads within the Project will be removed promptly to avoid attracting eagles or other raptors to the Project Area. Carcass removal will be conducted following an approved protocol.
- Trash/waste will be collected and stored self-closing containers and removed daily.
- Noxious weeds will be managed in accordance with applicable regulations.
- Pesticide, herbicide, fertilizer and other chemical treatments will be used in accordance with federal and state regulations and laws to minimize drift and other potential impacts on native habitat.
- A Spill Prevention, Control, and Countermeasure (SPCC) Plan will be developed to outline spill response/containment and clean-up procedures.
- To avoid habitat destruction, BMPs for fire prevention during operation will be implemented to minimize wildfire potential.
- DCW workers and subcontractors will not be allowed to have firearms or pets at the Project and will be instructed to not disturb or harass wildlife.
- Lighting of the turbines will be pursuant to FAA aviation hazard lighting standards DCW may also install motion–activated, timed lighting on tower entrances and other facilities

that require lighting at night to avoid the potential to attract insects that may draw birds and bats toward the facility.

- DCW has agreed to develop and implement this WCS and the PPMP in its continued efforts to demonstrate due diligence in avoiding and minimizing impacts to avian and bat species and species of concern in association with development and operation of the Project.
- Specific measures to minimize bat fatalities will be implemented, including feathering turbine blades up to the manufacturer set cut-in speed from one-half hour before sunset to one-half hour after sunrise between April 1 – October 31.

4 POST-CONSTRUCTION MONITORING (TIER 4) AND RESEARCH (TIER 5)

To assess actual direct collision impacts to bird and bat species from the Project, post-construction mortality monitoring will be conducted by a qualified third party for a minimum of one year. These surveys will include searcher efficiency and carcass removal trials, and the overall fatality rates will be adjusted based on the trial results. The monitoring protocol will be developed through coordination with the MNDNR, and once developed, will be detailed in Appendix C (Post-Construction Monitoring Plan). The protocol will be based on guidelines from the WEG (USFWS 2012), the *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota* (Mixon et al. 2014), and the *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions* (Strickland et al. 2011). The goals of post-construction monitoring will be to estimate bird and bat fatality rates for the Project, evaluate the circumstances under which fatalities occur, and provide information to evaluate whether the impacts of the Project are higher than expected in the context of other wind projects in the Midwest. Post-construction monitoring results also provide information used in evaluating whether further adaptive management actions should occur (Section 5.1).

In addition to Tiers 1–4 described, the WEG contains *Tier 5 Other Post-Construction Studies*. In general, the studies identified in Tier 5 are research-related and “will not be necessary for most wind energy projects” (USFWS 2012). Results from the Tier 4 studies will be reviewed to determine the necessity for Tier 5 studies; however, these studies are not anticipated for this Project.

5 ADAPTIVE MANAGEMENT

Within the WEG, the USFWS defines adaptive management as “an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process” (USFWS 2012). The WEG further notes that adaptive management at most wind energy facilities is unlikely to be needed if they are sited in accordance with the tiered approach. Nevertheless, DCW recognizes the value of applying an adaptive management approach where Project activities include some uncertainty. As such, DCW has incorporated an adaptive approach for the conservation of wildlife potentially impacted by the Project.

5.1 Unexpected Avian or Bat Impacts

Based on the results of the Tier 4 monitoring program described in Appendix C, adaptive management measures could be considered to further avoid, minimize, or compensate for unanticipated and significant Project impacts to wildlife. Thresholds for considering an adaptive response will include:

- Fatality of an eagle or of a species listed as endangered/threatened under the federal ESA or Minnesota's Endangered Species Statute. Note, the final 4(d) ruling for the NLEB currently exempts wind energy projects from incidental take of this species during operation. Any documented NLEB mortality will be reported to the USFWS and MNDOC, but no adaptive management measures are necessary or required under the current 4(d) rule. If the status of the NLEB is changed (including potential changes to the current 4(d) rule), DCW will update this WCS and adaptive management measures, as appropriate.
- Significant levels of mortality of unlisted species of birds or bats. Significance will be determined by qualified biologists and will be based on the latest information available, including the most recent data on species' population sizes and trends. For example, even relatively high levels of mortality of the most common species may not be significant. Conversely, lower levels of mortalities of less common species may be of more concern, particularly if these species appear to be at risk.

6 IMPLEMENTATION OF THE WILDLIFE CONSERVATION STRATEGY

6.1 Document Availability

This WCS will be maintained by DCW's environmental representative and a copy of the WCS will be kept on-site throughout operation of the Project.

6.2 Annual Audits

By March 15 following each complete or partial calendar year of operation, DCW will file with the PUC an annual report detailing findings of its annual audit of WCS practices. The annual report will include summarized and raw data of bird and bat fatalities, and injuries documented through either Post-Construction Monitoring and Management (PCMM) or Wildlife Response & Reporting System (WRRS; Appendix D). DCW will provide a copy of the report to the MNDNR and the USFWS at the time of filing with the PUC.

6.3 Reporting

DCW will provide a quarterly wildlife incident report summary to the MNDOC, MNDNR, and USFWS for the life of the LWECS Site Permit. Additionally, the Project owner, the MNDOC, MNDNR, and the USFWS will be notified within 24 hours of the discovery of any of the following:

- one or more dead or injured state-listed threatened or endangered bird or bat species or species of special concern
- one or more dead or injured federally listed bird or bat species
- one or more dead or injured bald or golden eagles
- five or more dead or injured birds or bats at a single turbine during a single survey

7 PRIMARY CONTACTS

Key resource personnel associated with this WCS include the following:

- NextEra Dodge County Wind Energy Project: Sean Fitzgerald
  - Office: (561) 691-3274
  - Email: Sean.Fitzgerald@nee.com

- US Fish and Wildlife Service: Mags_Rheude (Eagles); Dawn Marsh (ESA species)
  - Office: (612) 713-5438; (952) 252-0092 ext. 202
  - Email: Margaret_Rheude@fws.gov; Dawn_Marsh@fws.gov

- US Fish and Wildlife Service Law Enforcement
  - Office: USFWS Law Enforcement – St. Paul Station
  - Contact: (651) 778-8360

- Minnesota Department of Natural Resources: Cynthia Warzecha
  - Office: (651) 259-5078
  - Email: Cynthia.Warzecha@state.mn.us

- Minnesota Department of Commerce: Rich Davis
  - Office: (651) 539-1846
  - Email: Richard.Davis@state.mn.us

8 REFERENCES

8.1 Acts, Laws, and Regulations

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Appendix A. Agency Correspondence

Appendix A. Agency Correspondence with Dodge County Wind (DCW).

Date	Deliverable Type	Communication Type	Action Items	Outcome / Response
5/27/2014	MNDNR, Atwell, DCW	Email	Preliminary review of initial DCW siting area and suggested avoidance areas.	Project Area modified significantly in 2017 to avoid potentially sensitive areas.
2/16/2017	MNDNR, DCW	Letter	MNDNR indicated revised Project boundary for wind and transmission area avoided higher value habitat. MNDNR indicated that Project is considered a low risk site and that additional bat acoustic data was not needed.	Additional bat studies were not planned, and project design continued.
3/7/2017	MNDNR, DCW, Atwell	Email	USFWS provided known eagle nest data out to 12 miles from the Project Area boundary in shapefile format.	Eagle nest data incorporated into avian studies. Previously documented eagle nest locations within the Project Area and 10-mile buffer were visited as part of aerial nest surveys to determine current nest status.
4/13/2017	MNDNR, DCW	Email	USFWS recommended Year 2 avian studies and requested eagle nest data from Atwell. MNDNR requested more information on Henslow's Sparrow and Loggerhead Shrike.	Year 2 avian studies conducted. Henslow's Sparrow and Loggerhead Shrike study conducted. Eagle nest data from Project aerial nest surveys were provided to USFWS.
4/21/2017	MNDNR, Atwell, DCW	Email	Natural Heritage Information System (NHIS) final data request review packet for the Project Area (initial boundary).	NHIS data were accounted for as part of site assessment (Tier 1), site characterization (Tier 2), and project design.
5/9/2017	MNDNR, NEER, Atwell, DCW	In-person MNDNR St. Paul office	Updated shapefiles for Bald Eagle nests in a 10-mile buffer.	Eagle nest data incorporated into avian studies.
5/9/2017	MNDNR, Atwell, DCW	Email	USFWS eagle nest data is purely incidental, no formal surveys have been flown within Minnesota by USFWS and MNDNR since de-listing of Bald Eagle (2007).	Eagle nest data incorporated into avian studies.
5/24/2017	MNDNR, Atwell, DCW	Email	MNDNR requested a review of Henslow's Sparrow and Loggerhead Shrike data and habitat for Project.	Henslow's Sparrow and Loggerhead Shrike study conducted. No Loggerhead Shrike detected in Project Area. Henslow's Sparrow detected in Project Area but outside of Project disturbance area.

5/26/2017	MNDNR, Atwell, DCW	Email	MNDNR recommended no direct impacts to public recreational lands. MNDNR identified an area (also referred to as “polygon of concern”, which is in west portion of Project Area) where they recommended not placing turbines due to potential higher bird and bat use. Recommended a mortality monitoring plan be included in ABPP. Recommended wildlife reports be updated to reflect revised project boundary and recommended alternative turbine locations be included in layout. Comments from MNDNR about Project boundary change, identification of avoidance area, and the need for additional avian study data collection.	Project avoids all direct impacts to public recreational lands. All turbines planned within the polygon of concern were removed from project design. A mortality monitoring plan is included in the ABPP. Wildlife reports were updated to reflect the revised project boundary. Alternative turbine locations are included in the project layout.
6/12/2017	USFWS, MNDNR, DCW, Atwell	In-person USFWS Minnesota Field Office	NHIS review for new Project Area boundary including review of Henslow's Sparrow and Loggerhead Shrike data submitted by Atwell.	NHIS data incorporated into project design.
8/16/2017	MNDNR, Atwell, DCW	Email	MNDNR identification of turbines recommended to not carry forward into permitting to reduce bird and bat impacts.	Turbines identified as a concern by MNDNR dropped from project design.
10/19/2017	MNDNR, DCW	Letter	Meeting to discuss turbine array and bat risk. MNDNR confirmed additional bat studies are not recommended, but careful siting of turbines can help reduce risk.	Turbines identified by MNDNR as a concern dropped from project design.
10/19/2017	MNDNR, DCW, Atwell	Email	Provided revised turbine array to document that locations of wind turbines identified by MNDNR as “poorly sited” were removed from project design.	Turbines identified by MNDNR as a concern dropped from project design.
10/23/2017	MNDNR, DCW	Email	MNDNR further reviewed the Project and identified turbines with wildlife concerns.	Turbines identified by MNDNR as a concern were dropped from project design.
6/22/2018	MNDNR, Atwell, DCW	Email	Requested updated NHIS review for the Project Area.	NHIS data incorporated into Project design.

7/11/2018	MNDNR, NEER, Atwell, DCW	In-person MNDNR St. Paul office	Meeting to review findings of Year 2 avian studies and to update agencies on site and transmission line route application status. ABPP and Eagle Management Plan to be provided for USFWS and MNDNR review. USFWS recommended following 4(d) tree clearing restrictions for northern long-eared bat should any tree removal occur.	ABPP and Eagle Management Plan provided for agency review. In accordance with USFWS 4(d) rule, no tree clearing would occur within 150 feet of a known northern long-eared bat roost between June 1 and July 31.
7/16/2018	MNDNR, Atwell, DCW	Email	MNDNR identified a turbine location (T11 from 7/16/18 array) with potential wildlife setback issues.	Turbine T11 location unchanged. This wind turbine could not be moved due to land restrictions and this was communicated to MNDNR and MNDNR had no further recommendations regarding this wind turbine.
12/16/2020	MNDNR, Atwell, DCW	Email	Atwell requested an updated NHIS review of the Project from MNDNR.	No additional species or habitats identified; confirmation that Natural Heritage letter dated November 15, 2018 is valid.
02/02/2021	MNDNR;WEST, Atwell, DCW	Conference call/webinar	DCW and WEST provided an update on Project, including summary of 2020 surveys and proposed schedule and approach to further surveys and application.	MNDNR requested information on previous Project boundary and previously MNDNR-identified avoidance areas and how they related to current Project boundary and layout. The WCS has been updated to address and document that current turbines have been placed outside the previously-identified avoidance areas.

Appendix B. Wildlife Survey Results 2014-2021

Bat Monitoring Final Report for the Dodge County Wind Resource Area

Dodge County, Minnesota

Prepared for
NextEra Energy Resources, LLC
700 Universe Blvd
Juno Beach, FL 33408

Prepared by
Normandeau Associates, Inc.
102 NE 10th Ave, 1st Floor
Gainesville, FL 32601
www.normandeau.com

December 24, 2014

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Acronyms and Abbreviations

ABPDH	average bat passes per detector hour
ABPDN	average bat passes per detector night
AIC	Akaike Information Criterion
dB	decibel
h	hours
kHz	kilohertz
met tower	meteorological tower
Precip	total daily precipitation
ReBAT®	Remote Bat Acoustic Technology
RSZ	rotor swept zone
WRA	wind resource area

1 Project Summary and Study Area Description

- *Project Name:* Dodge County WRA
- *County:* Dodge County and Steele County
- *Closest City:* Owatonna, MN
- *Number of Towers:* 2 meteorological based ReBAT® station(s)

NextEra Energy Resources is proposing to build a wind energy facility approximately 15 km southeast of Owatonna, Minnesota, in Dodge and Steele counties (Figure 1). Land use and land cover within the project site and surrounding area consists of an agricultural matrix with small–moderate woodlots interspersed throughout (

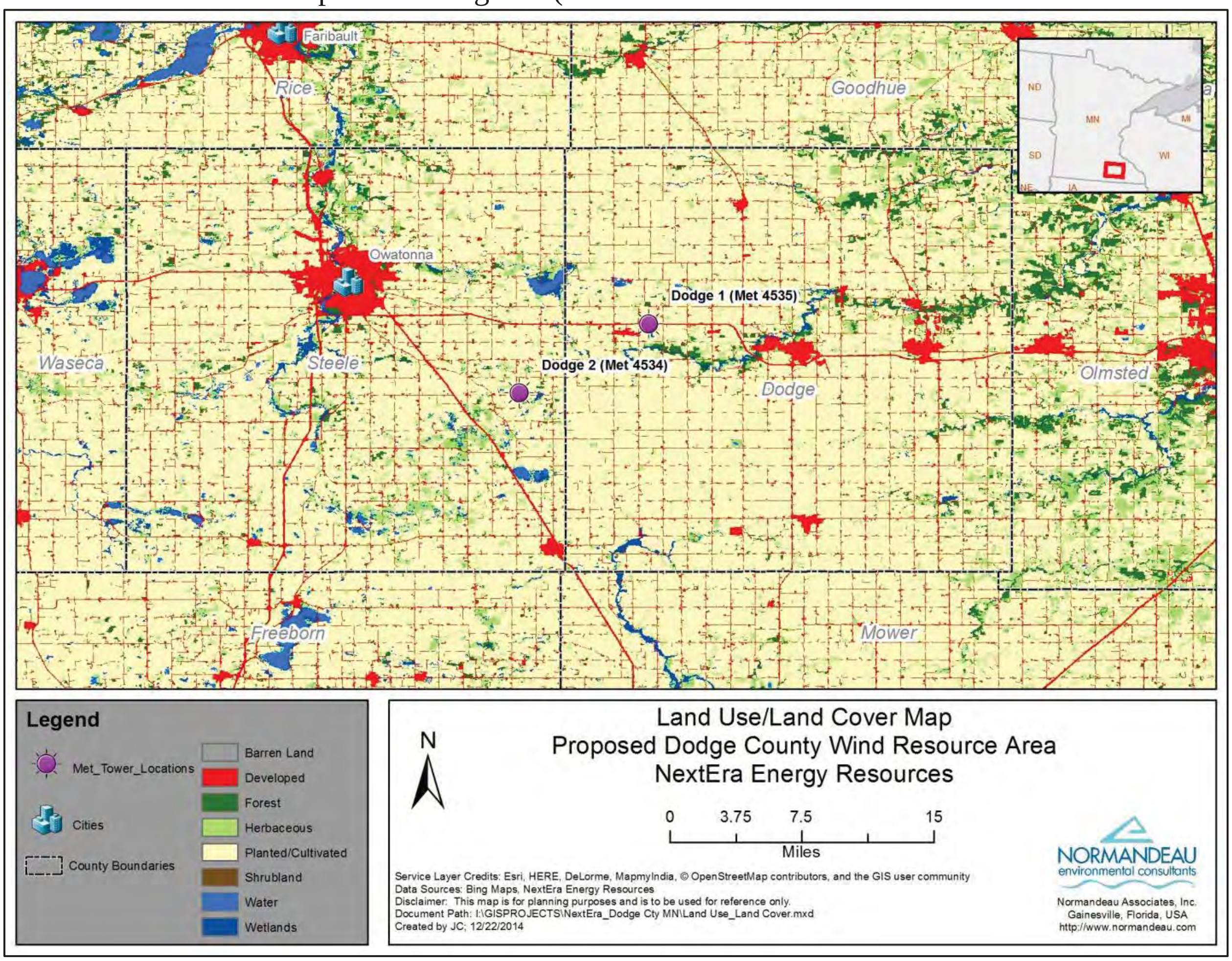

Figure 2).

2 Methods

2.1 Acoustic Data Capture

Two Remote Bat Acoustic Technology (ReBAT®) systems were deployed on two 30-m-tall permanent meteorological (met) towers (see Figure 1) located within the project site. For the two ReBAT systems, the upper receiver was attached to the met tower at approximately 30 m and sampled as high as 60 m. The lower receiver was attached to the tower at 15 m and sampled as high as 45 m. See Table 1 for station identifiers and tower locations..

Acoustic receivers were protected from the elements in weather-resistant aluminum housing units that are raised and lowered on a pulley system attached to the portable tower. To avoid microphone damage from precipitation, the microphones were positioned within the protective aluminum housing pointing straight down. A plastic reflector plate was attached to the aluminum housing at a 45° angle to allow for maximum bat detectability.

Table 1. ReBAT™ Station Identifiers and Locations

Tower	Client Name	Longitude	Latitude
Dodge 01	Met 4535	44° 3' 10.44"N	92° 58' 36.84"W
Dodge 02	Met 4534	43°59' 45.24"N	93° 5' 0.24"W

The arrays were programmed to record bat acoustic data nightly from an hour before sunset to an hour after sunrise. Recordings were triggered based on frequency (in kilohertz [kHz]) and decibel (dB). Recorded sound files were 1.7 seconds in duration. Data from the acoustic receivers were transmitted to a custom-built computer located at the base of the tower. The data were transmitted via cellular signal to Normandeau's office in Florida for storage and analysis. Each system was powered through a series of batteries and solar panels. All critical components were secured and stored in weatherproof housing at the base of the portable tower.

2.2 Acoustic Data Analysis

Qualitative analysis of recorded echolocation calls was performed on all operational detector nights using SCAN'R™ (Binary Acoustic Technology 2007) filtering software to remove noise files. Call files (duration = 1.7 seconds) were used to describe a bat pass. Call files classified as bat were further analyzed using SonoBat™ (SonoBat 2.2, Arcata, CA) acoustic analysis software and were assigned to a species or species group based on comparison to reference libraries of species-specific bat calls.

Because risk of mortality is closely tied to species, it is important to identify calls to species when possible. Although each bat species has specific call characteristics, there is overlap among call parameters, and bats vary their calls situationally. Because of known overlap in echolocation call characteristics that occurs among some sympatric species (Barclay 1999), a portion of the acoustic data was classified to species groups rather than to individual species. Classification to species or species group was possible only for calls with a low signal-to-noise ratio and minimal echo. If the species or species group could not be determined because of call quality or if calls were assignable to more than three species due to overlap in echolocation call parameters, the call was categorized as unknown.

2.3 Activity Data Analysis

Results from the acoustic data analysis were used to assess the level of bat activity, the spatial and temporal distribution of bats, and the influence of weather conditions on bat activity within the proposed wind resource area (WRA).

2.3.1 Activity Indices

Bat activity at wind facilities is typically reported as average bat passes per detector night (ABPDN) and average bat passes per detector hour (ABPDH). ABPDN is defined as the average number of detected bat passes per night per detector for all bat species. ABPDH is defined as the nightly count of bat passes per number of recorded hours per detector for all bat species. For data analysis, the ABPDH and the ABPDN were determined for each ReBAT station using nights during which the system was operational for at least 400 minutes. These measures control for variation in total sampling effort at each monitoring station.

Bat passes, rather than number of individual bats, are reported because a single bat may produce more than one recorded bat pass during a night or over a period of nights. Thus bat passes are used as an indicator of activity.

To describe the temporal variation in bat activity within the proposed WRA, mean bat activity from each monitoring station (ABPDN) was calculated on a per night basis throughout the Spring, Summer, and Fall monitoring periods. Postconstruction bat mortality studies have shown that risk of wind turbine collision may be species-specific, with migratory tree bats most often killed at operational WRAs throughout North America during periods of migration (Arnett et al. 2008). Therefore, evidence of migratory activity (spikes in migratory bat activity) was examined through acoustic data analysis and plotted over the Spring and Fall monitoring periods. Additionally, summer activity was examined to assess baseline bat activity during the non-migratory season. Hourly variation in bat activity levels was examined by calculating ABPDH during the Spring, Summer, and Fall monitoring periods.

A bat must be flying within the rotor swept zone (RSZ) to be at risk of mortality. Therefore, only bats detected at the upper detector were at risk. The vertical distribution of bat activity was determined by calculating the proportion of bat passes detected at the upper and lower detectors from each monitoring station. Additional species-specific vertical distribution was also determined for each monitoring station.

Acoustic analysis was based on data recorded during the Spring and Fall 2014 migratory periods as well as the Summer 2014 season. A sample of monitored acoustic data was analyzed with an increased sampling effort during the Fall 2014 migratory period. The Fall 2014 migratory period was selected for additional analysis because bat fatalities at operational wind facilities in North America are often concentrated in the fall. A complete list of the analyzed nights can be found in Appendix 3.

2.3.2 Atmospheric Factors

Previous studies (Fiedler 2004; Kerns et al. 2005; Arnett et al. 2006; Barclay et al. 2007) have indicated that bat activity and/or bat mortality may be correlated with atmospheric conditions. If these relationships are robust, they may provide an avenue for managing bat mortality at operational wind facilities.

To understand how atmospheric variables can affect bat activity and potential risk of collisions with wind turbines, the number of bat passes was modeled as a function of six different atmospheric variables (

). This approach allowed for determination of the atmospheric variables that were most associated with bat activity at the Dodge County WRA. An information-theoretic approach to model building was used, which involves constructing models *a priori* based on known biological information and before any data analysis is done (Burnham and Anderson 2002). Constructing models using this approach reduces the occurrence of spurious results from models that are biologically supported.

The modeling used both acoustic data from the ReBAT detectors and data from the met towers within the project site. Seventeen candidate models were constructed for two of the migratory bat species recorded at the site–hoary bat (*Lasiurus cinereus* [LACI]) and silver-haired bat (*Lasionycteris noctivagans* [LANO])—as well as species within the *Myotis* group [MYSP40k_E]. There were not enough passes of the Eastern red bat (*Lasiurus borealis* [LABO]) for statistical analysis.

A Poisson regression was used to model the number of bat passes as a function of atmospheric variables. This type of regression is useful when modeling count data because count data (e.g., bat passes) are often Poisson distributed (Dalgaard 2008). The response variable was the number of bat passes of each species totaled for a given night during 2014. Eight atmospheric variables were chosen based on their likely influence on bat activity (see

). Variables were chosen based on known relationships from the literature and expert opinion. All variables were standardized using Z-scores prior to analysis to a mean of zero and a standard deviation of one. In addition to modeling atmospheric variables, a null model for each species was run, which only included the detector variable and assumes that atmospheric conditions have no influence. The null model served as a baseline so that the differences in likelihood of the other models that include atmospheric variables could be examined. Poisson regression was performed in R using the General Linear Model function (R Development Core Team 2009).

Table 2. Variables Used in Modeling Approach Examining Bat Activity in Relation to Atmospheric Patterns

Variable Abbreviation	Description
TwrAvgTemp_Avg	Average nightly temperature (^{o}C)
TwrAvgSpeed_Avg	Average nightly wind speed (m/s)
Precip_Avg	Average nightly precipitation (mm)
RH_Avg	Average nightly relative humidity (%)
TwrAvgPressure_Avg	Average nightly barometric pressure (mmHg)
TwrAvgPressureSunset_Avg	Average barometric pressure between 1 hour prior to sunset and 2 hours after sunset (mmHg)
TwrAvgTempSunset_Avg	Average temperature between 1 hour prior to sunset and 2 hours after sunset
TwrAvgSpeedSunset_Avg	Average wind speed between 1 hour prior to sunset and 2 hours after sunset

Models were evaluated by comparing the Akaike Information Criterion (AIC) values and Akaike weights among the other models in each candidate set. These metrics assess the likelihood of the model relative to other models in the candidate set. Comparisons of AIC values and model weights are only valid within a given suite of models for a specific season and species. Comparisons cannot be done across seasons or species (Burnham and Anderson 2002). Models with lower AIC values (those closer to zero) indicate a model that provides the most parsimonious explanation.

3 Results and Discussion

3.1 Monitoring Schedule

A random sample of the nights monitored was analyzed with an increased sampling effort during the fall migratory period (

Table 3) because previous research at operational wind energy facilities has indicated an increased risk to turbine-related mortality during the fall migratory period (Arnett et al. 2008). The Dodge 01 (Met 4535) monitoring tower was operational for 100% of the time during the Spring and Summer 2014 sampling seasons and 99% of the time for the Fall 2014 sampling season (

Table 4). Tower Dodge 02 (Met 4534) was also operational for 100% of the time during the Spring and Summer 2014 sampling seasons but 95% of the Fall 2014 sampling season (see

Table 4).

Table 3. Monitoring and Call Analysis Schedule

Monitoring Period	Start Date	End Date	Minimum Number of Nights to be Analyzed
Spring 2014	05/30/14	06/15/14	10
Summer 2014	06/16/14	07/15/14	15
Fall 2014	07/16/14	10/15/14	30

Table 4. System Operational Status for Each Tower for Each Sampling Season

Season	Begin Date	End Date	Client Tower No.	Expected Nights	Lower Detector Nights	Upper Detector Nights	Percent Operational
Spring 2014	05/30/14	06/15/14	Met 4535	17	17	17	100
Summer 2014	06/16/14	07/15/14	Met 4535	30	30	30	100
Fall 2014	07/16/14	10/15/14	Met 4535	92	91	91	99
Spring 2014	05/30/14	06/15/14	Met 4534	17	17	17	100
Summer 2014	06/16/14	07/15/14	Met 4534	30	30	30	100
Fall 2014	07/16/14	10/15/14	Met 4534	92	87	88	95

Note: A system is considered operational if data are collected for at least one-half of the expected hours (data collection occurs from ½ hour before sunset to ½ hour after sunrise).

3.2 Species Detected and Indices of Abundance

Bat echolocation data can be analyzed to determine not only species presence but also to develop activity indices and spatiotemporal patterns of activity. Activity indices can be used to compare activity levels at multiple spatial and temporal scales. The number of bat passes is not equivalent to the number of bats present, because a single bat can be detected multiple times in a night or a season.

In total, 20 detector-nights were considered from the Spring migratory period and 30 detector-nights for the Summer migratory period at each met tower. Fifty-eight detector nights were considered at Dodge 01 (Met 4535) and 60 detector-nights were considered at Dodge 02 (Met 4534) for the Fall 2014 migratory period (Table 5). From the 218 detector-nights analyzed, 2,370 bat passes were recorded (see Table 5).

The recorded bat passes were classified into 11 species or species groups along with two unknown classifications (Table 6). No federally threatened or endangered species were detected during the preconstruction surveys. However, bat passes were identified as belonging to the *Myotis* (MYSP40k_E) species group, which includes the proposed federally endangered northern long-eared bat (*Myotis septentrionalis*). Because of overlap in echolocation calls of free-flying *Myotis* species, echolocation passes attributable to this genus were classified to the *Myotis* species group, rather than to individual species.

During the Spring of 2014 at Dodge 01 (Met 4535), bat species belonging to the EPFU_LANO species group had the highest activity levels followed by LANO, LACI, and the *Myotis* species group. All other species/groups detected had low or very low activity levels (Figure 3). At Dodge 02 (Met 4534), the *Myotis* species group had the highest activity levels followed by the EPFU_LANO group, LACI, and a fairly small number of LANO. All other species/groups showed low or very low activity (see Figure 3).

During the Summer 2014 monitoring period at Dodge 01 (Met 4535), LACI had the highest activity levels followed by LANO and a much lower level of EPFU_LANO activity. All other species/groups detected had low or very low activity levels (Figure 4). At Dodge 02 (Met 4534), the *Myotis* species group had by far the highest activity levels followed by EPFU_LANO and LACI, which both had the same level of activity. All other species/groups detected showed low or very low activity (see Figure 4).

During the Fall 2014 monitoring period at Dodge 01 (Met 4535), LANO and the EPFU_LANO and *Myotis* species groups comprised the highest activity, followed by much fewer detections of EPFU and LACI. All other species/groups detected had low or very low activity levels (Figure 5). At Dodge 02 (Met 4534), the *Myotis* species group had the highest activity level followed by the EPFU_LANO group, LANO, LACI, and EPFU. Other species/groups detected had low or very low activity (see Figure 5).

Table 5. Summary of Bat Activity for Each Tower for Each Sampling Season

Client Tower No.	Season	No. of Species or Species Complexes Detected	Total Passes Detected	No. of Analyzed Nights	No. of Detector-Nights	ABPDN[1]	ABPDH[2]
Met 4535	Spring 2014	8	131	10	20	6.55	0.614
Met 4535	Summer 2014	10	105	15	30	3.50	0.330
Met 4535	Fall 2014	11	912	30	58	15.72	1.220
Met 4534	Spring 2014	9	137	10	20	6.85	0.643
Met 4534	Summer 2014	9	397	15	30	13.23	1.209
Met 4534	Fall 2014	11	688	30	60	11.47	0.890
TOTAL			**2,370**	**na**	**na**	**na**	**na**

[1]Average Bat Passes per Detector Night
[2]Average Bat Passes per Detector Hour
Note: The total number of recorded bat calls provided an index of activity, but does not necessarily constitute the number of bats present because a single bat could potentially have made several calls within a night and over many nights.

Table 6. Species Metrics (Detected Species Presence at the Project Site)

Code	Species Name	Common Name	State Status	Federal Status	Tower : Presence (%)					
					Met 4535			Met 4534		
					Sp	Su	Fall	Sp	Su	Fall
EPFU	*Eptesicus fuscus*	Big Brown bat	NA	NA	0.00%	2.86%	6.14%	0.00%	4.28%	8.87%
EPFU_LACI_LANO	*Eptesicus fuscus (EPFU), Lasiurus cinereus (LACI), Lasionycteris noctivagans (LANO)*	Big Brown bat, Hoary bat, Silver-haired bat	NA	NA	0.00%	0.00%	4.71%	0.00%	1.76%	2.76%
EPFU_LANO	*Eptesicus fuscus (EPFU), Lasionycteris noctivagans(LANO)*	Big Brown bat, Silver-haired bat	NA	NA	25.95%	5.71%	21.60%	24.82%	12.09%	18.60%
LABO	*Lasiurus borealis*	Eastern Red bat	NA	NA	0.76%	2.86%	2.74%	1.46%	1.51%	1.74%
LABO_PESU	*Lasiurus borealis (LABO), Perimyotis subflavus (PESU) - formerly called Pipistrellus subflavus*	Eastern Red bat, Tri-colored bat—Formerly Called Eastern Pipistrelle	PS: SSC	NA	1.53%	1.90%	0.77%	0.73%	0.50%	0.29%
LACI	*Lasiurus cinereus*	Hoary bat	NA	NA	13.74%	32.38%	5.04%	13.14%	11.59%	10.90%
LANO	*Lasionycteris noctivagans*	Silver-haired bat	NA	NA	24.43%	14.29%	24.45%	5.84%	0.00%	14.97%
MYSP40k_E	*Myotis lucifugus (MYLU), Myotis septentrionalis (MYSE)*	Little Brown bat, Northern Long-eared bat	NA	MYSE (proposed FLE)	10.69%	3.81%	20.50%	27.74%	45.09%	28.20%

Code	Species Name	Common Name	State Status	Federal Status	Tower : Presence (%)					
					Met 4535			Met 4534		
					Sp	Su	Fall	Sp	Su	Fall
PESU	*Perimyotis subflavus - formerly called Pipistrellus subflavus*	Tri-colored bat—Formerly Called Eastern Pipistrelle	SSC	NA	0.00%	5.71%	3.84%	2.19%	0.00%	1.02%
UNKN	*unknown species*	Unknown Species	NA	NA	14.50%	20.95%	6.14%	11.68%	6.55%	6.10%
UNKN_hifreq	*unknown species with a minimum frequency > 33 kHz*	Unknown Species	NA	NA	8.40%	9.52%	4.06%	12.41%	16.62%	6.54%

3.3 Activity Patterns

3.3.1 Seasonal Patterns

Spring 2014

Bat activity in Spring 2014 was highest on 1 June at both towers (Dodge 01 and Dodge 02). Both towers also had high activity on 2 June. Dodge 02 also had fairly high activity on 12 June. All other dates had moderate or low activity. There is little or no trend in the data with multiple peaks and low points throughout June (Figure 6).

Summer 2014

Bat activity in Summer 2014 was modestly highest at Dodge 01 on 13 July and by far highest on 27 and 29 June at Dodge 02. All other dates had moderate or low activity. There is a distinct trend in the data between the towers as bat activity at Dodge 02 was much higher than at Dodge 01 during the summer (Figure 7).

Fall 2014

Contrary to the summer bat activity trends, Dodge 01 had much higher activity in Fall 2014 than Dodge 02. Bat activity in Fall 2014 at Dodge 01was substantially higher on 17 August than any other date at either tower. Dodge 01 also had high activity on 13 August, 26 August, and 16 September. Fairly high activity was observed at Dodge 01 on 21 August, 1 September, 9 September, and 2 October. Dodge 02 had highest activity on 12, 13, and 17 August along with fairly high bat activity on 18 August, 26 August, and 2 September. All other dates had moderate or low activity. There is a noticeable trend in the data with mid-August showing highest bat activity for the entire time of sampling in all three seasons (Figure 8).

3.3.2 Nightly Patterns

Spring 2014

Bat activity in Spring 2014 showed the same trend at both towers with a peak at about midnight. Activity dropped off at 0300 h (Figure 9).

Summer 2014

There was a major difference in bat activity between the two towers in Summer 2014. Activity was highest at Dodge 01 from 2000 h to 2200 h but overall was much less than Dodge 02. Dodge 02 had highest activity at midnight with lower peaks in the 2100 and 0200 hours. Both towers had an end in activity before 0400 h (Figure 10).

Fall 2014

Bat activity during Fall 2014 peaked at Dodge 01 at about 2000 h and remained relatively high until about 0100 h. Activity was relatively high at Dodge 02 from 2100 h until about 0000 h. Activity at both towers ended in the 0400 h (Figure 11).

3.3.3 Migratory Species-Specific Patterns

Silver-haired Bat (LANO)

Low levels of silver-haired bat activity were recorded in Spring 2014. The peak of detections occurred at Dodge 01on 2 June and 14 June. Dodge 02 had low or no LANO activity for the entire Spring sample period (Figure 12). A noticeable hourly trend at Dodge 01 occurred during the 0100 hour. LANO detections at Dodge 02 were low enough that only a very mild peak in hourly activity was recorded during the 0900 hour (Figure 13).

Very few LANO were detected in Summer 2014 with all but one bat being detected on 28 June and no detections at all at Dodge 02 (Figure 14). Hourly activity happened entirely during the 2000 hour except for one bat (Figure 15).

During Fall 2014, LANO activity at both towers peaked on 2 October with lower peaks on 12 and 13 August. LANO activity was higher at Dodge 01 than at Dodge 02 (Figure 16). Dodge 01 had two peaks in hourly activity at 2100 h and 0100 h. The peak activity at Dodge 02 ocurred during the 0200 hour (Figure 17).

LANO were detected primarily in mid-August and early October with a moderate period of detection in the first half of June. This corresponds with fall and spring migration (Cryan 2003).

Hoary Bat (LACI)
During the Spring 2014 monitoring period, there was moderate daily LACI activity with detections at Dodge 01 peaking on 1 June and at Dodge 02 on 12 June (Figure 18). Both towers showed a trend in hourly activity with a peak in detections right after sunset and an end to activity in the 0200 hour (Figure 19).

LACI activity at both towers was low or absent at the very end of June, and the dates of highest summer activity were quite similar among the two towers. Activity peaked at Dodge 01 on 24 June and 13 July. At Dodge 02, peak activity occurred on 20 June and 15 July (Figure 20). Hourly activity was highest at Dodge 01 in the 2200 hour and peaked at Dodge 02 around midnight (Figure 21).

In Fall 2014, a large spike in activity occurred at Dodge 02 on 18 August. Otherwise, LACI activity was sporadic until tapering off in very early October (Figure 22). Hourly activity at both towers showed an initial peak in the 2000 hour and a second peak at about midnight (Figure 23).

Eastern Red Bat (LABO)
Red Bat activity was extremely low in Spring 2014 (three calls) and was spread out across the entire sampling period (Figures 24 and 25).
In the summer, only nine LABO calls were recorded. Mid-July showed slightly higher activity than the rest of the summer (Figure 26). Activity was generally highest in the 2100 hour (Figure 27).

LABO activity in Fall 2014 peaked in mid-August at both towers with small fluctuations at Dodge 01 throughout the season (Figure 28). Both towers also showed slightly more activity an hour or two after sunset (Figure 29).

3.3.4 Myotis-specific patterns

In Spring 2014, *Myotis* activity was higher at Dodge 02 than Dodge 01, with peak activity occurring on 1 June at Dodge 02, followed closely by 5 June at Dodge 02. Activity was low at Dodge 02 for the remainder of Spring 2014 and at Dodge 01 throughout Spring 2014 (Figure 30). Myotis were most active at Dodge 02 right at sunset (around 2000 h) and within the 2300 hour. At Dodge 01, *Myotis* activity was even throught the night (Figure 31).

Myotis activity was extremely low at Dodge 01 during Summer 2014, with only a few calls detected. Converely, Summer 2014 *Myotis* activity was very high at Dodge 02, particularly around the end of June (Figure 32). While *Myotis* were active throughtout the night, highest activity was observed between 0000 h and 0400 h (Figure 33).

In Fall 2014, *Myotis* activity was moderate and variable at both towers, with the peak activity occurring on 17 August, followed by 16 September (Figure 34). *Myotis* activity at Dodge 01 was highest between 2000 h and 2300 h, and decreased abruptly after 0000 h. At Dodge 02, activity was highest between 2200 h and 0100 h, with another large spike in activity just before sunrise (Figure 35).

3.3.5 Vertical Distribution

Relative Abundance

Vertical distribution of detected bat calls varied somewhat among monitoring stations and varied more substantially among seasons. The lower detector always detected higher activity than the upper detector at Dodge 02. Dodge 01 had similar results except that activity levels were close to equal at the lower and upper detectors in Summer.

During the Spring 2014 monitoring season, both towers recorded about three times as much activity at the lower detector than the upper detector (Figure 36). In the Summer, activity differed from tower to tower. Dodge 01 had about the same number of calls at each detector while Dodge 02 had about six times more calls at the lower detector than the upper detector (Figure 37). During Fall 2014, the lower detector recorded about twice as many bat calls as the upper detector at both towers (Figure 38).

Species Distribution

In the Spring 2014 monitoring period, the activity of most species or species groups was higher at the lower detector (mounted at 15 m). In a few cases, activity was the same at both detectors. Activity was slightly higher for LACI calls at the upper detector on Dodge 02. Other than that, activity was never higher at the upper detector for any classification of calls other than the unknown (Figure 39). Moderate, low, or zero activity was recorded in all other cases.

Summer vertical distribution amongst species was very similar to what was seen in Spring 2014 with the exception of a high number of MYSP40k_E calls at Dodge 02. The upper detector at Dodge 01 had many more LANO calls and unknown calls than the lower detector. LACI were also frequently detected at the upper detector at Dodge 01. Dodge 02 recorded a few more calls from LACI at the lower detector than the upper detector. Otherwise, the lower detector always showed more activity than the upper (Figure 40). MYSP40k_E calls were very common at the lower detector on Dodge 02 with EPFU calls being fairly common. LANO calls were highest at the upper detector of Dodge 01. LACI calls were common at all four detectors.

Species vertical distribution was more variable in Fall 2014 with more call records at the upper detectors than during the rest of the year. Still, the lower detectors recorded many more calls within the Fall 2014 season than did the upper detectors (Figure 41). MYSP40k_E calls were highest at the lower detector on both towers. LANO calls were highest on the upper detector at Dodge 01, although they were also high at the lower detector on Dodge 01.

3.3.6 Atmospheric Factors

LACI

There were three LACI models that had AIC values within <2 points of each other, meaning that there is very little difference among them, and they should all be considered. The simplest of the three models contains average temperature around sunset, average wind speed around sunset, and average nightly precipitation (model weight = 0.447). The other two models contained these same variables, plus average nightly barometric pressure in one (model weight = 0.347) and average nightly relative humidity in the other (model weight = 0.194). Sunset temperature had the greatest influence on LACI activity (Figure 42). Activity increased with increasing temperature around sunset, increasing precipitation, and increasing nightly temperature. Activity decreased with increasing sunset wind speed. Complete model output may be found in Appendix 4.

LANO

Two LANO models had similar model weight values. The simplest of the two models contained average nightly temperature, average nightly wind speed, average nightly precipitation, and average nightly relative humidity (model weight = 0.577). The second model contained the same variables, with the addition of average nightly barometric pressure (model weight = 0.413). Sunset wind speed had the greatest influence on LANO activity (Figure 43). Activity increased with increasing humidity and barometric pressure around sunset. Activity decreased with increasing average temperature and wind speed, both nightly and sunset averages.

Myotis (MYSP40k_E)

Two *Myotis* models had AIC values within 2 points of each other. The simplest model contained average temperature around sunset, average wind speed around sunset, average nightly precipitation, and average nightly relative humidity (model weight = 0.644). The second model contained the same variables, with the addition of average nightly barometric pressure (model weight = 0.324). Average temperature around sunset had the greatest influence on *Myotis* activity (Figure 44). *Myotis* activity increased with increasing temperature (nightly and sunset), and relative humidity. Activity decreased with increasing wind speed (nightly and sunset) and precipitation.

Refer to Appendix 2 for the complete model outputs.

3.3.7 Automated Acoustic Identification Results

Refer to Appendix 3 for the results of the automated species identification.

4 Discussion

Overall, bat activity detected at the proposed Dodge County WRA was moderate (10.87 ABPDN) when compared to overall activity at other wind energy facilities throughout North America (**Error! Reference source not found.**). Bat activity was relatively low at both towers during Spring 2014 (6.55 and 6.85 ABPDN). There was a large difference in bat activity levels between the towers during the Summer monitoring period, with Dodge 02 having about four times the activity of Dodge 01 (13.23 and 3.50 ABPDN, respectively). Fall 2014 activity was moderate at both towers (15.72 and 11.47 ABPDN; see Table 5). Activity was generally highest in Fall 2014, as expected.

Overall activity at the Dodge County WRA was higher than at Buffalo Ridge WRA, which is approximately 250 km to the west (see Table 7). This higher activity may be due to the proximity of the Dodge towers to larger woodlots as well as farm buildings that may contain roosts of little brown bats and big brown bats. Dodge 01 is located less than 2 km from a moderately sized wooded area, which includes potential drinking water. It is likely that this area contains ideal roosting habitat for a variety of bat species and is within foraging distance of Dodge 01. There are also several woodlots containing potential roosting habitat within foraging distance of Dodge 02. The bat activity level at the Dodge County WRA was between the levels of activity reported at two other wind farms in the Midwest: Fowler Ridger and Top of Iowa (see **Error! Reference source not found.**). The Fowler Ridge wind farm in western Indiana experienced low bat activity with 4.7 ABPDN in 2011 and 6.8 ABPDN in 2012 (Good et al. 2011, 2012). Top of Iowa wind farm in north-central Iowa had high bat activity at 34.9 ABPDN (Jain 2005). Both of these wind farms are located in landscapes similar to that in the Dodge County WRA.

Table 7. Active Wind Energy Facilities with Both Acoustic Bat Data and Estimated Bat Mortality Data

Wind Project Name	State	Bat Passes Per Night (Annual Average)	Estimated Bat Mortality Per Turbine Per Year	Reference
Buffalo Ridge	MN	2.1	2.2	Johnson et al. 2004
Foote Creek Rim	WY	2.2	1.3	Gruver 2002
Fowler Ridge	IN	4.7	29.9	Good et al. 2011
Fowler Ridge	IN	6.8	34.1	Good et al. 2012
Dodge County	***MN***	***10.87***	***NA***	***This final report***
Buffalo Mountain	TN	23.7	20.8	Fiedler 2004
Record Hill	ME	24.6	6.78	Stantec Consulting 2013
Top of Iowa	IA	34.9	10.2	Jain 2005
Mountaineer	WV	38.3	38	Arnett et al. 2005
Cohocton and Dutch Hill	NY	106.7	5.04–25.62	Stantec Consulting 2011

When comparing bat activity among sites, the number of bat passes per night must be interpreted with caution because of potential differences in level of effort, timing of sampling, species recorded, and detector settings and position (Kunz et al. 2007). Only a few studies have collected bat acoustic data concurrently with mortality searches (see Table 7), and many of the study sites listed have a different suite of species, do not have the same topography and habitat, and do not occur in the same geographic area as the proposed Dodge County WRA.

Bat activity across the site was fairly low and somewhat sporadic throughout spring and continued to be low at Dodge 01 during the summer. However, activity at Dodge 02 increased to a moderate level in the summer and stayed that way through the fall. During early fall, bat activity increased at both monitoring stations with the highest activity detected between 12 August and 26 August. This increased activity during the fall coincides with the fall migration season.

Species belonging to the MYSP40k_E group (*Myotis lucifugus* and *Myotis septentrionalis*) made up a fairly large proportion of activity at the site, with the exception of Dodge 01 during the Summer 2014 monitoring period. Conversely they made up close to half of detected bat passes at Dodge 02 during the Summer 2014 monitoring period. MYSP40k_E bats were detected most often at the lower detectors, which is not surprising given the typical low flight altitude of these species. Myotis were influenced by multiple weather variables during the 2014 monitoring period, particularly temperature. *Myotis septentrionalis* is proposed for listing as federally endangered in April 2015 due to habitat loss, disease (e.g., white-nose syndrome), anthropogenic factors, and inadequacy of existing regulatory mechanisms as the principal threats to the species (Center for Biological Diversity 2010). Additionally, the scientific community has petitioned the U.S. Fish and Wildlife Service (USFWS) to review the status of the little brown bat (Kunz and Reichard 2010). Although the fungus that causes white nose syndrome has been discovered in Minnesota caves, it has not yet been documented in Minnesota bats. At active wind energy facilities in North America, species of *Myotis* have been reported as fatalities and in low, variable proportions (0.7%–10.7%; Arnett et al. 2008).

LACI and LANO (individually and as part of the EPFU_LANO species group), were detected at the Dodge County WRA throughout the 2014 monitoring season. While both species are considered migratory, LANO was the only species that noticeably increased during the Fall 2014 monitoring period compared to the Summer 2014 period. LABO are also migratory but were detected in very low numbers. Activity of both LACI and LANO was influenced by multiple weather variables during the 2014 monitoring season. Migratory tree bats are the most commonly reported bat fatalities at wind energy facilities in the United States. The three migratory tree bat species have large geographic ranges and are capable of long distance migrations of up to 1,243 mi (2,000 km; e.g., Cryan 2003). These characteristics, in combination with behaviors such as fast, high-altitude flight while foraging and commuting from roosts to foraging grounds, increase the risk of collision due to flight in the proximity of the RSZ. Furthermore, these bat species are often found foraging in the open areas of forest clearings (Ford et al. 2005; Smith and Gehrt 2010), which is typical habitat at many wind energy facilities, especially in the eastern United States.

Other species/groups detected during the monitoring periods in low to moderate numbers were EPFU (*E. fuscus*), PESU (*P. subflavus*), LABO_PESU (*L. borealis_P. subflavus*), and EPFU_LACI_LANO (*E. fuscus_L. cinereus_L. noctivagans*). These species have experienced mortality at active wind energy facilities throughout North America, with PESU making up 20% of mortality at some sites.

5 Conclusions

Overall bat use at the proposed Dodge County WRA is considered moderate. Current postconstruction monitoring at active wind energy facilities indicates that migratory tree bats are at greatest risk to mortality from turbine collision during the fall migratory period. While bat activity was low at both towers during the Spring 2014 monitoring period, the higher bat activity during the Fall 2014 monitoring period indicates that bats are likely migrating through the proposed WRA. The migratory species detected during the summer seasons are most likely resident in the area.

Myotis had fairly high levels of activity throughout the 2014 monitoring season, and it is likely that these bats are resident within the area.

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7 Figures

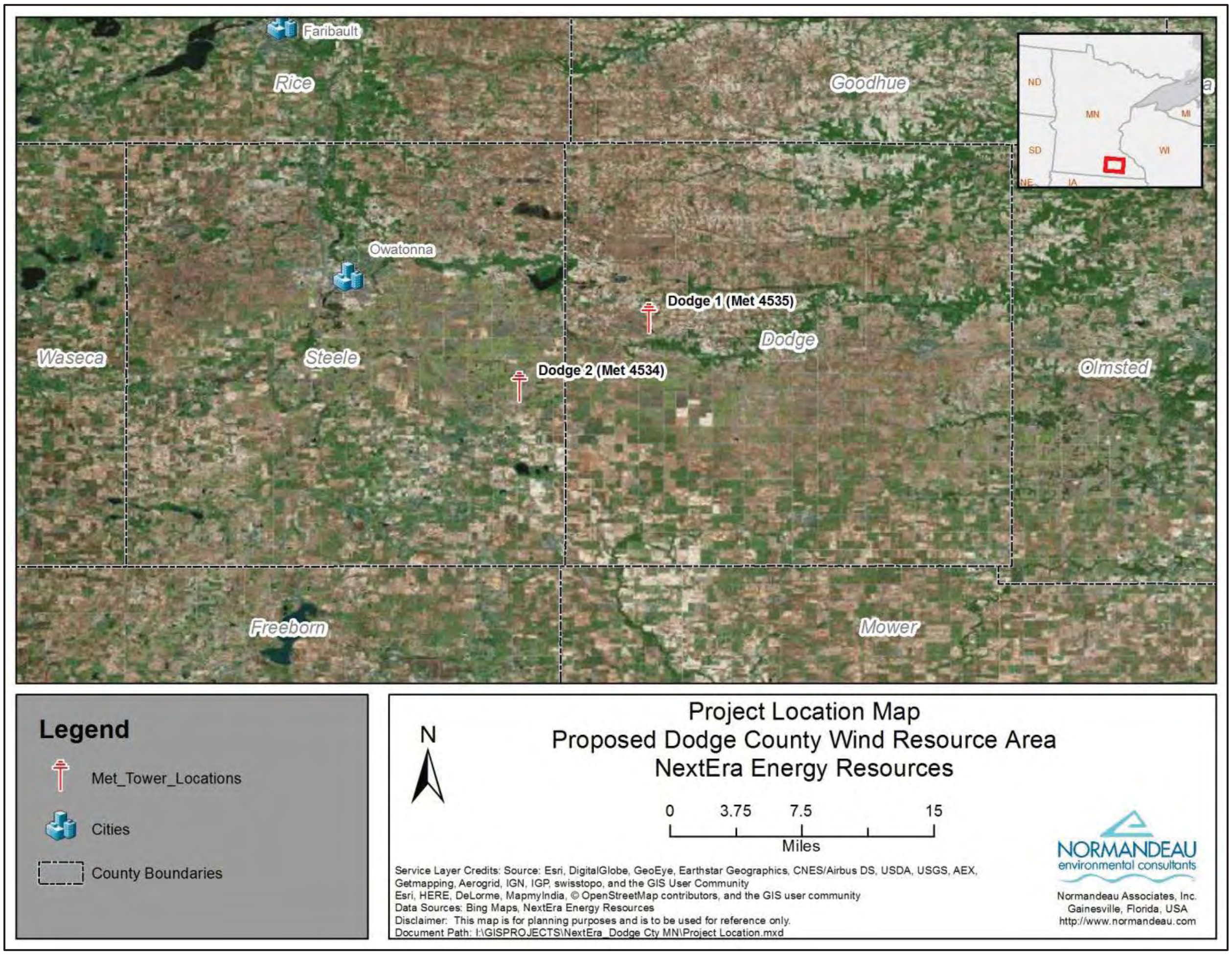


Figure 1. Site map showing locations of met towers and surrounding area.

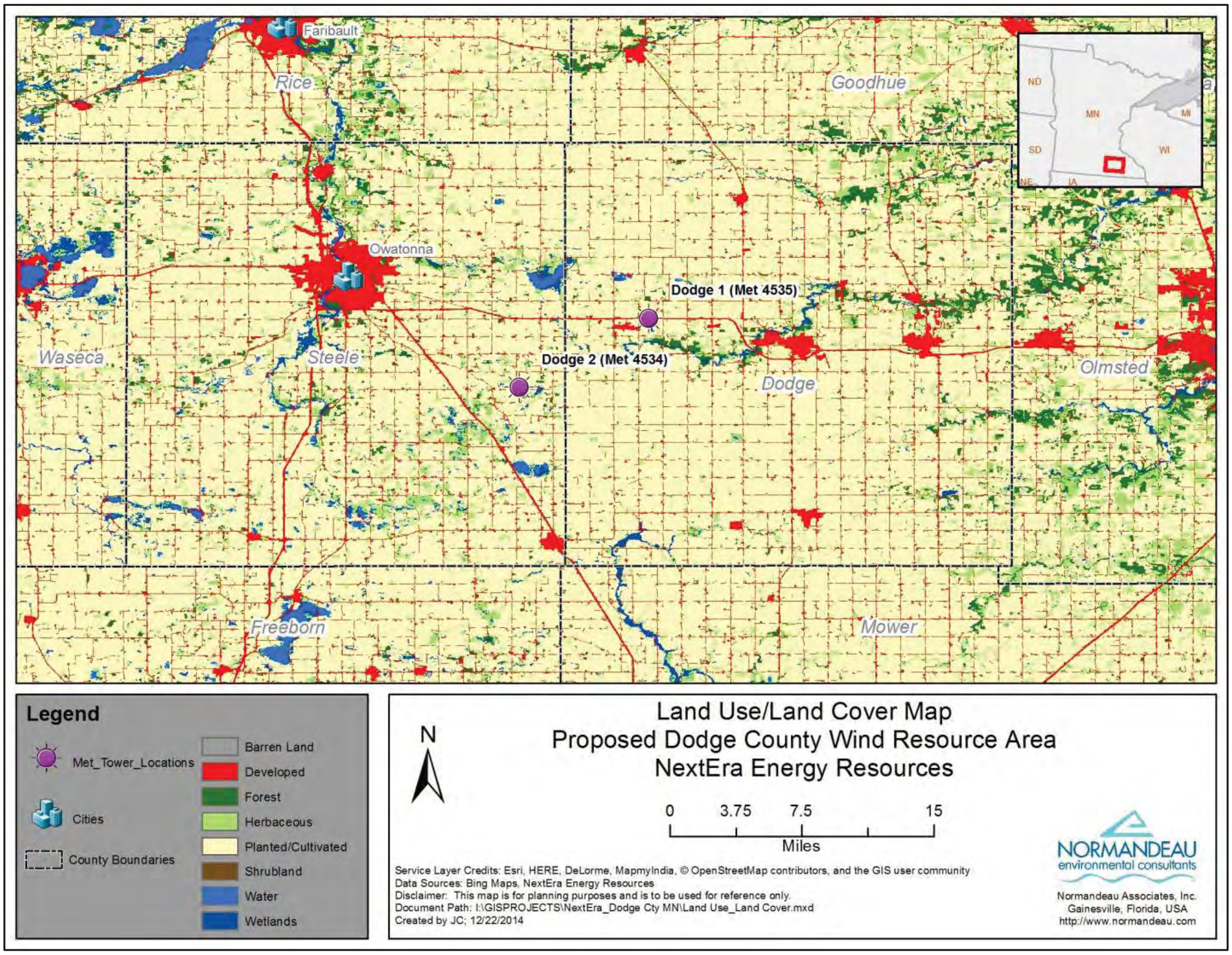


Figure 2. Land use/land cover and tower locations within the project boundaries.

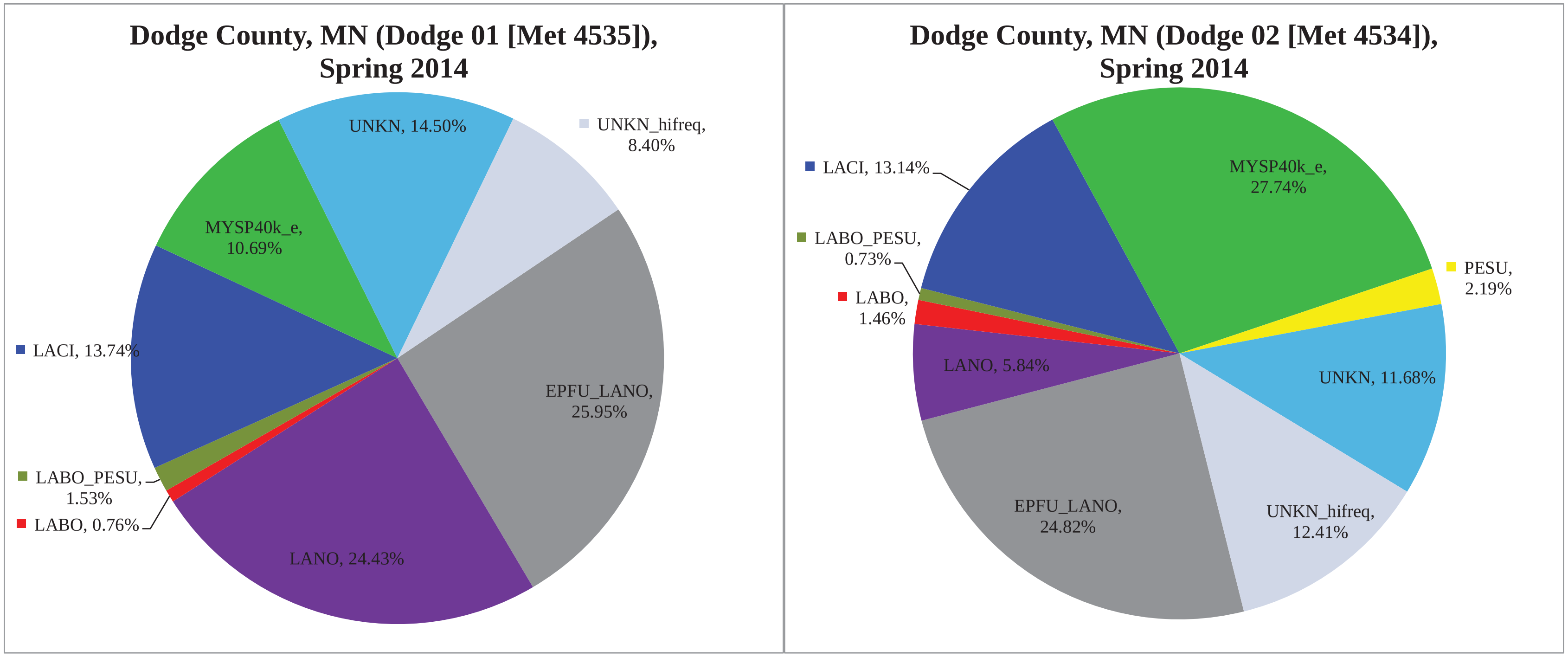


Figure 3. **Species occurrence at each tower during the Spring 2014 sampling period.**

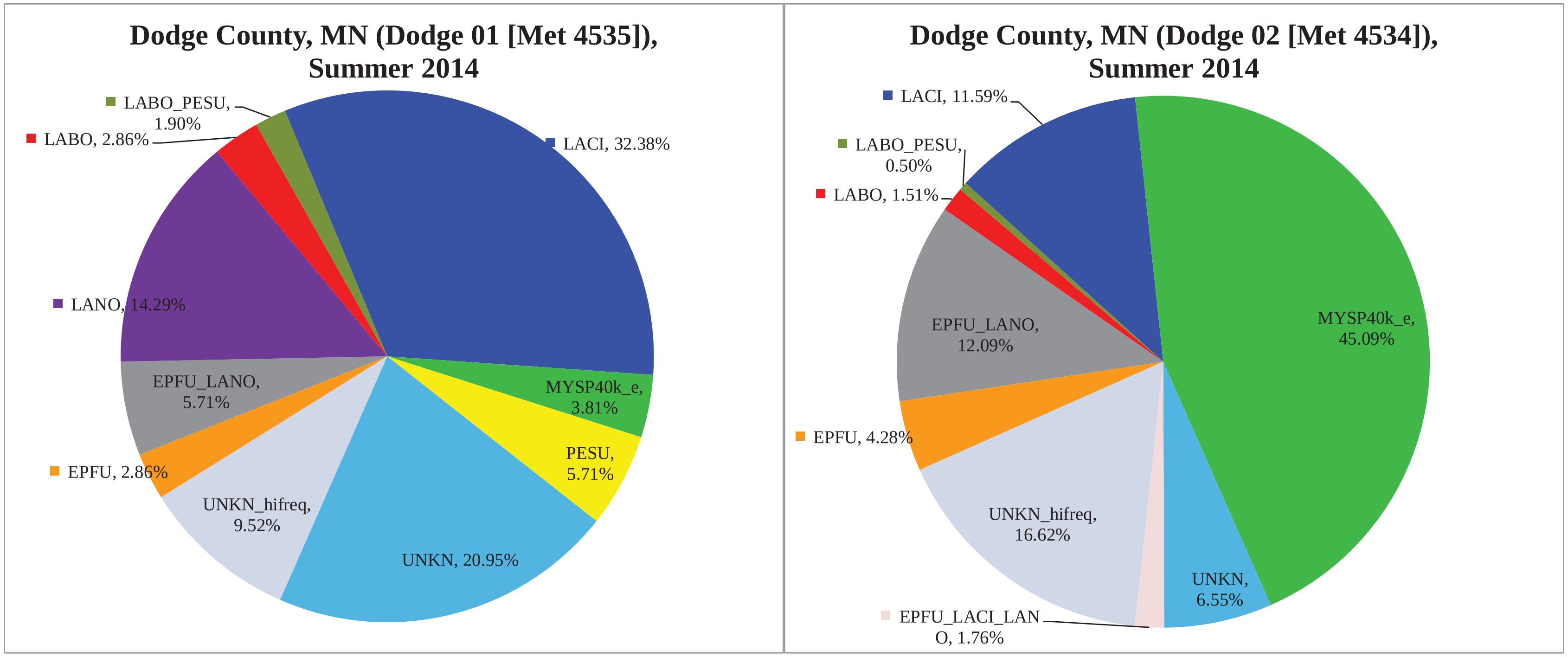
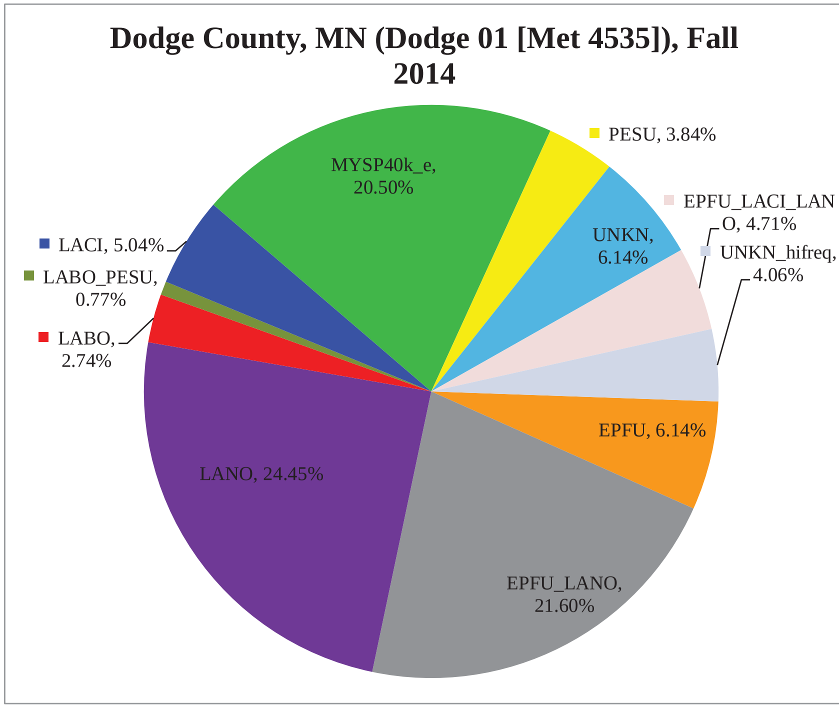


Figure 4. Species occurrence at each tower during the Summer 2014 sampling period.



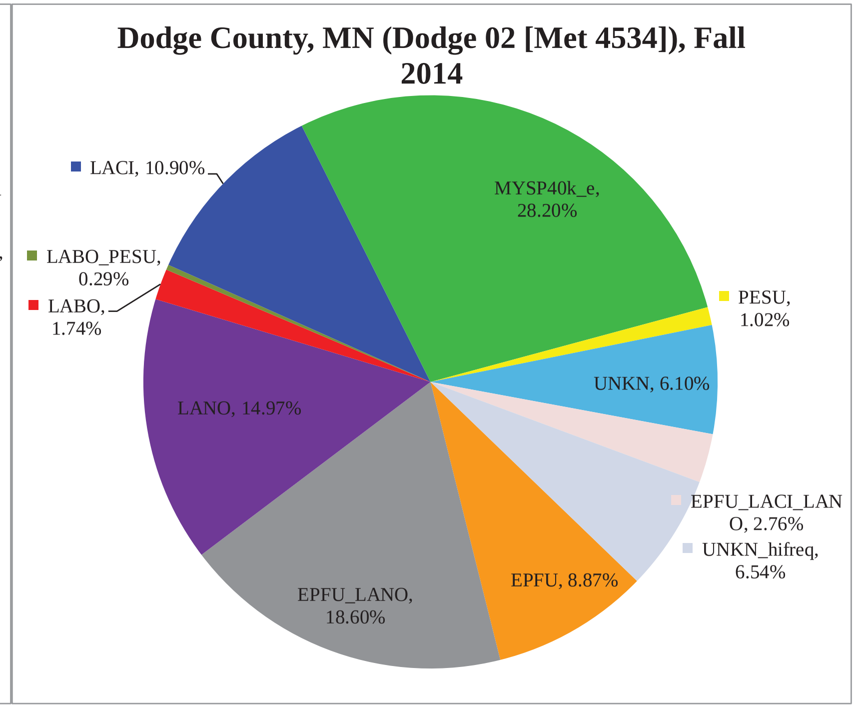


Figure 5. Species occurrence at each tower during the Fall 2014 sampling period.

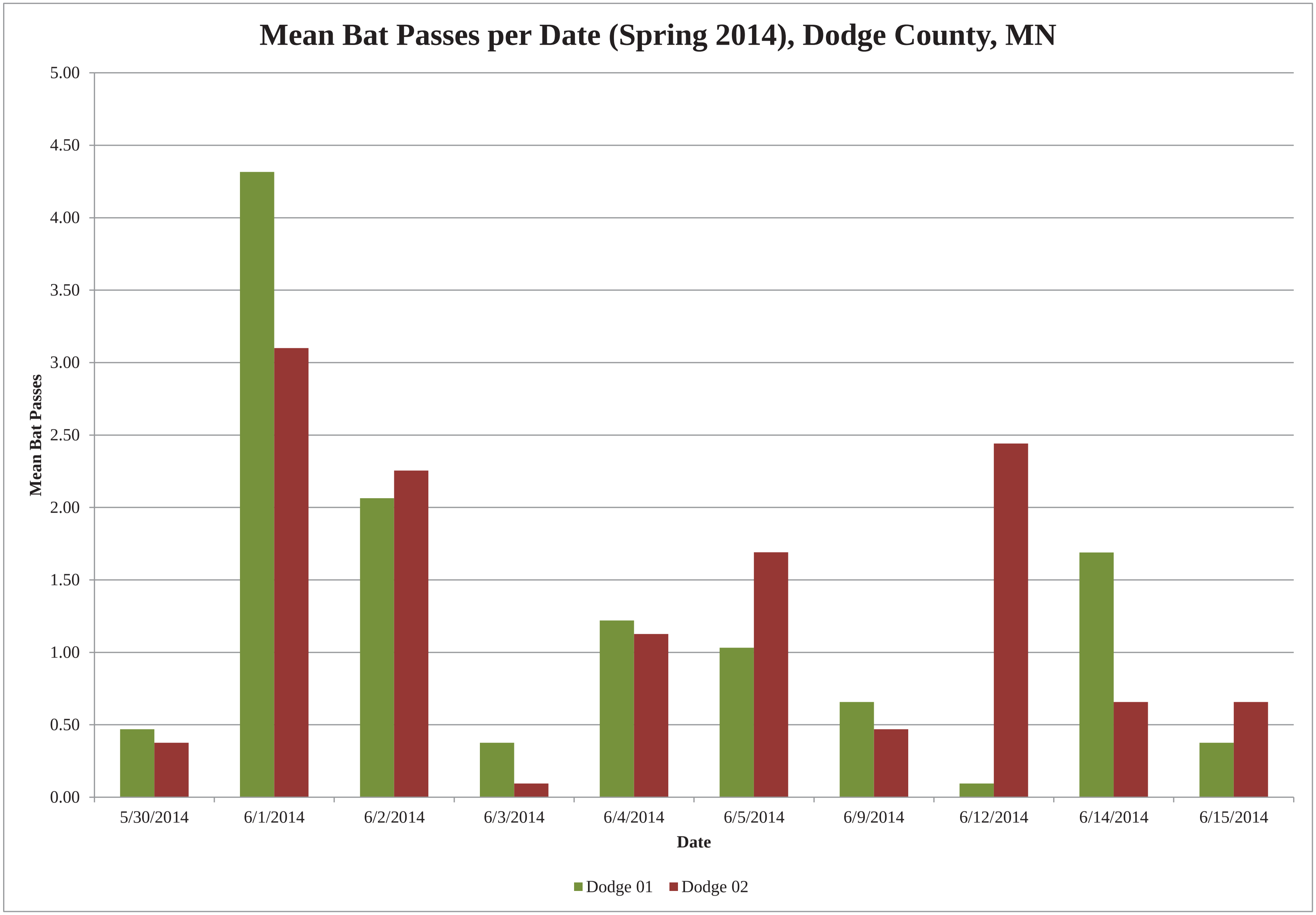


Figure 6. Mean bat passes for each analyzed night for each tower during the Spring 2014 sampling period.

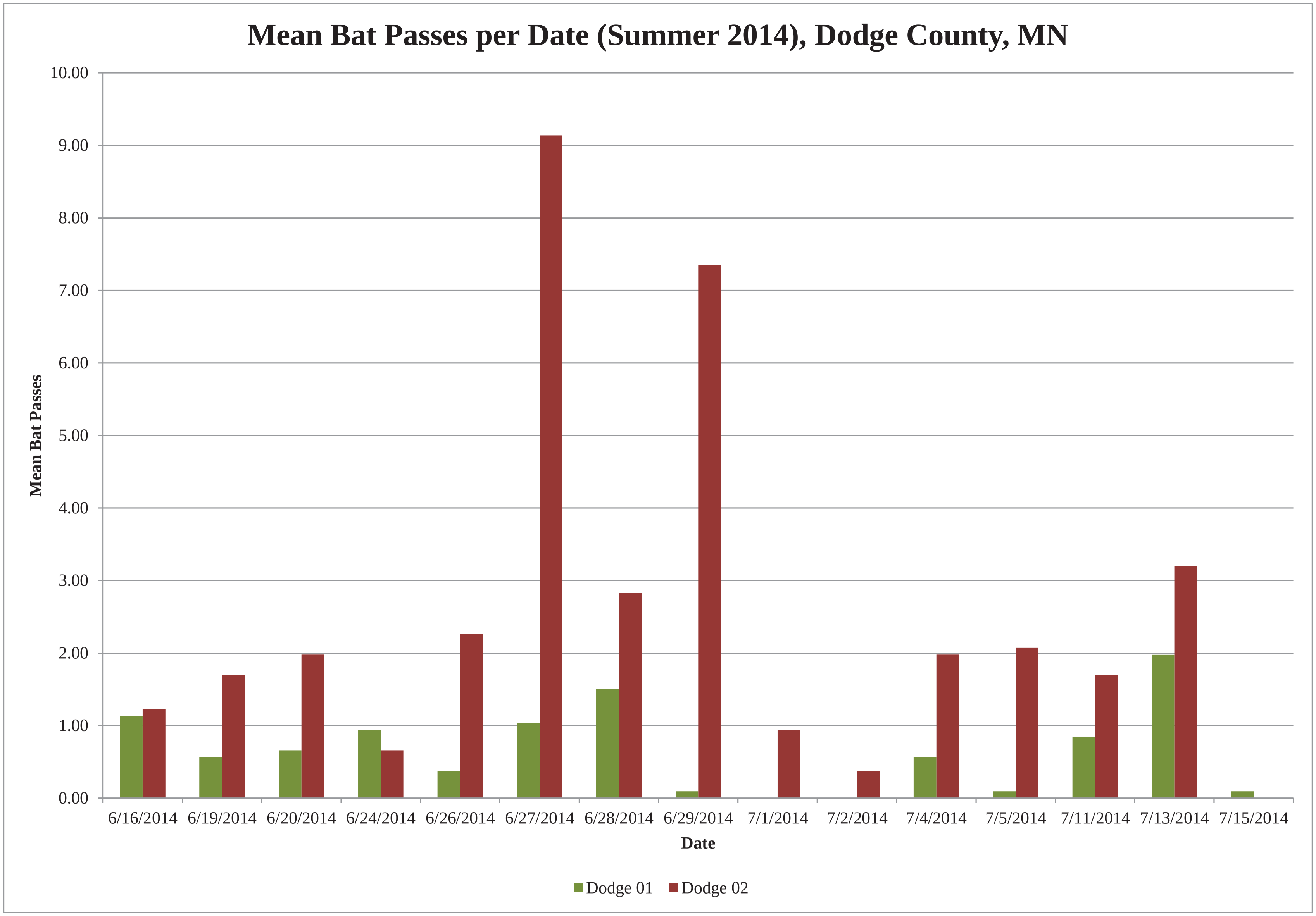


Figure 7. **Mean bat passes for each analyzed night for each tower during the Summer 2014 sampling period.**

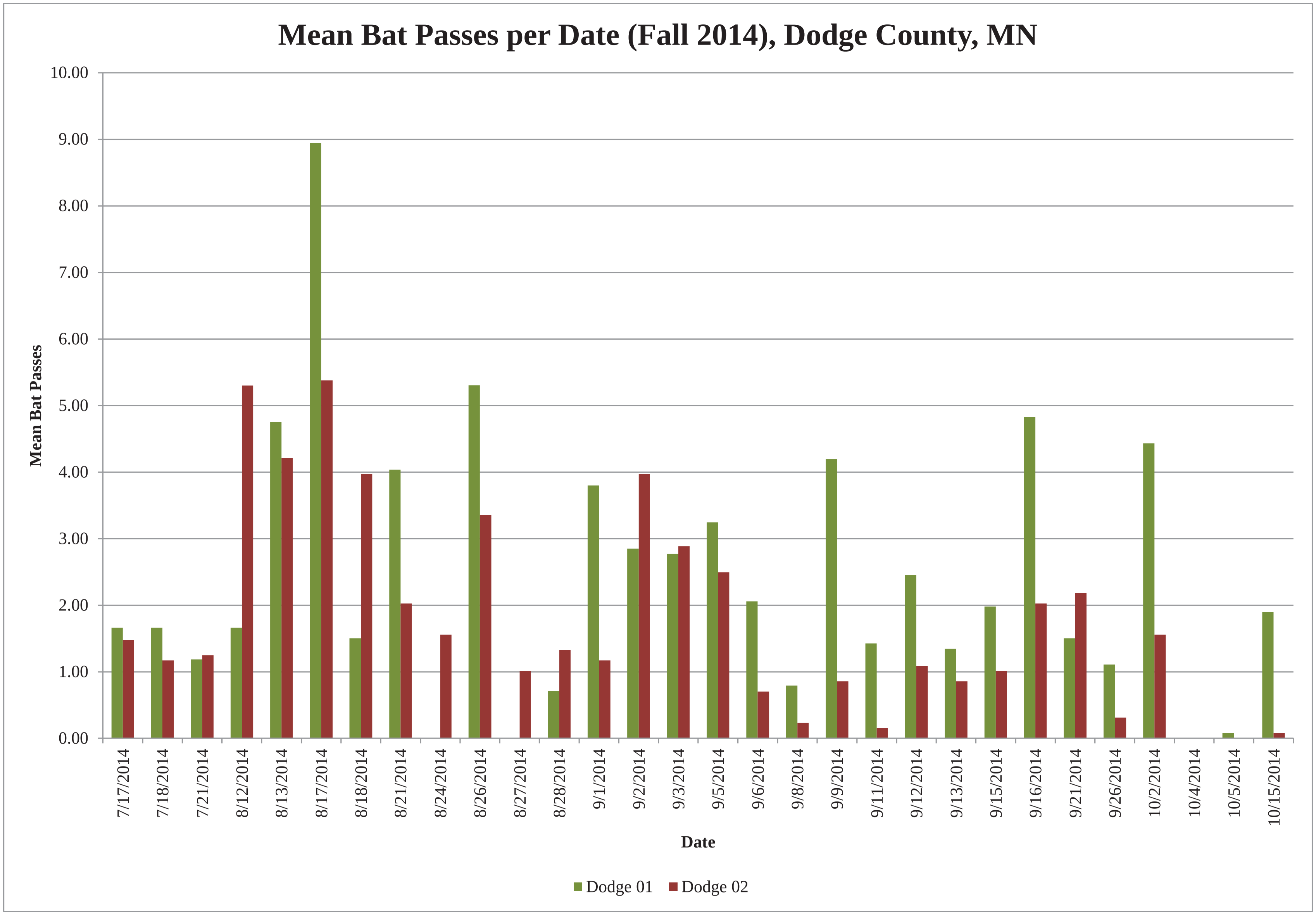


Figure 8. **Mean bat passes for each analyzed night for each tower during the Fall 2014 sampling period.**

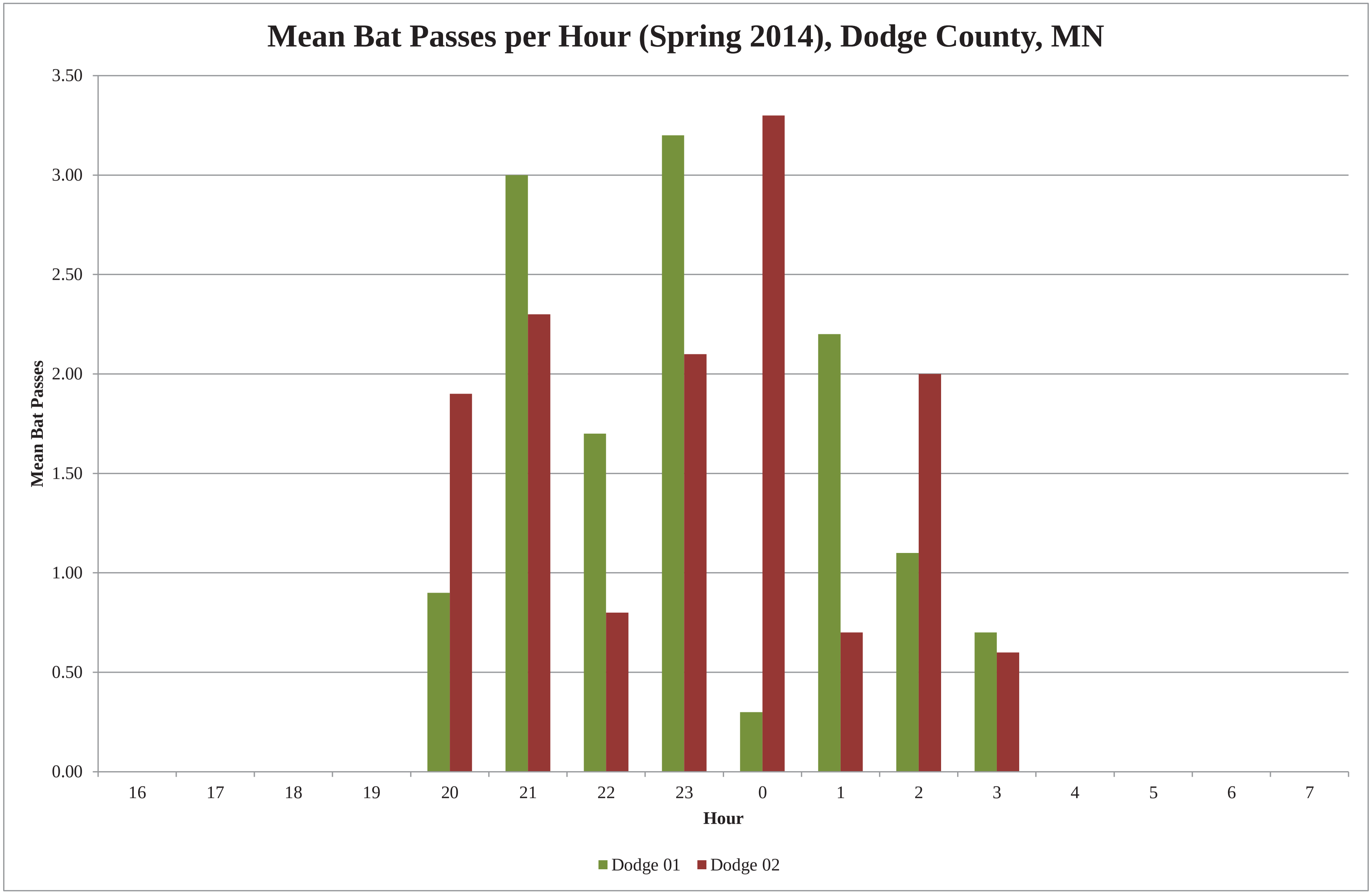


Figure 9. **Mean bat passes for each hour for each tower during the Spring 2014 sampling period.**

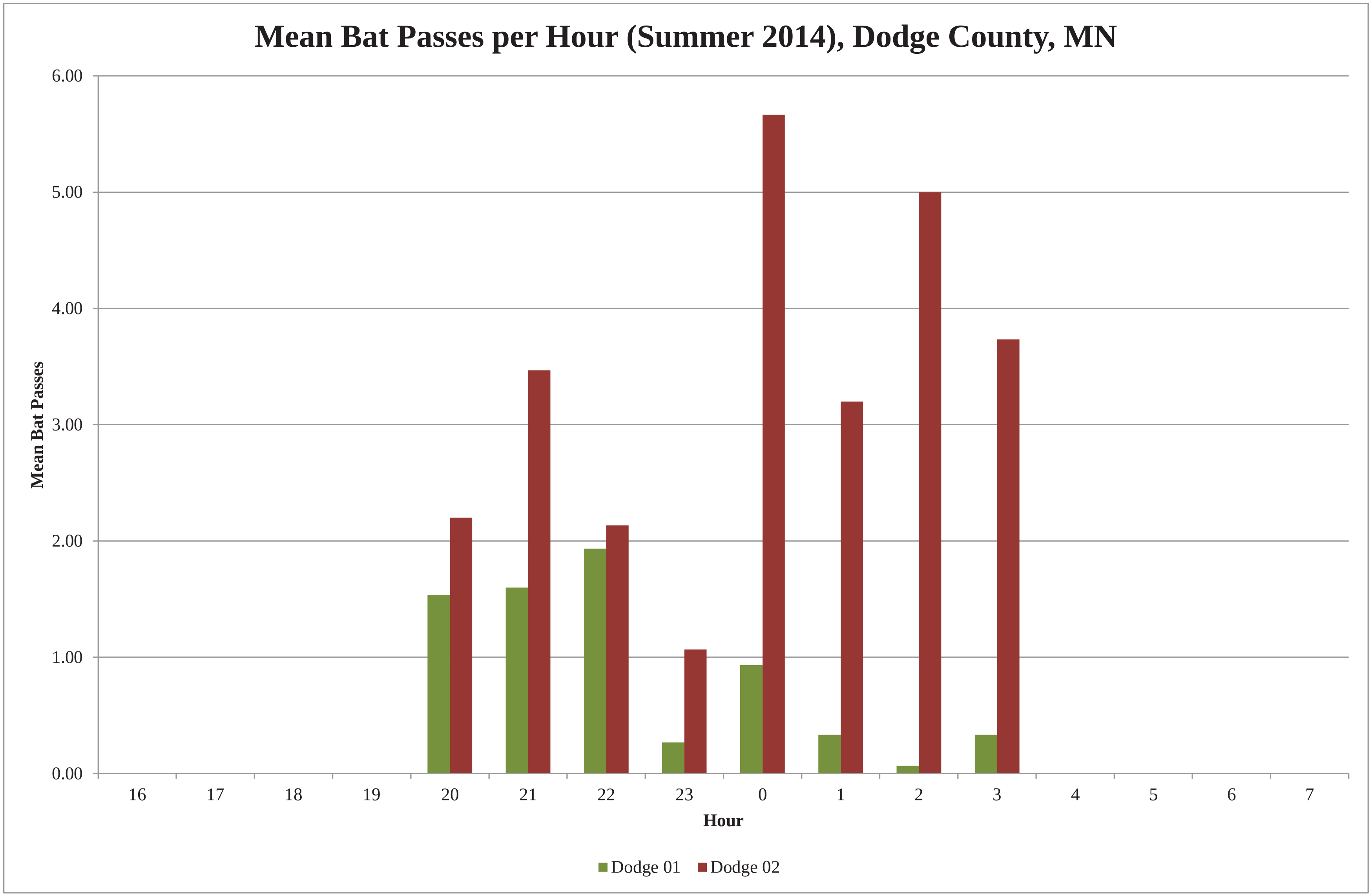


Figure 10. Mean bat passes for each hour for each tower during the Summer 2014 sampling period.

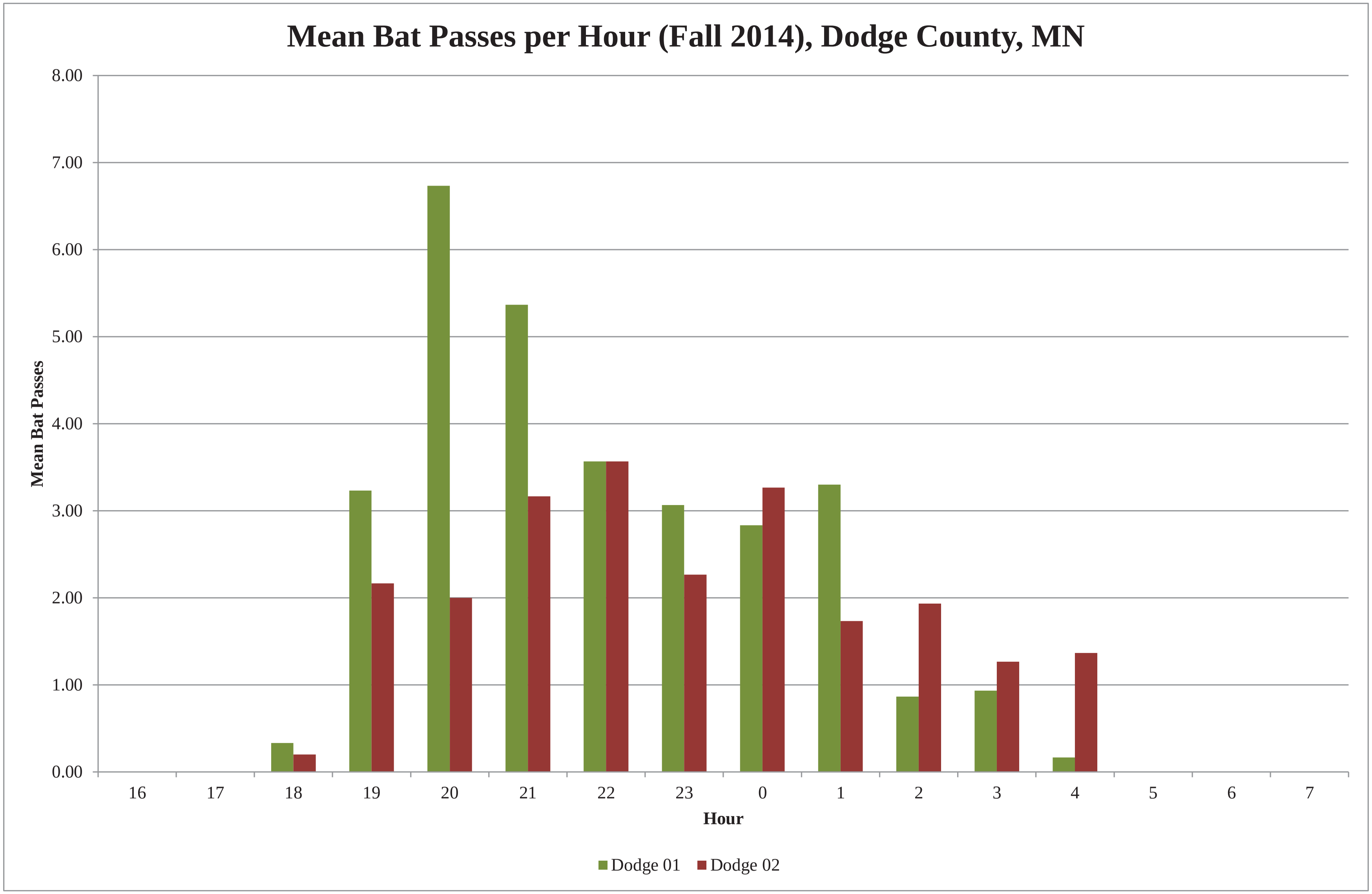


Figure 11. Mean bat passes for each hour for each tower during the Fall 2014 sampling period.

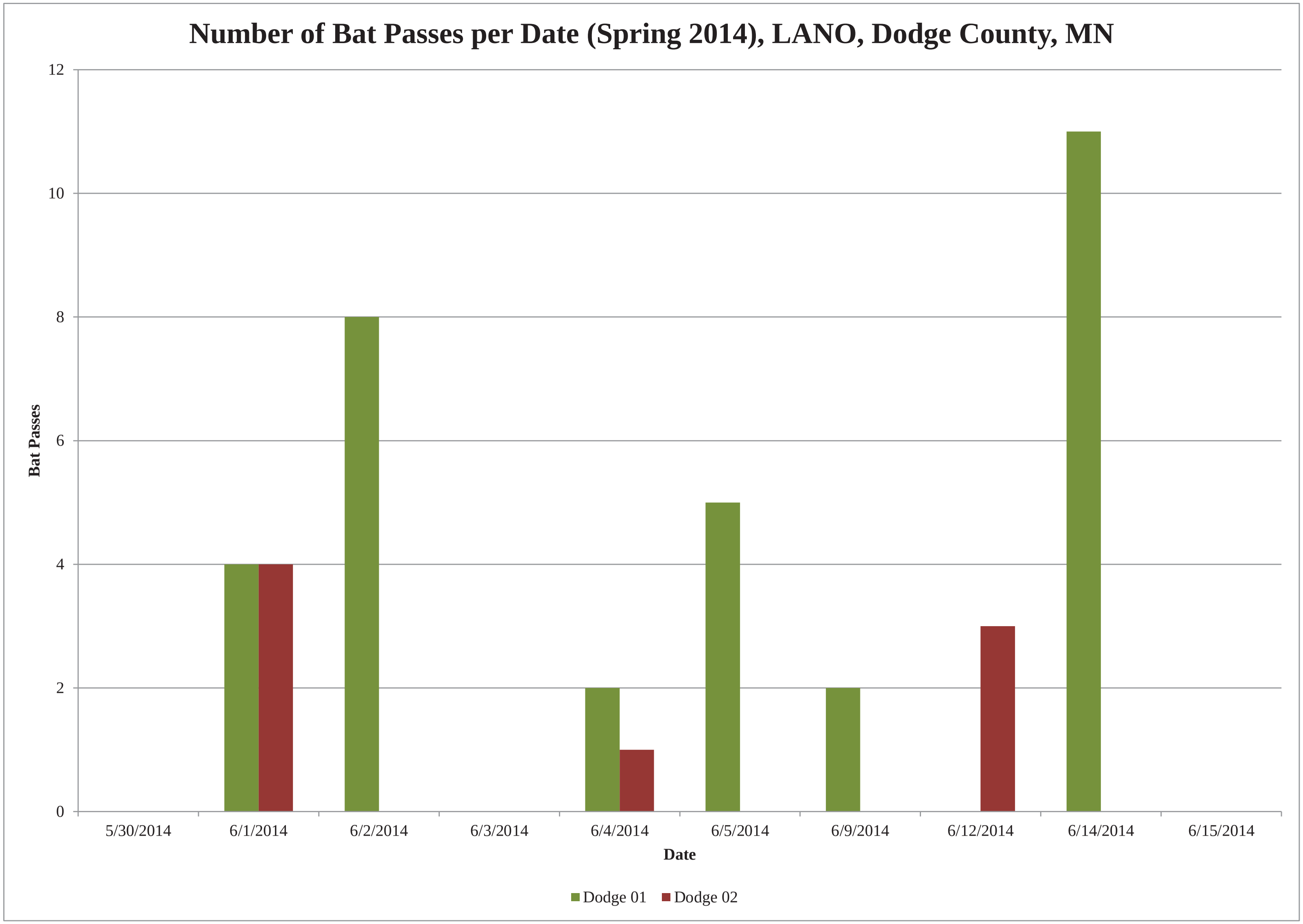


Figure 12. **Number of bat passes (LANO) for each analyzed night during the Spring 2014 sampling period for each tower.**

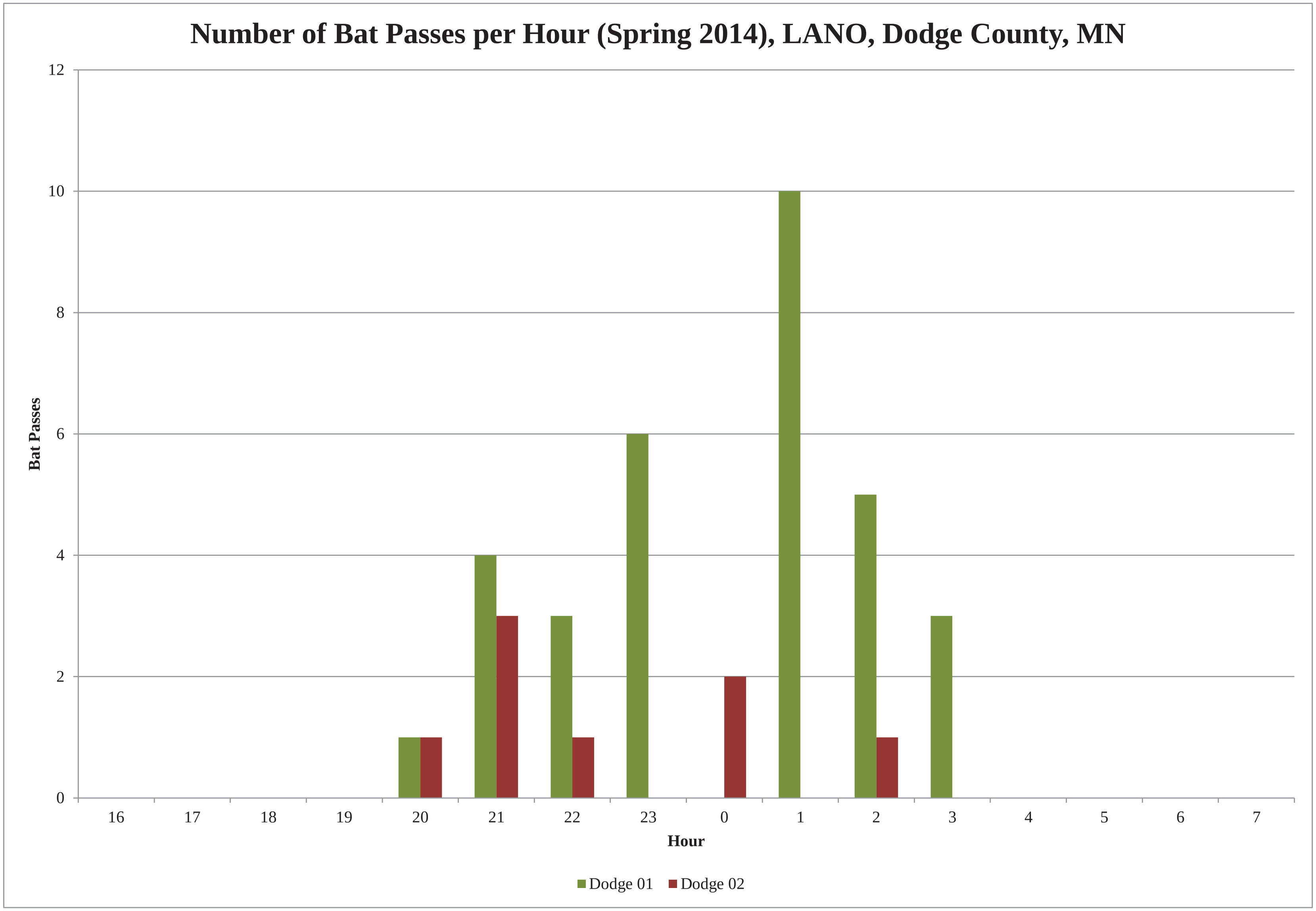


Figure 13. **Number of bat passes (LANO) for each hour from all analyzed nights during the Spring 2014 sampling period for each tower.**

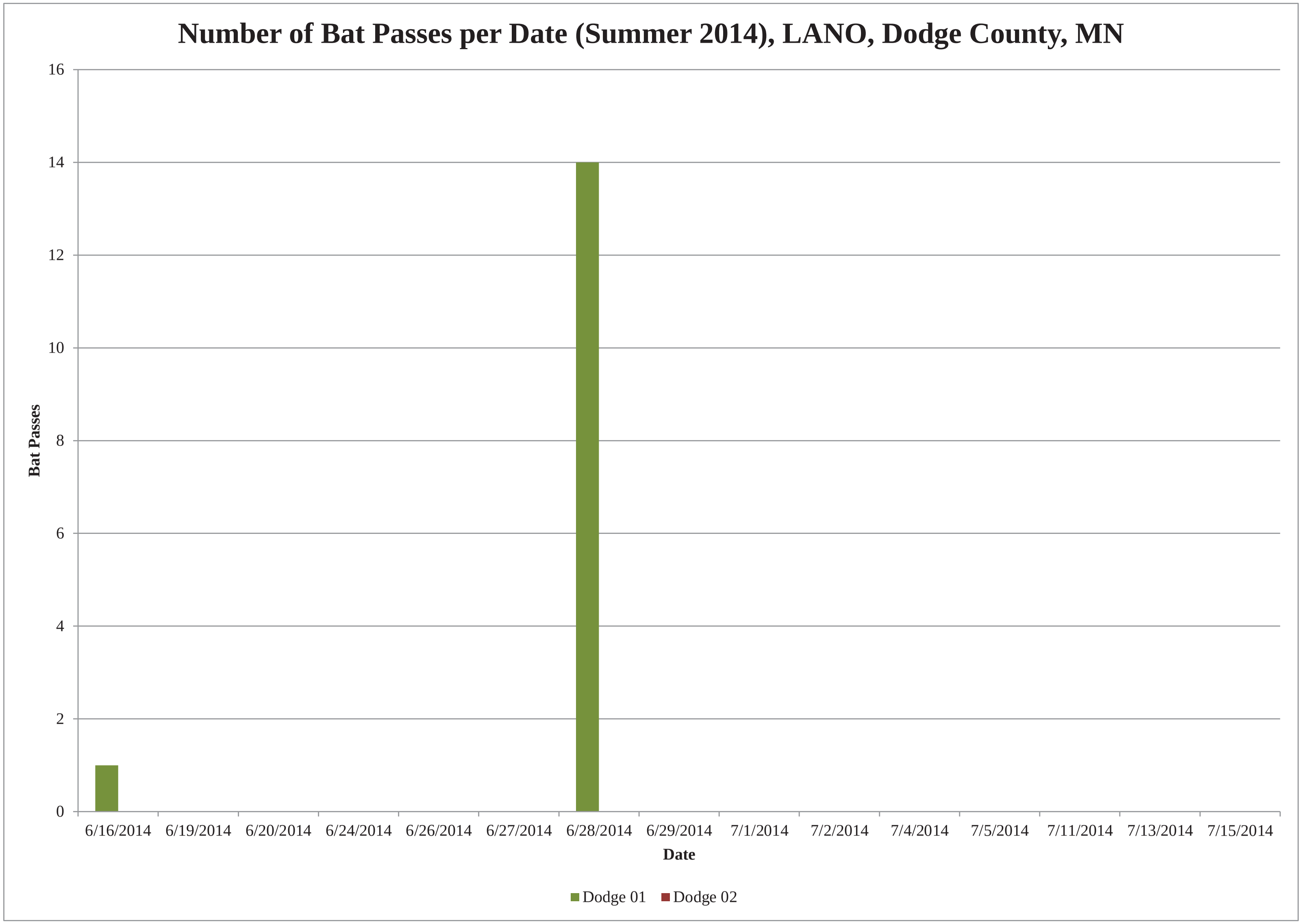


Figure 14. Number of bat passes (LANO) for each analyzed night during the Summer 2014 sampling period for each tower.

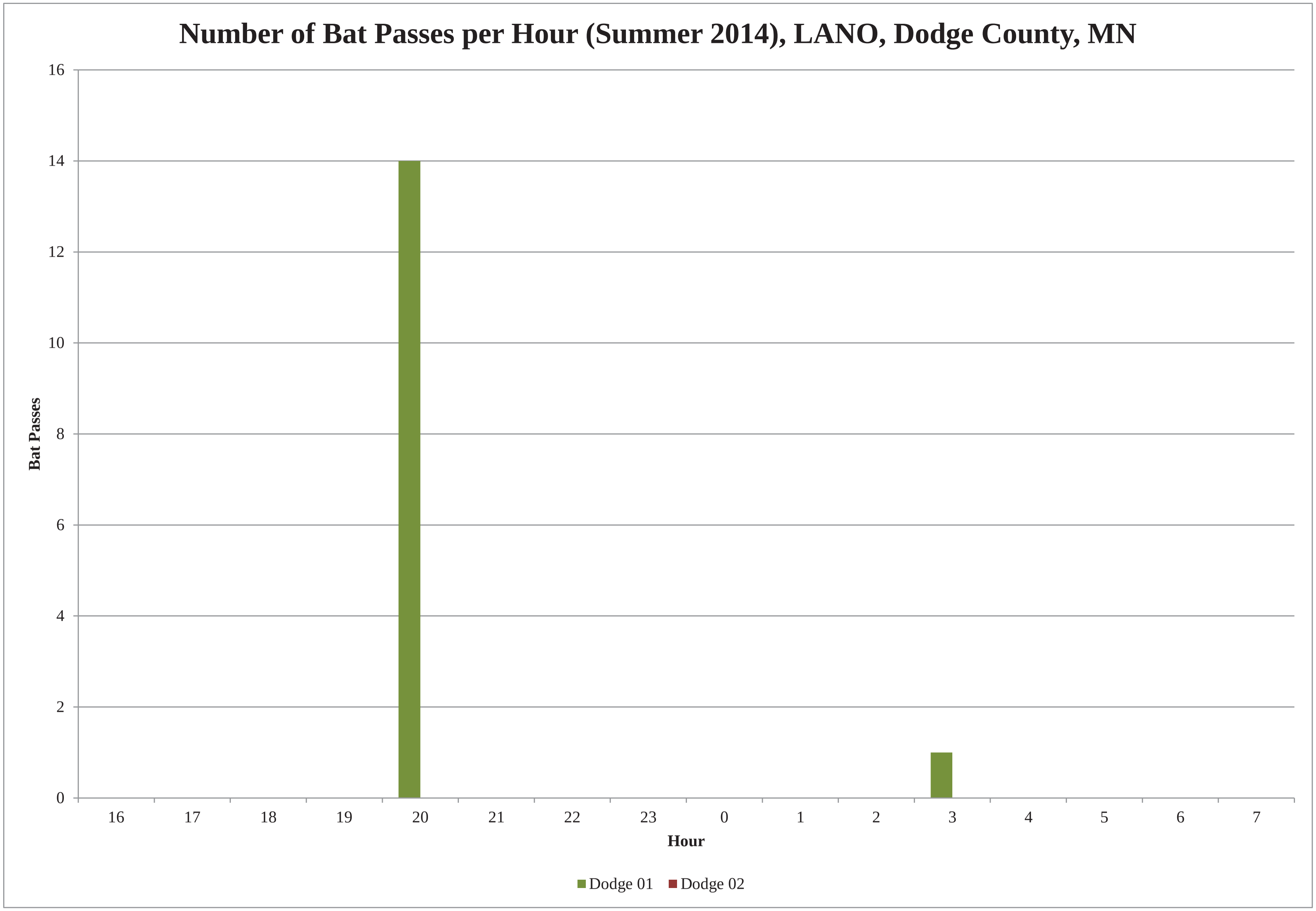


Figure 15. Number of bat passes (LANO) for each hour from all analyzed nights during the Summer 2014 sampling period for each tower.

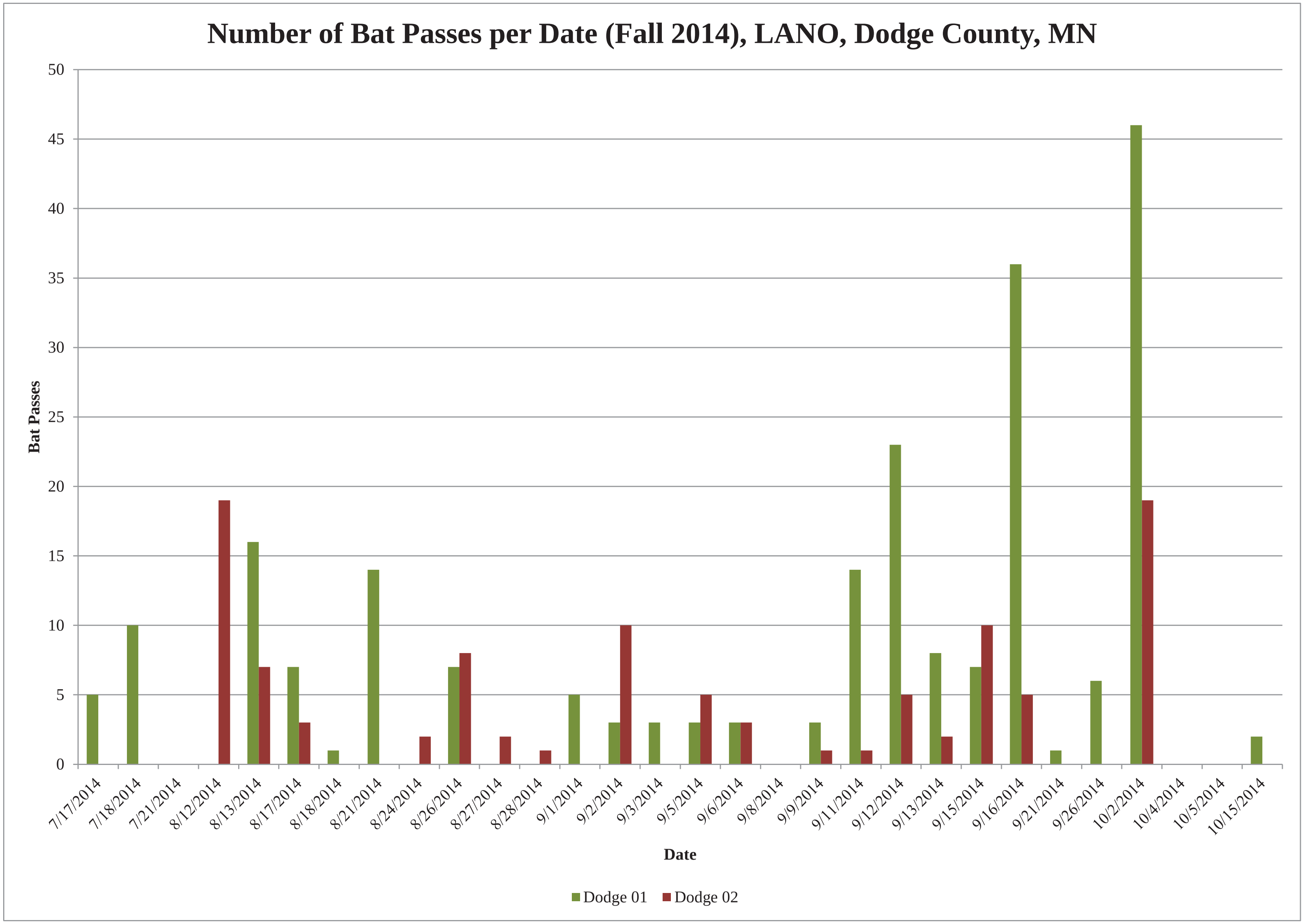


Figure 16. Number of bat passes (LANO) for each analyzed night during the Fall 2014 sampling period for each tower.

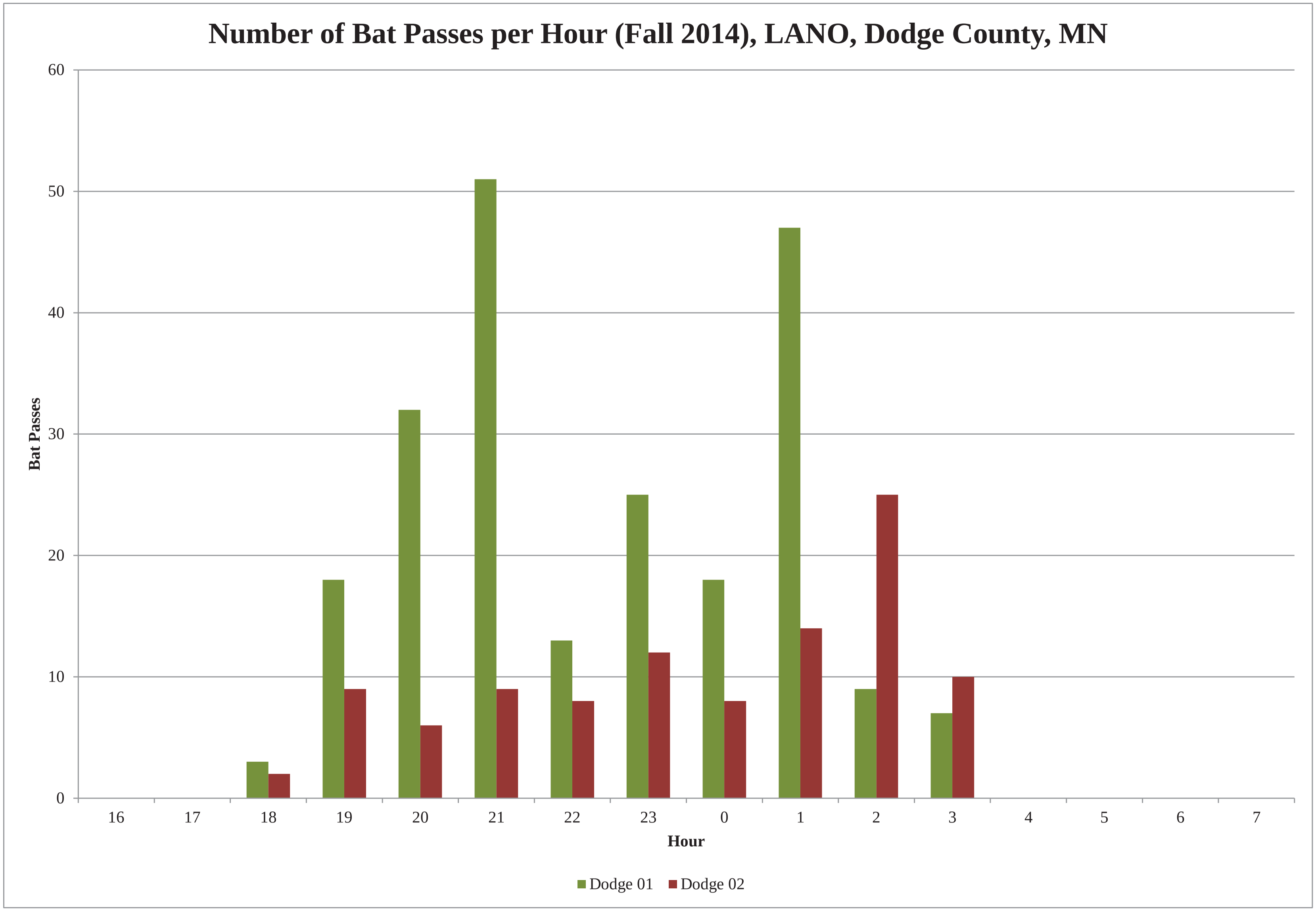


Figure 17. **Number of bat passes (LANO) for each hour from all analyzed nights during the Fall 2014 sampling period for each tower.**

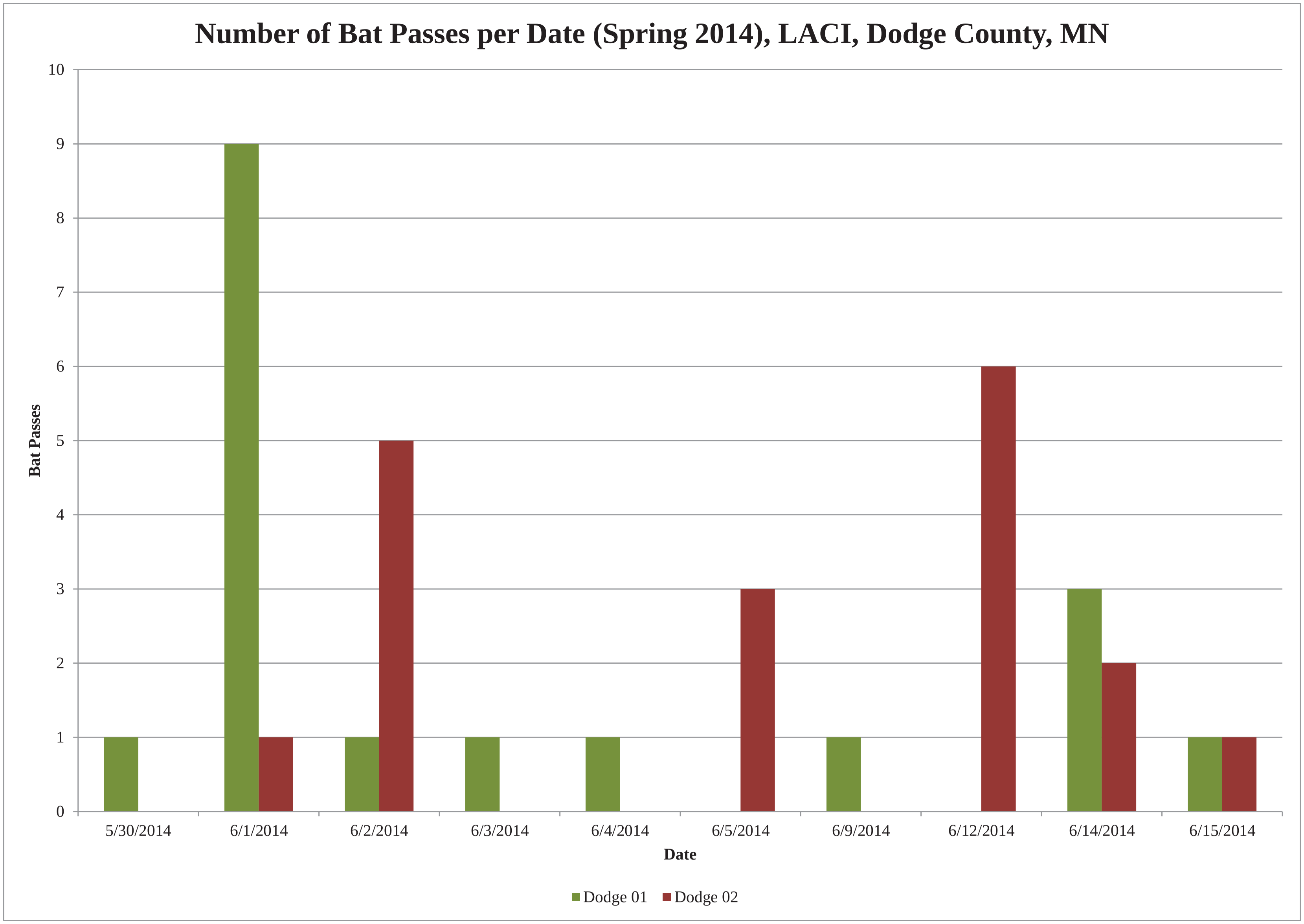


Figure 18. Number of bat passes (LACI) for each analyzed night during the Spring 2014 sampling period for each tower.

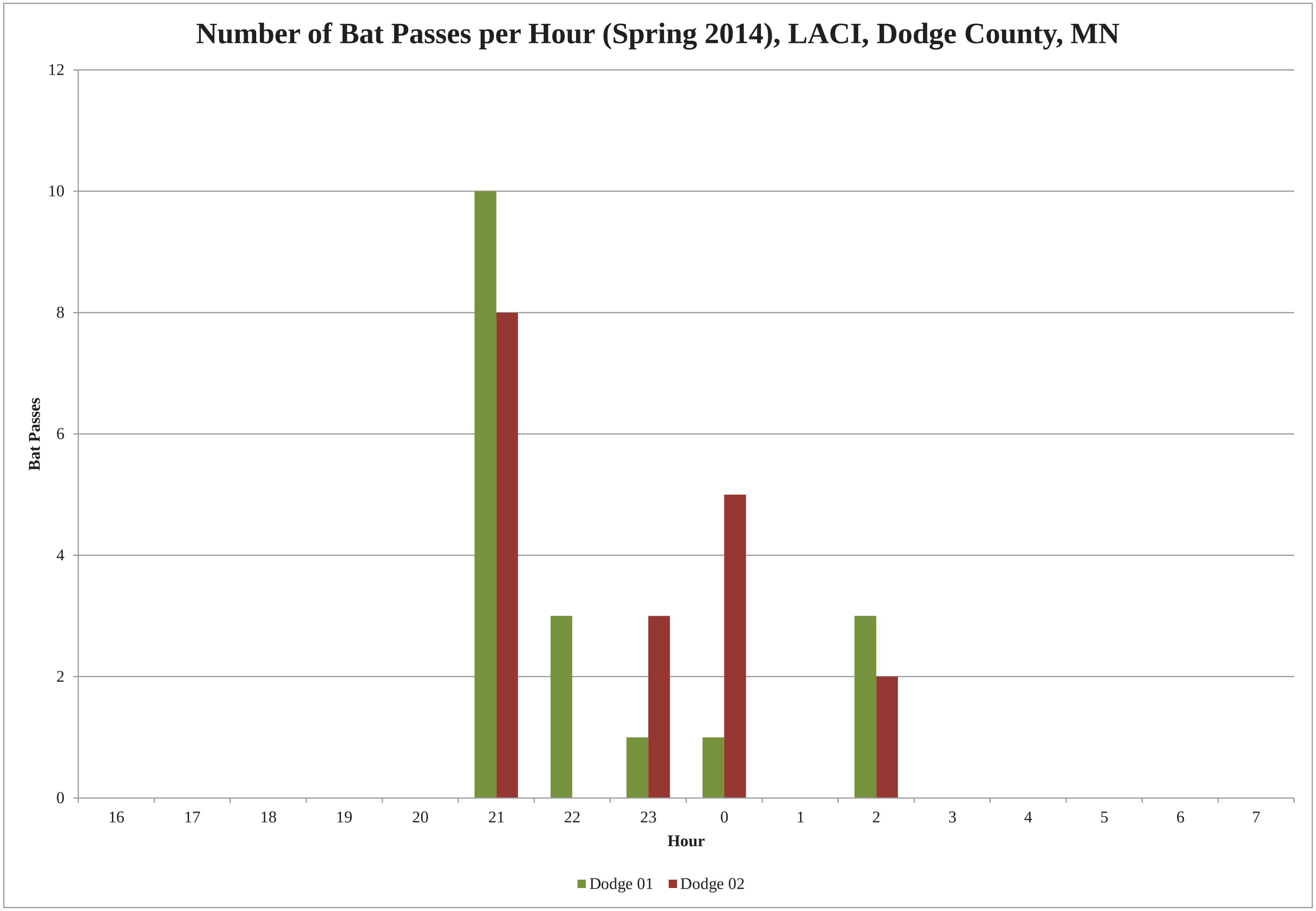


Figure 19. **Number of bat passes (LACI) for each hour from all analyzed nights during the Spring 2014 sampling period for each tower.**

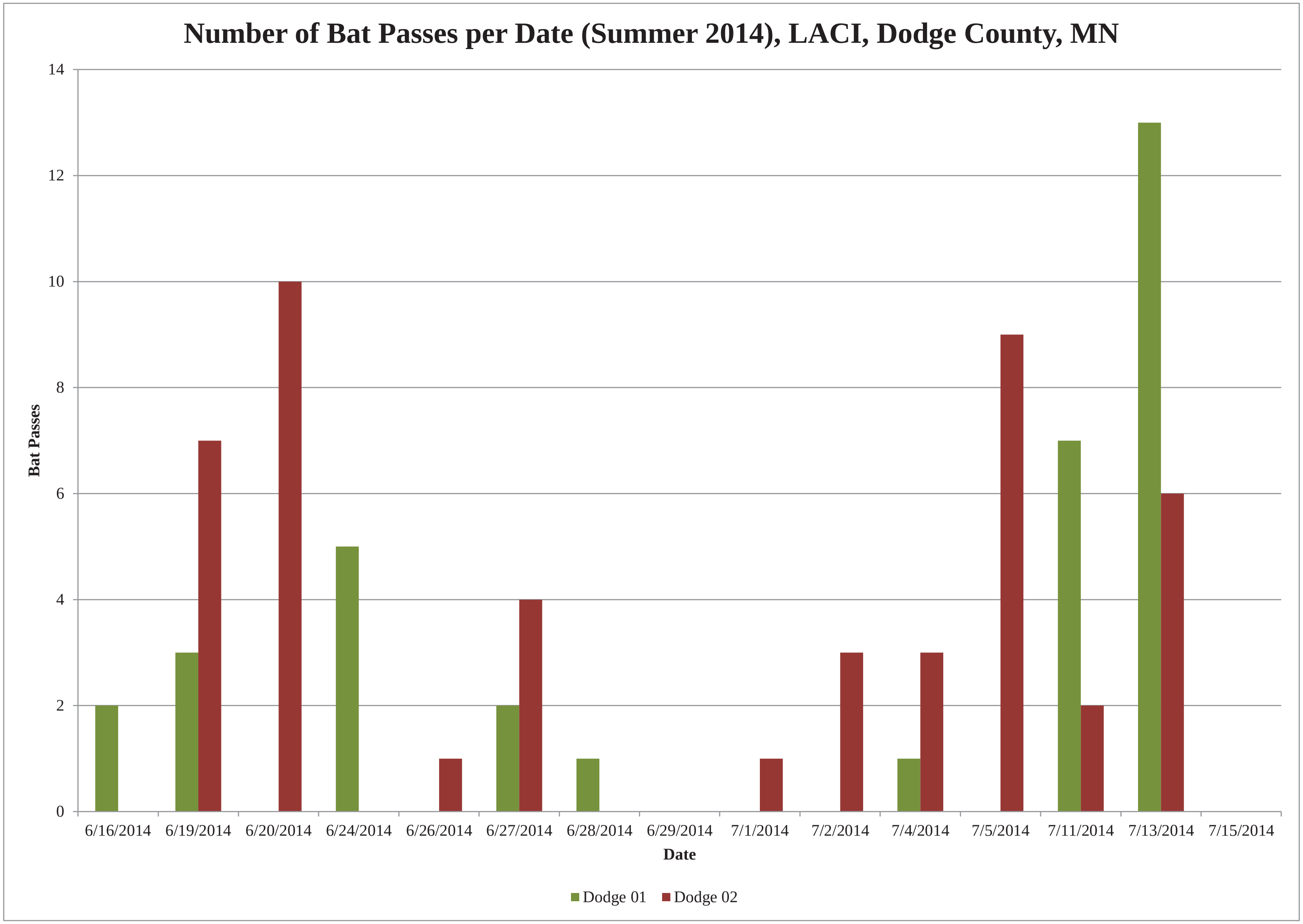


Figure 20. Number of bat passes (LACI) for each analyzed night during the Summer 2014 sampling period for each tower.

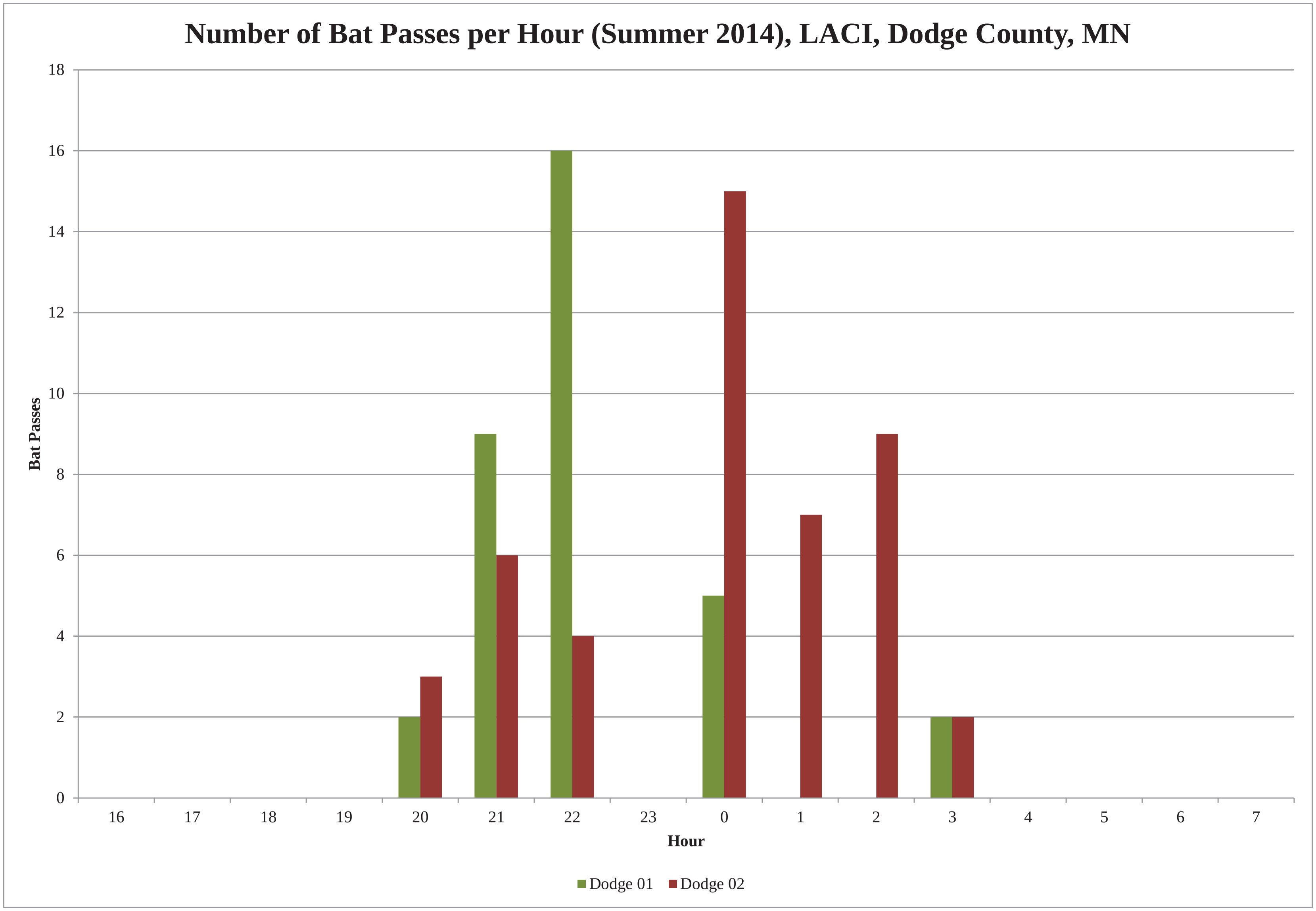


Figure 21. Number of bat passes (LACI) for each hour from all analyzed nights during the Summer 2014 sampling period for each tower.

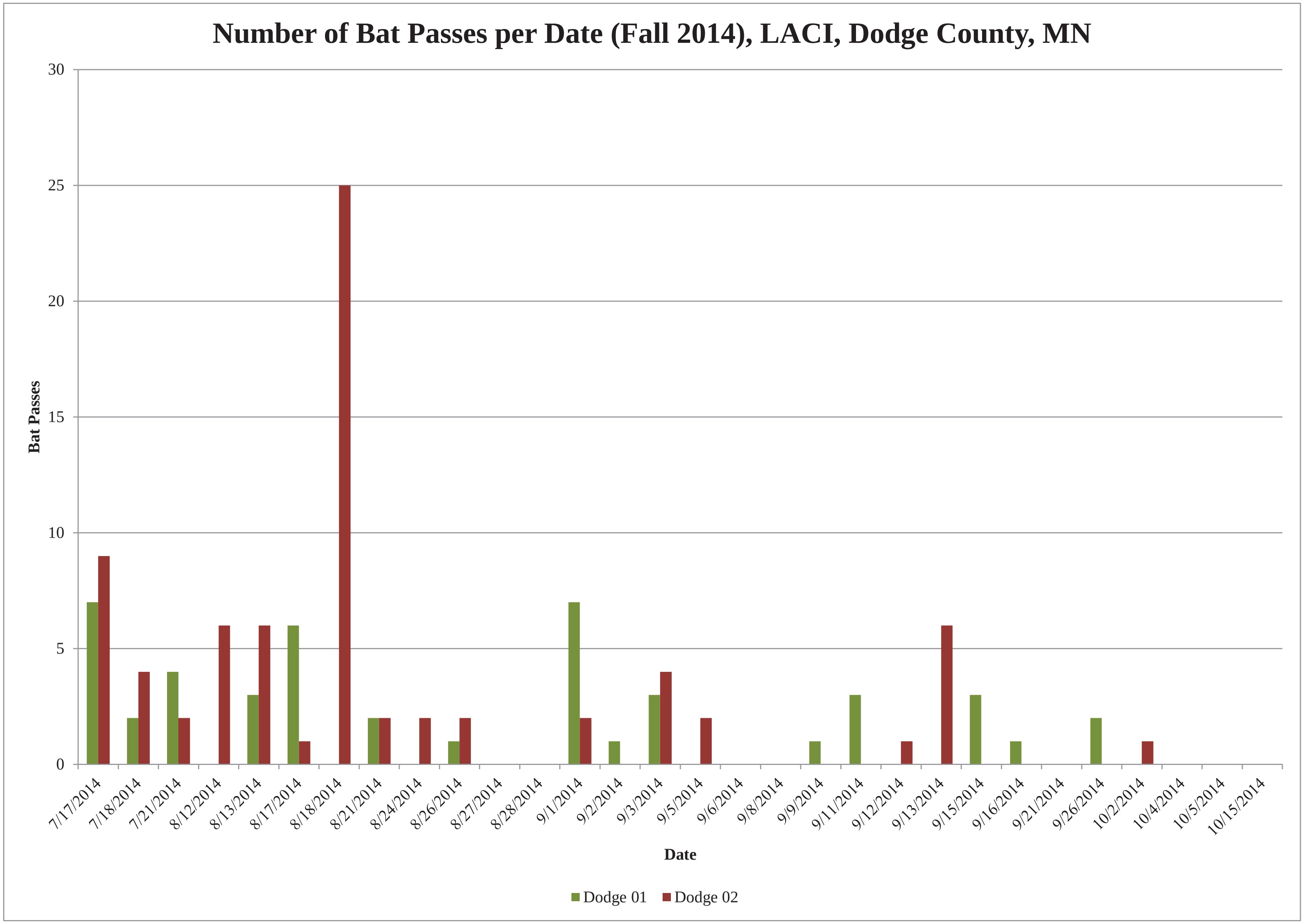


Figure 22. Number of bat passes (LACI) for each analyzed night during the Fall 2014 sampling period for each tower.

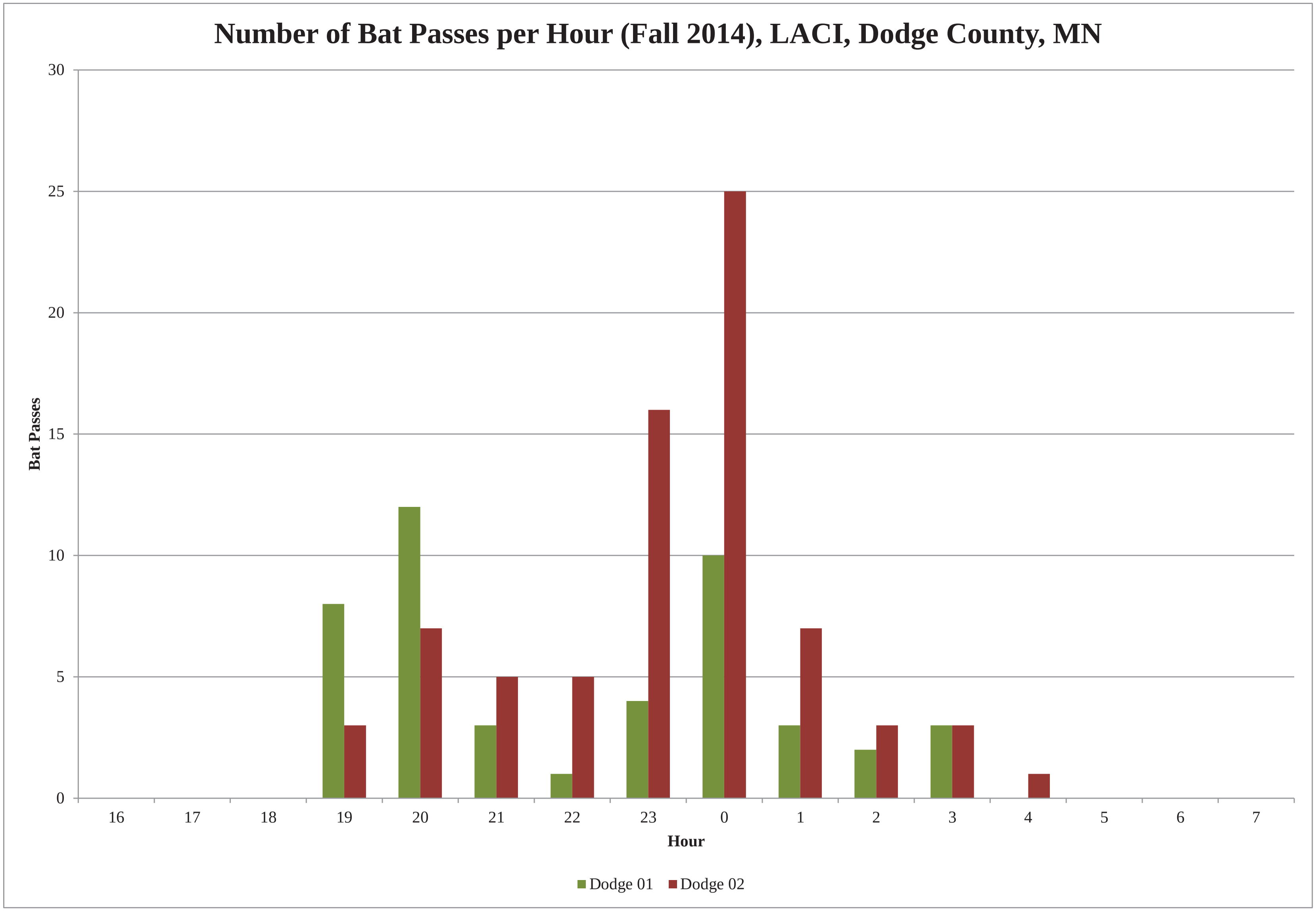


Figure 23. Number of bat passes (LACI) for each hour from all analyzed nights during the Fall 2014 sampling period for each tower.

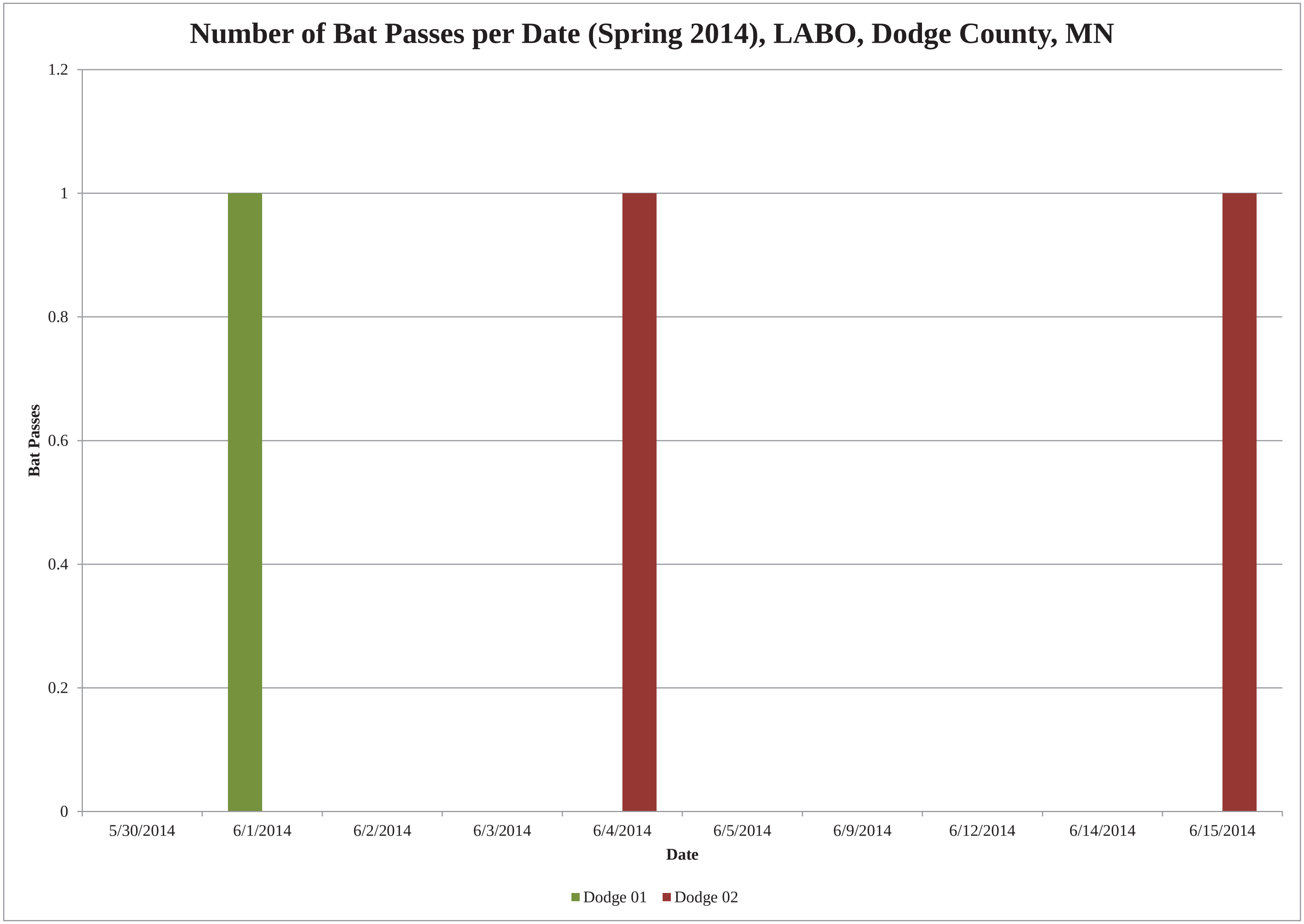


Figure 24. **Number of bat passes (LABO) for each analyzed night during the Spring 2014 sampling period for each tower.**

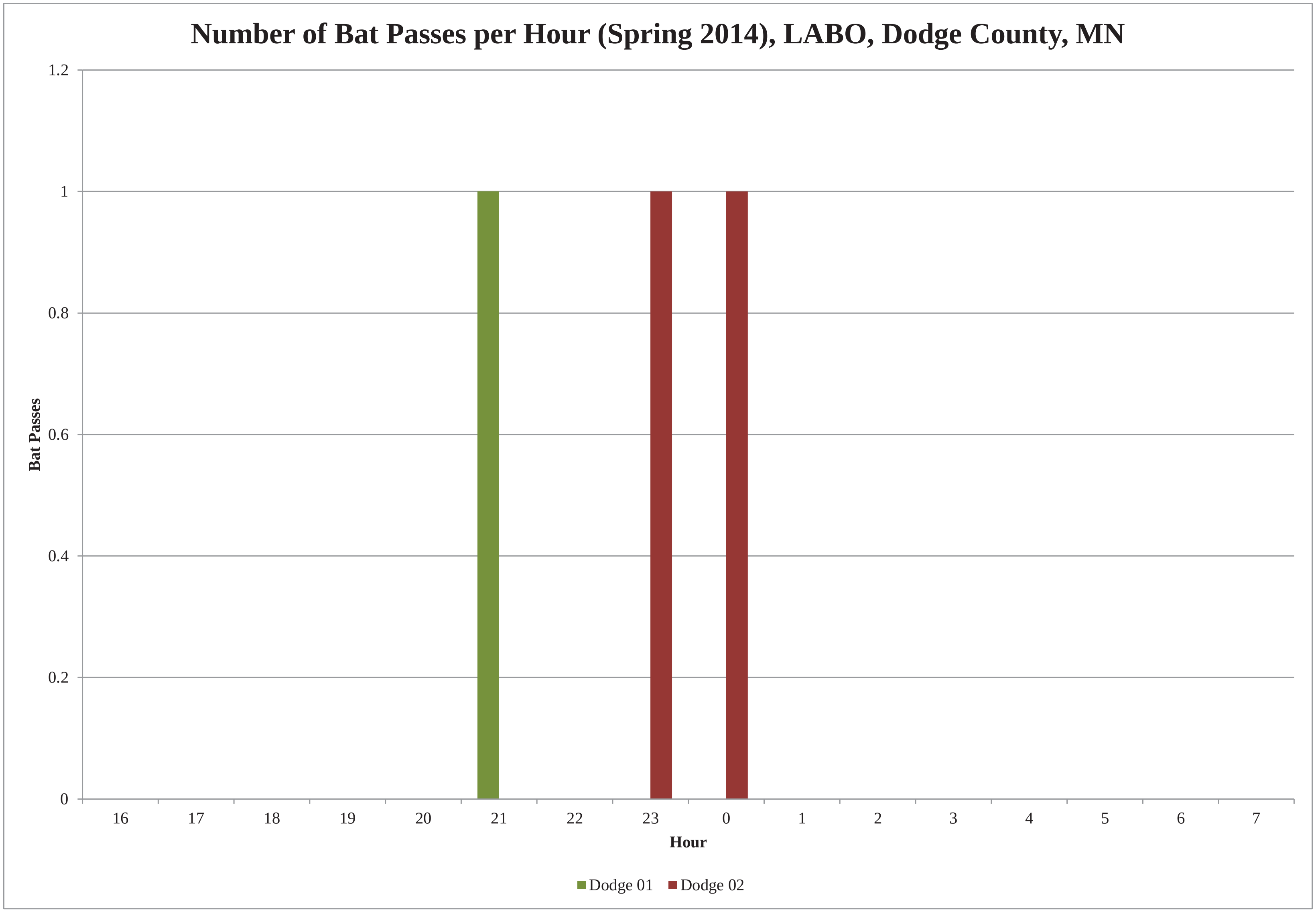


Figure 25. Number of bat passes (LABO) for each hour from all analyzed nights during the Spring 2014 sampling period for each tower.

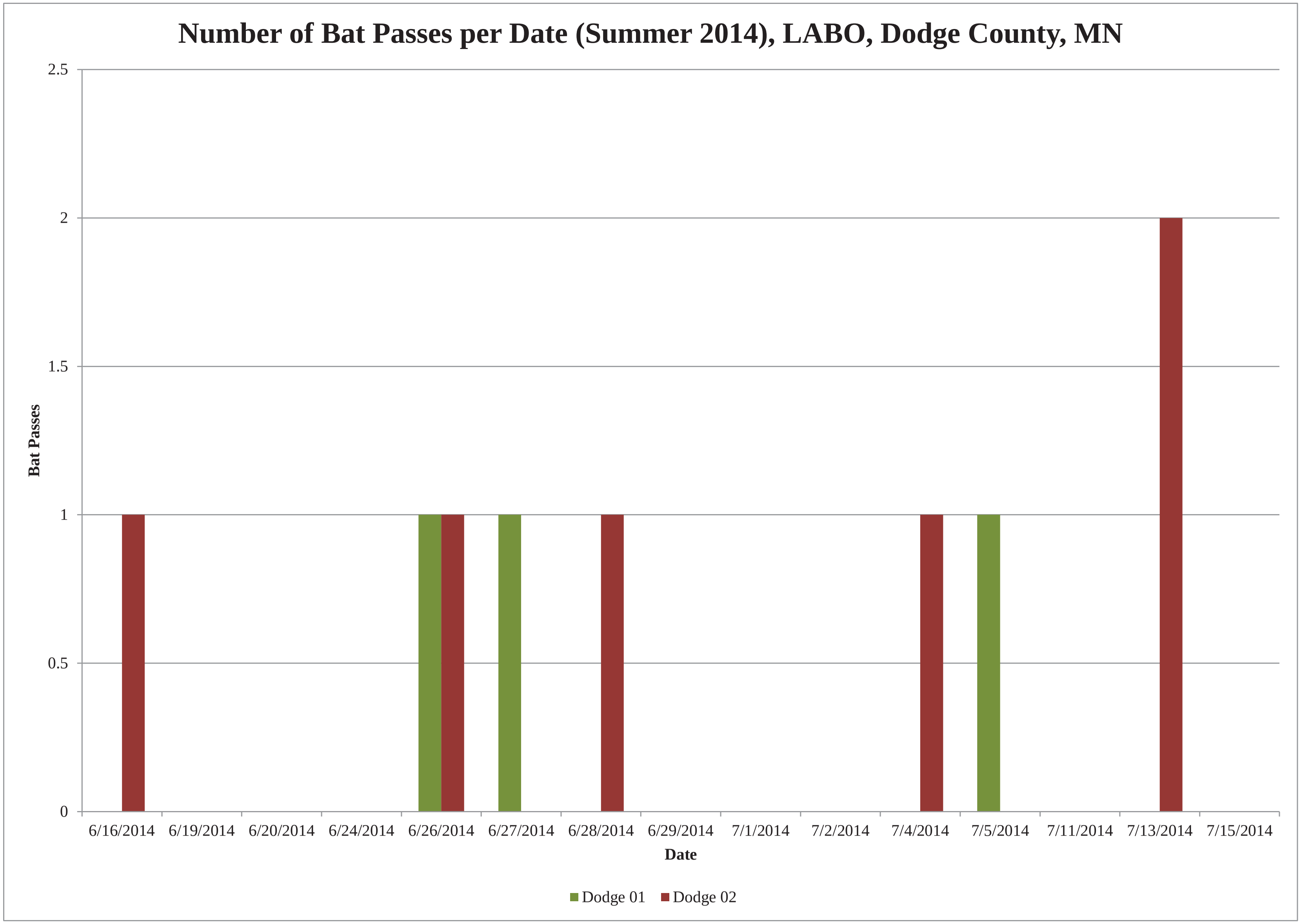


Figure 26. Number of bat passes (LABO) for each analyzed night during the Summer 2014 sampling period for each tower.

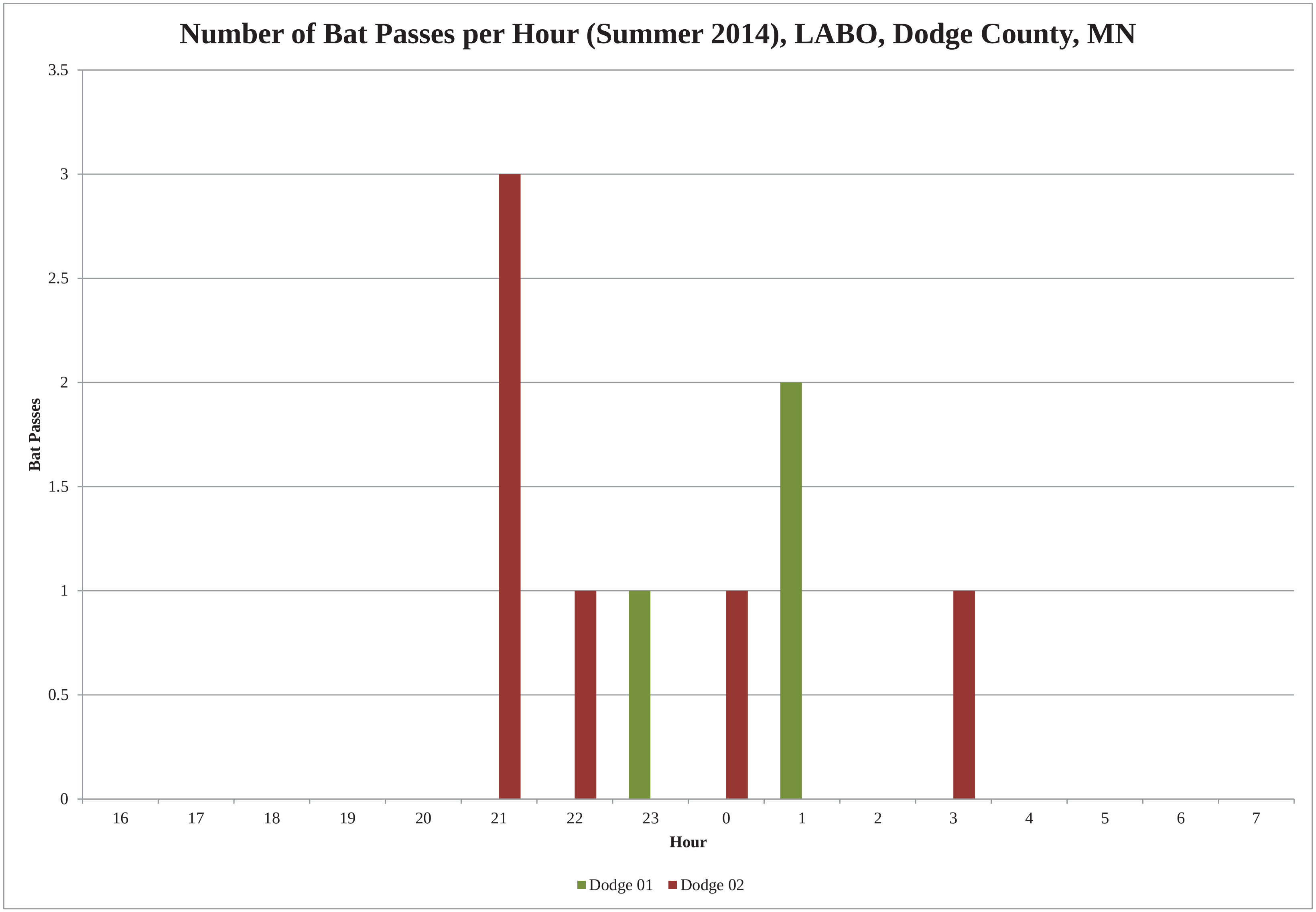


Figure 27. Number of bat passes (LABO) for each hour from all analyzed nights during the Summer 2014 sampling period for each tower.

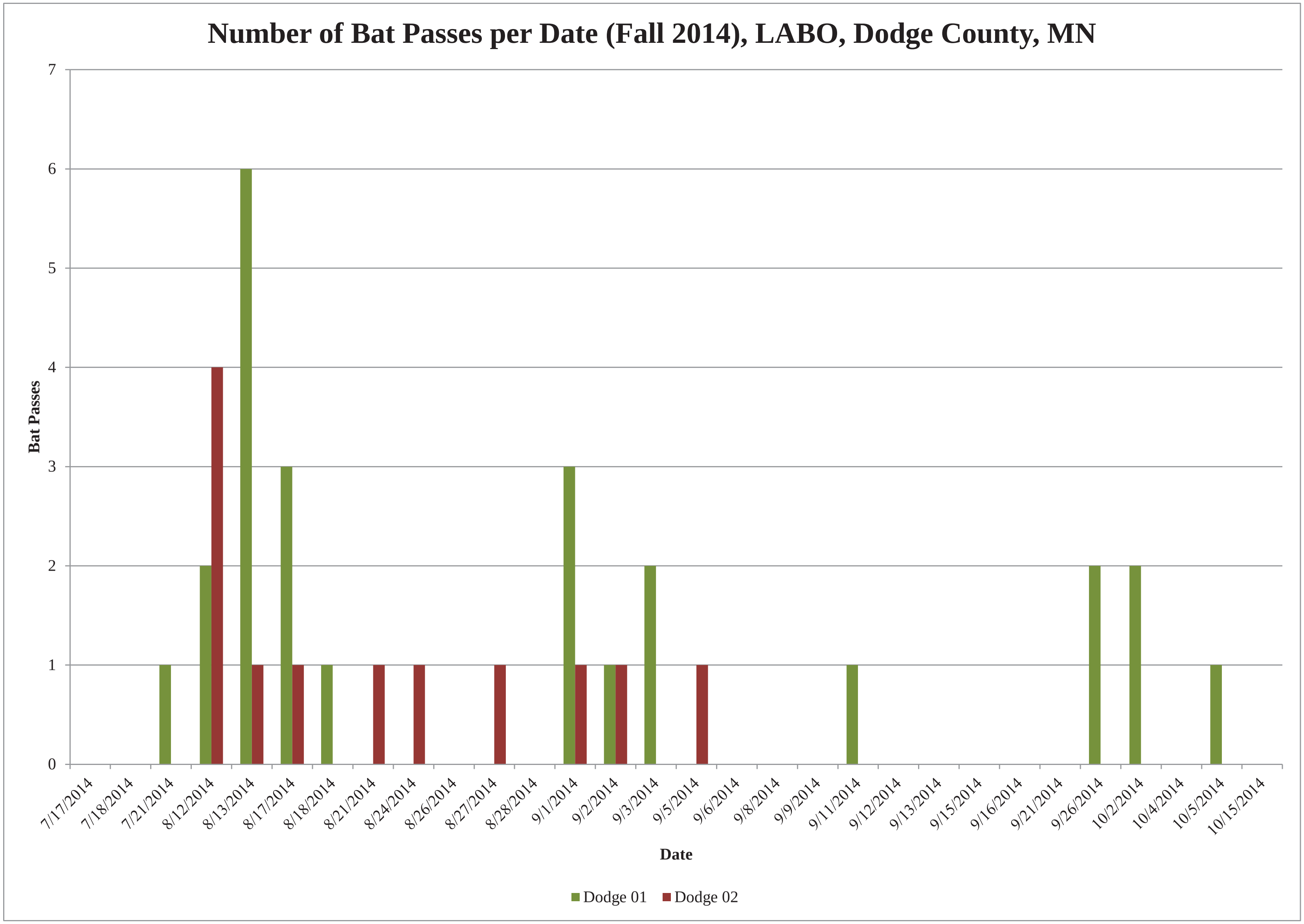


Figure 28. Number of bat passes (LABO) for each analyzed night during the Fall 2014 sampling period for each tower.

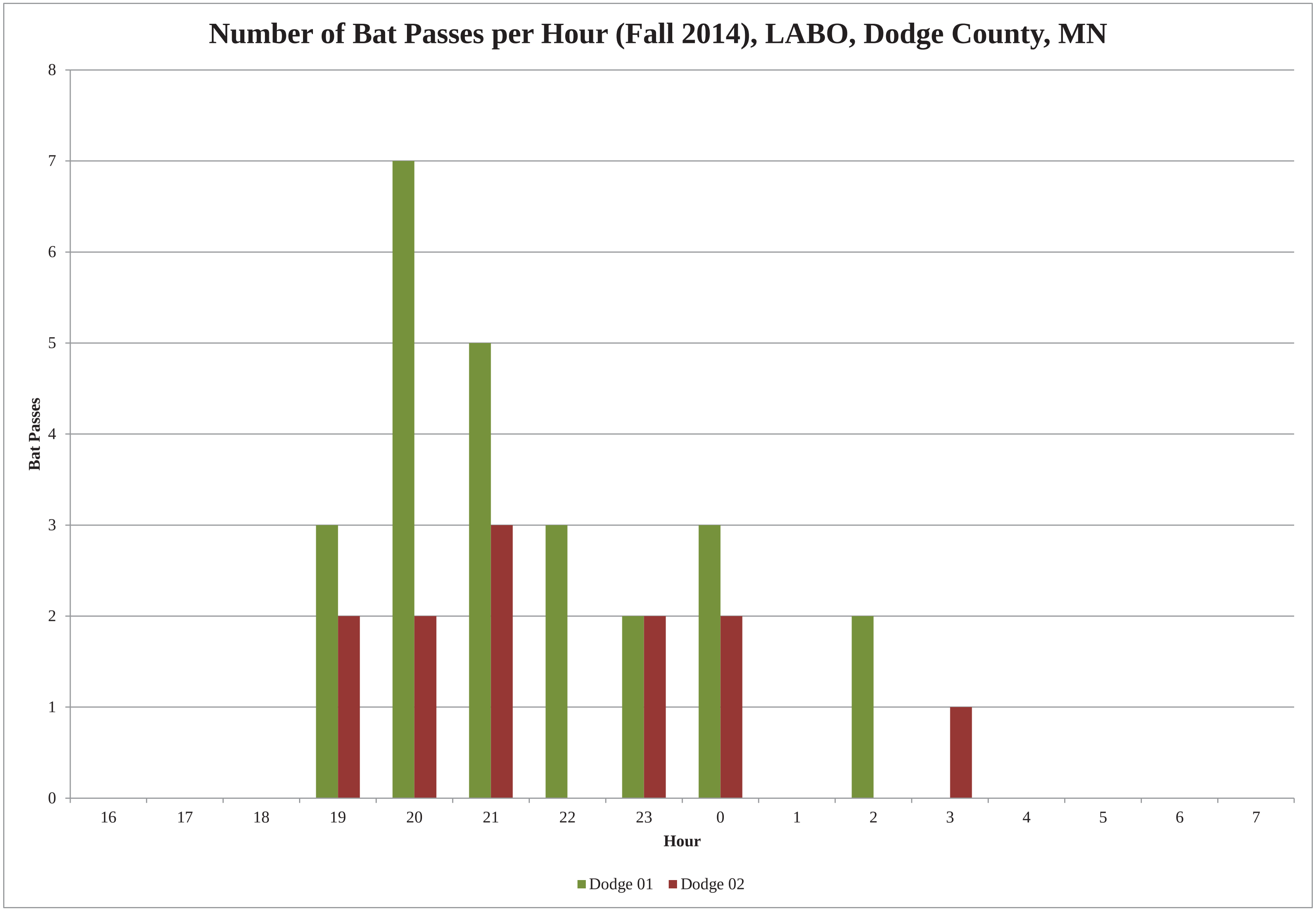


Figure 29. Number of bat passes (LABO) for each hour from all analyzed nights during the Fall 2014 sampling period for each tower.

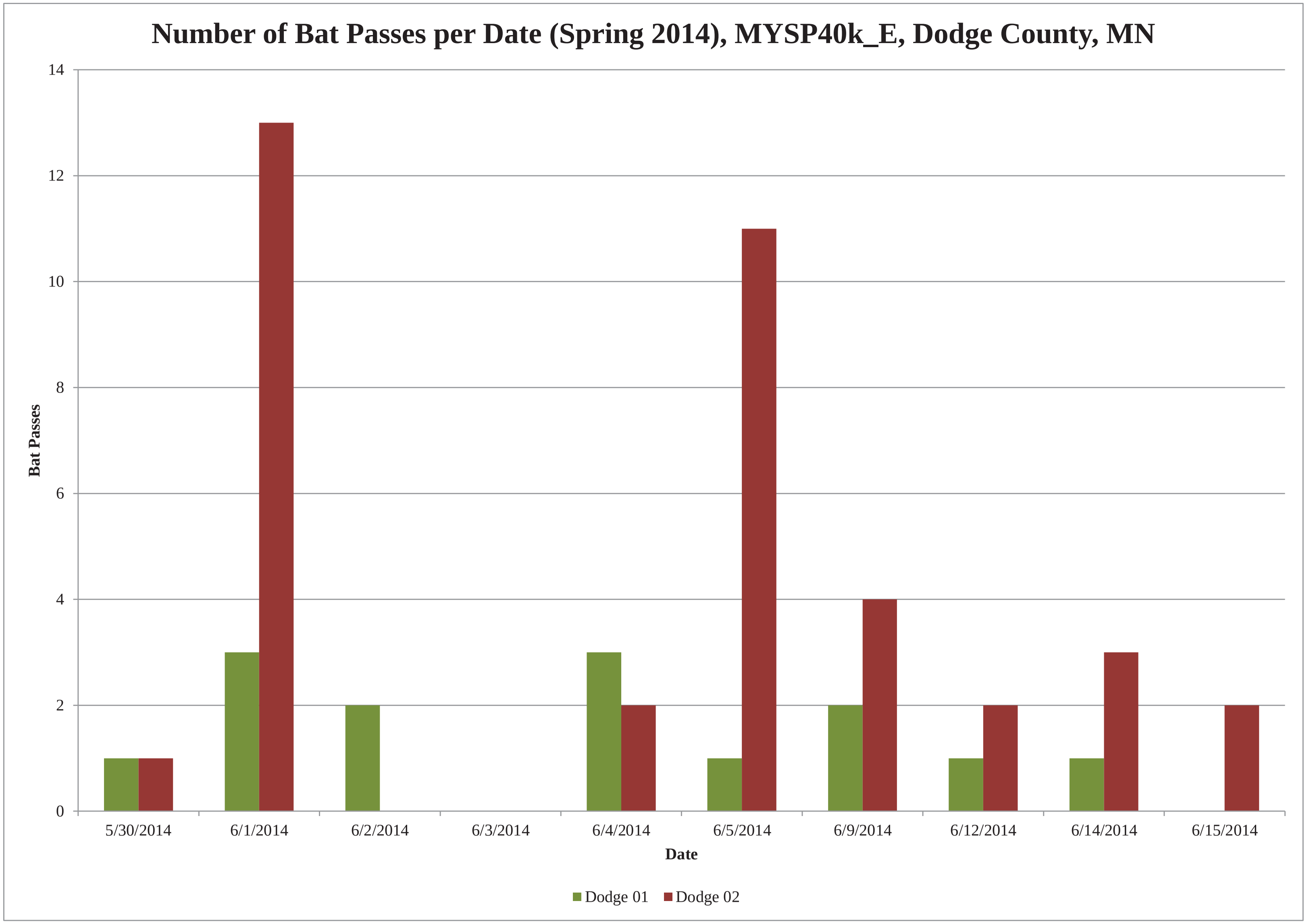


Figure 30. Number of bat passes (MYSP40k_E) for each analyzed night during the Spring 2014 sampling period for each tower.

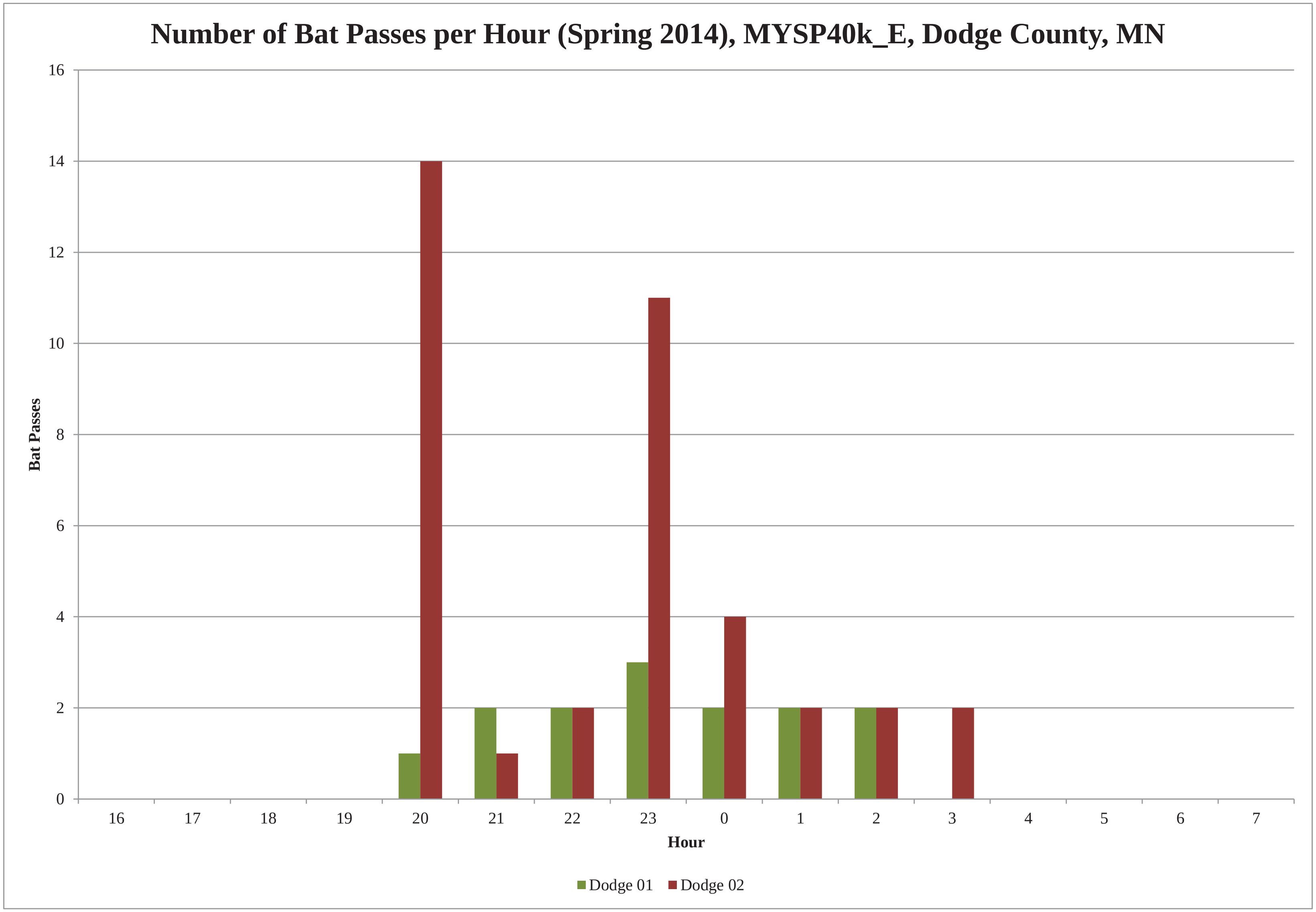


Figure 31. Number of bat passes (MYSP40k_E) for each hour from all analyzed nights during the Spring 2014 sampling period for each tower.

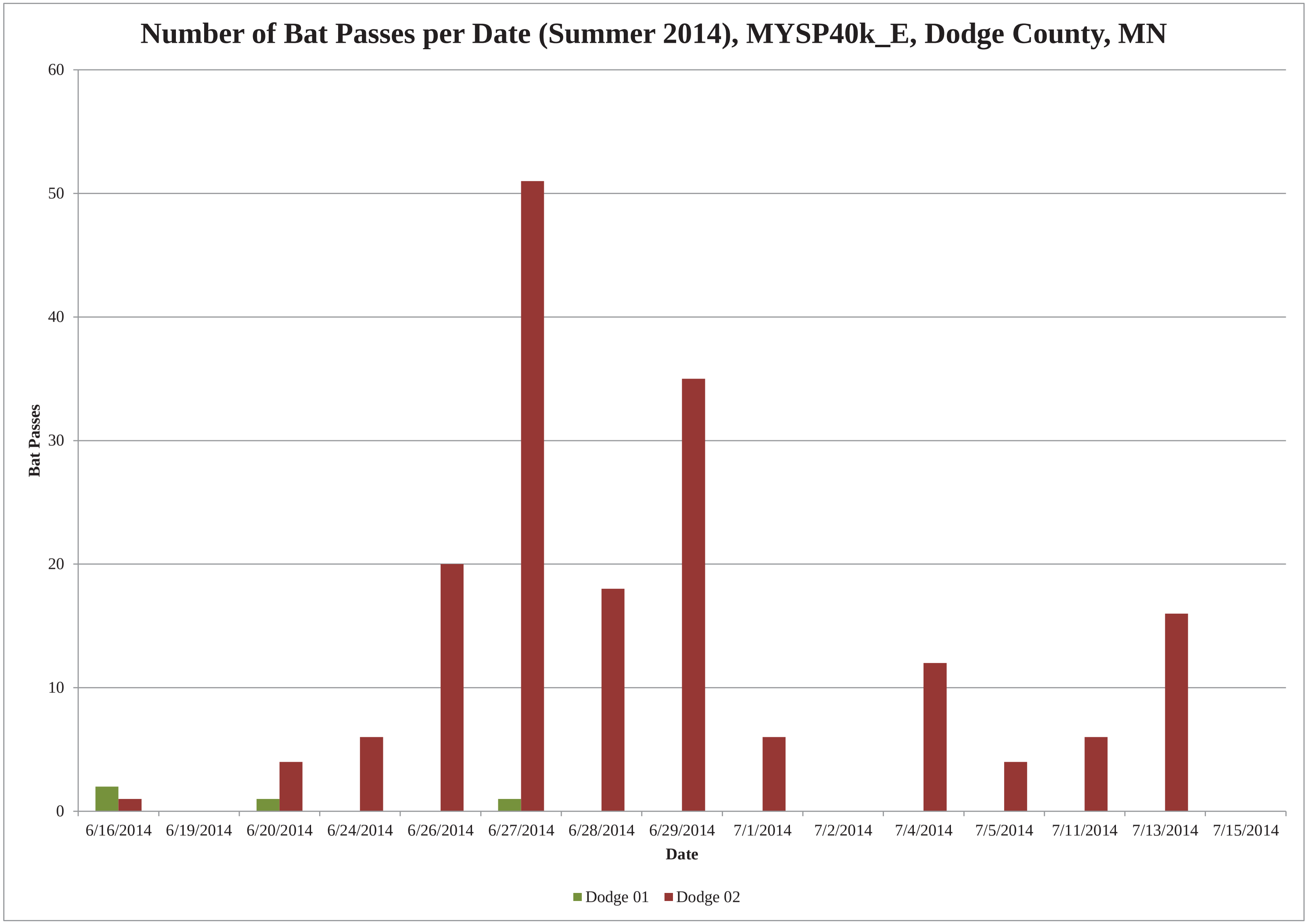


Figure 32. Number of bat passes (MYSP40k_E) for each analyzed night during the Summer 2014 sampling period for each tower.

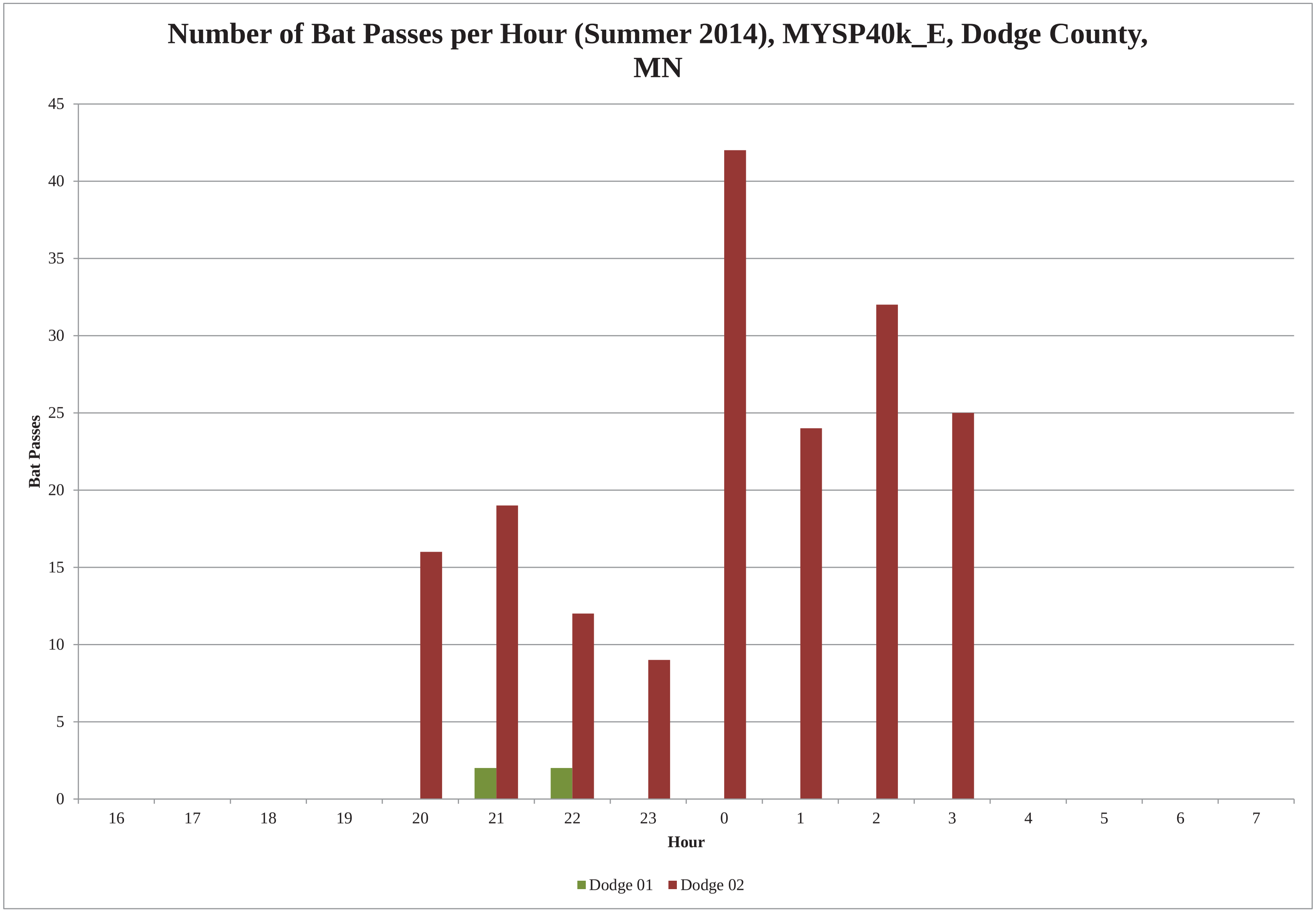


Figure 33. Number of bat passes (MYSP40k_E) for each hour from all analyzed nights during the Summer 2014 sampling period for each tower.

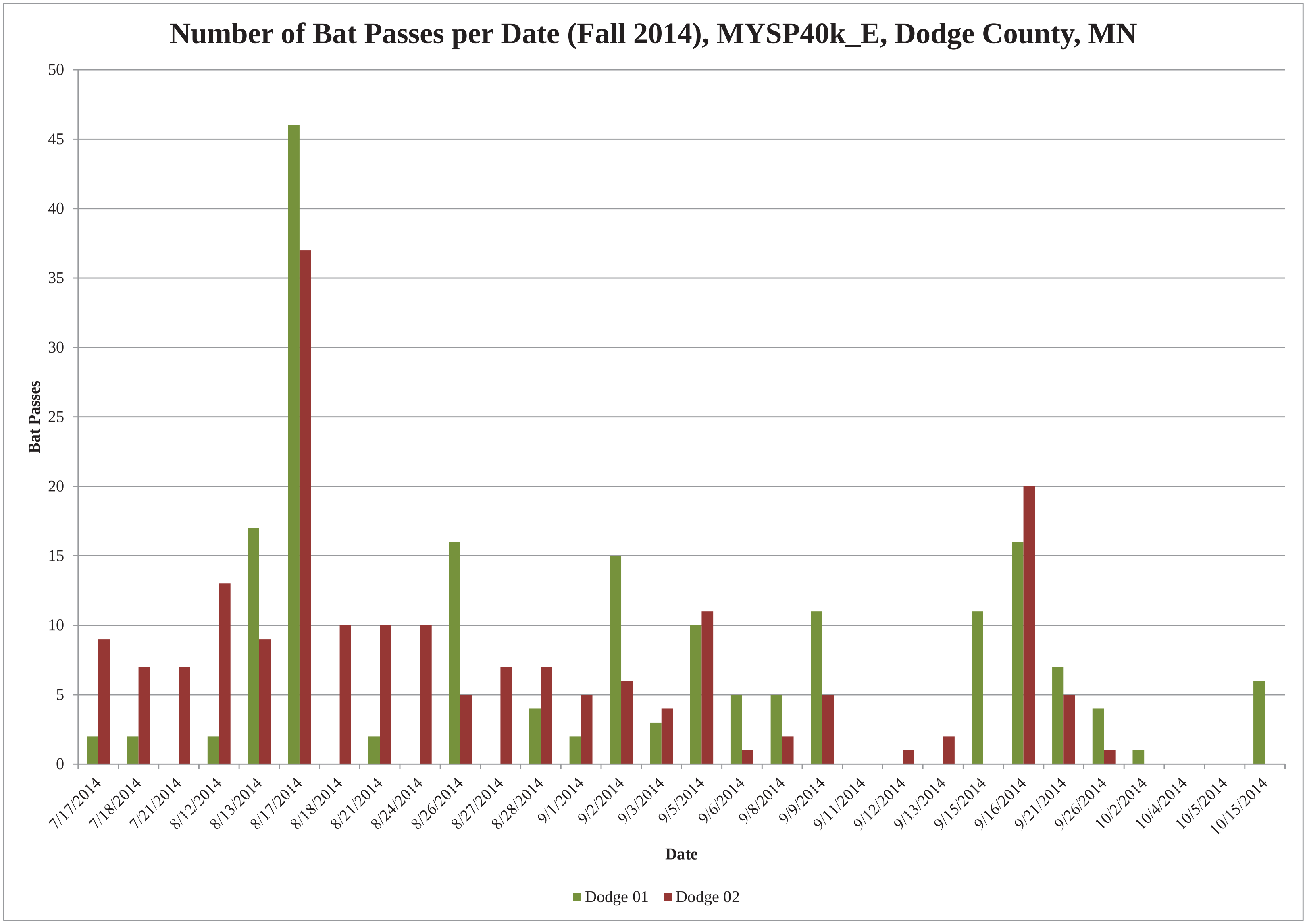


Figure 34. **Number of bat passes (MYSP40k_E) for each analyzed night during the Fall 2014 sampling period for each tower.**

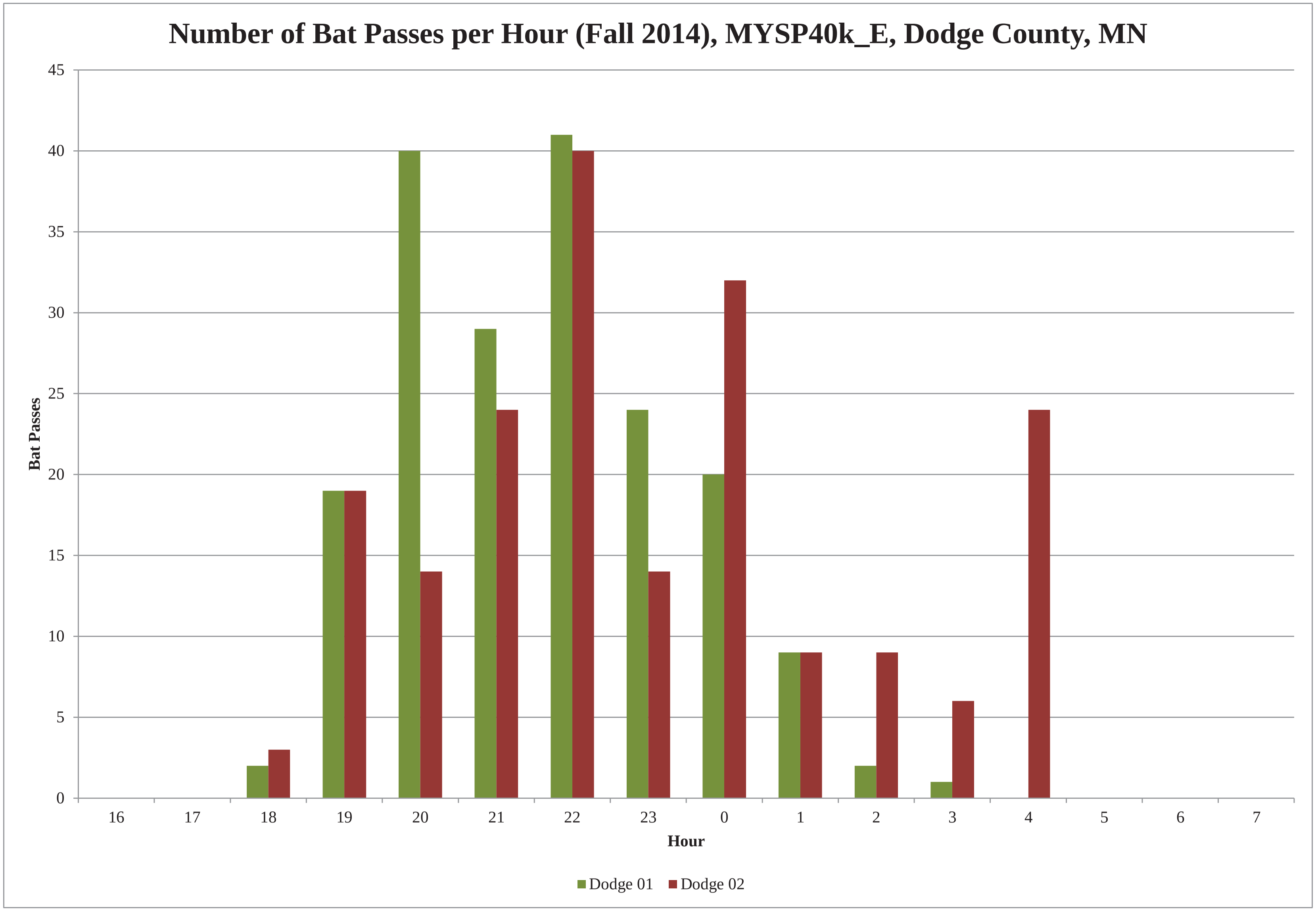


Figure 35. **Number of bat passes (MYSP40k_E) for each hour from all analyzed nights during the Fall 2014 sampling period for each tower.**

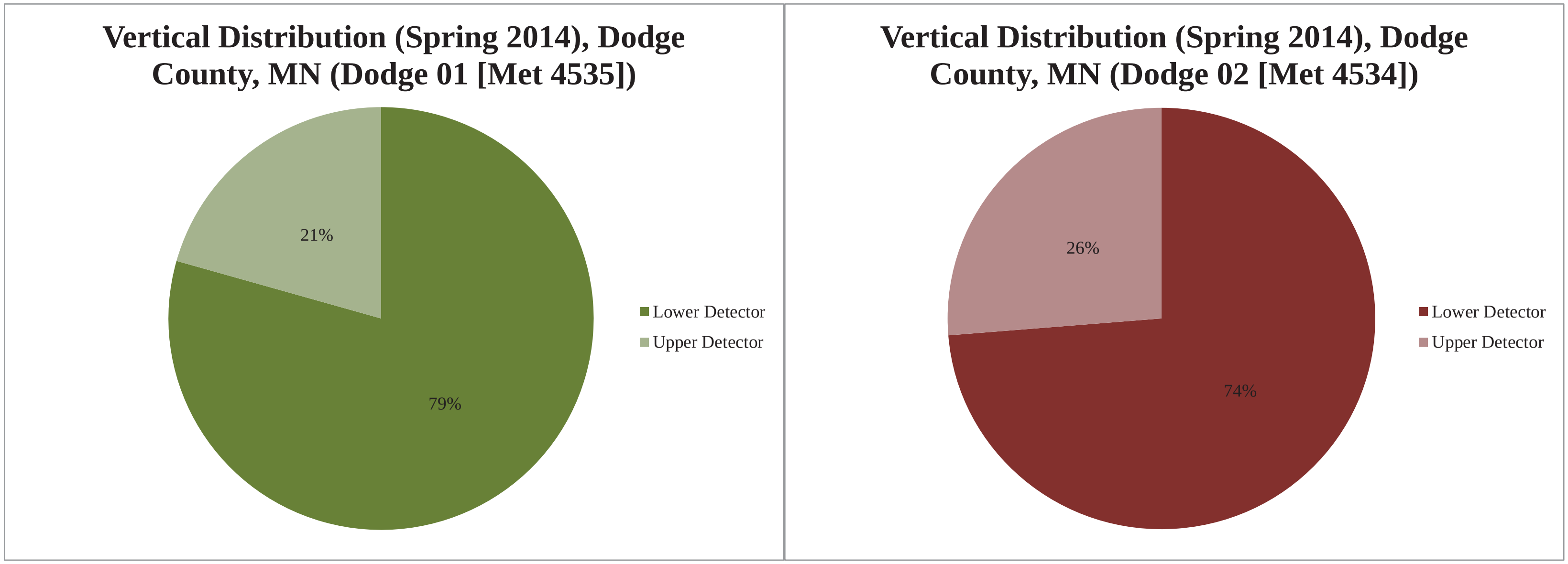
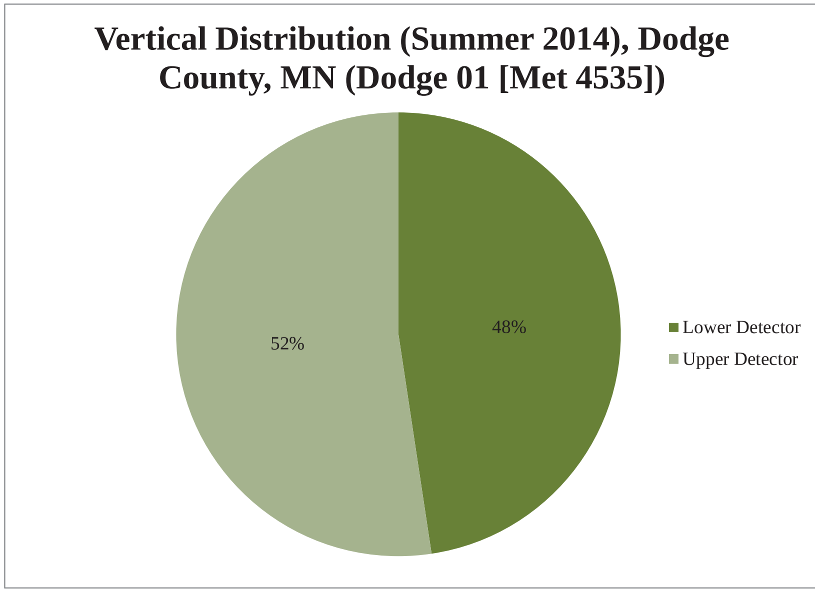


Figure 36. Vertical distribution (relative species abundance between upper and lower detectors) for each tower for the Spring 2014 sampling period.



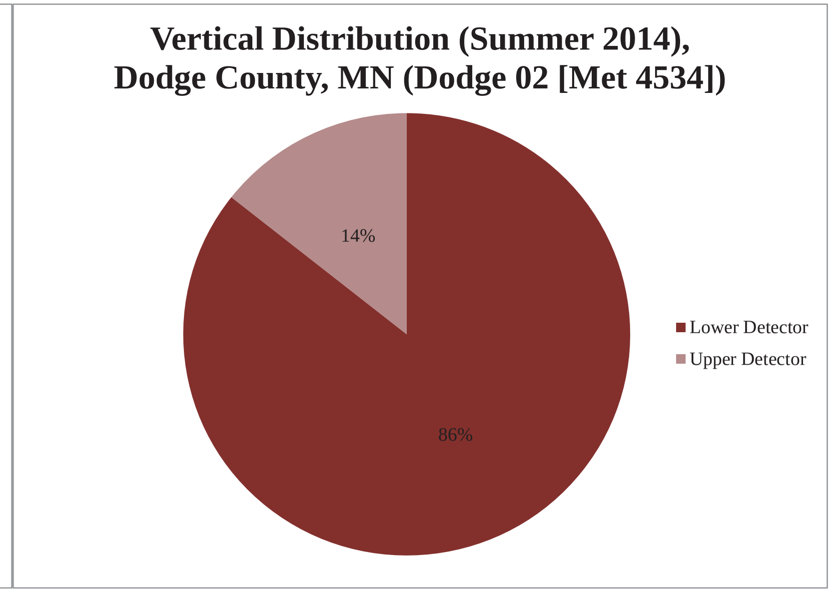
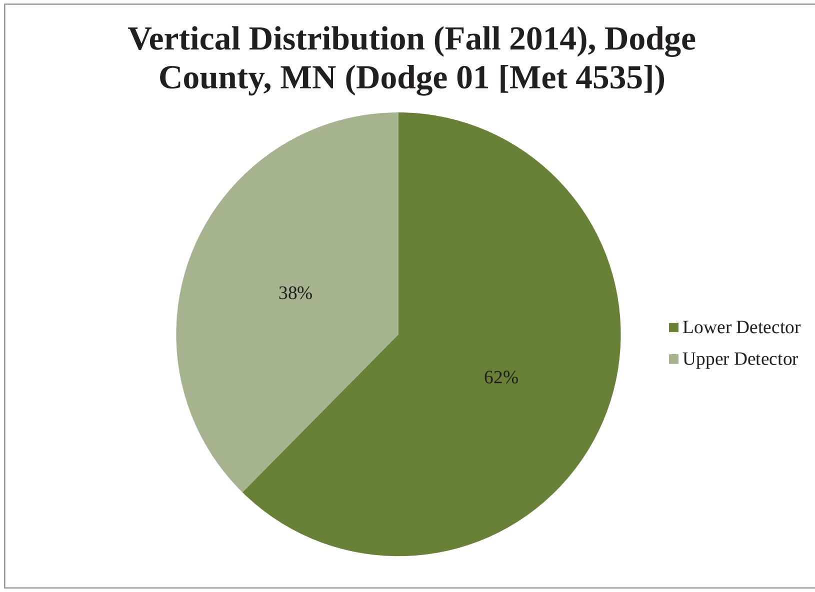


Figure 37. Vertical distribution (relative species abundance between upper and lower detectors) for each tower for the Summer 2014 sampling period.



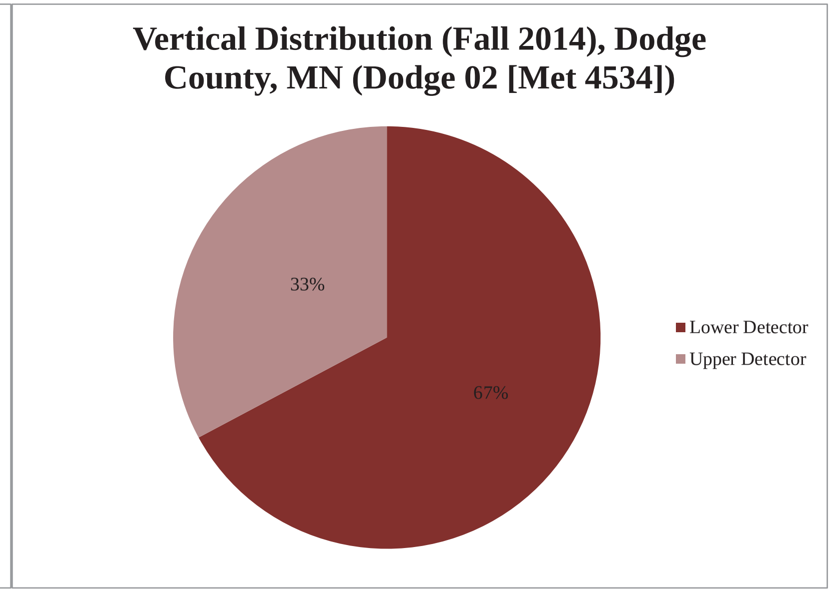
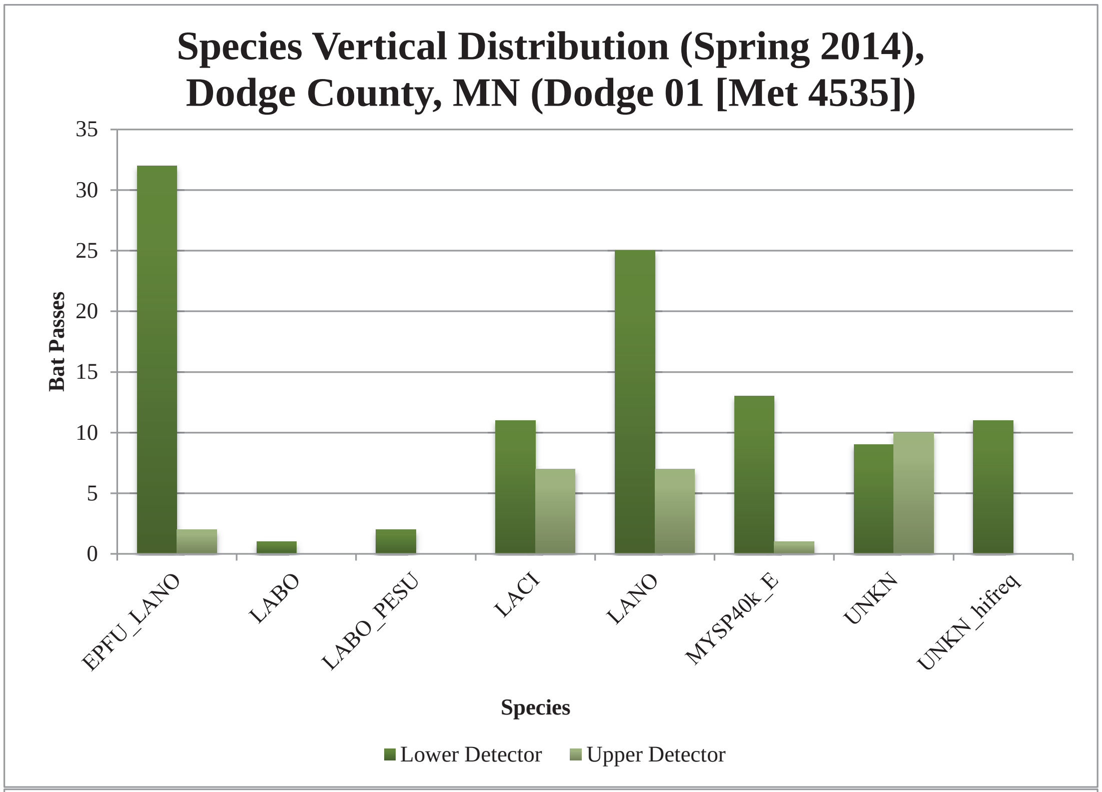


Figure 38. Vertical distribution (relative species abundance between upper and lower detectors) for each tower for the Fall 2014 sampling period.



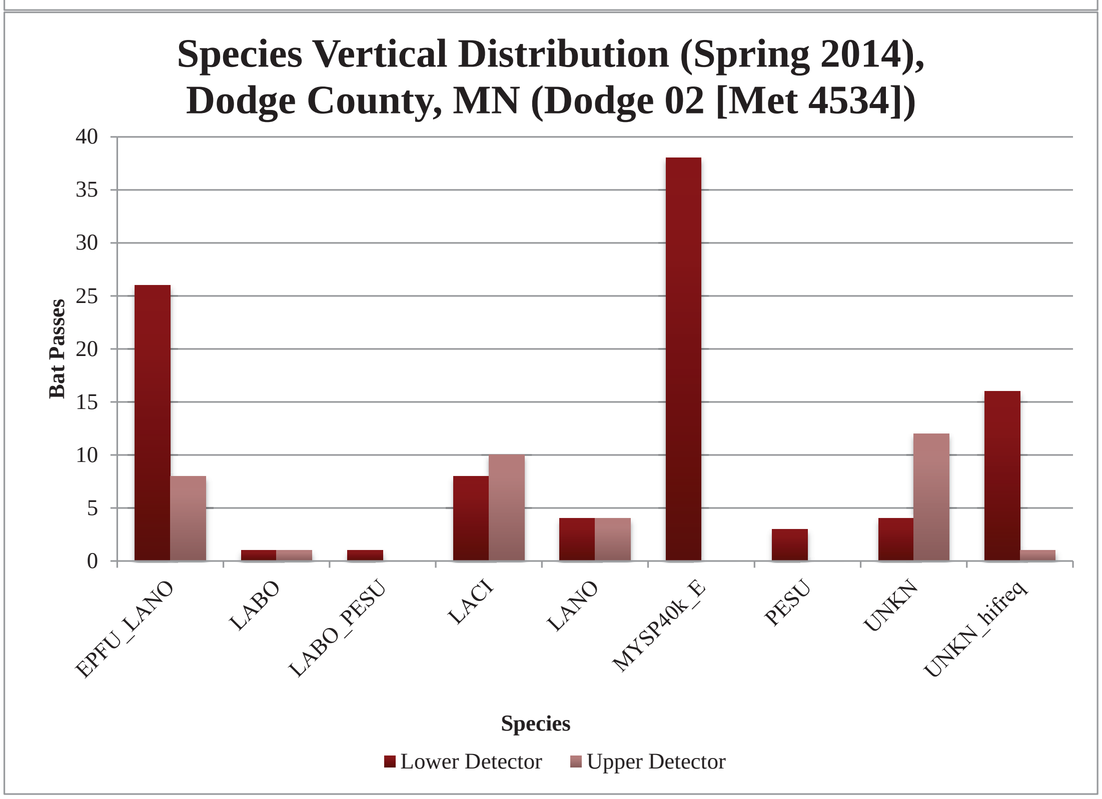
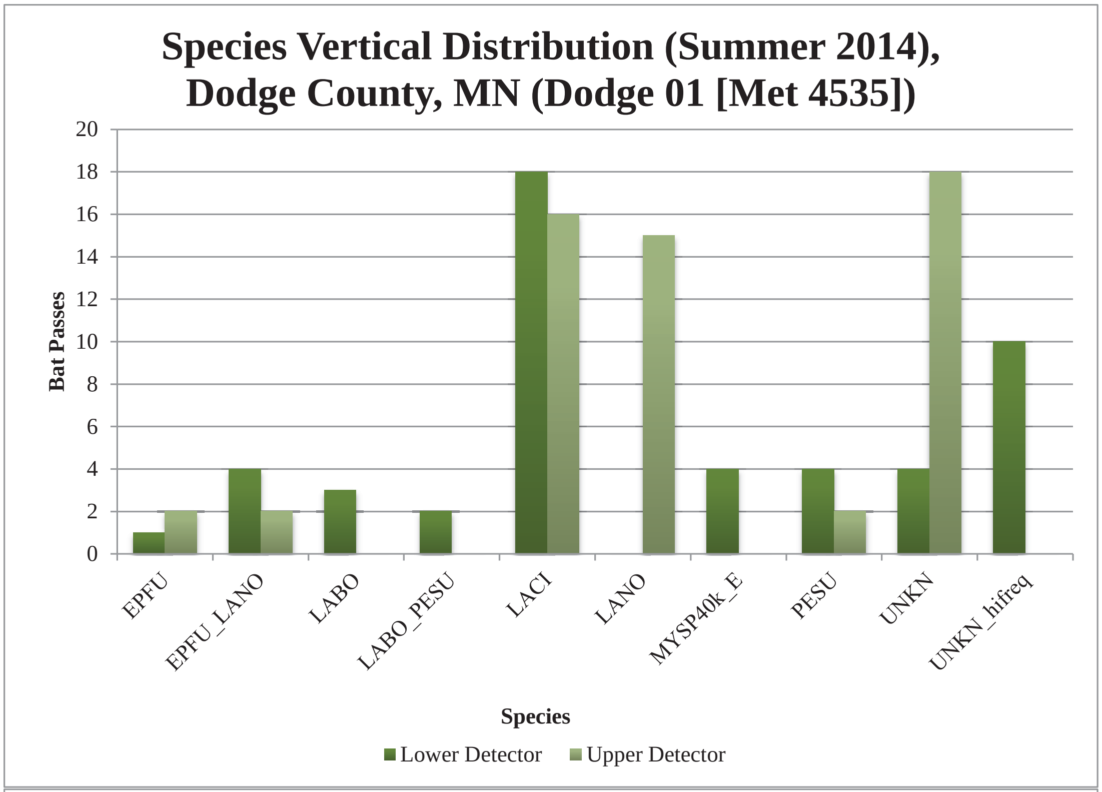


Figure 39. Species vertical distribution between the lower and upper detectors for each tower during the Spring 2014 sampling period.



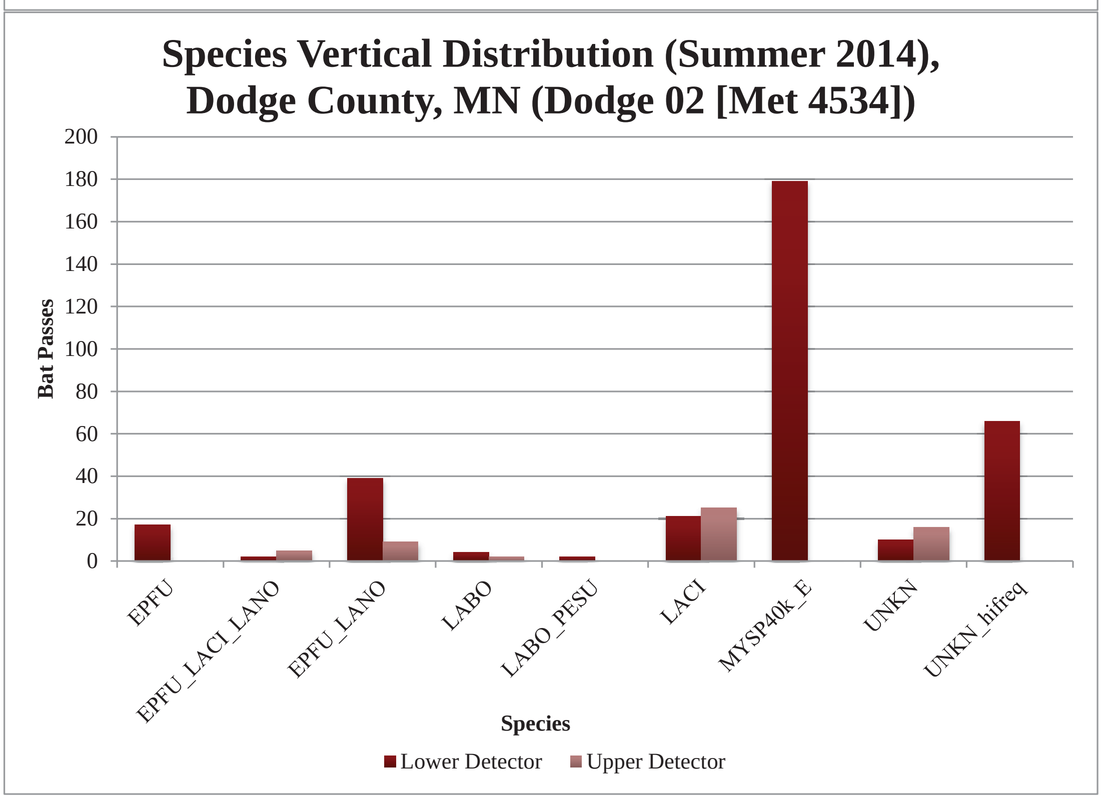
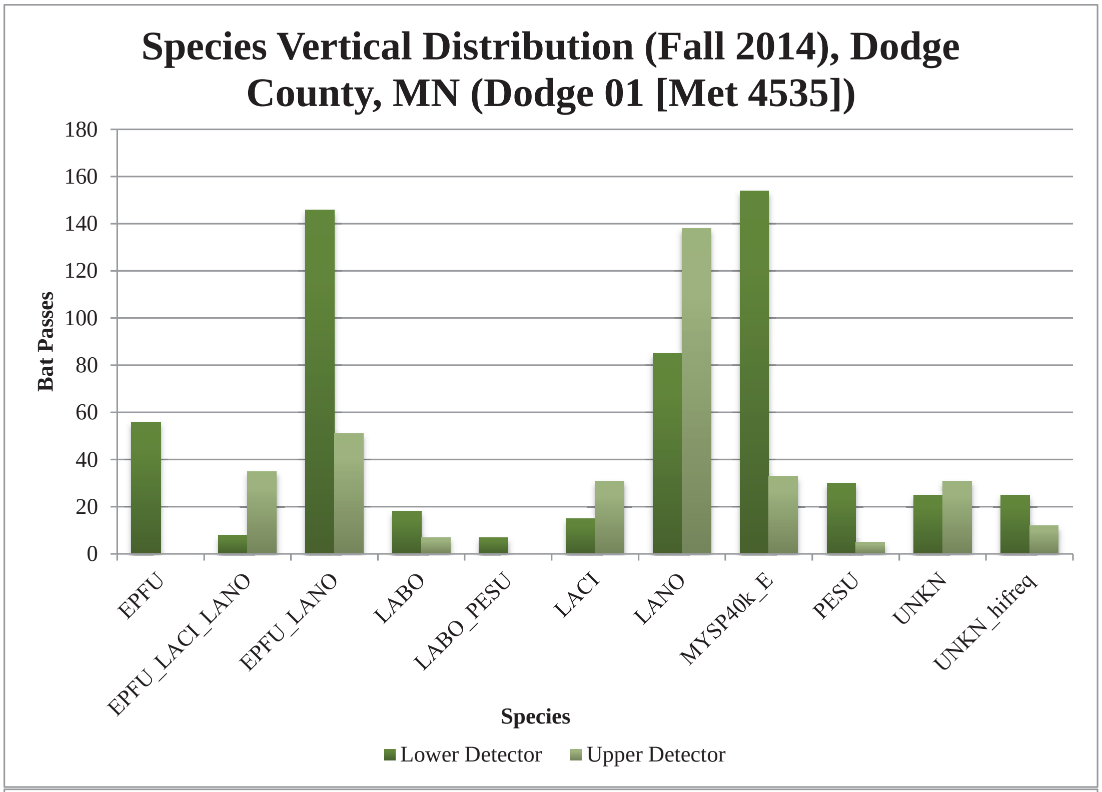


Figure 40. Species vertical distribution between the lower and upper detectors for each tower during the Summer 2014 sampling period.



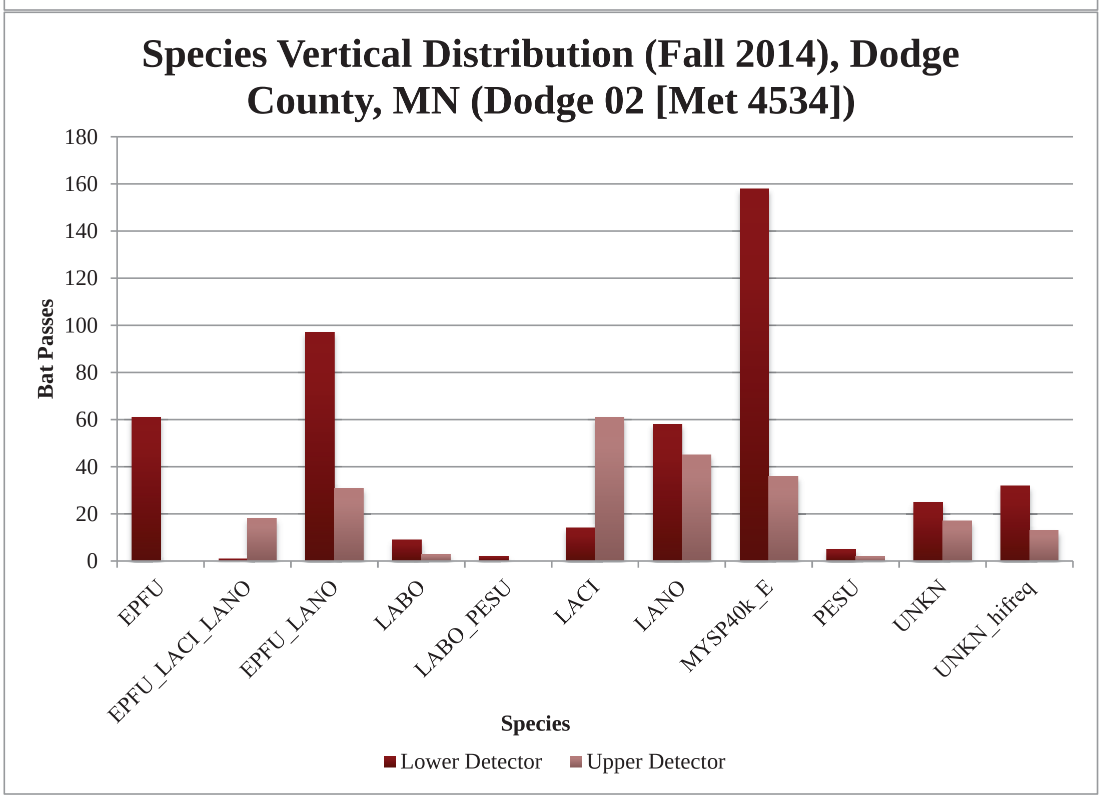


Figure 41. Species vertical distribution between the lower and upper detectors for each tower during the Fall 2014 sampling period.

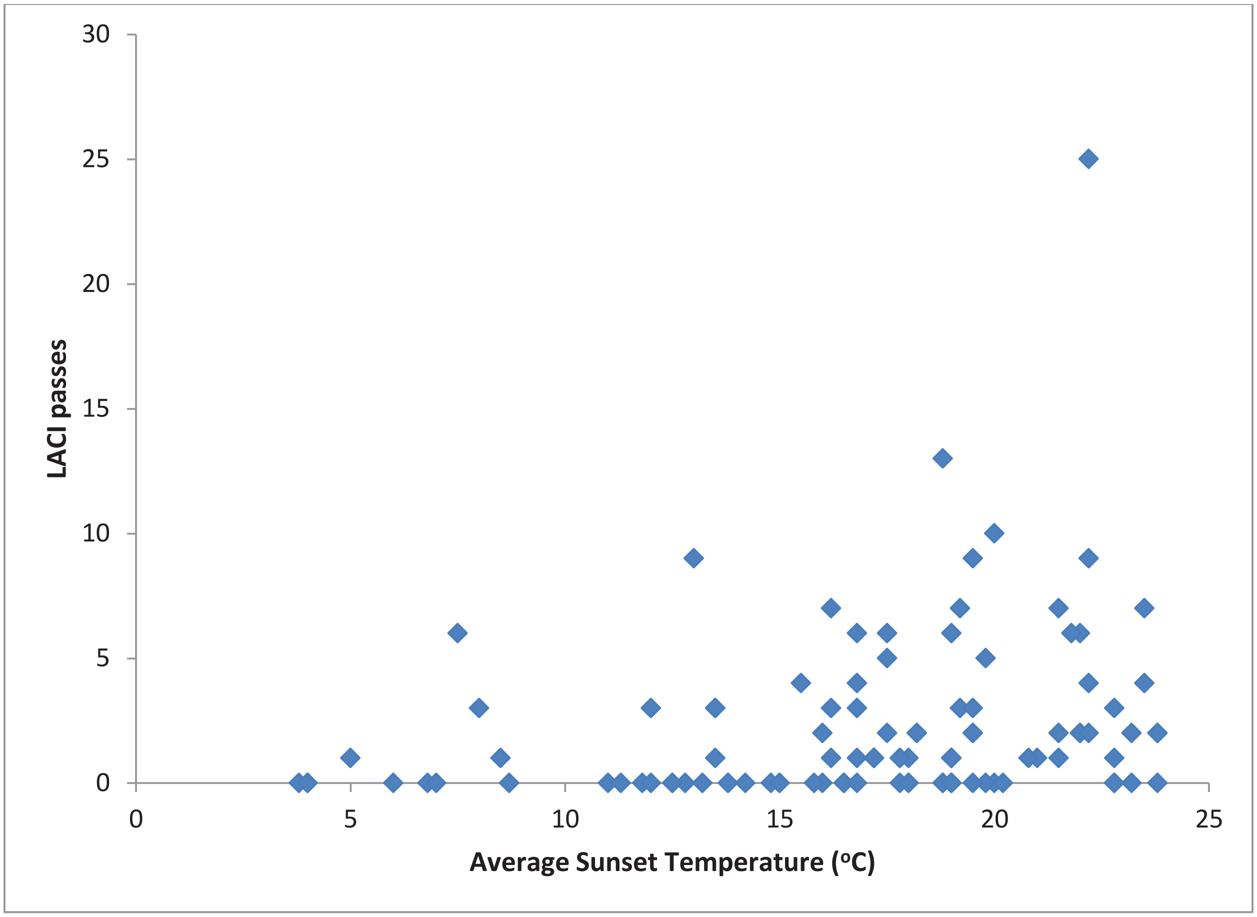


Figure 42. Relationship between LACI activity and average temperature around sunset.

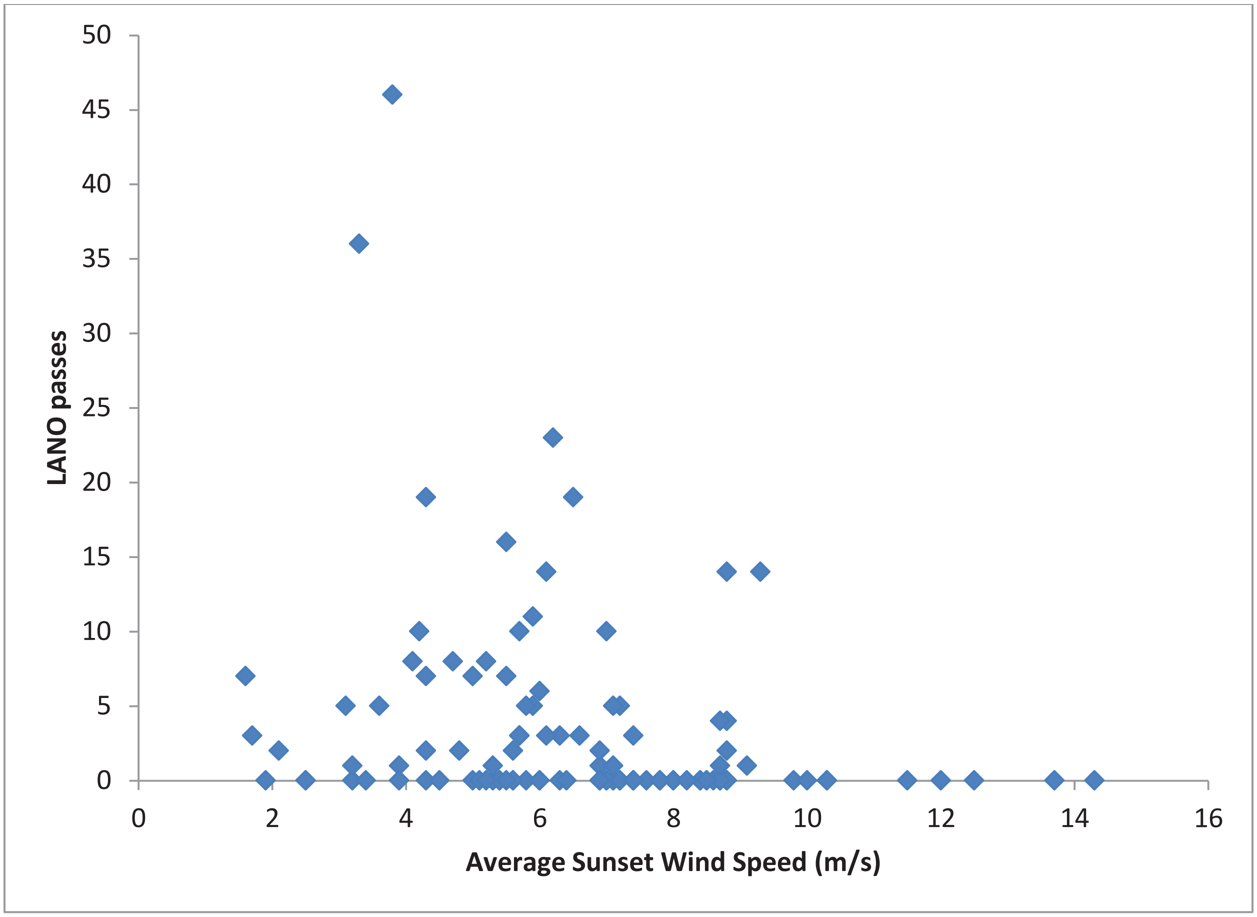


Figure 43. Relationship between LANO activity and average wind speed around sunset.

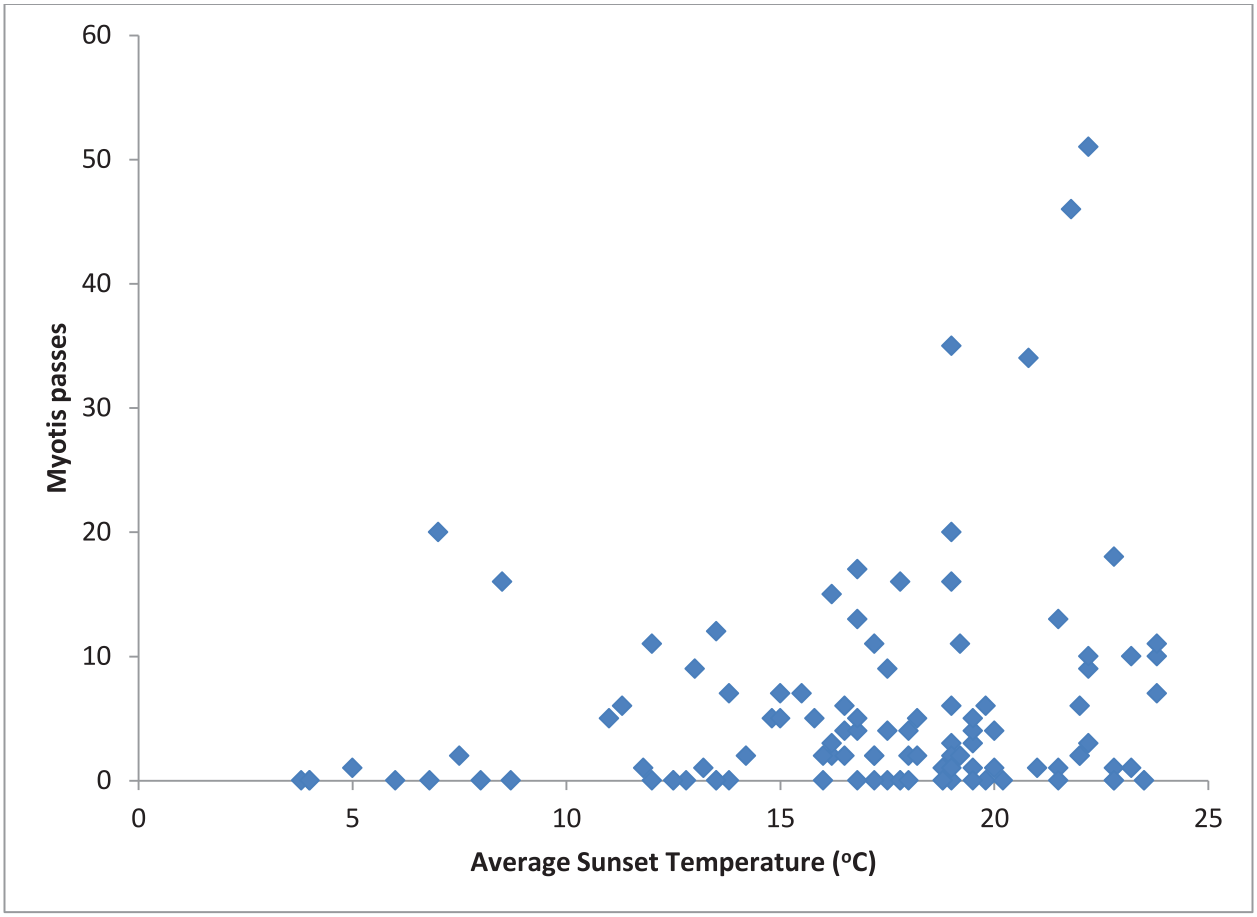


Figure 44. Relationship between MYSP40k_E activity and average temperature around sunset.

Appendices

Appendix 1. Dates Analyzed

Spring 2014 (10 nights)	Summer 2014 (15 nights)	Fall 2014 (30 nights)
5/30/2014	6/16/2014	7/17/2014
6/1/2014	6/19/2014	7/18/2014
6/2/2014	6/20/2014	7/21/2014
6/3/2014	6/24/2014	8/12/2014
6/4/2014	6/26/2014	8/13/2014
6/5/2014	6/27/2014	8/17/2014
6/9/2014	6/28/2014	8/18/2014
6/12/2014	6/29/2014	8/21/2014
6/14/2014	7/1/2014	8/24/2014
6/15/2014	7/2/2014	8/26/2014
	7/4/2014	8/27/2014
	7/5/2014	8/28/2014
	7/11/2014	9/1/2014
	7/13/2014	9/2/2014
	7/15/2014	9/3/2014
		9/5/2014
		9/6/2014
		9/8/2014
		9/9/2014
		9/11/2014
		9/12/2014
		9/13/2014
		9/15/2014
		9/16/2014
		9/21/2014
		9/26/2014
		10/2/2014
		10/4/2014
		10/5/2014
		10/15/2014

Appendix 2. Atmospheric Conditions and Bat Activity Model Output

	LACI					
Model	**K**	**AICc**	**Delta AICc**	**Wi**	**Cumulative Wi**	**Evidence Ratio**
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg	4	531.3279	0	0.447436	0.447436	1
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	531.8352	0.507315	0.347191	0.794627	1.28873
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg	5	532.9939	1.665951	0.194524	0.989152	2.300152
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	539.3325	8.004568	0.008176	0.997328	54.72299
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg	4	542.2241	10.89621	0.001926	0.999254	232.318
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg	5	544.1214	12.7935	0.000746	1	599.8936
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg	3	567.5792	36.25131	6.01E-09	1	74451164
TwrAvgTemp_Avg + TwrAvgSpeed_Avg	3	573.7431	42.41522	2.76E-10	1	1.62E+09
Precip_Avg	2	574.2025	42.87455	2.19E-10	1	2.04E+09
Precip_Avg + RH_Avg	3	575.8565	44.52861	9.58E-11	1	4.67E+09
TwrAvgTemp_Avg	2	578.2756	46.94763	2.86E-11	1	1.57E+10
TwrAvgTempSunset_Avg	2	581.4432	50.11532	5.87E-12	1	7.63E+10
TwrAvgSpeedSunset_Avg	2	614.2185	82.8906	4.48E-19	1	9.99E+17
TwrAvgPressureSunset_Avg	2	621.8791	90.55113	9.72E-21	1	4.6E+19
null.model	1	622.3358	91.00782	7.74E-21	1	5.78E+19
TwrAvgSpeed_Avg	2	623.023	91.69512	5.49E-21	1	8.15E+19
TwrAvgPressure_Avg	2	623.8954	92.56744	3.55E-21	1	1.26E+20
LACI.wx.vars	**LACI.wx.betas**	**LACI.wx.SE**	**LACI.wx.LCI**	**LACI.wx.UCI**		
TwrAvgTemp_Avg	0.526925	0.099472	0.331963	0.721886		
TwrAvgSpeed_Avg	-0.14096	0.085849	-0.30922	0.027305		
Precip_Avg	0.241878	0.034936	0.173404	0.310352		

RH_Avg	0.073699	0.075008	-0.07331	0.220711		
TwrAvgPressure_Avg	0.172295	0.094474	-0.01287	0.357461		
TwrAvgPressureSunset_Avg	0.103897	0.065337	-0.02416	0.231954		
TwrAvgTempSunset_Avg	0.4853	0.095399	0.298321	0.67228		
TwrAvgSpeedSunset_Avg	-0.30316	0.084276	-0.46834	-0.13798		

	LANO					
Model	**K**	**AICc**	**Delta AICc**	**Wi**	**Cumulative Wi**	**Evidence Ratio**
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg	5	921.7816	0	0.576812	0.576812	1
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	922.4474	0.665781	0.413487	0.990299	1.394994
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg	5	930.7992	9.017609	0.006352	0.996651	90.81317
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	932.0803	10.29873	0.003347	0.999998	172.3223
TwrAvgTemp_Avg + TwrAvgSpeed_Avg	3	947.6412	25.8596	1.40E-06	1	412421.6
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg	4	949.7835	28.00192	4.79E-07	1	1203757
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg	3	957.8084	36.02685	8.67E-09	1	66547434
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg	4	959.9374	38.15578	2.99E-09	1	1.93E+08
TwrAvgSpeed_Avg	2	998.7143	76.93276	1.14E-17	1	5.08E+16
TwrAvgSpeedSunset_Avg	2	1026.224	104.4427	1.21E-23	1	4.78E+22
Precip_Avg + RH_Avg	3	1044.362	122.5803	1.39E-27	1	4.15E+26
TwrAvgTemp_Avg	2	1054.728	132.9463	7.80E-30	1	7.39E+28
TwrAvgTempSunset_Avg	2	1057.097	135.3152	2.39E-30	1	2.42E+29
TwrAvgPressure_Avg	2	1103.622	181.8407	1.88E-40	1	3.06E+39
TwrAvgPressureSunset_Avg	2	1111.759	189.9769	3.22E-42	1	1.79E+41
Precip_Avg	2	1118.354	196.572	1.19E-43	1	4.84E+42

null.model	1	1125.565	203.7834	3.24E-45	1	1.78E+44
LANO.wx.vars	**LANO.wx.betas**	**LANO.wx.SE**	**LANO.wx.LCI**	**LANO.wx.UCI**		
TwrAvgTemp_Avg	-0.33983	0.048206	-0.43431	-0.24535		
TwrAvgSpeed_Avg	-0.50318	0.065781	-0.63211	-0.37426		
Precip_Avg	-0.08369	0.078737	-0.23801	0.070634		
RH_Avg	0.381178	0.076859	0.230537	0.531819		
TwrAvgPressure_Avg	-0.06537	0.051632	-0.16657	0.035827		
TwrAvgPressureSunset_Avg	0.2056	0.051714	0.104242	0.306958		
TwrAvgTempSunset_Avg	-0.3896	0.050934	-0.48943	-0.28978		
TwrAvgSpeedSunset_Avg	-0.47837	0.063392	-0.60261	-0.35412		

	MYSP40k_E					
Model	**K**	**AICc**	**Delta AICc**	**Wi**	**Cumulative Wi**	**Evidence Ratio**
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg	5	1084.632	0	0.643947	0.643947	1
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	1086.002	1.370276	0.324563	0.96851	1.984045
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg	5	1091.319	6.687025	0.02274	0.991249	28.31841
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg + RH_Avg + TwrAvgPressure_Avg	6	1093.229	8.596993	0.008751	1	73.58907
TwrAvgTemp_Avg + TwrAvgSpeed_Avg + Precip_Avg	4	1131.243	46.61099	4.87E-11	1	1.32E+10
TwrAvgTemp_Avg + TwrAvgSpeed_Avg	3	1132.958	48.32585	2.07E-11	1	3.12E+10
TwrAvgTempSunset_Avg +	4	1144.697	60.0649	5.83E-14	1	1.1E+13

TwrAvgSpeedSunset_Avg + Precip_Avg						
TwrAvgTempSunset_Avg + TwrAvgSpeedSunset_Avg	3	1145.903	61.27167	3.19E-14	1	2.02E+13
TwrAvgSpeed_Avg	2	1214.731	130.0991	3.62E-29	1	1.78E+28
TwrAvgSpeedSunset_Avg	2	1225.745	141.1132	1.47E-31	1	4.39E+30
Precip_Avg + RH_Avg	3	1248.784	164.152	1.46E-36	1	4.42E+35
TwrAvgTempSunset_Avg	2	1264.273	179.6413	6.31E-40	1	1.02E+39
TwrAvgTemp_Avg	2	1275.989	191.3568	1.80E-42	1	3.57E+41
Precip_Avg	2	1320.911	236.2788	3.17E-52	1	2.03E+51
TwrAvgPressure_Avg	2	1321.651	237.0194	2.19E-52	1	2.94E+51
TwrAvgPressureSunset_Avg	2	1322.124	237.4921	1.73E-52	1	3.72E+51
null.model	1	1322.485	237.8532	1.44E-52	1	4.46E+51

MYSP40k_E.wx.vars	**MYSP40k_E.wx.betas**	**MYSP40k_E.wx.SE**	**MYSP40k_E.wx.LCI**	**MYSP40k_E.wx.UCI**		
TwrAvgTemp_Avg	0.486989	0.055821	0.377583	0.596396		
TwrAvgSpeed_Avg	-0.44531	0.045764	-0.53501	-0.35561		
Precip_Avg	-0.16728	0.052313	-0.26982	-0.06475		
RH_Avg	0.3759	0.054452	0.269177	0.482624		
TwrAvgPressure_Avg	0.05128	0.055933	-0.05835	0.160907		
TwrAvgPressureSunset_Avg	0.063501	0.040694	-0.01626	0.14326		

TwrAvgTempSunset_Avg	0.519151	0.05543	0.41051	0.627793		
TwrAvgSpeedSunset_Avg	-0.4033	0.048203	-0.49777	-0.30882		

Appendix 3: Results of Automated Acoustic Identification

Files collected at the Dodge County WRA between 30 May 2014 and 15 October 2014 were run through two acoustic identification software programs: Sonobat™ 3.0.2 (North-Northeast [NNE] version; Arcata, CA) and Kaleidoscope® Pro (Wildlife Acoustics, Inc., Concord, MA). The purpose of using these programs was to determine if any northern long-eared bats (*Myotis septentrionalis*) were potentially present in the project area during that time. Both programs use a maximum likelihood estimator (MLE) technique to determine whether a species is likely to be present at a site. Both of these programs are on the list of candidate acoustic ID programs as required by the 2014 Range-Wide Indiana Bat Summer Survey Guidelines (USFWS 2014). There are no current guidelines for monitoring northern long-eared bats.

Both acoustic identification software programs agreed that hoary bats (*Lasiurus cinereus*) and silver-haired bats (*Lasionycteris noctivagans*) had the highest activity levels overall, although they differed in the number of bat passes that they classified to each species. Eastern red bats (*Lasiurus borealis*) had moderate activity levels, although Kaleidoscope classified calls as red bat more often than Sonobat.

Northern long-eared bat calls were detected much more frequently by Kaleidoscope, with Sonobat only classifying 4 calls as northern-long eared, and only at Dodge2 (Table 1). Both programs classified northern long-eared bats as likely present at Dodge2, but only Kaleidoscope classified them as present at Dodge1 (Tables 2 and 3). Both programs agreed that little brown bats (*Myotis lucifugus*) are present within the project area, and are particularly active at Dodge2.

It should be noted that the Sonobat™ Batch Classifier default setting for the NNE identification module includes both the Eastern small-footed bat (*Myotis leibii*) and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), and does not allow them to be removed. The species ranges of both species do not overlap with the project area; therefore, the Sonobat™ results that indicate presence of this species are very likely false and were removed from this report.

Table 1. Number of Bat Passes Identified by either Kaleidoscope or Sonobat™ Acoustic Identification Software Package for each tower

Site	Acoustic ID Program	MYLU	MYSE	PESU	EPFU	LABO	LACI	LANO
Dodge1	Kaleidoscope	179	32	58	102	207	416	897
	Sonobat	88	0	25	111	31	237	487
Dodge2	Kaleidoscope	228	75	19	87	313	471	525
	Sonobat	103	4	5	119	31	219	180

Table 2. Sonobat Probability Values—1 = 100% Probability of Presence. Shaded cells indicate probable presence

Site	MYSE	MYLU	PESU	LABO	EPFU	LANO	LACI
Dodge1	0.1624	1	1	1	1	1	1
Dodge2	0.9765	1	0.9947	1	1	1	1

Table 3. Kaleidoscope P Values—If P < 0.05, the Species Is Likely Present (shaded cells)

Site	EPFU	LABO	LACI	LANO	MYLU	MYSE	PESU
Dodge1	1	0	0	0	0	< 0.001	0
Dodge2	1	0	0	0	0	0	1

Reference:

USFWS 2014. Range-Wide Indiana Bat Summer Survey Guidelines. January 2014. Available at: http://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2014IBatSummerSurveyGuidelines13Jan2014.pdf. Accessed January 2014.

Bat Activity Studies for the Dodge County Wind Project Dodge & Steele Counties, Minnesota

June 24 – October 5, 2020

Prepared for:

Dodge County Wind, LLC

700 Universe Blvd
Juno Beach, Florida 33408

Prepared by:

Brenna Hyzy, Jennifer Stucker, Kristina Hammond

Western EcoSystems Technology, Inc.
7575 Golden Valley Road, Suite 300
Golden Valley, Minnesota 55427

January 22, 2021

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. conducted a bat acoustic survey for the proposed Dodge County Wind Energy Project (Project) in Dodge and Steele Counties, Minnesota. This bat acoustic survey was designed to estimate levels of bat activity throughout the Project area during summer and fall seasons.

Acoustic surveys were conducted from June 24 – October 5 at four monitoring stations located in cropland habitat, which is the dominant land cover type within the Project area and therefore representative of future turbine placement ('representative stations'). Ultrasonic microphones for Wildlife Acoustics SM3 detectors were paired at two meteorological (MET) towers with one microphone placed near the ground at 5.0 feet (ft; 1.5 meter [m]) and the other placed within the rotor-swept zone at 148 ft (45 m). One additional detector was located near the ground in habitat considered attractive to bats (e.g. riparian forest, forest edge, ponds, etc.) and this station was designated as a 'bat feature' station. In total five monitoring stations were deployed throughout the Project area.

Bat activity within the Project area varied among representative stations. Activity was noticeably higher at the ground station at DC2g (63.45 ± 10.70 bat passes per detector-night), when compared to the other three representative stations, which on average recorded almost three times less activity than DC2g. Activity at the bat feature station was almost four times higher (159.06 ± 14.45 bat passes per detector-night) than at representative ground stations (41.40 ± 5.63).

Bat activity at representative stations was relatively high in the summer (43.97 ± 8.58) and lower in the fall (23.10 ± 2.99). Weekly acoustic activity at MET towers was relatively low from late-June to mid-July, but increased in mid-July, and again in late-August, peaking from August July 18 to July 24 (92.5 bat passes per detector-night). Overall bat activity was 23.31 ± 2.89 during the fall migration period at representative stations, 27.67 ± 3.69 at ground representative stations, and 18.95 ± 3.34 at raised representative stations.

Of the total bat passes recorded at representative stations, 93.9% were classified as low-frequency (LF; e.g., big brown bats, hoary bats, and silver-haired bats), and 6.1% of bat passes were classified as high-frequency (HF; e.g., tri-colored bats, eastern red bats, and *Myotis* species). Big brown bat and silver-haired bat were the primary species recorded, both present on 93% of calendar nights. Hoary bat was the third most frequently identified species (91% of calendar nights). Other commonly detected species included little brown bat (85%), evening bat (84%), eastern red bat (76%), and tri-colored bat (42%). Potential northern long-eared bats calls were only detected on 10% of calendar nights. A qualified bat biologist manually reviewed all 15 bat calls Kaleidoscope Pro classified as potentially northern long-eared bat, along with 1,266 HF bat calls that were recorded on the same nights. After qualitative review was completed, none of the 15 northern long-eared bat calls were confirmed. Ten of the fifteen calls were reclassified as eastern red bats, four were reclassified as unknown HF species, and one was reclassified as a little brown bat. No additional northern long-eared bat calls were confirmed while reviewing HF calls.

STUDY PARTICIPANTS

Jennifer Stucker	Project Manager
Joyce Pickle	Senior Manager
Brenna Hyzy	Bat Biologist; Bat Data Labeler and Data Analyst; Writer
Kristina Hammond	Bat Biologist Reviewer
Sarah Martinson	Bat Acoustic Coordinator
Kelsey O'Brien	Statistician
Wes Conway	GIS Technician
Kelsey O'Brien	Technical Editor
Isaac Christopherson	Field Biologist
Lindsey Dervnosek	Field Coordinator

REPORT REFERENCE

Hyzy, B., J. Stucker, and K. Hammond. 2020. Bat Activity Studies for the Dodge County Wind Energy Project, Dodge & Steele County, Minnesota. Final Report: June 24 – October 5, 2020. Prepared for Dodge County Wind, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. January 22, 2021.

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INTRODUCTION

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. DCW contracted Western EcoSystems Technology, Inc. (WEST) to conduct a study of bat activity following the recommendations of the US Fish and Wildlife Service (USFWS) Land-based Wind Energy Guidelines (USFWS 2012) and Kunz et al. (2007a).

Previously, bat surveys were conducted at the Project in 2014, but Minnesota Department of Natural Resources (MDNR) requested a limited duration survey to refresh that status of bats at the project. The objectives for this study were to collect updated spatial and temporal bat activity within the Project area in habitat representative of where turbines will be placed during the summer and fall seasons. Habitat that contained features attractive to bats were also monitored to determine an upper threshold of bat activity and assess species composition for the Project. This report describes the results of the acoustic monitoring surveys conducted within the Project area from June 24 – October 5, 2020.

SURVEY AREA

The Project is within the Northern Great Plains (Commission for Environmental Cooperation 1997) Ecoregion, which extends from the central prairies of Canada to the Gulf of Mexico coast in Texas. The Project is located within the Eastern Iowa and Minnesota Drift Plains Level IV Ecoregion, within the Western Corn Belt Plains Level III Ecoregion (US Environmental Protection Agency 2017), which is comprised of glaciated till plains and undulating loess plains. The rolling topography of the Great Plains Ecoregion grasslands and prairies of Minnesota and the Dakotas, are on glacial moraines identified as the Northern Glaciated Plains Level III Ecoregion, (Wilken et al. 2011). According to the National Land Cover Database (NLCD; 2016), cultivated crops compose the majority (90.2%) of the land cover in the Project Area (Table 1, Figure 2). Other relatively common land covers in the Project Area include developed open space (2.6%), hay/pasture (2.4%), deciduous forest (1.5%), emergent herbaceous wetlands (1.1%), and herbaceous (1.0%; Table 1, Figure 2). All other land cover types each compose less than 1.0% of the Project Area.

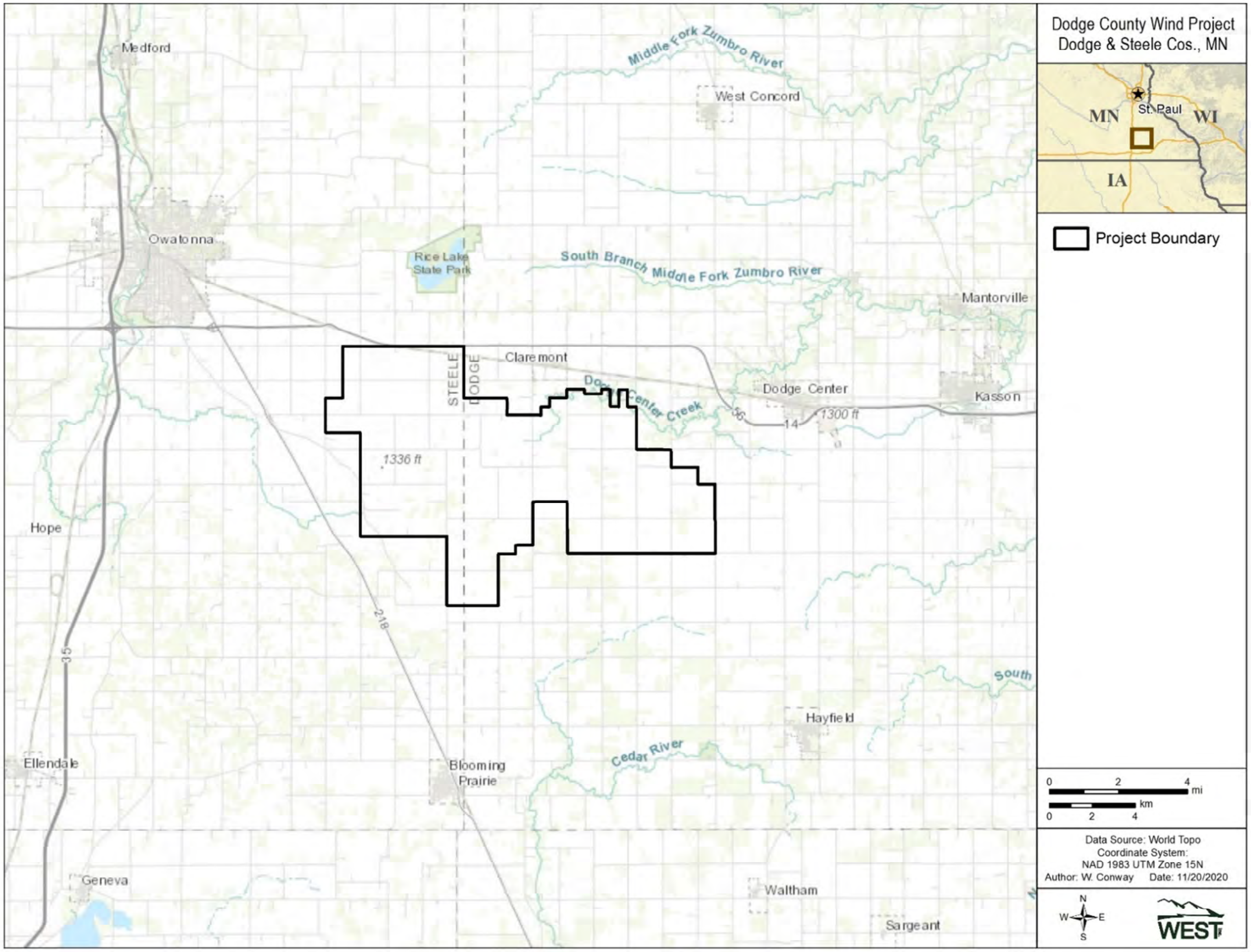

Figure 1. Location of the Dodge County Wind Project, Dodge and Steele counties, Minnesota.

Table 1. Land cover types, coverage, and percent composition at the Dodge County Wind Project in Steele and Dodge counties, Minnesota.

Land Cover	Acres	Hectares	% Composition
Cultivated Crops	27,362.1	11,073.1	90.2
Developed, Open Space	782.9	316.8	2.6
Hay/Pasture	716.1	289.8	2.4
Deciduous Forest	464.3	187.9	1.5
Emergent Herbaceous Wetlands	318.6	128.9	1.1
Herbaceous	306.5	124.0	1.0
Developed, Low Intensity	191.2	77.4	0.6
Woody Wetlands	133.5	54.0	0.4
Developed, Medium Intensity	33.4	13.5	0.1
Mixed Forest	18.2	7.4	<0.1
Developed, High Intensity	9.1	3.7	<0.1
Open Water	6.1	2.5	<0.1
Barren Land	3.0	1.2	<0.1
Total[a]	**30,345.0**	**12,280.2**	**100**

Source: National Land Cover Database (2016).

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

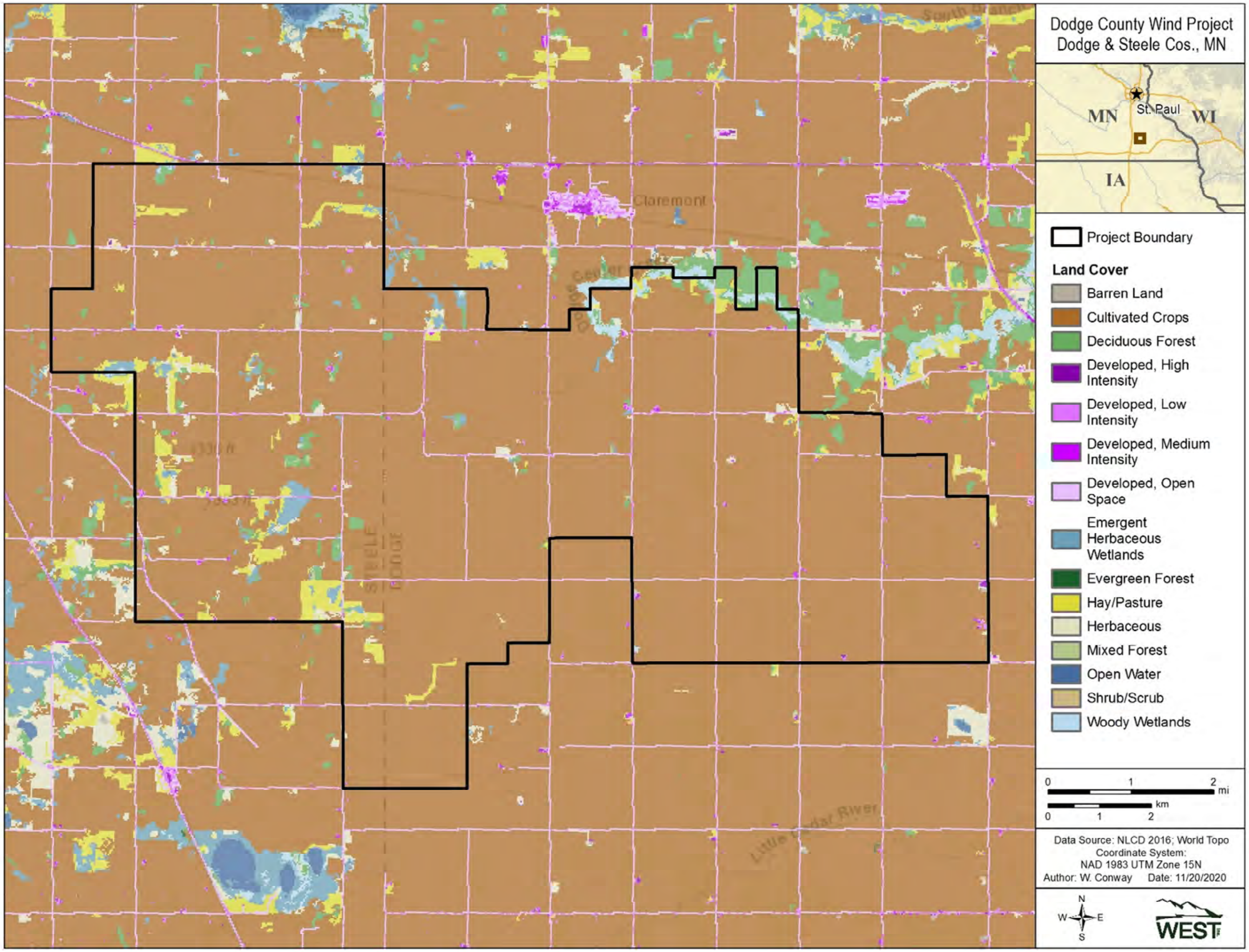

Figure 2. Land cover types and coverage within the Dodge County Wind Project, Dodge and Steele counties, Minnesota.

Overview of Bat Diversity

Eight bat species potentially occur within the Project area (Table 2; International Union for Conservation of Nature 2017, USFWS 2020), four of which are state or federally listed in Minnesota. Northern long-eared bats (*Myotis septentrionalis*) are federally listed as a threatened species, and big brown bats (*Eptesicus fuscus*), little brown bats (*Myotis lucifugus*), and tri-colored bats (*Perimyotis subflavus*) are all listed as state species of special concern (USFWS 2016; MDNR 2013).

Table 2. Bat species with potential to occur within the Dodge County Wind Project, Dodge and Steele counties, Minnesota, categorized by echolocation call frequency.

Common Name	Scientific Name
High Frequency (≥30 kHz)	
northern long-eared bat[1,2,4]	*Myotis septentrionalis*
eastern red bat[1,3]	*Lasiurus borealis*
little brown bat[1,4]	*Myotis lucifugus*
tri-colored bat[1,4]	*Perimyotis subflavus*
evening bat[1]	*Nycticeius humeralis*
Low Frequency (<30 kHz)	
big brown bat[1,4]	*Eptesicus fuscus*
silver-haired bat[1,3]	*Lasionycteris noctivagans*
hoary bat[1,3]	*Lasiurus cinereus*

[1] species known to have been killed at wind energy facilities (American Wind Wildlife Institute 2018);

[2] federally threatened species (US Fish and Wildlife Service [USFWS] 2016);

[3] long-distance migrant; and

[4] state listed species (MDNR 2013)

kHz = kilohertz

METHODS

Bat Acoustic Surveys

The bat activity acoustic surveys were conducted to estimate the level of bat activity throughout the Project area from June 24 – October 5, 2020. Ultrasonic detectors collect information on the spatial distribution, timing, and species composition of bats that can provide insights into the possible impacts of wind development (Kunz et al. 2007a; Britzke et al. 2013; Loeb et al. 2015) and inform potential mitigation strategies (Weller and Baldwin 2012). All bat station locations were provided to the MDNR prior to initiating field data collection, and align with MDNR guidance on pre-construction survey effort for bats (Mixon et al 2014).

Survey Stations

Three full-spectrum Song Meter SM3BAT ultrasonic detectors (hereafter “SM3”; Wildlife Acoustics, Maynard, MA) were used during the study, surveying at a total of five stations. The SM3 detector records on two channels, allowing for simultaneous recording on two microphones. An SM3 detector was placed at each of two meteorological (MET) towers, with one microphone at ground level (‘ground station’; approximately 5.0 feet [ft, 1.5 meter (m)] above ground level

[AGL]) and another within the rotor-swept zone (‘raised station’; approximately 148 ft [45 m] AGL; Figure 3). A station samples a discrete airspace, while multiple stations may be recorded by a single detector at a single location (ex., MET tower). Species activity levels and composition can vary with altitude (Baerwald and Barclay 2009; Collins and Jones 2009; Müeller et al. 2013). Therefore, this survey strategy can be useful to monitor activity at different heights (Kunz et al. 2007b). Microphones at ground stations likely detect a more complete sample of the bat species present within the Project area, whereas microphones at raised stations may provide a more accurate assessment of risk to bat species flying at rotor swept heights (Kunz et al. 2007b; Collins and Jones 2009; Müeller et al. 2013; Roemer et al. 2017).

At the two MET towers, two pairs of stations were located in cropland habitat, the dominant land cover type (Table 1). MET towers locations are representative of potential turbine locations within the Project area (representative stations). One additional station was placed in habitat with features considered attractive to bats for foraging, drinking, or roosting opportunities (bat feature station; e.g., riparian forest, forest edges, ponds, streams, and forested flyways; Figure 3). Monitoring at these features provides an upper threshold for bat activity within the Project area that can be used for comparison to representative stations. An experienced bat biologist (Brenna Hyzy, M.S.) selected the location of the bat feature station. The bat feature station was located near the ground along a forest edge, which could serve as both foraging and commuting habitat for local bats.

The SM3 microphones are weatherproof, and were secured atop a wooden pole at ground stations with a metal grounding wire. Raised microphones were elevated on met towers using a pulley system. Audio cables connected microphones to the SM3 detector at the base of the met tower. SM3 microphones have a variable detection distance (approximate maximum detection distance of 98 ft [30 m]), influenced by atmospheric attenuation (e.g., changes with humidity, temperature, and air pressure), surrounding vegetation, and wind, as well as the bat’s call frequency, amplitude, and direction.

Survey Schedule

Bat activity surveys were conducted from June 24 – October 5 and detectors were programmed to turn on 30 minutes (min) before sunset and turn off 30 min after sunrise each night. To highlight seasonal activity patterns, the study was divided into two survey periods: summer (June 24 – July 31), and fall (August 1 – October 5). Mean bat activity was also calculated for a standardized Fall Migration Period (FMP), defined here as July 30 – October 14. WEST defined the FMP as a standard for comparison with activity from other wind projects. During this time North American bats generally begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008; Arnett and Baerwald 2013). Detectors were programmed to record from approximately 30 min before sunset until 30 min after sunrise each night throughout the survey period.

Data Collection and Call Analysis

The SM3 is a full-spectrum bat detector that records complete acoustic waveforms by sampling sound waves at a rate of 256 kilohertz (kHz). This high sampling rate enables the detector to make high-resolution recordings of sound amplitude data at all frequencies up to 128 kHz. Full-spectrum data were transformed into zero-crossing data using the program Kaleidoscope 5.1.0, allowing data to be viewed in Analook© software as digital sonograms that show changes in echolocation call frequency over time. Frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, rain, insects, etc.) and to determine the call frequency category. The terms “bat pass” and “bat call” are used interchangeably. A bat pass was defined as a sequence of at least two echolocation calls (pulses) produced by an individual bat with no pause between calls of more than one second (Fenton 1980, Gannon et al. 2003).

For each survey location, bat passes were sorted into two groups based on their minimum call frequency. High-frequency (HF) bats such as eastern red bats (*Lasiurus borealis*) and *Myotis* species have minimum frequencies greater than 30 kHz. Low-frequency (LF) bats such as big brown bats, silver-haired bats (*Lasionycteris noctivagans*), and hoary bats (*Lasiurus cinereus)* typically emit echolocation calls with minimum frequencies below 30 kHz. HF and LF species that may occur in the Project area are listed in Table 2.

Call files that were confirmed to contain bat passes were then run through the automated identification feature in Kaleidoscope using the Bats of North America classifier 5.1.0 (Wildlife Acoustics) at the neutral sensitivity setting to complete initial identification of potentially occurring species. These settings and versions are approved by the USFWS for acoustic analysis of sensitive species[1]. Kaleidoscope utilizes Hidden Markov Models and other statistical methods known for similar applications in temporal pattern recognition, such as speech analysis, handwriting analysis, and deoxyribonucleic acid (commonly DNA) sequencing (Agranat 2012). Despite the capabilities of Kaleidoscope, many bat passes cannot be identified with absolute certainty, either because only call fragments were recorded due to the distance between the bat and microphone, or because many bat species produce similar calls with overlapping call characteristics often indistinguishable between species. Therefore, automated call identification is imperfect, and each identification has an associated error rate (USFWS and US Geological Survey 2019). In addition, the error rates associated with Kaleidoscope identifications of unknown bat calls have not been characterized. For these reasons, the results of the Kaleidoscope analysis can be misleading and should be viewed with caution. Because of Kaleidoscope’s limitations, the output will be used to generate a list of potentially occurring bat species present in the Project area. Only files confirmed as bat passes by a bat biologist were included in the Kaleidoscope analysis. Additionally, an experienced bat biologist (Dr. Kevin Murray) qualitatively identified any potential northern long-eared bat echolocation calls through visual comparison of echolocation call metrics (e.g., minimum frequency, slope, and duration) to reference calls of known bats (Murray et al. 2001, O’Farrell and Gannon 1999, Yates and Muzika 2006). Qualitative verification was also conducted on any HF calls recorded on the nights that northern long-eared bat calls

[1] This version of Kaleidoscope is approved by the USFWS for the identification of the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*M. septentrionalis*) in the eastern United States (USFWS 2020).

were recorded, to verify that no additional northern long-eared at calls were overlooked during the species analysis.

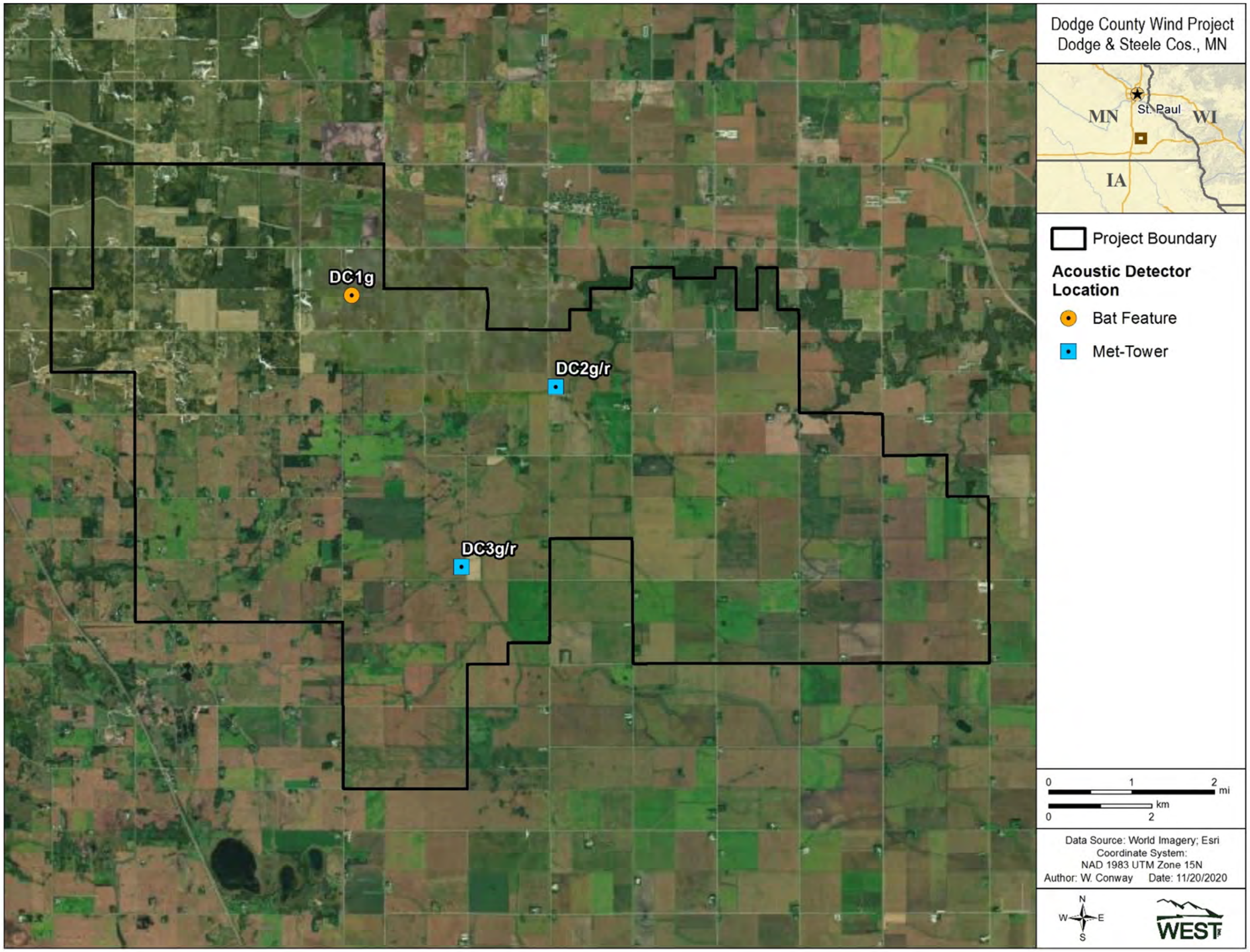

Figure 3. Location of bat stations within the Dodge County Wind Project, Dodge & Steele counties, Minnesota.

Statistical Analysis

The standard metric used for measuring bat activity is the number of bat passes per detector-night; this metric was used as an index of bat activity in the Project area. A detector-night was defined as one detector operating for one entire night. Bat passes per detector-night were calculated for all HF and LF bats. The calculation of bat passes per detector-night was based on the first and last call sequence positively identified during the study period as requested by the Minnesota DNR. Bat pass rates represent indices of bat activity and do not represent numbers of individuals. An experienced bat biologist (Brenna Hyzy, M.S.) determined the number of bat passes per station using Analook. Mean bat activity was calculated by station, by season, and overall.

Comparisons were made of mean bat activity during each season to evaluate seasonal variation in bat activity over the year. In addition, comparisons were made of mean bat activity between the ground-based and raised stations to evaluate spatial differences in bat activity.

The period of peak sustained bat activity was defined as the seven-day period with the highest average bat activity. If multiple seven-day periods equaled the peak sustained bat activity rate, all dates in these seven-day periods were reported. This and all multi-station averages in this report were calculated as an unweighted average of total activity at each detector.

RESULTS

Bat Acoustic Surveys

Bat activity was monitored at five stations for 482 detector-nights from June 24 – October 5 (Table 3). All detectors and microphones were operating for 93.5% of the sampling period for all stations (Figure 4). The primary cause of lost data was technical difficulties such as data transfer errors and SD card malfunction.

Table 3. Results of bat activity surveys conducted at stations within the Dodge County Wind Project, Dodge and Steele counties, Minnesota. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).

Station	Location	Type	# of HF Bat Passes	# of LF Bat Passes	Total Bat Passes	Detector-Nights	Mean Bat Passes/ Night[1]
DC1g	ground	bat feature	4,880	10,708	15,588	98	159.06 ± 14.45
DC2g	ground	representative	269	5,505	5,774	91	63.45 ± 10.70
DC2r	raised	representative	90	1,898	1,988	85	23.39 ± 3.53
DC3g	ground	representative	255	1,758	2,013	104	19.36 ± 1.73
DC3r	raised	representative	95	1,844	1,939	104	18.64 ± 2.27
Total Representative Ground (%)			524 (6.7%)	7,263 (93.3%)	7,787	195	41.40 ± 5.63
Total Representative Raised (%)			185 (4.7%)	3,742 (95.3%)	3,927	189	21.02 ± 2.85
Total Representative Stations (%)			709 (6.1%)	11,005 (93.9%)	11,714	384	31.21 ± 3.47
Total Bat Feature Stations (%)			4,880 (31.3%)	10,708 (68.7%)	15,588	98	159.06 ± 13.61
Total			**5,589**	**21,713**	**27,302**	**482**	**--**

[1]± bootstrapped standard error.

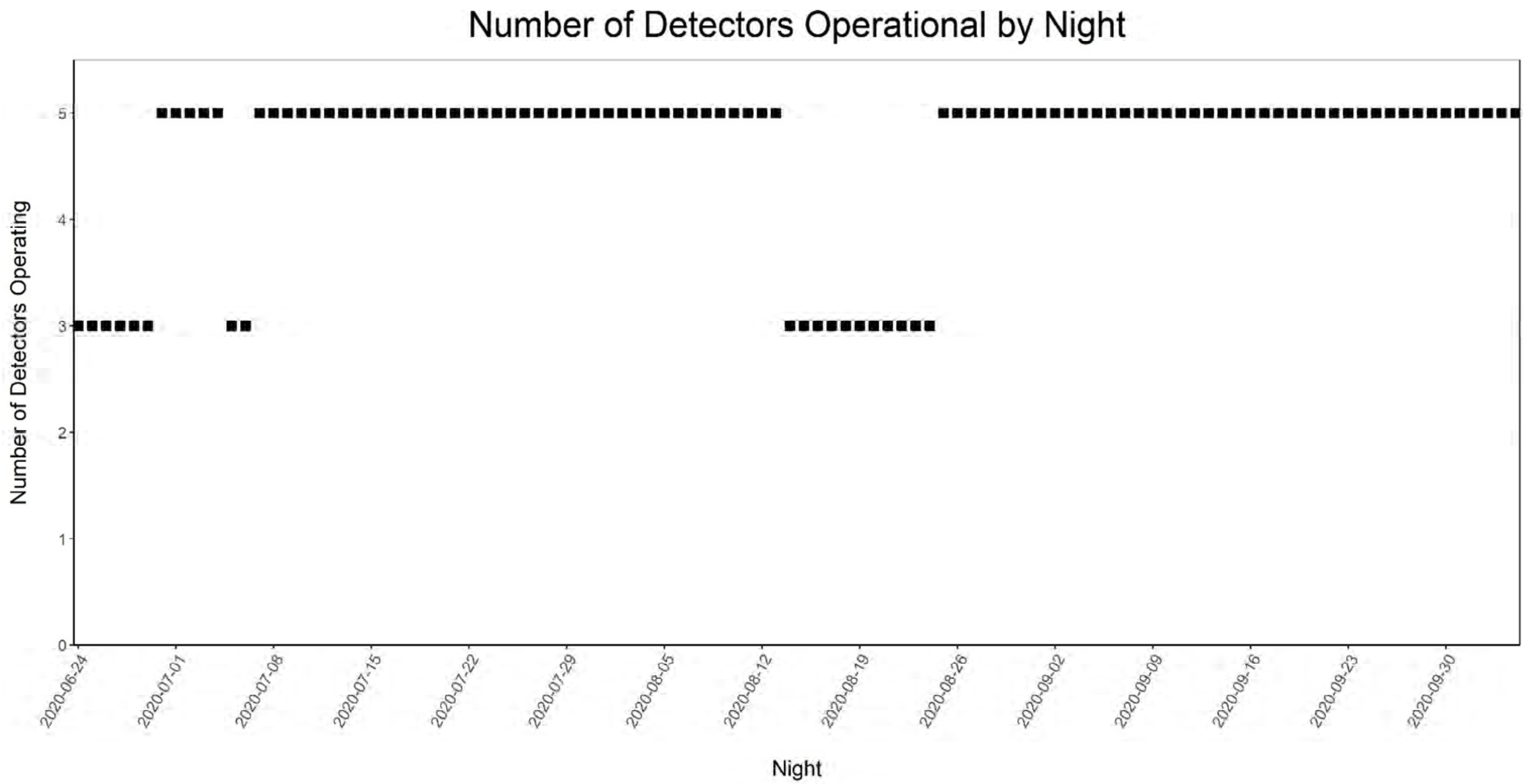

Figure 4. Operational status of bat detectors and microphones (n=5) operating at the Dodge County Wind Project, Dodge and Steele counties, Minnesota during each night of the study period June 24 – October 5, 2020.

Spatial Variation

Bat activity within the Project area varied among representative stations (Figure 5a; Table 3). Activity was higher at the ground station at DC2g (63.45 ± 10.70 bat passes per detector-night) compared to the other three representative stations, which on average recorded almost three times less activity than DC2g (Figures 5a & 6; Table 3). Bat activity levels were similar between stations DC3g and DC3r (Figure 5; Table 3).

Activity at the bat feature station was almost four times higher (159.06 ± 14.45 bat passes per detector-night; Table 3; Figure 5b) than at representative ground stations (41.40 ± 5.63; Table 3).

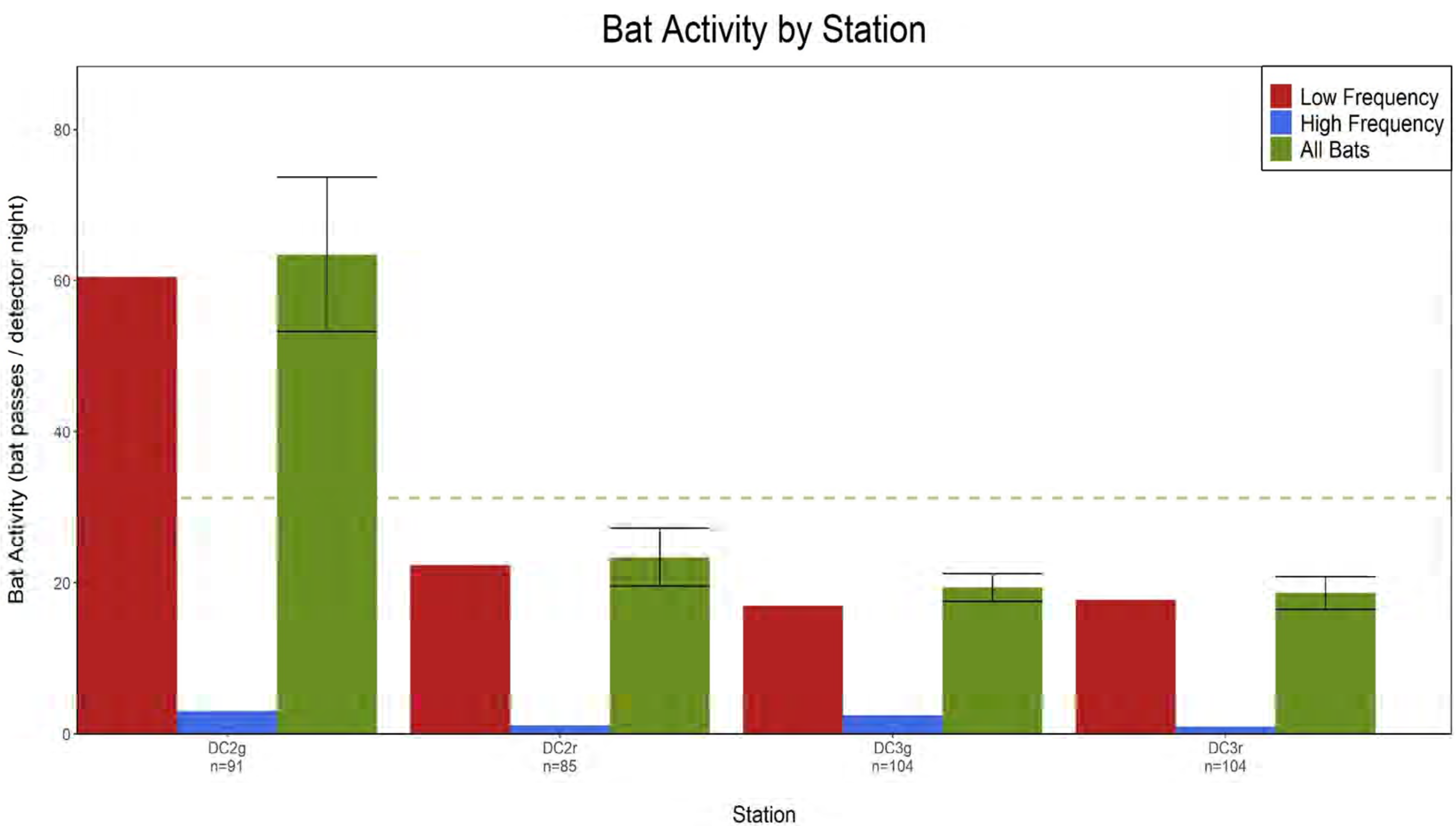

Figure 5a. Number of high-frequency and low-frequency bat passes per detector-night recorded at representative stations (ground [g], and raised [r]) within the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

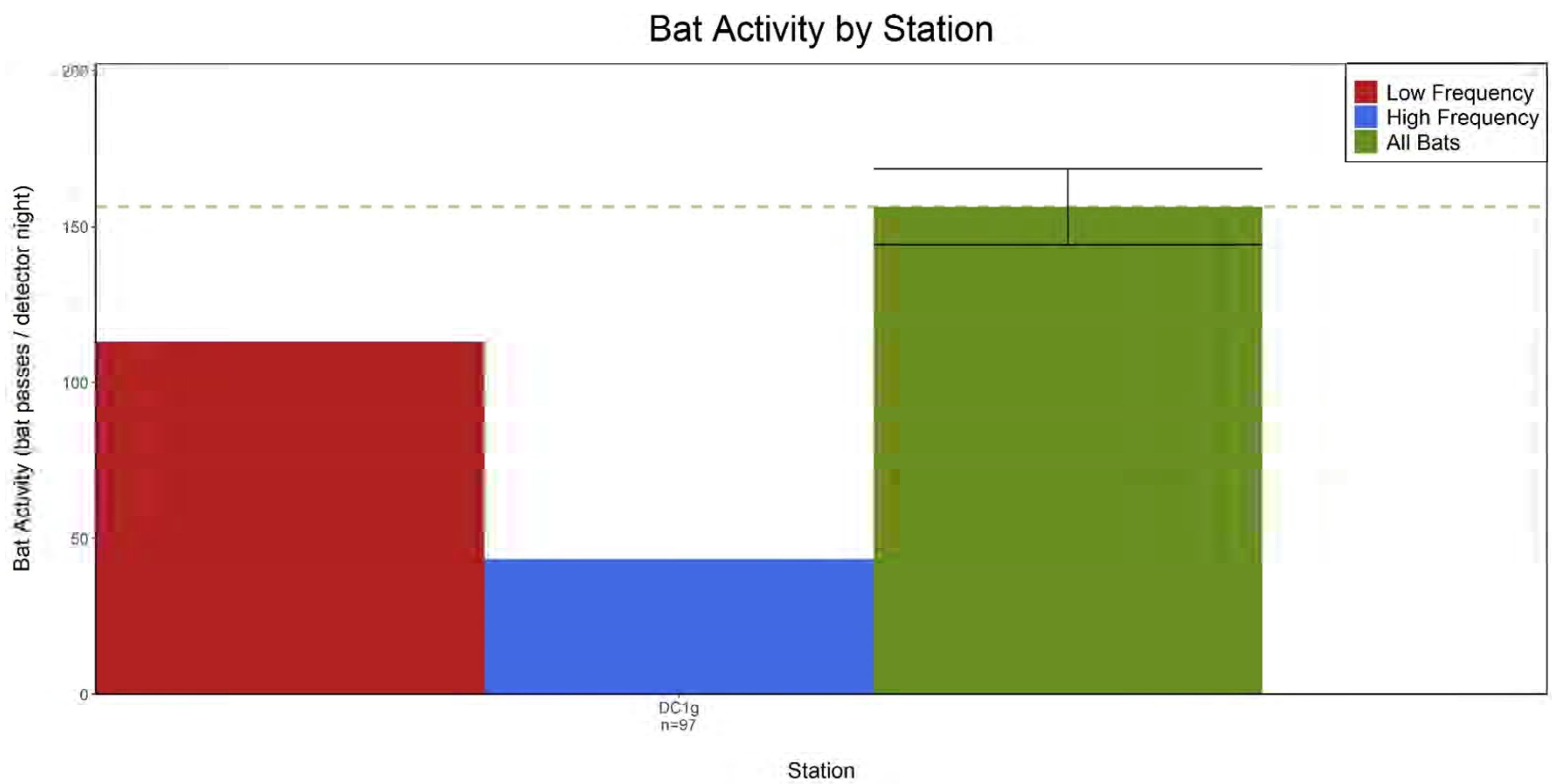

Figure 5b. Number of high-frequency and low-frequency bat passes per detector-night recorded at the ground (g) based bat feature station within the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

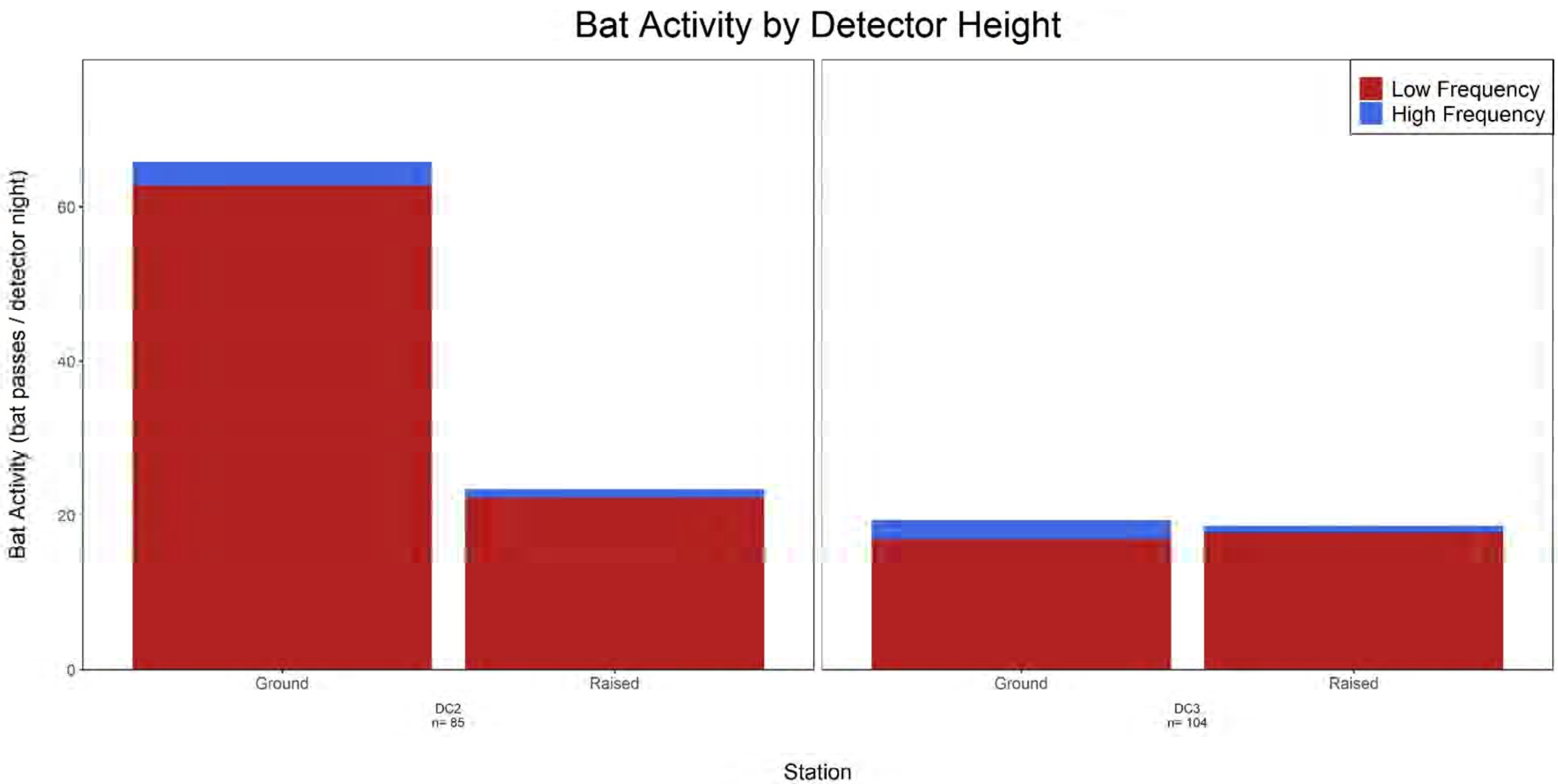

Figure 6. Number of high-frequency and low-frequency bat passes per detector-night recorded at paired representative stations (ground and raised) for nights that both detectors were operating within the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020.

Temporal Variation

Bat activity at the representative MET tower stations was comparatively higher in the summer (43.97 ± 8.58) and lower in the fall (23.10 ± 2.99; Table 4a; Figure 7a). Weekly acoustic activity at representative stations was relatively low from late-June to mid-July (Figure 8a), but started increasing in mid-July, peaking from July 18 to July 24 (92.5 bat passes per detector-night; Table 5; Figure 8a) but remained high until early September when it dropped off and remained low and even included a secondary peak in mid-August. Overall bat activity sharply decreased at the beginning of September, and was low for the remainder of the study period (Figure 8a). Overall bat activity was 23.31 ± 2.89 during the FMP at representative stations, 27.67 ± 3.69 at ground representative stations, and 18.95 ± 3.34 at raised representative stations (Table 4a).

Comparing paired representative stations, weekly activity was higher at ground microphones throughout most of the study period during nights that ground and raised detectors were both operating (Figure 9). However, for a short period of time from August 6 to August 19, activity was higher at raised stations (Figure 9).

At the bat feature station, activity was relatively similar across both the summer and fall seasons, with summer (168.59 ± 22.15) being slightly higher than fall (154.44 ± 15.65; Table 4b; Figure 7b & Figure 8b). Bat activity at the bat feature station increased slightly in early July, and then again in mid-August, peaking from August 20 to August 26 (430.42 bat passes per detector-night; Table 5; Figure 8b).

Table 4a. The number of bat passes per detector-night recorded at representative stations (ground [g], and raised [r]) within the Dodge County Wind Project, Dodge and Steele counties, Minnesota during each season, separated by call frequency: high frequency (HF), low frequency (LF), and all bats (AB).

Station	Call Frequency	Summer Jun 24 – Jul 31	Fall Aug 1 – Oct 5	Fall Migration Period Jul 30 – Oct 14
DC2g	LF	102.78	32.82	33.74
	HF	3.28	2.75	2.88
	AB	106.06	35.56	36.61
DC2r	LF	32.33	16.87	16.82
	HF	1.13	1.02	1.04
	AB	33.47	17.89	17.86
DC3g	LF	18.5	15.98	15.97
	HF	2.18	2.61	2.76
	AB	20.68	18.59	18.74
DC3r	LF	14.97	19.32	19.04
	HF	0.71	1.03	1.00
	AB	15.68	20.35	20.04
Ground Means	**LF**	60.64 ± 12.26	24.40 ± 3.56	24.85 ± 3.51
	HF	2.73 ± 0.40	2.68 ± 0.28	2.82 ± 0.29
	AB	63.37 ± 12.43	27.08 ± 3.72	27.67 ± 3.69
Raised Means	**LF**	23.65 ± 4.41	18.10 ± 3.41	17.93 ± 3.29
	HF	0.92 ± 0.17	1.02 ± 0.15	1.02 ± 0.15
	AB	24.58 ± 4.47	19.12 ± 3.46	18.95 ± 3.34

Table 4a. The number of bat passes per detector-night recorded at representative stations (ground [g], and raised [r]) within the Dodge County Wind Project, Dodge and Steele counties, Minnesota during each season, separated by call frequency: high frequency (HF), low frequency (LF), and all bats (AB).

Station	Call Frequency	Summer Jun 24 – Jul 31	Fall Aug 1 – Oct 5	Fall Migration Period Jul 30 – Oct 14
	LF	42.15 ± 8.47	21.25 ± 2.90	21.39 ± 2.80
Mean Overall	**HF**	1.83 ± 0.24	1.85 ± 0.20	1.92 ± 0.20
	AB	43.97 ± 8.58	23.10 ± 2.99	23.31 ± 2.89

Table 4b. The number of bat passes per detector-night recorded at representative stations (ground [g]) within the Dodge County Wind Project, Dodge and Steele counties, Minnesota during each season, separated by call frequency: high frequency (HF), low frequency (LF), and all bats (AB).

Station	Call Frequency	Summer Jun 24 – Jul 31	Fall Aug 1 – Oct 5	Fall Migration Period Jul 30 – Oct 14
	LF	123.56	102.33	100.68
DC1g	HF	45.03	52.11	56.68
	AB	168.59	154.44	157.35
	LF	123.56 ± 17.57	102.33 ± 13.35	100.68 ± 13.00
Mean Overall	**HF**	45.03 ± 10.98	52.11 ± 6.79	56.68 ± 7.76
	AB	168.59 ± 22.15	154.44 ± 15.65	157.35 ± 15.24

Table 5. Periods of peak activity for high frequency (HF), low frequency (LF), and all bats at Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020.

Station Type	Species Group	Start Date of Peak Activity	End Date of Peak Activity	Bat Passes per Detector-Night
	LF	July 18	July 24	89.6
Representative	HF	August 19	August 25	3.9
	All Bats	July 18	July 24	92.5
	LF	August 20	August 26	357.1
Bat Feature	HF	July 31	August 6	158.0
	All Bats	August 20	August 26	430.4

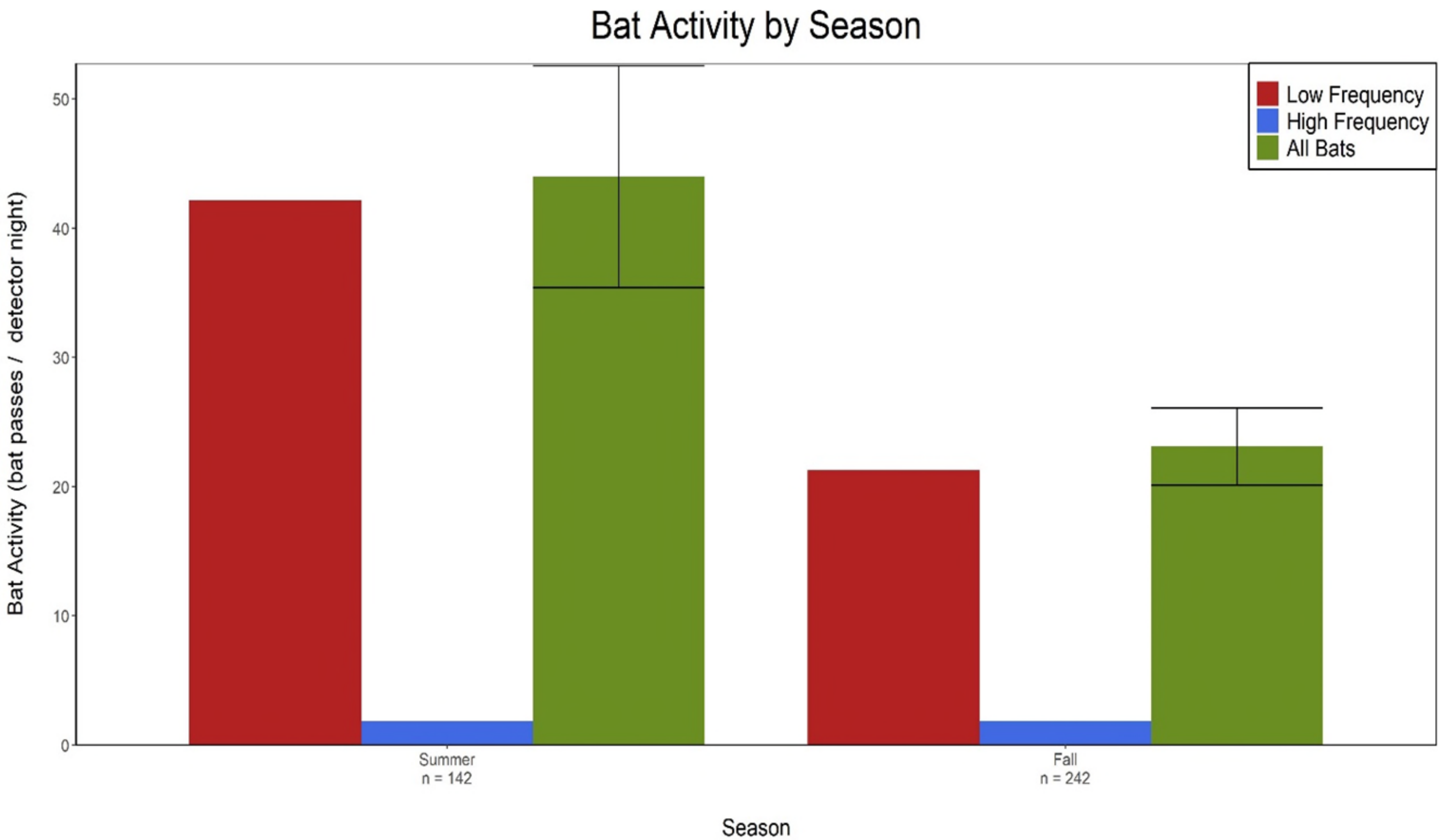

Figure 7a. Seasonal bat activity by high frequency, low frequency, and all bats at representative stations at the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020. The bootstrapped standard errors are represented on the 'All Bats' columns.

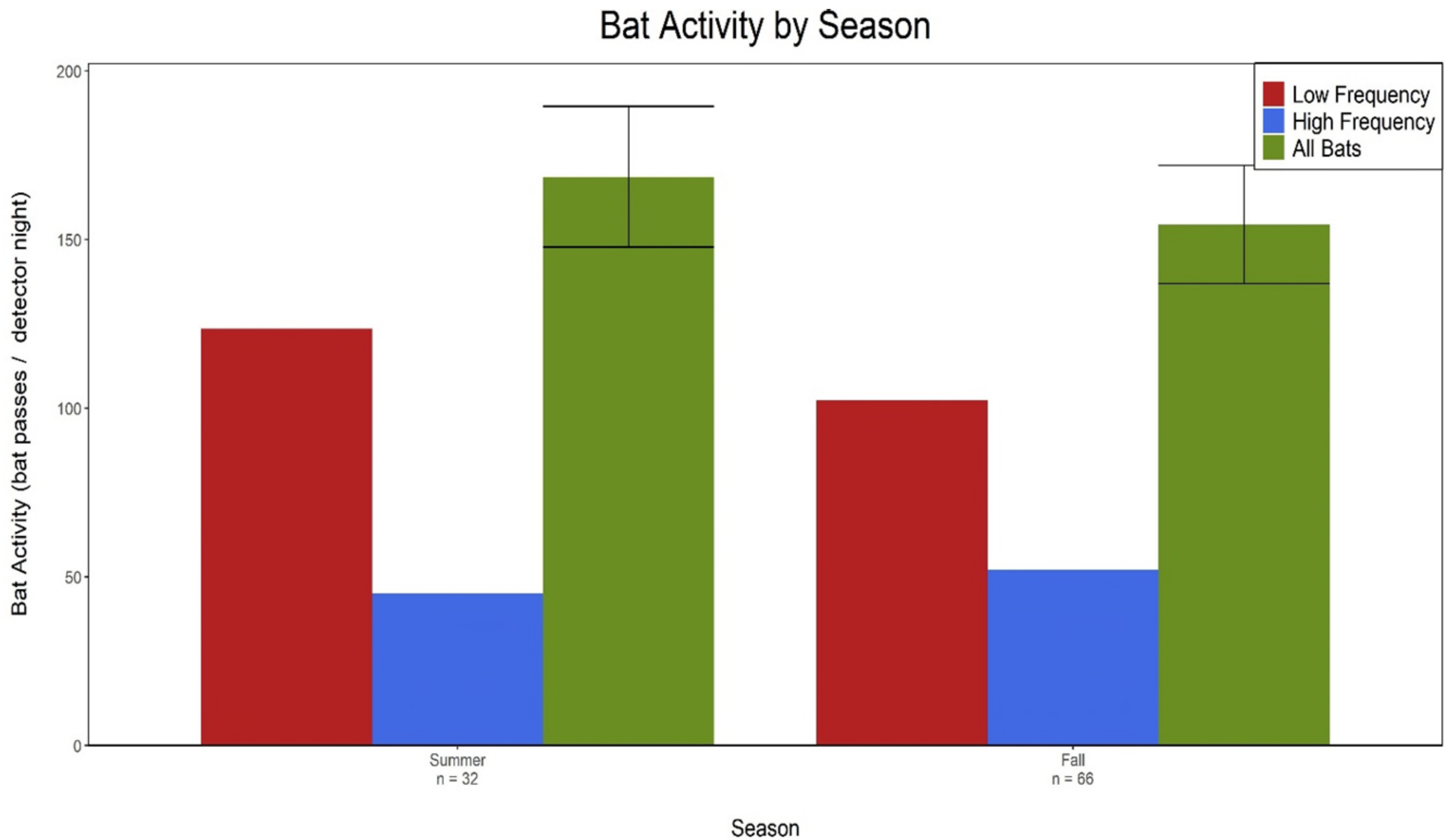

Figure 7b. Seasonal bat activity by high frequency, low frequency, and all bats at the bat feature station at the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020. The bootstrapped standard errors are represented on the 'All Bats' columns.

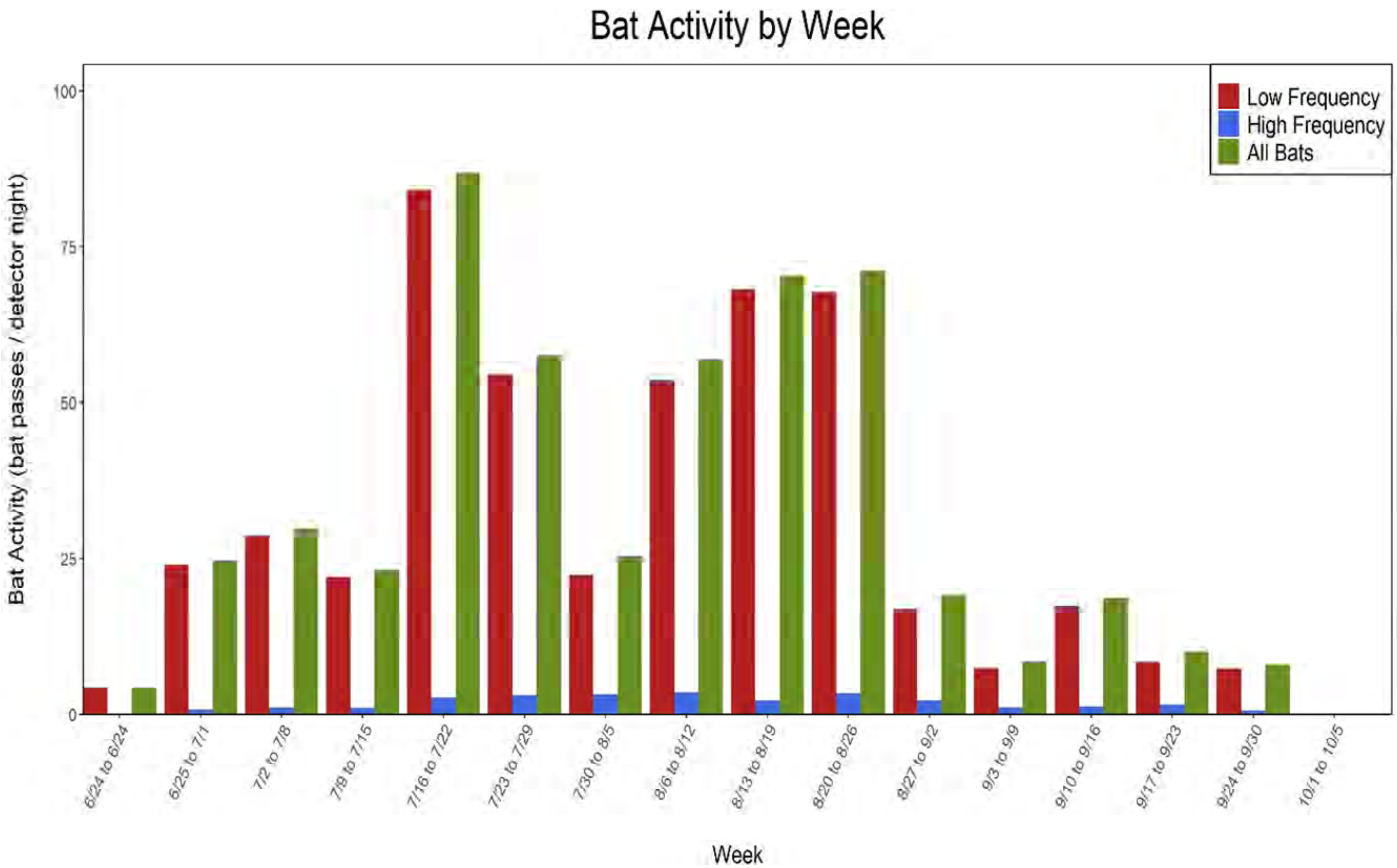

Figure 8a. Weekly patterns of bat activity by high frequency, low frequency, and all bats at representative stations at the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020

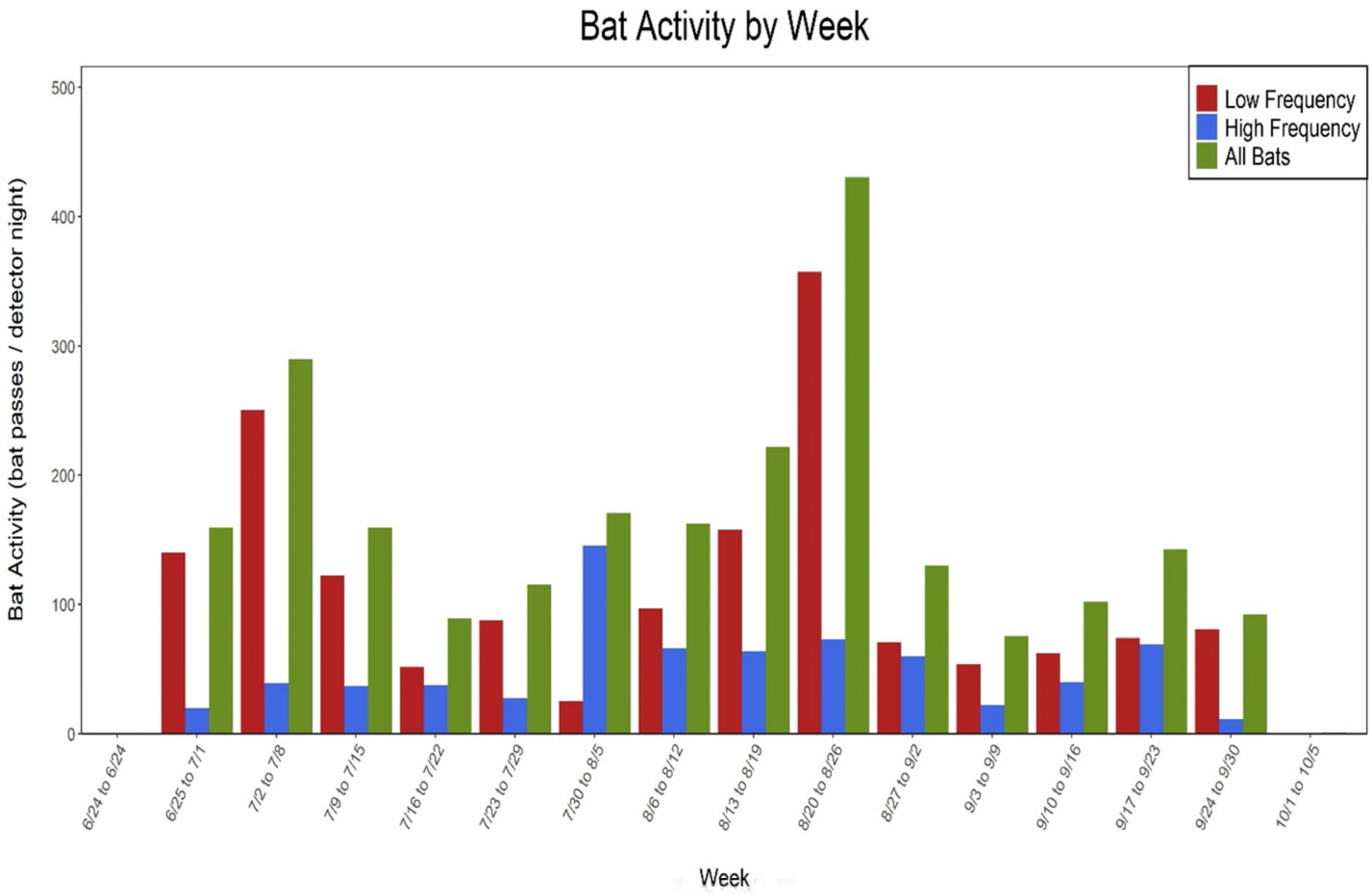

Figure 8b. Weekly patterns of bat activity by high frequency, low frequency, and all bats at the bat feature station at the Dodge County Wind Project, Dodge and Steele counties, Minnesota from June 24 – October 5, 2020.

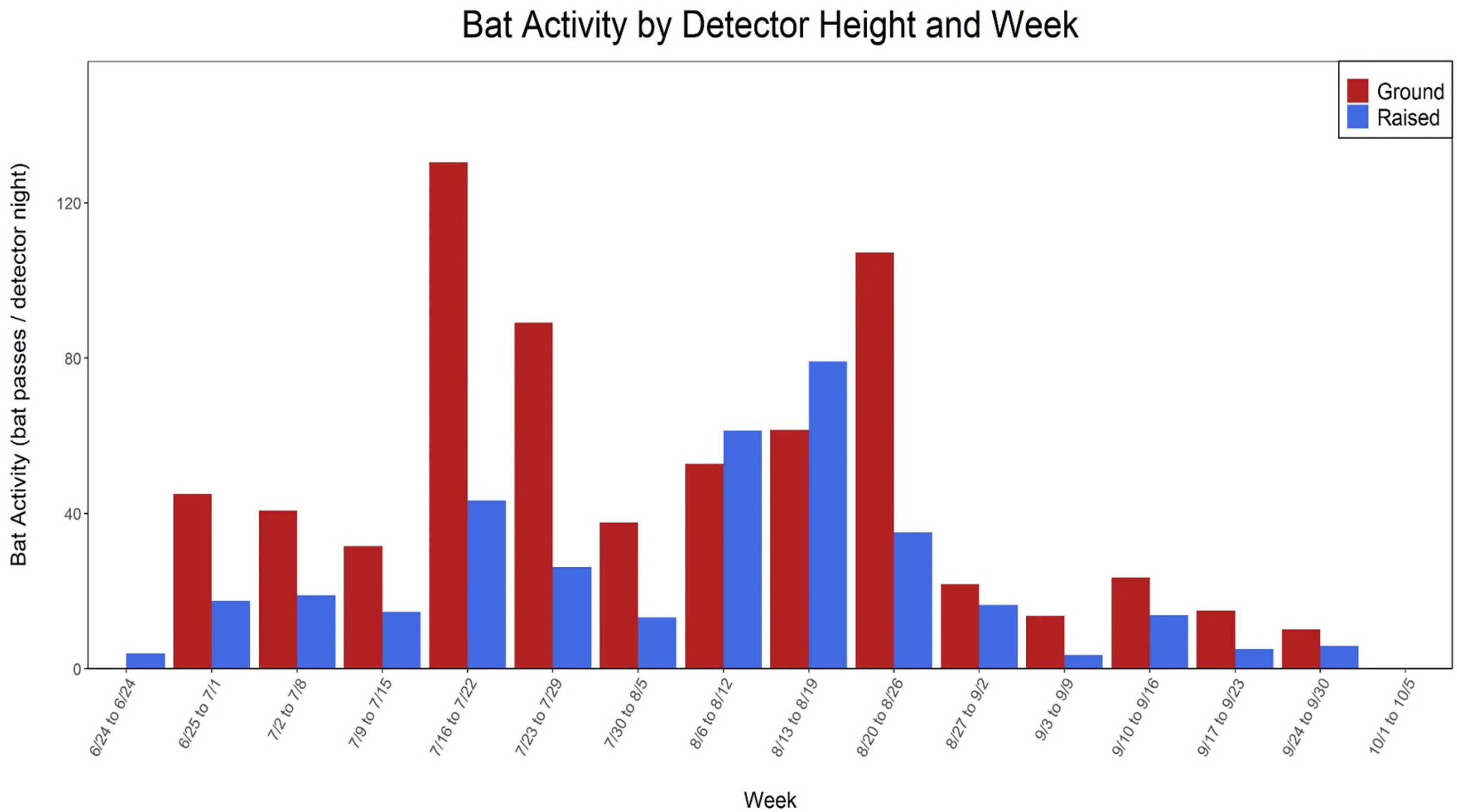

Figure 9. Weekly patterns of bat activity from June 24 – October 5, 2020 at ground and raised meteorological tower stations for nights that both detectors were operating at the Dodge County Wind Project, Dodge and Steele counties, Minnesota.

Species Composition

Of the total bat passes recorded at representative stations, 93.9% were classified as LF (e.g., big brown bats, hoary bats, and silver-haired bats), and 6.1% of bat passes were classified as HF (e.g., tri-colored bats, eastern red bats, and *Myotis* species; Tables 2 and 3). There was significantly more activity by LF bat species than HF bat species at the representative stations (Figure 5a; Table 3), and this trend held true at the bat feature station also (Figure 5b; Table 3).

Of verified bat calls, Kaleidoscope Pro identified bat calls for eight species that potentially occur within the Project area (Table 2; Table 6). Big brown bat and silver-haired bat were the primary species recorded, both present on 93% of all calendar nights. Hoary bat was the third most frequently identified species (91% of calendar nights). Other commonly detected species included little brown bat (85%), evening bat (*Nyctecius humeralis*, 84%), eastern red bat (76%), and tri-colored bat (42%; Table 6). Possible northern long-eared bat calls were identified by Kaleidoscope Pro on 10% of all calendar nights (Table 6). A qualified bat biologist manually reviewed all 15 bat calls Kaleidoscope Pro classified as potential northern long-eared bat at the bat feature station DC1g, along with 1,266 HF bat calls that were recorded on the same nights at that station (Appendix A). After qualitative review was completed, none of the 15 possible northern long-eared bat calls were confirmed. Ten of the fifteen calls were reclassified as eastern red bats, four were reclassified as unknown HF species, and one was reclassified as a little brown bat. No additional northern long-eared bat calls were confirmed while reviewing HF calls.

Table 6. The number of nights and percent of calendar nights (in parentheses) that bat species were detected using Kaleidoscope Pro 5.1.0 at the proposed Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota, from June 24 – October 5, 2020. Project Total represents the number of nights (percent) a species was detected regardless of location within the Project.

	Bat Feature		Representative Stations			Project
Common Name	**DC1g**	**DC2g**	**DC2r**	**DC3g**	**DC3r**	**Total[2]**
High Frequency (>30 kHz)						
little brown bat	80 (82%)	40 (44%)	7 (8%)	45 (43%)	11 (11%)	88 (85%)
evening bat	78 (80%)	26 (29%)	7 (8%)	14 (13%)	7 (7%)	87 (84%)
eastern red bat	63 (64%)	35 (38%)	28 (33%)	42 (40%)	27 (26%)	79 (76%)
tri-colored bat	39 (40%)	4 (4%)	1 (1%)	4 (4%)	2 (2%)	44 (42%)
northern long-eared bat	10 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	10 (10%)
Low Frequency (15–30 kHz)						
big brown bat	85 (87%)	79 (87%)	35 (41%)	76 (73%)	48 (46%)	97 (93%)
silver-haired bat	75 (77%)	77 (85%)	64 (75%)	59 (57%)	66 (63%)	97 (93%)
hoary bat	80 (82%)	76 (84%)	64 (75%)	78 (75%)	85 (82%)	95 (91%)

[1] These species were identified by Kaleidoscope Pro 5.1.0 but could not be confirmed by a bat biologist.

g=ground; r=raised

[2] Project Total differs from detector-nights because a specific calendar night is only counted once regardless of the number stations deployed at the Project. For each species the percentage is based on whether that species was detected anywhere in the project on each given calendar night.

DISCUSSION

Although pre-construction bat activity is not correlated to post-construction bat fatality (Solick et al. 2020) pre-construction acoustic surveys still provide useful information about species composition and seasonal activity peaks. Overall bat activity at the Project was 27.67 bat passes per detector-night at ground representative stations during the FMP. The MET tower stations were deployed in cropland habitat representative of areas where turbines are likely to be sited. Open habitat typically results in decreased bat activity relative to habitat near open water, forested, or riparian habitat attractive to bats (Brooks and Ford 2005). For this Project, the higher levels of bat activity seen at representative stations was largely driven by DC2g, the ground station deployed at the northern-most MET tower (Figure 3). This trend is likely attributable to the location of the MET tower, which is located at the southern end of a locally large riparian forest patch along Dodge Center Creek that extends into the Project area from the northeast (Figures 2 and 3). The ground station (DC2g) at this MET tower likely captured more activity as bats entered the Project area via this forest patch, while the MET tower to the south (DC3g/r) is located in the middle of isolated cropland further from forest areas and showed reduced bat activity because of that (Figures 2 and 3; Table 3).

Weekly acoustic activity at representative stations increased in mid-July, and again in late-August, peaking from July 18 to July 24 (92.5 bat passes per detector-night; Table 5; Figure 8a). Bat activity at the bat feature station also increased in early July, and then again in mid-August, peaking from August 20 to August 26 (430.42 bat passes per detector-night; Table 5; Figure 8b). These two peaks seen in July and August at both the bat feature station and MET tower representative stations likely captures the recruitment of young bats following the reproductive season (born in early July, early volancy in late July), as well as increased activity and preparation for fall migration as a result of fully volant juvenile bats in late August. However, it is worth noting that this study did not capture an entire year of bat activity data, these data only reflect two short seasons of monitoring.

Approximately 93.9% of bat passes recorded at representative stations in the Project area were emitted by LF bats. Kaleidoscope Pro indicated that hoary bats, silver-haired bats, and big brown bats were present on the majority (91 – 93%) of all project nights. Activity by HF bat species composed 6.1% of bat passes recorded at representative stations in the Project area. Kaleidoscope Pro indicated that little brown bats and evening bats were present on the majority (85 and 84%, respectively) of all project nights. Eastern red bats were detected on 76% of all project nights, and tri-colored bats were detected on 42% of all project nights. Potential northern long-eared bat calls were only detected on 10% of all project nights.

The fifteen calls that were identified by Kaleidoscope as potential northern long-eared bat calls were all recorded at the bat feature station (DC1g), which was purposefully targeting quality bat habitat within the Project. A qualified bat biologist manually reviewed all fifteen bat calls Kaleidoscope classified as northern long-eared bat, along with 1,266 HF bat calls that were recorded on the same nights (Appendix A). After qualitative review was completed, none of the fifteen northern long-eared bat calls were confirmed. Ten of the fifteen calls were reclassified as eastern red bats, four were reclassified as unknown HF species, and one was reclassified as a little brown bat. No northern long-eared bat calls were recorded at any of the representative stations. No additional northern long-eared bat calls were confirmed while reviewing HF calls.

This study was designed to estimate general activity levels of all bats at the Project; it was not specifically designed to meet the qualifications of a presence/probable absence study. The bat feature station where all of the northern long-eared bat calls were recorded was also where the majority of all state-listed species (big brown bat, little brown bat, and tri-colored bat) were most frequently recorded (Table 6). This bat feature station was deployed within habitat that was previously identified as potential bat habitat during the northern long-eared bat desktop habitat assessment completed in May 2020 (Hyzy and Stucker 2020). This desktop assessment also identified the larger forest patches to the northeast of the project that likely contributed to higher bat activity levels at DC2g. These potentially suitable habitat patches identified during the desktop assessment, and therefore the bat feature station area, are being actively avoided by the Project in designing the proposed turbine array excluded these areas to avoid and minimize any potential detrimental effects on sensitive bat species.

Any conclusions drawn from the data presented in this study should be made with caution, given the limited temporal scope and the inclusion of a bat feature station that provided an upper threshold of bat activity and a more accurate analysis of species composition at the project. A previous bat activity study completed at the Project in 2014 (Normandeau Associates, Inc.) reported much lower estimates of bat activity. However, this study took place 6 years ago (before White-nose Syndrome was confirmed in Minnesota), only monitored bat activity with one detector at two MET towers in two separate locations, used a different model of detector (ReBat), and had an even more restricted survey window. Unless data are collected side by side, it is not accurate to compare activity levels recorded by SM3 detectors to activity levels recorded by other bat detectors because the various detectors use different microphones, sample a different volume of airspace, and process data differently. It is also possible that the arrival of White-nose Syndrome in Minnesota in 2016 (https://www.whitenosesyndrome.org) altered the distribution and proportion of bat species on the landscape, which makes the comparing bat activity levels across multiple years difficult. The data collected during this study suggest that bat activity at the Project is largely driven by LF species, and peaks briefly during the reproductive season and the initiation of fall migration. The results of the species composition analysis suggest that northern long-eared bats were not present at the Project at locations surveyed during the time of this study.

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Appendix A. Qualitative Review

Appendix A1. Summary of qualitative review of fifteen northern long-eared bat calls identified by Kaleidoscope at the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Station	Night	Kscope ID	KLM qualitative ID[1]	Justification
DC1g	8/4/2020	MYOSEP	HF	< 5 pulses; cannot ID to species; not MYSE; Fmin too high; slope and bandwidth too low
DC1g	8/5/2020	MYOSEP	LABO	variable Fmin; low slope, bandwidth, and Fmax
DC1g	8/5/2020	MYOSEP	LABO	variable Fmin; low slope, bandwidth, and Fmax
DC1g	8/5/2020	MYOSEP	HF	Not MYSE; low slope, bandwidth, and Fmax; variable Fmin
DC1g	8/5/2020	MYOSEP	HF	Not MYSE; low slope, bandwidth, and Fmax; variable Fmin
DC1g	8/6/2020	MYOSEP	LABO	variable Fmin; low slope
DC1g	8/6/2020	MYOSEP	LABO	variable Fmin; high Fmin; low slope
DC1g	8/6/2020	MYOSEP	LABO	variable Fmin; high Fmin; low slope
DC1g	8/10/2020	MYOSEP	HF	100% fragmentary calls; cannot identify to species; not MYSE, low slope and bandwidth, high Fmin
DC1g	8/12/2020	MYOSEP	LABO	variable and high Fmin; low slope and bandwidth
DC1g	8/13/2020	MYOSEP	LABO	variable and high Fmin; low slope
DC1g	8/16/2020	MYOSEP	MYLU	MYLU; slope too low for MYSE; bandwidth and Fmax slightly too low
DC1g	8/25/2020	MYOSEP	LABO	variable Fmin; low slope
DC1g	9/22/2020	MYOSEP	LABO	high Fmin; variable Fmin; low slope

[1] KLM = Kevin Murray

HF = high frequency, LF = low frequency

Fmin = minimum frequency, Fmax = maximum frequency

MYSEP/MYSE = northern long-eared bat, LABO = eastern red bat, MYLU = little brown bat

Appendix A2. Summary of qualitative review of ten nights at the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota that northern long-eared bat calls identified by Kaleidoscope prior to qualitative review.

Station	Night	Target Species Present	Comments	HF calls reviewed	Kscope MYSE calls reviewed
DC1g	8/4/2020	none	all HF calls reviewed; nearly all HF calls are LABO; there is 1 MYLU call	283	1
DC1g	8/5/2020	none	all HF calls reviewed; mostly LABO calls, but still a lot of MLYLU calls	314	4
DC1g	8/6/2020	none	all HF calls reviewed; nearly all HF calls are LABO; there are 2 MYLU calls	187	3
DC1g	8/10/2020	none	all HF calls reviewed; mix of MYLU and LABO calls	36	1
DC1g	8/12/2020	none	all HF calls reviewed; mix of MYLU and LABO calls	86	1
DC1g	8/13/2020	none	all HF calls reviewed; mostly LABO calls with a few MYLU	55	1
DC1g	8/16/2020	none	all HF calls reviewed; mix of MYLU and LABO calls	84	1
DC1g	8/25/2020	none	all HF calls reviewed; mix of MYLU and LABO calls	82	1
DC1g	9/22/2020	none	all HF calls reviewed; mostly LABO calls with a few MYLU	137	1
DC1g	9/26/2020	none	all HF calls reviewed; a couple of LABO calls	2	1
Totals	**10**			**1,266**	**15**

HF = high frequency, LF = low frequency

LABO = eastern red bat, MYLU = little brown bat, MYSE= northern long-eared bat

ENVIRONMENTAL & STATISTICAL CONSULTANTS

7575 Golden Valley Drive, Suite 300, Golden Valley, MN 55427
612.655.1726 ♦ www.west-inc.com

TECHNICAL MEMORANDUM

Date: February 8, 2021

To: Dodge County Wind Energy Project, LLC

From: Brenna Hyzy and Jennifer Stucker,
Western EcoSystems Technology, Inc.

Subject: Dodge County Wind Energy Project, Steele & Dodge County, Minnesota
Northern Long-Eared Bat Habitat Assessment

INTRODUCTION

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. DCW contracted Western EcoSystems Technology, Inc. (WEST) to conduct a northern long-eared bat (*Myotis septentrionalis*; NLEB) habitat assessment from to identify potentially suitable summer NLEB habitat within the Project Boundary and a 2.5 mile (mi) buffer. The purpose of the assessment was to identify potentially suitable summer NLEB habitat within the proposed Project Boundary.

METHODS

For the purposes of this assessment, NLEB potential habitat is considered all forest types and woody wetlands patches that are greater than ten acres. Linear forest features, including loose assemblages of trees with variable amounts of canopy closure and shelterbelts, were considered to represent suitable habitat for NLEB if these features were within 1,000 ft of suitable habitat. Isolated trees and isolated small forest stands (less than 10 ac) located greater than 1,000 ft away from suitable forested areas were considered unsuitable habitat for NLEB, as per supporting research (Foster and Kurta 1999, USFWS 2017, Henderson and Broders 2008).

Forested areas were classified using a machine learning classifier supplemented with manual desktop digitization. Training data polygons of forested areas were created manually using high resolution Esri World Imagery. The model response included imagery and spectral indices derived from the National Agriculture Imagery Program (NAIP) as well as the Landsat 8 (USGS 2020) and Sentinel-2 (ESA 2020) satellites. A random forests model was then used to classify forested areas. The random forest model uses an ensemble method where multiple decision trees are created and averaged to improve classification accuracy (Breiman 2001). The results from this model were filtered and visually assessed by a GIS Specialist for accuracy. Manual digitizing was conducted to improve both classification precision and accuracy to ensure false positives and false negatives were removed from the final data product and polygons closely resembled canopy cover.

RESULTS

The resulting forest patches were classified into two categories; equal or greater than 10-acre (ac) patches and less than 10 ac forest patches. A 1,000-foot (ft) buffer was applied to the 10-ac or greater patches and all forested areas (regardless of patch size) within or intersecting the buffers were used to calculate the total acreage of potential suitable northern long-eared bat habitat. This assessment determined a total of 757.9 acres of potentially suitable habitat is present within the 30,345-acre Project Boundary (approximately 2.5% of the Project Boundary), with less habitat within the Project than in the surrounding area.

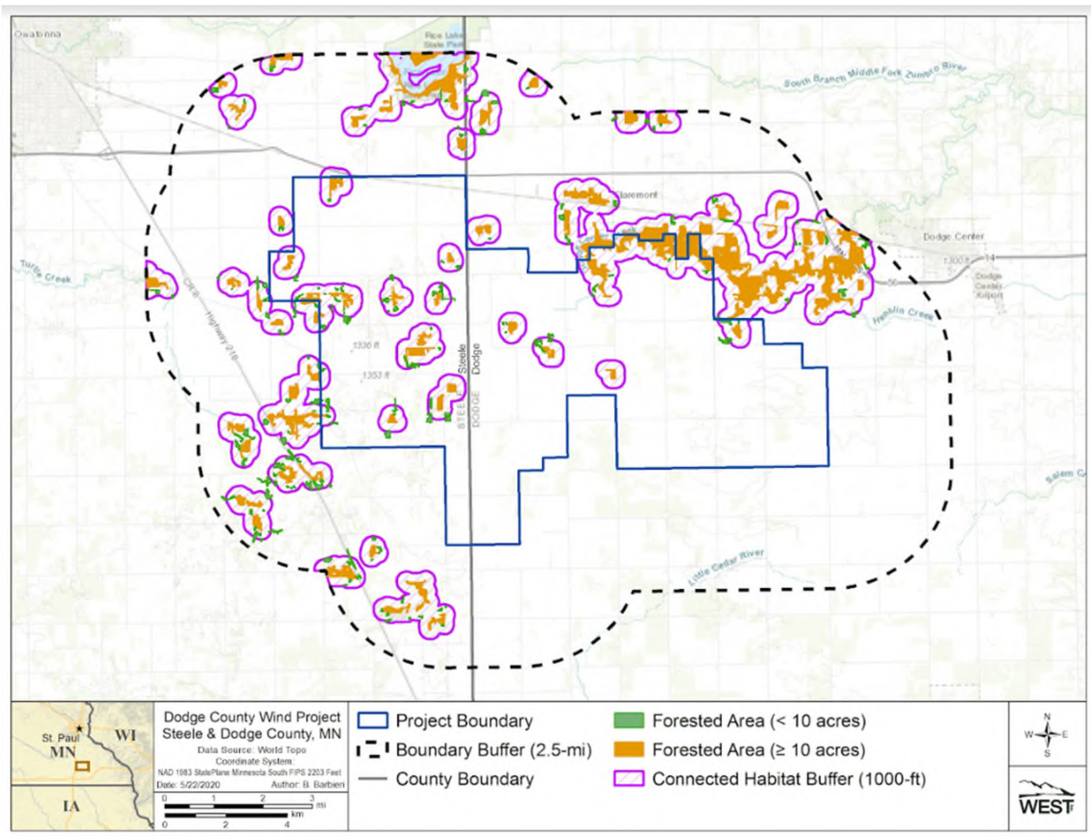

Figure 1. Potentially suitable habitat for the federally listed northern long-eared bat at the proposed Dodge County Wind Energy Project (Project Boundary) and a 2.5 mile buffer, Steele & Dodge counties, Minnesota.

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Avian Use Report

Dodge County Wind Project

Dodge County Wind LLC.

Dodge and Steele Counties, Minnesota

March 15, 2017

Summary

NextEra Energy Resources (NEER) is proposing to construct and operate a 200-megawatt (MW) wind facility (Dodge County Wind Project) in Dodge County, Minnesota. Based on the presence of suitable habitat for a wide variety of avian species, including several special-status species, NEER retained HDR Engineering, Inc. (HDR) to conduct an avian use study at the proposed Dodge County Wind Project (Project) site. HDR developed the study scope and methodology in accordance with the following guidance documents:

1. Minnesota Department of Natural Resources' (MDNR) 2011 *Guidance for Commercial Wind Energy Projects*
2. MDNR and Minnesota Department of Commerce's (MDOC) Energy Environmental Review and Analysis 2014 *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota*
3. US Fish and Wildlife Service's (USFWS) 2013 *Eagle Conservation Plan Guidance* (ECPG)
4. USFWS' Tier 3 of the 2012 *Land-based Wind Energy Guidelines (WEG)*

The USFWS and MDNR initially approved the approach during a conference call on May 7, 2014, in addition to providing input prior to surveys beginning in 2015.

NEER provided HDR with an initial turbine array plan in 2015. The 99 square mile (63,937 acre) Study Area was established by adding a one-mile (mi) buffer to this plan. The Study Area is predominantly agricultural cropland with a few small isolated seasonal wetlands, intermittent streams, ephemeral ditches, and woodlots. Several wildlife management areas (WMAs) and waterfowl production areas (WPAs) are also located in and within two miles of the Study Area. Additionally, MDNR's Natural Heritage Information System records indicate that bald eagles have historically nested near the Study Area.

Avian surveys for the Project included: 1) an Avian Use Survey; 2), an Avian Wetland Utilization Survey; 3) a Bald Eagle Nest Survey; and 4) Bald Eagle Point-Count Surveys.

HDR biologists conducted Avian Use Surveys from June 2, 2015, through October 29, 2016, at 18 locations representative of the overall Study Area and documented 16,112 individual birds representing 144 different species[1]. During the survey, no federally listed endangered, threatened, or candidate species were identified. Surveys detected 31 state-designated Species of Greatest Conservation Need (SGCN) including two state designated Special Concern Species (SCS): Franklin's gull and the Acadian flycatcher. These special status species were relatively uncommon making up only two percent of all observations. The percentage of observed avian flights within the Rotor Swept Zone (RSZ), which is between 20 and 150 meters (m) above ground level (AGL), was 0.7 percent for raptors, 1.4 percent for waterbirds, 11.7 percent for waterfowl, and 10.1 percent for passerines.

HDR biologists conducted Avian Wetland Utilization Surveys from March 16, 2016, through September 26, 2016, at two wetland complexes in the Study Area (Oak Glen Wetland and Ashland Township Wetland Complex). Biologists documented 21,243 individual birds representing 18 different species of waterfowl and waterbird during these surveys. The most commonly observed species were redhead and ring-necked duck (25 percent and 13 percent of all observations, respectively). These surveys also incidentally documented the presence of one state-listed endangered species

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[1] Please note that the Project Snapshot provided in Appendix A indicates a species richness totaling 155 species. However, this total includes 11 unidentified species categories, which were not included when calculating species richness.

(Henslow's sparrow) on an isolated patch of restored grassland contiguous with the Ashland Township Wetland Complex.

HDR biologists conducted Bald Eagle Nest Surveys in March 2015 and June 2016. During these surveys, biologists identified three active bald eagle nests in or within five miles of the Study Area. HDR biologists checked the activity levels at these nests again during June 2016, and found that they were occupied.

HDR conducted Bald Eagle Point-Count Surveys from March 2016 through February 2017 at 18 avian point-count locations selected specifically for the bald eagle survey. Surveys documented 63 eagle flight minutes with 18 of these eagle flight observations occurring within the RSZ. These 18 flight observations accounted for 30 of the total eagle flight minutes recorded. The highest number of eagle flight observations occurred near the nest at the Oak Glen Wetland.

The baseline avian use data presented above provides the foundational information to assess potential risk to avian species from development of the Project.

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Introduction

NextEra Energy Resources, Inc. (NEER) is proposing to develop the Dodge County Wind Project (Project) as a 200-megawatt (MW) wind energy facility in south-central Minnesota. The Project Study Area was defined in 2015 by adding a one-mile (mi) buffer to an initial turbine array plan provided by NEER (Figure 1: Study Area and Project Boundaries). Due to changes in the turbine layout, the current Project boundary encompasses approximately 97 square miles (62,331 acres) in Dodge County, Minnesota (Figure 1: Study Area and Project Boundaries) and does not completely coincide with the Study Area. Per NEER's request, HDR Engineering, Inc. (HDR) initiated avian surveys in June 2015; however, NEER placed the Project on hold after the breeding season point-count surveys were completed. HDR re-initiated and completed the following surveys in 2016:

1. Avian Use Survey
2. Avian Wetland Utilization Survey
3. Bald Eagle Nest Survey
4. Bald Eagle Point-Count Surveys.

The objective of these surveys was to characterize and quantify baseline avian use in the Study Area. The baseline avian use data derived from these studies provides the foundational information to assess potential risk to avian species from development of the Project, if needed in the future. The study methods were based on guidance from the Minnesota Department of Natural Resources (MDNR), Minnesota Department of Commerce (MDOC), and the US Fish & Wildlife Service (USFWS). Particular focus was concentrated on state and federal special status species and species that may be at particular risk due to wind energy development. This report summarizes the methods employed and results obtained during the baseline avian surveys.

Existing Conditions

The Study Area is located on approximately 99 square miles (63,937 acres) of cropland, isolated wetland, and small woodlots in south-central Minnesota between the cities of Claremont and Dodge Center to the north and Blooming Prairie and Hayfield to the south (Figure 1: Study Area and Project Boundaries).

The Project is located on the northeastern edge of the Oak Savanna subsection of the Eastern Broadleaf Forest Province according to the MDNR's Ecological Classification System (MDNR 2005). Oak Savanna is a large subsection that includes part of northeastern Iowa and reaches into southeastern Minnesota. This subsection lies within the Mississippi flyway, which is a migratory flyway for approximately 40 percent of North American waterfowl and shorebirds (USFWS 2016a). Birds use this route because there are few topographical impediments, and there are ample stopover sites with adequate sources of food, water, and protective cover along its entire length. Historically, the predominant land cover in the Oak Savanna subsection was treeless, fire-dependent grassland and brushland types interrupted by lakes, streams, marshes, and pothole wetlands (MDNR 2005).

According to the U.S. Geological Service's Gap Analysis Program (GAP) land cover data, the Study Area primarily consists of croplands with numerous drained and undrained wetlands, along with upland grassland, pasture, homesteads, small woodlots, and fencerows (Figure 2: Study Area Land Cover, and Table 1). As depicted in Figure 3: Project Boundary Land Cover and Table 1, the land cover composition of the Project area is very similar to the survey area. Based on HDR's site observations — with the exception of a small, isolated patch of restored grassland habitat at the Ashland Township Wetland Complex — the mapped grassland areas actually support cultivated croplands, pasture, wetland, or hay.

Several USFWS-designated waterfowl production areas (WPAs) and wildlife management areas (WMAs) supporting restored prairie, grassland, and lake habitats occur within and near the Study Area (Figures 2 and 3).

Table 1: Land Cover Composition for the Dodge County Wind Project and Study Area

Cover Type	Project Area Acres	Study Area Acres	Percent (%) Project Area/Study Area
Cultivated Crops	57,212.2	55,475.8	92/87
Developed, Open Space	2,823.0	2,987.8	5/5
Upland Grassland/Herbaceous[1]	923.9	1,771.1	<1/3
Hay/Pasture	304.2	605.7	<1/<1
Deciduous Forest	197.6	1,038.9	<1/<1
Developed, Low Intensity	554.0	774.5	<1/<1
Emergent Herbaceous Wetlands	76.1	191.4	<1/<1
Developed, Medium Intensity	106.6	207.7	<1/<1
Open Water	14.6	213.7	<1/<1
Woody Wetlands	69.0	12.0	<1/<1
Barren Land	14.7	15.8	<1/<1
Evergreen Forest	1.6	1.6	<1/<1
Developed, High Intensity	33.4	85.1	<1/<1
Total	**62,330.7**	**63,937.2**	

Source: USGS 2011

[1] Based on HDR's site observations — with the exception of a small, isolated patch of restored grassland habitat at the Ashland Township Wetland Complex — the mapped grassland areas actually support cultivated croplands, pasture, wetland, or hay.

The Study Area's main water features include streams that occur at its northern and southern borders. Wooded habitats are found adjacent to these streams, and provide the only contiguous forests near the Project. The Little Cedar River flows south out of the Study Area and joins the Cedar River between Blooming Prairie and Hayfield City. Dodge Center Creek flows through the north-central portion of the Study Area towards Dodge Center. Generally, Dodge Center Creek and associated branches drain to the north, while the Little Cedar River and associated branches drain to the south (Figure 2: Study Area Land Cover).

Regulatory Framework

Federal Regulations

ENDANGERED SPECIES ACT

The federal Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531) prohibits “take” of listed endangered or threatened species, and prohibits adverse modification of their designated critical habitat. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect, or attempt to engage in any such conduct. “Take” includes habitat modification or degradation that results in death or injury of a listed species by impairing essential behaviors.

BALD AND GOLDEN EAGLE PROTECTION ACT

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. § 668-668d) prohibits take of bald and golden eagles. Rules published in 2009 (USFWS 2009) and revised in 2016 (USFWS 2016b) outline the issuance of take permits under BGEPA. Permitted activities do not distinguish between lethal and non-lethal takes. Regulated activities include those that disturb individual eagles by causing injury, decreasing eagle productivity, or by substantially interfering with normal breeding, feeding, or sheltering behavior.

EAGLE CONSERVATION PLAN GUIDANCE

The USFWS issued the *Eagle Conservation Plan Guidance* (ECPG) in 2013. This document provides guidance for conserving bald and golden eagles during the siting, construction, and operation of wind energy projects. The ECPG supplements the USFWS’s *Land-based Wind Energy Guidelines* (WEG). Implementation of the ECPG is voluntary; however, the document provides a framework to avoid unintentional take of eagles or collect the biological data required to support an application for an Eagle Take Permit, if needed.

MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703-712) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, or barter any migratory bird or the parts, nests, or eggs of migratory birds. The MBTA protects 1,027 species of birds, including waterfowl, shorebirds, songbirds, raptors, wading birds, and seabirds. Unlike the ESA and the BGEPA, MBTA regulates direct take or nest destruction and not habitat modifications. The level of direct take by a wind facility that would invoke prosecution under the MBTA has not been established. There is currently no permitting process to protect a project developer from prosecution for incidental take under the MBTA.

The USFWS is actively developing an incidental take permit process similar to the Eagle Take Permit under the MBTA that would be specific to migratory birds other than bald and golden eagles (80 FR 30032).

LAND-BASED WIND ENERGY GUIDELINES

The USFWS Wind Turbine Guidelines Advisory Committee completed the WEG in 2012. The document recommends procedures to mitigate impacts to wildlife and their habitats from construction and operation of wind energy facilities. The WEG outlines a tiered approach to evaluate and quantify the effects of wind energy development on wildlife resources. This document recommends voluntary compliance with the guidelines and development of communication with USFWS personnel as part of due diligence to avoid and minimize effects to species regulated under the ESA, BGEPA, and MBTA.

The WEG also recommends the adoption of best management practices during the development and construction of wind energy facilities. It recommends identifying species of concern, which include those protected under the ESA, BGEPA, MBTA, or any species that “(i) is designated by law, regulation or other formal process for protection and/or management by the relevant agency or other authority, or that has been shown to be significantly adversely affected by wind energy development, and ii) is determined to be possibly affected by the project."

Several WPAs and WMAs also occur adjacent to, or within one mile of the Project. The USFWS also established guidelines for considering wind turbine siting on WPA lands that may directly influence development of wind energy at this site. One of the guidelines directs USFWS refuge managers and district managers administering easement lands to avoid obvious "duck passes" between large, semi-permanent wetlands or sloughs and known migratory bird corridors or flight paths, especially in areas such as colonial bird nesting areas (USFWS 2003).

State Regulations

STATE ENDANGERED SPECIES STATUTE

At the state level, Minnesota Statutes, Section 84.0895, requires the MDNR to adopt rules designating species meeting statutory definitions of endangered, threatened, and special concern (ETSC). The resulting ETSC species list is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also authorizes the MDNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are further codified as Minnesota Rules, Parts 6212.1800 to 6212.2300. A person may not take, import, transport, or sell any portion of an endangered or threatened species. These regulations require avoidance, minimization, and mitigation measures for unavoidable impacts. The MDNR defines ETSC species as:

- ***Minnesota Endangered Species:*** A plant or animal species that is threatened with extinction throughout all or a significant portion of its range in Minnesota.
- ***Minnesota Threatened Species*:** A plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range in Minnesota.
- ***Minnesota Special Concern Species (SCS):*** Species that are not endangered or threatened, but are extremely uncommon in Minnesota, or have unique or highly specific habitat requirements and deserve careful monitoring of their status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations. SCS are not protected by Minnesota's Endangered Species Statute or the associated Rules.
- ***Minnesota Species of Greatest Conservation Need (SGCN)*:** Species identified in the state's Wildlife Action Plan that was developed in response to the federal State and Tribal Wildlife Grant Program. This designation alone does not confer legal protection.

MINNESOTA WIND ENERGY GUIDELINES

In 2011, MDNR issued *Guidance for Commercial Wind Energy Projects* (2011 MDNR Guidance) (MDNR, 2011). The guidance outlines the recommended planning process for wind energy development. The MDNR provides technical assistance during the planning process so that natural resource impacts are considered during project planning, environmental review, permitting, construction, and post-construction phases. The MDNR provides recommendations to the permitting agency that are designed to identify high value natural resources; to help developers avoid, minimize, and propose mitigation for impacts to those resources; and to recommend wildlife surveys to quantify potential impacts of specific projects.

The MDNR subsequently developed *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota* (MDNR Survey Protocols) (Mixon, et al 2014) to supplement the 2011 MDNR

Guidance and WEG. The document provides technical guidance, and was developed jointly between the MDNR and MDOC – Energy Environmental Review and Analysis (EERA). The intention of this guidance is to promote the usage of valid methods to collect data, and that consistent protocols are used on projects in Minnesota. The guidance includes both pre-construction survey protocols from which site-specific risk assessments can be developed and post-construction fatality monitoring in order to document actual impacts.

Additional state guidelines exist for setbacks from WMAs such as the three rotor diameters (RD) east and west by five RD north and south setbacks from non-leased properties recommended by the MDOC. To date, the MDNR has not recommended any additional setbacks for the Project.

Methods

HDR developed a survey protocol based on guidance provided by the following documents mentioned in the Introduction section:

- 2011 MDNR Guidance
- MDNR Survey Protocols
- USFWS ECPG and WEG

The USFWS and MDNR initially approved the study methods during a May 7, 2014, conference call, and also provided input on species studies and point location selections prior to surveys beginning in June 2015.

HDR conducted the following surveys in the Study Area:

1. Avian Use Surveys
2. Avian Wetland Utilization Surveys
3. Bald Eagle Nest Surveys
4. Bald Eagle Point-Count Surveys

The objectives of these surveys was to sample avian use of the site during migratory periods, identify breeding species within the site, develop data on habitat use patterns, and document flight paths of large birds at sample locations.

Avian Use Surveys

The Avian Use Surveys used avian point-counts to describe the flight patterns, habitat utilization, distribution, relative abundance, and behavior of birds in the Study Area. The surveys were designed to follow WEG Tier 3 guidance. Although the MDNR Survey Protocols do not include point-count survey methods, the 2011 MDNR Guidance indicates that point-counts may be used as a means to collect site-specific wildlife data in consultation with MDNR. The Avian Use Survey protocol described below was accepted by MDNR e-mail correspondence on June 15, 2015.

Consistent with the above guidelines, HDR conducted fixed-radius point-counts to provide baseline data regarding the temporal and spatial use of the Study Area by birds, including raptors. Staff conducted point-count surveys every other week during the 2015 non-migratory season between June 2, 2015, and July 30, 2015, and once per week during the 2016 migratory seasons (March 15, 2016 - May 16, 2016 and August 15, 2016 - October 29, 2016) for 25 total surveys conducted at each of the 18 point-count locations. Each point-count location was surveyed for 20 minutes for a total survey time of 150 hours (or an average of 8.3 hours of observation per station).

Standardized point-count techniques were used to reduce methodological variance between observers or locations (Ralph et al. 1995). The 18 fixed point-count locations were randomly selected within several habitat strata represented in the Study Area. Locations were selected to provide geographic coverage and to cover generalized habitat types such as cropland, forested land, and pasture. Point-count locations were refined in the field to maximize observer safety and provide unobstructed sight lines (Figure 4: Avian Use Survey Point-Count Locations). All changes made to point locations in the field were minor and did not change the habitat type of the selected point or cause significant changes to the radius of a given point.

Biologists documented information on all species observed including flight height, flight direction, and behaviors within an 800-meter radius beginning one-half hour before sunrise until 11 a.m., or for three hours before sunset. As permitted in the MDNR Survey Protocols, the time of observation was adjusted outside of the preferred survey times to accommodate multiple surveys in a single day. In addition, landmarks and objects with known heights (i.e. telephone poles) were used to standardize flight height estimates and to document the distance of flights taken by raptors and other large birds at each point-count location. Each bird observation or auditory identification was recorded as an individual observation and small groups were counted and recorded. Abundance of large flocks of birds (>25) were estimated. Birds recorded outside of the plot were counted as an incidental observation. Avian flight height, flight direction, behavior, species, and time of day were recorded on data sheets and on aerial photographs for each species observed during monitoring periods. Surveys were conducted during all weather conditions and points were established with Global Positioning System (GPS) technology capable of sub-meter accuracy to standardize sampling locations.

Pursuant to the MDNR Survey Protocol requirements, species richness was calculated for each point-count location and for the Study Area as a whole, and the percentage of observed flights within the RSZ was calculated for four avian groups (i.e., passerines, waterfowl, waterbirds, and raptors).

Avian Wetland Utilization Surveys

HDR biologists conducted Avian Wetland Utilization Surveys at two open water wetlands to document waterfowl and waterbird use. The objective of these surveys was to identify presence and relative numbers of avian species, to develop an index of peak abundance, and to identify potential travel corridors within the Study Area. Waterfowl, waterbird, and other avian species numbers were recorded at both wetland locations during each sample. The Ashland Township Wetland Complex is located near the center of the Study Area. The Oak Glen Wetland Complex occurs at the extreme western portion of the Study Area (Figure 5: Avian Wetland Utilization Survey Locations). Staff recorded the approximate number and species of waterfowl and waterbirds present at each site during a 10-15 minute observation period between 10 a.m. and 4 p.m. Following MDNR Survey Protocols, wetland observations occurred weekly from March 16, 2016, through October 29, 2016. Although the 10-15 minute observation time is less than the recommended 60 minutes, the total observation time exceeds the 180 minutes recommended in the protocol (32 visits*average 12.5 minutes/visit = approximately 400 minutes total observation time).

Bald Eagle Nest Surveys

The bald eagle breeds across much of North America, and is known to have a presence in every state in the United States except Hawaii. Bald eagles that reside in the northern United States and Canada migrate to the warmer southern climates of the United States during the winter. However, nesting pairs have been known to reside near nest sites throughout the winter. Bald eagle characteristic breeding habitat includes prominent trees, such as red and white pine, located near lakes and rivers that support an abundant supply of fish. While most nest sites are located in areas with minimal human activity, some bald eagles have adapted to human presence and nest near human dwellings or other features, including railroads, highways, and boat landings. In the Midwest, bald eagles begin courtship and nest building in late January-early February, and the young fledge by late July.

Based on comments made by USFWS personnel on the May 7, 2014 conference call, and the presence of potential eagle nesting habitat in the region, HDR conducted a ground-based Bald Eagle Nest Survey throughout all suitable habitat within five miles of the Study Area. The survey identified nest locations and eagle use areas in the Study Area and immediate vicinity. The USFWS indicated that in Minnesota, a two-mile survey buffer for bald eagles would have been sufficient; however, HDR chose to use a more conservative five-mile buffer to mitigate any potential future changes in the Project boundaries.

The survey purpose was to identify bald eagle and other raptor breeding sites in or within five miles of the Study Area. HDR developed an eagle nest model using ArcGIS™, publicly available environmental data in electronic format, and a list of correlative habitat influences built on peer-reviewed studies about bald eagle nesting characteristics, habitat use studies, species narratives, and a professional understanding of eagle nesting characteristics. Habitat characteristics, known to be highly correlative to the presence of bald eagle nest establishment, were overlain on other critical data layers using ArcGIS™ within the Study Area and a five mile buffer. Sites exhibiting required nesting characteristics show up as dark red in the model. Areas with fewer of the necessary characteristics show up as orange. Those areas with few or none of the required characteristics are mapped using green within the search areas (Figure 6: Bald Eagle Nest Habitat Model and Survey Results). An analysis of these criteria, when used with existing known nests from the prairie parkland province of Minnesota, show that approximately 90 percent of the nests were correctly associated with the model predictors. In March 2015, HDR biologists conducted ground-based eagle and other stick-nest activity surveys within five miles of the Study Area. Biologists conducted ground-based searches for new nests from public roads focusing on areas identified in the geographic information system (GIS) model by scanning forested areas and woodlots for stick nests and eagle activity. Biologists recorded all active raptor nest locations and other raptor observations.

Bald Eagle Point-Count Surveys

As recommended by the ECPG, HDR also conducted fixed-radius point-counts to collect eagle flight data for potential use in the USFWS eagle fatality model (New et al. 2015). With USFWS concurrence, staff conducted point-count surveys once per month between March 2016 and February 2017. Each point-count location was surveyed for 60 minutes. Surveys were conducted between one hour after sunrise until sunset. The Bald Eagle Point-Count Survey incorporated 18 surveyor-selected fixed point-count locations. The locations were established in consultation with USFWS to provide adequate geographic coverage, to total approximately 30 percent of the Study Area and the original turbine array, and to cover lands nearest to the known nest sites. Point locations were refined in the field to maximize observer safety and to establish unobstructed sight lines (Figure 7: Bald Eagle Point-Count Survey Locations and Results).

Biologists documented information on flight height, flight direction, time in flight, and general eagle age class (i.e., adult, immature, juvenile) within 800 meters of the point-count location. Landmarks and objects with known heights (i.e. telephone poles) were used to standardize flight height estimates and to document the distance of flights taken by eagles at each point-count location. Observers recorded eagle flights rounded to the next highest minute (e.g. 15 second flights were recorded as one eagle flight minute, 61 second flights were recorded as two flight minutes). Birds recorded outside of the 800-meter plot were counted as an incidental observations. Surveys were conducted during all weather conditions. Eagle flight data and avian use data were analyzed separately.

Data Analysis

Turbine models are expected to fall in the range of 1.5 to 3.0 MW each, with tower (hub) heights of 80-90 meters, and rotor diameters between 100-116 meters. Given these general specifications, the upper and lower limits of the Rotor Swept Zone (RSZ) would be between approximately 22-148 meters above ground level (AGL). The RSZ was set to 20 – 150 meter AGL for the purposes of this study, and to reflect the level of precision in flight heights estimated by the observers.

Avian Use Survey

Avian Use Survey data was analyzed to determine which species utilize airspace within the RSZ and how bird abundance and species diversity varied with season and habitat type.

Flight height was analyzed to assess the relative collision risk for special status species (i.e. species designated as ETSC and those considered SGCN) and species groups that were detected during the Avian Use Surveys. Flight frequency within the RSZ was calculated for each species and for the following species groups: waterfowl, waterbirds, raptors, and passerines. Relative risk was calculated by estimating the number of individuals of each species group that flew through the RSZ. NEER proposes to use turbines with an RSZ that ranges from approximately 20 meters to 150 meters AGL.

Survey results were used to calculate relative abundance (i.e., the number of birds of a particular species as a percentage of the total observations in a given area) by habitat type and by season. Average species richness (i.e. the number of species detected) for each point-count location and mean-use rates were also calculated. Mean-use rates were generated by dividing the number of birds observed within 800 meters of each point-count location during 20 minutes of survey (i.e., birds/plot/20-minute survey/800 meter). HDR combined species abundance, species richness, and species use rates into the following groups: waterfowl (all ducks, geese, and swans), waterbirds (loons, herons, terns, pelicans, bitterns, and cranes), and raptors (hawks, eagles, falcons, and harriers). Additionally, species listed as endangered, threatened or special concern (ETSC) or SGCN were grouped to analyze flight paths and assess risk.

Avian Wetland Utilization Survey

Similarly, Avian Wetland Utilization Survey data was analyzed to determine how waterfowl and waterbird abundance varied with season and which species were most abundant. Waterfowl data was divided into migratory (March 16 to April 30 and August 1 to October 29) and breeding (May 1 to July 30) periods for utilization estimates.

Bald Eagle Nest Survey

The locations, attendance, occupancy, and characteristics of bald eagle (and other raptor) nests observed during the Bald Eagle Nest Survey were recorded to aid in future planning and provide data for further monitoring.

Bald Eagle Point-Count Survey

Data collected during Bald Eagle Point-Count Surveys were summed to provide total flight minutes. The USFWS, as outlined in the ECPG, predicts the annual eagle fatality rate for a wind energy facility using a Bayesian model (New et al. 2015) to define the relationship between eagle exposure (from pre-construction survey data), collision probability, and fatalities (from reference sites). The USFWS method requires eagle exposure data in the form of eagle minutes, or a count of the amount of time eagles are present within each 800-meter-radius point-count per hour.

Results

Special Status Species

No ESA-listed species were detected during the surveys; however, three species listed by the State of Minnesota as ETSC were detected within the survey area. Observations of state-listed species included: Henslow's sparrow (*Ammodramus henslowii,* endangered), Acadian flycatcher (*Empidonax virescens,* special concern), and Franklin's gull (*Leucophaeus pipixcan,* special concern) (Figure 8: Special Status Species Observations). Additionally, bald eagles, which are protected by the BGEPA, were observed during Avian Use Surveys, Bald Eagle Nest Surveys, and Bald Eagle Point-Count Surveys. Bald eagle observations are described in detail under the Bald Eagle Nest Survey Results and Bald Eagle Point-Count Survey Results headings.

Henslow's Sparrow

Henslow's sparrows (state endangered) were incidentally observed during the Avian Wetland Utilization Survey on August 16, 2016. HDR documented two Henslow's sparrows at the Ashland Township Wetland Complex in an isolated patch of restored grassland adjacent to the wetland in the central portion of the Project. However, no additional Henslow's sparrow observations were noted during subsequent wetland surveys, and no nests were found within or near the Project on subsequent visits to this same grassland surrounding the wetland.

Acadian Flycatcher

One Acadian flycatcher (SCS) was observed during the Avian Use Survey during the spring migratory season. The bird was observed in the forested slopes and floodplain of Dodge Center Creek at the northern portion of the Project. However, no additional Acadian flycatcher observations were noted during subsequent additional surveys, and no nests were found within or near the Project on subsequent visits to this same forested area surrounding the creek.

Franklin's Gull

Franklin's gulls (SCS) were observed using wetlands within the Study Area during the spring migratory season. Wetlands that provide the essential habitat characteristics necessary for this species to breed are not found in the Study Area.

Avian Use Survey Results

HDR recorded 16,112 individual birds, representing 144 different species, during the Avian Use Surveys[2]. Of the total number of birds, 698 individuals (4 percent) could not be identified to a particular species, and are listed as unidentified. Thirty-one state-designated SGCN species, including two SCS (Franklin's gull and Arcadian flycatcher), were detected during the Avian Use Surveys and combined, make up 2 percent of all observations. Passerines were the most abundant group observed during Avian Use Surveys, making up 84 percent of all individuals observed. Passerines also made up 71 percent of the species listed as ETSC or SGCN observed in the Study Area, including the Acadian flycatcher and Franklin's gull. In particular, red-winged blackbirds, common grackles, and the American robin were the most abundant species observed during the Avian Use Surveys (Appendix A: Project Snapshot). These three species combined made up 40 percent of all observations. The Project Snapshot (Appendix A) summarizes passerine use of the Study Area.

Breeding passerines are common in a predominantly agricultural landscape, with horned larks being one of the most abundant species encountered (fifth most common species). Species associated with fencerows and farmyards such as common grackles, American robins, and American crows were also commonplace within the Study Area. Additionally, biologists encountered common forest species during migratory periods along the wooded corridors associated with watercourses at the fringes of the Study Area.

Raptors, including bald eagles, use the Study Area in relatively low numbers. A total of eight raptor species were observed during the Avian Use Surveys. Utilization of the Study Area can be divided into breeding and migratory categories. A single osprey, small groups of sharp-shinned hawks, northern harrier, and broad-winged hawks were observed migrating through the Study Area. The remaining raptor observations are presumed to be breeding individuals because there were repeated observations in the same general areas throughout the surveys. A total of 23 bald eagle observations were recorded during Avian Use Surveys.

Species Richness

The point-count location with the highest species richness (78 different species) was observation point 255804-003, located in the northeastern portion of the Study Area (Figure 4: Avian Use Survey Point-Count Locations). Habitat associated with point-count location 255804-003 includes a segment of the floodplain forests and upland forests adjacent to Dodge Center Creek. Avian use in this Study Area reflected species associated with forests and those seeking forested habitat during migration. Observation points 255804-002 and 255804-001 (Figure 4: Avian Use Survey Point-Count Locations) had the next highest species richness totals with 73 and 71, respectively. Both of these points likely had higher species richness due to the presence of trees, which harbored many woodland species that were not present at most of the remaining observation points. Both points are also situated along the Dodge Center Creek floodplain forest (Figure 4: Avian Use Survey Point-Count Locations). Floodplain forest habitat exhibited the highest species richness followed by cropland.

Survey points with the lowest richness totals (between 25 and 27 different species) were located in areas that were predominantly cropland with little habitat diversity, and were relatively isolated from waterbodies or drained wetlands that provide migratory stopover habitat for waterfowl, waterbirds, and shorebirds (Figure 4: Avian Use Survey Point-Count Locations, Points 255804-014, 255804-016, and 255804-018).

[2] Please note that the Project Snapshot provided in Appendix A indicates a species richness totaling 155 species. However, this total includes 11 unidentified species categories, which were not included when calculating species richness

The Project Snapshot (Appendix A) provides a complete list of species documented during the Avian Use Surveys along with species richness by point and by habitat.

Abundance

Abundance at each point-count location ranged from two to seven individual birds and averaged four birds per survey. Abundance at each point-count location was highest in wetland prairie habitat types, although this habitat was only represented by one point-count location. Waterfowl and waterbird abundance (as observed at point-count locations) peaked in March and October during spring and fall migration, as would be expected. Passerines also exhibited increased abundance during the migration season; however, the period of increased abundance was longer than for waterfowl. The Project Snapshot (Appendix A) provides mean abundance by point, mean abundance by habitat, overall mean abundance, total abundance, and a list of special-status species and their abundance.

Species Flight Heights

The Project Snapshot (Appendix A) provides overall mean flight-height, mean flight-height by point, and mean flight-height by species. Those species whose mean flight-height was below or above the RSZ (20 meters to 150 meters) would incur relatively lower risk than those species whose mean flight-height was within the RSZ.

Approximately 23.8 percent of all birds observed during the Avian Use Survey passed through at an elevation intersecting the theoretical RSZ for the project. Waterfowl exhibited the highest probability of passing through the RSZ (Table 2). Only 10.1 percent of all passerine flights occurred within the RSZ. The only species within this group with a mean flight-height within the RSZ were common nighthawks (43 meters AGL), upland sandpipers (90 meters AGL), and northern rough-winged swallows (22 meters AGL). Horned larks were observed regularly utilizing airspace within the RSZ throughout the spring season even though their mean flight-height was only 13 meters. Most of these observations were birds singing or conducting territorial displays in flight. Approximately 31.6 percent of special status individuals observed passed through the RSZ (Table 3).

Table 2: Species Group, Number, and Percentage of Flights Observed within the RSZ

Species Group	Total Number of Flights Observed	Percentage of Flights Observed in RSZ
Waterfowl	1,704	11.7
Waterbirds	317	1.4
Raptors	182	0.7
Passerines	10,607	10.1

Table 3: Special Status Species Observed within the RSZ

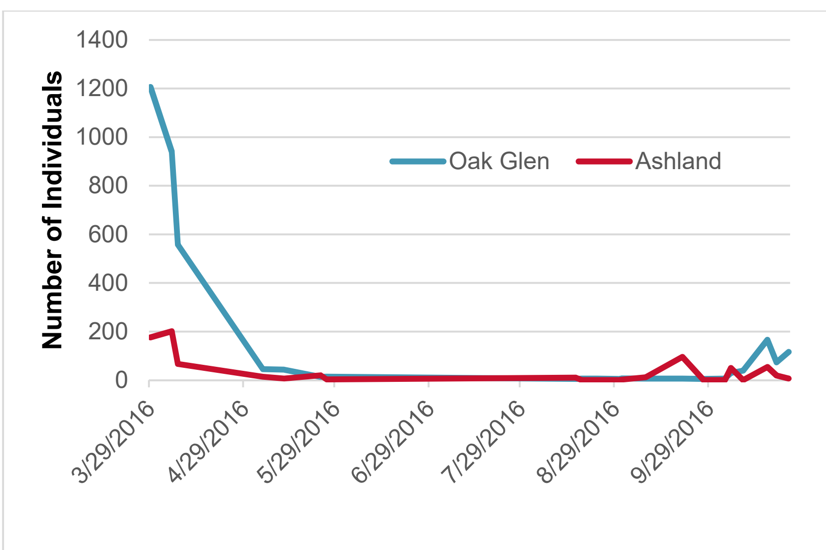
Common Name	Scientific Name	Abundance	% below RSZ (<20 m)	% within RSZ (20-150 m)	% above RSZ (>150 m)
Bald Eagle (SGCN)	Haliaeetus leucocephalus	23	35.3	58.8	5.9
Common Nighthawk (SGCN)	Chordeiles minor	25	88.0	12.0	0.0
Franklin's Gull (SPS)	Leucophaeus pipixcan	14	0.0	100.0	0.0
Lesser Scaup (SGCN)	Aythya affinis	26	0.0	100.0	0.0
Northern Harrier(SGCN)	Circus cyaneus	28	88.9	11.1	0.0
Northern Rough-Winged Swallow (SGCN)	Stelgidopteryx serripennis	12	45.5	54.5	0.0
Upland Sandpiper*(SGCN)	Bartramia longicauda	5	0.0	100.0	0.0

* *Display flight observations noted at a breeding location south of the Study Area are on April 19 and May 10, 20, and 26. These displays did not occur within established point-count locations.*

Avian Wetland Utilization Survey

HDR biologists documented 22,874 individual birds representing 18 different species of waterfowl and waterbirds during Avian Wetland Utilization Surveys. The most commonly observed species were redhead and ring-necked duck (25 percent and 13 percent of all observations, respectively). Peak abundance occurred during spring and fall migration periods (Chart 1).

Chart 1. Waterfowl and Waterbird Utilization by Date at Avian Wetland Utilization Survey Locations (Ashland Township Wetland Complex and Glen Oak Wetland)



These surveys also documented the presence of two individuals of a state-listed endangered species (Henslow's sparrow) on an isolated patch of restored grassland adjacent to the Ashland Township Wetland Complex. Data collected at the Oak Glen and Ashland Township wetland monitoring sites are presented in Appendix B: Wetland Use Data.

Wetland areas are abundant during the spring thaw and waterfowl occur in large numbers where water ponds over a frost layer in the soil on agricultural lands. Waterfowl use of these flooded fields generally subsides once the frost leaves the soil and surface waters recede. Wetlands and riparian areas, such as Dodge Center Creek and Oak Glen WMA, provide more permanent water sources used by waterfowl and water birds during migration, breeding, and rearing seasons. Waterfowl and other water birds generally concentrate at wetlands or waterbodies for roosting or loafing during the evening hours.

Bald Eagle Nest Survey Results

Three nesting pairs of bald eagles were identified inside or within five miles of the Study Area. One nest site was located along Dodge Center Creek, another was located at Oak Glen, and the third was located near Salem Creek east of the Study Area. Nest observations of these pairs throughout the 2016 breeding season indicated that the pair at the Oak Glen nest site successfully raised at least one young (Figure 6: Bald Eagle Nest Habitat Model and Survey Results).

Bald Eagle Point-Count Survey Results

Bald Eagle Point-Count Surveys conducted from March 2016 through February 2017 documented 63 bald eagle flight minutes. Many of these observations were of resident adults tending to their nests and young, or engaged in foraging forays. Of the 63 eagle minutes recorded during Bald Eagle Point-Count Surveys, 30 minutes occurred within the RSZ. The remaining flight minutes occurred below or above the RSZ. Bald eagle flight frequency and flight locations are depicted in Figure 7: Bald Eagle Point-Count Survey Locations and Results. A summary of the raw eagle flight data and summary of eagle flight minutes is presented in Appendix C: Eagle Flight Minute Raw Data.

Eagle flights consisted of foraging flights or territorial defense by the resident bald eagle pairs and other migratory eagles. HDR recorded between 20 and 30 bald eagle flight minutes near the nest at Oak Glen and less than 18 flights in the northeastern portion of the Study Area. However, the results of bald eagle flight surveys indicate that eagle flights occur over a broad geographic area along Dodge Center Creek in the northeast portion of the Study Area (near Dodge Center). The highest number of eagle flights (26 minutes) occurred near the nest at Oak Glen (Figure 7: Bald Eagle Point-Count Survey Locations and Results), and appear to have been associated with sustaining the nesting pair and their young. Bald eagle flights in the northeast portion of the Study Area consisted of more immature and juvenile eagles or transitory birds moving between Dodge Center Creek and other watercourses east of the Study Area.

Conclusion

Avian Use Surveys conducted from June 2, 2015, through October 29, 2016, documented sightings of 16,112 individual birds representing 144 different species. An additional 21,243 individual birds were counted during Wetland Utilization Surveys. Members of the passerine group were the most abundant species observed during the surveys. No federally listed species were observed during the surveys. Surveys identified 32 SGCN species, including two SCS species (Acadian flycatcher and Franklin's gull), and one state-listed endangered species (Henslow's sparrow). The Henslow's sparrow, Acadian flycatcher, and Franklin's gull species were observed using the site during migration. Breeding was observed or presumed for the following SGCN species: upland sandpiper, bobolink, sedge wren, marsh wren, northern harrier, brown thrasher, black-billed cuckoo, rose-breasted grosbeak, and swamp sparrow. Several SGCN are relatively sedentary once they arrive at their breeding grounds while others conduct frequent foraging flights between nests and feeding areas.

Of the avian species groups observed within the Study Area, waterfowl exhibited the highest probability of passing through the RSZ, while approximately 23.8 percent of all birds observed during the Avian Use Survey passed through the RSZ for the Project.

Three active bald eagle nest sites are located within five miles of the Study Area. Eagle flight surveys have documented 63 eagle flight minutes between March 2016 and December 2016. Most eagle flight minutes are associated with the Oak Glen Wetland Complex in the southwest portion of the Study Area.

The baseline avian use data presented above provides the foundational information to assess potential risk to avian species from development of the Dodge County Wind Project.

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Avian Use Report Figures

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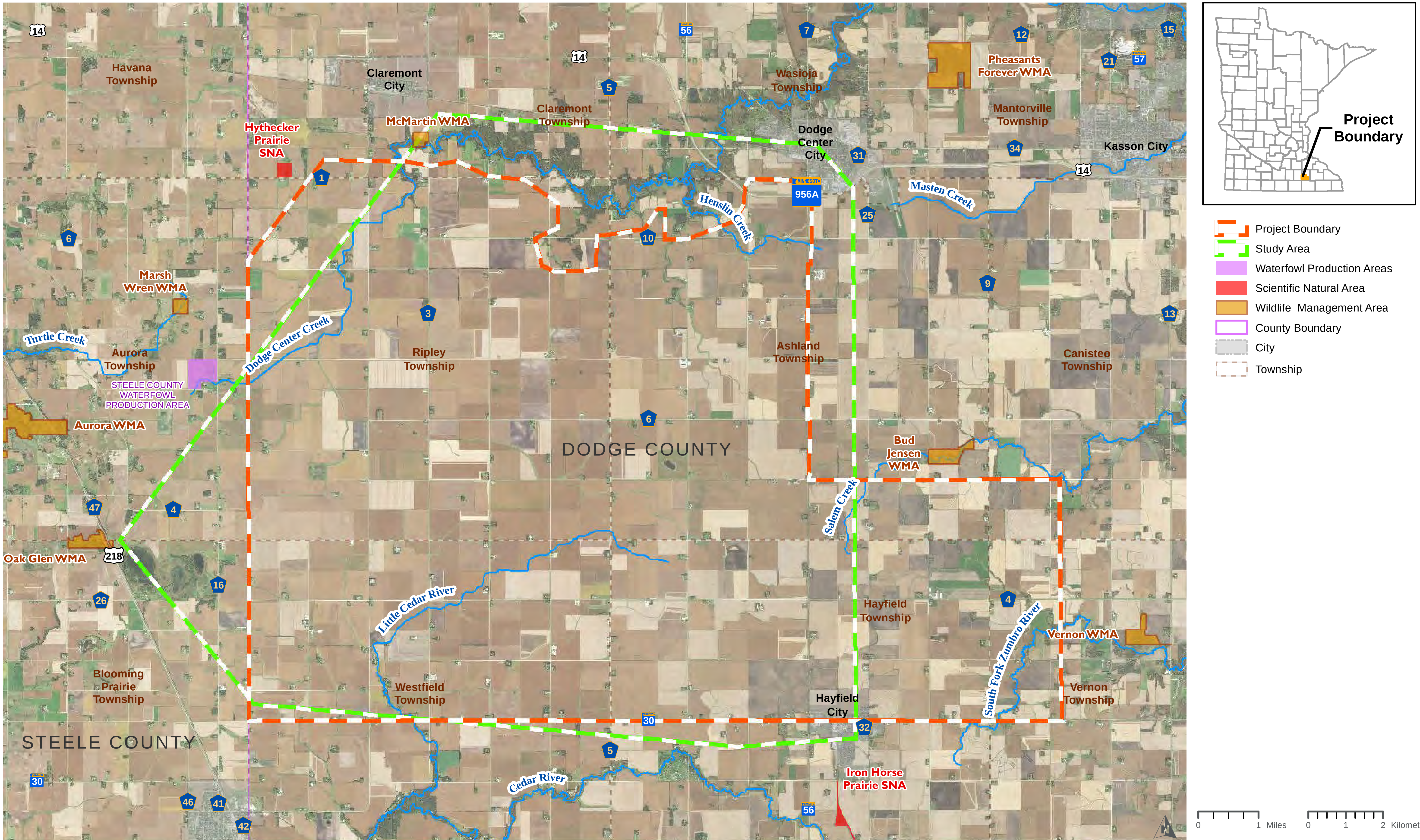
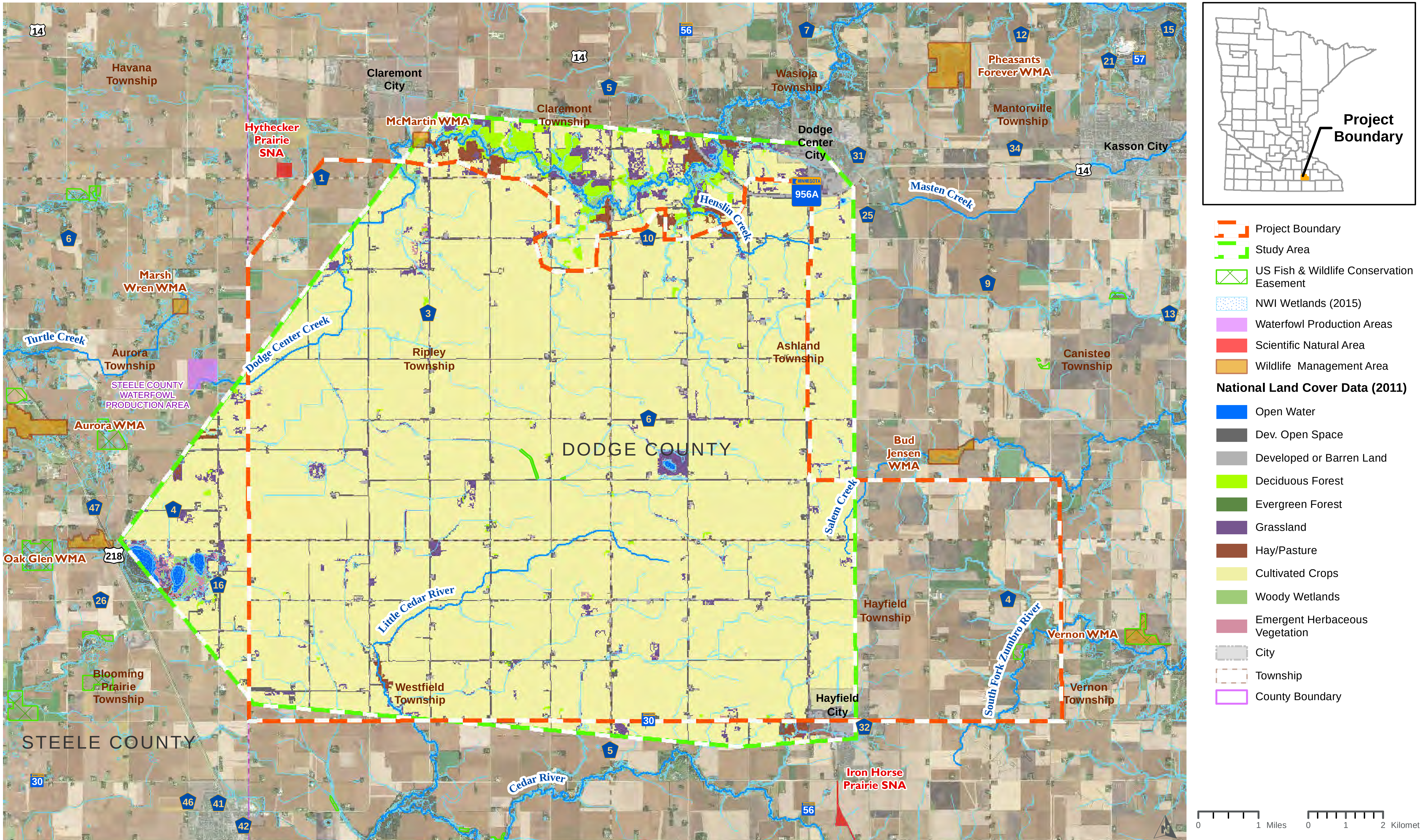


HDR NEXTera ENERGY

FIGURE 1
STUDY AREA AND PROJECT BOUNDARY
DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_1.MXD - USER: JWALTER - DATE: 3/13/2017

DODGE COUNTY WIND PROJECT



HDR NEXTera ENERGY

FIGURE 2
STUDY AREA LAND COVER
DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_2.MXD - USER: JWALTER - DATE: 3/13/2017

DODGE COUNTY WIND PROJECT

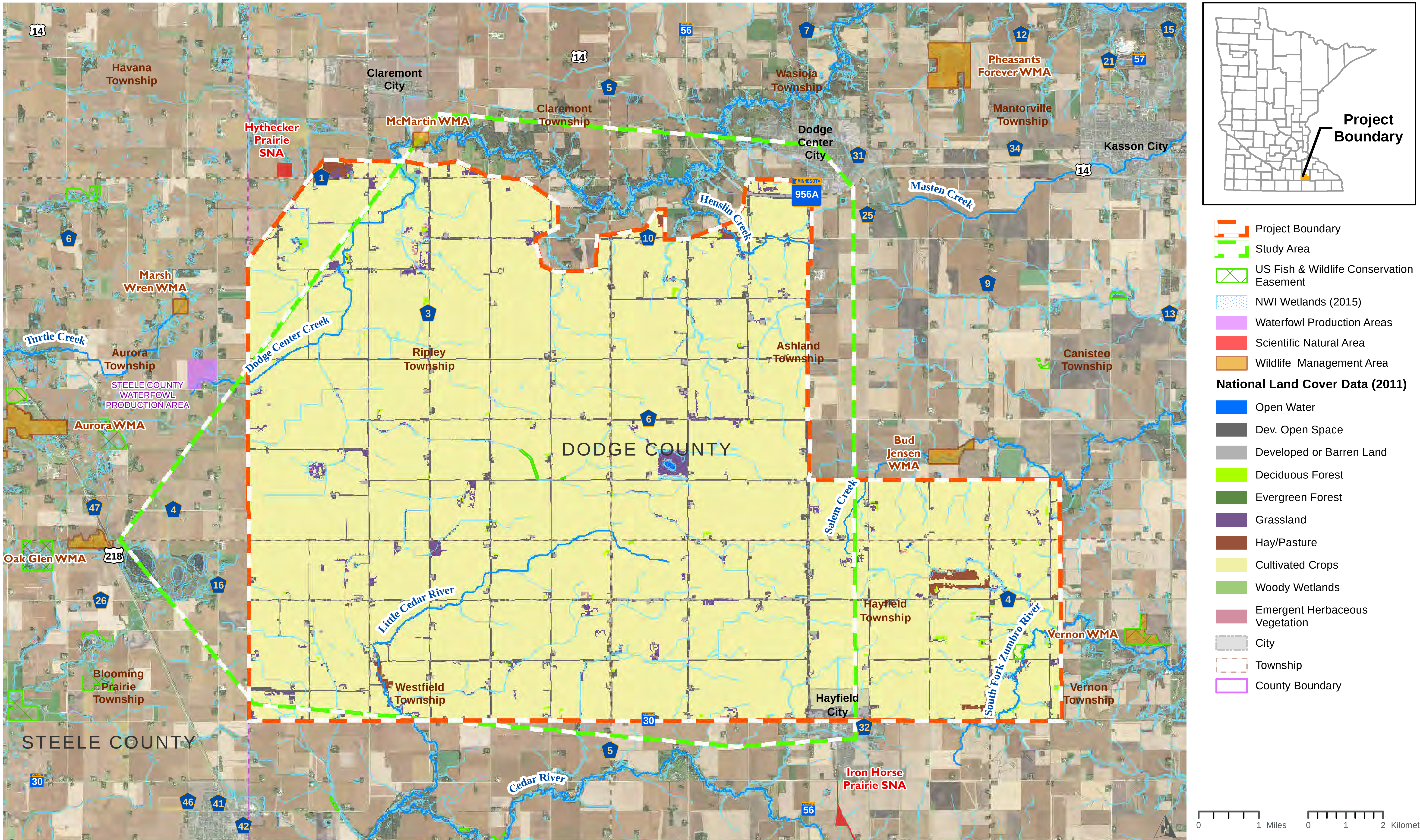


FIGURE 3
PROJECT BOUNDARY LAND COVER

DODGE AND STEELE COUNTIES, MINNESOTA

DODGE COUNTY WIND PROJECT

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_3.MXD - USER: JWALTER - DATE: 3/13/2017

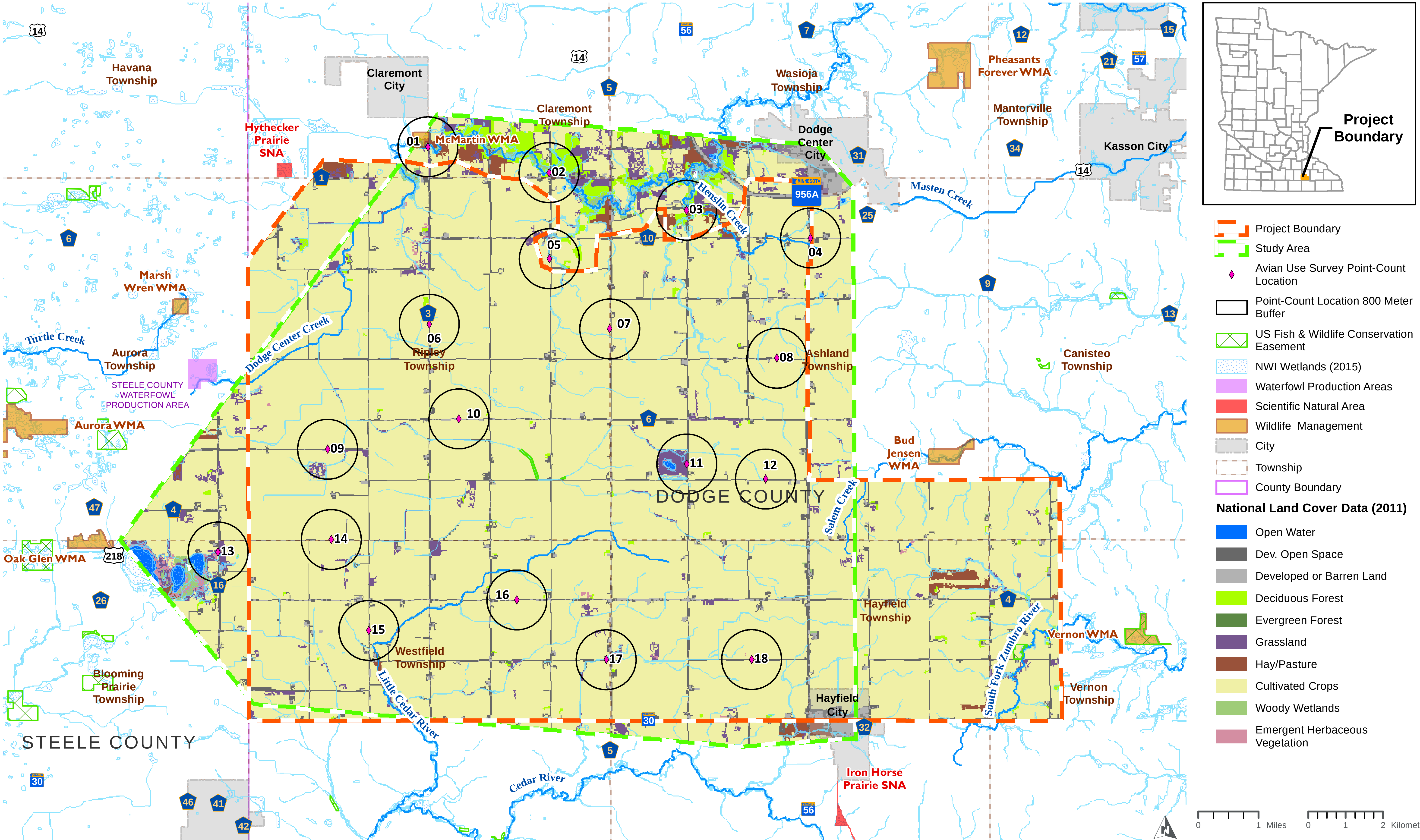


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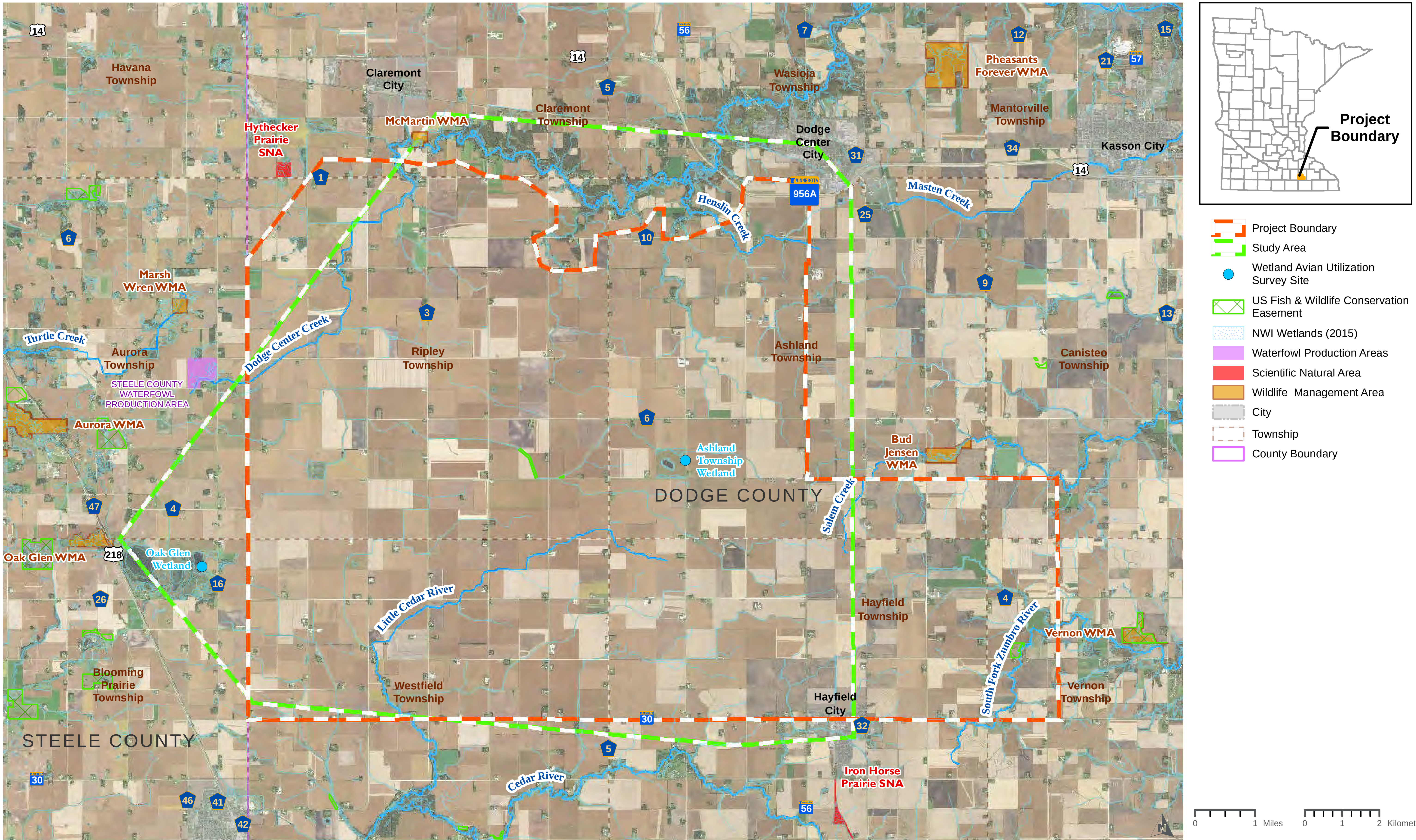
FIGURE 4

AVIAN USE SURVEY POINT-COUNT LOCATION LAND COVER

DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_4.MXD - USER: JWALTER - DATE: 3/14/2017

DODGE COUNTY WIND PROJECT



FDR NEXTera ENERGY

FIGURE 5

AVIAN WETLAND UTILIZATION SURVEY LOCATIONS

DODGE AND STEELE COUNTIES, MINNESOTA

DODGE COUNTY WIND PROJECT

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_5.MXD - USER: JWALTER - DATE: 3/12/2017

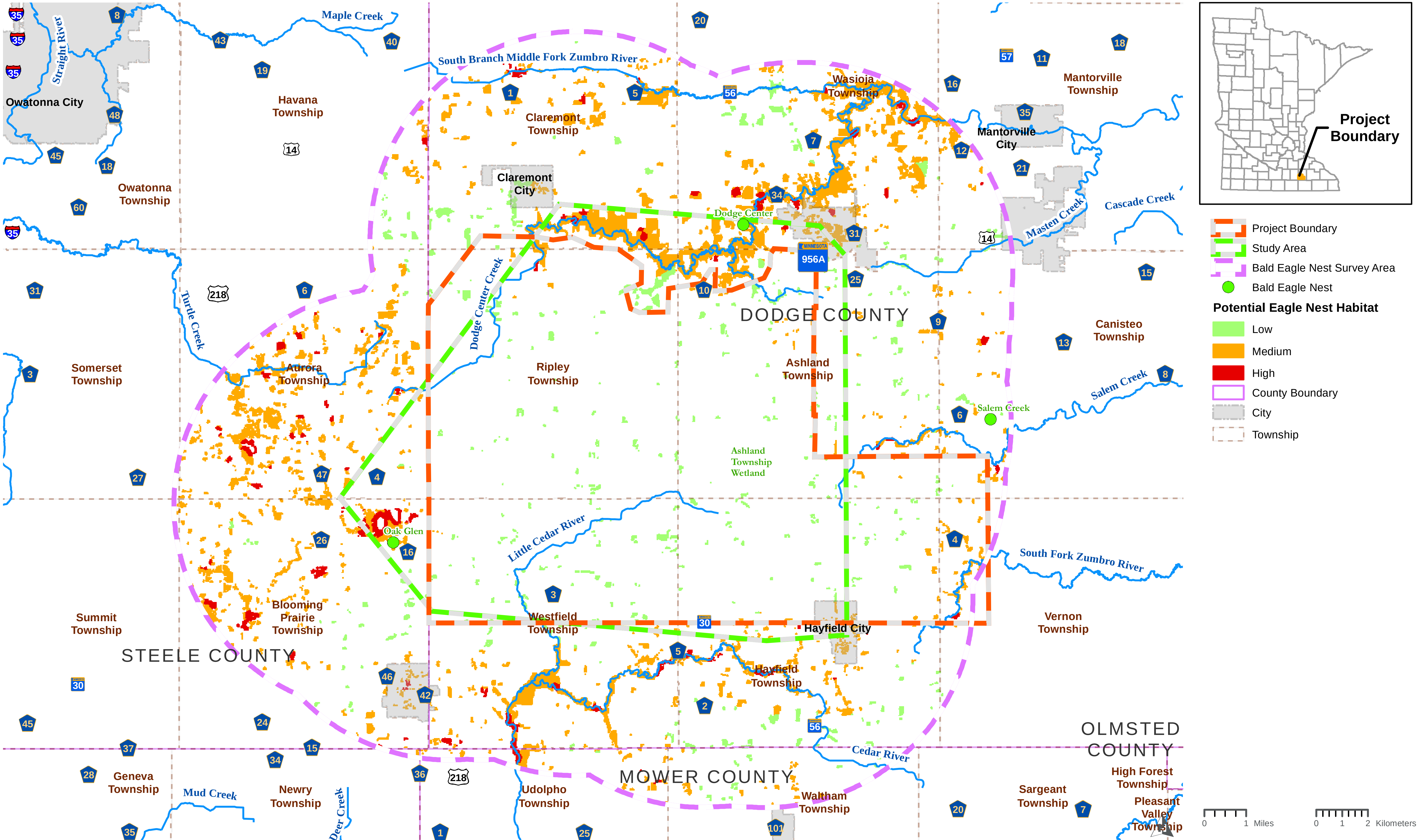


FIGURE 6
BALD EAGLE NEST HABITAT MODEL AND SURVEY RESULTS

DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_6.MXD - USER: JWALTER - DATE: 3/14/2017

DODGE COUNTY WIND PROJECT

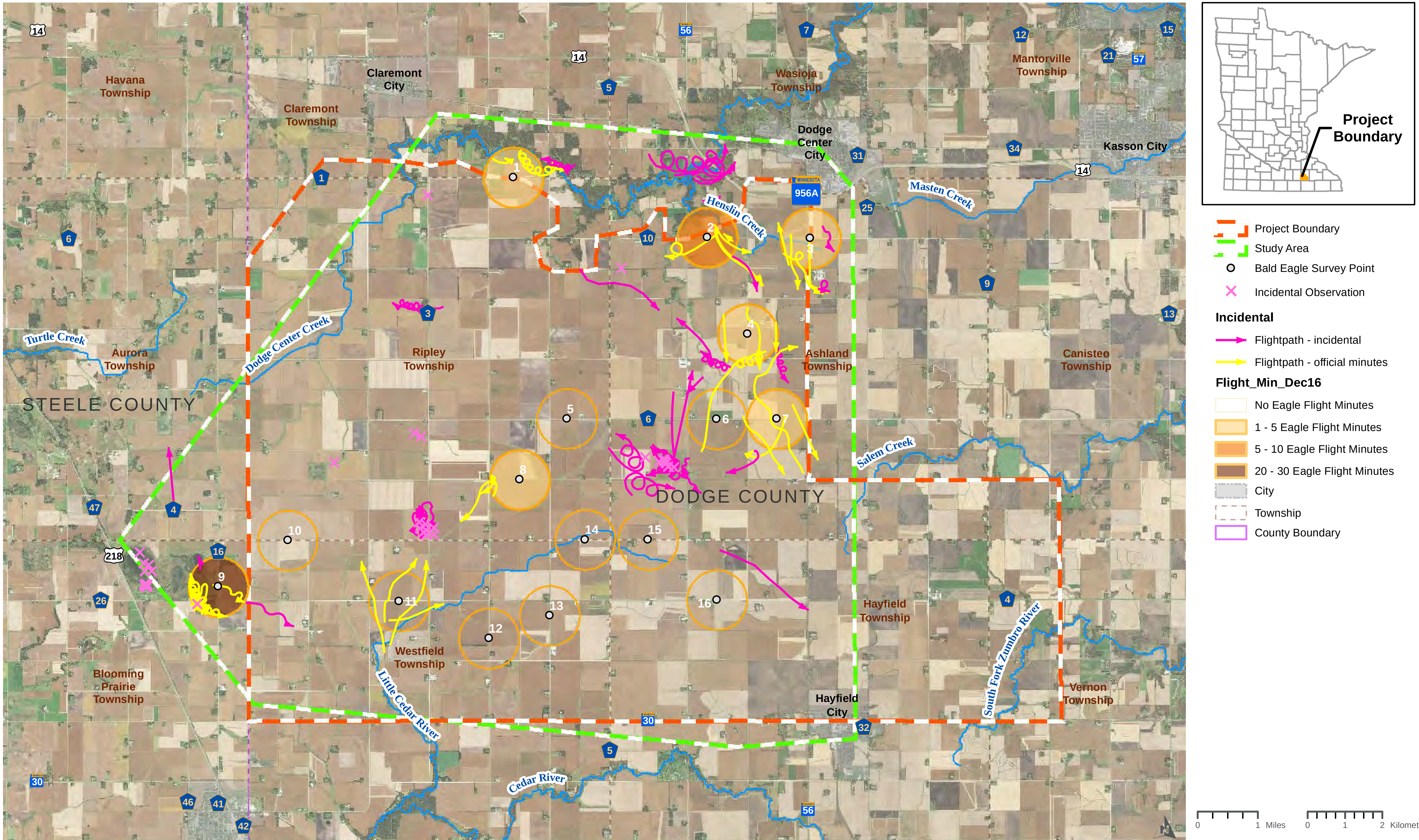


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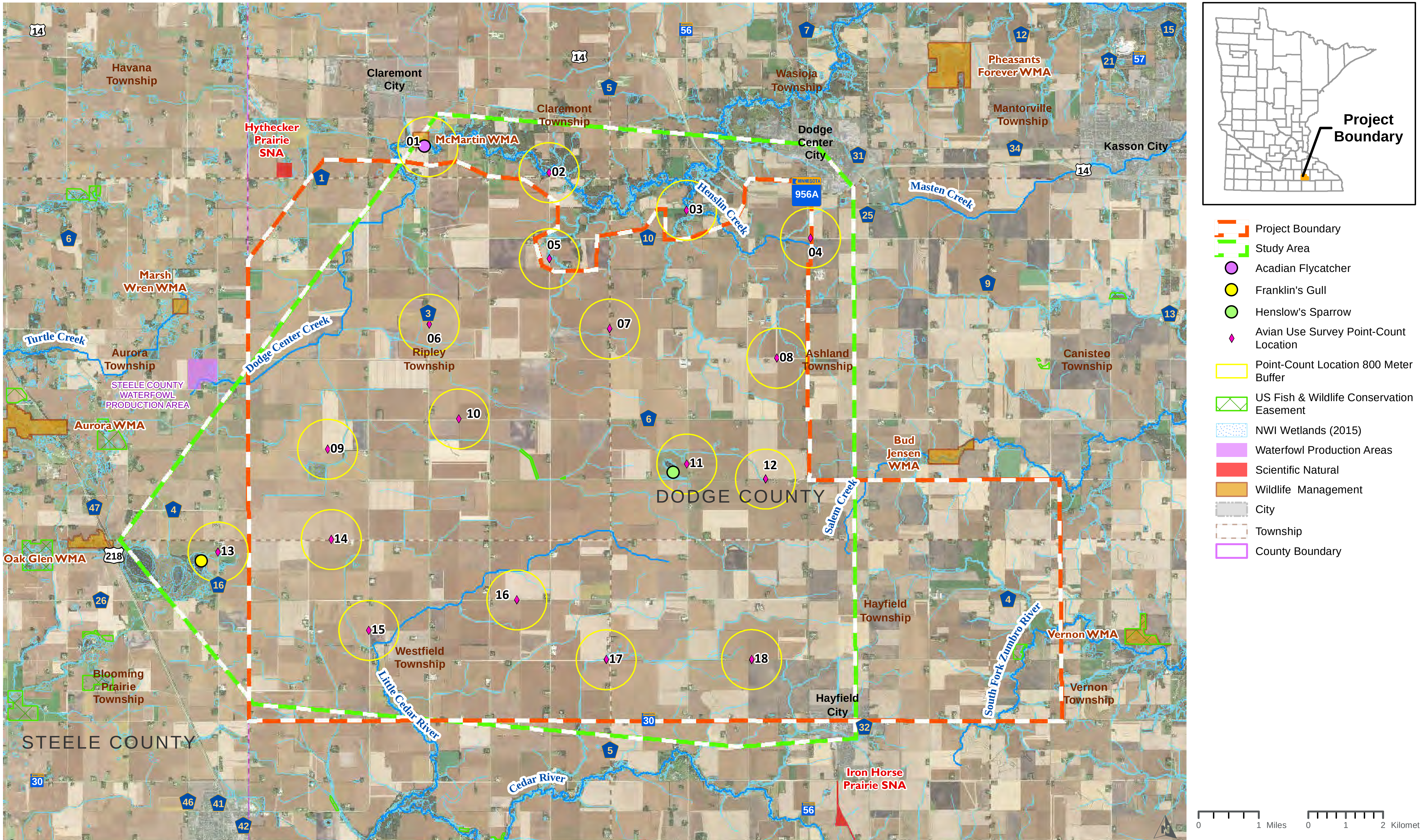
FIGURE 7
BALD EAGLE POINT-COUNT SURVEY LOCATIONS AND RESULTS

DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_7.MXD - USER: JWALTER - DATE: 3/12/2017

DODGE COUNTY WIND PROJECT



HDR NEXTera ENERGY

FIGURE 8
SENSITIVE SPECIES OBSERVATION
DODGE AND STEELE COUNTIES, MINNESOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\NEXTERA\229065\MAP_DOCS\REPORT\REPORT_FIGURE_8.MXD - USER: JWALTER - DATE: 3/14/2017

DODGE COUNTY WIND PROJECT

A

Avian Use Project Snapshot

Project Snapshot

255804 Dodge County Wind

SPECIES DATA

Overall Species Richness

155

Species List

Species	Abundance
Red-winged Blackbird	4178
Common Grackle	1575
American Robin	865
Lapland Longspur	640
Horned Lark	586
Barn Swallow	516
American Crow	488
Blue Jay	482
Cliff Swallow	471
European Starling	469
Mallard	452
Canada Goose	436
American Goldfinch	400
Brown-headed Cowbird	374
Greater White-fronted Goose	336
Dark-eyed Junco	317
Unidentified Duck	308
Killdeer	212
Blue-winged Teal	205
Song Sparrow	191
Unidentified Passerine	128
Black-capped Chickadee	127
Unidentified Warbler	124
Tree Swallow	114
Unidentified Shorebird	114
Brewer's Blackbird	100
Mourning Dove	96

Species Richness By Point

Point Number	Species Richness
255804-001	71
255804-002	73
255804-003	78
255804-004	38
255804-005	57
255804-006	30
255804-007	31
255804-008	29
255804-009	49
255804-010	29
255804-011	54
255804-012	46
255804-013	63
255804-014	25
255804-015	34
255804-016	25
255804-017	46
255804-018	27

Species Richness By Habitat

Habitat Type	Species Richness
Agriculture - Cropland	104
Grassland-Non-native	54
Floodplain Forest	110
Marsh	57
Wetland Prairie	63

Sensitive Species

Species	Abundance
Acadian Flycatcher	1
American Golden-Plover	38
Bald Eagle	23
Black-billed Cuckoo	1
Blue-winged Warbler	3
Bobolink	46
Brown Thrasher	17
Common Nighthawk	25
Dickcissel	5

Vesper Sparrow	75
House Sparrow	63
Chipping Sparrow	60
Northern Cardinal	53
Red-tailed Hawk	49
Bobolink	46
Turkey Vulture	44
Northern Flicker	39
Yellow-rumped Warbler	39
American Golden-Plover	38
Cedar Waxwing	37
American Kestrel	36
Eastern Phoebe	35
Downy Woodpecker	34
Eastern Bluebird	33
Wood Duck	32
Fox Sparrow	29
Savannah Sparrow	29
Sedge Wren	29
Indigo Bunting	28
Northern Harrier	28
American Tree Sparrow	28
Red-bellied Woodpecker	28
Sandhill Crane	28
Rock Pigeon	27
Lesser Scaup	26
Great Blue Heron	25
Wild Turkey	25
Common Yellowthroat	25
Eastern Kingbird	25
Common Nighthawk	25
White-breasted Nuthatch	24
Unidentified Sparrow	23
Bald Eagle	23
House Wren	21
Hairy Woodpecker	21

Dunlin	2
Eastern Meadowlark	19
Eastern Wood-Pewee	7
Field Sparrow	5
Franklin's Gull	14
Grasshopper Sparrow	5
Least Flycatcher	4
Lesser Scaup	26
Marsh Wren	1
Northern Harrier	28
Northern Rough-winged Swallow	12
Red-headed Woodpecker	5
Rose-breasted Grosbeak	9
Sedge Wren	29
Short-billed Dowitcher	1
Swamp Sparrow	15
Upland Sandpiper	5
Virginia Rail	1
White-throated Sparrow	20
Willow Flycatcher	2
Wood Thrush	1
Yellow-bellied Sapsucker	2

Unidentified Swallow	21
White-throated Sparrow	20
Snow Goose	20
Pectoral Sandpiper	20
Ring-necked Pheasant	20
Eastern Meadowlark	19
American Coot	18
American Pipit	17
Brown Thrasher	17
Snow Bunting	16
Swamp Sparrow	15
Unidentified Bird	15
Gray Catbird	14
Franklin's Gull	14
Sharp-shinned Hawk	13
Ruby-crowned Kinglet	13
Baltimore Oriole	12
Northern Rough-winged Swallo	12
Red-eyed Vireo	11
Ring-necked Duck	11
Palm Warbler	11
Cooper's Hawk	10
Great Crested Flycatcher	9
Hooded Merganser	9
Yellow-throated Vireo	9
Rose-breasted Grosbeak	9
Unidentified Raptor	9
Clay-colored Sparrow	8
American Redstart	8
Eastern Wood-Pewee	7
Warbling Vireo	6
Double-crested Cormorant	6
Nashville Warbler	6
Sanderling	6
Western Meadowlark	6
Dickcissel	5

Grasshopper Sparrow	5
House Finch	5
Wilson's Warbler	5
Field Sparrow	5
Upland Sandpiper	5
Red-headed Woodpecker	5
Scarlet Tanager	5
Black-bellied Plover	5
Belted Kingfisher	5
Golden-crowned Kinglet	4
Gray Partridge	4
Least Flycatcher	4
Yellow Warbler	4
Lincoln's Sparrow	4
Ring-billed Gull	4
Wilson's Snipe	3
Blue-winged Warbler	3
Blackpoll Warbler	3
Chimney Swift	3
Tennessee Warbler	3
Ruby-throated Hummingbird	3
Yellow-bellied Sapsucker	2
Spotted Sandpiper	2
Yellow-billed Cuckoo	2
Yellow-headed Blackbird	2
Ruddy Duck	2
Dunlin	2
Alder Flycatcher	2
Willow Flycatcher	2
Broad-winged Hawk	2
Brown Creeper	2
Green-winged Teal	2
Hermit Thrush	2
Common Snipe	2
Mourning Warbler	2
Pileated Woodpecker	2

Bank Swallow	1
Acadian Flycatcher	1
Green Heron	1
Wood Thrush	1
Magnolia Warbler	1
Marsh Wren	1
Virginia Rail	1
Unidentified Vireo	1
Black-throated Green Warbler	1
Unidentified Buteo	1
Northern Shoveler	1
Black-and-white Warbler	1
Sora	1
Black-billed Cuckoo	1
Short-billed Dowitcher	1
Orange-crowned Warbler	1
Osprey	1
Pied-billed Grebe	1
Unidentified Hawk	1

ABUNDANCE DATA

Overall Mean Abundance
4

Total Abundance All Intervals
16112

Total Abundance 20 Min. Interval
16095

Mean Abundance By Point

Point Number	Mean Abundance
255804-001	4
255804-002	5
255804-003	2
255804-004	3
255804-005	5
255804-006	2
255804-007	2
255804-008	3
255804-009	4
255804-010	2
255804-011	7
255804-012	3
255804-013	5
255804-014	2
255804-015	3
255804-016	2
255804-017	3
255804-018	4

Waterfowl Abundance

Sample Date	Abundance
6/4/2015	57
6/18/2015	3
3/16/2016	112
3/17/2016	901
3/22/2016	52
3/25/2016	56
3/29/2016	29
4/5/2016	4
4/6/2016	34
4/11/2016	1
4/12/2016	12
4/20/2016	6
4/22/2016	21
4/28/2016	7
5/5/2016	3
5/6/2016	8
5/12/2016	19

Mean Abundance By Habitat

Habitat Type	Mean Abundance
Agriculture - Cropland	3
Grassland-Non-native	5
Floodplain Forest	4
Marsh	5
Wetland Prairie	7

5/20/2016	21
5/24/2016	2
5/26/2016	32
8/16/2016	1
8/29/2016	33
9/8/2016	53
9/15/2016	22
9/20/2016	39
9/27/2016	9
10/6/2016	202
10/10/2016	9
10/21/2016	26
10/25/2016	15
10/28/2016	28

Abundance by Date and Group All Groups		
6/2/2015	Passerine	50
6/4/2015	Passerine	126
6/4/2015	Raptor	2
6/4/2015	Waterbirds	5
6/4/2015	Waterfowl	57
6/18/2015	Passerine	196
6/18/2015	Raptor	7
6/18/2015	Waterbirds	4
6/18/2015	Waterfowl	3
6/24/2015	Passerine	15
6/24/2015	Raptor	2
6/24/2015	Waterbirds	5
6/25/2015	Passerine	172
6/25/2015	Raptor	3
6/25/2015	Waterbirds	8
3/16/2016	Passerine	150
3/16/2016	Raptor	12
3/16/2016	Waterbirds	4
3/16/2016	Waterfowl	112
3/17/2016	Passerine	208
3/17/2016	Raptor	3
3/17/2016	Waterbirds	8
3/17/2016	Waterfowl	901
3/22/2016	Passerine	317
3/22/2016	Raptor	2
3/22/2016	Waterbirds	17
3/22/2016	Waterfowl	52
3/25/2016	Passerine	126
3/25/2016	Raptor	1
3/25/2016	Waterbirds	10
3/25/2016	Waterfowl	56
3/29/2016	Passerine	713
3/29/2016	Raptor	14
3/29/2016	Waterbirds	36

Abundance by Date and Group Sensitive Groups		
6/2/2015	Passerine	4
6/4/2015	Passerine	4
6/4/2015	Raptor	2
6/18/2015	Passerine	2
6/24/2015	Waterbirds	4
6/25/2015	Passerine	5
3/16/2016	Raptor	2
3/17/2016	Raptor	2
3/22/2016	Raptor	1
3/25/2016	Waterfowl	26
3/29/2016	Passerine	3
3/29/2016	Raptor	5
3/29/2016	Waterbirds	1
4/5/2016	Raptor	2
4/6/2016	Raptor	1
4/6/2016	Waterbirds	2
4/11/2016	Raptor	1
4/12/2016	Passerine	1
4/12/2016	Raptor	1
4/20/2016	Passerine	6
4/22/2016	Passerine	7
4/22/2016	Raptor	2
4/28/2016	Passerine	14
4/28/2016	Raptor	1
5/5/2016	Passerine	7
5/5/2016	Raptor	2
5/6/2016	Passerine	12
5/6/2016	Raptor	1
5/6/2016	Waterbirds	1
5/12/2016	Passerine	23
5/12/2016	Raptor	4
5/20/2016	Passerine	30
5/20/2016	Waterbirds	1
5/24/2016	Passerine	7

3/29/2016	Waterfowl	29
4/5/2016	Passerine	362
4/5/2016	Raptor	4
4/5/2016	Waterbirds	7
4/5/2016	Waterfowl	4
4/6/2016	Passerine	101
4/6/2016	Raptor	3
4/6/2016	Waterbirds	28
4/6/2016	Waterfowl	34
4/11/2016	Passerine	269
4/11/2016	Raptor	6
4/11/2016	Waterbirds	7
4/11/2016	Waterfowl	1
4/12/2016	Passerine	117
4/12/2016	Raptor	2
4/12/2016	Waterbirds	6
4/12/2016	Waterfowl	12
4/20/2016	Passerine	253
4/20/2016	Raptor	2
4/20/2016	Waterbirds	7
4/20/2016	Waterfowl	6
4/22/2016	Passerine	304
4/22/2016	Raptor	3
4/22/2016	Waterbirds	3
4/22/2016	Waterfowl	21
4/27/2016	Passerine	44
4/27/2016	Waterbirds	2
4/28/2016	Passerine	251
4/28/2016	Raptor	2
4/28/2016	Waterbirds	3
4/28/2016	Waterfowl	7
5/5/2016	Passerine	222
5/5/2016	Raptor	2
5/5/2016	Waterbirds	6
5/5/2016	Waterfowl	3
5/6/2016	Passerine	241
5/26/2016	Passerine	32
5/26/2016	Raptor	2
8/16/2016	Passerine	1
8/18/2016	Passerine	4
8/23/2016	Passerine	5
8/26/2016	Passerine	5
8/26/2016	Raptor	1
8/29/2016	Passerine	27
8/29/2016	Waterbirds	2
8/30/2016	Passerine	7
9/9/2016	Passerine	7
9/9/2016	Waterbirds	16
9/15/2016	Passerine	3
9/20/2016	Passerine	10
9/20/2016	Waterbirds	14
9/27/2016	Passerine	3
9/27/2016	Raptor	8
10/4/2016	Passerine	1
10/4/2016	Raptor	2
10/6/2016	Passerine	2
10/6/2016	Raptor	3
10/6/2016	Waterbirds	18
10/10/2016	Raptor	4
10/13/2016	Raptor	1
10/18/2016	Passerine	2
10/18/2016	Raptor	1
10/21/2016	Raptor	1
10/21/2016	Waterbirds	2
10/25/2016	Raptor	1

5/6/2016	Raptor	3
5/6/2016	Waterbirds	17
5/6/2016	Waterfowl	8
5/12/2016	Passerine	503
5/12/2016	Raptor	8
5/12/2016	Waterbirds	6
5/12/2016	Waterfowl	19
5/19/2016	Passerine	40
5/19/2016	Waterbirds	1
5/20/2016	Passerine	263
5/20/2016	Raptor	1
5/20/2016	Waterbirds	10
5/20/2016	Waterfowl	21
5/24/2016	Passerine	231
5/24/2016	Raptor	3
5/24/2016	Waterbirds	15
5/24/2016	Waterfowl	2
5/26/2016	Passerine	206
5/26/2016	Raptor	3
5/26/2016	Waterbirds	17
5/26/2016	Waterfowl	32
6/16/2016	Passerine	17
8/16/2016	Passerine	148
8/16/2016	Raptor	5
8/16/2016	Waterfowl	1
8/18/2016	Passerine	238
8/18/2016	Raptor	1
8/18/2016	Waterbirds	30
8/23/2016	Passerine	258
8/23/2016	Raptor	7
8/23/2016	Waterbirds	1
8/26/2016	Passerine	206
8/26/2016	Raptor	5
8/29/2016	Passerine	354
8/29/2016	Raptor	1
8/29/2016	Waterbirds	2

8/29/2016	Waterfowl	33
8/30/2016	Passerine	192
8/30/2016	Raptor	5
8/30/2016	Waterbirds	5
9/8/2016	Passerine	324
9/8/2016	Raptor	2
9/8/2016	Waterbirds	4
9/8/2016	Waterfowl	53
9/9/2016	Passerine	265
9/9/2016	Raptor	2
9/9/2016	Waterbirds	21
9/15/2016	Passerine	192
9/15/2016	Raptor	8
9/15/2016	Waterfowl	22
9/20/2016	Passerine	1478
9/20/2016	Raptor	14
9/20/2016	Waterbirds	19
9/20/2016	Waterfowl	39
9/27/2016	Passerine	407
9/27/2016	Raptor	36
9/27/2016	Waterfowl	9
10/4/2016	Passerine	113
10/4/2016	Raptor	5
10/6/2016	Passerine	189
10/6/2016	Raptor	3
10/6/2016	Waterbirds	165
10/6/2016	Waterfowl	202
10/10/2016	Passerine	231
10/10/2016	Raptor	19
10/10/2016	Waterbirds	17
10/10/2016	Waterfowl	9
10/13/2016	Passerine	101
10/13/2016	Raptor	1
10/13/2016	Waterbirds	3
10/18/2016	Passerine	1154
10/18/2016	Raptor	13

10/18/2016	Waterbirds	8
10/21/2016	Passerine	361
10/21/2016	Raptor	1
10/21/2016	Waterbirds	2
10/21/2016	Waterfowl	26
10/25/2016	Passerine	1727
10/25/2016	Raptor	1
10/25/2016	Waterfowl	15
10/28/2016	Passerine	83
10/28/2016	Waterfowl	28

MEAN USE DATA

Mean Annual Use By Group

Group	Mean Use
Passerine	8.62
Raptor	0.40
Waterbirds	0.46
Waterfowl	0.33

Mean Annual Use By Species

Species	Mean Use
Acadian Flycatcher	0.00
Alder Flycatcher	0.00
American Coot	0.02
American Crow	0.47
American Golden-Plover	0.02
American Goldfinch	0.43
American Kestrel	0.07
American Pipit	0.01
American Redstart	0.02
American Robin	0.78
American Tree Sparrow	0.02
Bald Eagle	0.04
Baltimore Oriole	0.02
Bank Swallow	0.00
Barn Swallow	0.42
Belted Kingfisher	0.01
Black-and-white Warbler	0.00
Black-bellied Plover	0.00
Black-billed Cuckoo	0.00
Black-capped Chickadee	0.16
Blackpoll Warbler	0.01
Black-throated Green Wa	0.00
Blue Jay	0.28
Blue-winged Teal	0.01
Blue-winged Warbler	0.01
Bobolink	0.07
Brewer's Blackbird	0.00
Broad-winged Hawk	0.00
Brown Creeper	0.00
Brown Thrasher	0.04
Brown-headed Cowbird	0.40
Canada Goose	0.16

Cedar Waxwing	0.03
Chimney Swift	0.01
Chipping Sparrow	0.11
Clay-colored Sparrow	0.00
Cliff Swallow	0.19
Common Grackle	0.71
Common Nighthawk	0.01
Common Snipe	0.00
Common Yellowthroat	0.05
Cooper's Hawk	0.02
Dark-eyed Junco	0.09
Dickcissel	0.00
Double-crested Cormoran	0.00
Downy Woodpecker	0.08
Dunlin	0.00
Eastern Bluebird	0.04
Eastern Kingbird	0.04
Eastern Meadowlark	0.04
Eastern Phoebe	0.08
Eastern Wood-Pewee	0.02
European Starling	0.19
Field Sparrow	0.00
Fox Sparrow	0.02
Franklin's Gull	0.00
Golden-crowned Kinglet	0.00
Grasshopper Sparrow	0.01
Gray Catbird	0.03
Gray Partridge	0.00
Great Blue Heron	0.04
Great Crested Flycatcher	0.02
Greater White-fronted G	0.00
Green Heron	0.00
Green-winged Teal	0.00
Hairy Woodpecker	0.05
Hermit Thrush	0.00
Hooded Merganser	0.00

Horned Lark	0.89
House Finch	0.00
House Sparrow	0.04
House Wren	0.05
Indigo Bunting	0.06
Killdeer	0.28
Lapland Longspur	0.12
Least Flycatcher	0.01
Lesser Scaup	0.00
Lincoln's Sparrow	0.00
Magnolia Warbler	0.00
Mallard	0.09
Marsh Wren	0.00
Mourning Dove	0.14
Mourning Warbler	0.00
Nashville Warbler	0.01
Northern Cardinal	0.10
Northern Flicker	0.08
Northern Harrier	0.06
Northern Rough-winged S	0.02
Northern Shoveler	0.00
Orange-crowned Warbler	0.00
Osprey	0.00
Palm Warbler	0.02
Pectoral Sandpiper	0.01
Pied-billed Grebe	0.00
Pileated Woodpecker	0.00
Red-bellied Woodpecker	0.06
Red-eyed Vireo	0.02
Red-headed Woodpecker	0.01
Red-tailed Hawk	0.11
Red-winged Blackbird	0.76
Ring-billed Gull	0.00
Ring-necked Duck	0.01
Ring-necked Pheasant	0.04
Rock Pigeon	0.03

Rose-breasted Grosbeak	0.02
Ruby-crowned Kinglet	0.02
Ruby-throated Humming	0.01
Ruddy Duck	0.00
Sanderling	0.00
Sandhill Crane	0.03
Savannah Sparrow	0.05
Scarlet Tanager	0.01
Sedge Wren	0.05
Sharp-shinned Hawk	0.03
Short-billed Dowitcher	0.00
Snow Bunting	0.00
Snow Goose	0.00
Song Sparrow	0.37
Sora	0.00
Spotted Sandpiper	0.00
Swamp Sparrow	0.02
Tennessee Warbler	0.01
Tree Swallow	0.08
Turkey Vulture	0.06
Unidentified Bird	0.00
Unidentified Buteo	0.00
Unidentified Duck	0.01
Unidentified Hawk	0.00
Unidentified Passerine	0.12
Unidentified Raptor	0.01
Unidentified Shorebird	0.02
Unidentified Sparrow	0.02
Unidentified Swallow	0.01
Unidentified Vireo	0.00
Unidentified Warbler	0.05
Upland Sandpiper	0.01
Vesper Sparrow	0.16
Virginia Rail	0.00
Warbling Vireo	0.01
Western Meadowlark	0.00

White-breasted Nuthatch	0.05
White-throated Sparrow	0.02
Wild Turkey	0.02
Willow Flycatcher	0.00
Wilson's Snipe	0.01
Wilson's Warbler	0.01
Wood Duck	0.03
Wood Thrush	0.00
Yellow Warbler	0.01
Yellow-bellied Sapsucker	0.00
Yellow-billed Cuckoo	0.00
Yellow-headed Blackbird	0.00
Yellow-rumped Warbler	0.03
Yellow-throated Vireo	0.01

FLIGHT HEIGHT DATA

Mean Flight Height

11 meters

Mean Flight Height By Point

Point #	Mean Flight Height
255804-00	11 meters
255804-00	13 meters
255804-00	13 meters
255804-00	13 meters
255804-00	9 meters
255804-00	8 meters
255804-00	9 meters
255804-00	12 meters
255804-00	16 meters
255804-01	11 meters
255804-01	12 meters
255804-01	10 meters
255804-01	12 meters
255804-01	14 meters
255804-01	12 meters
255804-01	12 meters
255804-01	9 meters
255804-01	11 meters

Total Flights By Group

Group	Total Flights
Passerine	10607
Raptor	182
Waterbirds	317
Waterfowl	1704

Mean Flight Height By Group

Group	Mean Flight Height
Passerine	10 m
Raptor	21 m
Waterbirds	20 m
Waterfowl	26 m

Mean Flight Height By Species

Species	Mean Flight Height
	m
Acadian Flycatcher	m
Alder Flycatcher	m
American Coot	14 m
American Crow	10 m
American Golden-Plover	6 m
American Goldfinch	11 m
American Kestrel	13 m
American Pipit	14 m
American Redstart	6 m
American Robin	9 m
American Tree Sparrow	2 m
Bald Eagle	40 m
Baltimore Oriole	7 m
Bank Swallow	2 m
Barn Swallow	8 m
Belted Kingfisher	15 m
Black-and-white Warbler	m
Black-bellied Plover	5 m
Black-billed Cuckoo	m
Black-capped Chickadee	3 m
Blackpoll Warbler	4 m
Black-throated Green Warble	m
Blue Jay	9 m
Blue-winged Teal	27 m
Blue-winged Warbler	m
Bobolink	5 m
Brewer's Blackbird	10 m
Broad-winged Hawk	30 m
Brown Creeper	m
Brown Thrasher	3 m

Brown-headed Cowbird	6 m
Canada Goose	25 m
Cedar Waxwing	11 m
Chimney Swift	7 m
Chipping Sparrow	4 m
Clay-colored Sparrow	m
Cliff Swallow	10 m
Common Grackle	11 m
Common Nighthawk	43 m
Common Snipe	5 m
Common Yellowthroat	2 m
Cooper's Hawk	33 m
Dark-eyed Junco	3 m
Dickcissel	2 m
Double-crested Cormorant	100 m
Downy Woodpecker	9 m
Dunlin	5 m
Eastern Bluebird	6 m
Eastern Kingbird	4 m
Eastern Meadowlark	3 m
Eastern Phoebe	4 m
Eastern Wood-Pewee	m
European Starling	7 m
Field Sparrow	3 m
Fox Sparrow	3 m
Franklin's Gull	23 m
Golden-crowned Kinglet	m
Grasshopper Sparrow	m
Gray Catbird	m
Gray Partridge	2 m
Great Blue Heron	21 m
Great Crested Flycatcher	8 m
Greater White-fronted Goose	45 m
Green Heron	10 m
Green-winged Teal	m

Hairy Woodpecker	8 m
Hermit Thrush	m
Hooded Merganser	25 m
Horned Lark	13 m
House Finch	22 m
House Sparrow	7 m
House Wren	1 m
Indigo Bunting	8 m
Killdeer	16 m
Lapland Longspur	18 m
Least Flycatcher	m
Lesser Scaup	30 m
Lincoln's Sparrow	1 m
Magnolia Warbler	m
Mallard	28 m
Marsh Wren	m
Mourning Dove	9 m
Mourning Warbler	m
Nashville Warbler	m
Northern Cardinal	4 m
Northern Flicker	9 m
Northern Harrier	7 m
Northern Rough-winged Swal	22 m
Northern Shoveler	m
Orange-crowned Warbler	m
Osprey	15 m
Palm Warbler	4 m
Pectoral Sandpiper	2 m
Pied-billed Grebe	m
Pileated Woodpecker	10 m
Red-bellied Woodpecker	5 m
Red-eyed Vireo	30 m
Red-headed Woodpecker	8 m
Red-tailed Hawk	21 m
Red-winged Blackbird	9 m

Ring-billed Gull	20 m
Ring-necked Duck	20 m
Ring-necked Pheasant	1 m
Rock Pigeon	14 m
Rose-breasted Grosbeak	m
Ruby-crowned Kinglet	5 m
Ruby-throated Hummingbird	5 m
Ruddy Duck	m
Sanderling	10 m
Sandhill Crane	40 m
Savannah Sparrow	6 m
Scarlet Tanager	20 m
Sedge Wren	1 m
Sharp-shinned Hawk	20 m
Short-billed Dowitcher	m
Snow Bunting	6 m
Snow Goose	20 m
Song Sparrow	2 m
Sora	m
Spotted Sandpiper	5 m
Swamp Sparrow	m
Tennessee Warbler	m
Tree Swallow	13 m
Turkey Vulture	26 m
Unidentified Bird	10 m
Unidentified Buteo	20 m
Unidentified Duck	28 m
Unidentified Hawk	150 m
Unidentified Passerine	7 m
Unidentified Raptor	4 m
Unidentified Shorebird	18 m
Unidentified Sparrow	10 m
Unidentified Swallow	18 m
Unidentified Vireo	15 m
Unidentified Warbler	19 m

Upland Sandpiper	90 m
Vesper Sparrow	5 m
Virginia Rail	m
Warbling Vireo	10 m
Western Meadowlark	4 m
White-breasted Nuthatch	5 m
White-throated Sparrow	2 m
Wild Turkey	m
Willow Flycatcher	m
Wilson's Snipe	12 m
Wilson's Warbler	m
Wood Duck	21 m
Wood Thrush	m
Yellow Warbler	5 m
Yellow-bellied Sapsucker	m
Yellow-billed Cuckoo	8 m
Yellow-headed Blackbird	m
Yellow-rumped Warbler	14 m
Yellow-throated Vireo	10 m

FLIGHT ZONE DATA

All Flight Zones Summary

% in Flight Zones: All Species	
<20m:	75.98%
20-150m:	23.84%
>150m:	0.18%

% in Flight Zones: Sensitive Species	
<20m:	67.96117%
20-150m:	31.55340%
>150m:	0.48544%

Rotor Sweep Zone

% in Rotor Sweep By Sensitive Species

Group	Abundance	%
Bald Eagle	10	58.824%
Common Nighthaw	3	12.000%
Franklin's Gull	14	100.000%
Lesser Scaup	26	100.000%
Northern Harrier	3	11.111%
Northern Rough-wi	6	54.545%
Upland Sandpiper	3	100.000%

% in Rotor Sweep By Sensitive Group

Group	Abundance	%
Passerine	9	4.369%
Raptor	13	6.311%
Waterbirds	17	8.252%
Waterfowl	26	12.621%

% in Rotor Sweep By All Species

Group	Abundance	%
American Coot	3	18.750%
American Crow	54	14.876%
American Goldfinc	69	19.167%
American Kestrel	4	21.053%
American Pipit	8	57.143%
American Robin	62	12.971%
Bald Eagle	10	58.824%
Barn Swallow	60	12.195%
Belted Kingfisher	1	33.333%
Blue Jay	72	19.251%
Blue-winged Teal	202	99.020%
Broad-winged Haw	1	50.000%
Brown-headed Co	7	2.800%
Canada Goose	260	64.677%
Cliff Swallow	118	25.160%
Common Grackle	164	11.469%
Common Nighthaw	3	12.000%
Cooper's Hawk	9	90.000%
Double-crested Cor	6	100.000%
European Starling	4	1.028%
Franklin's Gull	14	100.000%
Great Blue Heron	8	36.364%
Greater White-fron	336	100.000%
Hooded Merganser	9	100.000%
Horned Lark	73	23.028%

House Finch	5	100.000%
Indigo Bunting	2	16.667%
Killdeer	30	31.250%
Lapland Longspur	216	36.181%
Lesser Scaup	26	100.000%
Mallard	322	87.978%
Mourning Dove	7	10.145%
Northern Flicker	1	5.000%
Northern Harrier	3	11.111%
Northern Rough-wi	6	54.545%
Red-eyed Vireo	3	100.000%
Red-tailed Hawk	16	41.026%
Red-winged Blackbi	181	4.677%
Ring-billed Gull	2	100.000%
Ring-necked Duck	1	100.000%
Rock Pigeon	6	22.222%
Sandhill Crane	9	64.286%
Scarlet Tanager	1	100.000%
Sharp-shinned Haw	7	58.333%
Snow Goose	20	100.000%
Tree Swallow	39	35.780%
Turkey Vulture	34	77.273%
Unidentified Bird	14	93.333%
Unidentified Buteo	1	100.000%
Unidentified Duck	306	99.351%
Unidentified Hawk	1	100.000%
Unidentified Passer	6	6.250%
Unidentified Shore	101	93.519%
Unidentified Sparro	7	31.818%
Unidentified Swallo	20	95.238%
Unidentified Warbl	73	62.931%
Upland Sandpiper	3	100.000%
Wood Duck	22	68.750%
Yellow-rumped Wa	6	21.429%

% in Rotor Sweep By All Groups

Group	Abundance	%
Passerine	1288	10.055%
Raptor	86	0.671%
Waterbirds	176	1.374%
Waterfowl	1504	11.741%

Less than 30 meters

% < 20 meters By Sensitive Groups

Group	Abundance	%
Passerine	96	46.602%
Raptor	30	14.563%
Waterbirds	14	6.796%

% < 20 meters By All Groups

Group	Abundance	%
Passerine	9312	72.693%
Raptor	95	0.742%
Waterbirds	141	1.101%
Waterfowl	185	1.444%

% < 20 meters By Sensitive Species

Group	Abundance	%
American Golden-Plover	12	100.000%
Bald Eagle	6	35.294%
Bobolink	39	100.000%
Brown Thrasher	1	100.000%
Common Nighthawk	22	88.000%
Dickcissel	5	100.000%
Dunlin	2	100.000%
Eastern Meadowlark	9	100.000%
Field Sparrow	2	100.000%
Northern Harrier	24	88.889%
Northern Rough-winged Swallo	5	45.455%
Red-headed Woodpecker	4	100.000%
Sedge Wren	3	100.000%
White-throated Sparrow	6	100.000%

% < 20 meters By All Species

Group	Abundance	%
American Coot	13	81.250%
American Crow	309	85.124%
American Golden-Plover	12	100.000%
American Goldfinch	291	80.833%
American Kestrel	15	78.947%
American Pipit	6	42.857%
American Redstart	4	100.000%
American Robin	416	87.029%
American Tree Sparrow	1	100.000%
Bald Eagle	6	35.294%
Baltimore Oriole	7	100.000%
Bank Swallow	1	100.000%
Barn Swallow	425	86.382%
Belted Kingfisher	2	66.667%
Black-bellied Plover	5	100.000%
Black-capped Chickadee	29	100.000%
Blackpoll Warbler	2	100.000%
Blue Jay	302	80.749%
Blue-winged Teal	2	0.980%
Bobolink	39	100.000%
Brewer's Blackbird	100	100.000%
Broad-winged Hawk	1	50.000%
Brown Thrasher	1	100.000%
Brown-headed Cowbird	243	97.200%
Canada Goose	127	31.592%

Cedar Waxwing	22	100.000%
Chimney Swift	3	100.000%
Chipping Sparrow	23	100.000%
Cliff Swallow	351	74.840%
Common Grackle	1266	88.531%
Common Nighthawk	22	88.000%
Common Snipe	2	100.000%
Common Yellowthroat	1	100.000%
Cooper's Hawk	1	10.000%
Dark-eyed Junco	118	100.000%
Dickcissel	5	100.000%
Downy Woodpecker	10	100.000%
Dunlin	2	100.000%
Eastern Bluebird	16	100.000%
Eastern Kingbird	16	100.000%
Eastern Meadowlark	9	100.000%
Eastern Phoebe	15	100.000%
European Starling	385	98.972%
Field Sparrow	2	100.000%
Fox Sparrow	2	100.000%
Gray Partridge	4	100.000%
Great Blue Heron	14	63.636%
Great Crested Flycatcher	4	100.000%
Green Heron	1	100.000%
Hairy Woodpecker	9	100.000%
Horned Lark	244	76.972%
House Sparrow	32	100.000%
House Wren	1	100.000%
Indigo Bunting	10	83.333%
Killdeer	66	68.750%
Lapland Longspur	381	63.819%
Lincoln's Sparrow	2	100.000%
Mallard	44	12.022%
Mourning Dove	62	89.855%
Northern Cardinal	4	100.000%
Northern Flicker	19	95.000%

Northern Harrier	24	88.889%
Northern Rough-winged Swallo	5	45.455%
Osprey	1	100.000%
Palm Warbler	9	100.000%
Pectoral Sandpiper	7	100.000%
Pileated Woodpecker	1	100.000%
Red-bellied Woodpecker	5	100.000%
Red-headed Woodpecker	4	100.000%
Red-tailed Hawk	23	58.974%
Red-winged Blackbird	3689	95.323%
Ring-necked Pheasant	1	100.000%
Rock Pigeon	21	77.778%
Ruby-crowned Kinglet	1	100.000%
Ruby-throated Hummingbird	3	100.000%
Sanderling	3	100.000%
Sandhill Crane	5	35.714%
Savannah Sparrow	13	100.000%
Sedge Wren	3	100.000%
Sharp-shinned Hawk	5	41.667%
Snow Bunting	16	100.000%
Song Sparrow	40	100.000%
Spotted Sandpiper	2	100.000%
Tree Swallow	70	64.220%
Turkey Vulture	10	22.727%
Unidentified Bird	1	6.667%
Unidentified Duck	2	0.649%
Unidentified Passerine	90	93.750%
Unidentified Raptor	9	100.000%
Unidentified Shorebird	7	6.481%
Unidentified Sparrow	15	68.182%
Unidentified Swallow	1	4.762%
Unidentified Vireo	1	100.000%
Unidentified Warbler	43	37.069%
Vesper Sparrow	16	100.000%
Warbling Vireo	2	100.000%
Western Meadowlark	6	100.000%

White-breasted Nuthatch	5	100.000%
White-throated Sparrow	6	100.000%
Wilson's Snipe	2	100.000%
Wood Duck	10	31.250%
Yellow Warbler	1	100.000%
Yellow-billed Cuckoo	2	100.000%
Yellow-rumped Warbler	22	78.571%
Yellow-throated Vireo	4	100.000%

More than 150 meters

% > 150 meters By Sensitive Groups

Group	Abundance	%
Raptor	1	0.485%

% > 150 meters By All Groups

Group	Abundance	%
Passerine	7	0.055%
Raptor	1	0.008%
Waterfowl	15	0.117%

% > 150 meters By Sensitive Species

Group	Abundance	%
Bald Eagle	1	5.882%

% > 150 meters By All Species

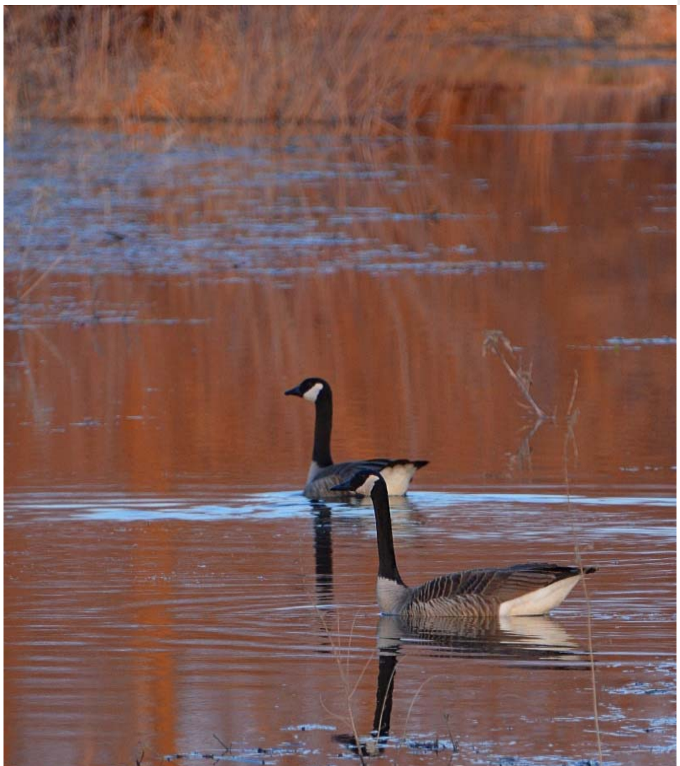
Group	Abundance	%
Bald Eagle	1	5.882%
Barn Swallow	7	1.423%
Canada Goose	15	3.731%

OBSERVATION DATA

Total Observations By Date

Sample Date	Abundance
6/2/2015	50
6/4/2015	190
6/18/2015	210
6/24/2015	22
6/25/2015	183
3/16/2016	278
3/17/2016	1120
3/22/2016	388
3/25/2016	193
3/29/2016	792
4/5/2016	377
4/6/2016	166
4/11/2016	283
4/12/2016	137
4/20/2016	268
4/22/2016	331
4/27/2016	46
4/28/2016	263
5/5/2016	233
5/6/2016	269
5/12/2016	536
5/19/2016	41
5/20/2016	295
5/24/2016	251
5/26/2016	258
6/16/2016	17
8/16/2016	154
8/18/2016	269
8/23/2016	266
8/26/2016	211
8/29/2016	390
8/30/2016	202
9/8/2016	383
9/9/2016	288
9/15/2016	222
9/20/2016	1550
9/27/2016	452
10/4/2016	118
10/6/2016	559
10/10/2016	276
10/13/2016	105

10/18/2016	1175
10/21/2016	390
10/25/2016	1743
10/28/2016	111



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Wetland Use Data

Ashland Township Wetland

Common Name	Scientific Name	Abundance	Location	Date
American Coot	Fulica americana	60	Ashland	3/29/2016
American Wigeon	Anas americana	10	Ashland	3/29/2016
Bald Eagle	Haliaeetus leucocephalus	2	Ashland	3/29/2016
Blue-winged Teal	Anas discors	6	Ashland	3/29/2016
Green-winged Teal	Anas crecca	20	Ashland	3/29/2016
Lesser Scaup	Aythya affinis	50	Ashland	3/29/2016
Mallard	Anas platyrhynchos	24	Ashland	3/29/2016
Northern Shoveler	Anas clypeata	20	Ashland	3/29/2016
Redhead	Aythya americana	30	Ashland	3/29/2016
Ring-necked Duck	Aythya collaris	10	Ashland	3/29/2016
Ruddy Duck	Oxyura jamaicensis	6	Ashland	3/29/2016
Sandhill Crane	Antigone canadensis	2	Ashland	3/29/2016
American Coot	Fulica americana	30	Ashland	4/5/2016
American Robin	Turdus migratorius	1	Ashland	4/5/2016
Bald Eagle	Haliaeetus leucocephalus	2	Ashland	4/5/2016
Blue-winged Teal	Anas discors	9	Ashland	4/5/2016
Dark-eyed Junco	Junco hyemalis	30	Ashland	4/5/2016
Green-winged Teal	Anas crecca	6	Ashland	4/5/2016
Lesser Scaup	Aythya affinis	20	Ashland	4/5/2016
Mallard	Anas platyrhynchos	100	Ashland	4/5/2016
Northern Shoveler	Anas clypeata	10	Ashland	4/5/2016
Redhead	Aythya americana	30	Ashland	4/5/2016
Ring-necked Duck	Aythya collaris	20	Ashland	4/5/2016
Ruddy Duck	Oxyura jamaicensis	6	Ashland	4/5/2016
American Coot	Fulica americana	30	Ashland	4/7/2016
American Crow	Corvus brachyrhynchos	4	Ashland	4/7/2016
American Robin	Turdus migratorius	1	Ashland	4/7/2016
American Tree Sparrow	Spizelloides arborea	2	Ashland	4/7/2016
Canada Goose	Branta canadensis	4	Ashland	4/7/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	4/7/2016
Mallard	Anas platyrhynchos	15	Ashland	4/7/2016
Northern Flicker	Colaptes auratus	1	Ashland	4/7/2016
Northern Harrier	Circus cyaneus	1	Ashland	4/7/2016
Northern Shoveler	Anas clypeata	4	Ashland	4/7/2016
Redhead	Aythya americana	10	Ashland	4/7/2016
Red-tailed Hawk	Buteo jamaicensis	1	Ashland	4/7/2016
Ring-necked Duck	Aythya collaris	30	Ashland	4/7/2016
Ruddy Duck	Oxyura jamaicensis	4	Ashland	4/7/2016
Sandhill Crane	Antigone canadensis	2	Ashland	4/7/2016
American Coot	Fulica americana	12	Ashland	5/5/2016
American Crow	Corvus brachyrhynchos	2	Ashland	5/5/2016
Bald Eagle	Haliaeetus leucocephalus	1	Ashland	5/5/2016
Barn Swallow	Hirundo rustica	2	Ashland	5/5/2016

Oak Glen Wetland

Common Name	Scientific Name	Abundance	Location	Date
Greater White-fronted Goo	Anser albifrons	400	Oak Glen	3/29/2016
Canada Goose	Branta canadensis	8	Oak Glen	3/29/2016
Gadwall	Anas strepera	50	Oak Glen	3/29/2016
Mallard	Anas platyrhynchos	12	Oak Glen	3/29/2016
Redhead	Aythya americana	500	Oak Glen	3/29/2016
Ring-necked Duck	Aythya collaris	100	Oak Glen	3/29/2016
Lesser Scaup	Aythya affinis	100	Oak Glen	3/29/2016
Bufflehead	Bucephala albeola	6	Oak Glen	3/29/2016
Ruddy Duck	Oxyura jamaicensis	30	Oak Glen	3/29/2016
Bald Eagle	Haliaeetus leucocephalus	1	Oak Glen	3/29/2016
American Coot	Fulica americana	300	Oak Glen	3/29/2016
Ring-billed Gull	Larus delawarensis	30	Oak Glen	3/29/2016
Dark-eyed Junco	Junco hyemalis	4	Oak Glen	3/29/2016
Song Sparrow	Melospiza melodia	1	Oak Glen	3/29/2016
Canada Goose	Branta canadensis	16	Oak Glen	4/5/2016
Tundra Swan	Cygnus columbianus	2	Oak Glen	4/5/2016
Gadwall	Anas strepera	100	Oak Glen	4/5/2016
American Wigeon	Anas americana	10	Oak Glen	4/5/2016
Canvasback	Aythya valisineria	200	Oak Glen	4/5/2016
Redhead	Aythya americana	200	Oak Glen	4/5/2016
Ring-necked Duck	Aythya collaris	200	Oak Glen	4/5/2016
Lesser Scaup	Aythya affinis	200	Oak Glen	4/5/2016
Bufflehead	Bucephala albeola	6	Oak Glen	4/5/2016
Ruddy Duck	Oxyura jamaicensis	6	Oak Glen	4/5/2016
Pied-billed Grebe	Podilymbus podiceps	1	Oak Glen	4/5/2016
American Coot	Fulica americana	600	Oak Glen	4/5/2016
Ring-billed Gull	Larus delawarensis	2	Oak Glen	4/5/2016
Song Sparrow	Melospiza melodia	1	Oak Glen	4/5/2016
Greater White-fronted Goo	Anser albifrons	200	Oak Glen	4/7/2016
Canada Goose	Branta canadensis	12	Oak Glen	4/7/2016
Gadwall	Anas strepera	100	Oak Glen	4/7/2016
American Wigeon	Anas americana	30	Oak Glen	4/7/2016
Mallard	Anas platyrhynchos	6	Oak Glen	4/7/2016
Redhead	Aythya americana	100	Oak Glen	4/7/2016
Ring-necked Duck	Aythya collaris	50	Oak Glen	4/7/2016
Lesser Scaup	Aythya affinis	50	Oak Glen	4/7/2016
Ruddy Duck	Oxyura jamaicensis	10	Oak Glen	4/7/2016
Pied-billed Grebe	Podilymbus podiceps	1	Oak Glen	4/7/2016
Horned Grebe	Podiceps auritus	1	Oak Glen	4/7/2016
American Coot	Fulica americana	300	Oak Glen	4/7/2016
Ring-billed Gull	Larus delawarensis	30	Oak Glen	4/7/2016
Canada Goose	Branta canadensis	15	Oak Glen	5/5/2016
Trumpeter Swan	Cygnus buccinator	2	Oak Glen	5/5/2016

Ashland Township Wetland

Common Name	Scientific Name	Abundance	Location	Date
Blue-winged Teal	Anas discors	6	Ashland	5/5/2016
Bobolink	Dolichonyx oryzivorus	3	Ashland	5/5/2016
Canada Goose	Branta canadensis	2	Ashland	5/5/2016
Lesser Scaup	Aythya affinis	1	Ashland	5/5/2016
Mallard	Anas platyrhynchos	3	Ashland	5/5/2016
Pied-billed Grebe	Podilymbus podiceps	6	Ashland	5/5/2016
Red-winged Blackbird	Agelaius phoeniceus	2	Ashland	5/5/2016
Ruddy Duck	Oxyura jamaicensis	2	Ashland	5/5/2016
Sandhill Crane	Antigone canadensis	1	Ashland	5/5/2016
Song Sparrow	Melospiza melodia	1	Ashland	5/5/2016
Sora	Porzana carolina	1	Ashland	5/5/2016
Vesper Sparrow	Pooecetes gramineus	2	Ashland	5/5/2016
American Coot	Fulica americana	1	Ashland	5/12/2016
Bank Swallow	Riparia riparia	5	Ashland	5/12/2016
Barn Swallow	Hirundo rustica	50	Ashland	5/12/2016
Black Tern	Chlidonias niger	2	Ashland	5/12/2016
Blue-winged Teal	Anas discors	2	Ashland	5/12/2016
Bobolink	Dolichonyx oryzivorus	20	Ashland	5/12/2016
Brown-headed Cowbird	Molothrus ater	2	Ashland	5/12/2016
Cooper's Hawk	Accipiter cooperii	1	Ashland	5/12/2016
Northern Rough-winged S	Stelgidopteryx serripennis	6	Ashland	5/12/2016
Pied-billed Grebe	Podilymbus podiceps	2	Ashland	5/12/2016
Redhead	Aythya americana	5	Ashland	5/12/2016
Red-tailed Hawk	Buteo jamaicensis	1	Ashland	5/12/2016
Sharp-shinned Hawk	Accipiter striatus	1	Ashland	5/12/2016
Song Sparrow	Melospiza melodia	1	Ashland	5/12/2016
Sora	Porzana carolina	1	Ashland	5/12/2016
Tree Swallow	Tachycineta bicolor	40	Ashland	5/12/2016
American Coot	Fulica americana	1	Ashland	5/24/2016
Black Tern	Chlidonias niger	7	Ashland	5/24/2016
Bobolink	Dolichonyx oryzivorus	25	Ashland	5/24/2016
Canada Goose	Branta canadensis	17	Ashland	5/24/2016
Cliff Swallow	Petrochelidon pyrrhonota	2	Ashland	5/24/2016
Common Grackle	Quiscalus quiscula	6	Ashland	5/24/2016
Common Yellowthroat	Geothlypis trichas	3	Ashland	5/24/2016
Double-crested Cormoran	Phalacrocorax auritus	1	Ashland	5/24/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	5/24/2016
Grasshopper Sparrow	Ammodramus savannarum	2	Ashland	5/24/2016
Hooded Merganser	Lophodytes cucullatus	3	Ashland	5/24/2016
Mourning Dove	Zenaida macroura	2	Ashland	5/24/2016
Northern Rough-winged S	Stelgidopteryx serripennis	2	Ashland	5/24/2016
Red-winged Blackbird	Agelaius phoeniceus	8	Ashland	5/24/2016
Ring-necked Pheasant	Phasianus colchicus	1	Ashland	5/24/2016

Oak Glen Wetland

Common Name	Scientific Name	Abundance	Location	Date
Lesser Scaup	Aythya affinis	4	Oak Glen	5/5/2016
Bufflehead	Bucephala albeola	2	Oak Glen	5/5/2016
Common Goldeneye	Bucephala clangula	1	Oak Glen	5/5/2016
Hooded Merganser	Lophodytes cucullatus	1	Oak Glen	5/5/2016
Ruddy Duck	Oxyura jamaicensis	20	Oak Glen	5/5/2016
Pied-billed Grebe	Podilymbus podiceps	20	Oak Glen	5/5/2016
Horned Grebe	Podiceps auritus	2	Oak Glen	5/5/2016
Double-crested Cormorant	Phalacrocorax auritus	5	Oak Glen	5/5/2016
American White Pelican	Pelecanus erythrorhynchos	3	Oak Glen	5/5/2016
American Coot	Fulica americana	40	Oak Glen	5/5/2016
Mourning Dove	Zenaida macroura	1	Oak Glen	5/5/2016
Downy Woodpecker	Picoides pubescens	1	Oak Glen	5/5/2016
Tree Swallow	Tachycineta bicolor	1	Oak Glen	5/5/2016
American Robin	Turdus migratorius	1	Oak Glen	5/5/2016
Brown Thrasher	Toxostoma rufum	3	Oak Glen	5/5/2016
Song Sparrow	Melospiza melodia	2	Oak Glen	5/5/2016
Red-winged Blackbird	Agelaius phoeniceus	20	Oak Glen	5/5/2016
Common Grackle	Quiscalus quiscula	6	Oak Glen	5/5/2016
American Goldfinch	Spinus tristis	2	Oak Glen	5/5/2016
Canada Goose	Branta canadensis	6	Oak Glen	5/12/2016
Mallard	Anas platyrhynchos	2	Oak Glen	5/12/2016
Lesser Scaup	Aythya affinis	5	Oak Glen	5/12/2016
Ruddy Duck	Oxyura jamaicensis	30	Oak Glen	5/12/2016
Bald Eagle	Haliaeetus leucocephalus	1	Oak Glen	5/12/2016
Black Tern	Chlidonias niger	13	Oak Glen	5/12/2016
Peregrine Falcon	Falco peregrinus	1	Oak Glen	5/12/2016
Yellow-throated Vireo	Vireo flavifrons	6	Oak Glen	5/12/2016
Barn Swallow	Hirundo rustica	10	Oak Glen	5/12/2016
Common Yellowthroat	Geothlypis trichas	1	Oak Glen	5/12/2016
Yellow Warbler	Setophaga petechia	1	Oak Glen	5/12/2016
Chipping Sparrow	Spizella passerina	1	Oak Glen	5/12/2016
Song Sparrow	Melospiza melodia	1	Oak Glen	5/12/2016
Red-winged Blackbird	Agelaius phoeniceus	6	Oak Glen	5/12/2016
Common Grackle	Quiscalus quiscula	3	Oak Glen	5/12/2016
Baltimore Oriole	Icterus galbula	1	Oak Glen	5/12/2016
Canada Goose	Branta canadensis	12	Oak Glen	5/24/2016
Ring-necked Duck	Aythya collaris	1	Oak Glen	5/24/2016
Franklin's Gull	Leucophaeus pipixcan	2	Oak Glen	5/24/2016
Forster's Tern	Sterna forsteri	21	Oak Glen	5/24/2016
Willow Flycatcher	Empidonax traillii	1	Oak Glen	5/24/2016
Warbling Vireo	Vireo gilvus	1	Oak Glen	5/24/2016
Black-capped Chickadee	Poecile atricapillus	1	Oak Glen	5/24/2016
Gray Catbird	Dumetella carolinensis	1	Oak Glen	5/24/2016

Ashland Township Wetland

Common Name	Scientific Name	Abundance	Location	Date
Sedge Wren	Cistothorus platensis	4	Ashland	5/24/2016
Tree Swallow	Tachycineta bicolor	2	Ashland	5/24/2016
American Goldfinch	Spinus tristis	3	Ashland	5/26/2016
Black Tern	Chlidonias niger	6	Ashland	5/26/2016
Bobolink	Dolichonyx oryzivorus	8	Ashland	5/26/2016
Common Grackle	Quiscalus quiscula	4	Ashland	5/26/2016
Common Yellowthroat	Geothlypis trichas	2	Ashland	5/26/2016
Grasshopper Sparrow	Ammodramus savannarum	1	Ashland	5/26/2016
Mallard	Anas platyrhynchos	3	Ashland	5/26/2016
Red-winged Blackbird	Agelaius phoeniceus	6	Ashland	5/26/2016
Sedge Wren	Cistothorus platensis	1	Ashland	5/26/2016
American Goldfinch	Spinus tristis	2	Ashland	8/16/2016
Barn Swallow	Hirundo rustica	8	Ashland	8/16/2016
Cliff Swallow	Petrochelidon pyrrhonota	15	Ashland	8/16/2016
Common Yellowthroat	Geothlypis trichas	1	Ashland	8/16/2016
Henslow's Sparrow	Ammodramus henslowii	2	Ashland	8/16/2016
Mallard	Anas platyrhynchos	10	Ashland	8/16/2016
Northern Harrier	Circus cyaneus	1	Ashland	8/16/2016
Pied-billed Grebe	Podilymbus podiceps	15	Ashland	8/16/2016
Sedge Wren	Cistothorus platensis	5	Ashland	8/16/2016
Solitary Sandpiper	Tringa solitaria	1	Ashland	8/16/2016
Song Sparrow	Melospiza melodia	1	Ashland	8/16/2016
Yellow-billed Cuckoo	Coccyzus americanus	1	Ashland	8/16/2016
Barn Swallow	Hirundo rustica	6	Ashland	8/18/2016
Cliff Swallow	Petrochelidon pyrrhonota	12	Ashland	8/18/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	8/18/2016
Great Blue Heron	Ardea herodias	1	Ashland	8/18/2016
Pied-billed Grebe	Podilymbus podiceps	10	Ashland	8/18/2016
Sedge Wren	Cistothorus platensis	3	Ashland	8/18/2016
Tree Swallow	Tachycineta bicolor	2	Ashland	8/18/2016
American Goldfinch	Spinus tristis	2	Ashland	8/23/2016
American Kestrel	Falco sparverius	2	Ashland	8/23/2016
Barn Swallow	Hirundo rustica	6	Ashland	8/23/2016
Cliff Swallow	Petrochelidon pyrrhonota	12	Ashland	8/23/2016
Pied-billed Grebe	Podilymbus podiceps	6	Ashland	8/23/2016
Sedge Wren	Cistothorus platensis	1	Ashland	8/23/2016
Tree Swallow	Tachycineta bicolor	1	Ashland	8/23/2016
American Goldfinch	Spinus tristis	3	Ashland	8/31/2016
American Kestrel	Falco sparverius	1	Ashland	8/31/2016
Barn Swallow	Hirundo rustica	6	Ashland	8/31/2016
Cliff Swallow	Petrochelidon pyrrhonota	30	Ashland	8/31/2016
Great Blue Heron	Ardea herodias	1	Ashland	8/31/2016
Killdeer	Charadrius vociferus	1	Ashland	8/31/2016

Oak Glen Wetland

Common Name	Scientific Name	Abundance	Location	Date
Yellow Warbler	Setophaga petechia	1	Oak Glen	5/24/2016
Chestnut-sided Warbler	Setophaga pensylvanica	1	Oak Glen	5/24/2016
Blackpoll Warbler	Setophaga striata	1	Oak Glen	5/24/2016
Red-winged Blackbird	Agelaius phoeniceus	6	Oak Glen	5/24/2016
Common Grackle	Quiscalus quiscula	3	Oak Glen	5/24/2016
Trumpeter Swan	Cygnus buccinator	2	Oak Glen	5/26/2016
Mallard	Anas platyrhynchos	4	Oak Glen	5/26/2016
Ruddy Duck	Oxyura jamaicensis	8	Oak Glen	5/26/2016
Black Tern	Chlidonias niger	6	Oak Glen	5/26/2016
Red-eyed Vireo	Vireo olivaceus	1	Oak Glen	5/26/2016
House Wren	Troglodytes aedon	1	Oak Glen	5/26/2016
Common Yellowthroat	Geothlypis trichas	2	Oak Glen	5/26/2016
American Redstart	Setophaga ruticilla	1	Oak Glen	5/26/2016
Red-winged Blackbird	Agelaius phoeniceus	4	Oak Glen	5/26/2016
Common Grackle	Quiscalus quiscula	2	Oak Glen	5/26/2016
Trumpeter Swan	Cygnus buccinator	5	Oak Glen	8/16/2016
Pied-billed Grebe	Podilymbus podiceps	12	Oak Glen	8/16/2016
Franklin's Gull	Leucophaeus pipixcan	50	Oak Glen	8/16/2016
Barn Swallow	Hirundo rustica	5	Oak Glen	8/16/2016
Sedge Wren	Cistothorus platensis	2	Oak Glen	8/16/2016
American Goldfinch	Spinus tristis	3	Oak Glen	8/16/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	8/18/2016
Pied-billed Grebe	Podilymbus podiceps	25	Oak Glen	8/18/2016
Double-crested Cormorant	Phalacrocorax auritus	1	Oak Glen	8/18/2016
Ruby-throated Hummingbi	Archilochus colubris	3	Oak Glen	8/18/2016
American Crow	Corvus brachyrhynchos	2	Oak Glen	8/18/2016
Barn Swallow	Hirundo rustica	5	Oak Glen	8/18/2016
Tennessee Warbler	Oreothlypis peregrina	2	Oak Glen	8/18/2016
American Goldfinch	Spinus tristis	3	Oak Glen	8/18/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	8/23/2016
Turkey Vulture	Cathartes aura	1	Oak Glen	8/23/2016
Franklin's Gull	Leucophaeus pipixcan	25	Oak Glen	8/23/2016
Ruby-throated Hummingbi	Archilochus colubris	3	Oak Glen	8/23/2016
Cliff Swallow	Petrochelidon pyrrhonota	5	Oak Glen	8/23/2016
American Goldfinch	Spinus tristis	2	Oak Glen	8/23/2016
Trumpeter Swan	Cygnus buccinator	5	Oak Glen	8/30/2016
Pied-billed Grebe	Podilymbus podiceps	20	Oak Glen	8/30/2016
Franklin's Gull	Leucophaeus pipixcan	200	Oak Glen	8/30/2016
American Goldfinch	Spinus tristis	4	Oak Glen	8/30/2016
Trumpeter Swan	Cygnus buccinator	5	Oak Glen	8/31/2016
Mallard	Anas platyrhynchos	2	Oak Glen	8/31/2016
Pied-billed Grebe	Podilymbus podiceps	10	Oak Glen	8/31/2016
Franklin's Gull	Leucophaeus pipixcan	100	Oak Glen	8/31/2016

Ashland Township Wetland

Common Name	Scientific Name	Abundance	Location	Date
Mallard	Anas platyrhynchos	2	Ashland	8/31/2016
Northern Harrier	Circus cyaneus	1	Ashland	8/31/2016
Pied-billed Grebe	Podilymbus podiceps	4	Ashland	8/31/2016
Red-tailed Hawk	Buteo jamaicensis	1	Ashland	8/31/2016
Sedge Wren	Cistothorus platensis	1	Ashland	8/31/2016
Sora	Porzana carolina	1	Ashland	8/31/2016
sparrow sp.	Emberizidae sp. (sparrow sp.)	2	Ashland	8/31/2016
American Coot	Fulica americana	3	Ashland	9/8/2016
American Goldfinch	Spinus tristis	2	Ashland	9/8/2016
Barn Swallow	Hirundo rustica	2	Ashland	9/8/2016
Canada Goose	Branta canadensis	5	Ashland	9/8/2016
Cliff Swallow	Petrochelidon pyrrhonota	13	Ashland	9/8/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	9/8/2016
Lesser Yellowlegs	Tringa flavipes	2	Ashland	9/8/2016
Mallard	Anas platyrhynchos	7	Ashland	9/8/2016
Pied-billed Grebe	Podilymbus podiceps	6	Ashland	9/8/2016
Sandhill Crane	Antigone canadensis	3	Ashland	9/8/2016
Sedge Wren	Cistothorus platensis	1	Ashland	9/8/2016
American Coot	Fulica americana	10	Ashland	9/20/2016
American Goldfinch	Spinus tristis	2	Ashland	9/20/2016
Barn Swallow	Hirundo rustica	10	Ashland	9/20/2016
Blue-winged Teal	Anas discors	90	Ashland	9/20/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	9/20/2016
Northern Shoveler	Anas clypeata	6	Ashland	9/20/2016
Pied-billed Grebe	Podilymbus podiceps	25	Ashland	9/20/2016
Sedge Wren	Cistothorus platensis	3	Ashland	9/20/2016
Yellow-rumped Warbler	Setophaga coronata	2	Ashland	9/20/2016
American Coot	Fulica americana	38	Ashland	9/27/2016
American Golden-Plover	Pluvialis dominica	1	Ashland	9/27/2016
American Goldfinch	Spinus tristis	2	Ashland	9/27/2016
Barn Swallow	Hirundo rustica	15	Ashland	9/27/2016
Canada Goose	Branta canadensis	4	Ashland	9/27/2016
Northern Pintail	Anas acuta	3	Ashland	9/27/2016
Red-tailed Hawk	Buteo jamaicensis	3	Ashland	9/27/2016
American Crow	Corvus brachyrhynchos	1	Ashland	10/4/2016
Eastern Meadowlark	Sturnella magna	1	Ashland	10/4/2016
Fox Sparrow	Passerella iliaca	2	Ashland	10/4/2016
American Coot	Fulica americana	30	Ashland	10/6/2016
Bald Eagle	Haliaeetus leucocephalus	1	Ashland	10/6/2016
Blue-winged Teal	Anas discors	50	Ashland	10/6/2016
Eastern Meadowlark	Sturnella magna	5	Ashland	10/6/2016
Palm Warbler	Setophaga palmarum	4	Ashland	10/6/2016
Pied-billed Grebe	Podilymbus podiceps	2	Ashland	10/6/2016

Oak Glen Wetland

Common Name	Scientific Name	Abundance	Location	Date
Ruby-throated Hummingbi	Archilochus colubris	4	Oak Glen	8/31/2016
Cliff Swallow	Petrochelidon pyrrhonota	5	Oak Glen	8/31/2016
Cedar Waxwing	Bombycilla cedrorum	6	Oak Glen	8/31/2016
American Goldfinch	Spinus tristis	2	Oak Glen	8/31/2016
Trumpeter Swan	Cygnus buccinator	5	Oak Glen	9/8/2016
Mallard	Anas platyrhynchos	1	Oak Glen	9/8/2016
Pied-billed Grebe	Podilymbus podiceps	5	Oak Glen	9/8/2016
Franklin's Gull	Leucophaeus pipixcan	100	Oak Glen	9/8/2016
Ring-billed Gull	Larus delawarensis	10	Oak Glen	9/8/2016
Mourning Dove	Zenaida macroura	1	Oak Glen	9/8/2016
Ruby-throated Hummingbi	Archilochus colubris	4	Oak Glen	9/8/2016
Black-capped Chickadee	Poecile atricapillus	1	Oak Glen	9/8/2016
Cedar Waxwing	Bombycilla cedrorum	2	Oak Glen	9/8/2016
American Goldfinch	Spinus tristis	3	Oak Glen	9/8/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	9/20/2016
Pied-billed Grebe	Podilymbus podiceps	100	Oak Glen	9/20/2016
American Coot	Fulica americana	30	Oak Glen	9/20/2016
Franklin's Gull	Leucophaeus pipixcan	100	Oak Glen	9/20/2016
Barn Swallow	Hirundo rustica	20	Oak Glen	9/20/2016
Trumpeter Swan	Cygnus buccinator	5	Oak Glen	9/27/2016
Pied-billed Grebe	Podilymbus podiceps	40	Oak Glen	9/27/2016
Turkey Vulture	Cathartes aura	1	Oak Glen	9/27/2016
Northern Harrier	Circus cyaneus	1	Oak Glen	9/27/2016
Cooper's Hawk	Accipiter cooperii	1	Oak Glen	9/27/2016
Bald Eagle	Haliaeetus leucocephalus	1	Oak Glen	9/27/2016
American Coot	Fulica americana	1000	Oak Glen	9/27/2016
Ring-billed Gull	Larus delawarensis	20	Oak Glen	9/27/2016
Hairy Woodpecker	Picoides villosus	1	Oak Glen	9/27/2016
Nashville Warbler	Oreothlypis ruficapilla	5	Oak Glen	9/27/2016
White-throated Sparrow	Zonotrichia albicollis	5	Oak Glen	9/27/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	10/4/2016
Pied-billed Grebe	Podilymbus podiceps	50	Oak Glen	10/4/2016
Bald Eagle	Haliaeetus leucocephalus	1	Oak Glen	10/4/2016
American Coot	Fulica americana	1500	Oak Glen	10/4/2016
Franklin's Gull	Leucophaeus pipixcan	1	Oak Glen	10/4/2016
Ring-billed Gull	Larus delawarensis	2	Oak Glen	10/4/2016
Hairy Woodpecker	Picoides villosus	1	Oak Glen	10/4/2016
Blue-winged Teal	Anas discors	30	Oak Glen	10/6/2016
Pied-billed Grebe	Podilymbus podiceps	40	Oak Glen	10/6/2016
Cooper's Hawk	Accipiter cooperii	1	Oak Glen	10/6/2016
Bald Eagle	Haliaeetus leucocephalus	1	Oak Glen	10/6/2016
Red-tailed Hawk	Buteo jamaicensis	1	Oak Glen	10/6/2016
American Coot	Fulica americana	2000	Oak Glen	10/6/2016

Ashland Township Wetland

Common Name	Scientific Name	Abundance	Location	Date
Rock Pigeon (Feral Pigeor	Columba livia (Feral Pigeon)	1	Ashland ¯	10/6/2016
Turkey Vulture	Cathartes aura	1	Ashland ¯	10/6/2016
Yellow-rumped Warbler	Setophaga coronata	4	Ashland ¯	10/6/2016
American Coot	Fulica americana	5	Ashland ¯	10/10/2016
Bald Eagle	Haliaeetus leucocephalus	1	Ashland ¯	10/10/2016
Horned Lark	Eremophila alpestris	1	Ashland ¯	10/10/2016
Lapland Longspur	Calcarius lapponicus	5	Ashland ¯	10/10/2016
American Coot	Fulica americana	20	Ashland ¯	10/18/2016
Blue-winged Teal	Anas discors	35	Ashland ¯	10/18/2016
Bufflehead	Bucephala albeola	3	Ashland ¯	10/18/2016
Gadwall	Anas strepera	10	Ashland ¯	10/18/2016
Northern Harrier	Circus cyaneus	1	Ashland ¯	10/18/2016
Red-tailed Hawk	Buteo jamaicensis	1	Ashland ¯	10/18/2016
Ruddy Duck	Oxyura jamaicensis	6	Ashland ¯	10/18/2016
Song Sparrow	Melospiza melodia	2	Ashland ¯	10/18/2016
American Coot	Fulica americana	35	Ashland ¯	10/21/2016
American Crow	Corvus brachyrhynchos	2	Ashland ¯	10/21/2016
American Goldfinch	Spinus tristis	2	Ashland ¯	10/21/2016
American Wigeon	Anas americana	5	Ashland ¯	10/21/2016
Canvasback	Aythya valisineria	1	Ashland ¯	10/21/2016
Horned Lark	Eremophila alpestris	1	Ashland ¯	10/21/2016
Lapland Longspur	Calcarius lapponicus	3	Ashland ¯	10/21/2016
Lesser Scaup	Aythya affinis	4	Ashland ¯	10/21/2016
Pied-billed Grebe	Podilymbus podiceps	1	Ashland ¯	10/21/2016
Redhead	Aythya americana	6	Ashland ¯	10/21/2016
Ruddy Duck	Oxyura jamaicensis	3	Ashland ¯	10/21/2016
American Crow	Corvus brachyrhynchos	3	Ashland ¯	10/25/2016
American Wigeon	Anas americana	2	Ashland ¯	10/25/2016
Bald Eagle	Haliaeetus leucocephalus	1	Ashland ¯	10/25/2016
Mallard	Anas platyrhynchos	5	Ashland ¯	10/25/2016
Song Sparrow	Melospiza melodia	4	Ashland ¯	10/25/2016
		1633		

Oak Glen Wetland

Common Name	Scientific Name	Abundance	Location	Date
American Crow	Corvus brachyrhynchos	2	Oak Glen	10/6/2016
Swamp Sparrow	Melospiza georgiana	2	Oak Glen	10/6/2016
Red-winged Blackbird	Agelaius phoeniceus	30	Oak Glen	10/6/2016
Canada Goose	Branta canadensis	30	Oak Glen	10/10/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	10/10/2016
Blue-winged Teal	Anas discors	1	Oak Glen	10/10/2016
Northern Pintail	Anas acuta	2	Oak Glen	10/10/2016
Pied-billed Grebe	Podilymbus podiceps	20	Oak Glen	10/10/2016
American White Pelican	Pelecanus erythrorhynchos	70	Oak Glen	10/10/2016
Bald Eagle	Haliaeetus leucocephalus	3	Oak Glen	10/10/2016
American Coot	Fulica americana	2000	Oak Glen	10/10/2016
Franklin's Gull	Leucophaeus pipixcan	70	Oak Glen	10/10/2016
Ring-billed Gull	Larus delawarensis	40	Oak Glen	10/10/2016
Downy Woodpecker	Picoides pubescens	1	Oak Glen	10/10/2016
White-breasted Nuthatch	Sitta carolinensis	1	Oak Glen	10/10/2016
Ruby-crowned Kinglet	Regulus calendula	6	Oak Glen	10/10/2016
Trumpeter Swan	Cygnus buccinator	6	Oak Glen	10/18/2016
Gadwall	Anas strepera	10	Oak Glen	10/18/2016
American Wigeon	Anas americana	16	Oak Glen	10/18/2016
Mallard	Anas platyrhynchos	4	Oak Glen	10/18/2016
Blue-winged Teal	Anas discors	30	Oak Glen	10/18/2016
Redhead	Aythya americana	20	Oak Glen	10/18/2016
Ring-necked Duck	Aythya collaris	40	Oak Glen	10/18/2016
Lesser Scaup	Aythya affinis	30	Oak Glen	10/18/2016
Ruddy Duck	Oxyura jamaicensis	10	Oak Glen	10/18/2016
Pied-billed Grebe	Podilymbus podiceps	30	Oak Glen	10/18/2016
Double-crested Cormorant	Phalacrocorax auritus	1	Oak Glen	10/18/2016
Bald Eagle	Haliaeetus leucocephalus	2	Oak Glen	10/18/2016
Red-tailed Hawk	Buteo jamaicensis	1	Oak Glen	10/18/2016
American Coot	Fulica americana	2000	Oak Glen	10/18/2016
Franklin's Gull	Leucophaeus pipixcan	200	Oak Glen	10/18/2016
Ring-billed Gull	Larus delawarensis	100	Oak Glen	10/18/2016
Blue Jay	Cyanocitta cristata	2	Oak Glen	10/18/2016
American Crow	Corvus brachyrhynchos	4	Oak Glen	10/18/2016
Canada Goose	Branta canadensis	2	Oak Glen	10/21/2016
American Wigeon	Anas americana	10	Oak Glen	10/21/2016
Mallard	Anas platyrhynchos	1	Oak Glen	10/21/2016
Northern Shoveler	Anas clypeata	10	Oak Glen	10/21/2016
Redhead	Aythya americana	10	Oak Glen	10/21/2016
Ring-necked Duck	Aythya collaris	10	Oak Glen	10/21/2016
Ruddy Duck	Oxyura jamaicensis	30	Oak Glen	10/21/2016
Pied-billed Grebe	Podilymbus podiceps	50	Oak Glen	10/21/2016
Red-tailed Hawk	Buteo jamaicensis	1	Oak Glen	10/21/2016

Ashland Township Wetland				
Common Name	Scientific Name	Abundance	Location	Date

Oak Glen Wetland				
Common Name	Scientific Name	Abundance	Location	Date
American Coot	Fulica americana	3000	Oak Glen	10/21/2016
Franklin's Gull	Leucophaeus pipixcan	175	Oak Glen	10/21/2016
Ring-billed Gull	Larus delawarensis	50	Oak Glen	10/21/2016
Red-bellied Woodpecker	Melanerpes carolinus	1	Oak Glen	10/21/2016
Blue Jay	Cyanocitta cristata	2	Oak Glen	10/21/2016
American Robin	Turdus migratorius	2	Oak Glen	10/21/2016
Red-winged Blackbird	Agelaius phoeniceus	30	Oak Glen	10/21/2016
American Wigeon	Anas americana	10	Oak Glen	10/25/2016
Mallard	Anas platyrhynchos	10	Oak Glen	10/25/2016
Blue-winged Teal	Anas discors	10	Oak Glen	10/25/2016
Canvasback	Aythya valisineria	10	Oak Glen	10/25/2016
Ring-necked Duck	Aythya collaris	40	Oak Glen	10/25/2016
Lesser Scaup	Aythya affinis	6	Oak Glen	10/25/2016
Ruddy Duck	Oxyura jamaicensis	30	Oak Glen	10/25/2016
Pied-billed Grebe	Podilymbus podiceps	10	Oak Glen	10/25/2016
Northern Harrier	Circus cyaneus	1	Oak Glen	10/25/2016
Bald Eagle	Haliaeetus leucocephalus	2	Oak Glen	10/25/2016
American Coot	Fulica americana	3000	Oak Glen	10/25/2016
Ring-billed Gull	Larus delawarensis	6	Oak Glen	10/25/2016
Black-capped Chickadee	Poecile atricapillus	2	Oak Glen	10/25/2016
		21241		

C

Eagle Use Data

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
5/27/2015	1	65									0
5/27/2015	2	71									0
5/27/2015	3	74									0
5/27/2015	4	74									0
5/27/2015	7	77									0
5/27/2015	6	78									0
5/27/2015	5	80									0
5/27/2015	4	81									0
5/27/2015	8	81									0
5/27/2015	14	79									0
5/27/2015	15	82									0
5/27/2015	16	81									0
5/27/2015	13	76									0
5/27/2015	12	72									0
5/27/2015	11	69									0
5/27/2015	10	66									0
5/27/2015	9	64									0
6/23/2015	13	70									0
6/23/2015	10	68									0
6/23/2015	9	70									0
6/23/2015	11	74									0
6/23/2015	12	73									0
6/23/2015	14	75									0
6/23/2015	15	77									0
6/23/2015	16	77									0
6/25/2015	1	70									0
6/25/2015	2	71									0
6/25/2015	3	73									0
6/25/2015	4	75									0
6/25/2015	7	78									0
6/25/2015	6	81									0
6/25/2015	5	77									0
6/25/2015	8	80									0
7/21/2015	1	71									0
7/21/2015	2	73									0
7/21/2015	3	74									0

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
7/21/2015	4	75									0
7/21/2015	7	78									0
7/21/2015	6	80									0
7/21/2015	5	73									0
7/21/2015	8	75									0
7/29/2015	9	68									0
7/29/2015	10	74									0
7/29/2015	11	79									0
7/29/2015	12	81									0
7/29/2015	13	78									0
7/29/2015	14	80									0
7/29/2015	15	83									0
7/29/2015	16	79									0
8/4/2015	1	65									0
8/4/2015	5	65									0
8/4/2015	8	71									0
8/4/2015	15	73									0
8/4/2015	14	75									0
8/4/2015	13	75									0
8/4/2015	12	75									0
8/4/2015	11	76									0
8/25/2015	9	55									0
8/25/2015	10	60									0
8/25/2015	16	62									0
8/25/2015	7	66									0
8/25/2015	6	68									0
8/25/2015	4	68									0
8/25/2015	2	72									0
8/25/2015	3	73									0
9/22/2015	1	67									0
9/22/2015	3	71									0
9/22/2015	4	72									0
9/22/2015	6	71									0
9/22/2015	7	73									0
9/22/2015	16	75									0
9/22/2015	15	77									0

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
9/30/2015	9	47									0
9/30/2015	10	55									0
9/30/2015	11	56									0
9/30/2015	12	60									0
9/30/2015	13	62									0
9/30/2015	14	62									0
9/30/2015	5	62									0
9/30/2015	8	62									0
10/14/2015	1	64	Adult	S	NE	650	E	70	3	1	3
10/14/2015	9	50	Adult	P	SW	750	-	-	2	1	0
10/14/2015	9	50	Adult	PF	SW	750	SW	15	1	1	1
10/14/2015	10	51									0
10/14/2015	11	60									0
10/14/2015	12	62									0
10/14/2015	13	62									0
10/14/2015	8	62									0
10/14/2015	5	62									0
10/22/2015	3	47									0
10/22/2015	2	54									0
10/22/2015	4	59									0
10/22/2015	6	62									0
10/22/2015	7	62									0
10/22/2015	16	62									0
10/22/2015	15	64									0
10/22/2015	14	66									0
3/10/2016	2	31	Adult	PF	NE	300	SW	10	2	1	2
3/10/2016	1	31	Adult	PF	N	300		10	1	1	1
3/10/2016	1	29									0
3/10/2016	3	34									0
3/10/2016	4	36									0
3/10/2016	7	36									0
3/10/2016	6	37									0
3/10/2016	5	39									0
3/10/2016	8	42									0
3/16/2016	9	44	Adult	PF	W	100	SE	30	1	2	2
3/16/2016	9	44	Adult	PF	SW	600	N	30	4	1	4

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
3/16/2016	9	44	Immature	PF	W	700	SW	40	4	1	4
3/16/2016	9	44	Adult	PF	W	750	NW	20	1	2	2
3/16/2016	9	44	Adult	PF	W	780	NW	15	1	1	1
3/16/2016	9	44	Adult	P						1	0
3/16/2016	10	44									0
3/16/2016	11	44									0
3/17/2016	16	41									0
3/17/2016	15	40									0
3/17/2016	14	39									0
3/29/2016	13	55									0
3/29/2016	12	58									0
4/5/2016	5	33									0
4/5/2016	8	35									0
4/26/2016	16	45									0
4/27/2016	15	45									0
4/27/2016	14	50									0
4/27/2016	12	44									0
4/27/2016	13	50									0
4/28/2016	1	40									0
4/28/2016	2	40									0
4/28/2016	3	40									0
4/28/2016	4	40									0
4/28/2016	6	40									0
4/28/2016	7	40									0
5/6/2016	14	73									0
5/6/2016	15	82									0
5/20/2016	9		Adult	P						1	0
11/17/2016	5	48									0
11/17/2016	6	48									0
11/17/2016	1	51									0
11/17/2016	2	54									0
11/17/2016	3	58									0
11/17/2016	4	58									0
11/17/2016	7	59									0
11/17/2016	8	60									0
11/29/2016	14	34									0

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
11/29/2016	15	33									0
11/29/2016	10	37									0
11/29/2016	9	37									0
11/29/2016	11	35									0
11/29/2016	12	35									0
11/29/2016	13	34									0
12/13/2016	3	-2	Adult	PF	N	200	S	30	1	1	1
12/13/2016	2	-8	Adult	PF	E	400	NW	5	1	1	1
12/13/2016	4	2	Adult	PF	N	500	S	20	1	1	1
12/13/2016	7	4	Adult	PF	NE	500	SE	20	2	1	2
12/13/2016	1	-11	Immature	PF	NE	600	SE	10	1	1	1
12/13/2016	2	-8	Immature	PF	NE	600	SE	15	1	1	1
12/13/2016	2	-8	Adult	PF	NE	600	SE	20	2	1	2
12/13/2016	2	-8	Adult	PF	NE	600	SE	20	2	1	2
12/13/2016	2	-8	Adult	PF	NE	600	SE	20	1	1	1
12/13/2016	3	-2	Adult	PF	SE	600	SE	20	2	1	2
12/13/2016	3	-2	Immature	PF	W	700	SE	20	1	1	1
12/13/2016	4	2	Adult	PF	W	700	S	20	1	1	1
12/13/2016	4	2	Adult	PF	E	750	S	20	1	1	1
12/13/2016	7	4	Adult	PF	SW	750	SE	15	1	1	1
12/13/2016	8	1	Immature	PF	W	750	SW	10	1	1	1
12/13/2016	8	1	Adult	PF	W	750	SW	15	1	1	1
12/13/2016	6	3									0
12/13/2016	5	5									0
12/20/2016	9	29	Adult	P	SW	750			2	1	0
12/20/2016	9	29	Adult	PF	SW	750	SE	10	1	1	1
12/20/2016	9	29	Adult	PF	SW	750	SW	10	1	1	1
12/20/2016	9	29	Adult	PF	SW	750	N	10	1	1	1
12/20/2016	9	29	Immature	PF	SW	750	S	10	2	1	2
12/20/2016	9	29	Immature	S	SW	750	SW	15	2	1	2
12/20/2016	9	29	Adult	S	SW	750	SW	15	1	1	1
12/20/2016	10	31									0
12/20/2016	11	31									0
12/20/2016	12	32									0
12/20/2016	14	34									0
12/20/2016	15	34									0

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
12/20/2016	16	31									0
1/1/2017	1	18									0
1/1/2017	2	18									0
1/1/2017	3	22									0
1/1/2017	4	23									0
1/1/2017	5	25									0
1/1/2017	6	26									0
1/1/2017	7	25									0
1/1/2017	8	25									0
1/17/2017	9	27									0
1/17/2017	10	27									0
1/17/2017	11	29									0
1/17/2017	12	29									0
1/17/2017	13	31									0
1/17/2017	14	33									0
1/17/2017	15	35									0
1/17/2017	16	35									0
1/26/2017	3	27	Adult	PF	SW	780	NW	10	1	1	1
1/26/2017	1	26									0
1/26/2017	2	25									0
1/26/2017	7	28	Adult								0
1/26/2017	6	27									0
1/26/2017	5	25									0
1/26/2017	8	25									0
2/22/2017	7	54	Adult	PF	E	100	SW	10	1	1	1
2/22/2017	6	56	Adult	PF	SW	400	NE	30	2	1	2
2/22/2017	7	54	Adult	PF	SE	600	N	10	2	1	2
2/22/2017	1	40									0
2/22/2017	2	45									0
2/22/2017	3	52									0
2/22/2017	8	58									0
2/23/2017	11	34	Adult	PF	S	400	NE	20	1	1	1
2/23/2017	11	34	Immature	PF	SW	500	NE	5	4	1	4
2/23/2017	11	34	Immature	PF	S	600	NE	5	3	1	3
2/23/2017	11	34	Immature	PF	SW	780	NW	15	1	1	1
2/23/2017	9	34									0

Date	Point #	Temperature	Eagle Age	Behavior	Direction from Point	Distance from Point	Flight Direction	Height	Duration	Abundance	Eagle Minutes
2/23/2017	12	37									0
2/23/2017	13	37									0
2/23/2017	14	37								52	0
2/23/2017	16	37									0
										Total	63

PRE-CONSTRUCTION AVIAN MIGRATION & EAGLE USE STUDY
Year 2
Spring 2017 through Spring 2018
for

DODGE COUNTY WIND PROJECT
DODGE AND STEELE COUNTIES, MINNESOTA

Prepared for

Dodge County Wind, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

Submitted by: Atwell, LLC – Atwell Project No. 16002517

September 7, 2018

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APPENDICES

EXECUTIVE SUMMARY

This report summarizes the second year (year-two) of pre-construction avian and eagle use surveys at the proposed Dodge County Wind Project (the Project) in Dodge and Steele Counties, Minnesota. Year-two avian surveys were conducted from May 2017 through April 2018 by Atwell, LLC (Atwell) on behalf of Dodge County Wind, LLC (Dodge County Wind). The study addresses avian use of the Dodge Wind Project Area, which encompasses the area in which all wind turbines for the Dodge Wind project will be sited. This report includes results and discussion from: one year of standardized eagle use surveys, spring and fall avian migration surveys, one year of wetland utilization surveys, and one season of nesting and winter roost surveys across the Project Area and surrounding study areas.

This second year of pre-construction avian and eagle use study supplements existing eagle and general avian use data gathered as part of the year-one avian study previously conducted within the Project Area by HDR (HDR 2017) .

Key results include:

- Federal Threatened/Endangered avian species were not observed within the Project Area during migration stopover or during standardized avian use point count surveys.

- Two (2) total Golden Eagles detections occurred during the study period. One (1) Golden Eagle was detected during standardized eagle use surveys and one was detected while *en route* to survey locations and is considered an incidental detection. The Project Area is located outside of the Golden Eagle nesting distribution (Kochert et al. 2002), and Golden Eagle nests were not observed within the Project Area.

- 358 total Bald Eagle detections occurred over the year-two study. One hundred ninety seven (197) Bald Eagles were observed during aerial nest and roost surveys. 68 Bald Eagle detections occurred during standardized eagle use surveys. Ninety three (93) Bald Eagle detections were detected/recorded incidental to surveys. Incidental detections include eagles seen *en route* to surveys, eagles seen beyond the 800 m standardized count cylinder about the survey point, and eagles observed only before or after standardized count durations at the point.

- No Bald Eagle nests or eagle concentrations were found within the Project Area. Two (2) Bald Eagle roosts were found within 10 miles of the Project Area. Thirteen (13) Bald Eagle nests were found within 10 miles of the original Project Area boundary. After a boundary shift in May 2017, seven (7) of these 13 nests are within 10 miles of the current Project Area boundary. One (1) nest at a historic location appears to have been removed and was not seen during aerial surveys.

- Bald Eagle mean use rates and accrued minutes at collision risk heights were highest in the spring, though similar to results recorded in the fall and winter. Bald Eagles were rarely observed during standardized surveys in the summer.

- A variety of avian species migrates through the Project Area, use habitat within the Project Area during migration stopover, and nest within the Project Area. In general, species of conservation concern are not found in high concentrations. Where scarce habitats are present (e.g., shrublands, grassland), avian species of conservation priority may be found to be utilizing Project Area habitats during the breeding season.

Key discussion points include:

- *Habitat Risk.* There is no evidence that eagles currently nest within the Project Area. It is anticipated that there will be no direct impacts to eagle nesting or wintering habitat resources as part of the proposed wind energy development.

- *Turbine Collision Fatality Risk.* The highest proportion of observed eagle minutes within the 35 – 150 meter rotor swept zone (RSZ) occurred during the spring and fall. The waterbird and raptor species guilds demonstrated the riskiest flight profile behavior within the Project Area observed during spring and fall.

1.0 INTRODUCTION

Atwell was contracted in 2017 by Dodge County Wind, a subsidiary of NextEra Energy Resources, LLC (NextEra), to conduct avian surveys and an eagle use-assessment study for the proposed Dodge County Wind Energy Center (Project) in Dodge and Steele Counties, Minnesota. Avian resources were previously evaluated through one year of pre-construction eagle use surveys, spring and fall migration surveys, raptor nest surveys, winter eagle roost surveys, and all-species avian surveys across several wetland areas. Taken together, these avian surveys provide comprehensive quantitative documentation of avian migration use, summer use, raptor nesting use, and winter use. Dodge County Wind commissioned these pre-construction surveys to occur from May 2017 through April 2018, which equates to a second year of avian use studies associated with the development of this Project (e.g., HDR 2017). Year-1 avian use study was conducted between 2016 and 2017 by HDR and findings from the Year-1 study are summarized separately (HDR 2017).

This report summarizes one of several studies that Dodge County Wind has conducted as part of a holistic natural resources review approach to assess potential effects from development of this wind energy project on species of concern and their habitats. The results reported herein will be combined with results from other natural resource studies and will aid in responsibly siting wind turbines, access roads, underground electric collection lines, an electric substation, overhead high-voltage transmission line, and other proposed infrastructure. To date, this approach has enabled Dodge County Wind to adapt quickly during project design planning and has further minimized potential impacts to sensitive natural resources.

The Dodge Wind Project includes the development of up to 70 wind turbines, associated collection line, access roads, and a collector substation to be located in Dodge and Steele counties. A transmission line is also proposed that extends approximately 21 miles from the Project collector substation to the existing Byron Substation. The transmission line is located in Dodge and Olmsted counties. *Figure 1 - Avian Migration Use & Eagle Use Point County Survey Schematic*, **Appendix I** shows the location of the Project's preliminary wind turbine array in relation to the Project Area. All wind facilities are planned within the Project Area and the transmission line extends to the east of the Project Area. The transmission line corridor is shown in *Figure 2 - Aerial Raptor Nest Survey Study Plan Schematic*, **Appendix I**.

The objective of the survey tasks that are summarized in this report was to document eagle use, in addition to use by other avian species, fulfilling a second year of eagle use data collection as recommended by USFWS Twin Cities Ecological Field Office during a Project coordination meeting on April 13, 2017. Eagle survey task objectives included evaluating migration patterns, potential for breeding, and potential for concentrated use, such as winter communal roosting. As such, the protocols described herein were selected as they comply with Tier 3 requirements established by the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (WEG, USFWS 2012) and with

Stage 2 assessments described in the *Eagle Conservation Plan Guidance (ECPG): Module 1 – Land-based Wind Energy Version 2* (USFWS 2013). These two documents were developed to provide wind energy operators guidelines for compliance with the *Bald and Golden Eagle Protection Act* (BGEPA 1940). Additionally, Atwell utilized industry standard approaches to designing avian use studies at proposed wind energy developments as promoted by the National Wind Wildlife Coordinating Collaborative (e.g., Strickland et al. 2011).

In order to develop and document a baseline presentation of raptor use within the Project Area, Atwell completed the following WEG Tier 3 (USFWS 2012) surveys:

- Eagle use surveys (May 2017 through April 2018)
- Raptor nest surveys (March 2017)
- Winter eagle roost survey (March 2017).

Atwell also conducted wetland utilization surveys at two (2) locations that were also studied during the Year-1 avian use survey (HDR 2017), as well as at a third location that was added to the study in 2017. Wetland utilization survey results are also summarized in this report. Atwell executed targeted Henslow's Sparrow and Loggerhead Shrike breeding surveys that are discussed in this report but are summarized in additional detail separately under separate cover (Atwell 2017b).

Eagle use surveys were also designed to meet the following secondary study objectives:

1. Document nesting presence of Bald Eagles (*Haliaeetus leucocephalus*) within 10 miles of the Project Area.
2. Document Bald Eagle and Golden Eagle (*Aquila chrysaetos*) winter roost locations within 10 miles of the Project Area.
3. Document standardized migratory Bald Eagle and Golden Eagle use within the Project Area.
4. Characterize seasonal differences in the migration flight profiles of Bald and Golden Eagles migrating through the Project Area.
5. Document relative wind turbine exposure risks for Bald and Golden Eagles within the Project Area.
6. Document areas within and, when possible, near the Project Area that concentrate Bald Eagle and Golden Eagle use.
7. Document seasonal presence of other raptor species that breed and migrate within the Project Area, applying eagle objectives listed above to other species to develop a more complete representation of raptor use.

This report addresses avian resources documented during the 2017-2018 migratory ecological periods. Results from bi-weekly spring migration surveys (conducted in May 2017 and March through April 2018), and bi-weekly fall migration surveys (August through November 2017) are described and analyzed in detail.

2.0 METHODS

2.1 Project Setting

The Project Area covers approximately 52,085 acres in southwestern Dodge County and southeastern Steele County, Minnesota and is located approximately 15 miles west of Rochester and 67 miles south of Minneapolis (see *Figure 1 - Eagle Use and Migration Watch Study Points,* **Appendix I)**. Overall, the Project Area is dominated by agricultural cropland and is drained by a moderately extensive network of agricultural ditches and intermittent and ephemeral streams, many of which support herbaceous riparian buffers. The general topography of the Project Area is described as undulating, rolling relief with approximate elevations between 1,210 and 1,354 feet above mean sea level (MSL) and generally has an eastern aspect.

The 2011 National Land Cover Database (NLCD; Homer et al. 2015) classifies roughly 87.4% (approximately 45,530 acres) of the Project Area as cultivated cropland (*Figure 1*). Approximately 5.2% (roughly 2,702 acres) of the Project Area is classified as either pasture or grassland/herbaceous. Developed, open space makes up approximately 4.4% (or 2,283 acres) of the Project Area. Deciduous Forest (1.17%), Emergent Herbaceous Wetlands (0.70%), Woody Wetlands (0.23%), Open Water (0.12%), Scrub/Shrub (0.01%), and Barren Land (0.01%) cover small portions of the Project Area.

2.2 Eagle Use Surveys

Eagle use surveys followed a fixed-point protocol designed to record activity and behavior of individual bird detections (e.g. minutes of flight within a cylindrical air-space plot) in full adherence with ECPG Stage 2 methodology guidance (USFWS 2013). This protocol is typically used for wind energy projects in the United States, with the survey area being an 800-meter fixed-radius circular plot approach (Strickland et al. 2011). The ECPG refers to these surveys as point counts, recognizing that a point-based protocol that also records flight duration is slightly different than traditional point count methodology used for other bird species (USFWS 2013). For each observed eagle, the surveyor recorded the distance to initial detection, closest distance to detection, time of detection, and duration of flight within RSZ within 800 m of the point count station.

Over one year, 461 hours of standardized eagle use surveys were conducted (*Table 1 – Standardized Survey Effort Review*) and incidental (i.e., non-standardized) eagle observations were recorded while *en route* to surveys, during Bald Eagle nest surveys, and during targeted breeding season surveys (as described in Sections 2.3-2.7 below).

Following ECPG recommendations, surveys were scheduled year-round, with survey data summarized according to the following seasons for ease of data organization and analysis: winter (December – February), spring (March – May), summer (June – July), and fall (August – November). The survey period began in May 2017 and continued through April 2018, yielding a dataset with surveys through one (1) spring period, one (1) summer period, one (1) fall period, and one (1) winter period. Survey effort at each point count station is summarized by season in *Table 1*.

All point count stations were surveyed for 60-minute durations twice monthly. Point count stations were divided into a series of two subgroups (i.e., A and B) containing eight (8) points each, and each subgroup was surveyed on alternating weeks. Stations within the same subgroup were a minimum of 1,600 m apart in order to avoid overlap of the 800-m fixed point count radius.

The avian use study plan was developed in accordance with USFWS-ECP Guidance and designated roadside point count stations across the Project Area (*Figure 1 – Eagle Use and Migration Watch Study Points,* **Appendix I**). Point count stations maintained a stratified sampling schematic for representative habitat diversity and were located along roads with low traffic levels, year-round access, and where reasonable survey vantages of the surrounding landscape were attainable.

Point locations are illustrated in *Figure 1,* **Appendix I**, and seasonal effort totals are reported for each station in *Table 1 – Standardized Survey Effort Review.* Sixteen (16) points were established based on an earlier project boundary at the study's outset, in May 2017. After two site visits, the boundary shifted, requiring dropping and adding point station locations to meet the Project Area's updated geography. Based on the boundary shift, five (5) points in the eastern section of the original sample (point stations 32, 34, 40, 82, and 87) were dropped from the survey schedule, and nine (9) points (stations 71, 72, 73, 74, 75, 76, 77, 78, and 79) were added to the sample. Nineteen roadside point count stations were used for the remainder of the study. *Figure 1*, **Appendix I** shows the pre-boundary shift avian study points that were dropped with the revised Project Area and the avian study points used for the remainder of the study for the revised Project Area.

Sixteen (16) of 19 point count stations intersect the Project Area, covering 13.66% of the Project Area. As of the August 20, 2018 turbine layout, point counts and their associated 800-m radius standardized count cylinders cover 12.65% of the turbine layout's 1 km buffer. Nine (9) standardized count cylinders intersect the turbine layout's 1 km buffer (*Figure 1,* **Appendix I**).

Table 1. Standardized Avian Use Survey Effort Hours at Dodge County Wind Energy Center

	Survey Effort Hours				
Avian Use Point	**Winter**	**Spring**	**Summer**	**Fall**	**Total Hours**
11	6	6	4	8	24
12	6	6	4	8	24
13	6	6	4	8	24
14	0	0	0	1	1
21	6	6	4	8	24
22	6	6	4	8	24
24	6	6	4	8	24
25	6	6	4	8	24
31	6	6	4	8	24
32	0	1	0	0	1
34	0	1	0	0	1
40	0	1	0	0	1
41	6	6	4	7	23
42	6	6	4	8	24
71	6	6	4	8	24
72	6	6	4	8	24
73	6	6	4	8	24
75	6	6	4	8	24
76	6	6	4	8	24
77	6	6	4	8	24
78	6	6	4	8	24
79	6	6	4	8	24
82	0	1	0	0	1
84	6	6	4	8	24
87	0	1	0	0	1
Grand Total	**114**	**119**	**76**	**152**	**461**

2.3 Raptor Nest Surveys

Prior to April 2017 aerial surveys, historic eagle nest data taken in the vicinity of the Nest Survey Study Area were provided by the USFWS (USFWS unpublished data, March 07, 2017). 2017 aerial surveys also followed pre-survey Tier 2 analysis (Tetra Tech EC, INC 2013, Atwell 2017a) and previous Tier 3 reporting (HDR 2017) which found that the Project Area could potentially contain Bald Eagle nesting habitat. , An aerial nest survey was conducted to identify nest structures of Bald Eagles, of other raptor species, and of large-bodied colonial-nesting birds. The study was conducted from March 17-21, 2017, covering the Project Area and area within 10 miles of portions of the Project Area as shown in *Figure 2*, **Appendix I**. This search area is referred to as the Nest Survey Study Area. Aerial transect surveys were conducted by Atwell avian specialists and were flown via helicopter at low speeds (30 – 40 knots).

Riparian target zones (*Figure 2,* **Appendix I**) were defined from a desktop approach using a Geographic Information System (GIS) and satellite imagery data. Most target zones were defined based on at least one major forested riparian corridor, in addition to the presence of other relatively more contiguous upland forest cover and wetland/open water systems where Bald Eagles would be most expected to nest (Buehler 2000).

Flight-line transects at 1-kilometer intervals were created in GIS across each target zone of the Nest Search Study Area. No noticeable forest canopy leaf out was evident at the time of surveys. When nest structures were identified, the helicopter hovered for up to 15 seconds and no closer than 50 m from a nest in order to provide efficient data capture.

<u>Ground Nest Surveys</u>

In addition to the aerial nest survey, Atwell conducted a limited ground-based raptor nest survey that consisted of approximately seven (7) hours of survey effort focused particularly on a target zone surrounding the Straight River (*Figure 2*, **Appendix I**). Accessible roads flanking this heavily forested riparian corridor were used to gain as many ground-based habitat vantages as possible. Additional targeted survey effort was performed near other open water features such as small ponds and/or lakes.

2.4 Eagle Winter Roost Surveys

Incidental eagle observations were documented throughout the aerial survey (Section 2.3, above). During the survey, specific eagle concentrations were observed, which indicated the possible presence of nearby communal roosts. Communal roosts are locations where Bald Eagles may congregate in large numbers to overnight during the winter season. Roost site selection has been correlated to canopy structure and composition, disturbance regime, and proximity to foraging areas locations (Buehler 2000). These factors may exist in limiting extents throughout the Bald Eagle wintering range, and Bald Eagles may thus rely on preferred roosting sites throughout the season and across years. Atwell conducted ground-based reconnaissance of these concentration areas during crepuscular periods on two evenings (March 19 - 20, 2017) to identify Bald Eagle roost areas in the Project Area vicinity. This targeted roost observation effort was conducted utilizing the recommendations within the ECP Guidance (USFWS 2013) and the USFWS *Northern States Bald*

Eagle Recovery Plan (USFWS 1983) to provide a more comprehensive picture of other eagle use factors pertaining to the Project Area.

Areas with eagle concentrations that were identified during 2017 aerial roost surveys were revisited for crepuscular surveys on December 14, 2017, March 10-11, 2018 and April 10-11, 2018.

2.5 Spring and Fall Migration Watch Surveys

Point count methodologies adhered to typical industry standard recommendations (National Wind Coordinating Committee 1999, Strickland et al. 2011) and those targeted specifically at providing eagle collision risk due diligence (USFWS 2013).

The same survey point locations that were identified as eagle use survey points also served as locations for migration watch surveys (*Figure 1,* **Appendix I**). Point count methodology followed ECP guidance (USFWS 2013) but with minor adaptations to accommodate the capture of baseline avian use data for a wider array of avian taxa.

The point count protocol was designed to document diurnal bird movements through the Project Area and to assess potential collision risk of those species detected during daytime migration. During each point count station visit, biologists conducted a point count of 20 minutes in duration, recording all avian species detected. Large-bodied birds (e.g., waterfowl, raptors) detected within an 800-meter radius (approx. 2 km^2) and small-bodied birds (e.g., passerines) detected within a 300-meter radius (approx. 0.3 km^2) were noted. Habitat use, count, behaviors, detection distance, and flight height profile were recorded for all detections.

The spring migration watch weekly point count survey window occurred between May 1 and May 31, 2017, and between March 1 and April 30, 2018. The fall migration watch weekly point count survey window occurred between August 1 and November 30, 2017. Surveys were conducted between dawn and dusk.

2.6 Wetland Utilization Surveys

The Ashland Township Wetland Complex (ATWC), the Oak Glen Wetland Complex (OGWC), and the Dodge Center Creek Waterfowl Production Area (DWPA) (*Figure 1*, **Appendix I**) were surveyed weekly during the spring, summer, and winter periods to evaluate incidental avian wetland utilization. These sites have been designated for their conservation value and hold habitats reminiscent of prairie and prairie pothole ecosystems more common in the region prior to the landscape being converted to agricultural use. These wetland complexes may support higher bird abundance and richness of bird species than surrounding agricultural habitats and they provide an opportunity to assess breeding statuses for several sensitive species, particularly passerine bird species that are more difficult to assess from roadside point count locations. The objectives of the wetland utilization surveys were 1) to document seasonal use by sensitive species at wetland areas and 2) to observe the tendency for there to be relatively large numbers of avian species (i.e., waterfowl and other waterbirds) concentrated at these locations. The ATWC and OGWC were also surveyed as part of the first year of avian use study that was completed by HDR (HDR 2017). The DWPA was added to the survey schedule in May 2017.

Surveys generally followed protocol outlined in the *Minnesota Department of Natural Resources Guidance for Commercial Wind Energy Projects* (MNDNR 2011). These non-standardized surveys were designed and executed to document all avian use during each visit. As such, effort varied between visits and was dependent on the time required for the observer to adequately assess all birds that were believed to be present (generally 10 – 20 minutes per visit). Cumulative numbers of visits to each wetland area are summarized in *Table 2 – Cumulative Wetland Utilization Survey Visits.*

Table 2. Cumulative Wetland Utilization Survey Visits at Dodge County Wind Energy Center

SEASON	ATWC	OGWC	DWPA
Spring (May) 2017	4	4	3
Summer (June – July) 2017	9	9	10
Fall (August – November) 2017	17	17	17
Spring (March – April) 2018	14	14	14

2.7 Breeding Bird Survey

Targeted breeding surveys for Loggerhead Shrike (*Lanius ludovicianus*) and Henslow's Sparrow (*Ammodramus henslowii*) were conducted in June 2017 and described under a separate cover (Atwell 2017b). Other targeted breeding bird surveys were not conducted, but breeding observations for sensitive species found within the Project Area, including singing, pairs found in suitable habitat, territorial defense, courtship displays, copulation, agitated behavior suggesting proximity of an active nest, nesting material carries, nests, food carries, and dependent fledglings were recorded during avian use surveys in the spring and summer. When a state listed species or other conservation concern species was first detected, occurrences of those species were tracked over subsequent visits in an effort to ascertain the species' breeding statuses within the Project Area. Currently assessed breeding status is included with a superscripted numeral in *Table 6* after the species name: 1 = observed only, 2 = unlikely to breed within the Project Area, 3 = possibly breeding within the Project Area, 4 = probably breeding within the Project Area. Breeding statuses for raptor species are reported in Section 3 below.

2.8 Incidental Observations

Outside of weekly standardized surveys, incidental avian data were recorded for raptors and eagles, and sensitive species that were observed within the Project Area and its surrounding buffers. Particular attention was given to habitats that may act as local concentration points for a variety of avian taxa. All observation locations were marked with a GPS, and species, number of individuals, and behaviors were recorded. Incidental detections included observations recorded while *en route* to surveys, birds observed beyond the 800 m-radius standardized count cylinder during point count surveys, birds observed immediately outside the beginning and end of the point count survey duration, and birds observed during non-standardized breeding bird surveys.

2.9 Data Management

Protocol surveys described above were conducted by five (5) avian biologists over the course of the study. All completed data forms were proof-checked and photocopied, with data subsequently entered into an electronic database and proofed-checked to confirm accurate data entry.

2.10 Data Analysis

Data were organized and analyzed with *Microsoft Excel* and *Program R* (R CORE TEAM 2014). The following statistics/data appearing in this report are:

- Site species richness
- Species mean use
- Relative abundance (for selected species only)
- Species occurrence frequency
- Species percent composition
- Raptor species richness
- Eagle mean use
- Raptor occurrence frequency
- Raptor percent composition
- Eagle seasonal movement profiles

Point count data were standardized across time and area. All data were analyzed on a seasonal basis alone. Mean use statistics were calculated for each species per unit of area (e.g., eagles/km^2) per point count period (e.g., standardized species count/20-minute survey). It is important to note that mean use does not reflect absolute density of a particular species. Therefore, the term "abundance" should not be used to describe mean use statistics. Standard deviations are reported alongside of mean use values.

Frequency of occurrence is the percentage of surveys (as a percentage of total surveys conducted) that a particular species was recorded during conducted surveys. Frequency statistics are reported seasonally across all point count stations and across use surveys. Species composition is a measure of overall mean use in comparison to all other species recorded during scheduled surveys. Since many avian species migrate in flocks, some of which can approach hundreds or thousands of birds per flock, statistics pertaining to mean use may not accurately reflect their relative occurrence within this portion of Minnesota during migration periods. Frequency of occurrence and species composition provide additional insight into the overall avian use diversity at the survey area.

Adhering to the sampling framework outlined in USFWS (2013) allowed for collection of use data suitable for possible incorporation into the USFWS collision fatality model, following Tier 4 guidance outlined in USFWS (2012).

3.0 RESULTS

3.1 Raptor Nests and Local Area Bald Eagle Nesting Population

Key results from the 2017 aerial nest survey include the following:

- Zero (0) Bald Eagle nests were identified within the Project Area.

- Eleven (11) active Bald Eagle nests and two (2) inactive Bald Eagle nests were found within the pre- March 2017 Nest Survey Study Area during aerial nest surveys. After the Project Area shifted northwestward in May 2017, five (5) active Bald Eagle nests and two (2) inactive Bald Eagle nests remain within 10 miles of the current Project Area boundary (*Figure 3 – Bald Eagle Nest Map*, **Appendix I**).

- Five (5) of these nests were newly identified and not previously identified in a USFWS nest data query (USFWS data, accessed March 7, 2017) or in previous eagle nest survey results (HDR 2017).

- One (1) previously known Bald Eagle nest (USFWS data) located within the Nest Survey Study Area was found to no longer be present during aerial surveys.

There are 14 known Bald Eagle nest locations located within 18 miles of project turbines. This includes nests that are now beyond 10 miles from the Project Area but which were found before the Project Area's boundary shift in May 2017. These nests are listed in *Table 3* and are described in detail below:

Table 3. Bald Eagle Nest Distances to Closest Turbines at Dodge County Wind Energy Center

NEST NAME	COUNTY	DISTANCE TO CLOSEST TURBINE (mi)	TURBINE NO.	LATITUDE	LONGITUDE	STATUS
Blooming Prairie North	Steele	2.12	12	43.92101°N	93.06162°W	Active
Dodge Center North	Dodge	3.02	55	44.03116°N	92.89324°W	Active
Havana North	Steele	4.38	2	44.09531°N	93.15203°W	Inactive
Moland South	Steele	7.05	2	44.14048°N	93.04584°W	Active
Kasson South	Dodge	7.36	66	43.96345°N	92.77390°W	Active
Hayfield Southwest	Mower	9.16	70	43.84606°N	92.89208°W	Active
Kasson Northeast	Dodge	11.19	66	44.06009°N	92.72145°W	Inactive
Waltham	Mower	11.32	70	43.82268°N	92.85727°W	Removed
Berne South	Dodge	11.47	43	44.13097°N	92.78332°W	Active
Mantorville East	Dodge	11.74	66	44.06661°N	92.71391°W	Active
Vernon Southeast	Dodge	13.20	66	43.88098°N	92.69502°W	Active
Byron Southeast	Olmsted	15.06	66	43.98154°N	92.61691°W	Active
Rock Dell East	Olmsted	17.06	66	43.90759°N	92.59328°W	Active
High Forest West	Olmsted	17.95	66	43.84837°N	92.61118°W	Active

<u>Bald Eagle Nests Identified in Dodge County</u>

- Dodge Center North Nest: (44.03116°N, 92.89324°W, Dodge County, Wasioja Township, Section 32): 3.02 miles northeast of proposed Turbine #55. This known nest location was provided by the USFWS and is near Dodge Center Creek. An adult was observed on the nest during the 2017 aerial survey. 2017 Status: *Active-Confirmed.*

- Kasson South Nest: (43.96345°N, 92.77390°W, Dodge County, Canisteo Township, Section 29): 7.36 miles east of proposed Turbine #66. This known nest location was provided by the USFWS. An adult was observed on the nest during the aerial survey 2017 Status: *Active-Confirmed.*

- Kasson Northeast Nest: (44.06009°N, 92.72145°W, Dodge County, Mantorville Township, Section 22): 11.19 miles northeast of proposed Turbine #66. This known nest location was provided by the USFWS and is on the South Branch of the Zumbro River. This nest was not found to be active, and it is a suspected alternate nest for the active Mantorville East nest located 0.6 miles northeast. 2017 Status: *Inactive-Confirmed.*

- Berne South Nest: (44.13097°N, 92.78332°W, Dodge County, Milton Township, Section 30): 11.47 miles northeast of proposed Turbine #43. This is a new nest location and is on

Milliken Creek. An adult was observed on the nest during the aerial survey. 2017 Status: *Active-Confirmed.*

- Mantorville East Nest: (44.06661°N, 92.71391°W, Dodge County, Mantorville Township, Section 14): 11.74 miles northeast of proposed Turbine #66. This is a new nest location and is on the South Branch of the Zumbro River. This nest may be an alternate nest for the inactive Kasson Northeast nest located 0.6 miles southwest. An adult was observed on the nest during follow-up ground reconnaissance, and the landowner indicated that this nest has been present at least five years. 2017 Status: *Active-Confirmed.*

- Vernon Southeast Nest: (43.88098°N, 92.69502°W, Dodge County, Vernon Township, Section 24): 13.20 southeast of proposed Turbine #66. This known nest location was provided by the USFWS. An adult was observed on the nest during the aerial survey 2017 Status: *Active-Confirmed.*

<u>Bald Eagle Nests Identified in Mower County</u>

- Hayfield Southwest Nest: (43.84606°N, 92.89208°W, Mower County, Waltham Township, Section 5): 9.16 miles southeast of proposed Turbine #70. This is known nest location provided by the USFWS. An adult was observed on the nest during the aerial survey. 2017 Status: *Active-Confirmed.*

- Waltham Nest: (43.82268°N, 92.85727°W, Mower County, Waltham Township, Section 10): 11.32 miles southeast of proposed Turbine #70. This is known nest location provided by the USFWS. An isolated grove of cottonwoods that likely held the nest was found, but the nest was not observed, and freshly-cut branch stumps were observed on a possible nest tree within this grove of cottonwoods. 2017 Status: *Historic-No Longer Present.*

<u>Bald Eagle Nests Identified in Olmsted County</u>

- Byron Southeast Nest: (43.98154°N, 92.61691°W, Olmsted County, Salem Township, Section 16): 15.06 miles east of proposed Turbine #66. This is a new nest location located between a flooded gravel pit and Salem Creek. An adult was observed on the nest during the aerial survey. 2017 Status: *Active-Confirmed.*

- Rock Dell East Nest: (43.90759°N, 92.59328°W, Olmsted County, Rock Dell Township, Section 11): 17.06 miles southeast of proposed Turbine #66. This is a new nest location. An adult was observed on the nest during the aerial survey. 2017 Status: *Active-Confirmed.*

- High Forest West Nest: (43.84837°N, 92.61118°W, Olmsted County, Rock Dell Township, Section 34): 17.95 miles southeast of proposed Turbine #66. This known nest location was provided by the USFWS and is on the North Branch of the Root River. An adult was observed on the nest during the aerial survey. 2017 Status: *Active-Confirmed.*

Bald Eagle Nests Identified in Steele County

- Blooming Prairie North Nest: (43.92101°N, 93.06162°W, Steele County, Blooming Prairie Township, Section 12): 2.12 miles southwest of proposed Turbine #12. This known nest location was provided by the USFWS, and is just south of the Oak Glen Wetland Complex (Section 2.6). This nest was frequently observed during utilization surveys and was found to be active in both 2017 and 2018. 2017 Status: *Active-Confirmed.* 2018 Status: *Active-Confirmed.*

- Havana North Nest (44.09531°N, 93.15203°W, Steele County, Havana Township, Section 6): 4.38 miles northwest of proposed Turbine #2. This is a new nest location, discovered during the aerial survey near Maple Creek. The nest was consistent for Bald Eagle in size and structure, and Bald Eagles were observed within one mile of the nest during the aerial survey. No activity was seen at the nest itself. 2017 Status: *Inactive-Possible.*

- Moland South Nest (44.14045°N, 93.04584°W, Steele County, Merton Township, Section 23): 7.05 miles northeast of proposed Turbine #2. This is a new nest location, discovered during the aerial survey. A female was found to be incubating two eggs. 2017 Status: *Active-Confirmed.*

Two other historic eagle nest locations provided by the USFWS (Hayfield East, 43.88599°N, 92.69926°W, and Hayfield East Alternate, 43.90302°N, 92.69768°W) were not observed during the aerial survey. However, the historic Hayfield East locations were only listed as approximate, and the nearby Vernon Southeast nest (above) may represent one of these nests. Coordinates of both Hayfield East nests are greater than 10 miles from the closest proposed turbine.

Other Raptor Nests

Atwell located twenty-two (22) active Red-tailed Hawk (*Buteo jamaicensis*) nests and eleven (11) active Great Horned Owl (*Bubo virginianus*) nests during March 2017 aerial nest surveys (see *Figure 4 – Raptor Nest Map,* **Appendix I**). Of these, one (1) Red-tailed Hawk nest and two (2) Great Horned Owl nests were found within the Project Area. Each active nest was observed with either: an incubating adult, an adult defending the nest, eggs, or nestlings.

Atwell noted thirty-three (33) raptor nests during the aerial nest survey that were not associated with a known raptor species (*Figure 4,* **Appendix I**). These nests were described as large enough to be raptor nests (though likely too small to be eagle nests), of recent construction (2016 or 2017, gauging from condition of nesting material and nest cup structure), yet unattended by hawks or owls. In addition to Red-tailed Hawks and Great Horned Owls, Broad-winged Hawks (*Buteo platypterus)*, Cooper's Hawks (*Accipiter cooperii*), Swainson's Hawks (*Buteo swainsoni*) and Barred Owl (*Strix varia*) are all potential breeders within the Project Area and may use these structures (Pfannmuller et al. 2017). Only one of these unattended structures is located within the Project Area.

During the standardized point count use surveys in late spring and summer, a mated pair of Swainson's Hawks (*Buteo swainsoni*) was observed in multiple locations within the same general vicinity of the Project Area (Steele County segment at approximately 43.986478°N, 93.12386°W) (Atwell 2017c). This *Buteo* species migrates into the state later than typical timing used to conduct eagle nest surveys and may be missed during typical raptor nest surveys because of methodology timing. At the time this species was detected within the Project Area, forest canopy leaf-out was complete, thus eliminating confirmation of an exact nest location. Regardless, observed behavior cues indicated that a pair of Swainson's Hawks likely is nesting within at least one location in the Steele County portion of the Project Area.

Nesting Swainson's Hawks are listed as a species of greatest conservation need in Minnesota (MNDNR 2016). Pfannmuller et al. (2017) confirm that Swainson's Hawk is a rare nesting hawk that nests primarily in the southwestern corner of the state, whereas breeding observations are distributed sparsely to the south and southeast of Minneapolis. The observation of a probable nesting pair within the Project Area was not unprecedented, and the breeding bird atlas project recently documented a possible nesting observation from Steele County (Pfannmuller et al. 2017).

3.2 Bald Eagle Winter Roost Surveys

Bald Eagle roost locations were identified during aerial surveys and subsequently revisited with ground reconnaissance. Key Bald Eagle detections, including aggregations of Bald Eagles, include:

- Two (2) communal roosts were identified within the Nest Search Survey Area; Rice Lake in Merton Township, Steele County, and Cedar River in Udolpho Township, Mower County (*Figure 5 – Bald Eagle Observations & Roosts Map*, **Appendix I**).

- Seventeen (17) Bald Eagles were observed at the Cedar River communal roost on March 19, 2017. The Cedar River roost is located 9.92 miles from the closest proposed turbine (Turbine #12).

- Ten (10) Bald Eagles were observed at the Rice Lake communal roost on March 20, 2017. The Rice Lake roost is located 4.89 miles from the closest proposed turbine (Turbine #2).

- 197 Bald Eagles were observed from 71 different locations (*Figure 5 – Bald Eagle Observations & Roosts Map*, **Appendix I**). All but three (3) of the individuals were observed outside of the Project Area.

Concentrations of 10-20 Bald Eagles were repeatedly seen during mid-day during the aerial survey, with birds clustered at roadkill. These locations (visible in *Figure 5*, which notes the number of eagles observed for each sighting) were revisited on March 19-20, 2017, yielding the locations of the Cedar River and Rice Lake roosts when eagles were again seen nearby.

3.3 Eagle Use Characterization

3.3.1 Bald Eagle

<u>Overall Detections</u>

Overall, 68 Bald Eagles were detected over 461 hours of standardized effort during this pre-construction eagle use study (see *Table 4 – Raptor Survey Seasonal Use Summary Statistics* and *Figure 6a – Eagle Observation Density Map*, **Appendix I**).

This total only includes eagles observed during standardized use surveys and which were detected within the 800 m-radius count cylinder about the point. When 93 incidental detections are included (detections beyond the 800 m-radius count cylinder during surveys and detections while *en route* to points), 161 total Bald Eagle detections occurred during standardized use surveys and during travel between standardized use points (*Figure 6,* **Appendix I**).

<u>Seasonal Mean Eagle Use</u>

Bald Eagle standardized mean use rates were similar in the spring, fall, and winter, and were highest in the spring (*Table 4 – Raptor Survey Seasonal Use Summary Statistics*). Bald Eagle mean use rates decreased by an order of magnitude in the summer compared to other seasons.

Standardized mean use (Bald Eagles/20 minutes within 800 m of point count stations) was 0.076 Bald Eagles/20 minutes (*SD* = 0.331) during the spring, 0.053 Bald Eagles/20 minutes (*SD* = 0.314) during the fall, and 0.046 Bald Eagles/20 minutes (*SD* = 0.272) during the winter period (*Table 4*). Mean use was 0.004 Bald Eagles/20 minutes (*SD* = 0.066) during the summer period.

One (1) Bald Eagle was observed for approximately every 4.4 hours of standardized observation effort during the spring, one (1) individual for approximately every 6.3 hours of standardized surveys during the fall, and one (1) individual for every 7.3 hours during the winter. One (1) Bald Eagle was observed for every 83.3 hours of standardized observation during the summer period.

Figure 7 - Raptor Monthly Occurrence Frequency, **Appendix I** plots monthly species-specific occurrence frequencies observed during standardized use surveys and includes monthly occurrence of other raptor species for context.

Bald Eagle Standardized Use Relative to Other Raptor Species

Bald Eagles accounted for 9.1% of total raptor (hawks, eagles, falcons, owls, and excluding vultures) detections recorded at distances of under 800 m over the course of the 1-yr study period (*Table 4*).

Excluding vultures, Bald Eagles accounted for 14.4% of spring raptor detections during standardized surveys, 1.2% of summer raptor detections, 5.6% of fall raptor detections, and 30.2% of winter detections.

- Bald Eagle seasonal use patterns do not parallel the seasonal use patterns for the raptor guild as a whole (hawks, eagles, falcons, and owls, (*Table 4*). During colder winter months, Bald Eagle use rates diminished but remained similar to use rates observed in the spring and fall. However, Bald Eagles are one of the only raptor species that were observed using the Project Area during the winter period, the season with lowest mean use for the raptor guild as a whole.

- Contrary to Bald Eagle seasonal use patterns, use rates for the raptor guild as a whole (hawks, eagles, falcons, owls, and excluding vultures) were the highest in the fall period. This pattern was driven by a large movement of migrating Broad-winged Hawks (*Buteo platypterus*) that were recorded during surveys on September 26, 2017.

Excluding vultures, mean raptor use was highest during the fall migration period (mean use = 0.934 raptors/20 minutes, *SD* = 7.169), and spring migration period (mean use = 0.527 raptors/20 minutes, *SD* = 0.879). Mean raptor use (excluding vultures) was 0.155 raptors/20 min (*SD* = 0.443) during the winter period, and mean use was 0.364 raptors/20 min (*SD* = 0.793) during the summer period, when Bald Eagles were rarely seen (*Table 4*). *Figure 7,* **Appendix I** identifies Red-tailed Hawks, Northern Harriers (*Circus hudsonius*), and Bald Eagles as the drivers of raptor mean use during the spring and fall, later-arriving Swainson's Hawks join these three species to dominate summer mean use, and Rough-legged Hawks (*Buteo lagopus*) contribute to raptor mean use during the winter period.

Spatial Distribution of Detections

Figure 6 - Eagle Observation Density Map, **Appendix I** displays Bald Eagle observation densities throughout the Project Area, and *Figures 8a-8d - Seasonal Bald Eagle Mean Use Maps,* **Appendix I** separate mean use values by season. In *Figure 6*, Bald Eagle relative observation densities within five miles of each eagle observation are shaded from green (lowest density) to red (highest density) across the Project Area. Bald Eagles were most frequently observed in the southwestern portion of the Project Area, with many observations occurring near an active nest near the Oak Glen Wetland Complex in Blooming Prairie Township, immediately southwest of the Project Area.

Figures 8e-8h Seasonal Raptor Mean Use Maps, **Appendix I** portray each eagle observation recorded during standardized point count surveys and incidental to point count observations. Each season's map lacks a clear pattern of spatial distribution of detections across the Project Area, suggesting that there are not physiographic or habitat features within the Project Area that notably aggregate raptor use, particularly during migration flights.

Table 4. Seasonal Use Summary Statistics for Raptor Species Detected within the Dodge County Wind Energy Center

Species Group/Species Name	SPRING						SUMMER						FALL						WINTER					
	Total Std. Detections	All Detections	% Comp.	Mean Use (birds/20-min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	All Detections	% Comp.	Mean Use (birds/20-min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	All Detections	% Comp.	Mean Use (birds/20-min)	Stan. Dev.	Occur. Freq.	Total Std. Detections	All Detections	% Comp.	Mean Use (birds/20-min)	Stan. Dev.	Occur. Freq.
American Kestrel	14	16	5.58%	0.039	0.221	0.034	30	30	20.98%	0.132	0.531	0.079	21	21	4.00%	0.046	0.210	0.046	3	3	5.66%	0.009	0.093	0.009
Merlin	5	6	1.99%	0.014	0.118	0.014	.	.	.	.	.	.	3	3	0.57%	0.007	0.105	0.004	.	.	.	.	.	.
Peregrine Falcon	3	3	1.20%	0.008	0.091	0.008	.	.	.	.	.	.	1	1	0.19%	0.002	0.047	0.002	.	.	.	.	.	.
Unknown Falcon	0	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Golden Eagle	.	.	.	.	.	.	.	.	.	.	.	.	1	1	0.19%	0.002	0.047	0.002	.	.	.	.	.	.
Bald Eagle	27	75	10.76%	0.076	0.331	0.056	1	3	0.70%	0.004	0.066	0.004	24	27	4.57%	0.053	0.314	0.035	16	56	30.19%	0.047	0.272	0.035
Unknown Eagle	0	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	4	.	.	.	.
Osprey	.	.	.	.	.	.	.	.	.	.	.	.	4	4	0.76%	0.009	0.093	0.009	.	.	.	.	.	.
Broad-winged Hawk	4	4	1.59%	0.011	0.167	0.006	.	.	.	.	.	.	283	283	53.90%	0.621	7.010	0.026	.	.	.	.	.	.
Northern Harrier	23	24	9.16%	0.064	0.307	0.050	6	6	4.20%	0.026	0.160	0.026	13	13	2.48%	0.029	0.191	0.024	.	.	.	.	.	.
Swainson's Hawk	5	5	1.99%	0.014	0.140	0.011	10	10	6.99%	0.044	0.322	0.026	1	1	0.19%	0.002	0.047	0.002	.	.	.	.	.	.
Red-tailed Hawk	77	102	30.68%	0.216	0.509	0.171	33	33	23.08%	0.145	0.451	0.105	48	48	9.14%	0.105	0.452	0.070	24	30	45.28%	0.070	0.298	0.058
Rough-legged Hawk	13	25	5.18%	0.036	0.215	0.031	.	.	.	.	.	.	4	4	0.76%	0.009	0.093	0.009	4	9	7.55%	0.012	0.108	0.012
Unknown Buteo	0	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	1.89%	0.003	0.054	0.003
Sharp-shinned Hawk	5	5	1.99%	0.014	0.140	0.011	.	.	.	.	.	.	10	10	1.90%	0.022	0.161	0.020	.	.	.	.	.	.
Cooper's Hawk	6	6	2.39%	0.017	0.149	0.014	2	2	1.40%	0.009	0.093	0.009	9	9	1.71%	0.020	0.139	0.020	.	.	.	.	.	.
Unknown Accipiter	1	1	0.40%	0.003	0.053	0.003	1	1	0.70%	0.004	0.066	0.004	1	1	0.19%	0.002	0.047	0.002	.	.	.	.	.	.
Turkey Vulture	63	63	25.10%	0.176	1.049	0.059	60	60	41.96%	0.263	1.119	0.114	99	99	18.86%	0.217	0.645	0.129	.	.	.	.	.	.
Short-eared Owl	1	1	0.40%	0.003	0.053	0.003	.	.	.	.	.	.	3	3	0.57%	0.007	0.081	0.007	.	.	.	.	.	.
Snowy Owl	2	2	0.80%	0.006	0.075	0.006	.	.	.	.	.	.	.	.	.	.	.	.	5	5	9.43%	0.015	0.120	0.015
Unknown Raptor	2	9	0.80%	0.006	0.075	0.006	.	.	.	.	.	.	.	.	.	.	.	.	0	6	.	.	.	.
All Raptors	**251**	**351**	**100.00%**	**0.703**	**1.524**	**0.370**	**143**	**145**	**100.00%**	**0.627**	**1.413**	**0.289**	**525**	**528**	**100.00%**	**1.151**	**7.248**	**0.311**	**53**	**115**	**100.00%**	**0.155**	**0.443**	**0.126**
All Raptors (excluding vultures)	**188**	**288**	**74.90%**	**0.527**	**0.879**	**0.353**	**83**	**85**	**58.04%**	**0.364**	**0.793**	**0.232**	**426**	**429**	**81.14%**	**0.934**	**7.169**	**0.221**	**53**	**115**	**100.00%**	**0.155**	**0.443**	**0.126**

Seasonal mean use statistics by species. *Total Std. Detections* = total number of detections occurring within the 800 m-radius count cylinder during standardized use surveys; *All Detections* = total number of detections including incidental detections. Both detection totals are cumulative and occasionally may double-count individuals observed across concurrent 20-minute segments at the point. *% Comp.* = % of species composition using total standardized detections; *Mean Use* = Total standardized detections divided by number of point count segments conducted within the season, with standard deviation; *Occur. Freq.* = occurrence frequency, the number of segments at which the taxon was detected divided by the total number of segments conducted during that season.

Directional Movements

Bald Eagle directional movements are summarized in rose-plot diagrams in *Bald Eagle Directional Movement Plots – Figures 9a-c*, **Appendix I**. Key patterns are listed below:

- Directional movements (see) trended southward in the fall, as expected during migration.
- Over a third of the Bald Eagles observed during the spring period were moving in a southerly direction, suggesting that a significant proportion of eagles observed during the spring period may be territorial residents or lingering wintering individuals.
- There was no clear directional trend during the winter season, consistent with a pattern expected from wintering Bald Eagles.

Seasonal sample sizes for directional movement analysis were small (particularly during the spring season) and do not eliminate the possibility that observed patterns in directional movement were not due to chance.

Flight Heights

Flight heights were highest during the fall survey period for Bald Eagles and for raptors as a whole (see *Figures 10a – d Raptor Flight Height Profiles,* **Appendix I**). Bald Eagle mean minimum and maximum flight heights were within the 35 – 150 m RSZ zone during the fall and winter periods, and Bald Eagle mean maximum flight height was within the RSZ during the spring.

Figures 10a – d, **Appendix I** provide a series of boxplots that describe the distributions of minimum and maximum flight heights for Bald Eagles, Golden Eagles, Swainson's Hawks, Red-tailed Hawks, Rough-legged Hawks, and Northern Harriers. Spring maximum flight height means were within the RSZ for Swainson's Hawk, Red-tailed Hawk, Rough-legged Hawk, and Bald Eagle. Fall maximum flight height means were within the RSZ for Bald Eagle and Red-tailed Hawk. It is important to note that these figures strictly describe the distribution of flight height data, and they do not necessarily speak to collision probability.

Collision Risk

Bald Eagles were encountered at flight heights within the 35 – 150 m RSZ within the Project Area. Rates of passage within the RSZ were similar in the spring (0.229 minutes within RSZ/standardized survey hour), fall (0.194 RSZ minutes/survey hour), and winter (0.211 RSZ minutes/survey hour).

Bald Eagles were observed within the RSZ for 27.2 minutes over 119 spring survey hours, 29.5 minutes over 152 fall survey hours, and for 24.1 minutes over 114 winter survey hours. Bald Eagles were not observed within the RSZ over 76 hours of standardized surveys in the summer. In total, Bald Eagles were observed flying within the RSZ for a total of 80.8 minutes over 461 total standardized survey hours across the year.

3.3.2 Golden Eagle

Two (2) Golden Eagle detections occurred over the course of this pre-construction eagle use study (see *Figure 6a, 6b - Eagle Observation Density Map*, **Appendix I**). One (1) of these individuals was observed during 461 hours of standardized mean use surveys.

The Golden Eagle observed during standardized use surveys was seen from point # 77 on November 2, 2017. It was observed within the standardized count cylinder for 5.3 minutes and was moving south-southwestward in apparent migration. The other Golden Eagle was observed incidentally on March 10, 2017, in Ripley Township (43.9503°N, 92.9417°W), perched on the side of the road.

Standardized mean use was 0.002 Golden Eagles/20 minutes (*SD* = 0.047) during the fall and zero (0) during other seasons.

3.4 Wetland Utilization Survey Summary

No federally listed species were observed during wetland utilization surveys. One (1) State Endangered Henslow's Sparrow (*Ammodramus henslowii*) was observed singing on June 22, 2017 at the DWPA. This individual was not observed on subsequent visits and thus Henslow's Sparrow breeding status was determined by Atwell as *possible* within the Project Area in *Table 5 – Incidental Wetland Utilization Survey Summary*. For more information regarding the results of targeted endangered avian species surveys, please reference Atwell (2017b). Several Minnesota *Species of Greatest Conservation Need* (SGCN; MNDNR 2016) associated with grassland habitats were determined by Atwell to be probable breeders within the Project Area, including (in order of decreasing frequency of occurrence): Dickcissel (*Spiza americana*), Bobolink (*Dolichonyx oryzivorus*), Sedge Wren (*Cistothorus platensis*), Swamp Sparrow (*Melospiza georgiana*), Eastern Meadowlark (*Sturnella magna*), and Marsh Wren (*Cistothorus palustris*).

American White Pelican (MNDNR-SGCN, *Pelecanus erythrorhynchos*) represented the single species that demonstrated a tendency to flock in relatively large numbers during the observation period. State Threatened Trumpeter Swans (*Cygnus buccinator*) were present in moderate numbers during the breeding season and are considered to be probable breeders within the Project Area (*Table 5*).

Table 5. Incidental Wetland Avian Utilization Survey Summary – Dodge County Wind Energy Center

STATUS	SPECIES	ATWC				OGWC				DWPA			
		Spring 2017	Summer 2017	Fall 2017	Spring 2018	Spring 2017	Summer 2017	Fall 2017	Spring 2018	Spring 2017	Summer 2017	Fall 2017	Spring 2018
SE	Henslow's Sparrow[3]	0	0	0	0	0	0	0	0	0	1	0	0
	Horned Grebe[1]	0	0	0	0	8	0	0	0	0	0	0	0
ST	Trumpeter Swan[4]	0	0	0	0	13	57	32	0	0	0	0	0
SC	Short-eared Owl[1]	0	0	0	1	0	0	0	0	0	0	0	0
SGCN	American Bittern[3]	0	0	0	0	2	0	0	0	0	0	0	0
	American White Pelican[1]	0	1	0	0	182	0	167	0	0	0	12	0
	Black Tern[1]	0	0	0	0	0	0	14	0	0	0	0	0
	Black-billed Cuckoo[1]	0	0	0	0	0	0	1	0	0	0	0	0
	Black-throated Blue Warbler[1]	0	0	0	0	1	0	0	0	0	0	0	0
	Bobolink[4]	50	76	3	0	0	0	0	0	31	71	0	0
	Brown Thrasher[4]	1	0	0	0	0	1	0	0	0	0	0	0
	Dickcissel[4]	0	35	0	0	0	17	1	0	0	24	0	0
	Eared Grebe[1]	0	0	0	0	2	0	0	0	0	0	0	0
	Eastern Meadowlark[3]	2	4	1	1	0	0	0	0	2	3	0	0
	Eastern Wood-Pewee[3]	0	0	0	0	1	5	10	0	0	0	0	0
	Forster's Tern[1]	4	0	0	0	0	0	3	0	0	0	0	0
	Lesser Scaup[1]	0	0	0	2	10	0	0	0	0	0	0	0
	Marsh Wren[4]	2	0	0	0	4	14	0	0	2	5	0	0
	Northern Harrier[3]	4	2	2	4	0	0	0	1	1	1	0	3
	Northern Pintail[1]	0	0	0	0	0	0	79	0	0	0	0	0
	Red-headed Woodpecker[3]	0	0	0	0	0	0	0	0	0	2	1	0
	Red-necked Grebe[3]	0	0	0	0	4	1	0	0	0	0	0	0
	Rose-breasted Grosbeak[3]	0	0	0	0	2	1	0	0	0	0	0	0
	Rusty Blackbird[1]	0	0	0	0	0	0	0	0	0	0	0	8
	Sedge Wren[4]	6	42	19	0	3	20	1	0	6	36	6	0
	Willow Flycatcher[3]	2	2	0	0	0	0	0	0	0	2	0	0
BGEPA	Bald Eagle[2]	2	0	1	2	4	0	9	13	0	0	0	1

ATWC = Ashland Township Wetland Complex; **OGWC** = Oak Glen Wetland Complex; **DWPA** = Dodge Center Creek Waterfowl Production Area. **SE** = State Endangered; **ST =** State Threatened; **SC** = Special Concern; **SGCN** = Species of Greatest Conservation Need; **BGEPA** = Bald and Golden Eagle Protection Act species. Breeding statuses are provided with superscripted numerals occurring after each special status species name and include: 1 = observed only; 2 = unlikely breeder within the Project Area due to extensive surveys within the Project Area; 3 = possibly breeding within the Project Area; and 4 = probably breeding within the Project Area. Breeding statuses within the Project Area were informed by preliminary data from the Minnesota Breeding Bird Atlas Project (Pfannmuller et al. 2017) and field observation. Breeding status definitions can be found on the Minnesota Breeding Bird Atlas website at https://mnbirds.com/wp-content/uploads/2016/11/BreedingEvidenceCodes_Tips.pdf

3.5 Review of Migration Use Data

Migration use of the Project Area was higher during the fall season than during the spring season, though specific taxonomic groups (e.g., waterfowl) did not follow this pattern (*Figure 11,* **Appendix I**).

- Fall Migration = 3,761 total individuals were detected during the fall season, a rate of approximately 25 birds/20-minute count segment during fall standardized surveys.

- Spring Migration = 2,647 individuals were detected during the spring season, a rate of approximately 22 birds/20-minute count segment during spring standardized surveys.

Small-bodied passerines, corvids, and waterfowl together comprised the large majority of detections during both seasons (87% of spring detections and 84% of fall detections), largely driving seasonal differences in avian use of the Project Area during migration. Mean use statistics for all species referenced below and encountered during spring and fall standardized surveys are provided in **Appendix II**.

Avian guilds utilize Project Area air space at different altitudes (*Figure 12a, 12b,* **Appendix I**). When taken together, the waterbird and raptor species guilds encounter relatively riskier flight heights more so than other avian species guilds.

<u>Waterfowl</u>
Waterfowl (3.8 individuals/spring 20-min count segment) represented 17.2% of spring migration detections. Numbers decreased during fall migration to 1.7 individuals/20-min fall count segment, representing only 6.9% of fall migration detections. Canada Geese (*Branta Canadensis*) and Mallards (*Anas platyrhynchos*) together represented the majority of waterfowl observations during spring and fall migration (96.7% and 90.4% of waterfowl detections respectively).

<u>Waterbirds</u>
The waterbird group includes loons, grebes, cormorants, and gulls. Waterbird detections increased notably from the spring to the fall, from only four (4) individuals detected over the entire spring survey period (0.03 detections/20-min count segment in the spring) to 0.8 detections/20-min count segment in the fall. This seasonal difference was driven by passage of Franklin's Gulls (*Leucophaeus pipixcan*) through the Project Area in the fall, representing 95.9% of fall waterbird detections.

<u>Waders</u>
Waders include herons and cranes. They were rarely recorded during migration, with 20 individuals observed over the entire spring period, and 11 individuals observed over the entire fall period. Sandhill Cranes (*Grus Canadensis*) accounted for the majority of wader detections (55% in the spring and 91% in the fall).

Shorebirds

Shorebirds were observed at similar rates in the spring and fall (0.4 spring detections/20-min count segment and 0.3 fall detections/20-min count segment, respectively). They accounted for 1.6% of overall detections in the spring and 1.3% of all overall detections in the fall. Killdeer (*Charadrius vociferous*) accounted for the majority of shorebird detections (73.7% of spring shorebird detections and 45.8% of fall shorebird detections).

Upland Gamebirds

Upland gamebirds were detected three times more frequently in the spring (0.3 detections/20-min count segment) than in the fall (0.1 detections/20-min count segment). They represented 1.6% of overall spring detections and 0.4% of overall fall detections. This seasonal pattern was driven entirely by Wild Turkeys (*Meleagris gallopavo*), which were not observed during the fall period.

Raptors

Seasonal raptor use of the Project Area is described in Section 3.3 above. Use rates were highest during the fall season, driven by large movements of Broad-winged Hawks through the Project Area over short durations. Fall and spring raptor use rates were otherwise similar, with raptors representing 3.1% of all total bird detections in the spring and 2.6% of all bird detections in the fall during 20-minute migration watch count segments.

Non-passerines

Non-passerines include woodpeckers, doves, pigeons, and swifts. Detection rates of non-passerines were higher in the fall (1.9 detections/20-min count segment) than in the spring (1.4 detections/20-min count segment). Non-passerine detections accounted for 7.7% of all detections in the fall and 6.2% of all detections in the spring. The large majority of non-passerine detections were Rock Pigeons (*Columba livia*, 83.5% of spring non-passerine detections and 91.0% of fall non-passerine detections).

Corvids

Corvid detection rates were higher in the spring (1.8 detections/20-min count segment) than in the fall (1.5 detections/20-min count segment). This species group represented 8.0% of all spring detections and 6.0% of all fall detections. All corvid detections were American Crows (*Corvus brachyrhynchos*).

Passerines

Small-bodied passerine species accounted for the large majority of detections both in the spring (61.3%) and in the fall (71.5%). Observers recorded 13.6 small-bodied passerines/spring 20-min count segment and 17.7 small-bodied passerines/fall 20-min count segment.

Fifty-nine (59) small-bodied passerine species were recorded during standardized migration watch surveys. Red-winged Blackbirds (*Agelaius phoeniceus*, 20.4% of spring passerine detections and 20.6% of fall passerine detections), Common Grackles (*Quiscalus quiscula*, 11.4% of spring passerine detections and 9.1% of fall passerine detections), Horned Larks (*Eremophila alpestris*, 20.3% of spring passerine detections and 2.8% of fall passerine detections), Lapland Longspurs (*Calcarius lapponicus,* 22.7% of spring passerine detections, 3.7% of fall passerine detections), and European Starlings (*Sturnus vulgaris*, 2.6% of spring passerine detections and 10.6% of fall passerine detections) were the most common passerine species observed during migration watch surveys.

Seasonal patterns in passerine use of the Project Area were largely driven by increased use in the fall season by European Starlings, swallows (Barn Swallows [*Hirundo rustica*] and Cliff Swallows [*Petrochelidon pyrrhonata*]), American Goldfinches (*Spinus tristis*), and Blue Jays (*Cyanocitta cristata*) that were found in significantly higher numbers during the fall season (**Appendix II**).

3.6 Review of Sensitive Species Data

3.6.1 Federally Listed Species

Atwell biologists did not observe species listed as federally threatened or endangered during surveys throughout the April 2017 – March 2018 study period.

3.6.2 Minnesota State Listed Species and Species of Greatest Conservation Need

Table 6 – Summary of Sensitive Species Detected During Standardized Use Surveys summarizes Bald and Golden Eagle Protection Act (BGEPA) species, Minnesota State Endangered Species (E), Threatened Species (T), Species of Concern (SC), and the State Wildlife Action Plan's SGCN observed during spring, summer, and fall eagle use surveys. Basic summary statistics detail species counts; percent of spring point count locations (16 in 2017 and 19 in 2018) and summer and fall point count locations (19) at which the species was observed; percent of total spring 2017 site visits (n = 43), summer 2017 site visits (n = 76), fall 2017 site visits (n = 152), winter 2017-18 site visits (n = 114), and spring 2018 site visits (n = 76) during which the species was observed.

One (1) State Threatened Species (Trumpeter Swan) and nine (9) SGCN are considered to be probable breeders within the Project Area, including Swainson's Hawk, American Kestrel (*Falco sparverius*), Marsh Wren (*Cistothorus palustris*), Sedge Wren (*Cistothorus platensis*), Brown Thrasher (*Toxostoma rufum*), Swamp Sparrow (*Melospiza georgiana*), Dickcissel (*Spiza americana*), and Bobolink (*Dolichonyx oryzivorus*).

Table 6. Summary of Sensitive Avian Species Detected during Standardized Avian Use Surveys – Dodge County Wind Energy Center

Special Status Desig.	Species	Total Individuals Observed					Frequency of Stations Species Was Detected					Frequency of Surveys Species Was Detected				
		Spr 17	Sum 17	Fall 17	Win 17	Spr 18	Spr 17	Sum 17	Fall 17	Win 17	Spr 18	Spr 17	Sum 17	Fall 17	Win 17	Spr 18
ST	Trumpeter Swan[4]	2	3	2	0	0	4%	5%	5%	0%	0%	2%	1%	1%	0%	0%
SC	American White Pelican[1]	35	0	66	0	20	17%	0%	16%	0%	5%	9%	0%	3%	0%	1%
	Peregrine Falcon[1]	2	0	1	0	0	8%	0%	5%	0%	0%	5%	0%	1%	0%	0%
	Purple Martin[3]	7	7	1	0	0	13%	16%	5%	0%	0%	7%	4%	1%	0%	0%
	Short-eared Owl[1]	0	0	1	0	1	0%	0%	5%	0%	5%	0%	0%	1%	0%	1%
SGCN	American Kestrel[4]	6	16	21	0	0	21%	37%	58%	0%	0%	14%	13%	13%	0%	0%
	Belted Kingfisher[3]	2	2	0	0	0	19%	5%	0%	0%	0%	3%	1%	0%	0%	0%
	Bobolink[4]	32	78	14	0	0	13%	47%	16%	0%	0%	5%	25%	3%	0%	0%
	Brown Thrasher[4]	8	13	0	0	0	21%	32%	0%	0%	0%	19%	13%	0%	0%	0%
	Chimney Swift[3]	4	14	1	0	0	13%	16%	5%	0%	0%	7%	4%	1%	0%	0%
	Dickcissel[4]	3	122	2	0	0	13%	84%	5%	0%	0%	7%	54%	1%	0%	0%
	Eastern Meadowlark[3]	3	10	6	0	0	8%	26%	11%	0%	0%	5%	11%	2%	0%	0%
	Field Sparrow[3]	0	1	1	0	0	0%	5%	5%	0%	0%	0%	3%	1%	0%	0%
	Franklin's Gull[1]	0	0	385	0	0	0%	0%	26%	0%	0%	0%	0%	8%	0%	0%
	Least Flycatcher[3]	1	5	0	0	0	4%	26%	0%	0%	0%	2%	7%	0%	0%	0%
	Marsh Wren[4]	2	14	3	0	0	4%	11%	11%	0%	0%	2%`	8%	1%	0%	0%
	Northern Harrier[3]	7	8	10	0	0	21%	37%	32%	0%	0%	14%	9%	5%	0%	0%
	Red-headed Woodpecker[3]	0	2	1	0	0	0%	11%	5%	0%	0%	0%	3%	1%	0%	0%
	Sedge Wren[4]	9	33	14	0	0	17%	32%	11%	0%	0%	9%	18%	4%	0%	0%
	Swainson's Hawk[4]	3	15	1	0	0	6%	16%	5%	0%	0%	5%	5%	1%	0%	0%
	Swamp Sparrow[4]	14	25	7	0	0	13%	21%	11%	0%	0%	7%	12%	3%	0%	0%
	Upland Sandpiper[3]	1	9	3	0	0	4%	5%	11%	0%	0%	2%	5%	1%	0%	0%
	Virginia Rail[1]	2	0	1	0	0	4%	0%	5%	0%	0%	2%	0%	1%	0%	0%
	Willow Flycatcher[3]	0	4	0	0	0	0%	16%	0%	0%	0%	0%	4%	0%	0%	0%
	Yellow-bellied Sapsucker[1]	0	1	0	0	0	0%	5%	0%	0%	0%	0%	3%	0%	0%	0%
BGEPA	Bald Eagle[2]	10	3	22	41	37	33%	16%	58%	79%	89%	19%	4%	11%	21%	29%
	Golden Eagle[1]	0	0	1	0	0	0%	0%	5%	0%	0%	0%	0%	1%	0%	0%

Station Frequencies calculated from 16 stations sampled in spring 2017 and 19 stations sampled in seasons thereafter. **Survey Frequencies** calculated from: 43 spring 2017 visits; 76 summer 2017 visits; 152 fall 2017 visits; 114 winter 2017-18 visits; and 76 spring 2018 visits. **ST** = State Threatened; **SC** = Special Concern; **SGCN** = Species of Greatest Conservation Need; **BGEPA** = Bald and Golden Eagle Protection Act species. Breeding statuses are provided with superscripted numerals occurring after each special status species name and include: 1 = observed only; 2 = unlikely breeder within the Project Area due to extensive surveys within the Project Area; 3 = possibly breeding within the Project Area; and 4 = probably breeding within the Project Area. Breeding statuses within the Project Area were informed by preliminary data from the Minnesota Breeding Bird Atlas Project (Pfannmuller et al. 2017) and field observation. Breeding status definitions can be found on the Minnesota Breeding Bird Atlas website at https://mnbirds.com/wp-content/uploads/2016/11/BreedingEvidenceCodes_Tips.pdf

4.0 DISCUSSION & CONCLUSIONS

This Year-2 pre-construction avian use study provides a comprehensive assessment of avian use within the Project Area from May 1, 2017 through April 30, 2018. Key study findings include the following:

- Federal Threatened/Endangered Species were not observed within the Project Area.
- A wide variety of avian species migrate through the Project Area during spring and fall. Use rates vary widely among species guilds and across within-guild species.
- Golden Eagles detections during standardized surveys were rare events, only occurring once over 461 hours of standardized use surveys. Migration and wintering density of Golden Eagle is expected to be low within the Project Area.
- No Bald Eagle nests are known to be located within the Project Area. Five (5) active and two (2) inactive Bald Eagle nests are currently known to be located within 10 miles of the Project Area. The closest nest to turbine distance is 2.12 miles.
- Large congregations of Bald Eagles were not observed within the Project Area. The Cedar River roost (9.92 miles from the closest proposed turbine location) and the Rice Lake roost (4.89 miles from the closest proposed turbine location) were found during the March 2017 aerial nest survey and subsequent ground reconnaissance follow-up surveys.
- Bald Eagle standardized mean use was relatively constant in the spring, fall, and winter, though highest in the spring. Bald Eagles do not appear to intensively utilize the Project Area during summer months (i.e., June-July, and including August). Bald Eagle flight heights were highest in the fall, but seasonal rates at which Bald Eagles flew within the RSZ rates of flight within RSZ matched seasonal mean use patterns.
- One (1) State Threatened Species and eight (8) Minnesota Species of Greatest Conservation Need were observed within the Project Area during standardized use surveys are categorized as be probable breeders, including Trumpeter Swan, Swainson's Hawk, American Kestrel, Marsh Wren, Sedge Wren, Brown Thrasher, Swamp Sparrow, and Bobolink.
- American White Pelicans were the only species to congregate in large numbers during wetland utilization surveys. Trumpeter Swans were present in moderate numbers during wetland utilization surveys.

5.0 REFERENCES

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APPENDIX I

Report Figures

Figure 1. Avian Migration Use & Eagle Use Point County Survey Schematic – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

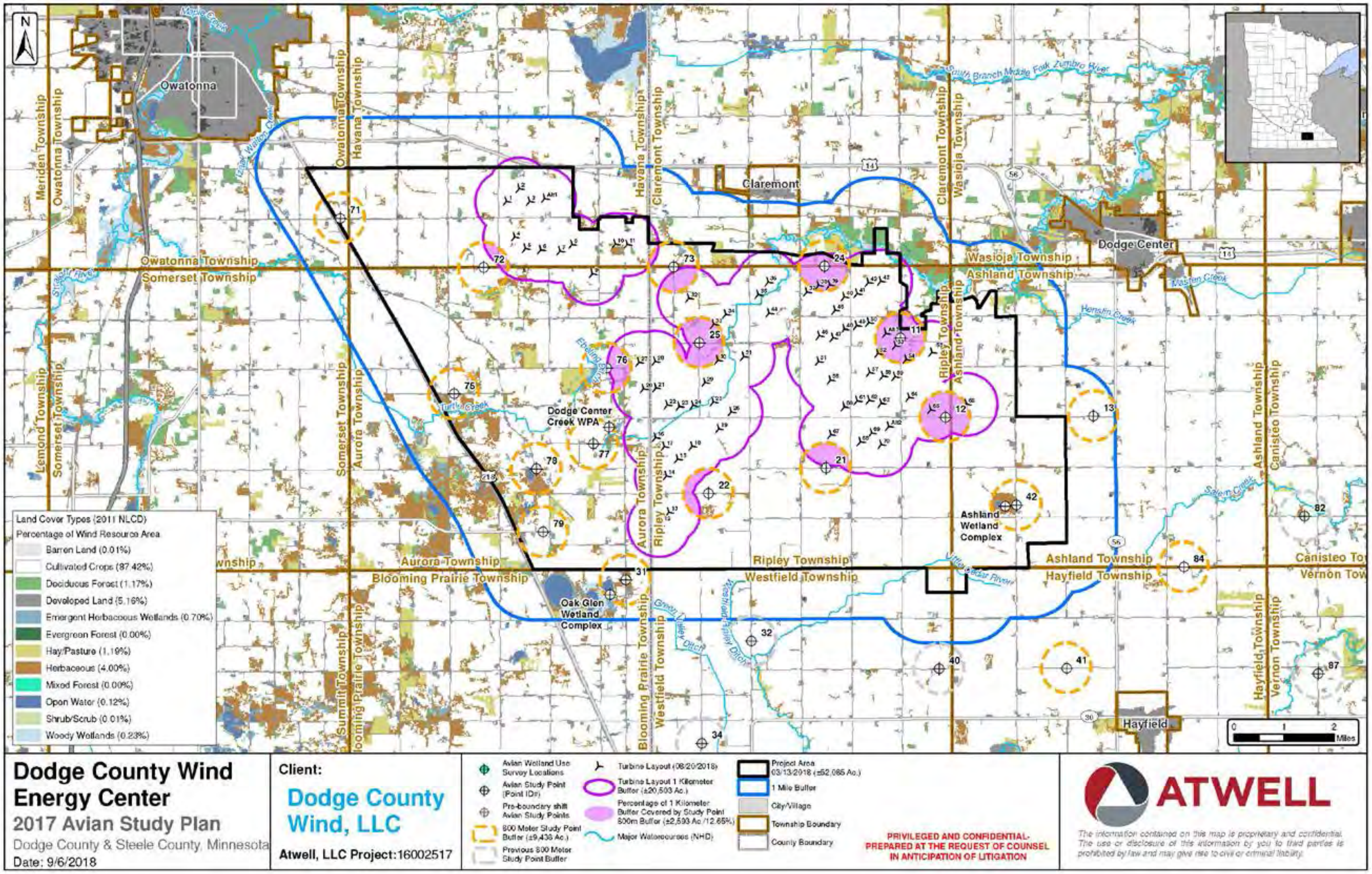


Figure 2. Aerial Raptor Nest Survey Study Plan Schematic – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

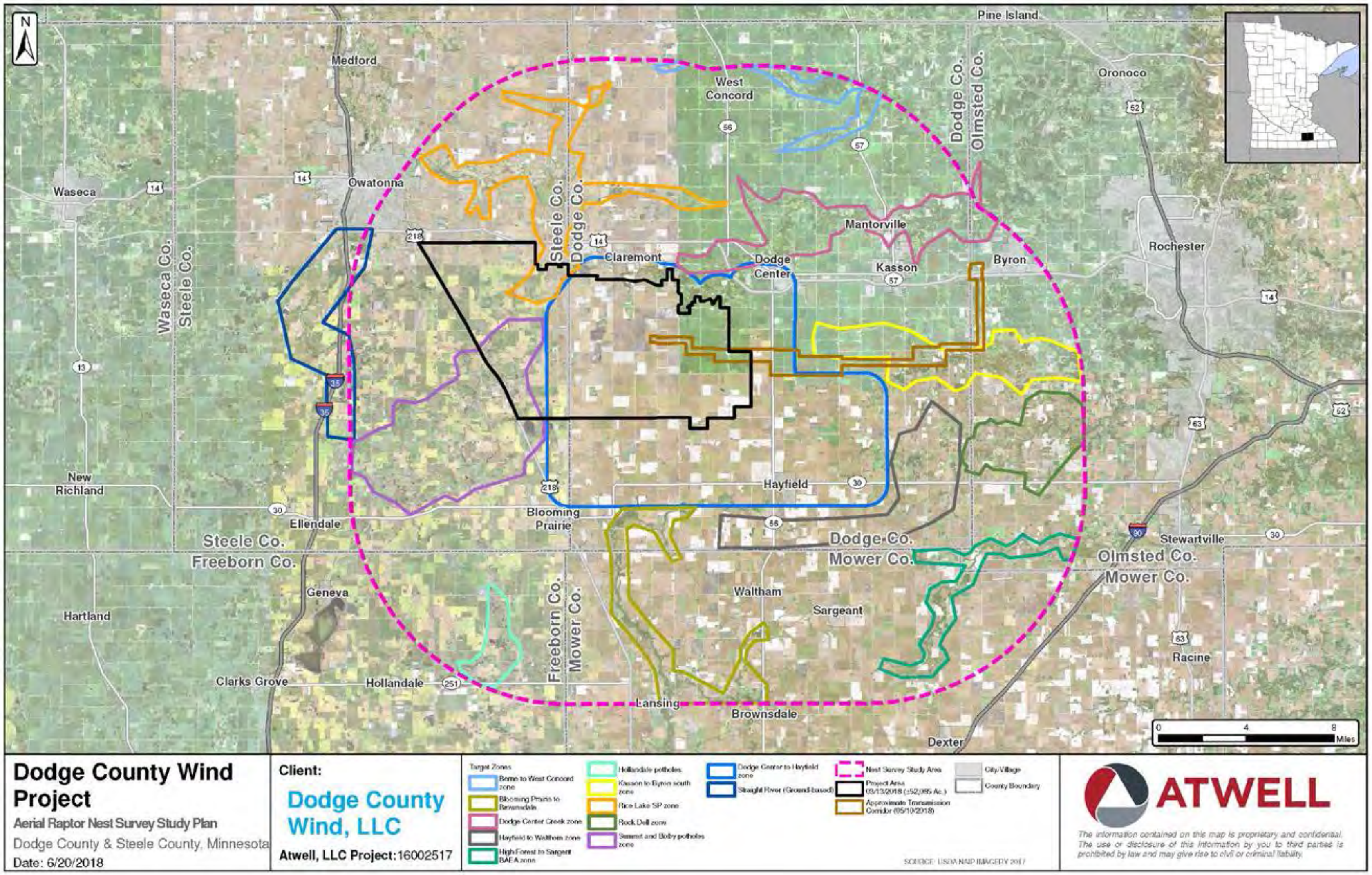


Figure 3. Eagle Nest Locations & Distances to Nearest Planned WTG – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

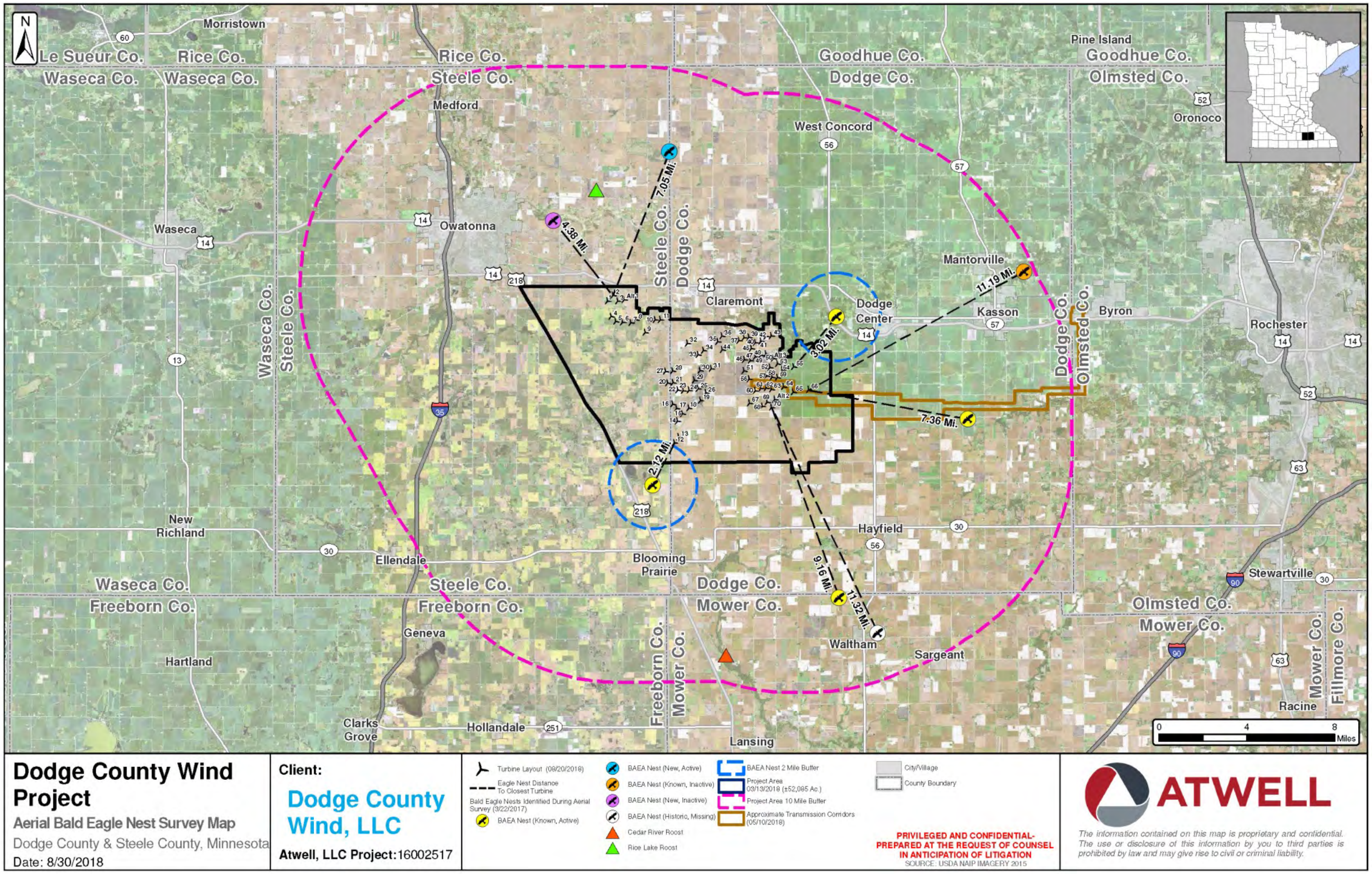


Figure 4. Other Raptor Species Nests (Including Heron Rookery Locations) – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

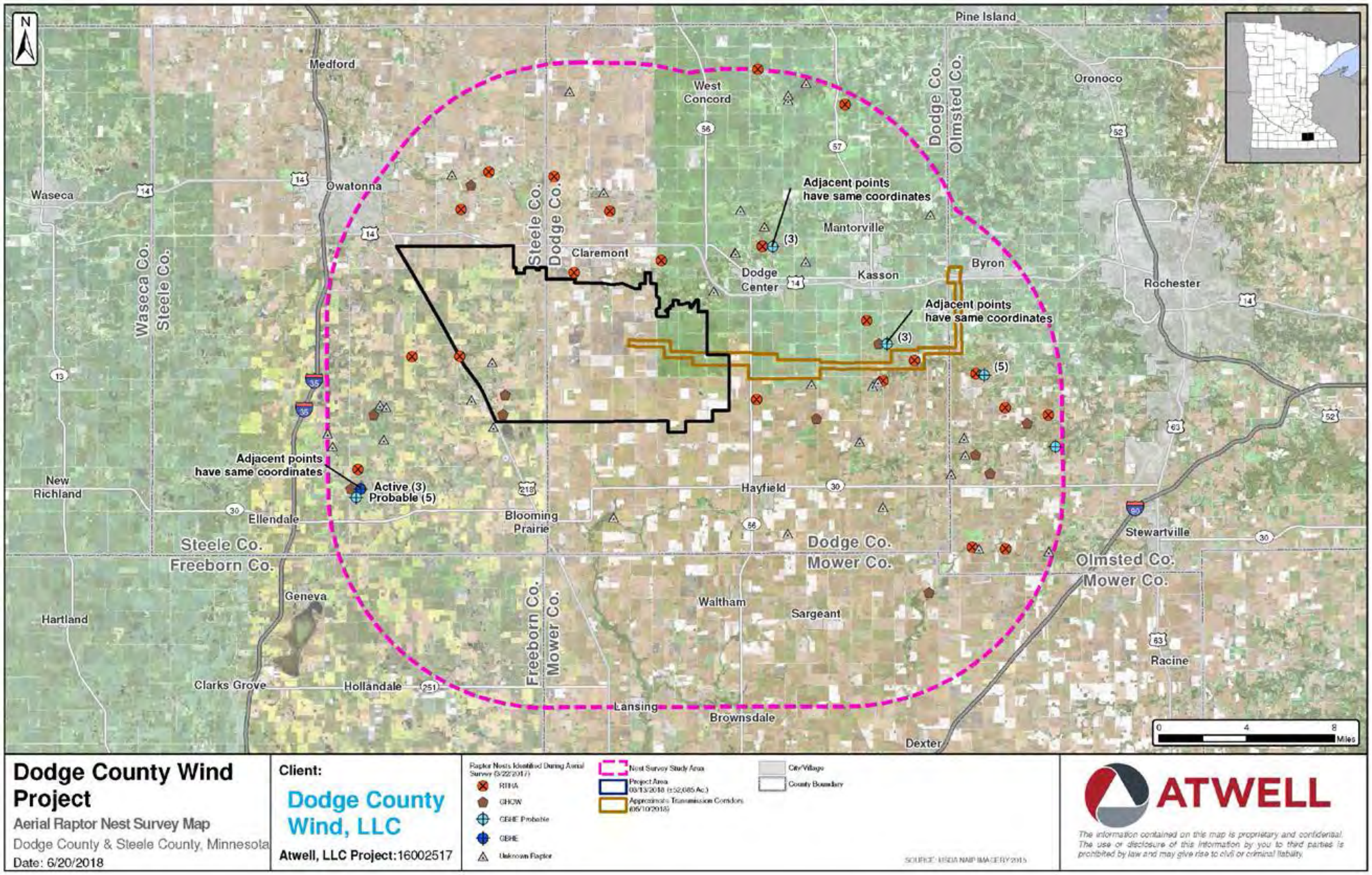


Figure 5. Bald Eagle Observation & Winter Communal Roosts from Aerial Survey Efforts (March 2017) – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

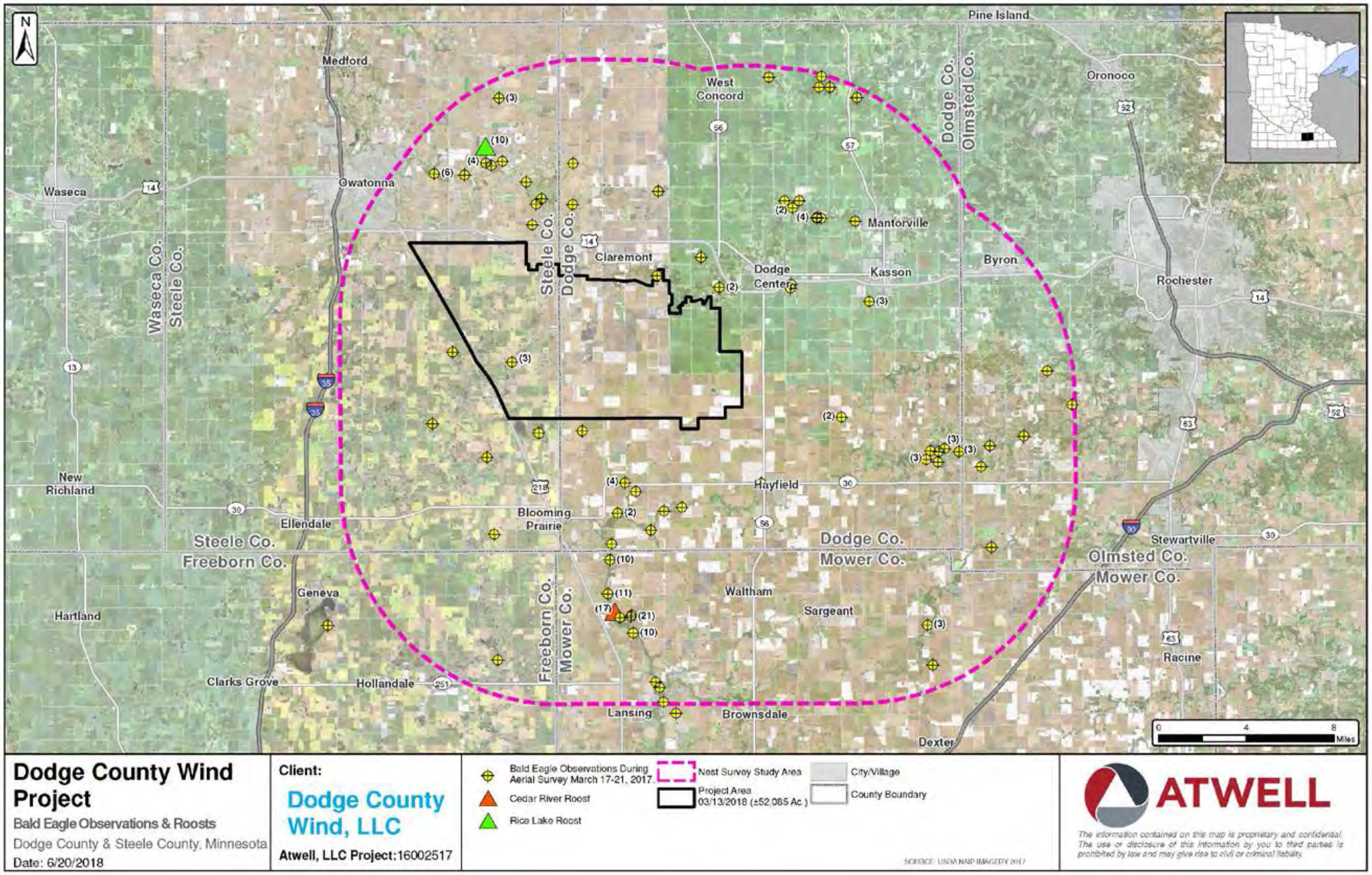


Figure 6. Eagle Observation Density Model (All Observations) – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

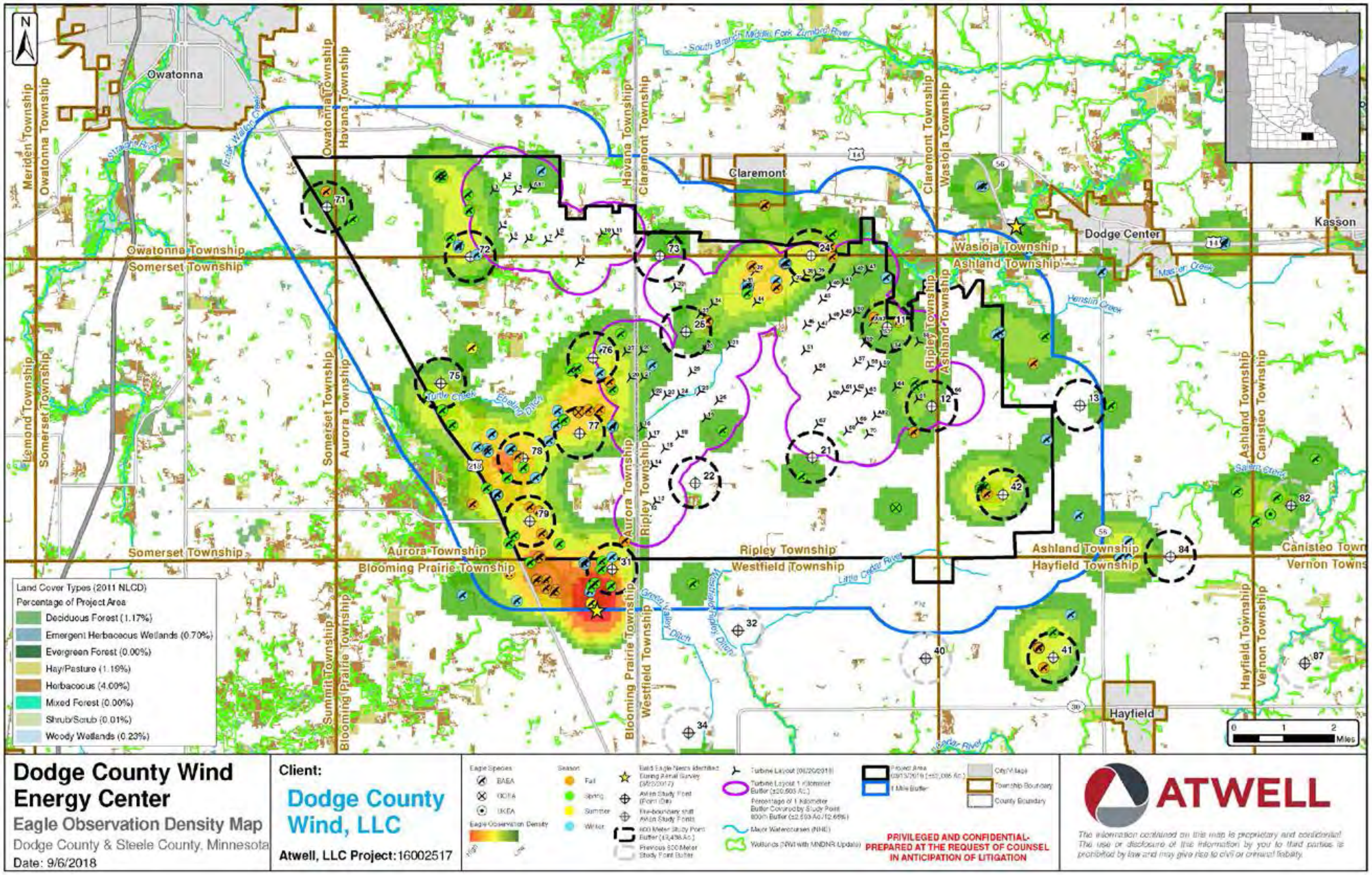


Figure 7. Raptor Species Occurrence Frequency by Month – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

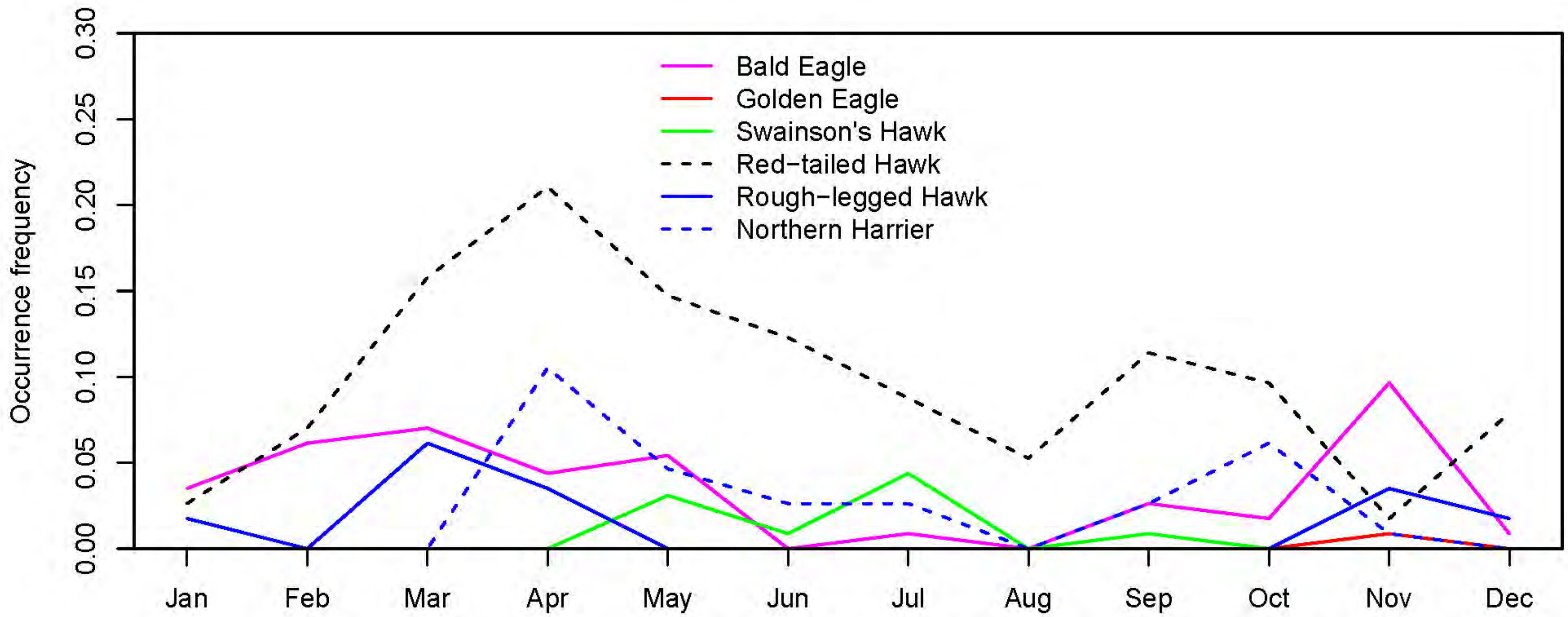


Figure 8a. Bald Eagle Mean Use by Point Count Station during Spring Migration – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

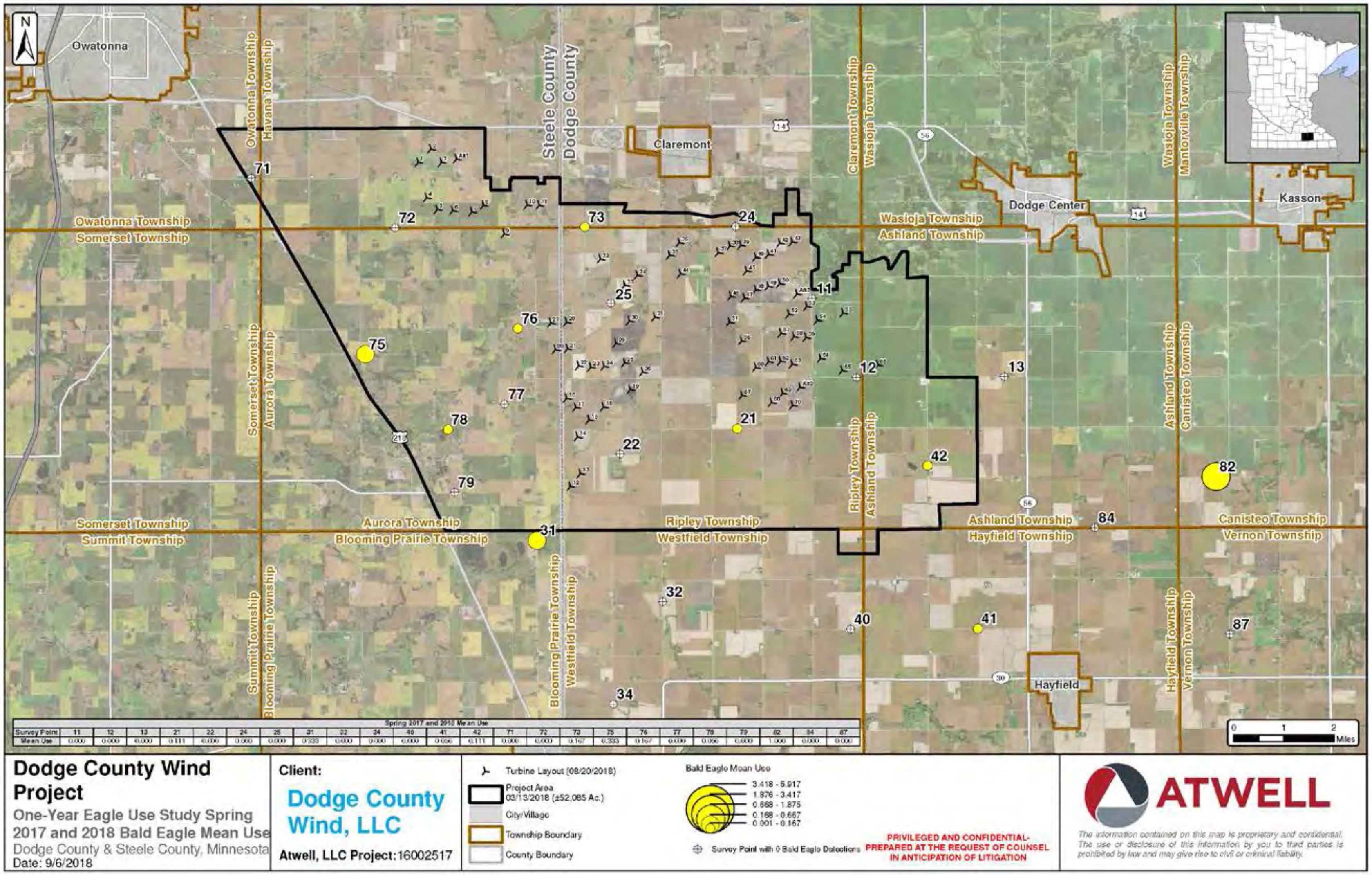
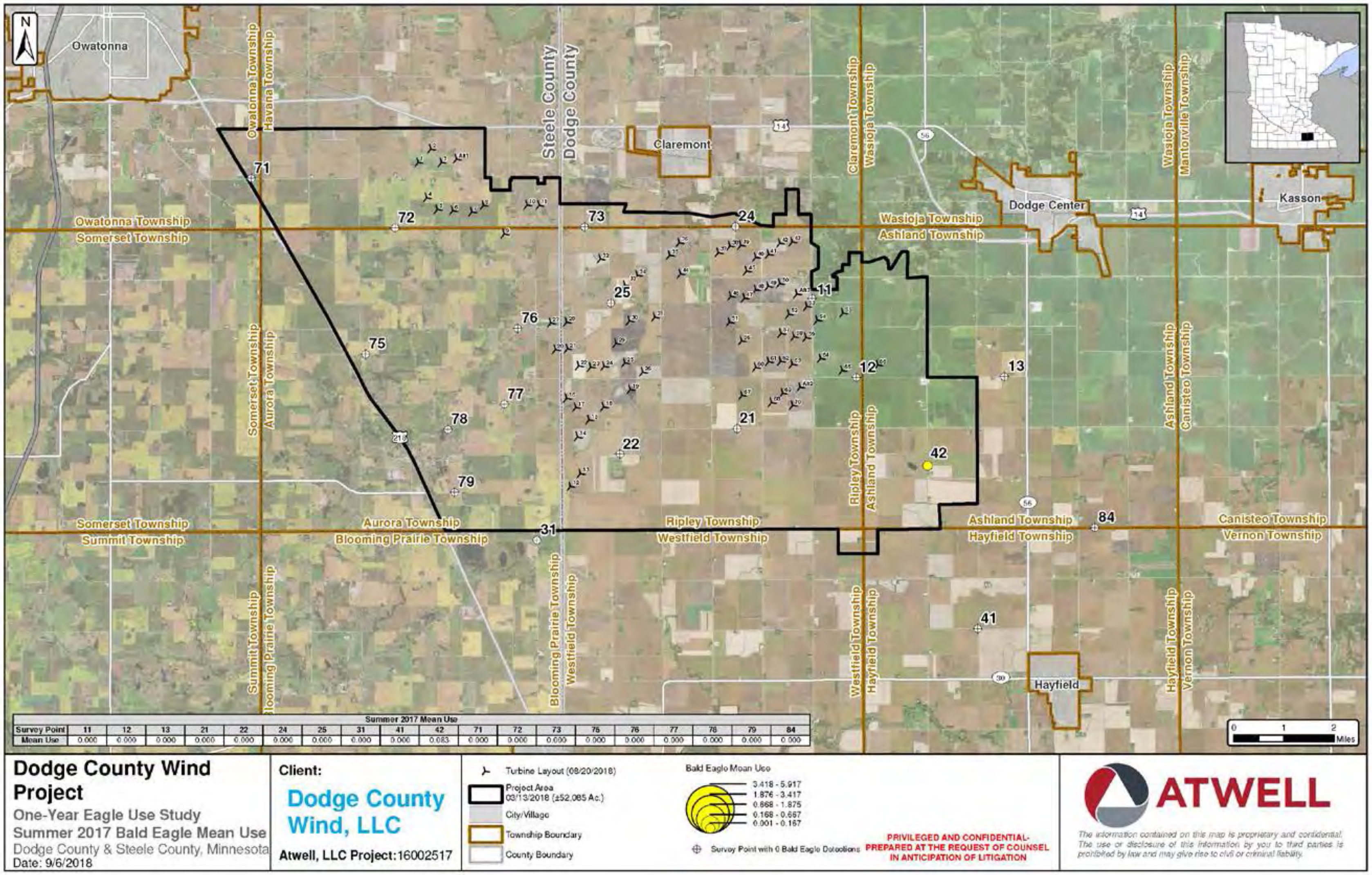
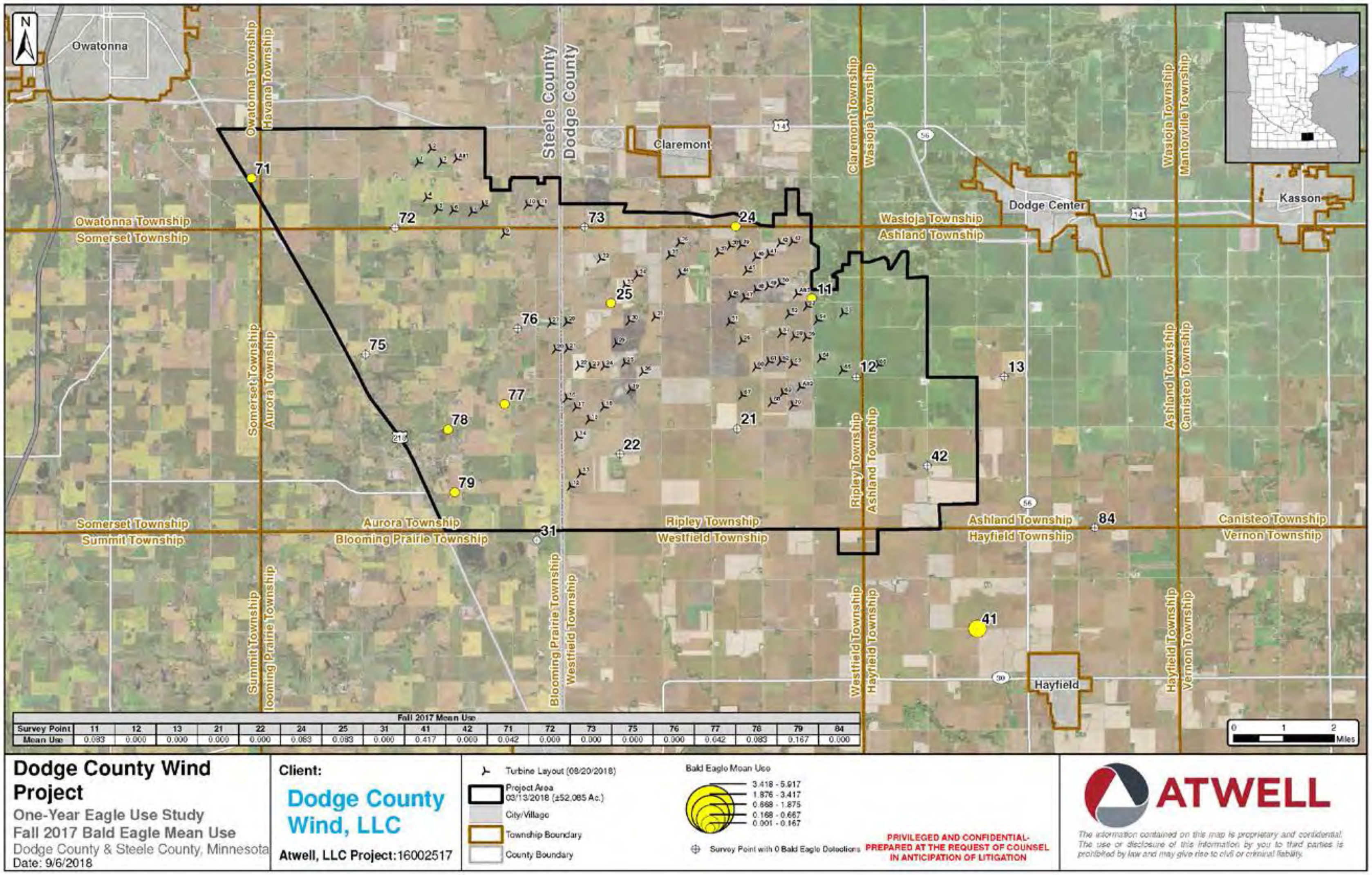


Figure 8b. Bald Eagle Mean Use by Point Count Station during Summer – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



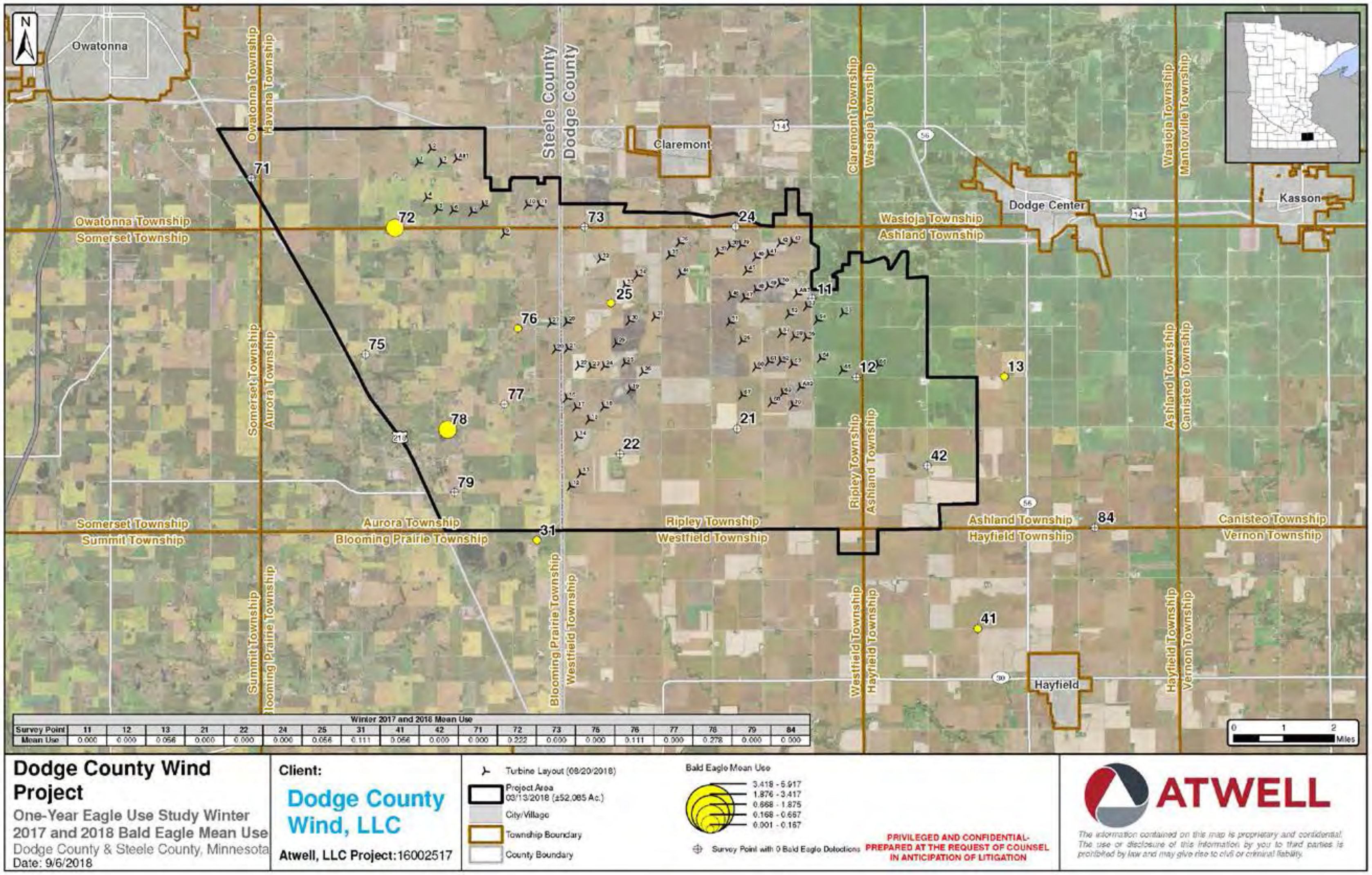
Summer 2017 Mean Use																			
Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Figure 8c. Bald Eagle Mean Use by Point Count Station during Fall Migration – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Fall 2017 Mean Use																				
Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	0.083	0.000	0.000	0.000	0.000	0.083	0.083	0.000	0.417	0.000	0.042	0.000	0.000	0.000	0.000	0.042	0.083	0.167	0.000

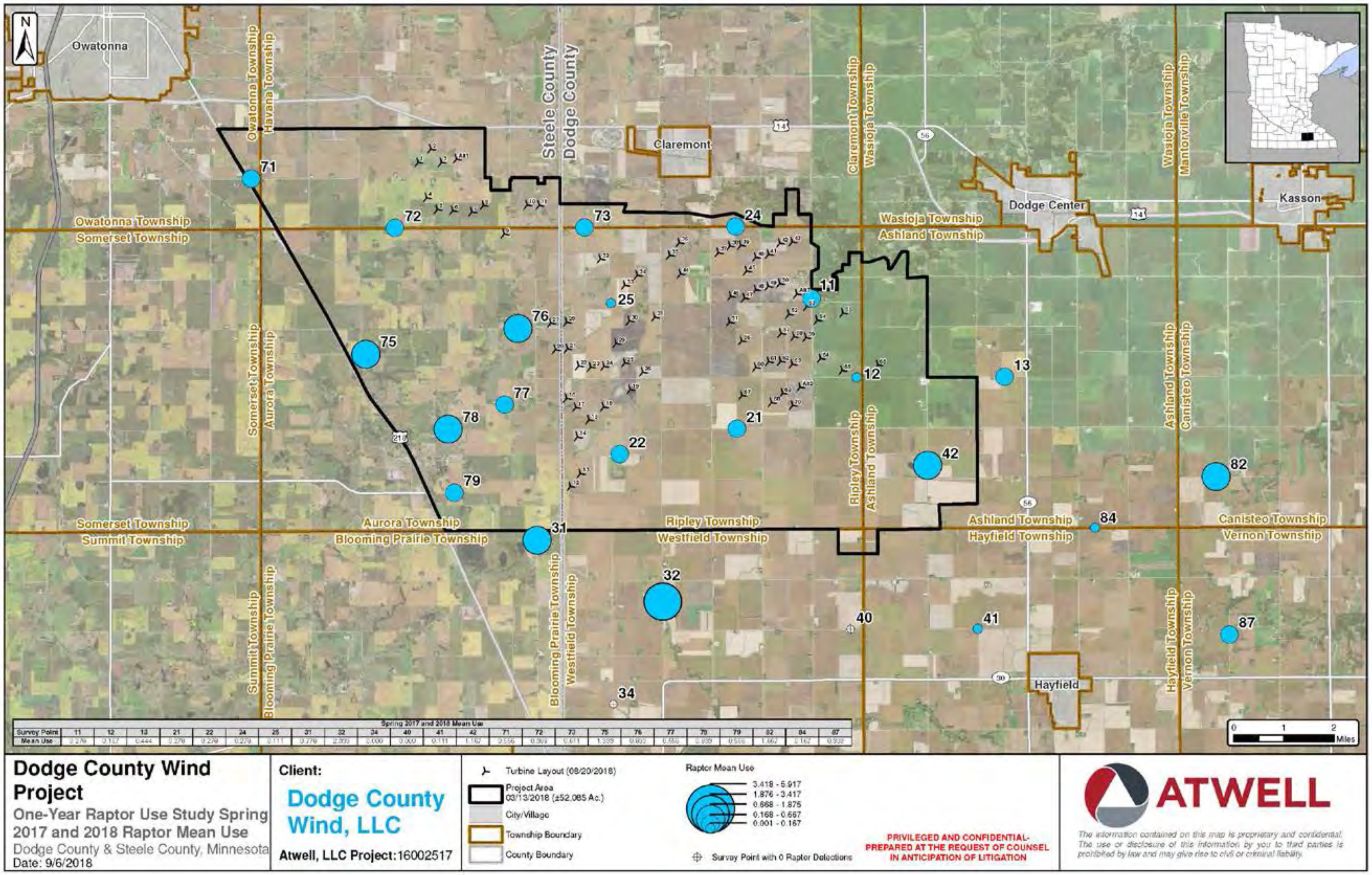
Figure 8d. Bald Eagle Mean Use by Point Count Station during Winter – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Winter 2017 and 2018 Mean Use

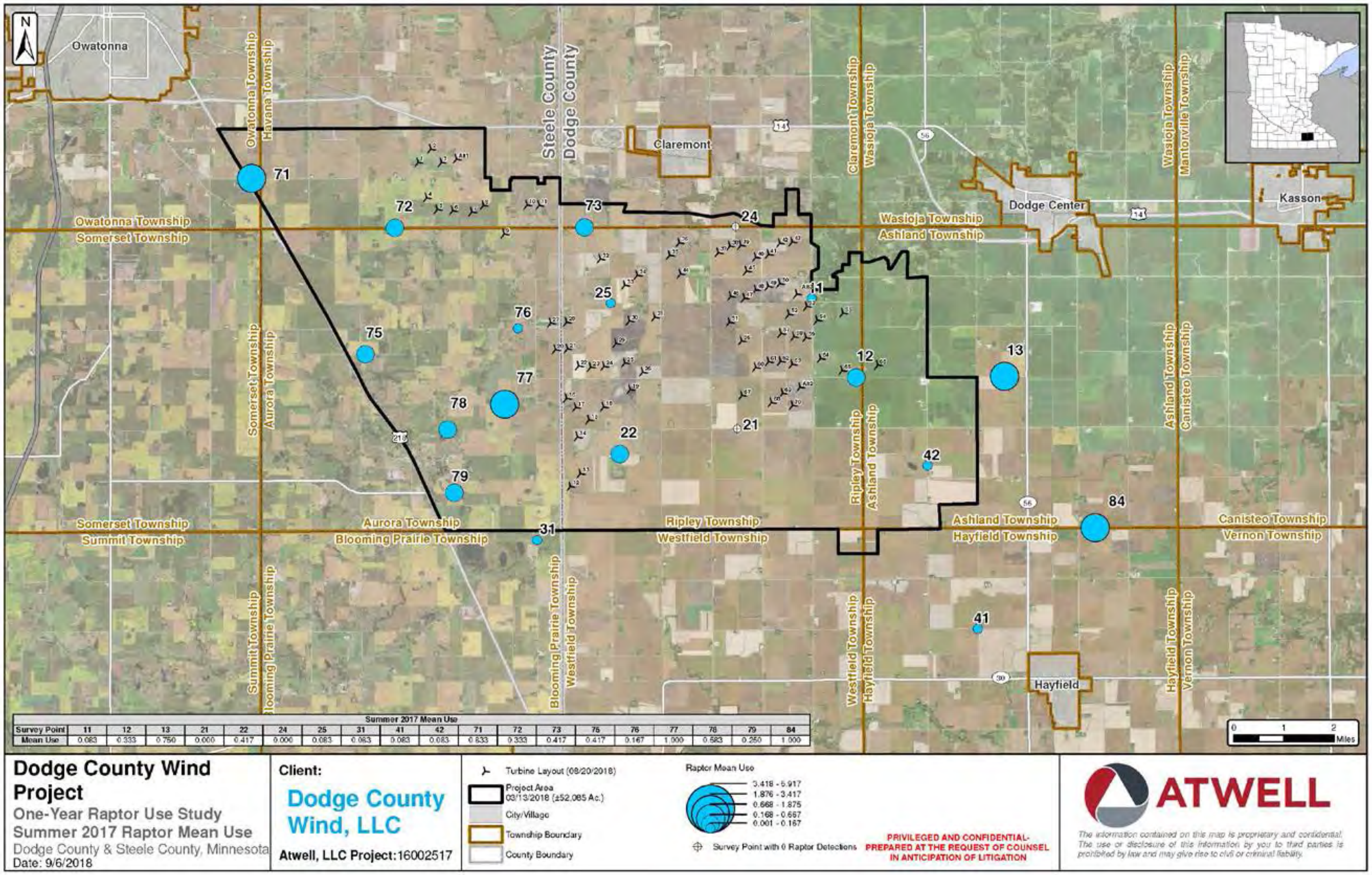
Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	0.000	0.000	0.056	0.000	0.000	0.000	0.056	0.111	0.056	0.000	0.000	0.222	0.000	0.000	0.111	0.000	0.278	0.000	0.000

Figure 8e. Raptor Guild Mean Use by Point Count Station during Spring Migration – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Spring 2017 and 2018 Mean Use																								
Survey Point	11	12	13	21	22	24	25	31	32	34	40	41	42	71	72	73	75	76	77	78	79	82	84	87
Mean Use	0.278	0.167	0.444	0.278	0.278	0.278	0.111	0.778	2.333	0.000	0.000	0.111	1.167	0.556	0.389	0.611	1.389	0.833	0.556	0.833	0.556	1.667	0.167	0.333

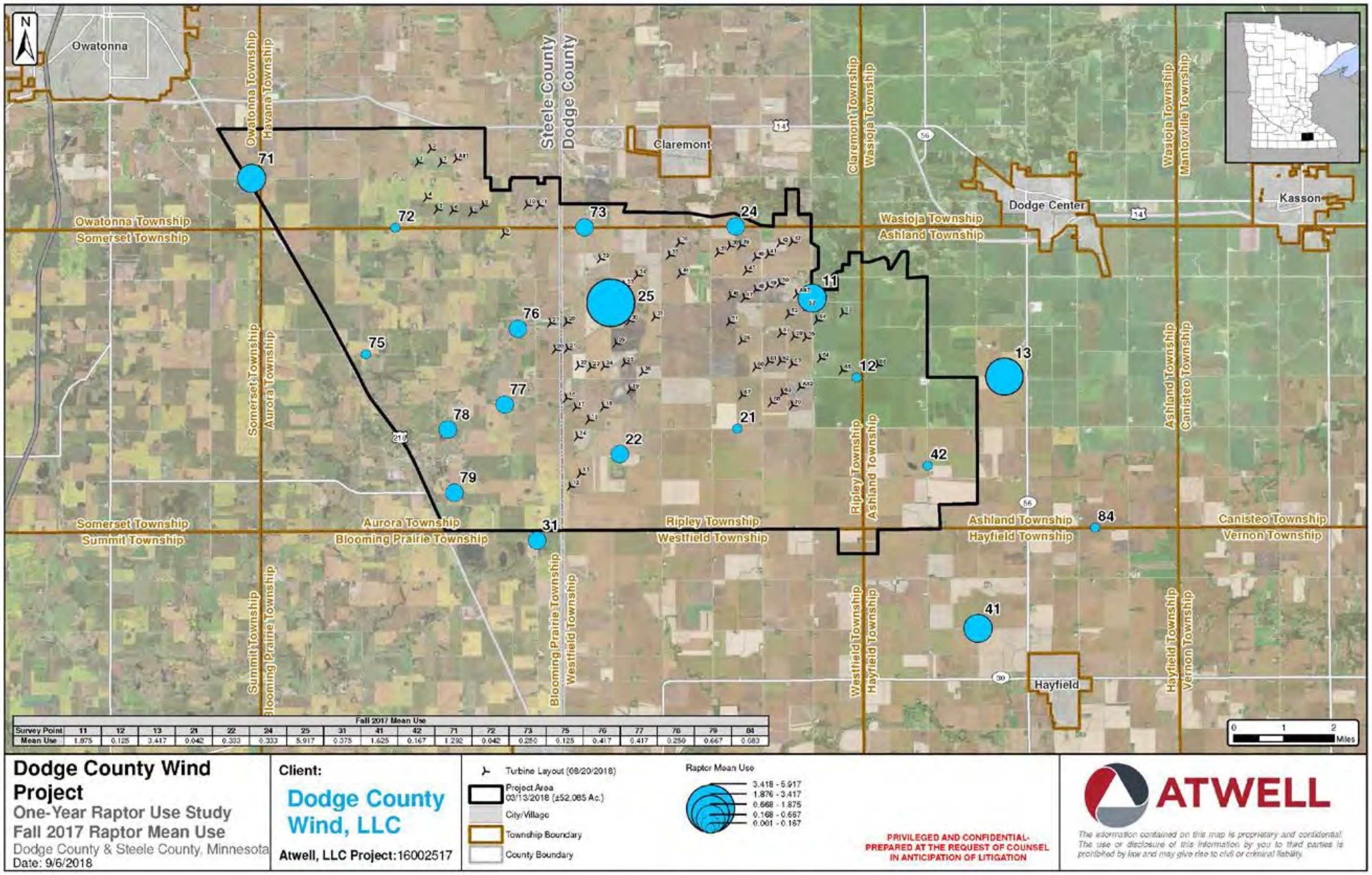
Figure 8f. Raptor Guild Mean Use by Point Count Station during Summer – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Summer 2017 Mean Use

Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	0.083	0.333	0.750	0.000	0.417	0.000	0.083	0.083	0.083	0.083	0.833	0.333	0.417	0.417	0.167	1.000	0.583	0.250	1.000

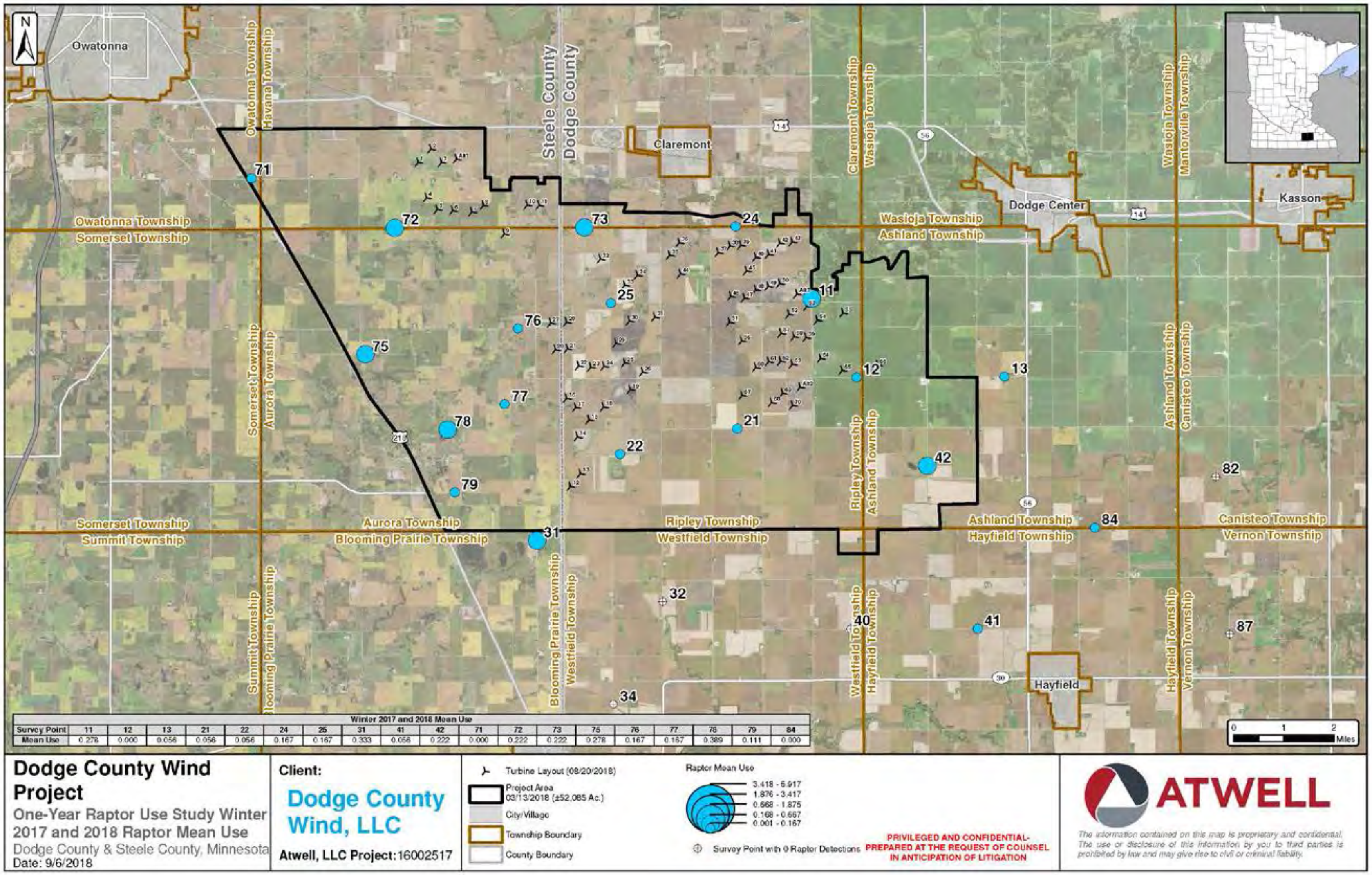
Figure 8g. Raptor Guild Mean Use by Point Count Station during Fall Migration – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Fall 2017 Mean Use

Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	1.875	0.125	3.417	0.042	0.333	0.333	5.917	0.375	1.625	0.167	1.292	0.042	0.250	0.125	0.417	0.417	0.250	0.667	0.083

Figure 8h. Raptor Guild Mean Use by Point Count Station during Winter – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)



Winter 2017 and 2018 Mean Use

Survey Point	11	12	13	21	22	24	25	31	41	42	71	72	73	75	76	77	78	79	84
Mean Use	0.278	0.000	0.056	0.056	0.056	0.167	0.167	0.333	0.056	0.222	0.000	0.222	0.222	0.278	0.167	0.167	0.389	0.111	0.000

Figure 9a. Bald Eagle Flight Direction Rose Plot for Spring Observations – Dodge County Wind Energy Center

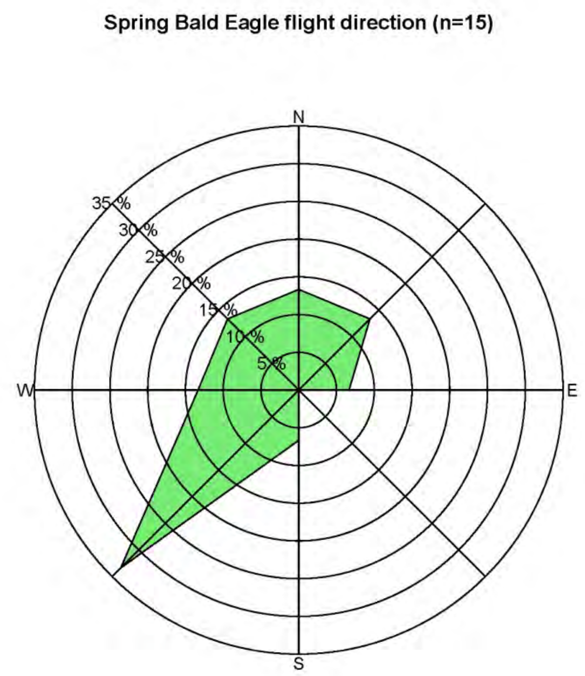


Figure 9b. Bald Eagle Flight Direction Rose Plot for Fall Observations – Dodge County Wind Energy Center

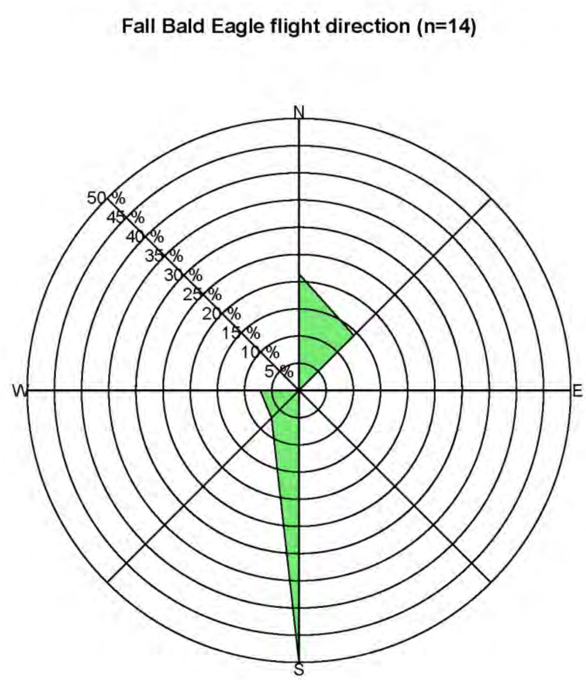


Figure 9c. Bald Eagle Flight Direction Rose Plot for Winter Observations – Dodge County Wind Energy Center

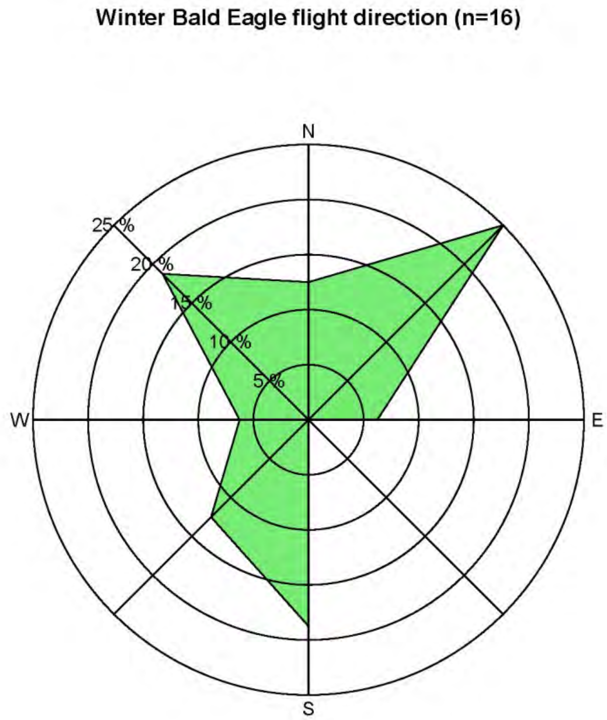


Figure 10a. Spring Migration Flight Height Profiles for Select Raptor Species Including Eagles – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)

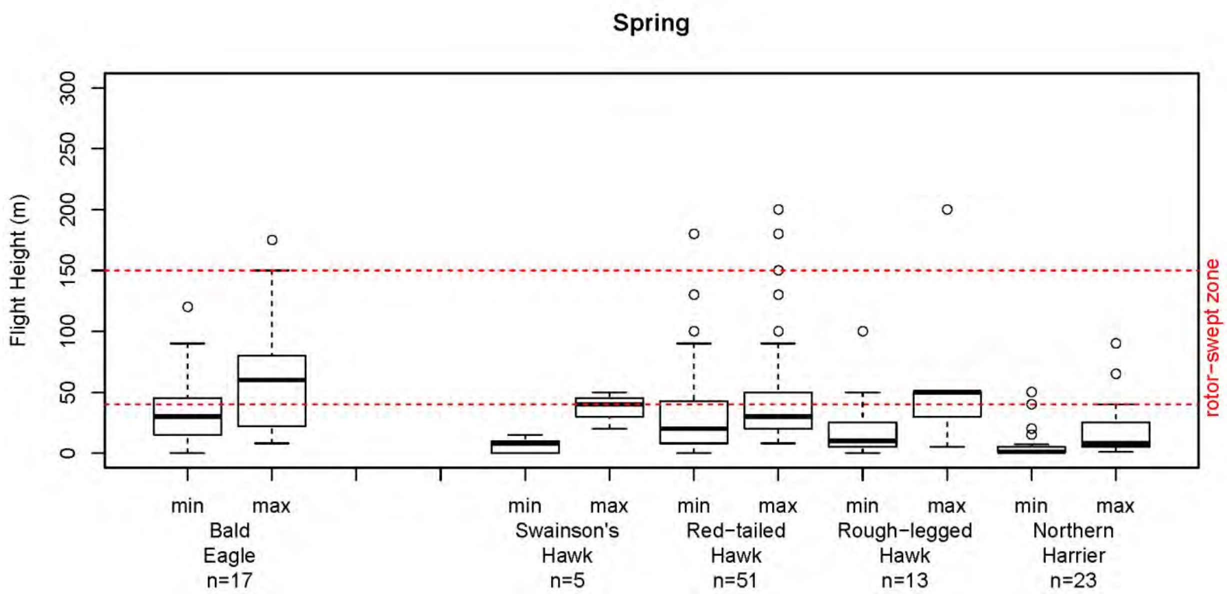


Figure 10b. Summer Flight Height Profiles for Select Raptor Species – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)

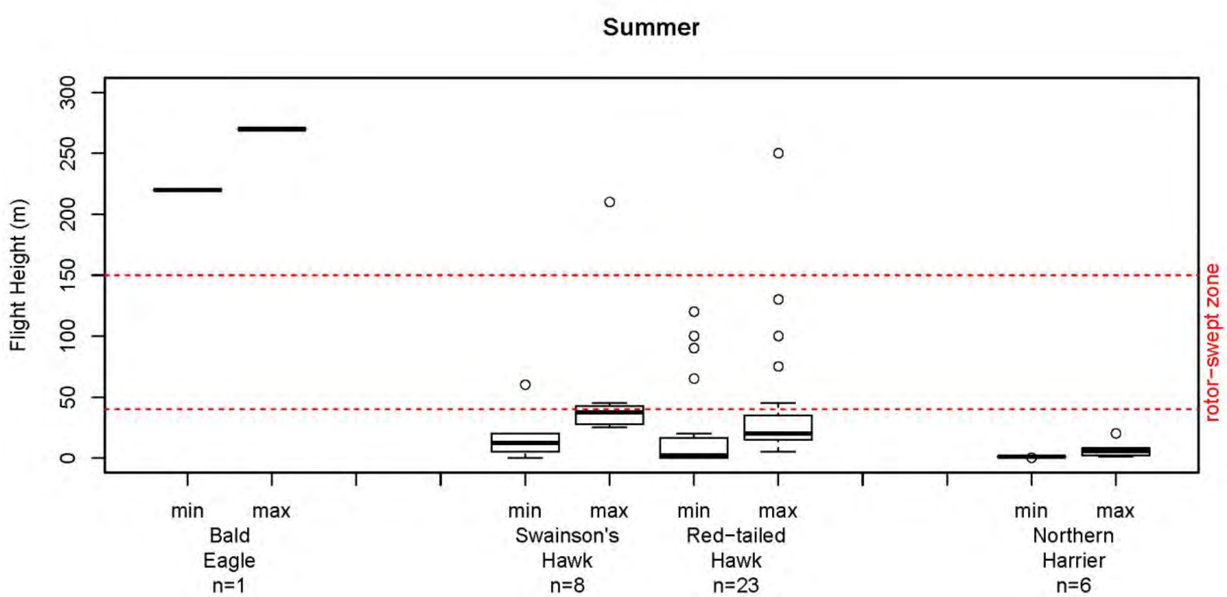


Figure 10c. Fall Migration Flight Height Profiles for Select Raptor Species Including Eagles – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)

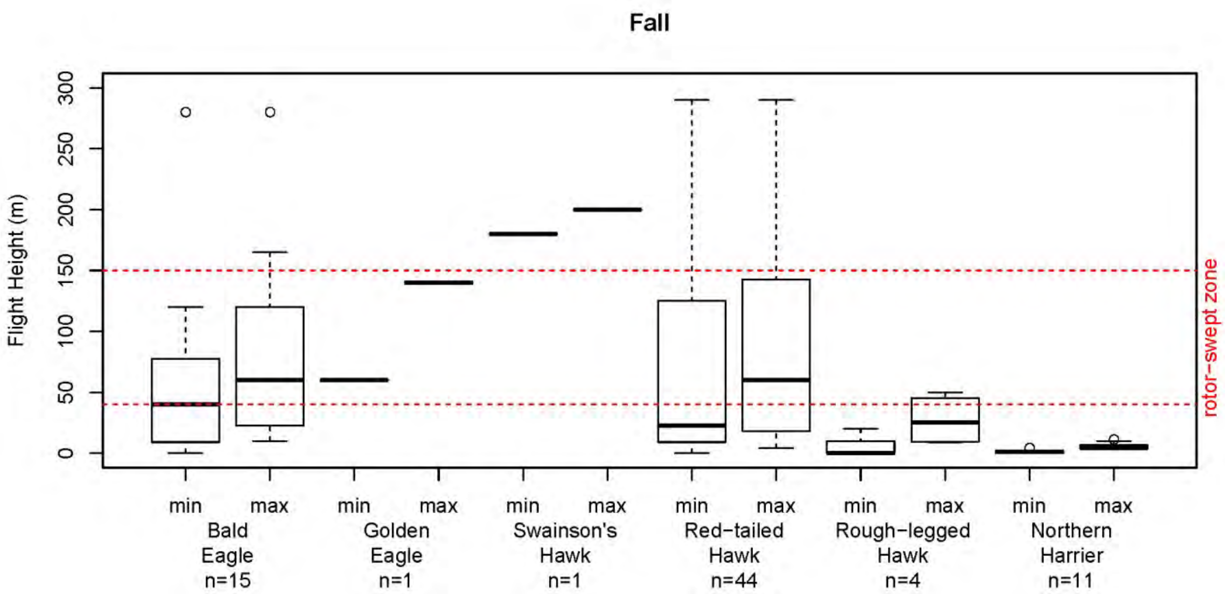


Figure 10d. Winter Flight Height Profiles for Select Raptor Species Including Eagles – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)

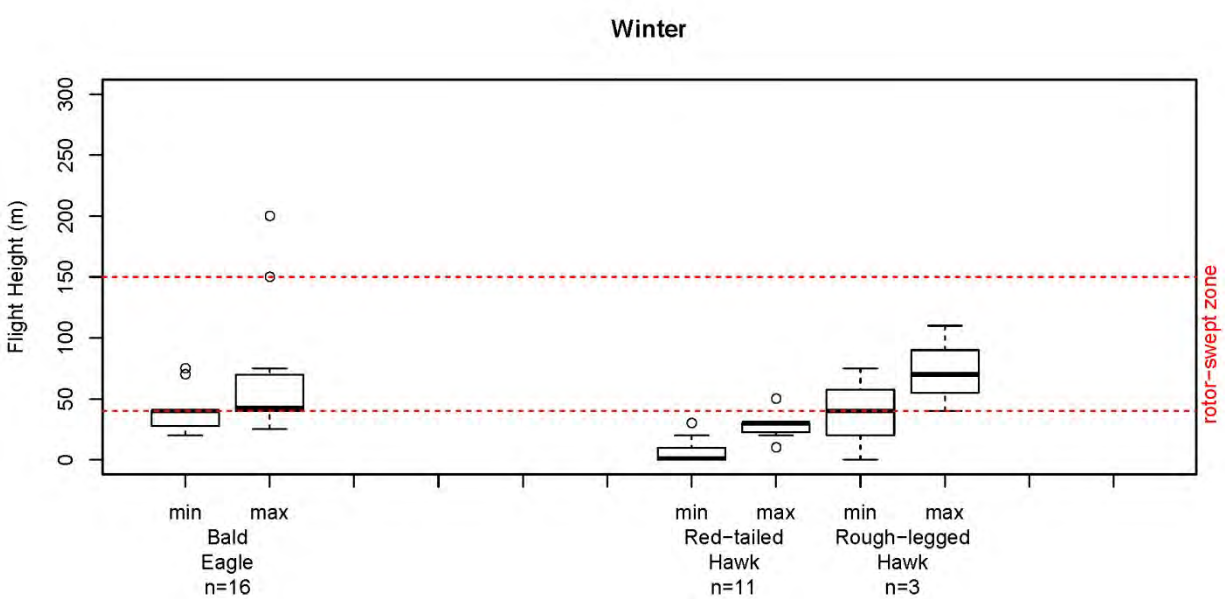


Figure 11. Avian Species Guild Monthly Occurrence Frequency during Spring & Fall Migration Periods – Dodge County Wind Energy Center (Dodge & Steele Counties, Minnesota)

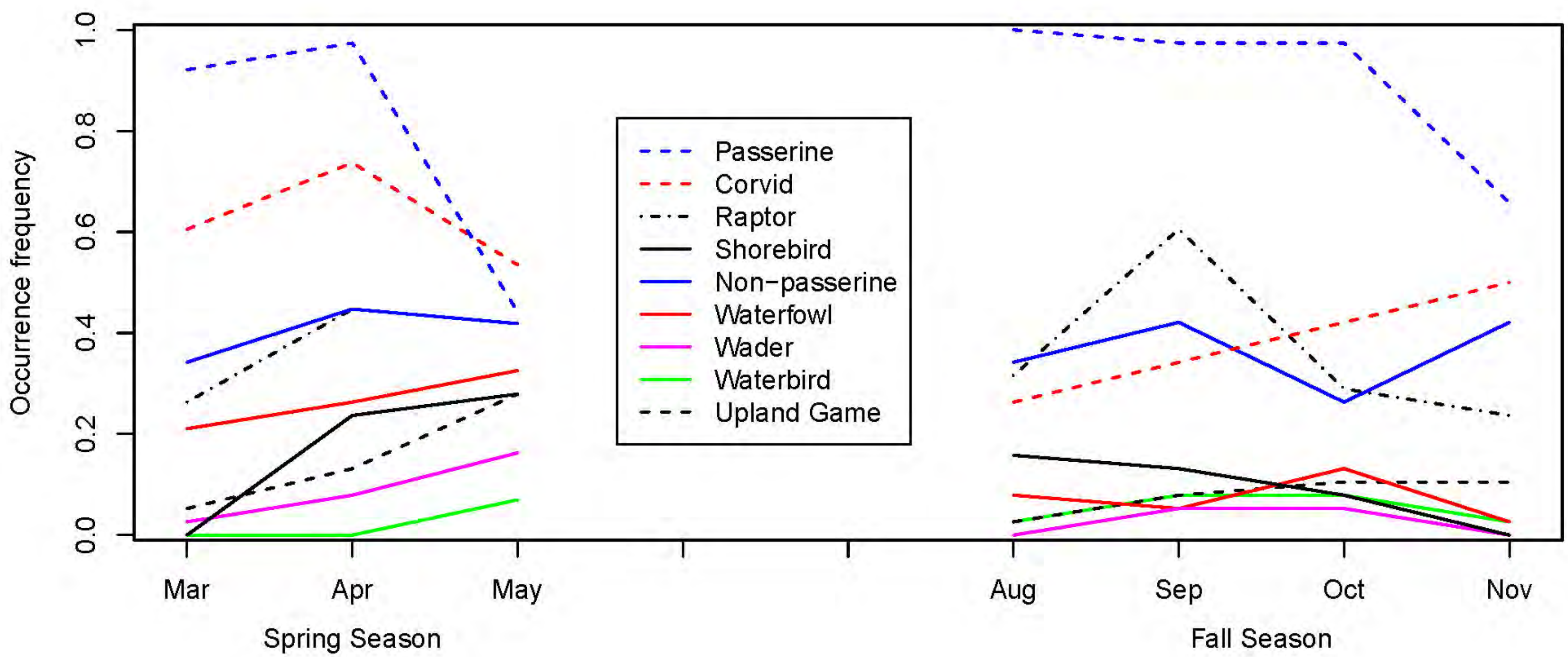


Figure 12a. Spring Migration Flight Height Profiles for Avian Species Guilds – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)

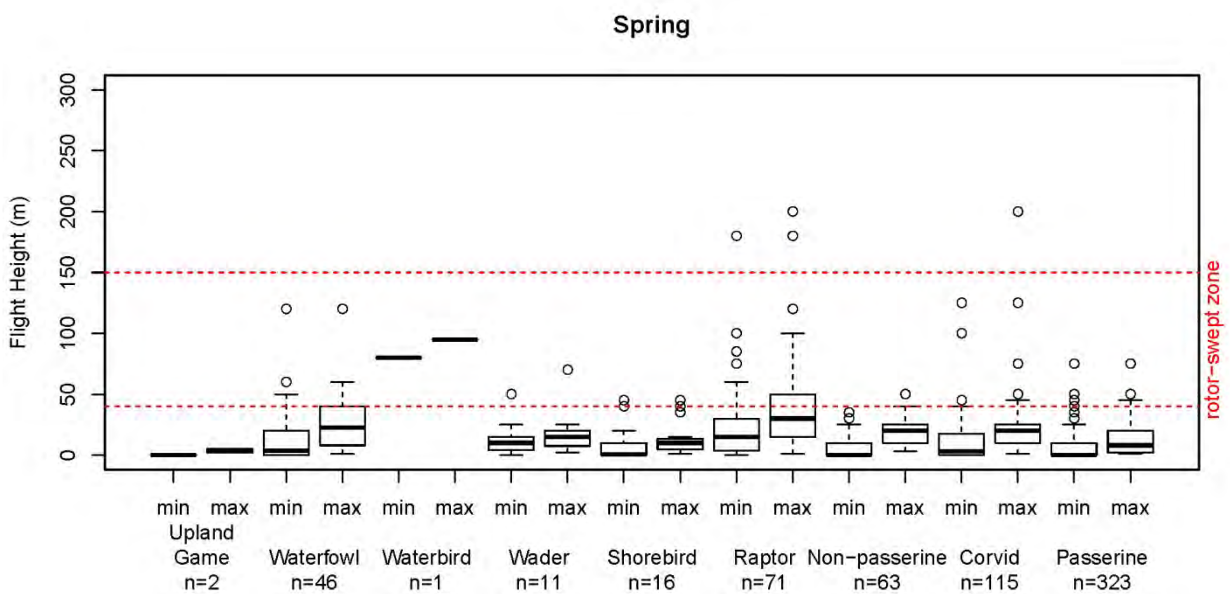
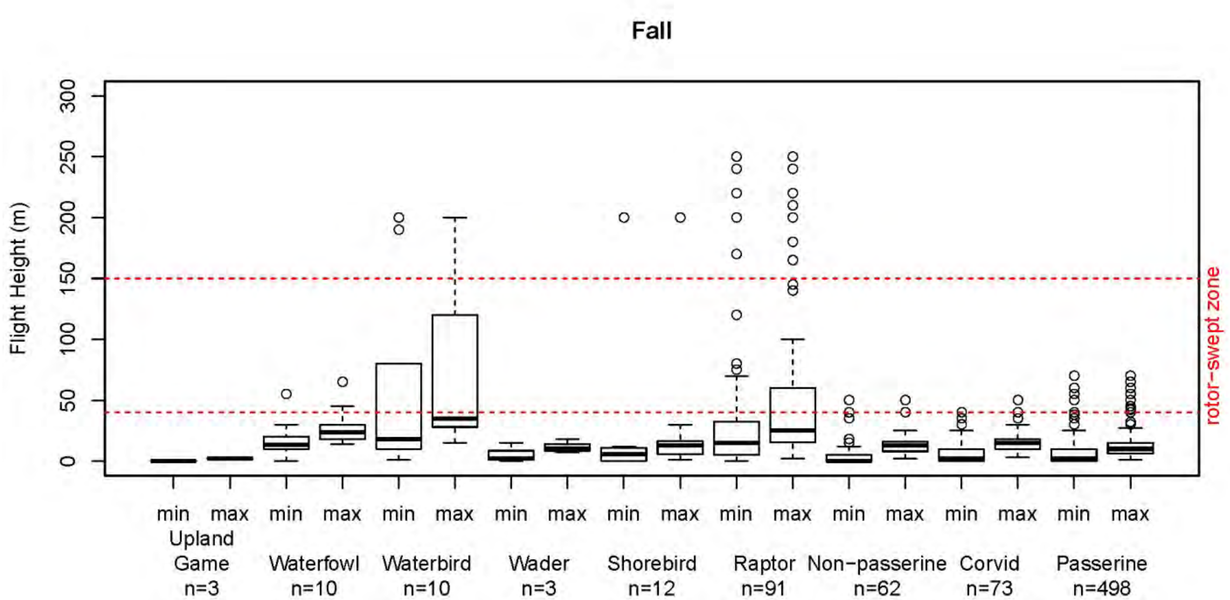


Figure 12b. Fall Migration Flight Height Profiles for Avian Species Guilds – Dodge County Wind Energy Center (Dodge & Steele Counties, MN)



APPENDIX II

Avian Migration Use Summary Statistics for Spring & Fall Migration Periods (2017)

APPENDIX II. Mean use statistics for all species during migration watch surveys in spring (May 2017), fall (August – November 2017), and spring (March – April 2018). Dodge County Wind Energy Center, Dodge & Steele Counties, MN.

	SPRING						FALL					
Species Group/Species Name	Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed	Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed
WATERFOWL												
Blue-winged Teal	2	1	0.08%	0.017	0.183	0.84%	.	.	.	.	.	.
Canada Goose	286	52	10.80%	2.403	10.288	21.01%	196	8	5.21%	1.289	7.986	4.61%
Gadwall	.	.	.	.	.	.	9	1	0.24%	0.059	0.730	0.66%
Green-winged Teal	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Mallard	155	15	5.86%	1.303	11.646	10.92%	40	4	1.06%	0.263	2.335	2.63%
Northern Shoveler	6	1	0.23%	0.050	0.550	0.84%	.	.	.	.	.	.
Trumpeter Swan	2	1	0.08%	0.017	0.183	0.84%	2	1	0.05%	0.013	0.162	0.66%
Unknown Swan	2	1	0.08%	0.017	0.183	0.84%	1	1	0.03%	0.007	0.081	0.66%
Wood Duck	2	2	0.08%	0.017	0.129	1.68%	13	3	0.35%	0.086	0.700	1.97%
WATERBIRDS												
American Coot	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Double-crested Cormorant	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Franklin's Gull	.	.	.	.	.	.	118	9	3.14%	0.776	4.801	3.29%
Pied-billed Grebe	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Ring-billed Gull	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Sora	2	2	0.08%	0.017	0.183	0.84%	2	2	0.05%	0.013	0.162	0.66%
Virginia Rail	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
WADERS												
Great Blue Heron	7	6	0.26%	0.059	0.327	4.20%	1	1	0.03%	0.007	0.081	0.66%
Green Heron	2	1	0.08%	0.017	0.183	0.84%	.	.	.	.	.	.
Sandhill Crane	11	5	0.42%	0.092	0.451	4.20%	10	4	0.27%	0.066	0.497	1.97%
SHOREBIRDS												
American Golden-Plover	.	.	.	.	.	.	2	2	0.05%	0.013	0.114	1.32%
Killdeer	28	22	1.06%	0.235	0.607	16.81%	22	9	0.58%	0.145	1.019	5.92%
Least Sandpiper	3	1	0.11%	0.025	0.275	0.84%	.	.	.	.	.	.
Pectoral Sandpiper	7	1	0.26%	0.059	0.642	0.84%	3	1	0.08%	0.020	0.243	0.66%
Unknown Dowitcher species	.	.	.	.	.	.	5	1	0.13%	0.033	0.406	0.66%
Unknown Shorebird	.	.	.	.	.	.	14	2	0.37%	0.092	0.986	1.32%
Wilson's Snipe	5	3	0.19%	0.042	0.273	2.52%	2	2	0.05%	0.013	0.114	1.32%
UPLAND GAMEBIRDS												
Ring-necked Pheasant	19	17	0.72%	0.160	0.431	13.45%	16	13	0.43%	0.105	0.477	7.89%
Wild Turkey	22	6	0.83%	0.185	1.836	2.52%	.	.	.	.	.	.
RAPTORS												
American Kestrel	4	4	0.15%	0.034	0.181	3.36%	8	8	0.21%	0.053	0.224	5.26%
Bald Eagle	7	7	0.26%	0.059	0.300	4.20%	8	8	0.21%	0.053	0.300	3.95%

Species Group/Species Name	SPRING Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed	FALL Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed
Broad-winged Hawk	3	3	0.11%	0.025	0.275	0.84%	5	5	0.13%	0.033	0.213	2.63%
Cooper's Hawk	1	1	0.04%	0.008	0.092	0.84%	5	5	0.13%	0.033	0.179	3.29%
Merlin	.	.	.	.	.	.	3	3	0.08%	0.020	0.181	1.32%
Northern Harrier	7	7	0.26%	0.059	0.270	5.04%	5	5	0.13%	0.033	0.213	2.63%
Osprey	.	.	.	.	.	.	3	3	0.08%	0.020	0.140	1.97%
Peregrine Falcon	3	3	0.11%	0.025	0.157	2.52%	1	1	0.03%	0.007	0.081	0.66%
Red-tailed Hawk	27	27	1.02%	0.227	0.528	17.65%	12	12	0.32%	0.079	0.355	5.92%
Rough-legged Hawk	7	7	0.26%	0.059	0.236	5.88%	1	1	0.03%	0.007	0.081	0.66%
Sharp-shinned Hawk	.	.	.	.	.	.	6	6	0.16%	0.039	0.227	3.29%
Short-eared Owl	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Swainson's Hawk	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Turkey Vulture	22	22	0.83%	0.185	0.939	7.56%	40	36	1.06%	0.263	0.787	13.82%
NON-PASSERINES												
Belted Kingfisher	2	2	0.08%	0.017	0.129	1.68%	.	.	.	.	.	.
Downy Woodpecker	1	1	0.04%	0.008	0.092	0.84%	2	2	0.05%	0.013	0.114	1.32%
Eurasian Collared Dove	9	4	0.34%	0.076	0.585	2.52%	2	1	0.05%	0.013	0.162	0.66%
Hairy Woodpecker	2	2	0.08%	0.017	0.129	1.68%	1	1	0.03%	0.007	0.081	0.66%
Mourning Dove	4	3	0.15%	0.034	0.258	1.68%	12	9	0.32%	0.079	0.373	5.26%
Northern Flicker	4	4	0.15%	0.034	0.181	3.36%	4	4	0.11%	0.026	0.161	2.63%
Pileated Woodpecker	2	2	0.08%	0.017	0.129	1.68%	.	.	.	.	.	.
Red-bellied Woodpecker	3	3	0.11%	0.025	0.157	2.52%	.	.	.	.	.	.
Rock Pigeon	137	58	5.18%	1.151	2.302	32.77%	264	47	7.02%	1.737	3.856	29.61%
Ruby-throated Hummingbird	.	.	.	.	.	.	5	5	0.13%	0.033	0.242	1.97%
LARGE-BODIED CORVIDS												
American Crow	213	150	8.05%	1.790	2.752	62.18%	224	70	5.96%	1.474	5.366	38.16%
PASSERINES												
American Goldfinch	11	6	0.42%	0.092	0.469	5.04%	289	125	7.68%	1.901	3.023	50.66%
American Pipit	.	.	.	.	.	.	20	5	0.53%	0.132	0.859	3.29%
American Robin	77	38	2.91%	0.647	2.985	16.81%	60	19	1.60%	0.395	2.336	11.84%
American Tree Sparrow	14	4	0.53%	0.118	1.027	2.52%	.	.	.	.	.	.
Baltimore Oriole	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Bank Swallow	.	.	.	.	.	.	6	4	0.16%	0.039	0.254	2.63%
Barn Swallow	33	13	1.25%	0.277	1.096	10.08%	210	53	5.58%	1.382	3.367	25.66%
Black-capped Chickadee	3	3	0.11%	0.025	0.157	2.52%	19	11	0.51%	0.125	0.479	7.24%
Blue Jay	12	10	0.45%	0.101	0.399	6.72%	138	42	3.67%	0.908	4.027	27.63%
Bobolink	9	9	0.34%	0.076	0.585	2.52%	7	3	0.19%	0.046	0.352	1.97%
Brown Thrasher	2	2	0.08%	0.017	0.129	1.68%	.	.	.	.	.	.

Species Group/Species Name	SPRING Total	SPRING Total Flocks	SPRING % of Total Season Detections	SPRING Mean Use (birds/20-min)	SPRING Stan. Dev.	SPRING % of Points Observed	FALL Total	FALL Total Flocks	FALL % of Total Season Detections	FALL Mean Use (birds/20-min)	FALL Stan. Dev.	FALL % of Points Observed
Brown-headed Cowbird	20	11	0.76%	0.168	0.572	9.24%	1	1	0.03%	0.007	0.081	0.66%
Cedar Waxwing	4	1	0.15%	0.034	0.367	0.84%	16	9	0.43%	0.105	0.504	5.26%
Chipping Sparrow	.	.	.	.	.	.	4	4	0.11%	0.026	0.161	2.63%
Cliff Swallow	1	1	0.04%	0.008	0.092	0.84%	320	44	8.51%	2.105	6.667	17.76%
Common Grackle	185	59	6.99%	1.555	5.798	19.33%	246	25	6.54%	1.618	16.810	10.53%
Common Yellowthroat	6	5	0.23%	0.050	0.255	4.20%	7	7	0.19%	0.046	0.240	3.95%
Dark-eyed Junco	52	9	1.96%	0.437	3.356	5.04%	7	3	0.19%	0.046	0.332	1.97%
Dickcissel	1	1	0.04%	0.008	0.092	0.84%	1	1	0.03%	0.007	0.081	0.66%
Eastern Bluebird	1	1	0.04%	0.008	0.092	0.84%	48	7	1.28%	0.316	1.720	4.61%
Eastern Kingbird	7	6	0.26%	0.059	0.300	4.20%	10	10	0.27%	0.066	0.249	6.58%
Eastern Meadowlark	3	3	0.11%	0.025	0.157	2.52%	4	1	0.11%	0.026	0.324	0.66%
Eastern Phoebe	1	1	0.04%	0.008	0.092	0.84%	1	1	0.03%	0.007	0.081	0.66%
Eastern Wood-Pewee	.	.	.	.	.	.	2	2	0.05%	0.013	0.114	1.32%
European Starling	42	18	1.59%	0.353	1.183	11.76%	284	27	7.55%	1.868	7.110	15.13%
Gray Catbird	2	2	0.08%	0.017	0.129	1.68%	.	.	.	.	.	.
Hooded Warbler	2	1	0.08%	0.017	0.183	0.84%	.	.	.	.	.	.
Horned Lark	330	153	12.47%	2.773	5.829	57.98%	77	29	2.05%	0.507	1.367	17.11%
House Finch	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
House Sparrow	11	5	0.42%	0.092	0.552	4.20%	53	16	1.41%	0.349	2.053	9.87%
House Wren	.	.	.	.	.	.	3	3	0.08%	0.020	0.140	1.97%
Indigo Bunting	.	.	.	.	.	.	4	4	0.11%	0.026	0.161	2.63%
Lapland Longspur	369	15	13.94%	3.101	21.093	5.88%	99	13	2.63%	0.651	2.908	8.55%
Lincoln's Sparrow	.	.	.	.	.	.	3	3	0.08%	0.020	0.140	1.97%
Marsh Wren	2	2	0.08%	0.017	0.183	0.84%	2	2	0.05%	0.013	0.114	1.32%
Nashville Warbler	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Northern Cardinal	3	2	0.11%	0.025	0.204	1.68%	2	2	0.05%	0.013	0.114	1.32%
Orange-crowned Warbler	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Orchard Oriole	2	1	0.08%	0.017	0.183	0.84%	.	.	.	.	.	.
Pine Siskin	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Purple Martin	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
Red Crossbill	.	.	.	.	.	.	16	1	0.43%	0.105	1.298	0.66%
Red-winged Blackbird	331	89	12.50%	2.782	8.851	23.53%	555	57	14.76%	3.651	22.657	21.05%
Rusty Blackbird	.	.	.	.	.	.	32	1	0.85%	0.211	2.596	0.66%
Savannah Sparrow	3	3	0.11%	0.025	0.204	1.68%	18	9	0.48%	0.118	0.563	5.92%
Sedge Wren	3	3	0.11%	0.025	0.204	1.68%	5	5	0.13%	0.033	0.213	2.63%
Snow Bunting	9	4	0.34%	0.076	0.507	3.36%	6	2	0.16%	0.039	0.487	0.66%
Song Sparrow	37	10	1.40%	0.311	2.049	7.56%	16	16	0.43%	0.105	0.308	10.53%

	SPRING						FALL					
Species Group/Species Name	Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed	Total	Total Flocks	% of Total Season Detections	Mean Use (birds/20-min)	Stan. Dev.	% of Points Observed
Swainson's Thrush	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Swamp Sparrow	2	2	0.08%	0.017	0.129	1.68%	3	3	0.08%	0.020	0.140	1.97%
Tree Swallow	1	1	0.04%	0.008	0.092	0.84%	14	3	0.37%	0.092	0.740	1.97%
Unknown Blackbird	2	1	0.08%	0.017	0.183	0.84%	12	1	0.32%	0.079	0.973	0.66%
Unknown Passerine	18	6	0.68%	0.151	1.140	4.20%	2	2	0.05%	0.013	0.114	1.32%
Unknown Sparrow	3	2	0.11%	0.025	0.275	0.84%	9	5	0.24%	0.059	0.330	3.29%
Unknown Swallow	.	.	.	.	.	.	15	1	0.40%	0.099	1.217	0.66%
Vesper Sparrow	5	5	0.19%	0.042	0.201	4.20%	9	9	0.24%	0.059	0.263	5.26%
Western Meadowlark	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
White-breasted Nuthatch	.	.	.	.	.	.	2	2	0.05%	0.013	0.114	1.32%
White-crowned Sparrow	.	.	.	.	.	.	1	1	0.03%	0.007	0.081	0.66%
White-throated Sparrow	.	.	.	.	.	.	12	3	0.32%	0.079	0.751	1.97%
Yellow Warbler	1	1	0.04%	0.008	0.092	0.84%	1	1	0.03%	0.007	0.081	0.66%
Yellow-headed Blackbird	1	1	0.04%	0.008	0.092	0.84%	.	.	.	.	.	.
Yellow-rumped Warbler	.	.	.	.	.	.	14	10	0.37%	0.092	0.451	5.92%
	TAXONOMIC GROUP TOTALS											
Corvid	213	150	8.05%	1.790	2.752	62.18%	224	70	5.96%	1.474	5.366	38.16%
Non-passerine	164	79	6.20%	1.378	2.514	40.34%	290	69	7.71%	1.908	3.897	36.18%
Passerine	1624	513	61.35%	13.647	26.611	76.47%	2690	613	71.52%	17.697	31.940	90.13%
Raptor	82	82	3.10%	0.689	1.376	37.82%	98	94	2.61%	0.645	1.124	36.18%
Shorebird	43	27	1.62%	0.361	1.118	17.65%	48	17	1.28%	0.316	1.770	9.21%
Upland Game	41	23	1.55%	0.345	1.871	15.97%	16	13	0.43%	0.105	0.477	7.89%
Wader	20	12	0.76%	0.168	0.572	9.24%	11	5	0.29%	0.072	0.503	2.63%
Waterbird	4	4	0.15%	0.034	0.223	2.52%	123	14	3.27%	0.809	4.803	5.26%
Waterfowl	456	74	17.23%	3.832	15.712	26.89%	261	18	6.94%	1.717	10.544	7.24%

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Monday, April 24, 2017

BALD EAGLE & RAPTOR NEST AERIAL SURVEY SUMMARY REPORT

PROJECT: Dodge County Wind Project, Dodge County, Minnesota (Atwell #16002517)

CLIENT: Dodge County Wind, LLC

Dodge County Wind, LLC (Dodge County Wind, Client) contracted Atwell, LLC (Atwell) to conduct a review of raptor nest resources for the proposed Dodge County Wind Resource Area (WRA) and the associated transmission line assessment area (hereafter collectively referred to as the Project Area) in Dodge County, Minnesota, approximately 15 miles west of Rochester (*Figure 1*). A significant component of this avian resources review was to assess raptor nest resources within the Project Area, particularly for Bald Eagle (*Haliaeetus leucocephalus*).

In preparation for conducting the aerial eagle nest survey and delineation of aerial transect placement, Atwell incorporated data review (including USFWS provided eagle nest data queries[1]) and prior nest survey data that was collected from prior nest studies within previous iterations of the WRA boundary (during 2015 and 2016[2]). The 2017 aerial nest survey conducted by Atwell evaluated the WRA, a 10-mile WRA footprint buffer[3], and the *transmission line assessment area*. Within the 10-mile buffer of the WRA and the transmission line assessment area, primary survey effort was standardized within target zones of habitat and/or habitat concentration that were deemed more likely to provide nesting resources for Bald Eagles (*Study Area*). Approximately five (5) percent of the transmission line assessment area fell outside of the 10-mile buffer of the WRA. This portion of the transmission line assessment area was observed incidentally for eagles, since no delineated target zones overlapped with this relatively small portion of the *Project Area*.

These target zones (*Figure 1*) were defined from a desktop approach using a Geographic Information System (GIS) and the most appropriate satellite imagery data. Most target zones were defined based on at least one major forested riparian corridor, in addition to the presence of other relatively more contiguous upland forest cover and wetland/open water systems. In general, target zones did not incorporate large expanses of non-forested cultivated cropland. Additionally, target zones largely avoided expanses of cultivated cropland where the majority of deciduous forest cover existed only as isolated and widely scattered woodlots.

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[1] Atwell requested and obtained Bald Eagle nest data from USFWS Ecological Services Field Office – Bloomington, MN on March 7, 2017.

[2] HDR (2017). Avian Use Report; Dodge Wind LLC, Dodge County Wind Project; Dodge and Steele Counties, Minnesota.

[3] USFWS (2011). Draft Eagle Conservation Plan Guidance. [Online.] Available at http://www.fws.gov/windenergy/docs/Final_ECP_draft_guidance_2.8.CLEAN.pdf.

Flight-line transects at 1-kilometer intervals were created in GIS across the entire WRA (including a standard 1-mile buffer inclusion) and each target zone of the overall *Study Area* (*Figure 1*). The helicopter was flown at relatively slow speeds (30 to 40 knots). The helicopter aerial nest survey was conducted between March 17-21, 2017, which coincided with peak Bald Eagle detectability per that species' local breeding phenology. No noticeable forest canopy leaf out was evident at the time of surveys. When nest structures were identified, the helicopter hovered for up to 15 seconds, no closer than 50 m from a nest in order to provide efficient data capture.

Incidental eagle observation data were documented throughout the aerial survey. During the survey, specific eagle concentrations were observed, which indicated the possible presence of nearby communal roosts. Atwell conducted ground-based reconnaissance during crepuscular periods on two evenings (March 19 & 20, 2017)[4] to identify Bald Eagle roost areas in the WRA vicinity. This targeted roost observation effort was conducted utilizing the recommendations within the ECP Guidance[5] and the USFWS *Northern States Bald Eagle Recovery Plan*[6] in order to provide a more comprehensive picture of other eagle use factors pertaining to this WRA.

Bald Eagle & Raptor Nest Survey Results (March 17-21, 2017)

During the aerial nest survey, 79 potential raptor nests were located (*Figure 2*). Table 1 provides a summary of the nest data.

No Bald Eagle nests were found within the WRA boundary. Thirteen (13) Bald Eagle nests (11 active and two inactive) were located within ten miles of the WRA (*Figure 2, Table 1*). Of these 13 nests, five (5) of them were newly identified during the aerial evaluation and were not previously identified in the USFWS nest data query (USFWS unpub. data, March 07, 2017) or previous eagle nest survey results[7]. These recently identified nests (*n* = 5), three (3) were active nests and two (2) were inactive.

Inactive Bald Eagle nests were carefully studied to ensure that they were not large Red-tailed Hawk (*Buteo jamaicensis*) nests (see Photographic Log). In general, Bald Eagle nests range from 4.9-5.9 ft. (1.5–1.8 m) in diameter and 2.3-3.9 ft. (0.7–1.2 m) in height. Nest shape is reported as conforming to

4 While not specifically included in the aerial raptor nest survey scope, these targeted surveys were conducted in areas where double-digit concentrations of eagles were observed during aerial surveys in order to provide a more complete picture of eagle use within the Study Area.

5 USFWS (2011). Draft Eagle Conservation Plan Guidance. [Online.] Available at http://www.fws.gov/windenergy/docs/Final_ECP_draft_guidance_2.8.CLEAN.pdf.

6 USFWS (1983). Northern States Bald Eagle Recovery Plan.

7 HDR (2017). Avian Use Report; Dodge Wind LLC, Dodge County Wind Project; Dodge and Steele Counties, Minnesota.

the shape of substrate tree and can be cylindrical, cone-shaped, or even platform-like[8]. Judging such dimensions in the field can be difficult, particularly when viewing nest structures from a distance through high-powered optics. Using a helicopter to standardize the distance from which each nest was viewed helped to gain true perspective for nest shape and size, and helped to attain additional visual cues by hovering above each nest. Inactive nest structures that did not support the above dimension criteria simply were labeled as “unknown raptor nests” (Table 1; Figure 2).

Of particular note was the absence of any eagle nest structure at three locations where USFWS data (March 07, 2017) had indicated previous eagle nest presence. Two (2) nest locations, provided by USFWS, were located to the southeast of the WRA and were carefully scrutinized, but no eagle nests were located. It is unknown what caused the disappearance of these previously identified nest structures. A third nest location south of the WRA was evaluated and at this location, it was apparent that the eagle nest had been removed. These former nest locations are noted in *Figure 2*.

A total of four (4) Bald Eagle nests (3 active and 1 inactive) are located within the transmission line assessment area (*Figure 2 & Table 2*). Approximately five percent of the transmission line assessment area is located outside of the WRA 10-mile buffer and no additional nests were located incidentally within the transmission line assessment area that is outside of the WRA 10-mile buffer.

Table 1. March 2017 Aerial Transect Raptor Nest Survey Results

Common Name	Active Nests	Inactive Nests	Nests/sq. mile (WRA & 1-mile)	Nests/sq. mile (10-mile Target Zones)
Bald Eagle (BAEA)	11	2	0.020	0.046
Red-tailed Hawk (RTHA)	22	--	0.014	0.101
Great Horned Owl (GHOW)	11	--	0.006	0.051
Unknown Raptor	n/a	33	0.020	0.152
Total Suitable Raptor Nests	**44**	**35**	**0.061**	**0.452**

Thirty-three (33) nest nests classified as “unknown raptor” nest structures. These unknown raptor nests may not have been active for the current breeding season, or may have been active nests that, at the time of the raptor nest surveys, were either not yet in use, or activity was not detectable at the time of surveys. Please refer to *Figure 2*, the *Photographic Log*, and Table 1 below.

8 Buehler, D. A. 2000. Bald Eagle (Haliaeetus leucocephalus). The Birds of North America Online.

In addition to raptor nests identified during the survey, 20 Great Blue Heron (GBHE; *Ardea herodias*) nest structures (17 of which were inactive) were identified. These nest structures have the potential to provide nesting resources for other raptors species, such as Great Horned Owls (*Bubo virginianus*; see *Figure 2*).

In general, overall raptor nest density within the WRA is relatively low when compared to the nest density calculated within the surrounding target zones (*Table 1*).

Table 2. Spring 2017 - Active & Inactive Bald Eagle Nest Locations Identified During the Aerial Survey within the 10-Mile Buffer of the Dodge County WRA.

Nest Name	Latitude	Longitude	County	Nest Activity	T-Line Assess. Area	WRA + 1-mile**
Blooming Prairie North	**43.921008**	**-93.061618**	**Steele**	**ACTIVE**		**Yes****
Dodge Center West	**44.031159**	**-92.893242**	**Dodge**	**ACTIVE**	**Yes**	**Yes****
Kasson South	**43.963452**	**-92.773896**	**Dodge**	**ACTIVE**	**Yes**	**Yes****
Vernon Southeast	43.880975	-92.695019	Dodge	ACTIVE		
Hayfield Southwest	43.846056	-92.892081	Mower	ACTIVE		
Moland South	44.140482	-93.045837	Steele	ACTIVE		
Havana North	*44.095309*	*-93.152030*	*Steele*	***Inactive***		
High Forest West	43.848372	-92.611177	Olmstead	ACTIVE		
Rock Dell East	43.907593	-92.593279	Olmstead	ACTIVE		
Kasson Northeast	*44.060083*	*-92.721457*	*Dodge*	***Inactive***	***Yes***	
Byron Southeast	43.981540	-92.616910	Olmstead	ACTIVE		
Mantorville East	44.066497	-92.713903	Dodge	ACTIVE	**Yes**	
Berne South	44.130971	-92.783316	Dodge	ACTIVE	**Yes**	

***none of these nests fell within actual WRA footprint; please refer to Figure 2*

The inter-nest distance between these 13 nest structures is 15.0 miles (*SD* =6.9 miles), with the WRA situated among the majority of nests. USFWS ECPG-Module 1 states (page 28)[9]:

"One-half the mean inter-nest distance has been used as a coarse approximation for the territory boundary in a number of raptor studies (e.g., Thorstrom 2001[10]). Eagle pairs at nests within 1⁄2 the

[9] USFWS (2011). Draft Eagle Conservation Plan Guidance. [Online.] Available at http://www.fws.gov/windenergy/docs/Final_ECP_draft_guidance_2.8.CLEAN.pdf.

mean project-area inter-nest distance of the project footprint are potentially susceptible to disturbance take and blade-strike mortality, as these pairs and offspring may use the project footprint. We recommend using this distance to delineate territories and associated breeding eagles at risk of mortality or disturbance."

Using this definition of an eagle territory, five (5) of the nests within the 10-mile nest assessment buffer would belong to circular territories that overlap the WRA (assuming a territory radius of *7.5 miles*; see *Figure 3*).

Bald Eagle Communal Winter Roost Observations

Over the course of the combined aerial nest helicopter survey and ground-based targeted roost effort conducted from March 17 to March21, 2017, two (2) communal wintering roosts were located within the Study Area (*Figure 4*).

A total of 197 individual Bald Eagles were observed from 71 different locations (*Figure 4*; **Appendix I**). Some of these individuals may have been counted more than once across multiple days of this survey effort, but this total excludes eagles observed at active nests. The vast majority of these observations were made outside of the WRA boundary (*Figure 4*). Golden Eagles (*Aquila chrysaetos*) were not observed during the 2017 aerial nest survey effort.

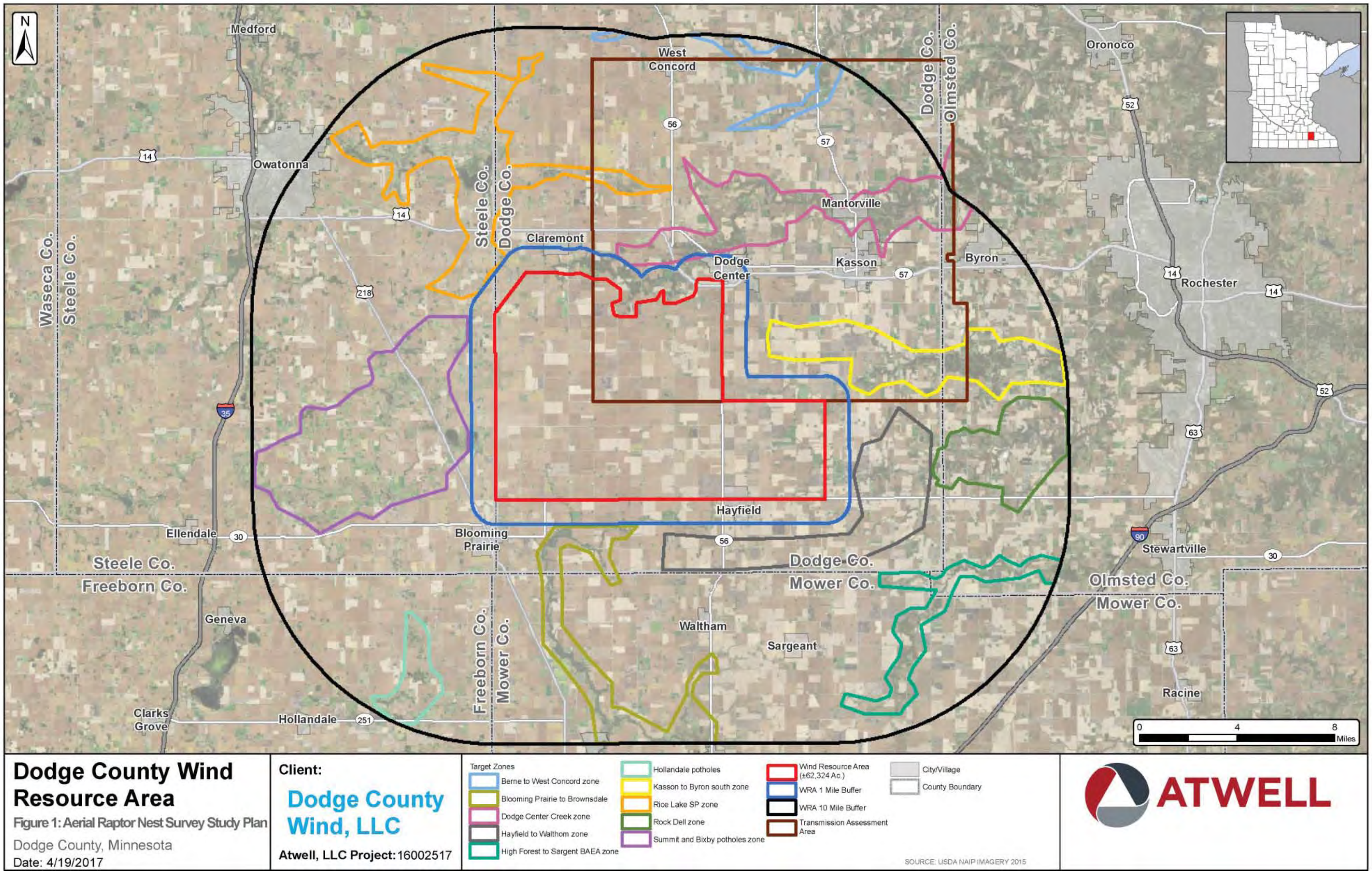
Of particular note were mid-day concentrations of 10-20 Bald Eagles at several locations with the *Study Area*, often in association with carrion food resources (see *Photographic Log)*. Based on these observed concentrations of Bald Eagles, Atwell conducted a targeted and ground-based survey effort during the evenings of March 19 and 20, 2017 at four locations in the general vicinity of the previously observed concentrations of Bald Eagles. Winter communal roosts are located at:

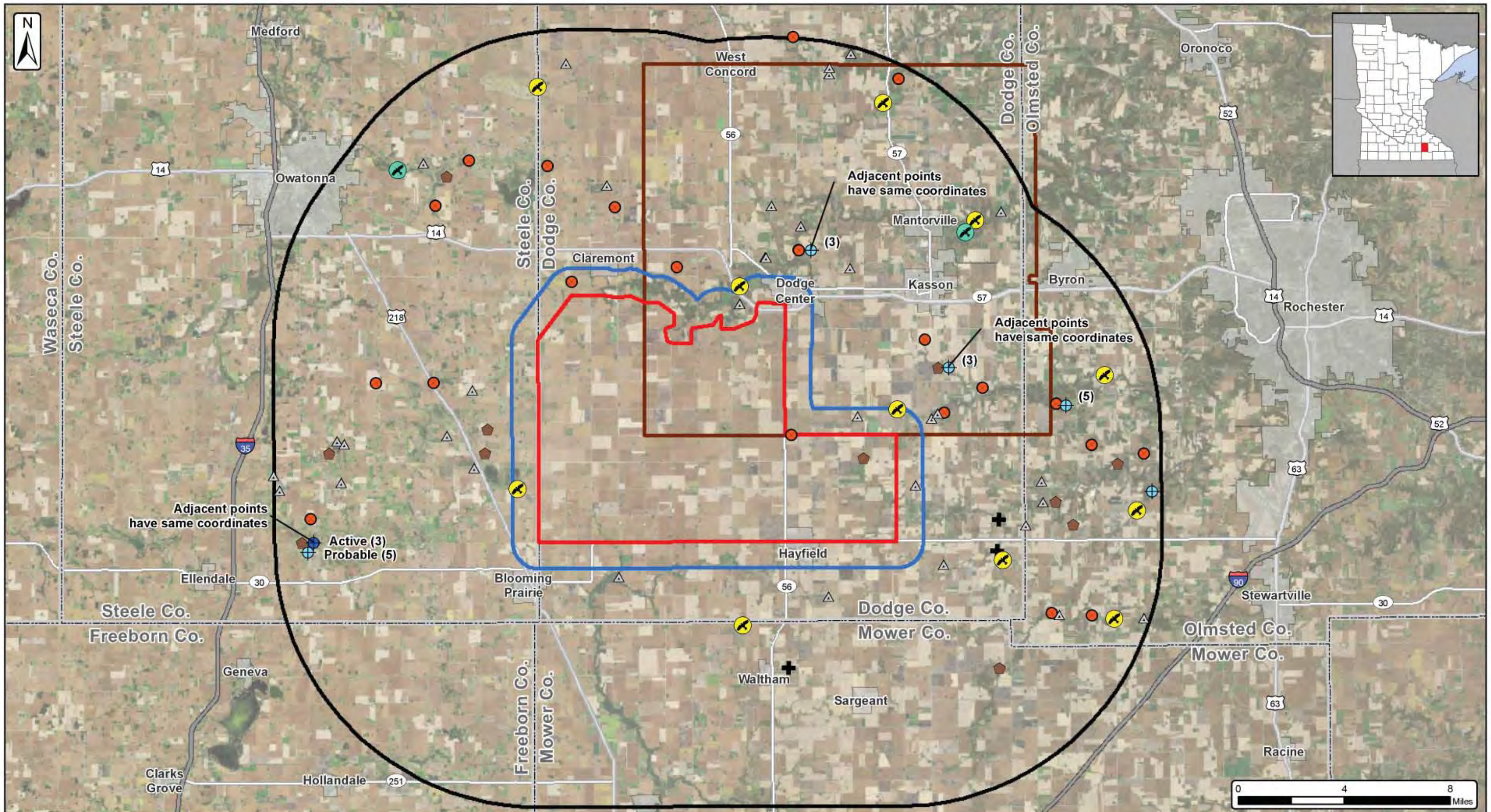
- Cedar River – 17 eagles observed the evening of March 19 located approximately 5.8 miles south of the WRA
- Rice Lake Roost – 10 eagles observed the evening of March 20 located approximately 7.6 miles northwest of the WRA

[10] Thorstrom, R. (2001). Nest-site characteristics and breeding density of two sympatric forest-falcons in Guatemala. Ornitologia Neotropical 12:337–343.

General Findings & Conclusions

- Raptor nest resources identified during this aerial raptor nest survey across the *Study Area* were limited to those species whose breeding phenology in southeastern Minnesota overlaps with late-March.
  - Overall raptor stick nest density was notably lower within the WRA & 1-mile buffer when compared to that within the 10-mile target zones.
- Bald Eagle nests were not identified within the WRA. Thirteen (13) Bald Eagle nests were observed within the overall *Study Area* including:
  - three (3) nests within the 1-mile buffer of the WRA and
  - five (5) within the transmission line assessment area.
- Eight (8) Bald Eagles not in association with nests were observed within the WRA. Bald Eagles not associated with nests were observed widely throughout the 10-mile buffer of the WRA, often feeding on carrion. Two (2) communal wintering Bald Eagle roosts were identified within the Study Area. These eagle roosts are not located within the WRA or the transmission line assessment area.


Medford
West Concord
Owatonna
Claremont
Dodge Center
Mantorville
Kasson
Byron
Oronoco
Rochester
Stewartville
Hayfield
Blooming Prairie
Ellendale
Geneva
Clarks Grove
Hollandale
Waltham
Sargeant
Racine
Waseca Co.
Steele Co.
Dodge Co.
Olmsted Co.
Freeborn Co.
Mower Co.
0 4 8 Miles
Dodge County Wind Resource Area
Figure 1: Aerial Raptor Nest Survey Study Plan
Dodge County, Minnesota
Date: 4/19/2017
Client:
Dodge County Wind, LLC
Atwell, LLC Project: 16002517
Target Zones
Berne to West Concord zone
Blooming Prairie to Brownsdale
Dodge Center Creek zone
Hayfield to Walthom zone
High Forest to Sargent BAEA zone
Hollandale potholes
Kasson to Byron south zone
Rice Lake SP zone
Rock Dell zone
Summit and Bixby potholes zone
Wind Resource Area (±62,324 Ac.)
WRA 1 Mile Buffer
WRA 10 Mile Buffer
Transmission Assessment Area
City/Village
County Boundary
SOURCE: USDA NAIP IMAGERY 2015
ATWELL



Dodge County Wind Resource Area

Figure 2: Aerial Raptor Nest Survey Map

Dodge County, Minnesota

Date: 4/19/2017

Client:

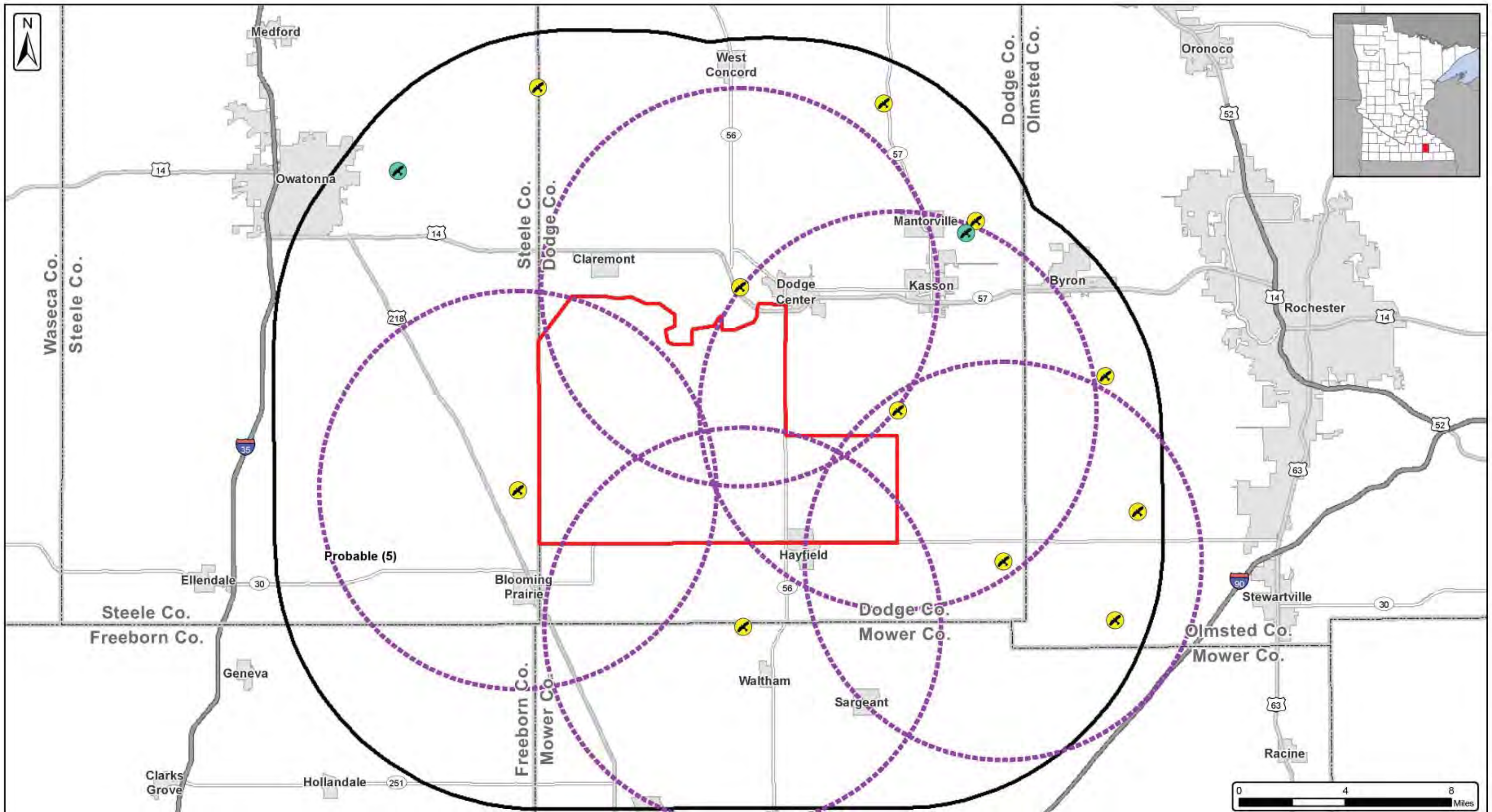
Dodge County Wind, LLC

Atwell, LLC Project: 16002517

Raptor Nests Identified During Aerial Survey (3/22/2017)

- BAEA Active
- BAEA Inactive
- USFWS Data BAEA – Confirmed Not Present (3/22/2017)
- RTHA Active
- GHOW Active
- GBHE Probable
- GBHE Active
- Unknown Raptor
- Wind Resource Area (±62,324 Ac.)
- WRA 1 Mile Buffer
- WRA 10 Mile Buffer
- Transmission Assessment Area
- City/Village
- County Boundary

SOURCE: USDA NAIP IMAGERY 2015



Dodge County Wind Resource Area

Figure 3: Bald Eagle Nest Distance Map

Dodge County, Minnesota

Date: 4/19/2017

Client:

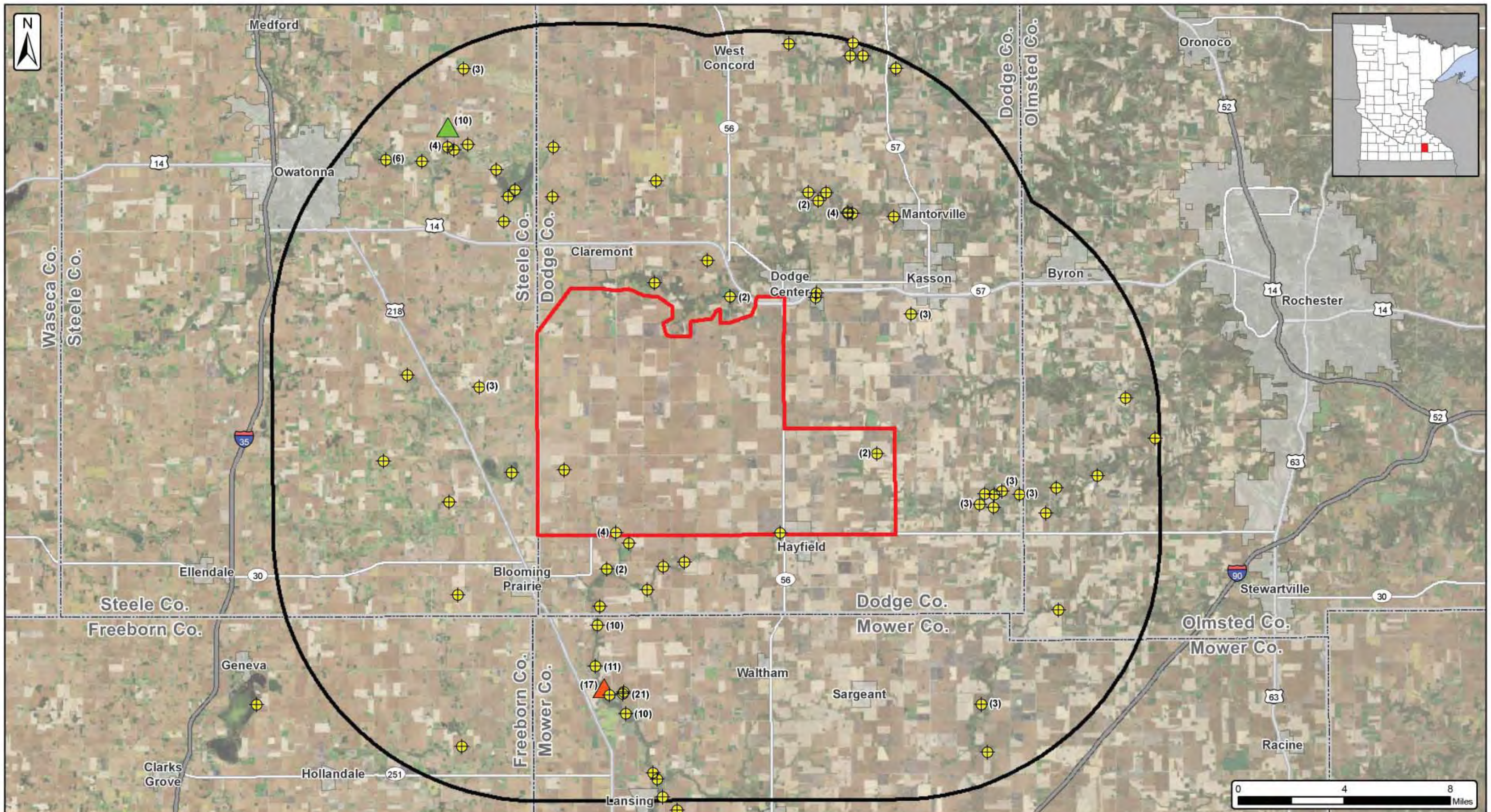
Dodge County Wind, LLC

Atwell, LLC Project: 16002517

Eagle Nests Identified During Aerial Survey (03/22/2017)

- BAEA Active
- BAEA Inactive
- Projected USFWS Territory Spacing (7.49 Miles from Nest)
- Wind Resource Area (±62,324 Ac.)
- WRA 10 Mile Buffer
- City/Village
- County Boundary

ATWELL



Dodge County Wind Resource Area Figure 4: Bald Eagle Observations & Roosts Dodge County, Minnesota Date: 4/19/2017	**Client:** **Dodge County Wind, LLC** **Atwell, LLC Project:** 16002517	Bald Eagle Observations During Aerial Survey March 17-21, 2017. Cedar River Roost Rice Lake Roost	Wind Resource Area (±62,324 Ac.) WRA 10 Mile Buffer City/Village County Boundary

SOURCE: USDA NAIP IMAGERY 2015

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Technical Data Summary Addendum

TO: Jennifer Field (Dodge County Wind, LLC)

FROM: Atwell, LLC

DATE: June 2, 2017

RE: Dodge County Wind – Raptor Nest Survey, Steele County Expansion

Dodge County Wind, LLC (DCW, Client) contracted Atwell, LLC (Atwell) to conduct a review of avian resources for the proposed Dodge County Wind Resource Area (WRA) and the associated proposed transmission line assessment area (hereafter collectively referred to as the *Project Area*) in Dodge County, Minnesota. A significant component of this avian resources review was to assess raptor nest resources within the *Project Area*, particularly for Bald Eagle (*Haliaeetus leucocephalus*).

During March 2015, an initial eagle nest survey effort was executed within the WRA and surrounding 5-mile buffer (HDR 2017). An additional eagle nest assessment on existing known nest locations was conducted in June of 2016 (HDR 2017).

Atwell incorporated additional raptor nest data acquisition through publicly available databases and reviewed information provided by DCW, including the aforementioned avian use study completed by HDR (2017), prior to conducting aerial raptor nest surveys for the original *Project Area* boundary and a 10-mile buffer around the *Project Area,* per guidance within U.S. Fish and Wildlife Service (USFWS 2013), during March 2017.

Within the WRA and a one-mile buffer, Atwell utilized flight-line transects at 1-kilometer intervals. Target Zones within the 10-mile buffer were also flown using transect flight-line methods. These Target Zones (*Figure 1*) were defined from a desktop approach using a Geographic Information System (GIS) and the most appropriate satellite imagery data. Most Target Zones were defined based on at least one major forested riparian corridor, in addition to the presence of other relatively more contiguous upland forest cover and wetland/open water systems. In general, Target Zones did not incorporate large expanses of non-forested cultivated cropland. Additionally, Target Zones largely avoided expanses of cultivated cropland where the majority of deciduous forest cover existed only as isolated and widely scattered woodlots. Surveys within the 10-mile buffer of the WRA focused only on Target Zones while surveys within the one-mile buffer utilized flight-line transects at 1-kilometer intervals

Atwell received a revised WRA boundary from DCW on May 11, 2017. The expanded boundary shifted the western portion of the WRA into Steele County, with U.S. Highway 218 serving as the new western boundary of the WRA. As such, a new 10-mile buffer around the WRA was generated, per guidance within USFWS (2013), and ground-based raptor nest surveys were conducted on May 11, 2017. As shown in the attached *Figure 1*, aerial surveys conducted by Atwell in March 2017 covered the following portions of the newly expanded WRA:

- One-mile buffer of the previous WRA
- GIS-identified Target Zones

Of the approximately 22,083 acres included in the Steele County expansion of the WRA, approximately 10,755 acres were covered by the March 2017 aerial surveys, leaving 11,328 acres (approximately 51%) of the revised WRA that have not been surveyed from the air.

The purpose of this addendum is to supplement previously conducted studies (HDR 2017, Atwell 2017) in consideration of the expanded *Project Area*, to assess areas within the newly generated 10-mile buffer not previously assessed, and to prioritize areas of avoidance/concern, in order to identify and highlight potential habitat and raptor nesting resources that could represent development constraints warranting further investigation, and/or mitigation.

The *Scope of Work* for the raptor nest survey included data acquisition, map creation, and site reconnaissance to address the following:

- to assess known eagle nest data (e.g., unpublished data from Minnesota Department of Natural Resources) within the expanded WRA and out to 10 miles from the expanded WRA footprint, in consideration of USFWS (2013)

- to generate a final technical summary report of the results of the raptor nest survey

RAPTOR RESOURCES ASSESSMENT

Atwell received updated USFWS and Minnesota Department of Natural Resources (MNDNR) Bald Eagle nest spatial data for the expanded 10-mile buffer from Margaret Rheude (USFWS) on May 9, 2017. A review of these data did not identify any additional known eagle nest structures within the expanded 10-mile buffer. USFWS noted that no formal eagle nest surveys have been conducted in Minnesota since federal de-listing of the species in 2007, thereby making the USFWS dataset outdated for purposes of precise *Project Area* assessment.

An Atwell biologist conducted a ground-based raptor nest survey within the expanded WRA and 10-mile buffer extension on May 11, 2017. Approximately seven (7) hours of survey effort were invested in updating eagle nest data. Within the new WRA, Atwell's biologist drove north/south and east/west roads searching for raptor nests. Within the 10-mile buffer, the Atwell biologist focused particularly on an additional Target Zone surrounding the Straight River. Accessible roads flanking this heavily forested riparian corridor were used to gain as many ground-based habitat vantages as possible. Additional targeted survey effort was performed near other open water features present within the 10-mile buffer extension, such as small ponds and/or lakes.

Four new raptor nests were identified during ground-based nest surveys. Two nests were observed to be active (a red-tailed hawk was present on one nest and an unidentified *accipter* species was present on the other active nest) and two nests did not exhibit signs of activity. No Bald Eagles or Bald Eagle nests were observed during this ground-based survey.

Atwell's biologist noted advanced tree canopy leaf-out during surveys, which notably contributed to limited visibility into the farther reaches of deciduous woodlands. All four raptor nests identified during surveys were located on the edges of woodlands, near open areas – the extent of forest cover that was visible to Atwell's biologist. It is important to note that, given the advanced progression of tree canopy leaf-out within the Steele County WRA expansion and 10-mile buffer extension, the absence of Bald Eagle nest observations should not be interpreted as a lack of occurrence.

GENERAL FINDINGS & CONCLUSIONS

- USFWS and MNDNR data for the expanded 10-mile buffer surrounding the updated WRA boundary do not identify any additional known Bald Eagle nest structures, but available datasets should be deemed incomplete
- No Bald Eagles or Bald Eagle nest structures were observed during ground-based raptor nest surveys of the expanded 10-mile buffer
    - March 2017 aerial surveys covered approximately 51% of the newly expanded WRA boundary
    - Tree canopy leaf-out was advanced during the May ground-based survey period, likely limiting adequate visibility

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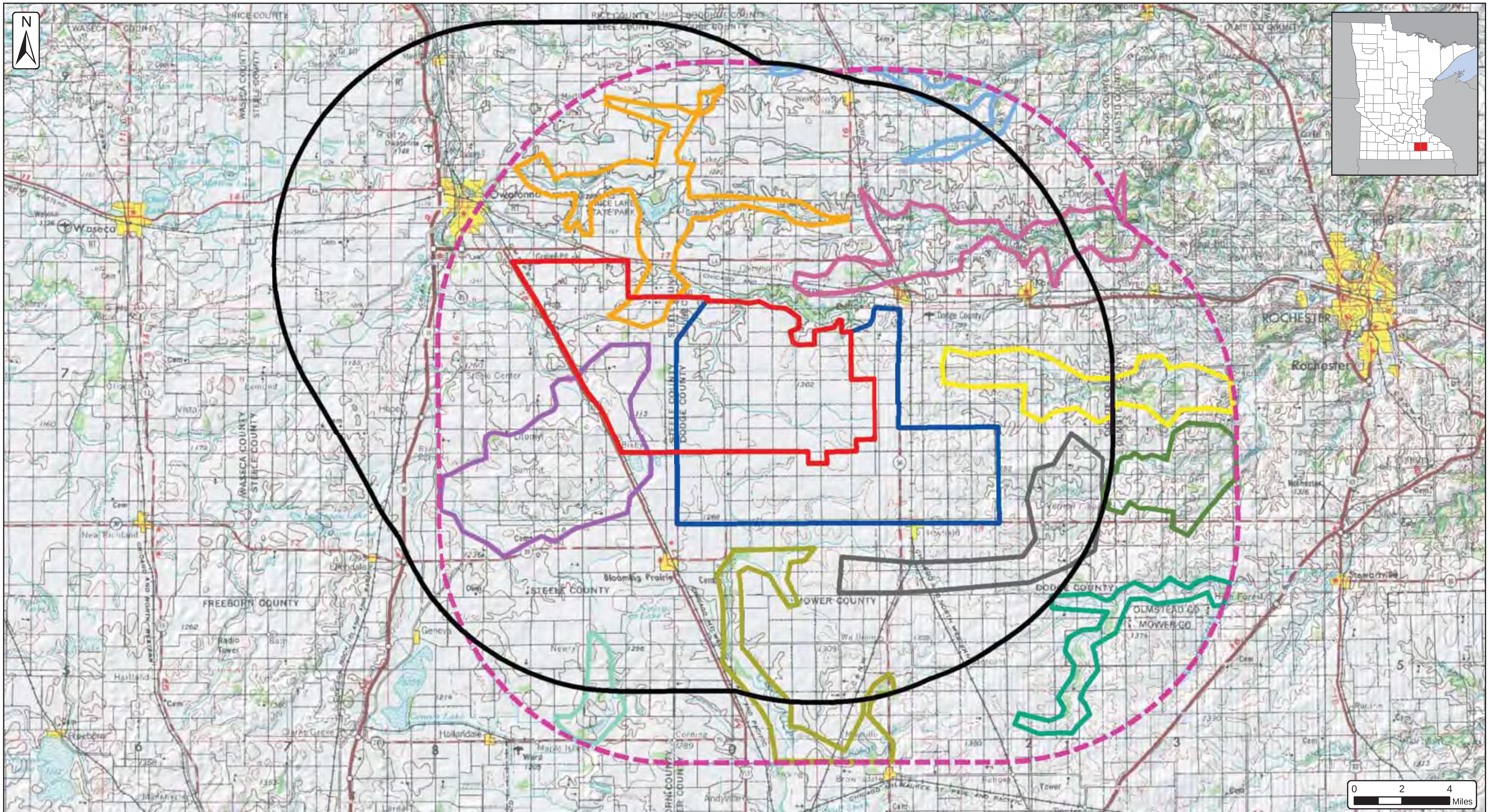

Dodge County Wind Resource Area

Aerial Raptor Nest Survey Plan

Dodge County & Steele County, Minnesota

Date: 5/16/2017

Client:

Dodge County Wind, LLC

Atwell, LLC Project:16002517

ATWELL

2020 Raptor Nest Survey

Dodge County Wind Energy Project

Dodge and Steele counties, Minnesota

Prepared for:

Dodge County Wind, LLC

700 Universe Boulevard
Juno Beach, Florida 33408

Prepared by:

Cecily Foo

Western EcoSystems Technology, Inc.
7575 Golden Valley Road, Suite 300
Golden Valley, Minnesota 55427

February 9, 2021

STUDY PARTICIPANTS

Jennifer Stucker	Project Manager
Cecily Foo	Biologist/Report Writer
Jordan Harrison	Biologist
Valerie Woelfel	GIS Specialist
Carmen Boyd	Project Tracking and Data Manager
Carissa Goodman	Technical Editor

REPORT REFERENCE

Foo, C. 2020. 2020 Raptor Nest Survey, Dodge County Wind Energy Project, Dodge and Steele Counties, Minnesota. Prepared for Dodge County Wind, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 9, 2021.

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INTRODUCTION

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. DCW contracted Western EcoSystems Technology, Inc. (WEST) to conduct an aerial raptor nest survey to record bald eagle (*Haliaeetus leucocephalus*) and other raptor nests in and near the Project boundary (Study Area). The aerial survey was conducted in accordance with the guidance provided in the US Fish and Wildlife Service (USFWS) *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013) and the USFWS *Interim Golden Eagle Technical Guidance* (Pagel et al. 2010).

SURVEY AREA

The survey area for all raptor stick-nests consisted of a 1.0-mile (mi; 1.6-kilometer [km]) buffer surrounding the Study Area, and the survey area for bald eagle nests consisted of a 5.0-mi (8.0-km) buffer of the Study Area (Figure 1). This area falls within the Western Corn Belt Plains Level III Ecoregion, and the Eastern Iowa and Minnesota Drift Plains Level IV Ecoregion (US Environmental Protection Agency [USEPA] 2016). The topography of the Eastern Iowa and Minnesota Drift Plains ecoregion ranges from undulating to level; the western and eastern portions of the ecoregion were formerly tallgrass prairie and the central portion was oak savannah. The majority of the ecoregion has been converted to cropland (USEPA 2016). There are no major waterbodies within the Study Area (Figure 1).

METHODS

Aerial Raptor Nest Survey

Aerial surveys were conducted from a helicopter from April 13 – 15, 2020, a period before leaf-out when raptors would be actively tending to a nest or incubating eggs. Aerial surveys were conducted in accordance with the guidance provided in the ECPG (USFWS 2013) and the USFWS *Interim Golden Eagle Technical Guidance* (Pagel et al. 2010). An experienced raptor ecologist and a skilled helicopter pilot conducted the surveys. Raptors were defined for the surveys as kites, accipiters, buteos, harriers, eagles, falcons, and owls (Buehler 2020). However, the main focus of the surveys was to identify bald eagle nests. Surveyors focused on locating eyries (large, stick nest structures) in suitable eagle nesting substrate (e.g., trees, transmission lines) within and around the Study Area. Pre-flight planning included the creation of field maps and mobile Geographic Information System files and review of relevant background information, such as previously recorded nest locations, topographic maps, and aerial photographs.

Surveys within the Study Area and 1.0-mi buffer documented all potential raptor nests, including bald eagle nests, while the surveys out to the 5.0-mi buffer of the Study Area focused only on identifying potential bald eagle nests. Efforts were made to minimize disturbance to breeding raptors; the greatest possible distance at which the species could be identified was maintained, with distances varying, depending upon nest location and wind conditions.

In general, all potential bald eagle and raptor nest habitat was surveyed by flying transects spaced approximately 0.5 mi (0.8 km) apart, flying at speeds of approximately 50 mi (80 km) per hour when actively scanning for nests. This survey was conducted concurrently with portions of the Dodge County Wind Energy Project Transmission Line Raptor Nest Survey[1]. Historic nest locations in the vicinity of the survey were checked using data collected during the 2017 eagle and raptor nest survey for the Project (Atwell 2017). Surveys were typically conducted between 07:00 hours and 19:00 hours.

The helicopter was positioned to allow thorough visual inspection of the habitat, and, in particular, to provide a view of the tops of the tallest dominant trees where bald eagles generally prefer to nest (Buehler 2020). The locations of all nests were recorded using a GPS-enabled tablet running Locus Map Pro software. The survey track was also recorded to ensure all areas were adequately covered.

To determine the status of a nest, the biologist evaluated behavior of any adults on or near the nest, and presence of eggs, young, whitewash, or fresh building materials (Pagel et al. 2010). Attempts were made to identify the species of raptor associated with each active nest. Raptor species, nest size, nest status, nest condition, and nest substrate were recorded at each nest location to the extent possible.

Follow-up Ground Survey of Eagle Nests

On May 18 and 19, 2020, WEST conducted follow-up ground-based surveys of potential bald eagle of interest that were documented during the aerial survey to confirm species, occupancy, and activity status. The follow-up survey occurred 33-36 days after the initial aerial survey, following ECPG recommendations that eagle nest status be checked at least 30 days after the initial observation.

Terminology

Included below are descriptions of terms used during the documentation of nests (see Results section).

Nest ID – WEST assigned a unique nest identification number for each nest documented.

Species – A species was assigned to each nest when possible, otherwise, it was classified as an unidentified raptor nest. Unidentified raptor nests were defined as any stick nest not having an occupant associated with it at the time of the survey. Many times nests become abandoned or are no longer used, and, over time, may become historic nest sites. Unidentified raptor nests, including nests that could become suitable for raptors, were documented in order to populate a

[1] Data collected within the overlapping survey areas is presented in each report. For transmission line survey results, see Foo 2020.

nest database to ensure future surveys include all potentially suitable nest sites. Unidentified raptor species nests that appeared consistent in size and structure with bald eagle nests were further classified as potential nesting sites for bald eagles.

Nest Condition – Nest condition was categorized as good, fair, or poor. Although the determination of nest condition can be subjective and may vary between observers, it gives a general sense of when a nest or nest site was last used. Nests in good condition were excellently maintained with a very well-defined bowl, no sagging, and would be possible to use immediately or were currently in use. Nests in fair condition had a fairly well-defined bowl, minor sagging, and might require some repair or addition to use immediately. Nests in poor condition were sloughing or sagging heavily, and would require effort to restore for successful nesting.

Substrate – Nest substrate was recorded to provide future observers a visual reference. Substrates include man-made structures (e.g., power lines, nest platforms, dock hoists), and biological and physical structures (e.g., conifer and deciduous tree species, cliff faces).

Nest Status – Nest status was categorized using definitions originally proposed by Postupalsky (1974) and largely followed the USFWS ECPG (USFWS 2013). Nests were classified as occupied if any of the following were observed at the nest structure:

1) an adult in an incubating position
2) eggs
3) nestlings or fledglings
4) presence of an adult (sometimes sub-adults)
5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed earlier in the breeding season, or
6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath

Occupied nests were further classified as active if (1) an adult was present on the nest in incubating position, (2) an egg or eggs were present, or (3) nestlings observed. Occupied nests were further classified as inactive if no eggs or nestlings were present. Nests not meeting the above criteria for occupied were simply classified as inactive.

RESULTS

Aerial Raptor Nest Survey

Twenty raptor nests representing three identifiable species and one great-blue heron colony were detected during the aerial surveys on April 13 – 15, 2020 and the ground-based follow up surveys on May 18 and 19, 2020 (Figure 1, Table 1). Five occupied and active bald eagle nests were documented within the 5.0-mi buffer; one additional occupied and active bald eagle nest was documented outside of the 5.0-mi buffer.

Additional raptor nests documented during the survey included two occupied and active red-tailed hawk (*Buteo jamaicensis*) nests, one occupied and active great horned owl (*Bubo virginianus*) nest, two occupied inactive unidentified raptor nests, and nine inactive unidentified raptor nests (Figure 1, Table 1). One great blue heron (*Ardea herodias*) colony was detected within the northeastern portion of the Study Area.

The following section provides more details on the bald eagle nests and nests consistent in size and structure with an eagle nest documented during the aerial surveys:

Nest 17081 – This nest was located 0.9 mi (1.4 km) west of the Study Area. The nest was in good condition and was consistent in size and structure with an eagle nest. During the aerial survey on April 14, no adults or eggs were observed and the nest was determined to be an inactive unidentified raptor nest. During the ground-based follow-up survey on May 19, two adult bald eagles were observed on the nest. The presence of nestlings could not be confirmed due to poor visibility due to dense leaves; however, the adults appeared to be tending nestlings. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1; Appendix A1).

Nest 17078 – This nest was located 1.8 mi (2.9 km) southwest of the Study Area. The nest was in good condition. An adult bald eagle was present on the nest and in incubating position during the aerial survey on April 13. No follow-up survey was conducted at this nest. The nest is therefore considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A2).

Nest 17057 – This nest was located 2.2 mi (3.5 km) northeast of the Study Area. The nest was in good condition. During the aerial survey on April 13, an adult bald eagle was present on the nest and in an incubating position. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A3).

Nest 17083 – This nest was located 2.6 mi (4.2 km) southeast of the Study Area. The nest was in good condition. During the aerial survey on April 14, one adult bald eagle flushed and two eggs were observed on the nest. A follow-up survey was conducted on May 18 and two adults were observed perched near the nest. The presence of nestlings could not be confirmed due to dense leaves and poor visibility. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A4).

Nest 17074 – This nest was located 4.8 mi (1.6 km) north of the Study Area. The nest was in good condition. During the aerial survey on April 13, an adult bald eagle was present on the nest and in an incubating position. No follow-up survey was conducted at this nest. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A5).

Nest 17097 – This nest was located 6.1 mi (9.8 km) north of the Study Area. The nest was in good condition. During the aerial survey on April 15, an adult bald eagle was present on the nest and in an incubating position. No follow-up survey was conducted at this nest. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A6). This nest was included in the 2017 survey for the Project and was called Moland South (Atwell 2017).

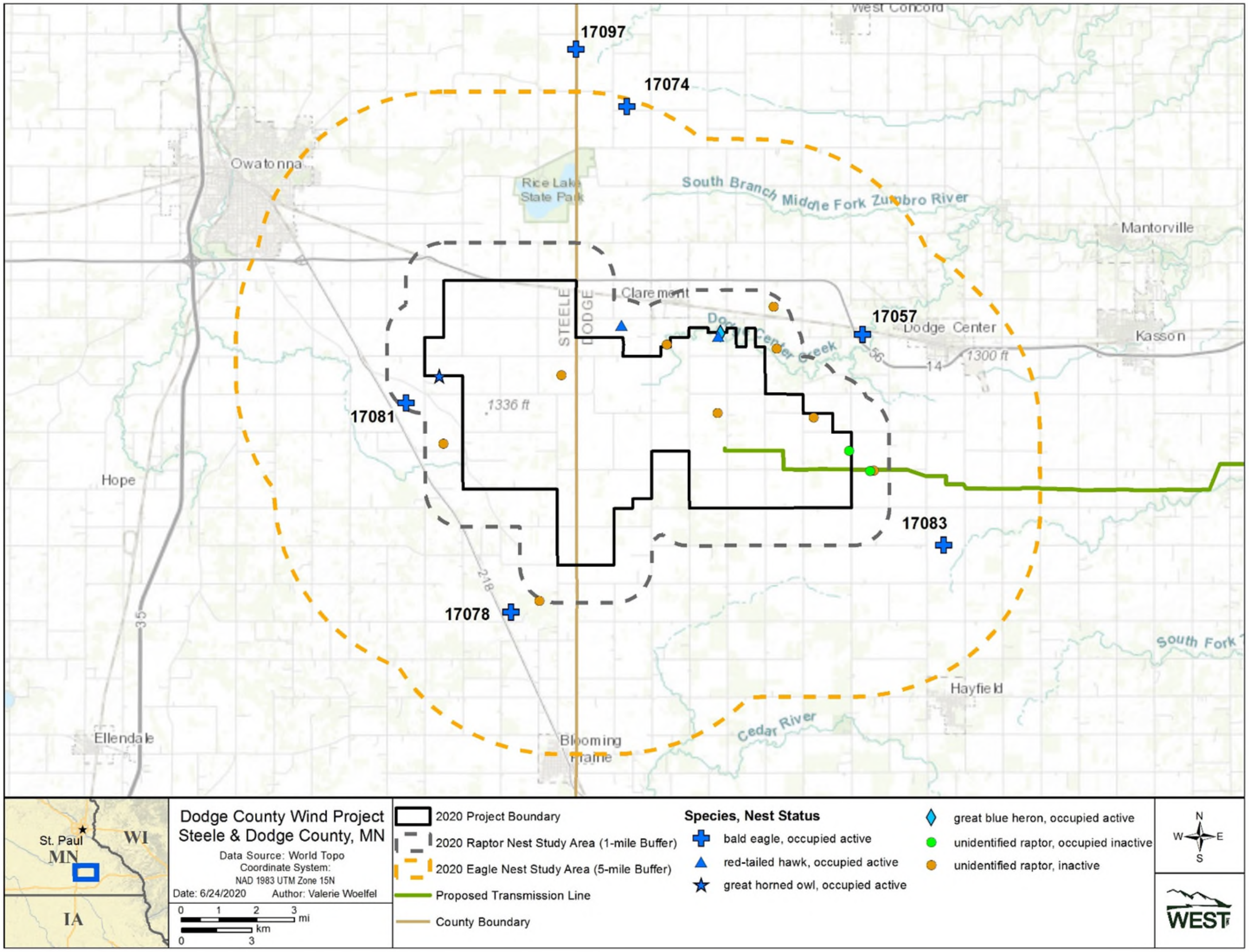

Figure 1. Raptor nests documented April 13 – April 15, 2020, near Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Table 1. Raptor Nest ID, location, species, status, substrate, and condition of nests documented during the 2020 raptor nest survey for the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Nest ID	2017 Nest ID	Latitude	Longitude	Species[1]	Status	Nest Substrate	Condition
17081	--	44.00492	-93.13615	BAEA	occupied active[2]	deciduous tree	good
17078	--	43.92477	-93.08011	BAEA	occupied active	deciduous tree	good
17057	--	44.03116	-92.89324	BAEA	occupied active	coniferous tree	good
17083	--	43.95036	-92.85032	BAEA	occupied active	deciduous tree	good
17074	--	44.11859	-93.01863	BAEA	occupied active	deciduous tree	good
17097	Moland South	44.14048	-93.04584	BAEA	occupied active	deciduous tree	good
17072	--	44.03055	-92.97002	RTHA	occupied active	deciduous tree	good
17075	--	44.03490	-93.02154	RTHA	occupied active	deciduous tree	good
17079	--	44.01528	-93.11846	GHOW	occupied active	deciduous tree	good
17076	--	44.01554	-93.05355	UNRA	inactive	deciduous tree	fair
17071	--	44.00107	-92.97044	UNRA	inactive	deciduous tree	good
17059	--	43.99935	-92.91936	UNRA	inactive	deciduous tree	good
17058	--	43.98666	-92.90055	UNRA	occupied inactive	deciduous tree	good
17095	--	44.02732	-92.99733	UNRA	inactive	deciduous tree	poor
17070	--	44.02584	-92.93900	UNRA	inactive	deciduous tree	good
17055	--	43.97886	-92.88935	UNRA	occupied inactive	deciduous tree	good
17080	--	43.98934	-93.11620	UNRA	inactive	deciduous tree	good
17056	--	43.97896	-92.88737	UNRA	inactive	deciduous tree	fair
17060	--	44.04188	-92.94048	UNRA	inactive	deciduous tree	good
17077	--	43.92909	-93.06502	UNRA	inactive	deciduous tree	fair
17073	--	44.03164	-92.96871	GBHE	occupied active	deciduous tree	--

[1]BAEA = bald eagle; GHOW = great-horned owl; RTHA = red-tailed hawk; UNRA = unidentified raptor; GBHE = great blue heron.

[2]Nest 17081 was an inactive unidentified raptor nest during the aerial survey on April 14, 2020, but was updated to an occupied active bald eagle nest based on the follow-up survey on May 19, 2020.

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Appendix A. Images of Occupied and Active Eagle Nests Found During the 2020 Raptor Nest Survey for the Dodge County Wind Energy Project, Dodge and Steele Counties, Minnesota.

Appendix A1. Nest 17081 was located 0.9 mi (1.4 km) west of the Study Area. During the aerial survey on April 14, the nest was determined to be an inactive unidentified raptor nest (pictured). During the ground-based follow-up survey on May 19, two adults were observed on the nest and appeared to be tending nestlings. Therefore, this nest is considered an occupied and active bald eagle nest in 2020.

Appendix A2. Nest 17078 was located 1.8 mi (2.9 km) southwest of the Study Area. An adult bald eagle was present on the nest and in incubating position during the aerial survey. The nest is therefore considered an occupied and active bald eagle nest in 2020.

Appendix A3. Nest 17057 was located 2.2 mi (3.5 km) northeast of the Study Area. During the aerial survey an adult bald eagle was present on the nest and in an incubating position. Therefore, this nest is considered an occupied and active bald eagle nest in 2020.

Appendix A4. Nest 17083 was located 2.6 mi (4.2 km) southeast of the Study Area. During the aerial survey, one adult bald eagle flushed and two eggs were observed on the nest. Therefore, this nest is considered an occupied and active bald eagle nest in 2020.

Appendix A5. Nest 17074 was located 4.8 mi (1.6 km) north of the Study Area. During the aerial survey an adult bald eagle was present on the nest and in an incubating position. Therefore, this nest is considered an occupied and active bald eagle nest in 2020 (Figure 1, Appendix A5).

Appendix A6. Nest 17097 was located 6.1 mi (9.8 km) north of the Study Area. During the aerial survey an adult bald eagle was present on the nest and in an incubating position. Therefore, this nest is considered an occupied and active bald eagle nest in 2020.

2021 Eagle Nest Survey

Dodge County Wind Energy Project

Dodge and Steele Counties, Minnesota

Prepared for:

Dodge County Wind, LLC

700 Universe Boulevard
Juno Beach, Florida 33408

Prepared by:

Cecily Foo and Joyce Pickle

Western EcoSystems Technology, Inc.
7575 Golden Valley Road, Suite 300
Golden Valley, Minnesota 55427

July 16, 2021

WEST

STUDY PARTICIPANTS

Joyce Pickle	Project Manager
Cecily Foo	Biologist/Report Writer
Ronald Moore	Biologist
Valerie Woelfel	GIS Specialist
Ashleigh Boyd	Project Tracking and Data Manager
Julia Preston-Fulton	Technical Editor

REPORT REFERENCE

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INTRODUCTION

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. At DCW's request, Western EcoSystems Technology, Inc. (WEST) conducted a ground-based nest survey to record bald eagle (*Haliaeetus leucocephalus*) nests in and near the Project boundary. The survey was conducted in accordance with the guidance provided in the US Fish and Wildlife Service (USFWS) *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013) and the 2020 *Updated Eagle Nest Survey Protocol* (USFWS 2020).

SURVEY AREA

The survey area for bald eagle nests consisted of a 2.0-mile (mi; 3.2-kilometer [km]) buffer surrounding the Project boundary (Survey Area, Figure 1). This area falls within the Western Corn Belt Plains Level III ecoregion and the Eastern Iowa and Minnesota Drift Plains Level IV ecoregion (US Environmental Protection Agency [USEPA] 2017). The topography of the Eastern Iowa and Minnesota Drift Plains ecoregion ranges from undulating to level; the western and eastern portions of the ecoregion were formerly tallgrass prairie and the central portion was oak (*Quercus* spp.) savannah. The majority of the ecoregion has been converted to cropland (USEPA 2017). There are no major waterbodies within the Survey Area (Figure 1).

METHODS

Ground-based Eagle Nest Survey

Ground-based eagle nest surveys were conducted from March 25 – 26, 2021, a period before leaf-out when eagles would be actively tending to a nest or incubating eggs. The survey was conducted in accordance with the guidance provided in the ECPG and the 2020 update (USFWS 2013, 2020). An experienced raptor ecologist conducted the survey. The main focus of the survey was to identify bald eagle nests and to determine nest activity. Surveyors focused on locating eyries (large, stick nest structures) in suitable eagle nesting substrate (e.g., trees, transmission lines) within and around the Project. Pre-survey planning included the creation of field maps and mobile Geographic Information System files, and review of relevant background information, such as previously recorded nest locations, topographic maps, and aerial photographs.

The biologist surveyed areas of potential habitat by driving along all public roads within the Survey Area. When the biologist observed a nest or suitable habitat, they pulled over their vehicle before scanning with binoculars or recording data. The biologist was provided with the locations of historic eagle nests documented in 2020 that were located within the Survey Area. The survey was conducted between 0700 hours and 1800 hours.

The survey track was recorded using a Global Positioning System-enabled tablet running Locus Map Pro software to ensure areas were adequately covered. All public roads were driven to allow a thorough visual inspection of the habitat, and, in particular, to provide views of trees from several different angles. The locations of eagle nests and nests consistent in size and structure with eagle nests were recorded using the tablet.

To determine the status of a nest, the biologist evaluated behavior of adults on or near the nest, and presence of eggs, young, whitewash, or fresh building materials. Species, nest type, nest status, nest condition, and nest substrate were recorded at each nest location, to the extent possible. If an inactive nest consistent in size and structure with an eagle nest is observed, the biologist monitored the nest for four hours, or until occupancy was confirmed.

Terminology

Included below are descriptions of terms used during the documentation of nests (and used in the Results section).

Nest ID – A unique nest identification number was assigned for each nest documented.

Nest Species – A species was assigned to each nest, when possible. Nests documented as unidentified raptor species were defined as any stick nest not having an occupant associated with it at the time of the survey. For this eagle-only survey, any unidentified raptor nests recorded were those consistent in size and structure with bald eagle nests.

Nest Condition – Nest condition was categorized as good, fair, or poor. Although the determination of nest condition can be subjective and may vary between observers, it gives a general sense of when a nest or nest site was last used. Nests in good condition were excellently maintained, no sagging, and are either suitable for immediate use or currently in use. Nests in fair condition had minor sagging, and appeared to require some repair or maintenance before being suitable for use. Nests in poor condition were sloughing or sagging heavily, and would require effort to restore for successful nesting.

Nest Substrate – Nest substrate was recorded to provide observers with a visual reference to facilitate locating the nest in the future. Substrates may include man-made structures, such as power lines, nest platforms, and biological and physical structures, such as conifer and deciduous tree species or cliff faces.

Nest Status – Nest status was categorized using definitions originally proposed by Postupalsky (1974) and largely followed the ECPG (USFWS 2013). Nests were classified as occupied if any of the following were observed at the nest structure:

1) an adult in an incubating position,
2) eggs,
3) nestlings or fledglings,

4) presence of an adult (sometimes sub-adults),
5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed earlier in the breeding season, or
6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath.

Occupied nests were further classified as active if 1) an adult was present on the nest in incubating position, 2) an egg or eggs were present, or 3) nestlings observed. Occupied nests were further classified as inactive if no eggs or nestlings were present. Nests not meeting the above criteria for occupied during the ground-based surveys were classified as inactive.

RESULTS

Ground-based Eagle Nest Survey

Three bald eagle nests were detected during the ground-based surveys on March 25 – 26, 2021 (Figure 1, Table 1). Two occupied and active bald eagle nests were documented within the 2.0-mi buffer; one additional occupied and active bald eagle nest was documented just outside of the 2.0-mi buffer. The following section provides more details on the bald eagle nests documented during the surveys:

Nest 17081 – This nest was located 0.9 mi (1.4 km) west of the Project. The nest was in good condition. An adult bald eagle was present on the nest and in an incubating position during the survey on March 26. Therefore, this nest is considered an occupied and active bald eagle nest in 2021 (Figure 1, Appendix A1). In 2020, Nest 17081 was an occupied and active bald eagle nest (Foo 2020).

Nest 17078 – This nest was located 1.3 mi (2.0 km) southwest of the Project. The nest was in good condition. An adult bald eagle was present on the nest and in incubating position during the survey on March 25. The nest is, therefore, considered an occupied and active bald eagle nest in 2021 (Figure 1, Appendix A2). In 2020, Nest 17078 was an occupied and active bald eagle nest (Foo 2020).

Nest 17057 – This nest was located 2.2 mi (3.5 km) northeast of the Project. The nest was in good condition. During the survey on March 26, an adult bald eagle was present on the nest and in an incubating position. Therefore, this nest is considered an occupied and active bald eagle nest in 2021 (Figure 1, Appendix A3). Nest 17057 was an occupied and active bald eagle nest in 2020 (Foo 2020).

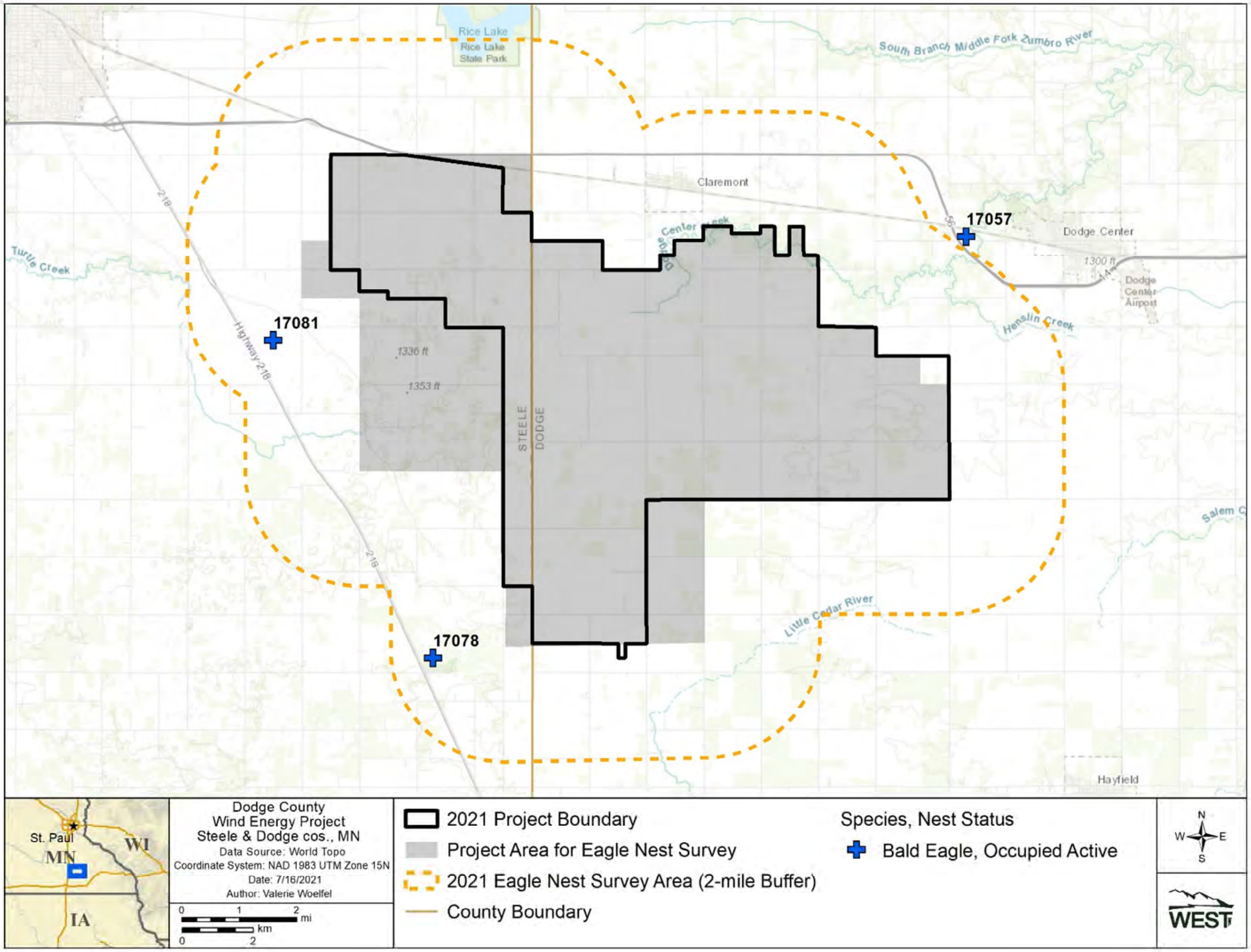

Figure 1. Raptor nests documented March 25 – 26, 2021, near Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Table 1. Results of the 2021 eagle nest surveys for the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Nest ID	Latitude	Longitude	Species[1]	2021 Status	2020 Status	Nest Substrate	Condition
17081	44.00492	-93.13615	BAEA	occupied active	occupied active	deciduous tree	good
17078	43.92477	-93.08011	BAEA	occupied active	occupied active	deciduous tree	good
17057	44.03116	-92.89324	BAEA	occupied active	occupied active	coniferous tree	good

[1.] BAEA = bald eagle.

ID = identification.

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Appendix A. Images of Occupied and Active Eagle Nests Found During the 2021 Raptor Nest Survey for the Dodge County Wind Energy Project, Dodge and Steele counties, Minnesota.

Appendix A1. Nest 17081 was an occupied and active bald eagle nest in 2021.

Appendix A2. Nest 17078 was an occupied and active bald eagle nest in 2021.

Appendix A3. Nest 17057 was an occupied and active bald eagle nest in 2021.

Technical Avian Data Summary

TO: Jennifer Field (NextEra Energy Resources, LLC)

FROM: Aaron Boone (Atwell, LLC)

DATE: 19 July, 2017

RE: PROJECT: Dodge County Wind Resource Study Area (Atwell #16002517)

CLIENT/CONTACT: NextEra - Jennifer Field

TASK: Targeted Loggerhead Shrike & Henslow's Sparrow Inventory Survey (Summer 2017)

The proposed Dodge County Wind Energy Center (i.e., DCWEC; located in Dodge and Steele counties, Minnesota, and hereafter referred to as the *Study Area* in conjunction with an overall wind resource assessment area--*Figure 1*) was assessed for territorial Loggerhead Shrike (*Lanius ludovicianus*) and Henslow's Sparrow (*Ammodramus henslowii*) use during summer 2017. The inventory survey window outlined within this data summary (20-23 June) intersects peak detection frequency during both species' nesting period (Figure 2; AKN 2017). Targeted inventory survey mobilizations occurred over the course of one site mobilization, but data were supplemented by other incidental survey efforts executed during regularly scheduled site mobilizations for conducting summer eagle use point surveys.

Survey methodology followed protocol outlined in an informal study plan approach for this DCWEC, which in turn closely follows recommendations set forth in the National Wind Coordinating Collaborative's *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions* (Strickland et al. 2011). Primarily, a comprehensive aerial review was conducted to locate all likely habitat parcels with accessible roadside vantages. A series of listening point count stations were delineated in order to provide maximum listening threshold coverage for available habitats within the *Study Area*. Each listening point was surveyed at least once during late June. All bird species were tallied for at least 10 minutes at each survey location. In the event that either of the target species was detected, that location would be revisited to acquire more substantial evidence of local territory maintenance or evidence of confirmed nesting within *Study Area* habitats.

This targeted inventory study partially fulfills Tier 3 analysis, as outlined within the U.S. Fish & Wildlife Service's *Land-based Wind Energy Guidelines* (WEG; USFWS 2012) and provides additional due diligence survey data to address preliminary *Study Area* occurrence concerns identified during previous Tiers 1

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and 2 WEG analysis. Likewise, this targeted inventory survey effort addresses an identified avian conservation step[1] outlined in the *Dodge County Wind Avian & Bat Protection Plan* (Atwell 2017).

State & Federally Threatened/Endangered Species - Survey Results

Minnesota maintains a separate list of state endangered and threatened species, along with other species they have determined to exhibit declining trends (MNDNR 2016). Those species listed by the federal Endangered Species Act of 1973 (ESA) can be separate from those listed at the state level (i.e., a state endangered species may have no federal ESA protection).

During targeted inventory surveys for Loggerhead Shrike and Henslow's Sparrow, no federally threatened or endangered species were recorded nesting within, migrating through, or utilizing migration stopover habitat within the Study Area.

A total of two (2) state endangered species and one (1) state special concern species was detected during this survey.

When compared with other grassland and shrubland nesting species, these species were demonstrated to be relatively scarce within the *Study Area* (*Table 1*). Shrubland nesting species generally were scarcer than grassland nesting species. A few grassland conservation concern species were among the most commonly detected species during the survey (e.g., Dickcissel [*Spiza americana*]).

- **Loggerhead Shrike** - Minnesota Endangered
    - Loggerhead Shrikes were not observed within the *Study Area*
    - a single adult observed in attendance of at least two recently fledged young located at the periphery of *Study Area* (Dodge County; *Figure 4a*)
        - N43.964151˚, W92.758483˚
    - observed at rather uncharacteristic rural homestead with ornamental spruce trees; surrounding landscape monoculture agriculture
- **Henslow's Sparrow** - Minnesota Endangered
    - territorial Henslow's Sparrows were detected within the Steele County portion of the *Study Area;* visuals of either bird were not obtained but the presence of territorial males in song supports the conclusion that active nesting activity within the Study Area can be considered *probable* at best (e.g., Herkert et al. 2002, MNBBA 2014)
    - Territory #1 - N43.971268˚, W93.0639˚ (*Figure 4b*)
        - a single male sparrow heard well for approximately 20 minutes
        - territory maintained within cultivated hay field
        - birds presumed to be females of a mated pair not observed at this location

[1] Aim to avoid operational infrastructure development within grassland habitat and/or initiate habitat mitigation protocols pre-construction if within nesting period, particularly if species demonstrates continued breeding presence within DCWEC

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- multiple follow-up visits yielded no additional auditory detections at this territory
    - Territory #2 - N43.985739˚, W93.121892˚ (*Figure 4c*)
      - a single male sparrow heard vocalizing briefly and from a distance under poor wind conditions
      - territory possibly maintained within more characteristic grassland restoration with notable presence of form species
      - multiple follow-up visits yielded no additional auditory detections at this presumed territory
- **Bell's Vireo (*Vireo bellii*)** - Minnesota Special Concern
    - This species was not the focus of targeted efforts during this survey, but this represented the single official Minnesota Special Concern species (MNDNR 2016) detected on territory within the *Study Area*. Because of this species' scarcity in Minnesota as a breeding species and its state listed status, this data point will be included within this technical data summary (*Figure 3*).
    - During WEG Tier II analysis for this DCWEC, the *Site Characteristics Study* (Atwell 2017) did not highlight this species as a potential concern (i.e., through USFWS Information and Planning and Consultation analysis), but more in depth analysis within this project's *Avian & Bat Protection Plan* (Atwell, LLC 2017) did indicate "moderate" occurrence probability within the *Study Area.*
    - A territorial male was detected singing on territory from Hythecker Prairie Scientific & Natural Area (approx.: N44.023854˚, W93.033183˚) and represents one of the few known summer records for Steele County (AKN 2017, MNBBA 2014).
      - multiple follow-up visits yielded no additional auditory detections at this presumed territory

<u>Loggerhead Shrike</u>

Populations of Loggerhead Shrike have declined in recent years across their continental range (Yosef 1996) and are listed with some priority conservation status in most Midwestern states. Within Minnesota, population trends have experienced notable but imprecise annual declining trends since the mid-1960s (Sauer et al. 2014).

This state endangered songbird occurs in open landscapes, typically with short vegetation and clusters of small trees or shrubs (Yosef 1996). Pastures and similar agricultural areas with fence rows often are used in Minnesota. A statewide census found that red cedar (*Juniperus virginiana*) comprised a majority of nest trees (Eliason 1996). This habitat configuration signature was used when creating a roadside survey schematic for the *Study Area* (*Figure 2*).

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Survey Conclusions:

- Targeted roadside surveys did not yield detections of Loggerhead Shrike within the *Study Area* (Figure 3)
    - likewise, a near weekly roadside survey presence within the DCWEC since early spring has not yielded incidental observations of this shrike species
- The occurrence of an active nesting territory at the periphery of the *Study Area* indicates that there remains a modest probability that Loggerhead Shrikes could at some point set up a nesting territory within suitable DCWEC habitat, particularly in suitable areas relatively far removed from roadsides that are not easily surveyed. Loggerhead Shrike presence is positively correlated with the presence of hay/pasture and other cover crop (Smith and Kruse 1992). The presence of this habitat configuration with the occurrence of red cedar or similar dense, low shrub clusters could attract this species in the near future.
- Importantly, Erickson et al. (2014) noted that Loggerhead Shrikes experienced "notable reductions" in mortality at more modernized wind power generation facilities, but several past studies have shown that shrikes are prone to vehicle collision mortality (Blumton 1989, Flickinger 1995, Wiggins 2005). This variation in mortality source could be a useful consideration during wind turbine generator micrositing, and facility access infrastructure design. Primary impact concern from DCWEC development on this species may be increased operations access-road traffic in close proximity to any active nesting territories or from direct impacts to habitat with active nests or recently fledged young.

Henslow's Sparrow

Populations of Henslow's Sparrow have declined notably in recent decades in Minnesota and have been described as "precarious" (Hanson 1994). Their general rarity within Minnesota has not contributed to adequate population trend estimates (Sauer et al. 2014). The recent Minnesota Breeding Bird Atlas project revealed that this sparrow may be more widely distributed across Minnesota than determined to the 1990s (Cooper 2012, MNBBA 2014)—a cluster of observations in Steele and Dodge counties intersects the Study Area (*Figure 3*).

The Henslow's Sparrow nests within tallgrass prairie, meadows, and weedy pastures (Herkert et al. 2002). With significant conversion of native prairies within the Midwest, this sparrow began to use cultivated hay and other grassland plantings (e.g., Conservation Reserve Program habitats). This habitat use relationship with hayfield cultivation was noted even during the early 20th century (Hyde 1939). Grassland habitats utilized by nesting Henslow's Sparrows are associated with specific vegetative litter component, forb and woody-stem densities, and overall habitat patch size. Scattered forbs are critical for providing suitable singing perches (Herkert et al. 2002).

Survey Conclusions:

- Targeted roadside surveys confirmed the presence of territorial Henslow's Sparrows at two locations within the Steele County portion of the *Study Area* (*Figure 3*)

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- Lituma et al. (2011) suggest that there may be detection issues for Henslow's Sparrow from road-side surveys. Similarly, this sparrow's primary song does not necessarily carry well over long distances. Existing suitable habitat within the *Study Area* away from roads were not adequately surveyed using this targeted roadside survey method.
- There does not appear to be much concern over direct collision mortality impact of Henslow's Sparrow with wind turbine generators, although collision mortality with stationary towers has been documented (Herkert et al. 2002). A primary impact concern from DCWEC development on this species may be direct impacts to habitat containing active nests or recently fledged young.

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Table 1. Targeted Inventory Survey Results for Grassland & Shrubland Birds

Species†	Total Observed	Occur Freq	Conservation Status
Dickcissel	*112*	*0.730*	*SGCN, BCC*
Sedge Wren	*51*	*0.405*	*SGCN, BCC*
Bobolink	*69*	*0.324*	*SGCN, BCC*
Savannah Sparrow	29	0.243	
Eastern Meadowlark	*13*	*0.216*	*SGCN*
Willow Flycatcher	*11*	*0.189*	*BCC*
Clay-colored Sparrow	10	0.108	
Brown Thrasher	*3*	*0.081*	*SGCN, BCC*
Grasshopper Sparrow	*3*	*0.054*	*SGCN, BCC*
Henslow's Sparrow	*2*	*0.054*	*MN END*
Loggerhead Shrike	*3*	*0.027*	*MN END*
Field Sparrow	*2*	*0.027*	*SGCN, BCC*
Upland Sandpiper	*2*	*0.027*	*SGCN, BCC*
Bell's Vireo	*1*	*0.027*	*MN SPC*

MN END = species considered endangered if the species is threatened with extinction throughout all or significant portion of its range within Minnesota
MN SPC = species considered a species of special concern if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations
SGCN = SGCN are defined as native animals, nongame and game, whose populations are rare, declining, or vulnerable to decline and are below levels desirable to insure their long-term health and stability. Also included are species for which Minnesota DNR has a stewardship responsibility

BCC = USFWS Bird of Conservation Concern (USFWS 2008)

†Species are sorted by most frequently occurring and subsequently sorted by greatest total of individuals observed

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Figure 1. Regional Occurrence Phenology (Eastern Tallgrass Prairie & Prairie Hardwood Transition)

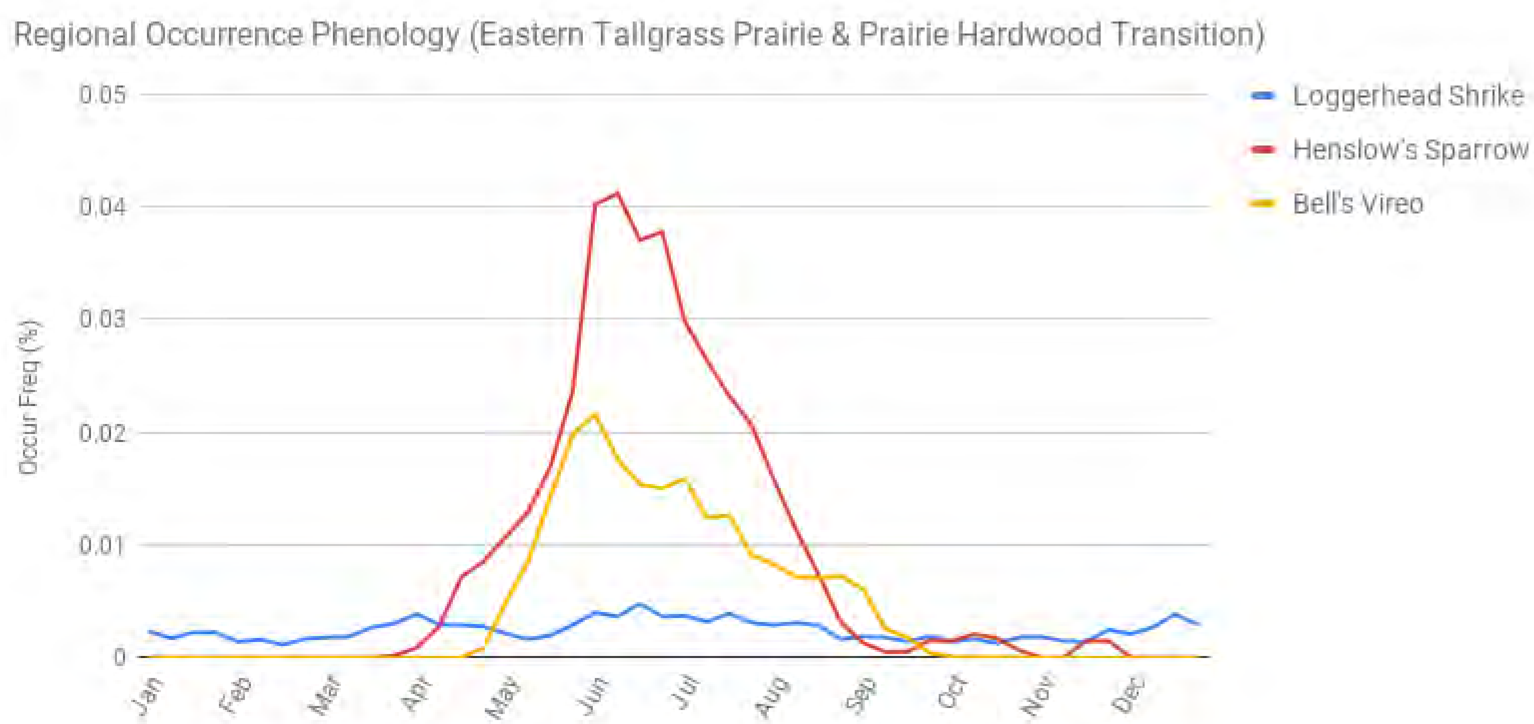

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Figure 2. Targeted Minnesota Endangered Avian Species Survey Plan

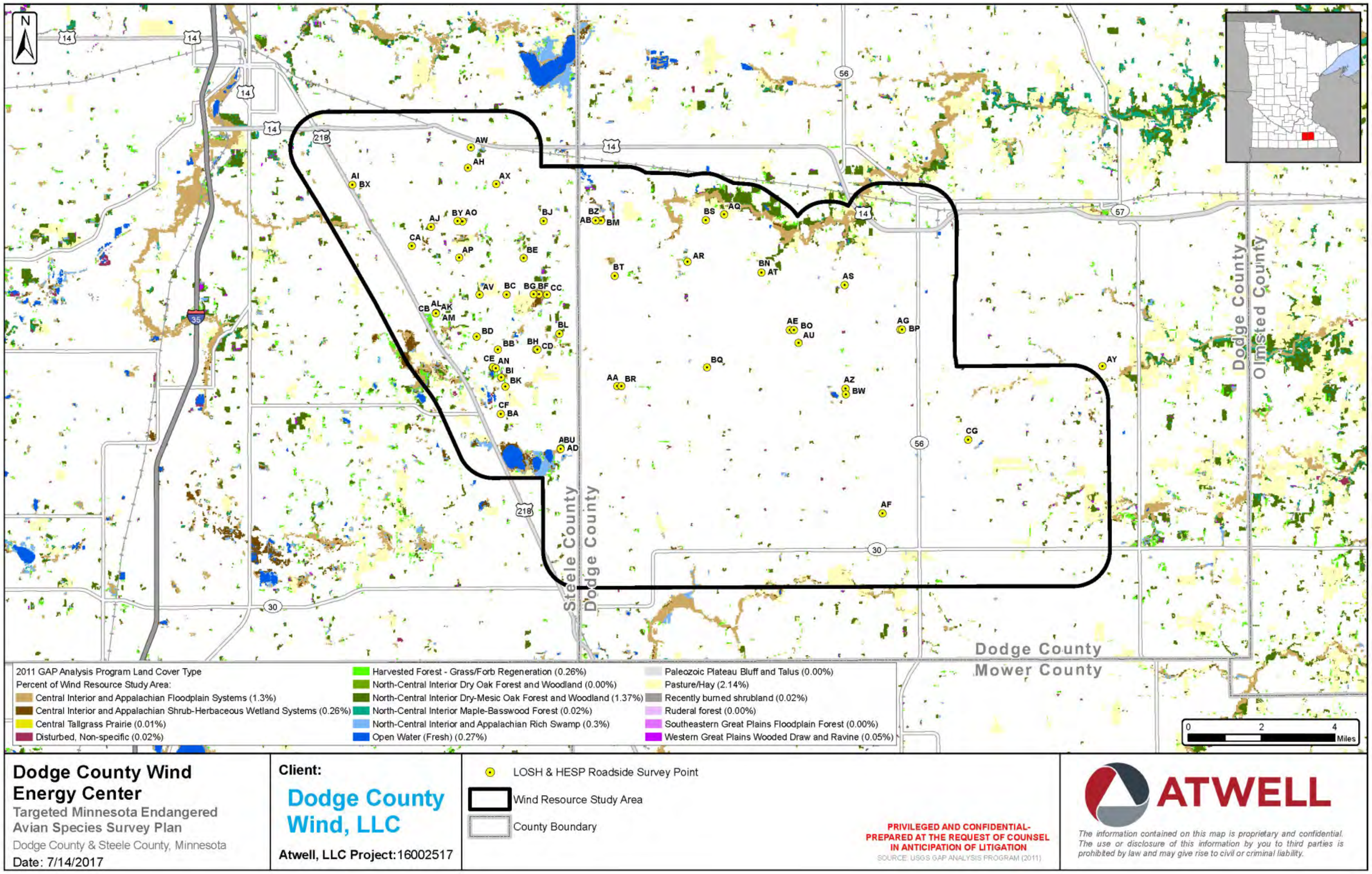

Figure 3. Loggerhead Shrike & Henslow's Sparrow Survey Data (Summer 2017)

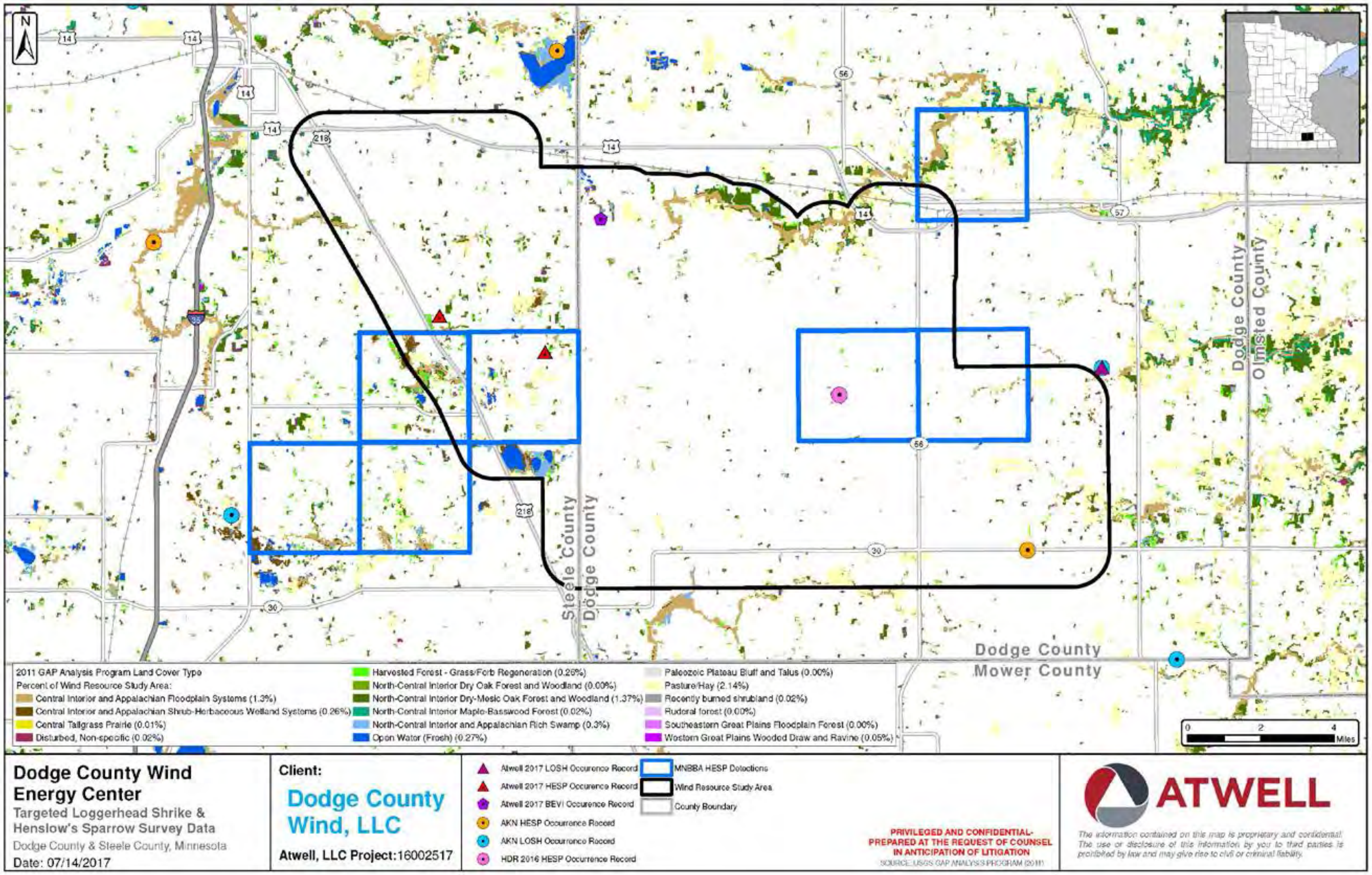

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Figure 4a. Adult Loggerhead Shrike (actively attending recently fledged young at periphery of *Study Area;* 21 June, 2017)

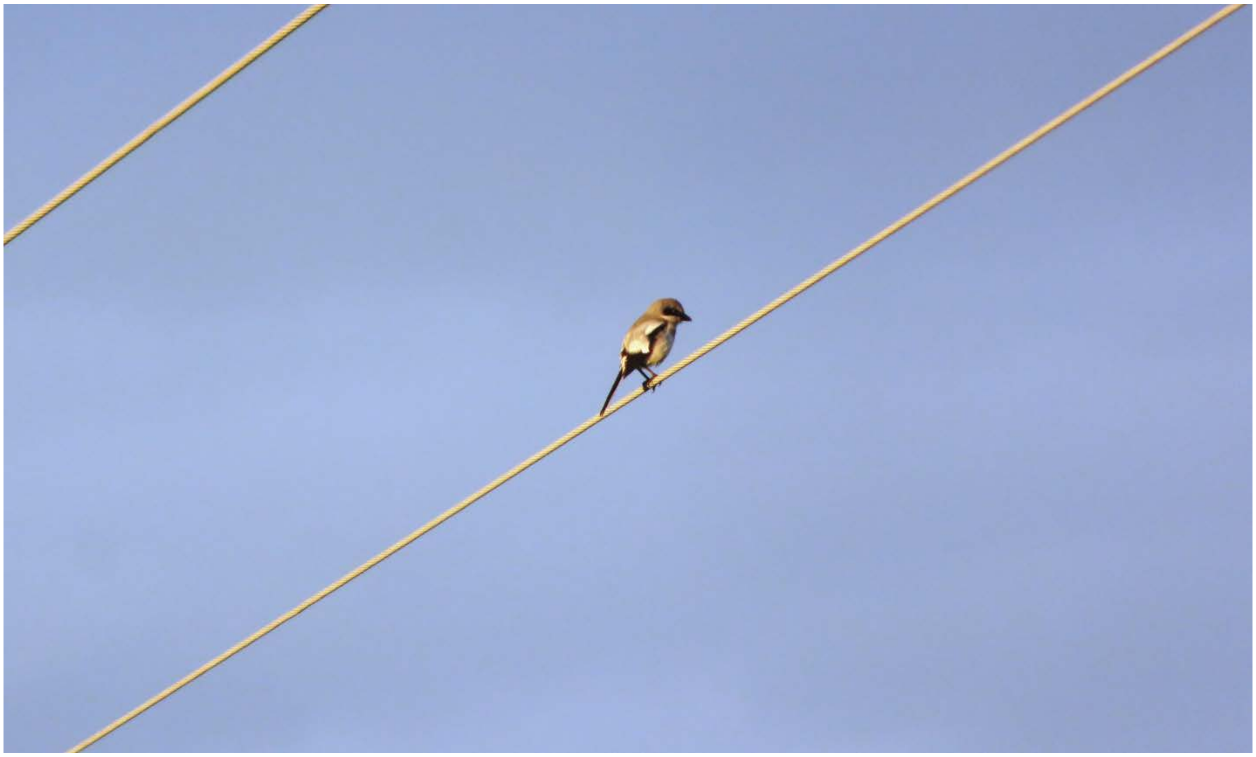

Figure 4b. Hayfield containing active Henslow's Sparrow territory in *Study Area*; 22 June, 2017 — Steele County, MN

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Figure 4c. Grassland restoration containing possible Henslow's Sparrow territory in Study Area; 22 June, 2017 — Steele County, MN

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ENVIRONMENTAL & STATISTICAL CONSULTANTS

7575 Golden Valley Drive, Suite 300, Golden Valley, MN 55427
612.655.1726 ♦ www.west-inc.com

TECHNICAL MEMORANDUM

Date: February 4, 2021

To: Dodge County Wind, LLC

From: Elizabeth Markhart, Western EcoSystems Technology, Inc. (WEST)

Subject: Dodge County Wind Energy Project Sullivant's Milkweed Screening

PURPOSE

Dodge County Wind, LLC (DCW), an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC (NEER), is proposing the development of the Dodge County Wind Energy Project (Project) in Steele and Dodge counties, Minnesota. DCW contracted Western EcoSystems Technology (WEST) to conduct a desktop screening and subsequent field survey to assess the likelihood of Sullivant's Milkweed (*Asclepias sullivantii;* a state listed threatened species) occurrences within the Project. The field assessments were conducted in August 2020 from public rights-of-way (ROW). The screening focused on sections within the Project Boundary that contain Minnesota Natural Heritage Information System (NHIS) records of Sullivant's Milkweed, or Minnesota Department of Natural Resources (DNR)-identified native prairie remnants which may host populations of the target species (Figure 1).

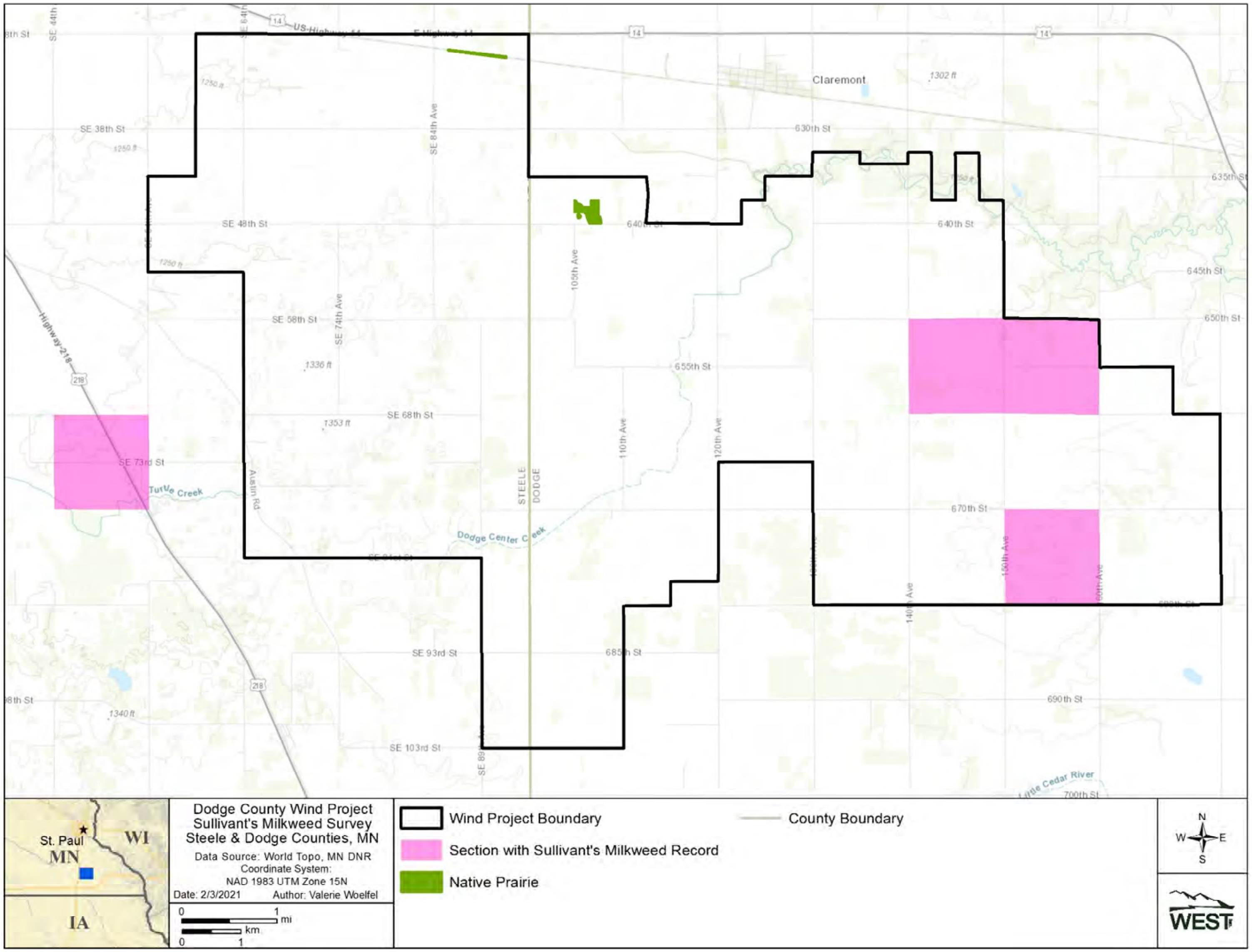

Figure 1. Sullivant's Milkweed August 2020 Screening Focus Areas for Dodge County Wind Energy Project in Steele and Dodge counties, Minnesota, August 2020.

METHODS

WEST used current (as of August 2020) MN NHIS database records to identify areas of documented Sullivant's Milkweed occurrences within the Project Boundary. Additionally, MN DNR-designated native prairie communities within the Project were identified as potential habitat for the target species. Following the desktop records review, a road-based field assessment was conducted on August 7, 2020 by a qualified WEST botanist, Elizabeth Markhart. To develop a visual search image for Sullivant's Milkweed, prior to the field assessment the botanist reviewed relevant literature and confirmed species identification, morphology and flowering status in the nearby Iron Horse Scientific Natural Area (SNA; see Attachment A). The objective of the road-based survey was to confirm presence of habitat that could support Sullivant's Milkweed, as well to document any of the target species that could be identified from adjacent public ROW.

RESULTS

The locations of the field observations, as well as the field notes, can be found in Attachment B. The botanist viewed both road-side ROW vegetated swales and adjoining uncultivated lands, focusing on areas in sections with NHIS records of Sullivant's Milkweed (observation points W-4 through W-11; Figure B-1) and DNR-designated native prairie (observation points W-1 through W- 3; Figure B-1), but also examining potential habitats viewable from public ROW elsewhere within the Project Boundary (observation points W-4 through W-6; Figure B-1).

Field screening notes (Attachment B) indicated frequently hayed roadside grasslands and cultivated cropland dominate the viewable areas in the vicinity of the Sullivant's Milkweed NHIS records and DNR- designated native prairies within the Project Boundary. None of the sections that were identified as having previous NHIS records of Sullivant's Milkweed within the Project appeared to harbor native prairie/Sullivant's Milkweed habitat, and no Sullivant's Milkweed stems were documented from the adjacent ROW observation points (Attachment B).

CONCLUSIONS AND RECOMMENDATIONS

Because the field observations occurred from public ROW, the results of this screening should not be viewed as conclusive presence/absence surveys in any of the examined areas. However, this screening indicates that the likelihood of Sullivant's Milkweed currently occurring within the Project Boundary is relatively low, despite prior NHIS records of its occurrence.

If temporary or permanent impacts are proposed within potential Sullivant's Milkweed habitat (either in grassed areas within sections that contain NHIS records of the species, or within DNR-designated native prairies), coordination with the DNR should occur. Site-specific field surveys during the optimal identification period (July) may be appropriate to determine if Sullivant's Milkweed are present in the construction footprint. If the species is observed, the exact location and extent of Sullivant's Milkweed plants should be recorded in order to inform layout modifications to avoid impacts to this species. If avoidance of any documented Sullivant's Milkweed is not possible through layout and/or construction modifications, further coordination with the DNR should occur.

Please address any questions regarding this memo to:

Elizabeth Markhart
Minnesota Department of Natural Resources Endangered and Threatened Plant Species Surveyor
WEST, Inc.
Phone: (651) 261-5641
Email: emarkhart@west-inc.com

Attachment A. Sullivant's Milkweed Range and Morphological Characteristics

Sullivant's milkweed (*Asclepias sullivantii)* is associated with tallgrass prairie in the central U.S. The northern fringe of the range crosses through southern Minnesota, Wisconsin, Michigan, and Ontario[1] (Figure A-1). Color coding of counties in Figure A-1 shows the species is rare (yellow) in all of Minnesota, Wisconsin, and Michigan, while not rare (lime green) in the states to the south. The State of Minnesota has listed the species as threatened as a result of losses of tallgrass prairie habitat.

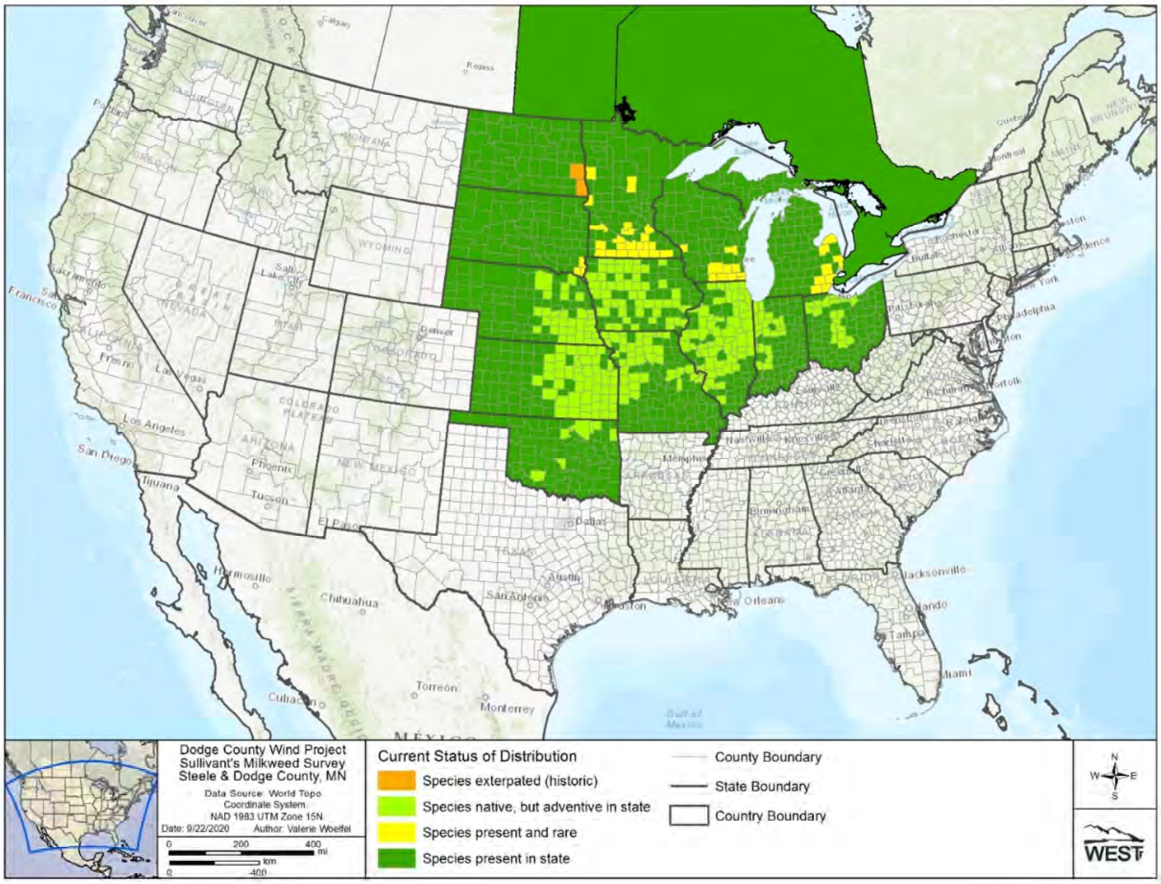

Figure A-1. Map of Sullivant's Milkweed records in counties of the U.S.

Common milkweed (*Asclepias syriaca*), which has no state listing in Minnesota and is common in roadside swales, needs to be ruled out before considering Sullivant's Milkweed to be likely present in the Milkweed Screening for the Project. To do this, a search image of morphological and phenological (seasonal variation) characteristics of the local populations of Sullivant's Milkweed was developed to help differentiate from common milkweed.

[1] Kartesz, J.T., The Biota of North America Program (BONAP). 2015. North American Plant Atlas. (http://bonap.net/napa). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)].

Morphological characteristics for comparison of the two milkweed species include the leaf bases, leaf surfaces, and flowers[2]. Iron Horse SNA, a recognized public, state-protected area, is known for Sullivant's Milkweed occurrences and is located within 30 miles of the Project. Iron Horse SNA was visited at the time of the Milkweed Screening to develop a search image of a local population. This would provide both an understanding of the 2020 phenology and morphological characteristics in the local populations. Photographs were taken to document stems of two small stands of milkweed located at Iron Horse SNA (Figures A-2 and A-3). No plants were blooming. These stems are likely to be Sullivant's Milkweed based upon the stems and leaves being glabrous (smooth, free of hairs) and leaf bases being rounded and close to clasping the stems. Photographs of a known stem of Common Milkweed (Figure A-4) show the contrast in leaf base and petiole (leaf stalk). The milkweed stems at Iron Horse had no flowers to use as a final and more definitive contrast to the Common Milkweed.

[2] Britton, Nathanial Lord and Hon. Addison Brown. 1970. An illustrated flora of the northern United States and Canada, second edition revised and enlarged. Volume III. Dover Publications, Inc. New York.

Figure A-2. Iron Horse Scientific and Natural Area - Sullivant's Milkweed stem with heart-lobed leaf bases and little to no petiole, August 7, 2020.

Figure A-3. Iron Horse Scientific and Natural Area - Sullivant's Milkweed stem with subcordate leaf bases, little to no petiole, and no flowers, August 7, 2020.

Figure A-4. Common Milkweed stem showing stout petiole and narrowed leaf bases, August 7, 2020.

Attachment B. Dodge County Wind Energy Project Milkweed Screening Field Notes, August 7, 2020.

Field Point ID	Description
W-1	Trunk Highway 14 new 4-lane highway construction is in process during 2020. Binocular viewing indicated relatively tall broad-leaved plants that are likely Giant Ragweed and/or *Erigeron annuus*. Notable dust deposition occurring from southerly wind transporting construction corridor soil. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-2	This location is the southwest corner of a 40-acre block of land named the Hythecker Scientific and Natural Area (SNA). The vegetation at this point consists of relatively uniform cover of Big Bluestem that suggests conservation seeding took place in the last few years. The Sullivant's Milkweed is not listed as a known species according to the State of Minnesota webpage for the property. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-3	This location is the southern boundary of the Hytheker SNA. Reed canary grass dominates a wet slough in this area. This species is often listed as invasive indicator of hydrologic alteration or agronomic introduction for low pasture use. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-4	Two areas extending off to the east and west. Species consistent with wet prairie to the east include *Helianthus* spp., Verbena simplex, a *Rumex* spp., *Asclepias incarnata* in a matrix of pasture grasses. To the west are patches of common cattail and a species of bulrush. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-5	A stretch of county road swales for about 1,000 feet. Big bluestem is the dominant grass. A minor component of forbs include compass plant (native prairie), red clover, and the State noxious species *Pastinaca sativa* (wild parsnip). The vegetation extends through the intersection and north toward Point 4. These ditches were hayed early in the season. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-6	This prairie field resembles a restoration seeding with a grass matrix of Big Bluestem and widespread *Ratibida pinnata* and *Monarda fistulosa* in bloom. Queen Anne's Lace is expanding and Sweet Clover is established along the edge. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-7	This relatively deep roadside swale has wet prairie indicator species, including Giant Ironweed, a species of *Scirpus*, Prairie Cordgrass, and Common Cattail. Woody succession is occurring to the east. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-8	Two triangles of land at a T-intersection that are not currently plowed. Pasture grasses dominate with patchy presence of Prairie Cordgrass and Green Bulrush. Broad-leaved plants are non-native, including the noxious Wild Parsnip, Bird's-foot trefoil, Sweet Clover, and a few clusters of a native sunflower species. No Sullivant's Milkweed stems observed from public ROW vantage point.

W-9	A 1,000-foot stretch of road swales not hayed. Species present may be indicative of the broader ditch swale composition where haying as recently occurred, and rapid visual assessment in untenable. Native species present: patchy Prairie Cordgrass, a species of Bulrush, Compass Plant, Spreading Dogbane, *Zizea aurea*, *Ratibida pinnata*, *Monarda fistulosa*, *Asclepias verticillata*, *Asclepias syriaca*, a species of *Helianthus*, *Rumex* spp., *Oenothera biennis*. Non-native pasture grasses dominate. Non-native broad-leaved species include Bird's-foot trefoil, red clover, Canada thistle, and the noxious plant *Pastinaca sativa* (wild parsnip). No Sullivant's Milkweed stems observed from public ROW vantage point.
W-10	This roadside swale is pasture grass dominated and hayed. Compass Plant, a native prairie forb, is in a few patches along the top of slope. At the intersection to west and for 2,000 feet north are intermittent patches of Prairie Cordgrass and more Compass Plant. No Sullivant's Milkweed stems observed from public ROW vantage point.
W-11	This stretch of roadside is dominated by pasture grasses and hayed. Non-native, common broad-leaved species are Bird's-foot Trefoil, Red Clover, Queen Anne's Lace, and the noxious *Pastinaca sativa* (wild parsnip). Both swales along the road are similar. No Sullivant's Milkweed stems observed from public ROW vantage point.

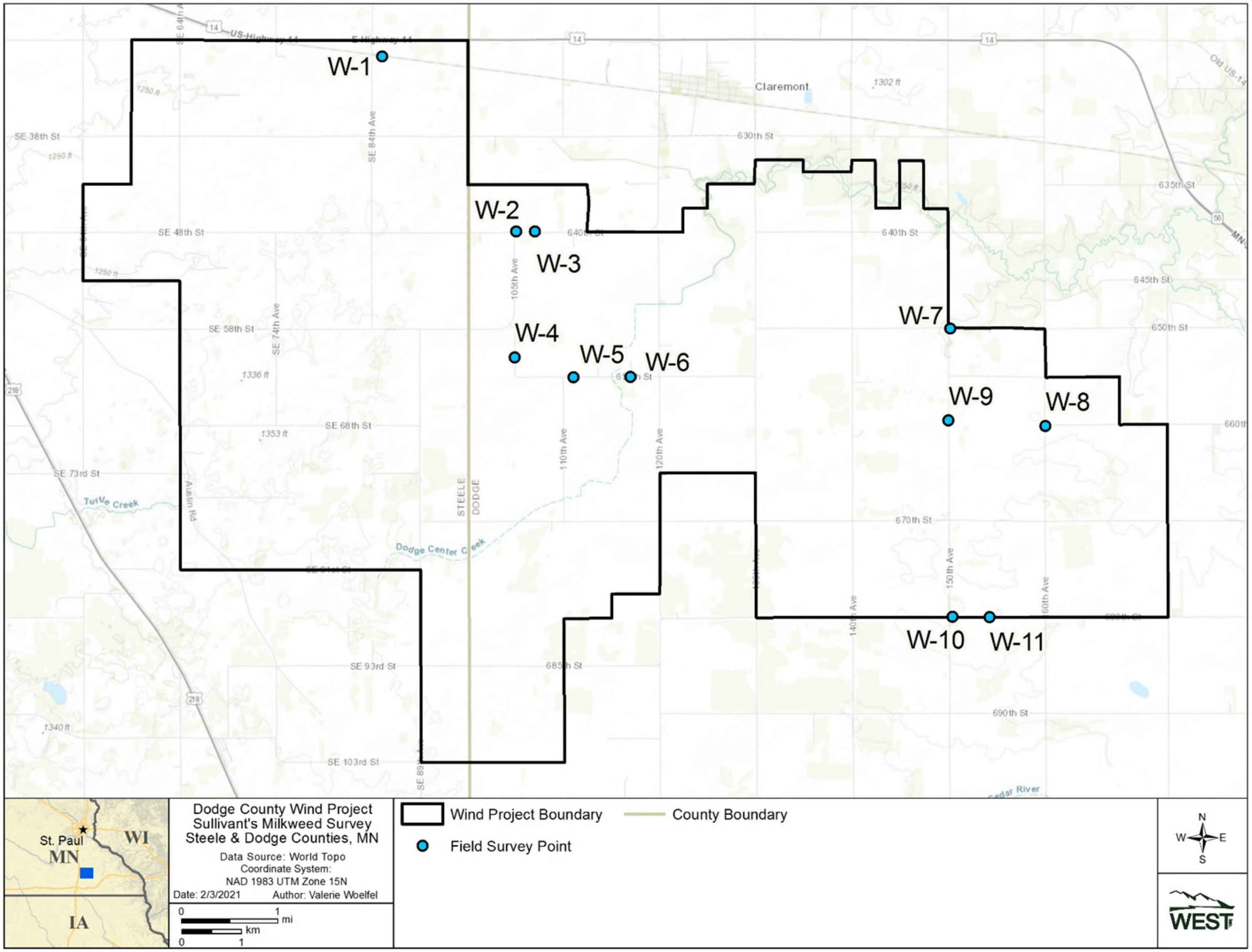

Figure B-1. Milkweed Screening field survey point locations.

Appendix C. Post-Construction Monitoring Plan
[to be developed]

Appendix D. Incidental Reporting Procedure

WILDLIFE RESPONSE & REPORTING SYSTEM (WRRS) MANUAL

FOR
WIND ENERGY CENTERS

Revised:

January 2020

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TABLE OF CONTENTS

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1.0 WILDLIFE MANAGEMENT PROGRAM

1.1 OUR COMMITMENT

As employees of NextEra Energy Resources, we have a responsibility to be good stewards of the environment and to adhere to the law.

Most birds that are seen across the country, including in NextEra Energy Resources' wind plants are protected by one of two laws; the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act. Some species have the additional classification of "endangered" or "threatened". Eagles and endangered species have special reporting requirements, and therefore have a special reporting procedure.

Bald and Golden Eagle Protection Act - 16 U.S.C.S. 668 (a)

"Whoever, ...shall ...take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner, any bald eagle, commonly known as the American eagle, or any golden eagle, alive or dead, or any part, nest, or egg thereof of the forgoing eagles, ...shall be fined not more than $5,000 or imprisoned not more than one year or both for each such violation."

Migratory Bird Treaty Act - 16 U.S.C.S. 703

The Act makes it unlawful to: ship, transport or carry from one state, territory or district to another, or through a foreign country, any bird, part, nest or egg that was captured, killed, taken, shipped, transported or carried contrary to the laws from where it was obtained; import from Canada any bird, part, nest or egg obtained contrary to the laws of the province from which it was obtained. § 705.

Endangered Species Act – 16 U.S.C.S 35

"...it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof..."

1.2 PURPOSE/SUMMARY

The purpose of this manual is to standardize the actions taken by NextEra Energy Resources in response to any wildlife fatalities and/or injuries found within the wind plant boundaries.

Any wildlife injury or fatality found within wind-plant boundaries, regardless of cause of death, should be reported immediately to the operations leader who shall complete an incident report and take photographs. Environmental Services – PGD Support shall be notified and further actions will be determined at that time based on the species and the circumstances surrounding the incident.

1.3 WILDLIFE FATALITIES

In addition to any complete or partial carcasses, any portion of a bird, bat or other animal, including individual feathers and/or bones, are all considered reportable wildlife fatalities. Report all finds even if the carcass and/or parts are not thought to be associated with wind plant operations. All wildlife species shall be reported.

1.4 WILDLIFE INJURIES

The majority of injured birds will have a broken wing. A broken wing will usually hang down oddly or blow in the wind. An injured bird will most likely be on the ground and unwilling or unable to fly. Raptors (any bird of prey or bird with a hooked beak and sharp talons) will sometimes perch on the ground and raptors will sometimes walk on the ground, but not often. If a bird is seen walking or perched on the ground, approach it slowly to see if it will fly away, if it runs away, refusing to fly, it is most likely injured.

Injured animals are dangerous. PGD prohibits personnel from getting too close or touching any wildlife without prior regulatory or PGD approval. This practice is enforced to avoid potential injury to self and to wildlife. Prior to completing any inspection related tasks or the collection of information needed for a report, conduct a risk assessment to define potential risks (e.g., uneven walking surfaces, snakes, etc.). Once safety is assessed, maintain visual contact with the injured animal while reporting the incident to the operations leader so that the correct process can be determined.

1.5 NON-AVIAN CARCASSES

Non-avian and mammal carcasses pose a potential risk to wind sites, as they may draw avian scavengers to the site. If you see any of the types listed below, it is important to take action to prevent an impact with large raptors.

A **large mammal carcass** is defined as a partial or entire livestock or game animal carcass present on the property. These include, but are not limited to, sheep, cows, horses, elk, and deer. All on-site finds shall be reported even if the carcass and/or parts are not believed to be related to site operations.

A **small mammal carcass** is defined as a small to medium sized animal, including, but not limited to, rabbits, dogs, foxes, coyotes, and prairie dogs. Multiple (5 or more) small mammal carcasses in close proximity to each other shall be reported even if the carcass and/or parts are not believed to be related to site operations.

A **gathering of avian scavengers** is defined as an unusual concentration of scavenging avian species such as crows, ravens, vultures, or eagles. All personnel on site should be observant of any atypical bird activity while traversing the site or visiting turbines for maintenance. Some examples of unusual bird activity that might represent a gathering of scavengers on a carcass could be:

1. Groups of eagles or vultures circling in a focused area
2. Groups of crows or ravens congregating in a specific area
3. Eagles, crows, ravens, or vultures seen perching in unusually high numbers

A significant event is defined as an event in which several large mammal carcasses, or multiple small animal carcasses (including bats), are located on site. Even if avian scavengers are not yet present, it is imperative that significant events are reported immediately, so that steps can be taken to remove the carcasses (if determined to be the course of action by Environmental Services) before avian scavengers are attracted to the site. Additionally, special notifications may be required if multiple bats are found on-site in a short period of time.

Contact Environmental Services – PGD Support to discuss implications and develop a plan of action. It may be necessary to contact the landowner to have the carcass removed from their property. Environmental Services – PGD Support may also suggest that the State wildlife agency be notified of the potential risk to the site.

In some cases, Law Enforcement may need to be notified in the case of carcasses purposely left on site.

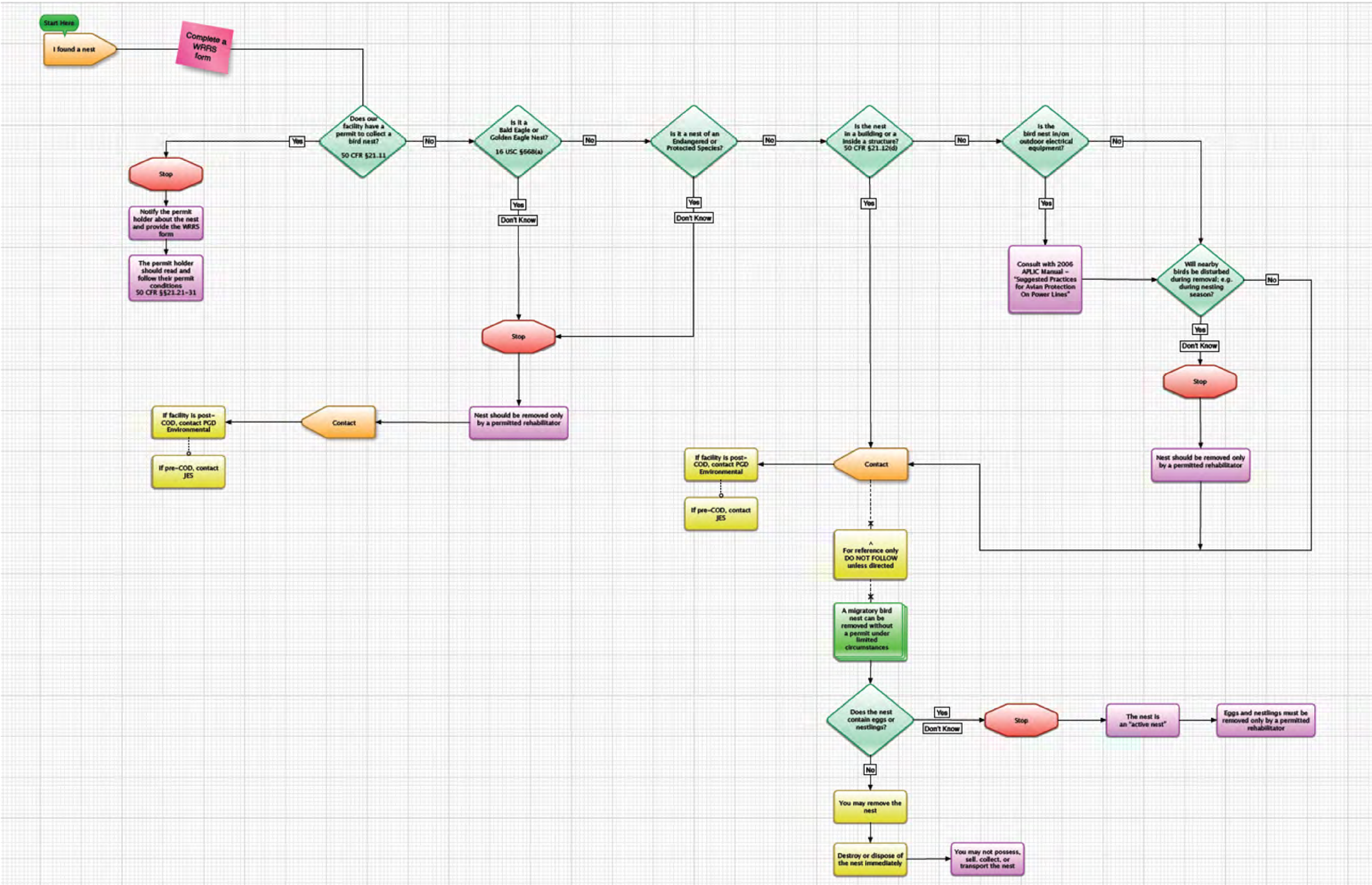
1.6 FINDS WITH BANDS

If you find a wildlife fatality with a band(s) (sometimes found in or around legs, ears or wings of animals), please notify your operations leader, and include this information in your WRRS reporting form. There are several different wildlife and agencies that may need to be contacted.

1.7 NESTS

If you find a nest in, on or around a turbine, power pole, substation, or transformer, please contact your Wildlife Program Manager for guidance. **Do not remove or touch a nest without permission.** Please note that a bird nest could be a collection of eggs with no nesting material below them (barn owl nests, for example).

The following flow chart (I Found a Nest Flow chart (OpModel) was developed as guidance for when the discovery of a nest has been made.



Start Here
I found a nest
Complete a WRRS form
Does our facility have a permit to collect a bird nest? 50 CFR §21.11
Yes
No
Stop
Notify the permit holder about the nest and provide the WRRS form
The permit holder should read and follow their permit conditions 50 CFR §§21.21-31
Is it a Bald Eagle or Golden Eagle Nest? 16 USC §668(a)
Yes
Don't Know
No
Is it a nest of an Endangered or Protected Species?
Yes
Don't Know
No
Stop
Nest should be removed only by a permitted rehabilitator
Contact
If facility is post-COD, contact PGD Environmental
If pre-COD, contact JES
Is the nest in a building or a inside a structure? 50 CFR §21.12(d)
Yes
No
Is the bird nest in/on outdoor electrical equipment?
Yes
No
Consult with 2006 APLIC Manual – "Suggested Practices for Avian Protection On Power Lines"
Will nearby birds be disturbed during removal; e.g. during nesting season?
Yes
Don't Know
No
Stop
Nest should be removed only by a permitted rehabilitator
Contact
If facility is post-COD, contact PGD Environmental
If pre-COD, contact JES
^
For reference only DO NOT FOLLOW unless directed
A migratory bird nest can be removed without a permit under limited circumstances
Does the nest contain eggs or nestlings?
Yes
Don't Know
Stop
The nest is an "active nest"
Eggs and nestlings must be removed only by a permitted rehabilitator
No
You may remove the nest
Destroy or dispose of the nest immediately
You may not possess, sell, collect, or transport the nest

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2.0 PROCEDURES

2.1 INSPECTIONS

The NextEra Energy Resources Wildlife Response and Reporting System relies solely on wind technicians and other site personnel to find and report birds, bats and other animals. Wildlife Inspections shall be completed as part of the Inspection of Watch (IOW) procedure.

Wildlife inspections must be conducted in accordance with our lease/easement agreements with individual landowners. Confirm these conditions prior to conducting any wildlife inspections. It is expected that the entire inspection process is completed during the Inspection of Watch. However, if damage to crops or other landowner property could occur during the inspection, do not trespass or damage property.

CRITICAL SUCCESS FACTORS:

- Ability to safely and legally walk the terrain around the wind turbine
- Awareness of animals or signs of animals on site property
- Ability to recognize when an animal is in distress
- Ability to immediately contact operations leader / Environmental Services to report the find
- Ability to ensure full compliance with any permit requirements, if any
- Knowledge of procedures for inspections and reporting

INSPECTION PROCEDURE

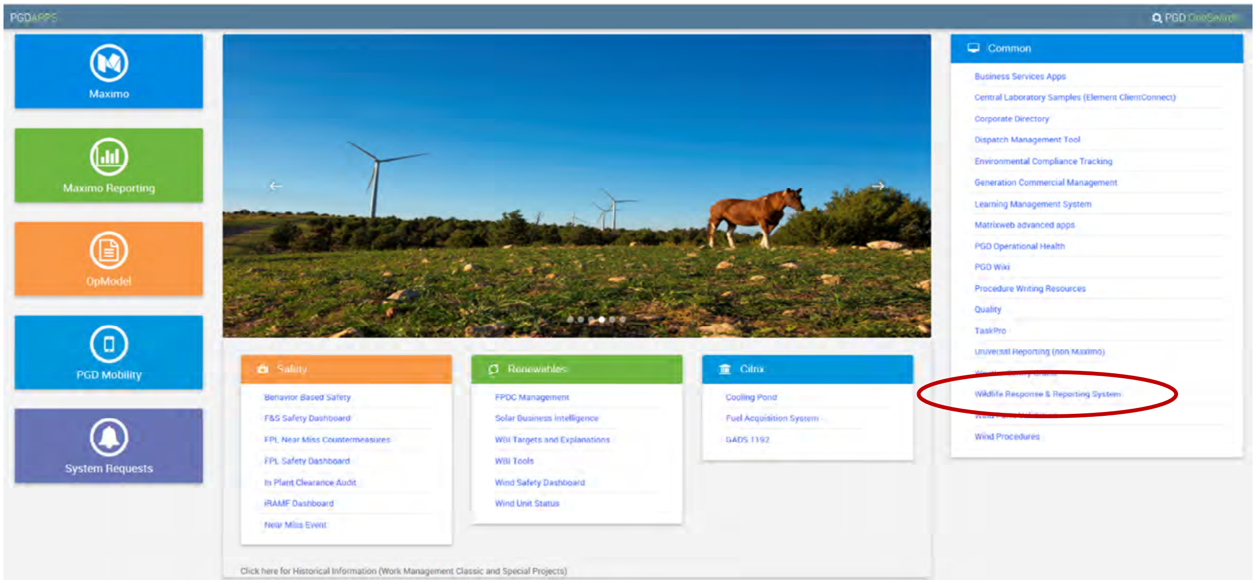
1. Upon arrival at the turbine complete all safety requirements. Please be aware of special on site hunting seasons while performing the inspections. This includes Risk Assessment Mitigation Forms (RAMF). Put on all applicable personal protective equipment (PPE). Remember that if at any time you feel your safety is compromised, **DO NOT** complete the Inspection. Beware of uneven walking surfaces, snake hazards, or other potential risks.
2. A complete Wildlife Inspection consists of three “Inspection Circles” that shall be walked. Each Inspection Circle consists of slowly walking around the turbine, scanning the ground as you walk, looking to the right and left, and checking on any suspicious objects in the distance. End “Inspection Circle” where you began.
3. To complete the first circle: Begin at the base of the turbine, walk away from the turbine 30 fet and complete one full Inspection Circle (see step 2) keeping **30** feet from the turbine. A good estimate of distance is 1 long step = 1 yard (3 feet).
4. To complete the second circle, walk out another 60 feet, and complete another Inspection Circle; keeping **90** feet away from the turbine.
5. To complete the third and final circle, walk out another 60 feet and complete another Inspection Circle keeping **150** feet from the turbine.
6. When the last circle is completed, answer the appropriate questions on the IOW checklist.
7. Immediately notify the operations leader if an animal is found, and then continue with the Reporting Procedures.
8. The IOW checklist shall be synced by the end of the day and accessible via the IOW dashboard.
9. All wildlife fatalities or injuries found during wildlife inspections shall be reported following the site procedures. Ensure a full report is submitted to Environmental Services using the SharePoint application (PGD Applications; common applications; Wildlife Response and Reporting System). See section 2.2.

2.2 INCIDENT REPORTS

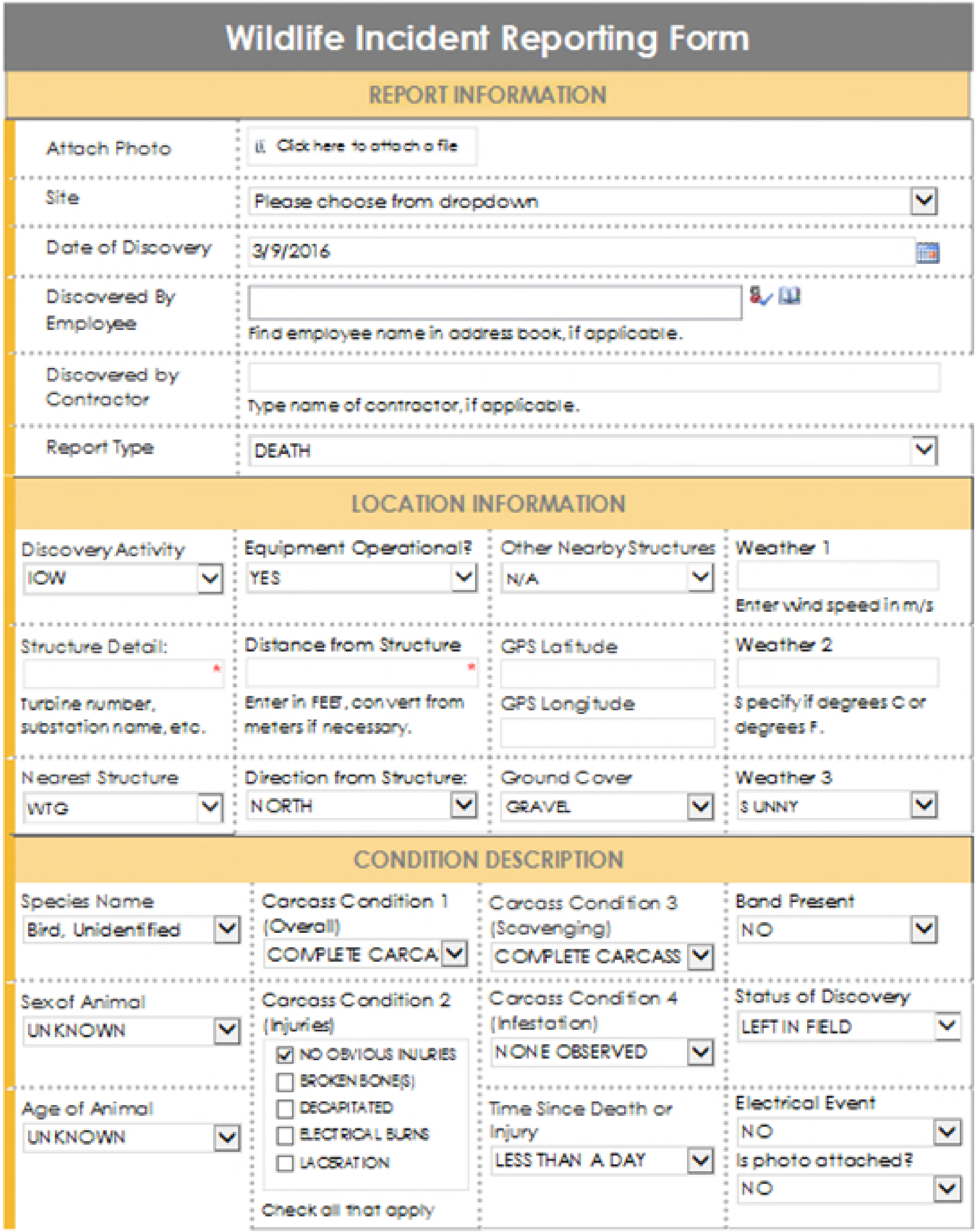
Every individual animal discovery requires a separate Wildlife Incident Report. Answer every question and include any additional information that may be helpful. Too much information is better than not enough. All questions shall be answered, even if the answer is "unknown."

The incident report should include at least one photograph of the discovery. Photographs should show a close up of the head and/or feet, as well as the carcass in relation to the closet structure, if possible. A common item placed next to, but not touching the carcass, helps indicate the size of the animal.

The WRRS Incident Report can be accessed via [PGD Applications](), under the Common Applications.



Complete the Wildlife Incident Reporting Form. Fields with a red asterisk * are required



Wildlife Incident Reporting Form

REPORT INFORMATION

Attach Photo	Click here to attach a file
Site	Please choose from dropdown
Date of Discovery	3/9/2016
Discovered By Employee	Find employee name in address book, if applicable.
Discovered by Contractor	Type name of contractor, if applicable.
Report Type	DEATH

LOCATION INFORMATION

Discovery Activity: IOW	Equipment Operational? YES	Other Nearby Structures: N/A	Weather 1: Enter wind speed in m/s
Structure Detail: * Turbine number, substation name, etc.	Distance from Structure * Enter in FEET, convert from meters if necessary.	GPS Latitude; GPS Longitude	Weather 2: Specify if degrees C or degrees F.
Nearest Structure: WTG	Direction from Structure: NORTH	Ground Cover: GRAVEL	Weather 3: SUNNY

CONDITION DESCRIPTION

Species Name: Bird, Unidentified	Carcass Condition 1 (Overall): COMPLETE CARCA	Carcass Condition 3 (Scavenging): COMPLETE CARCASS	Band Present: NO
Sex of Animal: UNKNOWN	Carcass Condition 2 (Injuries): ☑ NO OBVIOUS INJURIES ☐ BROKEN BONE(S) ☐ DECAPITATED ☐ ELECTRICAL BURNS ☐ LACERATION — Check all that apply	Carcass Condition 4 (Infestation): NONE OBSERVED	Status of Discovery: LEFT IN FIELD
Age of Animal: UNKNOWN		Time Since Death or Injury: LESS THAN A DAY	Electrical Event: NO; Is photo attached? NO

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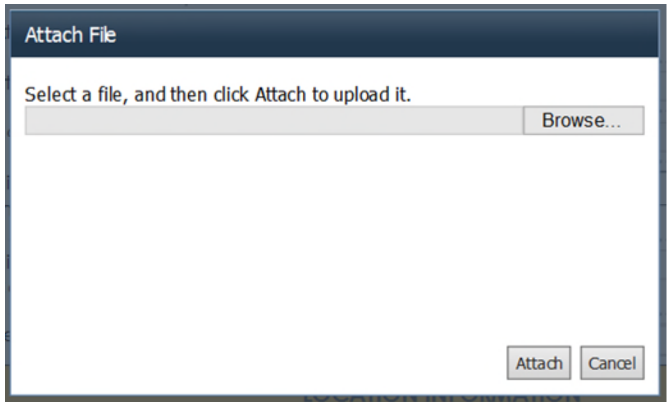
WILDLIFE INCIDENT REPORTING FORM

REPORT INFORMATION

Attach Photo:	System will accept multiple photos, but must be added individually



Site:	Drag down to specific site
Date of Discovery:	Defaults to entry date, but allows options
Discovered by Employee:	Enter SLID (Search by name)
Discovered by Contractor:	Manual entry field
Report Type:	Death, Injury, Nest, Other

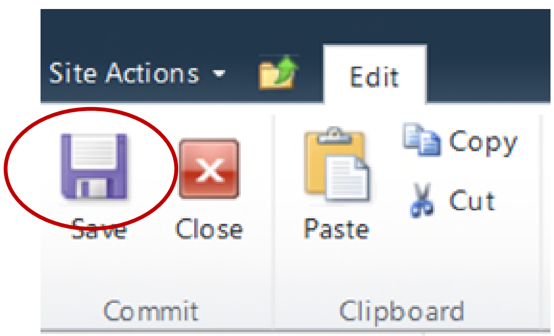
LOCATION INFORMATION

Discovery Activity:	IOW, Maintenance, Driving, Other
Structure Detail*:	Manual entry field, should include Turbine Number, substation name, etc.
Nearest Structure:	WTG, Substation, O&M, T-Line, Other
Equipment Operational:	Yes, No, N/A
Distance From Structure*:	Manual entry field (enter in feet)
Direction From Structure:	North, South, East, West, NE, SE, NW, SW
Other Nearby Structures:	N/A, Overhead Line, Fence, Road, Other
GPS Lattitude:	Manual entry field
GPS Longitude:	Manual entry field
Ground Cover:	Gravel, WTG Pad, PMT Pad, Grass/Dirt, Other
Weather 1:	Manual entry field, Windspeed in m/s (numeric only)
Weather 2:	Manual entry field, Temperature in numeric (F or C)
Weather 3:	Sunny, Clear, Foggy, Rainy, Overcast, Snowing

CONDITION DESCRIPTION

Species name:	Defaults to “Bird, Unidentifed”. Drag down options
Sex of Animal:	Unknown, Female, Male
Age of Animal:	Unknown, Adult, Juvenile
Carcass Condition 1:	Complete Carcass, Dismembered, Feathers Only, Bones Only, Feathers/Bones
Carcass Condition 2:	No Obvious Injuries; Broken Bone(s), Decapitated, Electrical Burns, Laceration
Carcass Condition 3:	Complete Carcass, Scavenged, N/A (injury)
Carcass Condition 4:	None Observed, Flies, Maggots, Ants, Beetles, Other
Time Since Death:	< Day, < Week, < Month, > Month
Band Present:	No, Yes, N/A
Status of Discovery:	Left in Field, Bagged & Tagged, USFWS, State FWS, Other
Electrical Event:	No, Yes
Photo Attached:	No, Yes

After completing the form, select the “save” option in the upper left corner of the screen.



2.3 EXTERNAL & INTERNAL NOTIFICATIONS

All wildlife discoveries at NextEra Energy wind sites must be reported internally via the WRRS Incident Report. Once the report is saved, Environmental Services – PGD Support receives an e-mail notification of the new entry. A review of the entry and information is completed, and changes made at the time. This may include corrected species identification information.

In some cases, notification to Federal or State agencies may be required, if a discovery of an injured or dead Eagle, or protected species is made.

Check with your operations leader to determine the process for landowner or rancher notifications if livestock carcasses are discovered. Livestock notifications should be made to ensure removal of carcasses of cattle or sheep. If an injured sheep or cow is found, a courtesy notification should be made as well.

GENERAL PROCEDURE

Due to the sensitivity of eagle and federally endangered species fatalities or injuries, it is very important these fatalities or incidents are recorded and reported immediately to the appropriate persons. Discussions and notifications with appropriate persons are critical to determine species, facts and potential risks (legal, operational, media).

1. The operations leader shall receive all pertinent information regarding incident, e.g., discovery of event, banding information, location, contact person, condition of find, photographs, etc.
2. Once the information is collected, the operations leader should immediately report to Environmental Services - PGD Support and enter into the information into the WRRS database. In addition, the operations leader should notify the Regional / General Operations Managers, and VP of Wind operations.
3. The operations leader should contact Environmental Services – PGD Support for guidance on making notifications, including a determination of what agencies to notify. After this discussion, notifications should be made by the operations leader by phone or e-mail, whichever is deemed appropriate. The operations leader should document the date & time of the call, as well the name of the person receiving the report.
4. Environmental Services shall forward incident details via e-mail to the Division's Regional Business Manager, legal counsel, and corporate communications personnel. If necessary, Environmental Services – PGD Support will conference with the appropriate parties to discuss potential implications.

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3.0 THREATENED & ENDANGERED SPECIES

All wind site personnel should have basic knowledge of the Federal and/or State-specific species that may be protected as a Threatened or Endangered species at their site. In many cases, discovery of an injured or dead animal will require notifications.

3.1 FEDERAL SPECIES

The United States Fish & Wildlife Service (USFWS) has compiled a list of animal species native to North America that are considered to be threatened or endangered.

The following definitions are included to illustrate the terms commonly used by the USFWS.

The "**endangered**" classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

The term "**threatened species**" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, as defined in the Endangered Species Act.

"**Species of concern**" is an informal term that refers to those species which might be in need of concentrated conservation actions. Such conservation actions vary depending on the health of the populations and degree and types of threats. Species of concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species

Plants and animals that have been studied and the Service has concluded that they should be proposed for addition to the Federal endangered and threatened species list are referred to as **candidate species,** and once they receive this designation are treated and reported as special status species until a final determination is made by the USFWS.

3.2 STATE SPECIES

In addition to the Federal Threatened & Endangered Species list, each state's wildlife agency has developed a similar list that is specific to the individual state.

Federal & State Threatened & Endangered Species lists, as well as species profile sheets have been archived on the Wind Operations/Environmental Tactical Team SharePoint page: 6.0 Natural Resources/T and E Species

These lists will be periodically uploaded by NEER, but the status of species can be updated yearly by agencies. Please confirm you are referencing a recent list. If you have any questions about the status of an animal, please contact Environmental Services – PGD Support.

4.0 ANNUAL TRAINING

Annual Wildlife Response & Reporting System (WRRS) training should be done at the site and consist of the following subjects:

- Location and content of the WRRS Manual
- WRRS Inspections (Inspection of Watch)
- Incident Reporting (SharePoint)
- Species Identification tools
- Federal & State Threatened & Endangered Species
- Internal / External Notification Procedures (including contact for general questions)

The corporate Learning Management System (LMS) has a training module for the WRRS program (REG-1206A). This training is required for all new employees, and is generally completed during the onboarding process.

In addition to the LMS course, Environmental Services has prepared a PowerPoint module and training roster for use at wind sites for a more detailed presentation. This presentation and roster can be found on the Wind Operations/Environmental Tactical Team SharePoint page: Natural Resources/WRRS Program

This manual includes a roster to be signed by participants during annual training at wind sites. The completed form should be filed in Section 6.2.6 of the EMS filing system. It is recommended that the operations leader create a reminder in the Environmental Compliance Tracker to trigger annual training.

In addition to the annual training, a review of the manual should be completed by each site once a year to ensure that contact information is complete and accurate.

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Site: ______________________________

Facilitator: ______________________________

Date: ______________________

Course:
- ☐ Spill Prevention, Control & Countermeasures (7.1.6)
- ☐ Universal Waste & Emergency Response (8.3.6)
- ☐ Wildlife Response & Recording System (6.2.6)

EMPLOYEE	SLID	SIGNATURE
File Completed Training Roster in EMS filing system		

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5.0 APPENDICES

This section of the plan is reserved for any other wildlife related documentation appropriate to the site. This may include the following documents:

- Pre-construction wildlife reports
- Site Operating Permit
- Environmental Impact Reports/Assessments (EIR/EIA)
- Avian / Bat Protection Plans (APBB, APP)
- Bird / Bat Conservation Strategies (BBCS)
- Adaptive Management Plans
- Post-Construction Mortality Monitoring reports (annual and final reports)
- Whooping Crane Curtailment Procedure (if applicable)
- Site specific agency agreements or legal agreements
- Other site-specific wildlife information

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DODGE COUNTYWIND ENERGY CENTER

WILDLIFE PROGRAM CONTACTS

PGD WIND OPERATIONS

Primary site contact, ***To be determined*** Associate Wind Site Manager	Office: Cell:	
Backup site contact, Title	Office: Cell:	

ENVIRONMENTAL SERVICES – PGD SUPPORT

Kortney Koch Environmental Specialist	Cell:	(904) 236-8939

ENVIRONMENTAL SERVICES - WILDLIFE

Sean Fitzgerald Project Manager, Wildlife	Office: Cell:	(561) 691-3274 (586) 255-0513
Janine Crane, Project Manager, Wildlife	Office: Cell:	(561) 691-2818 (561) 329-0914

INJURED BIRD or BAT RESPONSE

Vulture Conservancy PO Box 313, Kasson, MN 55944	Office:	(507) 271-6099
Windmill Animal Rescue & Wildlife Rehabilitation 350 Main St., Elko New Market, MN 55054	Office:	(952) 461-2765

REGULATORY AGENCIES *(Contact Environmental Services before calling)*

US Fish and Wildlife Service: Mags Rheude (Eagles); Dawn Marsh (ESA species) US Fish and Wildlife Service Law Enforcement – St. Paul Station	(612) 713-5438; (952) 252-0092 ext. 202 Contact: (651) 778-8360
Minnesota Department of Natural Resources: Cynthia Warzecha	Office: (651) 259-5078