Appendix H – Draft Avian and Bat Protection Plan

Avian and Bat Protection Plan
Freeborn Wind Farm
Freeborn County, Minnesota and Worth County, Iowa

Draft Report

Prepared for

Freeborn Wind Energy LLC

One South Wacker Dr, Ste 1800
Chicago, IL 60606

Prepared by:

Western EcoSystems Technology, Inc.

1710 Douglas Drive, Suite 283
Golden Valley, Minnesota 55422

May 10, 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Freeborn Wind Energy LLC (Freeborn) is proposing to develop, construct and operate the 200-megawatt (MW) Freeborn Wind Farm (Project) in Freeborn County, Minnesota and Worth County, Iowa (Figure 1.1). The Project area is approximately 19,127 hectares (ha; 47,263 acres [ac]). The proposed Project consists of several components, including up to 100 Vestas V116 and V110 2.0-MW wind turbines, access roads, transmission and communication equipment, storage areas, and control facilities. Construction of the Project is scheduled to begin in 2020.

Environmental surveys of the Project area commenced in December 2014. An area larger than the final Project area was studied to give the developer the flexibility to site the Project facilities away from high value environmental areas. The total area studied (Study area) is 38,602 ha (95,387 ac) (Figure 1.2). The first round of studies was conducted in Freeborn County, Minnesota from December 2014 - March 2016 (first year study area). Due to interest in expanding the Project area to the east and south, studies were continued in an expanded area from October 2016 - September 2017 (second year study area) (Figure 1.3).

1.1 Background

The Project is being developed under a purchase and sale agreement. Freeborn, a subsidiary of Invenergy LLC is the Project developer and will turn the project over to Northern States Power Company – Minnesota, dba Xcel Energy (NSPM) to construct and operate the Project.

Freeborn completed Tier 1, 2, and 3 wildlife studies consistent with the 2012 Land-Based Wind Energy Guidelines (WEG; U.S. Fish and Wildlife Service [USFWS] 2012), which correspond to stages 1 and 2 of the 2013 Eagle Conservation Plan Guidance (ECPG; USFWS 2013), and the Minnesota Department of Natural Resources (MNDNR) Guidance for Commercial Wind Energy Projects (MNDNR Guidance, MNDNR 2011) and MNDNR Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota (MNDNR Protocols, Mixon et al. 2014). Freeborn will conduct Tier 4 WEG studies (corresponding to stage 5 of the ECPG, the MNDNR Guidance, and the MNDNR Protocols) in the Project area once the Project is operational.

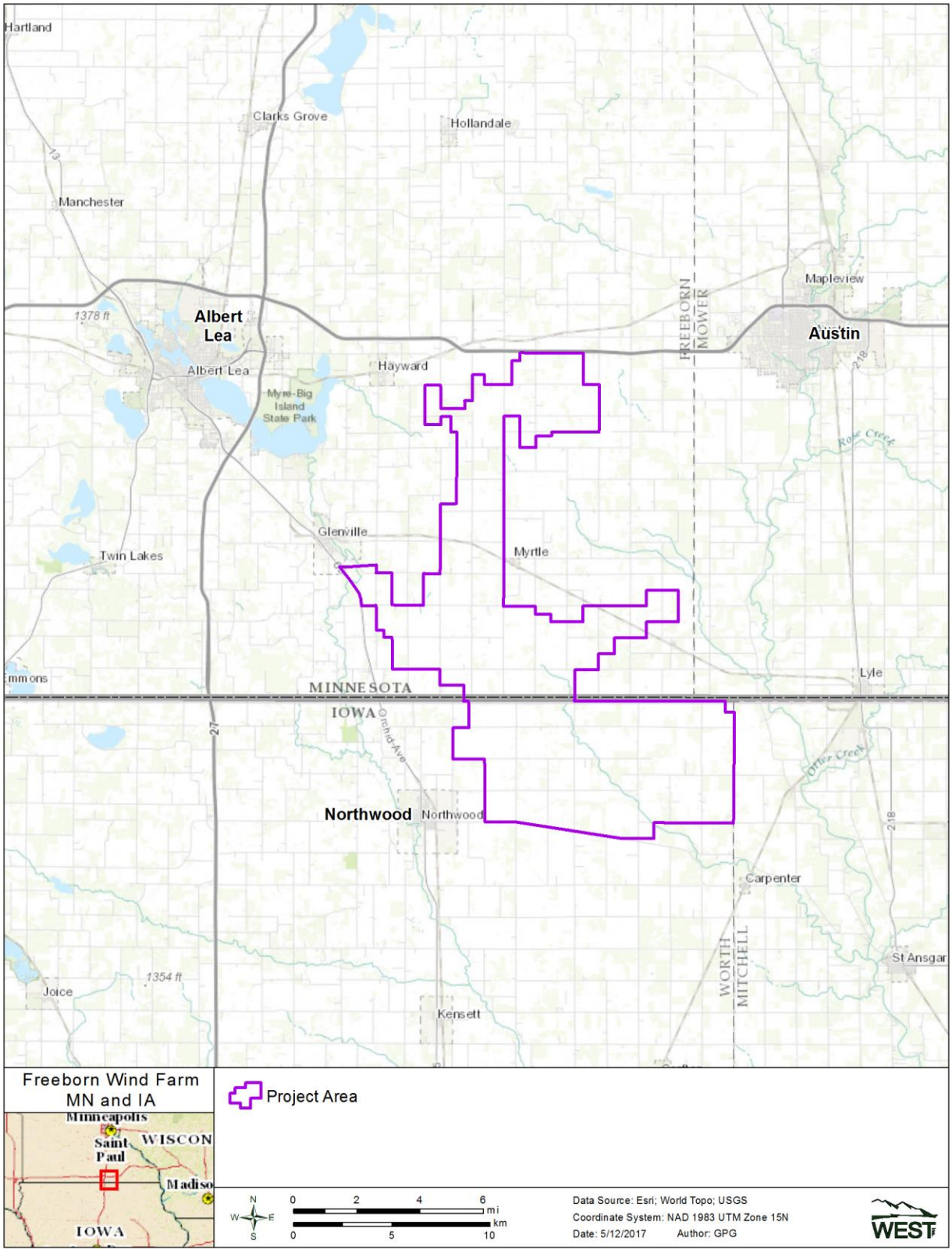

Figure 1.1 Freeborn Wind Farm Project area in Freeborn County, Minnesota and Worth County, Iowa.

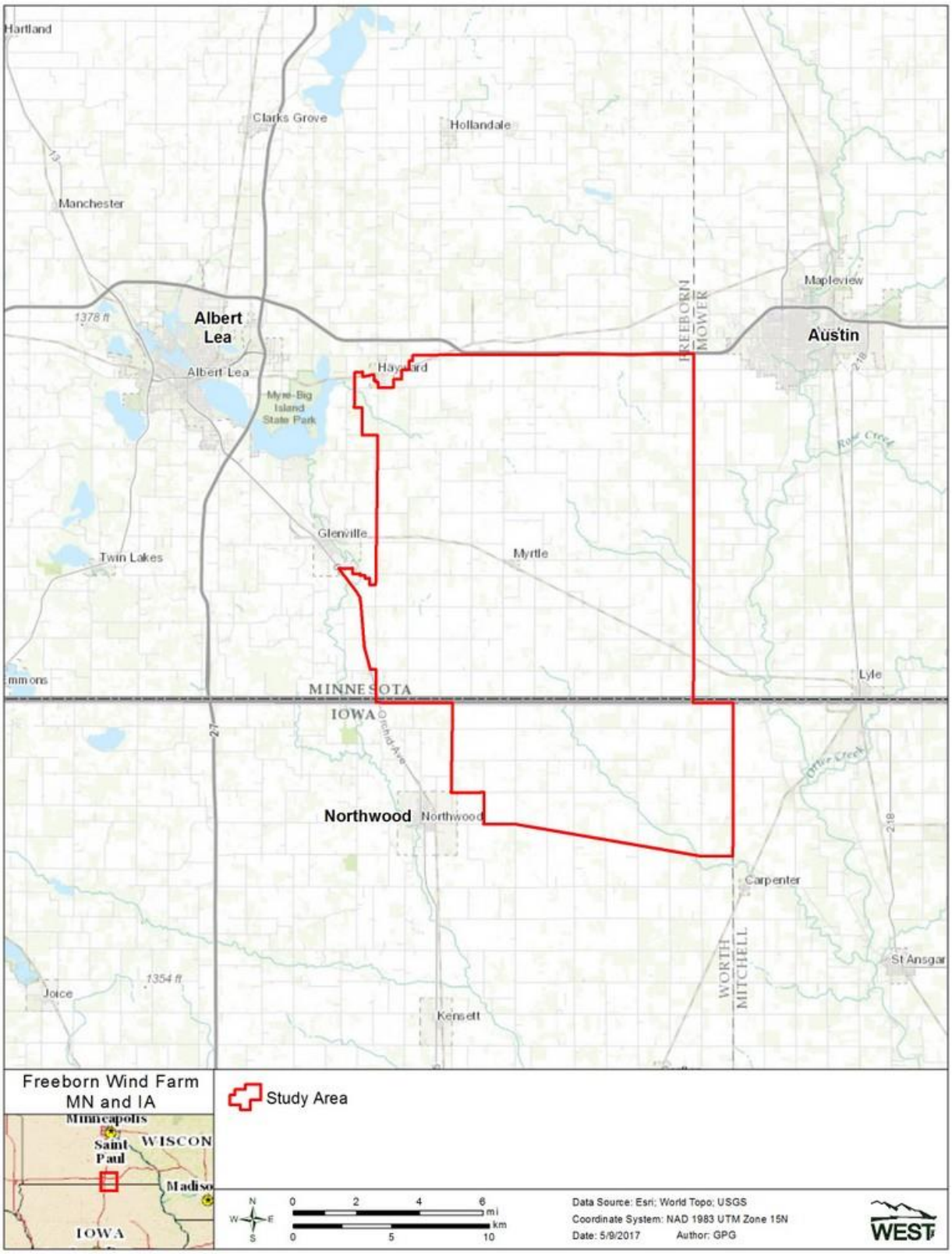

Figure 1.2 Freeborn Wind Farm Study area in Freeborn County, Minnesota and Worth County, Iowa.

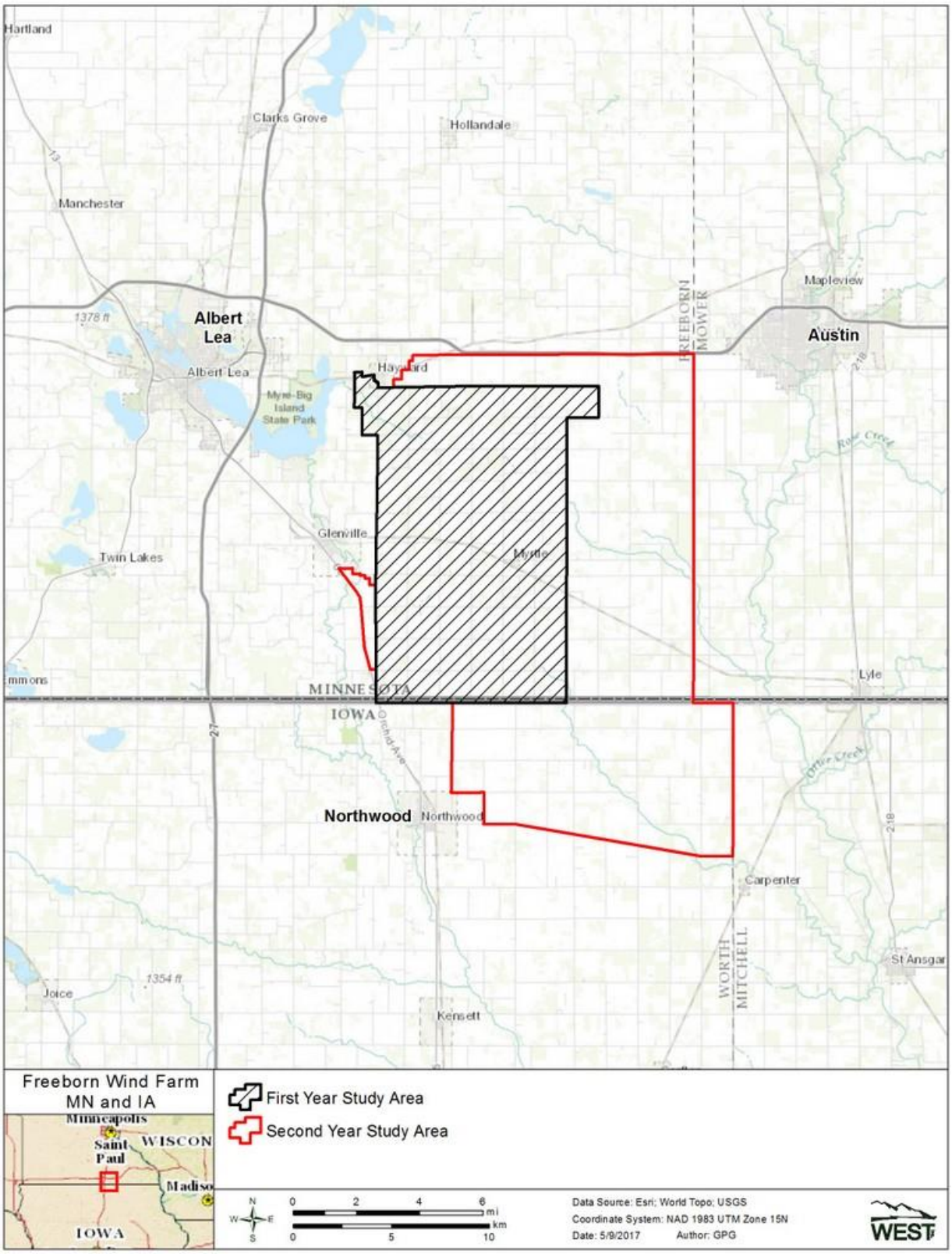

Figure 1.3 Freeborn Wind Farm first year study area and second year study area in Freeborn County, Minnesota and Worth County, Iowa.

1.2 Purpose and Objectives

The objectives of the Freeborn ABPP are as follows:

1) Document the results of the Project's habitat evaluation and wildlife surveys and its progression through the WEG assessments, ECPG assessments, and agency consultation.
2) Identify measures that, when implemented during construction, operation, maintenance, and decommissioning of the Project, will avoid and minimize potential impacts to birds and bats.
3) Describe post-construction monitoring and adaptive management procedures.

This ABPP is a living document that will evolve throughout the life of the Project as needed in response to changing conditions. The document is also labeled as a draft because once all pre-construction wildlife surveys are completed in fall 2017, it will be updated with survey results.

1.3 Project Facilities

The 200-MW Project will consist of up to 100 Vestas V116 and V110 wind turbines and associated facilities. The wind turbine generators will be supported by 80-meter (m; 262-foot [ft]), three-section tubular towers with 110-m-diamater (361-ft-diameter) or 116-m–diameter (381-ft-diameter) rotors. Support facilities will include step-up transformers, underground communication cables and 34.5-kilovolt (kV) electric power collection lines, permanent meteorological (met) towers, a 11- to 14.5- kilometer (km; 7- to 9.0- mile [mi]) 161 kV overhead transmission line, a 34.5/161-kV substation, a switchyard, an operations and maintenance (O&M) building, and other ancillary facilities or structures.

1.4 Regulatory Framework

1.4.1 Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 (16 U.S. Code [U.S.C.] §§ 1531 *et seq*.) provides for the listing, conservation, and recovery of endangered and threatened species. The USFWS implements the ESA to conserve terrestrial species and resident fish species. Section 9 of the ESA prohibits the unauthorized take of listed species. Under the ESA, "take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" a listed species (ESA § 3(19), 16 U.S.C 1532(19)). The term "harm" has been further defined in agency regulations to mean habitat modification that actually kills or injures a federally listed species.

Northern long-eared bat (*Myotis septentrionalis*) is the only ESA-listed species reported by the USFWS as potentially occurring in the Study area (USFWS 2015b). The final 4(d) rule published

January 14, 2016 (81 FR 1900)[1], exempts all incidental take of northern long-eared bats from otherwise lawful activities, including operation of wind turbines, from take prohibitions under Section 9 of the ESA.

1.4.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§ 703-711) prohibits the take of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. Under the MBTA, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 Code of Federal Regulations [CFR] § 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR § 10.13. This list includes over 1,000 species of migratory birds including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. At present, there is no MBTA permit authorizing the incidental or non-purposeful take of an MBTA-protected species.

1.4.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. §§ 668-668d) prohibits the take of bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles unless authorized by a permit. Under the BGEPA, take is defined as "…to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb" (50 CFR § 22.3). The term "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (50 CFR § 22.3).

BGEPA authorizes the Secretary of the Interior to permit the take of bald or golden eagles for several defined purposes, including when "necessary to permit the taking of such eagles for the protection of wildlife […] or other interests in any particular locality." Based on this authority, the USFWS published a final rule (Eagle Permit Rule) on September 11, 2009 (50 CFR § 22.26), authorizing permits for the take of bald eagles and golden eagles where take: (1) is compatible with the preservation of the bald and golden eagle; (2) is associated with and not the purpose of an otherwise lawful activity; and (3) cannot practicably be avoided.

[1] The final 4(d) rule published January 14, 2016 (81 FR 1900), exempts all incidental take of northern long-eared bats from otherwise lawful activities from take prohibitions under Section 9 of the ESA, except: take of northern long-eared bats in their hibernacula in areas affected by white-nose syndrome, take resulting from tree removal within 0.4 km (0.25 mi) of a known northern long-eared bat hibernaculum, and take resulting from removal of a known northern long-eared bat maternity roost tree or tree removal within a 45-meter [m] (150-foot [ft]) radius of a known northern long-eared bat maternity roost tree during the pup season (from June 1–July 31). Incidental take resulting from hazard tree removal for protection of human life and property is exempt from take prohibitions, regardless of where and when it occurs.

On May 2, 2013, the USFWS published the ECPG to assist wind energy developers in avoiding, minimizing, and mitigating risks to eagles during the construction and operation of a wind energy facility. The ECPG interpreted and clarified the permit requirements in the regulations at 50 CFR 22.26 and 22.27, but it did not impose any binding requirements beyond those specified in the regulations.

Effective January 17, 2017, the 2009 Eagle Rule was replaced by a new rule governing eagle take permits (81 FR 91495 [December 16, 2016]). The new rule adjusted the standards, maximum duration, and requirements for eagle take permits.

1.4.4 MNDNR Guidance for Commercial Wind Energy Projects and MNDNR Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota

The MNDNR Guidance (MNDNR 2011) complements the WEG and provides recommendations specific to Minnesota species and habitats, and considers existing processes used in Minnesota. The MNDNR Guidance provides recommendations for identification of high value resources and descriptions of various pre- and post-construction wildlife survey protocols that may be recommended by the MNDNR for wind energy projects. In addition, the MNDNR Protocols (Mixon et al. 2014) provide technical guidance for recommended wildlife survey protocols and is intended to be used in conjunction with the WEG and the MNDNR Guidance.

1.5 Agency Consultation

Freeborn coordinated with the USFWS and state agencies as part of the Project planning and development process. Freeborn submitted a Natural Heritage Information System (NHIS) data request to the MNDNR on February 17, 2015, for information on state- and federally listed species and sensitive natural resources within the first year study area. The MNDNR responded to the NHIS request in a letter dated March 26, 2015. The MNDNR's March 26, 2015, response stated that there are no NHIS records for bats in the vicinity of the first year study area, but all seven of Minnesota's bat species can be found throughout the state. No other NHIS records of rare species or significant natural features were noted in the vicinity of the first year study area. This information was incorporated into the Freeborn Site Characterization Study (SCS; Simon and Mattson 2016a), developed in accordance with Tier 1 and Tier 2 of the WEG (USFWS 2012), for the first year study area (Section 2).

On March 3, 2015, Freeborn met with the USFWS Twin Cities Field Office, the MNDNR, and the Minnesota Department of Commerce (DOC) to discuss the findings of the SCS and avian and bat survey protocols for the first year study area. Regarding bats, the USFWS noted there are no documented occurrences of the northern long-eared bat in Freeborn County, but the Project is located within 80 km (50 mi) of several large caves in Iowa; the USFWS did not provide information on northern long-eared bat presence in these caves. The MNDNR suggested spreading out the acoustic detectors (Freeborn proposed using four acoustic detectors on two met towers) to improve the characterization of bat activity within the first year study area. Freeborn responded to this suggestion by adding four additional ground-based acoustic detectors throughout the first year study area (Section 3.2.1).

In the March 3, 2015, meeting, the USFWS also noted eagle surveys had not been conducted by USFWS or MNDNR in Minnesota since 2005 due to increasing bald eagle populations in the state. USFWS noted that there were historic bald eagle nest sites located on the north side of Albert Lea Lake, one historic bald eagle nest was located across the state border in Iowa, and an unknown number of historic bald eagle nests occurred in the vicinity of the Minnesota and Cedar rivers, with bald eagle spring migration activity along the border between Minnesota and Iowa. The DOC added that there is frequent bald eagle movement along the Shell Rock River. The USFWS stated no known bald eagle carcasses had been found at wind energy facilities in Minnesota to date, but the agency would be concerned about turbine placement in areas that may interfere with bald eagle activity (e.g., between a nest and an active foraging area).

The USFWS also mentioned that there are waterfowl production areas near the Study area along the Shell Rock River. However, in a March 18, 2015, follow-up letter, the MNDNR did not recommend specific wetland or grassland bird surveys based on the size and isolated nature of wetland and grassland habitats within the first year study area, but noted such surveys could provide background avian use data to supplement the avian point counts and eagle surveys that Freeborn was conducting. Freeborn complied with the MNDNR's suggestion and conducted wetland bird surveys. Lastly, the MNDNR recommended Freeborn develop several alternative turbine locations to provide an opportunity to avoid or minimize potential impacts to natural resources and to work around potential issues that may arise during Project development. Freeborn studied a much larger area so that it would have the opportunity to responsibly site its turbines. Turbines have not been sited in the high value environmental areas identified by MNDNR throughout development.

Freeborn contacted the Minnesota and Iowa Natural Resources Conservation Service districts and the Freeborn Soil and Wetland Conservation District (SWCD) manager responded on April 13, 2015, suggesting that wetlands and conservation areas and construction impacts that may cause erosion should be avoided. Freeborn is avoiding conservation areas and wetlands to the greatest extent practicable, and will use responsible construction practices to avoid erosion impacts.

In coordination with the USFWS and the MNDNR, Freeborn developed the Tier 3 study protocols described in Section 2.6.3. These study protocols were discussed in detail with the MNDNR and DOC on May 12, 2015. The agencies approved of the protocols and discussed avoidance strategies for native prairie habitat.

On January 13, 2016, Freeborn met with MNDNR, DOC, and USFWS in Minnesota to share results from the first year of pre-construction studies. On May 5, 2016, Freeborn met with USFWS in Minnesota to specifically share its eagle use and raptor nest survey results and to discuss eagle conservation strategies. The USFWS recommended setbacks of 1.6 km (1 mi) from Albert Lea Lake and 0.8 km (0.5 mi; no more than four turbines) and 1.6 km (1 mi; all remaining turbines) from the Shell Rock River. Freeborn complied with these setbacks. Additionally, post-construction monitoring was discussed at the May 5, 2016, meeting including standardized carcass monitoring

to include plot searches at 30% of turbines, and operational staff monitoring training. The Project's post-construction monitoring program (Section 5) was designed in accordance with the MNDNR Protocols (Mixon et al. 2014).

Freeborn submitted a second NHIS data request to the MNDNR and an Environmental Review for Natural Resources request to the Iowa Department of Natural Resources (Iowa DNR) on December 14, 2016, for information on federally and state-listed species and sensitive natural resources within the second year study area. The MNDNR provided an NHIS report for the second year study area on January 18, 2017. The NHIS report documented one colonial waterbird nesting area, at Helmer Myre State Park, but no other sensitive bird or bat resources were identified within the second year study area or a 1.6-km (1.0-mi) buffer.

The Iowa DNR responded in a letter dated January 9, 2017, recommending setbacks from several natural resource areas within the second year study area. Freeborn complied by siting facilities away from the Deer Creek Wildlife Area and Deer Creek Forest. The Iowa DNR stated that it did not identify any site-specific records of rare species or significant natural communities. The Iowa DNR recommended setting back from forested riparian corridors to protect bat species. Freeborn applied 305-m (1,000-ft) setbacks from suitable bat foraging habitat. The Iowa DNR recommended a turbine setback from bald eagle nests, should any be found to exist within the second year study area. No bald eagle nests were found in the second year study area during the raptor nest survey in April 2017 (Section 3.1.1). The Iowa DNR also provided recommendations for post-construction monitoring at the Project. These recommendations were incorporated in the Project's turbine siting (Section 4.1.1), adaptive management (Section 6), and post-construction monitoring (Section 5.4). No Iowa Natural Areas Inventory records of rare species or significant natural communities were identified for the second year study area.

In January 2017, Freeborn contacted the USFWS Wetlands Management District managers in Minnesota and Iowa to determine whether there are any USFWS conservation easements within the Study area. Both the Minnesota and Iowa representatives responded that there were no easements within the Study area.

Freeborn met with the MNDNR on January 24, 2017, to review the wildlife and natural resources studies conducted to date and the ongoing and proposed surveys for the second year study area. Freeborn also invited USFWS to attend the meeting, but they were unavailable to participate. Freeborn proposed conducting the following pre-construction surveys in the second year study area: the SCS, the native prairie evaluation, the water resources evaluation, the large-bird use study, the small-bird use study, the wetland bird use study, and the raptor nest study, and the MNDNR approved of the protocols.

MNDNR and Freeborn also discussed whether additional bat acoustic surveys would be useful to understanding bat activity in the Study area given that the bat detectors in the first year of surveys were so spatially distributed on the landscape. Freeborn had two additional calls with the MNDNR on February 28, 2017 and April 11, 2017, to further discuss whether to conduct a 2017 bat acoustic survey. Based on the studies conducted in the first year study area, and turbine siting

avoidance measures for potential bat habitat (Section 4.1.1), the MNDNR agreed no additional bat surveys were needed in the second year study area.

On January 25, 2017, Freeborn shared baseline reports from the first year study area with the MNDNR and DOC, including: the SCS, the avian use report, the bat acoustic report, the native prairie report, the water resources report, the 2015 raptor nest report, and the 2016 raptor nest report.

The MNDNR followed up from the January 24, 2017, meeting in a letter dated February 21, 2017. The MNDNR identified two areas within the second year study area that have a higher potential for bird and bat use and recommended that turbines be sited outside of these "Avoidance Areas." Freeborn complied with this setback and did not site turbines in those areas.

On February 17, 2017, Freeborn met with the USFWS Rock Island Field Office to discuss the Iowa portion that was added to the second year study area. Freeborn shared the results of wildlife studies within the Study area to date and discussed its plan for ongoing surveys in 2017. The USFWS approved of the ongoing study protocols.

On March 31, 2017, Freeborn wrote a letter to the USFWS, MNDNR, and DOC to share a final Project area and request feedback on the Project. No feedback was received by May 2017. Through development, construction, and operation, Freeborn will continue to coordinate with the USFWS, the MNDNR and the Iowa DNR, as appropriate.

2 TIER 1 AND TIER 2 – SITE CHARACTERIZATION

2.1 Land Cover Types and Habitat within the Study Area

The Project is located within the Western Corn Belt Plains Ecoregion, which encompasses southern Minnesota and consists of glaciated till plains and undulating loess plains that were historically dominated by tallgrass prairie, oak-prairie savannas, and woody/herbaceous wetlands (Auch 2014). The ecoregion has since been cleared for farms producing corn (*Zea mays*), soybeans (*Glycine max*), and livestock (Auch 2014). Many smaller streams in the Study area have been tilled, ditched, and connected to existing drainage systems resulting in a loss of aquatic habitat in this ecoregion (Auch 2014).

Crop cultivation is the dominant land cover type (90%) within the Study area (Table 2.1 and Figure 2.1, NLCD 2011, Homer et al. 2015). Developed open space (associated with livestock production and homesteads) is the second most common land cover type (5%). Herbaceous and deciduous forest land cover types are the third and fourth most common and comprise approximately 2% and 1% of the Study area respectively. Other land cover types each compose less than 1% of the Study area (Simon and Mattson 2016a, Simon et al. 2017a).

Table 2.1 National Land Cover Database land cover types within the Freeborn Wind Farm.

Habitat	Hectares	Acres[a]	% Composition
First Year Study Area			
Cultivated Crops	14,701	36,328	91
Developed, Open Space	850	2,100	5
Herbaceous[b]	162	400	1
Hay/Pasture[b]	133	329	1
Deciduous Forest[b]	131	324	1
Developed, Low Intensity	56	139	<1
Emergent Herbaceous Wetlands[b]	40	99	<1
Developed, Medium Intensity	22	53	<1
Woody Wetlands[b]	8	20	<1
Open Water[b]	6	16	<1
Barren Land[c]	5	13	<1
Evergreen Forest[b]	3	7	<1
Developed, High Intensity	2	5	<1
Mixed Forest[b]	0	0	0
Shrub/Scrub[b]	0	0	0
First Year Study Area Total	**16,120**	**39,834**	**100**
Second Year Study Area			
Cultivated Crops	20,176	49,855	90
Developed, Open Space	1,230	3,041	6
Herbaceous[b]	431	1,066	2
Deciduous Forest[b]	227	561	1
Hay/Pasture[b]	142	352	<1
Developed, Low Intensity	100	248	<1
Emergent Herbaceous Wetlands[b]	86	212	<1
Woody Wetlands[b]	46	113	<1
Developed, Medium Intensity	28	70	<1
Open Water[b]	8	20	<1
Evergreen Forest[b]	3	6	<1
Developed, High Intensity	2	6	<1
Barren Land[c]	1	3	<1
Mixed Forest[b]	0	0	0
Shrub/Scrub[b]	0	0	0
Second Year Study Area Total	**22,482**	**55,553**	**100**
Study Area			
Cultivated Crops	34,877	86,183	90
Developed, Open Space	2,080	5,141	5
Herbaceous[b]	593	1,466	2
Hay/Pasture[b]	275	681	1
Deciduous Forest[b]	358	885	1
Developed, Low Intensity	156	387	<1
Emergent Herbaceous Wetlands[b]	126	311	<1
Developed, Medium Intensity	50	123	<1
Woody Wetlands[b]	54	133	<1
Open Water[b]	14	36	<1
Barren Land[c]	6	16	<1
Evergreen Forest[b]	6	13	<1
Developed, High Intensity	4	11	<1
Mixed Forest[b]	0	0	0
Shrub/Scrub[b]	0	0	0
Study Area Total	**38,602**	**95,387**	**-**

Table 2.1 National Land Cover Database land cover types within the Freeborn Wind Farm.

Habitat	Hectares	Acres[a]	% Composition

[a] These land cover data are from the U.S. Geological Survey 2011 National Land Cover Database (NLCD 2011, Homer et al. 2015) for the Study area; shapefiles dated April 8, 2015. Sum of values may not add to total value shown, due to rounding.
[b] Land cover types constituting native wildlife habitat (untilled and undeveloped).
[c] Barren land likely represents strip mines, gravel pits, and/or other accumulations of earthen material.

Desktop evaluations and partial ground-truthing field evaluations were conducted for the first year study area and the second year study area (together comprising the Study area) to confirm or correct the presence or absence of landscape features to the extent possible by viewing from public roads and other accessible areas. Native prairie and water resources within the first year study area and the second year study area were evaluated using these two methods.

2.1.1 Native Prairie Evaluation

The combined desktop evaluation and partial ground-truthing of potential native prairie estimated 85 ha (211 ac) of grasslands (herbaceous and hay/pasture) within the first year study area had been previously tilled (i.e., would not be considered native prairie per the MNDNR's definition). The MNDNR identified a very small (0.1 ha [0.2 ac]) native prairie plant community along a railroad verge at the southwest corner of the first year study area. In addition, two un-grazed prairies (in the northwest and northeast parts of the first year study area) had some floristic qualities associated with native prairie habitat and did not appear to be previously tilled. Railroad verge and other areas that could not be accessed by public lands within the first year study area also may support native prairie (Simon and Mattson 2016e).

The combined desktop evaluation and partial ground-truthing of potential native prairie estimated 145 ha (359 ac) of grasslands within the second year study area had been previously tilled. Conversely, an estimated 476 ha (1,176 ac) of grasslands within the second year study area may not have been previously tilled and could potentially contain remnant prairie plant communities (per the MNDNR's definition). The MNDNR identified two native prairie plant communities (2 ha [5ac] total) along the railroad verge on the western section of the second year study area (Simon et al. 2017b). The native prairie evaluation will be updated to cover any previously unevaluated areas and areas potentially harboring native prairie once the Project layout has been finalized. If construction will occur in areas that have floristic qualities of native prairie, land access will be coordinated for a focused evaluation prior to the start of construction in those areas. Any areas confirmed as native prairie during the evaluation will be avoided by construction activities.

2.1.2 Water Resource Evaluation

The combined desktop evaluation and partial ground-truthing of water resources estimated approximately 89 ha (220 ac) of the first year study area is comprised of wetlands. Wetland types documented within the first year study area included freshwater emergent wetlands (61 ha [150 ac]), emergent herbaceous wetlands), freshwater forested/shrub wetlands (20 ha [49 ac], woody wetlands), and freshwater ponds (9 ha [21 ac], open water).

These wetlands were found to be primarily situated as fringe wetlands along the riparian corridors of waterbodies (i.e., Peter Lund Creek, Deer Creek, and Mud Lake Creek) within the first year

study area. The ponds were primarily documented in the southwest and northwest corners of the first year study area, with the ponds in the southwest corner having substantial open water components. A few streams and several smaller drainage areas (open water) were confirmed within the first year study area, including Woodbury Creek in the northeast, Mud Lake Creek in the east, Deer Creek and tributaries in the south, Peter Lund Creek in the northwest, and other tributaries of the Shell Rock River in the west (Figure 2.2). Of these streams, Peter Lund Creek appeared to be the largest (Simon and Mattson 2016f).

The combined desktop evaluation and partial ground-truthing of water resources estimated approximately 290 ha (718 ac) of the second year study area is comprised of wetlands. Wetland types documented within the second year study area included freshwater emergent/shrub/forested wetlands (132 ha [326 ac], emergent herbaceous wetlands and woody wetlands), freshwater emergent wetlands (95 ha [235 ac]), freshwater emergent/shrub wetlands (27 ha [67 ac], emergent herbaceous wetlands and woody wetlands), freshwater emergent/forested wetlands (27 ha [67 ac], emergent herbaceous wetlands and woody wetlands), freshwater open water/emergent wetlands (8 ha [19 ac], emergent herbaceous wetlands and open water), freshwater ponds (1 ha [3 ac]), and freshwater shrub wetlands (1 ha [3 ac], woody wetlands).

Most of these wetlands were found to be located along the riparian corridors of waterbodies (i.e., Shell Rock River, Mud Lake Creek, Woodbury Creek, and Orchard Creek) within the second year study area. In particular, a large wetland complex (emergent/shrub/forested wetland) was documented along Mud Lake Creek in the northern section of the second year study area. The portion of this wetland complex located west of 890th Avenue and north of 145th Street has been designated as a Site of Biodiversity Significance (low quality) by the MNDNR (MNDNR 2015a). There also are large wetland areas along the Shell Rock River in the western section of the second year study area. Two ponds were documented in the western section of the second year study area and a few open water areas were located within some of the wetland complexes. Several rivers and streams were confirmed within the second year study area, including Shell Rock River in the west, Mud Lake Creek through the center, Woodbury Creek in the north, Orchard Creek in the northeast, and Deer Creek in the south (Figure 2.2, Simon et al. 2017c).

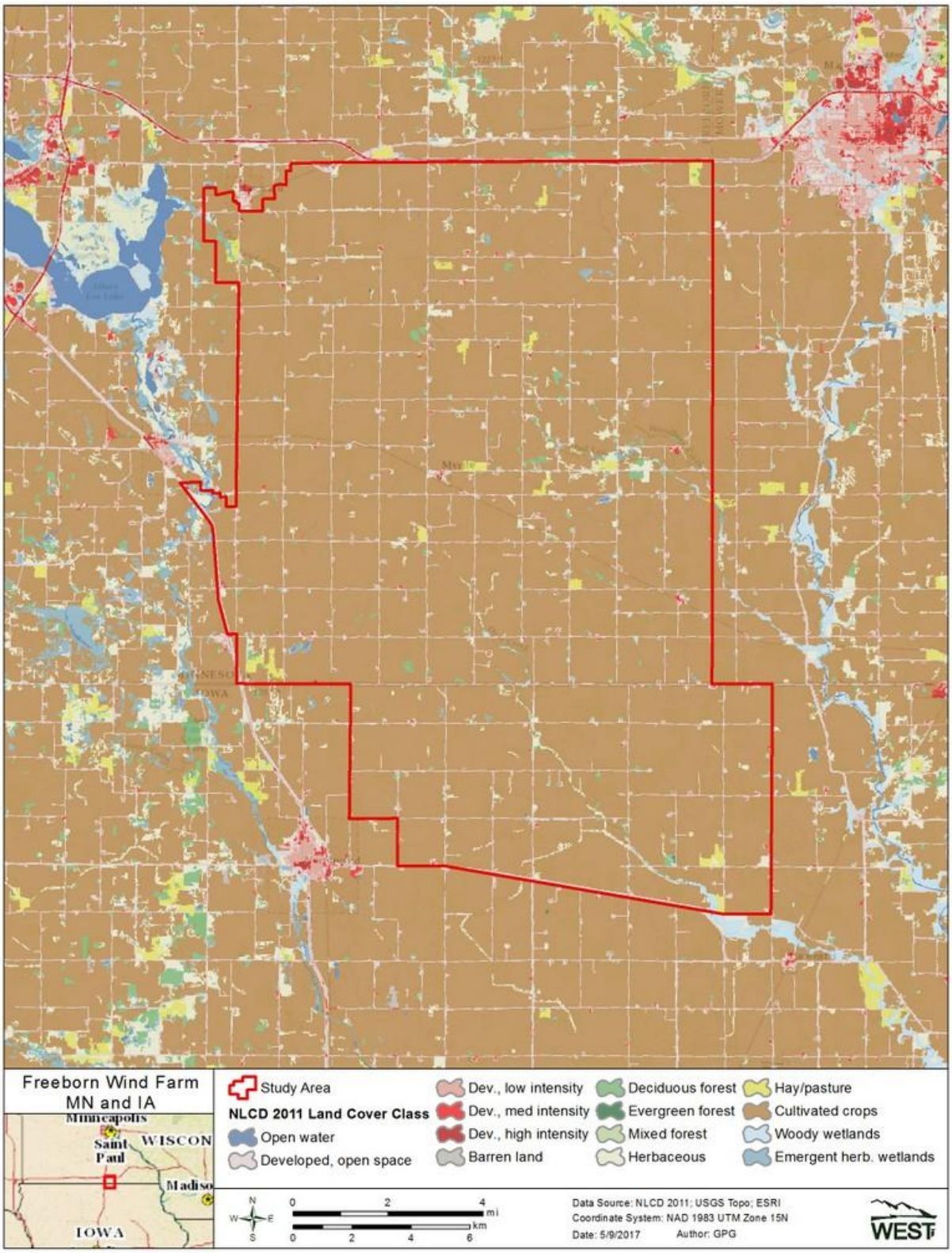

Figure 2.1 National Land Cover Database (NLCD) land cover types within and adjacent to the Freeborn Wind Farm in Freeborn County, Minnesota and Worth County, Iowa (USGS NLCD 2011, Homer et al. 2015).

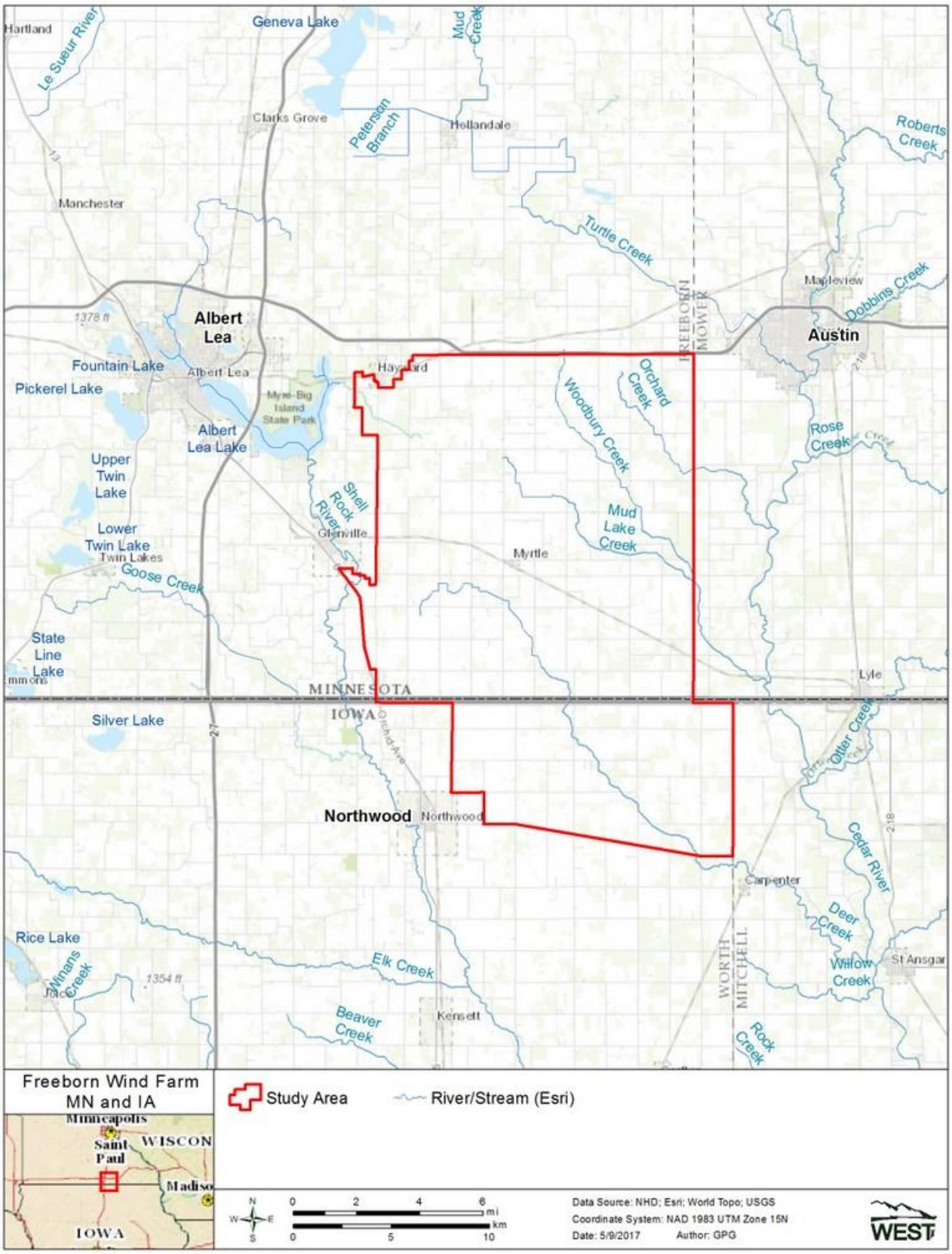

Figure 2.2 Water resources within and adjacent to the Freeborn Wind Farm in Freeborn County, Minnesota and Worth County, Iowa.

2.2 Wildlife Resources within the Study Area

2.2.1 Avian Resources

Avian habitat within the Study area is dominated by cultivated crops (90%); native avian habitat is limited to small, fragmented grasslands and hayfields/pastures, small groves of trees and fencerows near homesteads, and the riparian corridors and their associated wetlands. The western side of the Study area is located in close proximity to Albert Lea Lake and Shell Rock River, which are important aquatic habitat features on the landscape used by birds during migration, and possibly by some sensitive bird species. Myre-Big Island State Park is located adjacent to Albert Lea Lake and is recognized for bald eagle use throughout the year (see Sullivan et al. 2009).

Four Prairie Scientific and Natural Areas are located 10–40 km (6–25 mi) from the Study area (MNDNR 2015a). Five MNDNR-managed Wildlife Management Areas (WMA), consisting of 10 land parcels and several Reinvest in Minnesota conservation easement parcels are located <1–13 km (<1–8 mi) from the Study area (MNDNR 2015a). Three small WMA managed by the Worth County (Iowa) Conservation Board are located in the eastern side of the Study area. Two Waterfowl Production Areas (WPA) in Minnesota are located approximately 6 km (4 mi) and 5 km (3 mi) from the Study area; another WPA in Iowa is located approximately 12 km (8 mi) from the Study area (MNDNR 2016a). These areas provide native habitat that may support sensitive species. Two Game Refuges, which are managed for game hunting and waterfowl protection, also are located near the Study area; one Game Refuge is approximately 0.8 km (0.5 mi) from the northwest corner of the Study area and the other is located approximately 3 km (2 mi) north of the Study area (6). The closest registered Important Bird Area (IBA) to the Study area is the Blufflands-Root River IBA, located 52 km (32 mi) east of the Study area (Audubon 2014).

The Study area is located within the Mississippi Flyway and may be used as stopover habitat in spring and fall by migrating birds. If depressions within croplands in the Study area are saturated and/or pond water during the wet season, these areas may provide stopover habitat for shorebirds and waterfowl during spring migration. Wetlands and recently harvested croplands may provide stopover habitat and foraging opportunities for birds during fall migration. The presence of Albert Lea Lake and Shell Rock River, and the emergent wetlands associated with these waterbodies, approximately 1.6 km (1.0 mi) west of the northwest corner of the Study area, has the potential to increase waterfowl use in the Study area (Simon and Mattson 2016a, Simon et al. 2017a). However, waterfowl migration in the region generally follows a broad-front pattern (U.S. Geological Survey [USGS] 2013), meaning that migrating waterfowl are dispersed across the region rather than concentrated in migration corridors.

Raptors may fly over or move through the Study area during migration; although, because raptors are more likely to travel along north-south oriented large water bodies during migration (Liguori 2005), they are more likely to travel along the Shell Rock River, Cedar River, their tributaries, and Albert Lea Lake. These features may serve as a migration corridor and stopover habitat for migrating raptors, as well as other bird groups. Although migrating raptors may forage within the

Study area, given the predominance of cultivated croplands and the limited amount of native grassland and pasture habitats that may concentrate prey species (Rosenzweig 1989, Preston 1990), prey densities are unlikely to be higher within the Study area than surrounding areas (Simon and Mattson 2016a, Simon et al. 2017a).

The most common bird species recorded along the two USGS Breeding Bird Survey (BBS) routes closest to the Project (the Hartland Route and Austin Route, located approximately 19 km [12 mi] and 4 km [3 mi] north of the Study area, respectively) have been widespread, abundant, and disturbance-tolerant species: European starling (*Sturnus vularis*), common grackle (*Quiscalus quiscula*), red-winged blackbird (*Agelaius phoeniceus*), house sparrow (*Passer domesticus*), American robin (*Turdus migratorius*), horned lark (*Eremophila alpestris*), and song sparrow (*Melospiza melodia*; Pardieck et al. 2014).

2.2.2 Bat Resources

The Project is within the range of seven[2] bat species: hoary bat (*Lasiurus cinereus*), big brown bat, little brown bat, eastern red bat (*Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), northern long-eared bat, and tri-colored bat (Bat Conservation International 2015). A desktop habitat assessment using NLCD data (NLCD 2011, Homer et al. 2015) and a review of aerial imagery were conducted for the Study area to confirm or correct the presence or absence of landscape features to the extent possible. Approximately 714 ha (1,762 ac) of forested habitat (deciduous forest) that may provide foraging and roosting opportunities for tree-roosting bats was estimated to be present within the Study area. The majority of this forested habitat is located on the periphery of the Study area along semi-forested corridors of the Shell Rock River and Cedar River and their tributaries (e.g., Peter Lund Creek and Woodbury Creek, respectively), as well as along Mud Lake Creek. Forested habitats associated with Albert Lea Lake to the west and northwest of the Study area also may provide roosting and foraging habitat. The presence of wetlands, ponds, and cultivated cropland within the Study area may provide additional foraging and drinking opportunities for bats. The nearest known bat hibernaculum is Mystery Cave, located approximately 58 km (36 mi) east of the Study area.

2.3 Endangered, Threatened, and Sensitive Species

2.3.1 Birds

No federally listed bird species have been documented as potentially occurring within Freeborn or Worth counties. Although piping plover (*Charadrius melodus*) has not been documented in Freeborn or Worth counties, birds from the federally endangered Great Lakes population or birds from the federally threatened northern Great Plains population (USFWS 2015c) may move

[2] In July 2016, an evening bat (*Nycticeius humeralis*) was found for the first time in Minnesota (MNDNR 2016b). Captured in Arden Hills, it is currently unclear if this was an isolated individual or if this species has expanded its range into Minnesota.

through the Project Expansion Area during migration (Simon and Mattson 2016a, Simon et al. 2017a). Piping plover stopover sites include shorelines of reservoirs, industrial ponds, natural lakes, wetlands with open water, and rivers with sand or mixed sand or mud substrate; selection is highly influenced by local water levels and water management practices of these resources (Pompei and Cuthbert 2004). Additionally, piping plovers also will use wetlands with open water body components and fish hatcheries as stopover sites (Elliott-Smith and Haig 2004). Although there is potential for piping plovers to opportunistically utilize various wetland and waterbody features in the Study area, depending on annual hydroperiods (i.e., percentage of time a wetland is inundated), suitable piping plover habitat within the Study area is limited. Albert Lea Lake and the associated wetland complex approximately 1.6 km (1.0 mi) west of the northwest corner of the Study area are more likely to attract plovers during migration. Further, no piping plovers have been observed during the first or second year or avian use surveys. Data from sightings of migrating plovers also indicate that the species does not concentrate in large numbers at inland stopover sites; rather, individuals stop opportunistically (Pompei and Cuthbert 2004).

One state-listed bird species, the loggerhead shrike (*Lanius ludovicianus*; Minnesota state endangered) has been documented as occurring within Freeborn County, and has been recorded along both of the BBS routes north of the Study area (Pardieck et al. 2014). Although suitable nesting habitat is limited, most of the 11 Minnesota state-listed bird species and most of the nine Iowa state-listed bird species (four of which are also Minnesota state-listed species) have the potential to migrate through or stopover within the Study area (Simon and Mattson 2016a, Simon et al. 2017a).

Bald eagles use Albert Lea Lake and Myre-Big Island State Park throughout the year (Sullivan et al. 2009). An aeration system installed in Albert Lea Lake and the moving waters of Shell Rock River sustain areas of open water and thin ice during the winter, providing foraging opportunities for eagles. Bald eagles also use Albert Lea Lake as nesting habitat. The Study area and surrounding vicinity includes tributaries of Shell Rock River and Cedar River (i.e., Deer Creek, Orchard Creek, Woodbury Creek, Mud Lake Creek) that may provide foraging opportunities for eagles in spring, summer, and fall, but likely freeze in the winter. Bald eagles may, therefore, occur within the Study area year-round. Bald eagles also have been documented along both of the BBS routes north of the Study area (Pardieck et al. 2014).

Golden eagles do not breed in Minnesota, but they migrate through or winter in the southern part of the state (Kochert et al. 2002). There is a small population of approximately 130 golden eagles that winters in the bluff country of southeastern Minnesota, western Wisconsin, northern Illinois, and northeastern Iowa (Goetzman 2014). Birds from this population are more typically found to the east of Freeborn and Worth counties, and no non-breeding/migrant observations of golden eagles have been documented along the BBS routes north of the Study area (Pardieck et al. 2014) or have been incidentally recorded in Freeborn and Worth counties on the eBird system (Sullivan et al. 2009). Winter habitat for golden eagles in the Midwest includes reservoirs and wildlife refuges, which provide foraging opportunities; golden eagles also may use riparian corridors associated with wetland complexes east of the Mississippi River (Kochert et al. 2002). Therefore, the potential for golden eagle occurrence within the Study area is likely low, primarily

based on historic winter and migration movements, habitat use, and known occurrences within the state (Simon and Mattson 2016a, Simon et al. 2017a).

2.3.2 Bats

The northern long-eared bat is the only federally listed bat species with the potential to occur in the Study area; the northern long-eared bat is also a Minnesota state species of special concern. As previously noted, the final 4(d) rule published January 14, 2016 (81 FR 1900), exempts from Section 9 take prohibitions the incidental take of northern long-eared bats resulting from most otherwise lawful activities, including incidental take of northern long-eared bats due to the operation of wind turbines (see footnote in Section 1.4.1 for more information). The big brown bat, little brown bat, and tri-colored bat are also state species of special concern.

Northern long-eared bats have been documented in Mystery Cave, located approximately 58 km (36 mi) east of the Study area. The Project is located outside of the hibernaculum's 8-km (5-mi) fall swarming radius for northern long-eared bats (USFWS 2014). Although northern long-eared bats may migrate through the Study area, the amount of roosting and foraging habitat for the species within most of the Study area is limited. Northern long-eared bats are more likely to use the larger tracts of forested habitat associated with Albert Lea Lake and Shell Rock River west of the Study area as roosting and foraging habitat in the summer. Preliminary desktop habitat mapping indicated that most patches of forested habitat within the Study area are relatively small (i.e., less than 6 ha [15 ac]; Figures 2.3 and 2.4).

Although a minimum patch size has not been defined for suitable northern long-eared bat roosting habitat, studies of northern long-eared bats on agricultural landscapes have found that northern long-eared bats may use woodlots and riparian areas with as little as approximately 6–20 ha (15–49 ac) of forest cover (Foster and Kurta 1999, Henderson and Broders 2008). Many of the forested patches, particularly in the center of the first year study area and in the southern part of the second year study area, appear to be isolated (i.e., more than 305 m (1,000 ft) from large contiguous tracts of forest, as defined in the Northern Long-Eared Bat Interim Conference and Planning Guidance [USFWS 2014]). However, a few woodlots and forested riparian corridors in the western part of the Study area are connected to forested habitat adjacent to Albert Lea Lake and Shell Rock River. Additionally, forested riparian corridors in the eastern part of the first year study area and running through the center of the second year study area are connected to forested habitat adjacent to Cedar River (Simon and Mattson 2016a, Simon et al. 2017a). Thus, summer roosting and foraging habitat for northern long-eared bats from maternity colonies, if present, may exist in the larger contiguous woodlots and forested riparian corridors. Northern long-eared bats also may move through the Study area when migrating from these forested tracts west of the Project to Mystery Cave, located east of the Study area, or to other, undocumented hibernacula in the region.

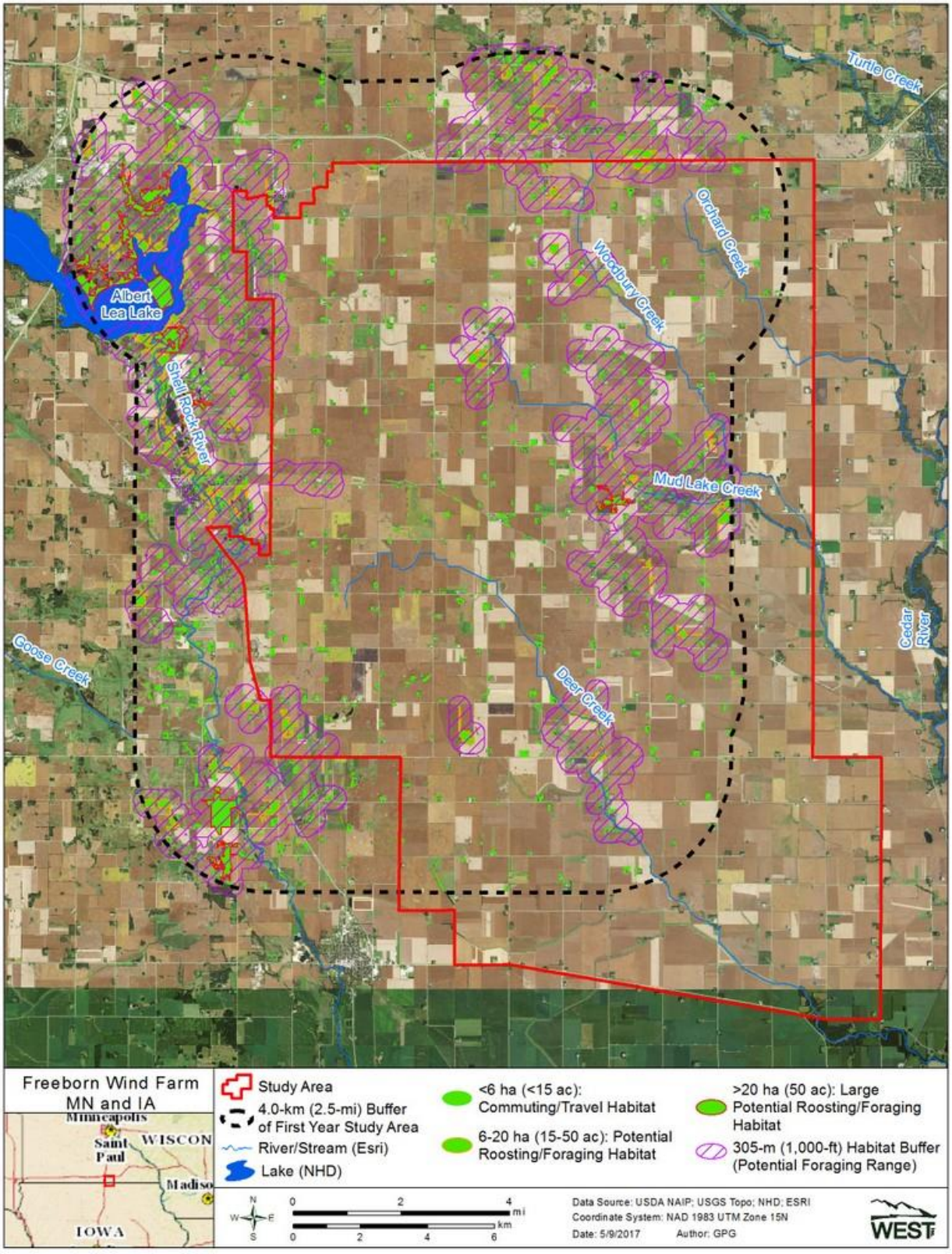

Figure 2.3 Results of the desktop habitat assessment for northern long-eared bats within the Freeborn Wind Farm first year study area and 4-kilometer buffer.

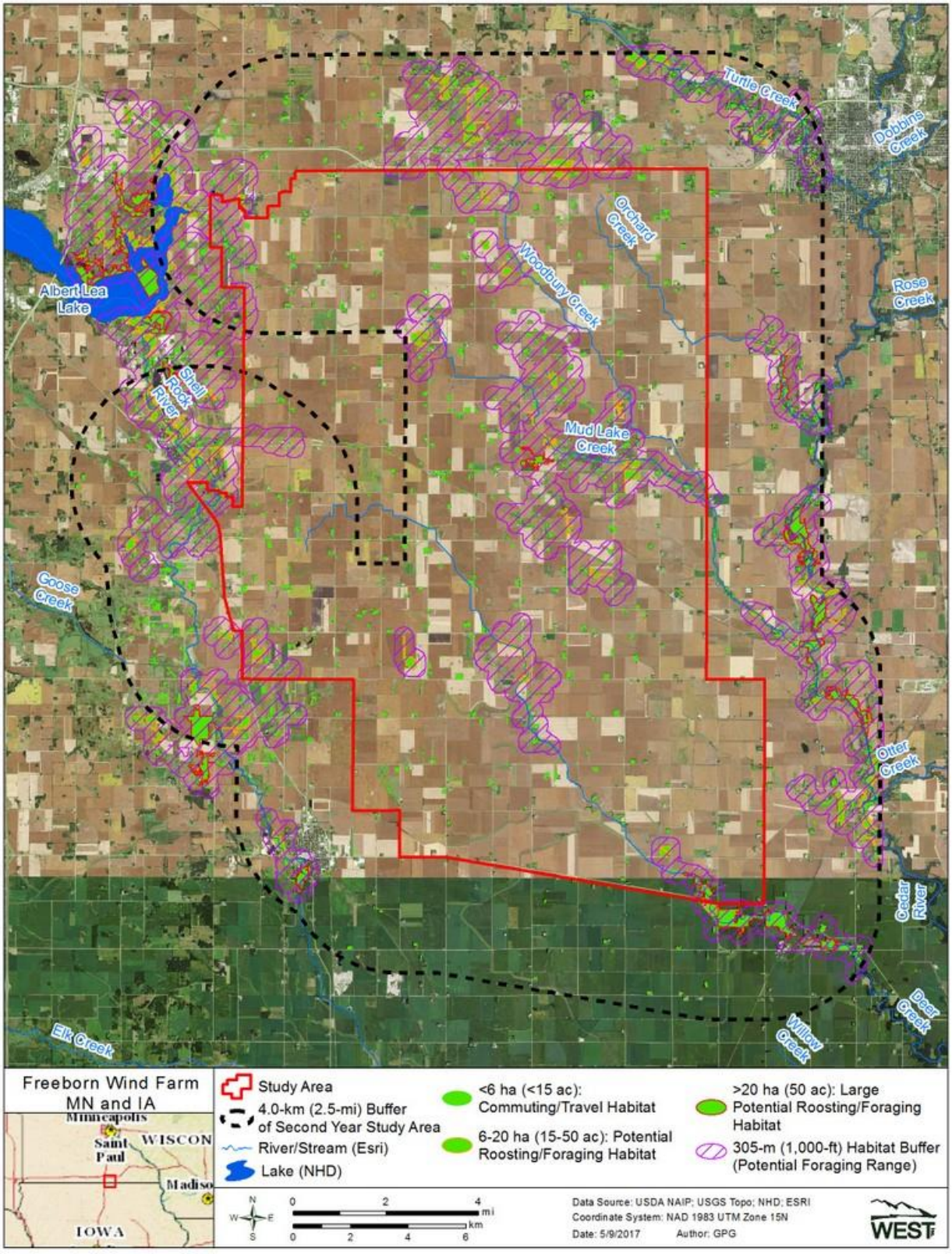

Figure 2.4 Results of the desktop habitat assessment for northern long-eared bats within the Freeborn Wind Farm second year study area and 4-kilometer buffer.

3 TIER 3 – FIELD STUDIES

To evaluate avian resources and bat activity within the Study area and assess potential impacts from the Project, several Tier 3 studies were conducted and others are ongoing.

Tier 3 studies completed in the first year study area include:

- Raptor nest study and eagle nest monitoring (Mattson et al. 2015) and follow-up eagle nest study (Simon and Mattson 2016b)
- Large-bird use study (Simon and Mattson 2016c)
- Small-bird use study (Simon and Mattson 2016c)
- Wetland bird use study (Simon and Mattson 2016c)
- Bat acoustic study (Simon and Mattson 2016d)

Ongoing Tier 3 studies in the second year study area include:

- Raptor nest study (fieldwork completed April 2017)
- Large-bird use study (fieldwork completion anticipated September 2017)
- Small-bird use study (fieldwork completion anticipated June 2017)
- Wetland bird use study (fieldwork completion anticipated June 2017)

3.1 Birds

3.1.1 Raptor Nest Study, Eagle Nest Monitoring, and Follow-up Eagle Nest Study

3.1.1.1 Methods

An aerial raptor nest study was conducted from March 20–21, 2015, within the first year study area and 3- and 16-km (2- and 10-mi) buffers of the study area for all raptor nests and eagle nests, respectively (Mattson et al. 2015). Within the first year study area, transects were flown approximately 0.4 and 0.8 km (0.2 and 0.5 mi) apart for complete coverage of construction disturbance areas. Within the 3- and 16-km (2- and 10-mi) buffers, a survey route was planned using aerial imagery and the USGS National Land Cover Dataset (NLCD 2011, Homer et al. 2015) to examine suitable bald eagle and other raptor nesting habitat within the buffer areas. Suitable nesting habitat included forested areas, riparian corridors, and forested margins of waterbodies.

Eagle nest monitoring was conducted through six ground-based surveys at all active eagle nests located within 3 km (2 mi) of the first year study area from April 29–August 13, 2015. The eagle nest monitoring surveys consisted of one 1,600-m (5,249-ft) radius fixed point established on public roads for each occupied bald eagle nest, following methods similar to Reynolds et al. (1980), and consistent with recommendations outlined in the ECPG (USFWS 2013). Each eagle nest monitoring point was located approximately 0.8 km (0.5 mi) from each bald eagle nest. The eagle nest monitoring points were established to document flight paths of the bald eagles in an

effort to determine the nesting territory and surrounding use areas, and particularly if these use areas overlapped the first year study area (Mattson et al. 2015).

A follow-up ground-based eagle nest study was conducted from March 29–31, 2016, within the first year study area and the 3-km (2-mi) buffer. The objectives of the study were to check the status of occupied and potential eagle nests documented during the 2015 study and to document any new potential eagle nests. The study encompassed driving all public roads within the first year study area and 3-km (2-mi) buffer and scanning woodlots, shelterbelts, riparian areas, and other treed habitats (Simon and Mattson 2016b).

3.1.1.2 Results

Within the first year study area, two occupied red-tailed hawk (*Buteo jamaicensis*) nests and six unoccupied nests of unknown species (Figure 3.1) were documented during the raptor nest study. No occupied or potential bald eagle nests were located within the first year study area or in the rest of the Study area. Within the 3-km (2-mi) buffer, two occupied bald eagle nests, five occupied great horned owl (*Bubo virginianus*) nests, three occupied red-tailed hawk nests, and 24 unoccupied nests of unknown species were documented. Two of the great-horned owl nests and one red-tailed hawk nest were located in the Study area east of the first year study area. Both of the bald eagle nests were located west of the southern end of the Study area. One of the occupied great-horned owl nests, located just northwest of the Study area, was consistent with the size and structure of a bald eagle nest. Within the 16-km (10-mi) buffer, one occupied great blue heron (*Ardea herodias*) nest was documented at a lake located west of the northern end of the Study area and two occupied bald eagle nests were documented near the edge of the buffer at lakes located north and west of the Study area. One occupied red-tailed hawk nest and one unoccupied nest of an unknown species were also documented within the 16-km (10-mi) buffer. Additionally, four bald eagle observations were recorded incidentally during the nest study on March 20 and 21, 2015 between the 3- and 16-km (2- and 10-mi) buffers. These observations were distributed west, north, northeast, and southeast of the Study area. No federally or state-listed threatened or endangered raptor species were observed during the study.

During the eagle nest monitoring, two bald eagle chicks and two bald eagle adults were documented at the southern nest (located less than 3 km [2 mi] west of the Study area) and one bald eagle chick and two bald eagle adults were documented at the northern nest (located less than 0.8 km [0.5 mi] west of the Study area). During April and May, typical bald eagle behavior consisted of one adult foraging away from the nest while the other adult remained in or near the nest. Fledglings were first observed out of the northern nest at the end of May and out of the southern nest in June. During June, typical adult bald eagle behavior consisted of staying near the nest and making occasional, short (less than 800-m [2,625–ft]) flights. During July, fledgling bald eagles made short (less than 400-m [1,313–ft]) flights around the nest, and adult bald eagles left fledglings alone for longer periods of time and took longer flights, a couple of which were observed to or from the Study area direction. In August, only juveniles were observed, making flights up to 800 m (2,625 ft), mostly to, from, and along the Shell Rock River corridor.

The majority of observed adult eagle flights at the southern nest occurred north of the nest, with a general north-south movement pattern. The majority of observed adult flights at the northern nest were to and from the Shell Rock River corridor. Occasional flights by adult bald eagles to and from the direction of the Study area were observed at both nests in July (Mattson et al. 2015).

During the follow-up eagle nest study in 2016, no new bald eagle nests were documented (Figure 3.2). The two bald eagle nests occupied in 2015 were also occupied during the 2016 survey. During avian use surveys in mid-March 2016 (Section 3.1.2), an adult bald eagle was observed in the nest previously occupied by great horned owls in 2015 that had been classified as a potential bald eagle nest. However, during the follow-up eagle nest study conducted in late March 2016, this potential eagle nest was unoccupied, with no bald eagles observed in or near the nest (Simon and Mattson 2016b).

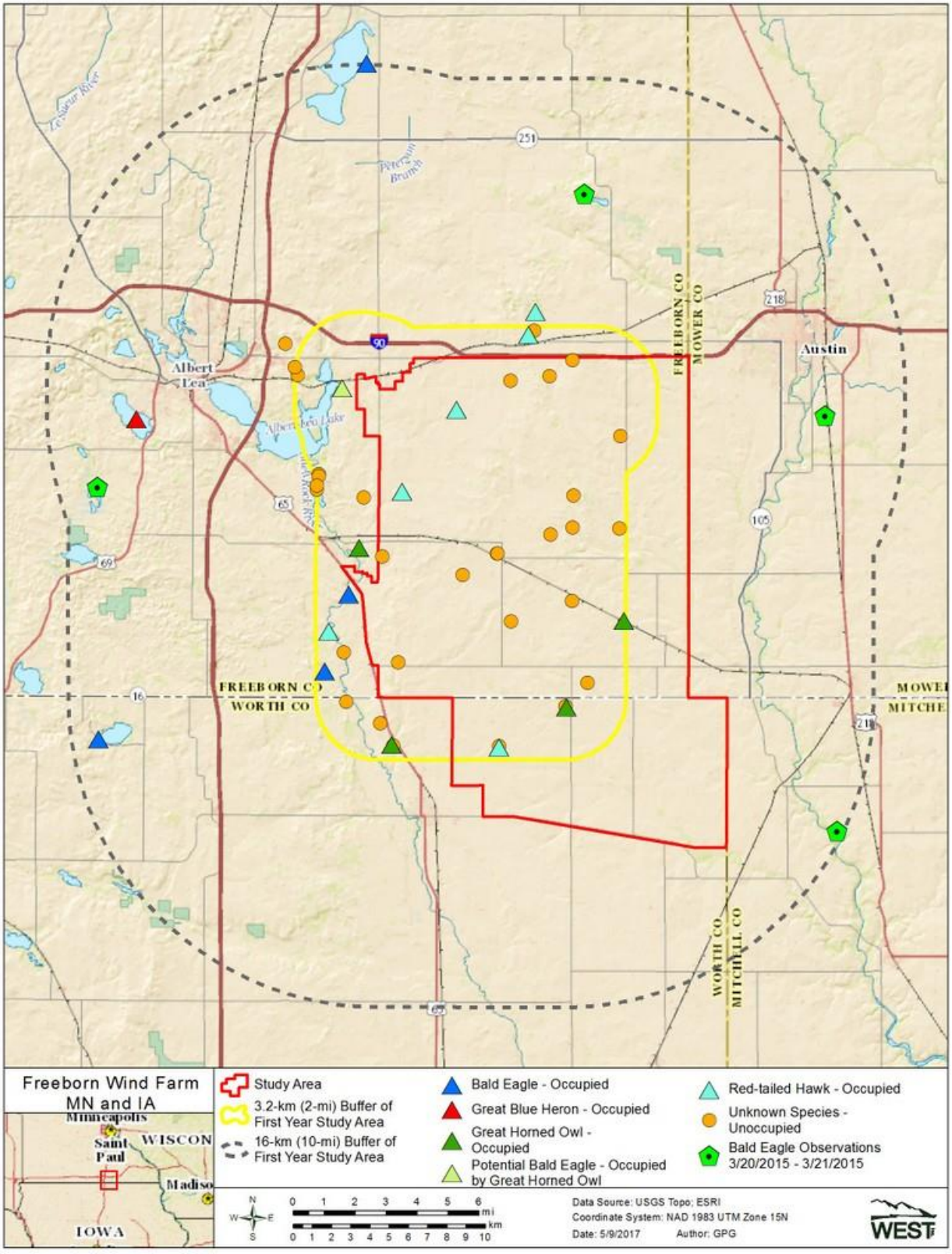

Figure 3.1 Results of a raptor nest study conducted from March 20–21, 2015 within the Freeborn Wind Farm first year study area and 3- and 16-kilometer buffers.

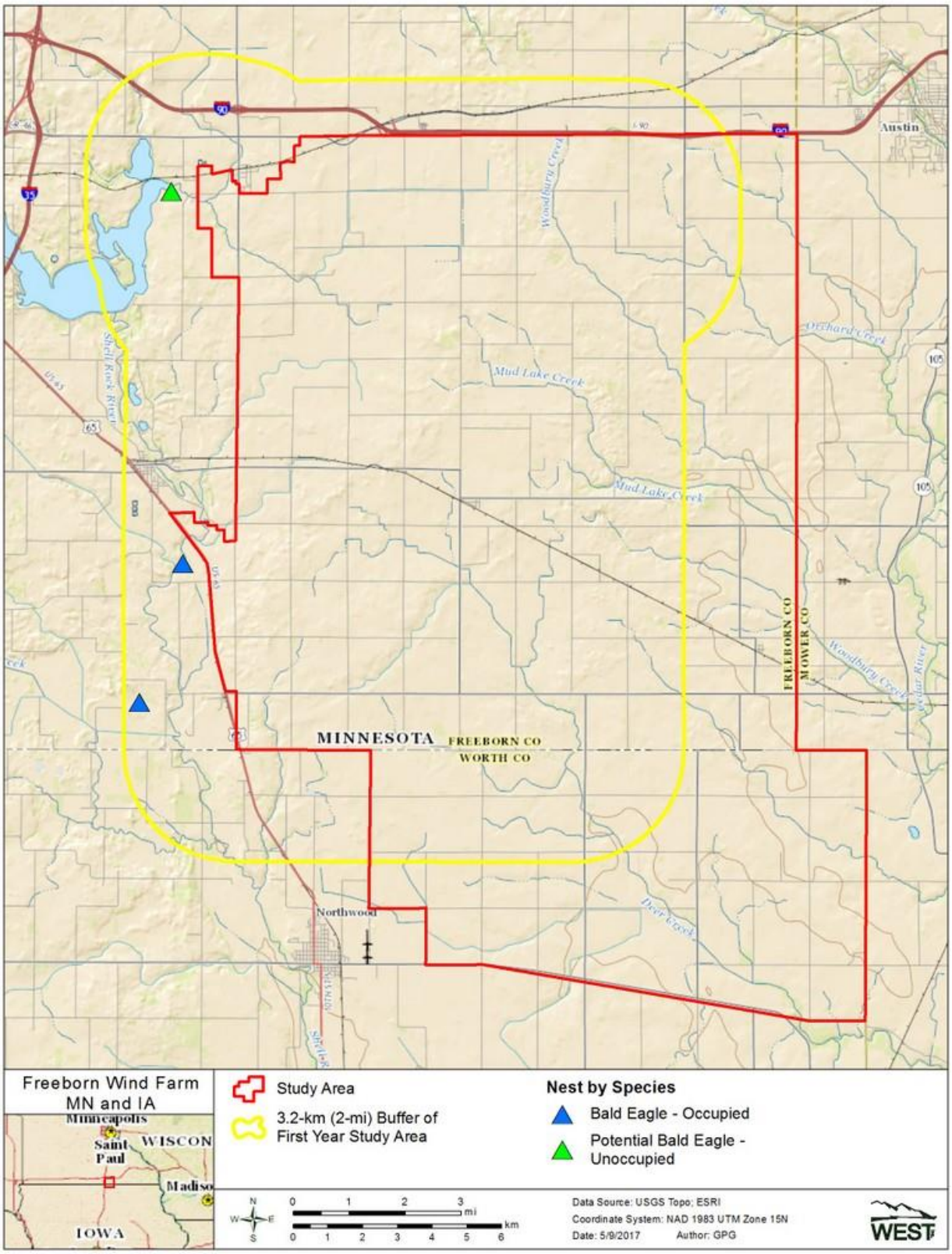

Figure 3.2 Results of an eagle nest study conducted from March 29–31, 2016 within the Freeborn Wind Farm first year study area and 3-kilometer buffer.

3.1.2 Large-bird Use Study

3.1.2.1 Methods

The large-bird use study consisted of surveys conducted at 18 point count locations within the first year study area. The objective of the large-bird use study was to evaluate (1) species composition, relative abundance, and diversity; (2) overall use, percent of use, and frequency of occurrence; (3) flight height; and (4) spatial use by large birds. Additional objectives were to document potential use of the first year study area by threatened, endangered, and sensitive avian species and eagles. This study effort was conducted using methods described by Reynolds et al. (1980). Data for eagle observations were recorded according to the ECPG (USFWS 2013).

Surveys were conducted once monthly for 60 minutes (min) at each point from January 17, 2015–March 22, 2016. Surveys were conducted during daylight hours, with varying survey periods to approximately cover all daylight hours within a season. All large-bird species observed were recorded, regardless of distance. Large birds observed within a 800-m (2,625-ft) plot at each point count location were included in statistical analyses, while large birds observed beyond this distance were recorded as incidental observations and not included in analyses (Simon and Mattson 2016c).

3.1.2.2 Results

During a total of 270 large-bird use surveys, 7,057 large-bird observations within 1,160 groups were recorded. The observations consisted of 54 bird species.

The most commonly recorded large-bird subtype was waterfowl (59.7% of large-bird observations), the majority of which were mallard (*Anas platyrhynchos*; 2,440 observations in 67 groups). Large corvids were the second most commonly recorded large-bird subtype (11.8%). Nine raptor species were observed, accounting for 3.1% of the large-bird observations. Bald and golden eagles (88 combined observations) accounted for 40.6% of all raptor observations and 1.2% of all large-bird observations.

The highest large-bird use occurred in the second winter (24.1 observations/plot/60-min survey), followed by fall (17.2), spring (10.2), the first winter (8.3), and summer (4.4). Raptor use was highest in the spring (0.7 observation/plot/60-min survey), followed by the second winter (0.5) and the first winter (0.5), fall (0.4), and summer (0.3). Eagle use was highest in the second winter (0.3 observation/plot/60-min survey), followed by the first winter (0.2), fall (0.1) and spring (0.1), and summer (< 0.1).

Overall, 44.8% of the large birds that were observed flying were within the estimated rotor-swept area (RSA) (25–150 m [82–492ft+] above ground level), while 49.7% were flying below the RSA and 5.5% were flying above the RSA. Most (53.6%) raptors observed flying were recorded within the RSA, 34.8% were below the RSA, and 11.6% were above it. Waterbirds had the highest percentage of flying birds within the RSA (95.2%), followed by gulls/terns (69.6%), eagles (69.0%), and Buteos (58.8%).

During the large-bird use surveys, 87 bald eagle observations and one golden eagle observation were recorded. Most (69.0%) of the eagles observed flying were within the RSA, 16.7% were below the RSA, and 14.3% were above the RSA. Eagle activity recorded within the first year study area amounted to 84 bald eagle min and 3 golden eagle min, for a total of 87 eagle min. More eagle min were recorded during March 2016 (42 eagle min) and February 2016 (14 eagle min) than during any of the other 13 months of the study (ranging from 0 to 8 eagle min). Mapped bald eagle flight paths revealed that bald eagle flight patterns were relatively dispersed throughout the first year study area, with the greatest area of concentrated activity at the survey point located to the northeast, between the Study area and Albert Lea Lake. The southern portion of the first year study area also showed greater flight activity of bald eagles at a survey point located adjacent to two ponds and a surrounding wetland complex and another survey point located adjacent to Deer Creek (Simon and Mattson 2016c).

3.1.3 Small-bird Use Study

3.1.3.1 Methods

The small-bird use study consisted of surveys conducted at nine point count locations established adjacent to forested areas (i.e., woodlots, shrubby areas, shelterbelts) along public roads within the first year study area. The objective of the small-bird use study was to evaluate: (1) species composition, relative abundance, and diversity; (2) overall use, percent of use, and frequency of occurrence; (3) flight height; and (4) spatial use by small birds. Additional objectives were to document use of the first year study area by threatened, endangered, and sensitive avian species and eagles.

Surveys were conducted twice monthly for eight min per point from March 21–May 21, 2015. Surveys were conducted between, approximately 0.5 hour before sunrise to four hours after sunrise. All small-bird species observed within a 100-m (328-ft) plot at each point count location were recorded. Small birds observed beyond the 100-m (328-ft) radius were recorded as incidental but not included in the statistical analyses (Simon and Mattson 2016c).

3.1.3.2 Results

During 45 small-bird surveys, 640 small-bird observations within 278 groups were recorded. The observations consisted of 38 bird species. The most-observed species were red-winged blackbird (30.8% of small-bird observations; 31.9% of passerine observations), common grackle (15.9% of small-bird observations; 16.5% of passerine observations), American robin (9.1% of both), and unidentified blackbird (8.1% of both). No federally or state-listed small-bird species were observed during the small-bird migration study (Simon and Mattson 2016c).

Small-bird use averaged 12.4 observations/plot/8-min survey. Passerine use averaged 12.0 observations/plot/8-min survey, mostly comprised of the blackbird/oriole subtype use, which averaged 7.2 observations/plot/8-min survey, and the sparrow and thrush subtypes use, both of which averaged 1.3 observations/plot/8-min survey. Use for all other bird groups averaged less than 1.0 observation/plot/8-min survey.

The height of bird flights were compared to the estimated RSA. Overall, 1.1% of the small birds observed flying were within the RSA, 98.9% were below the RSA, and 0% were above the RSA.

3.1.4 Wetland Bird Use Study

3.1.4.1 Methods

Although the MNDNR did not require wetland or grassland bird surveys, based on the limited amount of wetland and grassland habitats located within the first year study area, a wetland bird use study was conducted, which comprised surveys at three point count locations for 60 min per point within the first year study area. The point count locations were established within the first year study area adjacent or in close proximity to wetlands and/or waterbodies. The objective of the wetland bird use study was to evaluate (1) species composition, relative abundance, and diversity; (2) overall use, percent of use, and frequency of occurrence; (3) flight height; and (4) spatial use by wetland birds (i.e., waterbirds, waterfowl, shorebirds, rails/coots, loons/grebes). Additional objectives were to document use of the first year study area by threatened, endangered, and sensitive avian species and eagles.

Surveys were conducted three times from March 19–May 27, 2015, with approximately four weeks between surveys, to document bird use during spring migration and the early nesting season for wetland bird species[3], with at least one survey conducted to coincide with ice out (i.e., when the majority of waterbodies are free of ice) and peak waterfowl migration (Mixon et al. 2014). All large-bird species observed within a 800-m (2,625-ft) plot at each point count location were recorded. Observations of large birds beyond the 800-m (2,625-ft) radius were recorded as incidentals but not included in statistical analyses (Simon and Mattson 2016c).

3.1.4.2 Results

During nine wetland bird use surveys, 456 bird observations within 89 groups were recorded, consisting of 25 species. The most- observed species were Canada goose (*Branta canadensis;* 34.6% of bird observations; 39.1% of waterfowl observations), greater white-fronted goose (*Anser albifrons*; 29.4% of bird observations; 33.2% of waterfowl observations), mallard (6.8% of bird observations; 7.7% of waterfowl observations), and blue-winged teal (*Anas discors*; 3.3% of bird observations; 3.7% or waterfowl observations). Bald eagles accounted for 2.0% of all observations. No federally or state-listed bird species were observed during the wetland bird use study (Simon and Mattson 2016c).

Bird use at the wetlands averaged 39.2 observations/plot/60-min survey. Waterfowl use averaged 35.3 observations/plot/60-min survey, shorebird use averaged 1.4 observations/plot/60-min

[3] The wetland bird use surveys were conducted to establish avian use around lakes or wetlands with an open water component. Although these surveys were designed to emphasize use by waterfowl and shorebirds, the wetland bird use surveys are not limited to these groups of birds.

survey, raptor use averaged 1.0 observation/plot/60-min survey; use for all other bird groups averaged less than 1.0 observation/plot/60-min survey.

Overall, 64.1% of the birds observed flying at the wetlands were within the RSA, while 34.1% were below the RSA and 1.7% were above the RSA. The majority of waterfowl (69.4%), *Buteos* (100.0%, although note only one flying observation), and eagles (100.0%, although note only two flying observations) observed flying at the wetlands were within the RSA.

3.2 Bat Acoustic Study

3.2.1 Methods

A bat acoustic study was conducted from April 14–November 14, 2015. Study objectives were to: (1) estimate levels of bat activity at met towers and ground locations within the first year study area; (2) estimate activity levels for bats with high-frequency (HF) and low-frequency (LF) calls; and (3) analyze potential correlations between bat activity and the following weather variables: wind speed, temperature, and humidity. Four acoustic detectors (AnaBat™ SD I and SD 2 [Titley Scientific™, Columbia, Missouri]) were deployed at two met towers (raised and ground detectors at each tower) located in the center of the first year study area, and four detectors were deployed singly at four ground locations throughout the first year study area at representative potential turbine locations (i.e., in or adjacent to agricultural land). Detectors recorded bat calls from approximately 0.5 hour before sunset to 0.5 hour after sunrise nightly. Bat calls were categorized by frequency group, with calls higher than 30 kilohertz (kHz) considered HF and calls lower than 30 kHz considered LF. Bat species with ranges overlapping the Study area that produce HF calls include: eastern red bat, little brown bat, northern long-eared bat, and tri-colored bat. Bat species with ranges overlapping the Project that produce LF calls include: big brown bat, silver-haired bat, and hoary bat (Simon and Mattson 2016d).

3.2.2 Results

At the eight acoustic detectors, 15,276 bat passes were recorded over 1,431 detector-nights for an average bat activity rate of 10.4 $\pm$ 0.9 bat passes per detector-night. Bat activity was higher at the ground detectors (13.0 $\pm$ 1.3 bat passes/detector-night) than at the raised detectors (2.6 $\pm$ 0.3 bat passes/detector-night).

Bat activity was highest in the summer (June 1–July 15; 20.1 $\pm$ 2.2 bat passes/detector-night), followed by the fall migration period (July 30–October 14; 9.0 $\pm$ 1.1), fall (July 16–November 14; 7.5 $\pm$ 0.9), and spring (April 14–May 31; 6.6 $\pm$ 1.0). These seasonal patterns were the same for HF and LF bat activity, although the weeks with the highest activity rates differed among the frequency groups. High-frequency bat activity peaked at 31.1 bat passes per detector-night from June 20–June 26, 2015. Low-frequency bat activity peaked at 20.0 bat passes per detector-night from August 2–August 8, 2015. Overall bat activity gradually decreased from early September to late October and decreased substantially near the end of the study in November.

Bat activity decreased (both frequency groups) as wind speeds increased. The majority of nights fell within the 4–6 m/s (9–13 mph) wind speed category, with 92 nights total and 12.0 passes per detector-night for all bats. However, bat passes per detector-night were highest (21.7) on the five nights with wind speeds ranging from 0–2 m/s (0–5 mph). The number of bat passes per detector-night decreased for all bats as wind speeds increased, to 0.1 passes per detector-night in the 12–14 m/s (27–31 mph) category. The peak dates for all bat activity (June 20–June 26) coincided with the approximate 2-week window (mid-June–late June) where average wind speeds were lowest for a sustained period. Bat passes per detector-night and wind speed were negatively correlated (Pearson product-moment correlation coefficient = -0.32, $p<0.001$), indicating a negative association between bat activity and wind speed.

Bat activity also decreased (both frequency groups) as temperatures decreased. The majority of nights were within the 15–20° Celsius (°C; 59–68° Fahrenheit [°F]) temperature category, with 70 nights total and 20.4 passes per detector-night for all bats. The number of bat passes per detector-night decreased for all bats as temperatures decreased, with 0.1 bat passes per detector-night recorded in the -5–0 °C (23–32 °F) category. Higher temperatures from mid- to late June coincided with the period of highest bat pass rates, with the peak of all bat activity occurring around June 23 and little temperature variability in the week before and after this increase. Correlation analysis confirmed this positive relationship between temperature and bat activity (Pearson product-moment correlation coefficient = 0.46, $p < 0.001$). Bat activity decreased at the highest temperature category.

Finally, bat activity was assessed relative to humidity category (percent relative humidity). The majority of nights were within the 80–90% relative humidity category, with 71 nights total and 11.8 passes per detector-night for all bats. Bat passes per detector-night for all bats decreased to 2.5 bat passes per detector-night when relative humidity was between 40–50%. The peak of all bat activity, beginning approximately June 20, occurred during a sustained period of higher relative humidity, from around the second week in June to the third week in July. Relative humidity and bat activity were significantly correlated (Pearson's correlation coefficient = 0.16, $p = 0.02$). However, bat activity and relative humidity were not as strongly correlated as were the bat activity and the wind speed and temperature variables (Simon and Mattson 2016d).

3.3 Sensitive Species Observations

During the large-bird use study, the small-bird use study, the wetland bird use study, and recording of incidental observations, seven sensitive bird species were documented. Four state species of special concern were observed: trumpeter swan (*Cygnus buccinator*; four observations in two groups), peregrine falcon (also a USFWS Bird of Conservation Concern; *Falco peregrinus*; four observations in four groups), Franklin's gull (*Leucophaeus pipixcan*; 66 observations in seven groups), and American white pelican (884 observations in 33 groups). Three other sensitive species also were observed: bald eagle (BGEPA, USFWS Bird of Conservation Concern; 102 observations in 102 groups), American golden-plover (federal watch list species; *Pluvialis dominica*; 93 observations in three groups), and golden eagle (BGEPA; one observation). No state-listed threatened or endangered species or federally listed species were observed during the large-bird use, small-bird use, or wetland bird use surveys or incidentally (Simon and Mattson

2016c). Bat calls were not identified to species in the bat acoustic study (Simon and Mattson 2016d).

3.4 Summary of Concerns Identified During Research and Analysis

3.4.1 Birds

The potential for habitat fragmentation impacts is low because the Project is sited on a previously disturbed landscape. Agriculture is the dominant land cover type within the Study area, particularly where turbines and facilities will be located.

The Project has the potential to cause displacement of some bird species from the Study area due to increased human activity or the presence of tall structures. Many of the most-observed bird species within the first year study area were common, disturbance-tolerant species (Sections 3.1.1-3.1.4), similar to the species observed on the USGS BBS survey routes nearest the Study area (Section 2.2.1). However, shorebirds and waterfowl using saturated depressions within croplands in the Study area as stopover habitat during spring migration may be more sensitive to displacement by Project turbines, as displacement of these bird types has been reported at wind facilities in Europe (Winkelman 1990, Pedersen and Poulsen 1991, Spaans et al. 1998, Fernley et al. 2006).

Many of the bird displacement studies conducted to date have been inconclusive and inconsistent. The results of these studies indicate that both the spatial and temporal extent of displacement impacts vary greatly by species and land cover and possibly other, as yet undefined, factors influencing avoidance behavior (e.g., Shaffer and Johnson 2008, Shaffer et al. 2012). For these reasons, adequate data do not currently exist to support accurate determination of the potential spatial and temporal extent of the displacement impacts specific to certain species. If displacement effects were to occur, it is unclear whether they will persist for the life of the Project, given that certain species adapt to the presence of turbines (The Ornithological Council 2007). Given that most lands within the Study area are already disturbed and subject to human activity related to farming, and because most of the birds observed were common, disturbance-tolerant species, displacement effects are expected to be minimal.

Project operation may result in avian mortality from collision with the Project's turbines or other structures. Based on the results of post-construction monitoring at similar facilities located on agricultural landscapes in southern Minnesota and northern Iowa and given the lack of unique ecological features within the Study area that would attract birds, estimated bird carcass rates at the Project would be expected to be within the range or lower than those reported from studies at other wind facilities in the region (Table 3.1). These studies have reported carcasses of a variety of bird species, mostly passerines, and most carcasses were found during the spring, summer, and fall when passerines are migrating or on their summer range. At Freeborn, no single species is expected to experience a disproportionate amount of estimated mortality or impacts of a magnitude to affect the local or migratory population, as reflected in studies completed by Erickson et al. (2014). Additionally, the passerine species most-observed during the pre-construction surveys and on the USGS BBS survey routes nearest the Project (i.e., European

starling, common grackle, red-winged blackbird, house sparrow, American robin, horned lark, and song sparrow) are all common and abundant species (Simon and Mattson 2016a, Simon and Mattson 2016c).

The Project is located east of Albert Lea Lake and Shell Rock River, which are important aquatic habitat features on the landscape and concentrate use by waterfowl and shorebird species, potentially including some sensitive species, during migration and winter. Waterfowl constituted the most commonly recorded large-bird subtype during the large-bird use study (Section 3.1.2). However, waterfowl and shorebird carcass rates at wind energy projects have been low, even in areas of high use. Generally, waterfowl and shorebird carcass rates have shown to be insignificant at wind facilities, as compared to the rate of use or incidence of these groups (Erickson et al. 2002). Relatively low percentages of waterfowl and shorebird carcasses have been consistently recorded in carcass monitoring studies at wind energy facilities over the past several years. For example, at nine wind energy facilities in the Midwest and western U.S., waterfowl comprised 2.5% and shorebirds comprised 0.2% of the 1,033 carcasses (Erickson et al. 2001). The National Research Council (NRC) analyzed data from 14 studies (including four also used in Erickson et al. 2001) throughout the U.S. and found that waterfowl comprised about 2% and shorebirds comprised less than 1% of carcasses (NRC 2007). Therefore, based on available evidence, waterfowl and shorebirds do not seem especially vulnerable to turbine collisions and significant impacts are not likely.

Table 3.1 Annual bird carcass rate results from post-construction monitoring studies in southern Minnesota and northern Iowa.

Project Name	State	Estimated Bird Carcasses/Megawatt/Year	Source
Barton I and II	IA	5.50	Derby et al. 2011
Buffalo Ridge (Phase I; 1996)	MN	4.14	Johnson et al. 2000
Buffalo Ridge (Phase I; 1997)	MN	2.51	Johnson et al. 2000
Buffalo Ridge (Phase I; 1998)	MN	3.14	Johnson et al. 2000
Buffalo Ridge (Phase I; 1999)	MN	1.43	Johnson et al. 2000
Buffalo Ridge (Phase II; 1998)	MN	2.47	Johnson et al. 2000
Buffalo Ridge (Phase II; 1999)	MN	3.57	Johnson et al. 2000
Buffalo Ridge (Phase III; 1999)	MN	5.93	Johnson et al. 2000
Elm Creek	MN	1.55	Derby et al. 2010b
Elm Creek II	MN	3.64	Derby et al. 2012
Moraine II	MN	5.59	Derby et al. 2010c
Pioneer Prairie I (Phase II)	IA	0.27	Chodachek et al. 2012
Top of Iowa 2003	IA	0.42	Jain 2005
Top of Iowa 2004	IA	0.81	Jain 2005
Winnebago	IA	3.88	Derby et al. 2010d

The proximity to Albert Lea Lake and Shell Rock River may increase the potential for bald eagles to use the Study area, particularly during winter. The presence of bald eagle nests within 16 km (10 mi) of the Study area may increase the potential for bald eagles to use the Study area during the nesting season. However, eagle nest monitoring indicated most bald eagle activity is focused along the Shell Rock River corridor and flights to and from the direction of the Project are not common during the nesting season (Section 3.1.1). Avian use studies found that eagle use of the Project was highest in winter (and more eagle minutes were recorded in February and March than

in any other month) and the greatest concentration of eagle activity occurred between the first year study area and Albert Lea Lake (Section 3.1.2). Since eagle use was higher near Albert Lea Lake, wind turbines were sited more than four miles east of the lake. Golden eagles are expected to occur only as infrequent migrants through the Study area (Section 2.2.1).

No federally threatened or endangered bird species were observed during pre-construction surveys within the first year study area, and it is very unlikely that the Project would impact a federally listed bird species.

3.4.2 Bats

Limited information is available regarding the disturbance or displacement of bats at wind facilities (Kunz et al. 2007a). Any bats roosting in the Study area may be temporarily disturbed by human activities, although roosting habitat is limited within the Study area and activities would largely be focused away from drainages and human structures that could serve as bat roosts. Construction and decommissioning activities are not expected to require the removal of trees or old buildings, making it unlikely that roosting bats would be disturbed or incur mortalities. Turbines have been sited more than 1,000 feet from roosting and foraging habitat, minimizing impacts to bats during operation. Therefore, it is unlikely that operation of the Project turbines would disturb or displace bats from use of the Project.

All seven bat species known to occur in Minnesota may migrate through the Study area and the Project turbines are likely to result in some amount of bat mortality. However, bat habitat within the Study area is limited to small groves of trees and fencerows near homesteads and the riparian corridors along a few small streams with fringe wetlands. Outbuildings and other anthropogenic structures may be used as roosting habitat by some species. Cultivated crops also may provide marginal foraging habitat for bat species adapted to use such habitat. Therefore, estimated bat carcass rates at the Project would be expected to be within the range or lower than those reported from studies at other wind facilities in the region (Table 3.2).

Bat carcasses at wind energy facilities in the U.S. have mostly occurred in the swarming and migration seasons, typically between mid-July and mid-September (Howe et al. 2002, Johnson et al. 2003, Kerlinger et al. 2007, BHE Environmental 2010). Post-construction monitoring studies at other wind facilities in southern Minnesota also have reported a similar pattern, with most bat carcasses occurring during the fall migration season and consisting primarily of eastern red bats and hoary bats, both migratory tree bat species (Chodachek et al. 2014).

The pre-construction acoustic study at the Project (Section 3.2.1) recorded activity by LF bats (which include hoary bats) and HF bats (which include eastern red bats) at all detectors. Activity of both groups was highest in summer (June 1–July 15), followed by the fall migration period (July 30-October 14). Activity of both groups decreased as wind speeds at the Project increased, and as temperatures at the Project decreased.

Based on these regional post-construction monitoring results and the Project's pre-construction acoustic study results, bat mortality risk from Project operations is expected to primarily affect

migratory tree bats that are migrating through the Study area during the late summer or early fall. Turbines are sited away from wooded and riparian corridors to limit impacts to bats foraging or traveling along corridors. Additionally, certain weather conditions, including colder temperatures, low cloud ceilings, and high wind speeds, when turbines are most active, are likely to decrease the risk of bat carcasses (Kunz et al. 2007b, Gruver et al. 2009).

The Project is located within the range of the federally listed northern long-eared bat, and individuals may occur within the Study area during spring, summer, and fall (Section 3.3). Based on the Project's location relative to the nearest known northern long-eared bat hibernaculum (Section 2.3.2), no impacts to northern long-eared bats are expected to occur during the fall swarming period or during the winter when they are hibernating. As previously noted, the final 4(d) rule published January 14, 2016 (81 FR 1900), exempts from Section 9 take prohibitions the incidental take of northern long-eared bats resulting from most otherwise lawful activities, including incidental take of northern long-eared bats due to the operation of wind turbines (see footnote in Section 1.4.1 for more information).

Table 3.2 Annual bat carcass rate results from post-construction monitoring studies in southern Minnesota and northern Iowa.

Project Name	State	Estimated Bat Carcasses/Megawatt/Year	Source
Barton I and II	IA	1.85	Derby et al. 2011
Big Blue	MN	6.33	Chodachek et al. 2014
Buffalo Ridge (Phase I; 1999)	MN	0.74	Johnson et al. 2000
Buffalo Ridge (Phase II; 1998)	MN	2.16	Johnson et al. 2000
Buffalo Ridge (Phase II; 1999)	MN	2.59	Johnson et al. 2000
Buffalo Ridge (Phase III; 1999)	MN	2.72	Johnson et al. 2000
Buffalo Ridge (Phase II; 2001/Lake Benton I)	MN	4.35	Johnson et al. 2004
Buffalo Ridge (Phase II; 2002/Lake Benton I)	MN	1.64	Johnson et al. 2004
Buffalo Ridge (Phase III; 2001/Lake Benton II)	MN	3.71	Johnson et al. 2004
Buffalo Ridge (Phase III; 2002/Lake Benton II)	MN	1.81	Johnson et al. 2004
Crystal Lake II	IA	7.42	Derby et al. 2010a
Elm Creek	MN	1.49	Derby et al. 2010b
Elm Creek II	MN	2.81	Derby et al. 2012
Grand Meadow	MN	3.11	Chodachek et al. 2014
Moraine II	MN	2.42	Derby et al. 2010c
Oak Glen	MN	3.09	Chodachek et al. 2014
Pioneer Prairie I (Phase II)	IA	10.06	Chodachek et al. 2012
Top of Iowa 2003	IA	7.16	Jain 2005
Top of Iowa 2004	IA	10.27	Jain 2005
Winnebago	IA	4.54	Derby et al. 2010d

4 AVOIDANCE AND MINIMIZATION MEASURES

4.1 Preconstruction Siting and Design

4.1.1 Turbine Siting

- As recommended in the USFWS' Northern Long-Eared Bat Interim Guidance (USFWS 2014), all turbines will be sited more than 305 m (1,000 ft) from the edge of connected patches of forested habitat (Section 2.3.2) to avoid potential impacts to bats, including northern long-eared bats, during the summer
- The Project's location in a previously disturbed landscape avoids the following habitat features: (1) habitats associated with any federally listed wildlife or plant species, (2) bird movement corridors, (3) landscape features that attract raptors, (4) bat hibernacula or maternity/nursery colonies, and (5) concentrated bird and/or bat use areas
- The Project substation will be sited in a new location away from the original proposed site in Hayward due to higher observed bird activity near the original site
- Native habitat (including native prairie, forested habitat, and wetlands) will be avoided and previously disturbed lands (including existing roadways) will be used, where practical, to avoid wildlife habitat fragmentation
- At the recommendation of the MNDNR, several alternative turbine locations were developed to provide an opportunity to avoid or minimize potential impacts to natural resources and to work around potential issues that may arise during Project development
- All turbines will be sited away from the Shell Rock River: the nearest turbine is 1.0 km (0.62 mi) from the river, the next closest turbine is 1.44 km (0.89 mi) from the river, and all other turbines are more than 1.6 km (1 mi) from the river
- All turbines will be sited away from Albert Lea Lake: the nearest turbine is 6.4 km (4.0 mi) from the lake and all other turbines are more than 7.4 km (4.6 mi) from the lake
- All turbines will be sited away from the "Avoidance Areas" identified by the MNDNR
- All turbines will be sited away from the Deer Creek Wildlife Area and Forest at the recommendation of the Iowa DNR: the nearest turbine is 396 m (1,300 ft) from the wildlife area and 610 m (2,000 ft) from the forest
- All turbines will be sited more than 305 m (1,000 ft) from riparian corridors in Iowa, at the recommendation of the Iowa DNR
- All turbines will be sited more than 305 m (1,000 ft) from Type 3 and Type 4 wetlands (classified in the Circular 29 system as shallow marshes and deep marshes; Shaw and Fredine 1956) in Minnesota
- All other wetlands will be avoided during turbine siting

4.1.2 Turbine Design

- Turbine towers will be designed and constructed to discourage bird nesting and wildlife attraction
- The Project will employ unguyed, tubular towers with slow-rotating, upwind rotors

4.1.3 Lighting

- Aviation hazard lighting will be minimized to Federal Aviation Administration (FAA) requirements and strobed, minimum-intensity red lights will be installed on Project turbines, as recommended by the FAA and in the WEG (USFWS 2012) to avoid attracting birds or bats
- Hoods/shields will be installed on exterior lights at the O&M building and substation to minimize skyward light
- Turbine doors will not have exterior lights installed at the entrance

4.1.4 Collection and Transmission Lines

- The underground communication cables and power collection system will be buried along the access roads or in straight lines from one turbine to another in trenches extending to the Project's 34.5/161-kV substation; lines will be buried along both private and public rights-of-way
- In the event that the 34.5-kV electrical collection lines require overhead construction, the structures will be designed and constructed in accordance with the Avian Power Line Interaction Committee's (APLIC) suggested practices to minimize potential electrocution risk to perching birds (APLIC 2006)
- No electrocution risk is anticipated for the Project's 161-kV transmission line, given the clearances required for a line of this size (APLIC 2006)

4.2 Construction

- Freeborn will comply with all applicable federal, state, and local environmental laws, orders, and regulations
- Prior to construction, all supervisory construction personnel will be instructed on the ABPP and wildlife resource protection measures, including: (1) applicable federal and state laws (e.g., those that prohibit animal collection or removal) and (2) the importance of these resources and the purpose and necessity of protecting them, and ensure this information is disseminated to applicable contractor personnel, including the correct reporting procedures
- Prior to construction, field surveys will be conducted to determine the presence of any jurisdictional wetlands or streams within the footprint of each turbine location and ancillary facilities; during construction, Freeborn will comply with applicable federal regulations protecting waters of the U.S., as listed in Title 33 CFR Part 323
- A Storm Water Pollution Prevention Plan will be prepared and implemented, as required by the U.S. Environmental Protection Agency (USEPA); the plan will include standard sediment control devices (e.g., silt fences, straw bales, netting, soil stabilizers, check dams) to minimize soil erosion during and after construction
- Storm water management practices will be implemented to minimize open water resources that may attract birds and bats
- During construction, existing trees, vegetation, water resources, and wildlife habitat will be protected and preserved to a practical extent
- Traffic will be restricted to Project-specific roads; use of unimproved roads will be restricted to emergency situations

- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information
- Following construction, temporary work areas will be graded to the approximate original contour, and the areas will be revegetated with approved seed mixtures; Freeborn will consult with the Natural Resources Conservation Service and landowners on appropriate reclamation methods and seed mixtures
- Noxious weeds will be controlled in all surface-disturbed areas using mowing and herbicides
- All herbicide and pesticide mixing and applications will be conducted in accordance with all federal, state, and local laws and regulations and the specific product's label; herbicide and pesticide application will be directly applied to a localized spot and will not be applied by broadcasting techniques

4.3 Operation and Maintenance

4.3.1 Operational Procedures

- Freeborn will comply with all applicable federal, state, and local environmental laws, orders, and regulations
- Traffic will be restricted to Project-specific roads; use of unimproved roads will be restricted to emergency situations
- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information
- If an avian collision risk is identified along the Project's 161-kV transmission line during line operation, applicable measures to minimize the potential for bird collisions will be implemented in accordance with APLIC's suggested measures to increase the visibility of the smaller-diameter shield wire (APLIC 2012)
- All carrion (with the exception of birds and bats) discovered on site during regular maintenance activities will be removed and disposed of in an appropriate manner to avoid attracting eagles and other raptors; birds and bats discovered on site will be addressed in conformance with the Project's incidental reporting process and the post-construction monitoring protocol in Section 5
- In addition to carrion removal, Freeborn will encourage landowners with livestock operations in and adjacent to the Project area to clear livestock carcasses regularly and expediently to avoid attracting eagles and other raptors to the Project area
- Project turbines will be feathered below cut-in, 3.0 m per second (m/s; 6.7 mph) from sunset to sunrise April 1 – October 31 to reduce impacts to all bat species, including the northern long-eared bat
- Monitoring and adaptive management will be implemented in accordance with Sections 5 and 6 to ensure the effectiveness of the avoidance, minimization, and mitigation strategies incorporated into the Project, including the turbine operational protocol

4.3.2 Training

- All operations personnel will be provided training on the ABPP and practices to be used to avoid and to minimize impacts to wildlife; this training will include identification of potential wildlife conflicts and the proper response, sensitivity to birds and other wildlife, and education on wildlife laws
- An incidental reporting process will be developed for operations personnel ensuring they can document bird or bat casualties during routine maintenance work and at other times that they are within the Project area; incidentally found wildlife will be documented for the life of the Project to identify wildlife concerns, should they arise
- All operations personnel will be directed to extinguish nighttime exterior lights at the collector station and at the substation when not in use, and operations personnel will be briefed on the importance of minimizing nighttime light use at the Project

5 TIER 4 – POST-CONSTRUCTION AVIAN AND BAT MONITORING

5.1 Monitoring Goals

The goals of post-construction monitoring are to estimate bird and bat carcass rates for the Project, evaluate the circumstances under which carcasses occur, and provide an efficient, long-term survey protocol for detecting large-bird (i.e., large raptor, vulture, eagle) carcasses that may occur over the life of the Project. Post-construction monitoring results also provide the triggers for adaptive management, described in Section 6. In accordance with the WEG (USFWS 2012), the Project will analyze bird and bat carcass monitoring data to accomplish the following:

- Estimate bird and bat mortality rates for the Project
- Estimate mortality rates for species of concern
- Compare estimated mortality rates to predicted mortality rates
- Evaluate bird and bat carcasses within the Project site in relation to site characteristics
- Compare estimated mortality rates at the Project site to mortality rates from existing projects in similar landscapes with similar species composition and use
- Determine the composition of carcasses in relation to migrating and resident birds and bats at the site.
- Assess whether carcass data suggest the need for measures to reduce impacts

5.2 Species to be Monitored

The post-construction monitoring plan will address all bird and bat carcasses detected within the Project area. The monitoring plan is designed to detect carcasses and estimate all bird and bat carcass rates with enough precision to determine if the operational conservation measures are effective in reducing the estimated bird and bat carcass rate for the Project, compared to bird and bat carcass rates for other operating projects.

5.3 Permits and Wildlife Handling Procedures

5.3.1 Permits

Any carcasses found during monitoring will be documented as described in Section 5.4.2.2. Freeborn may elect to obtain federal and state collection permits; carcasses will be left in place and not handled unless permits are obtained, in which case carcasses will be handled in accordance with these permits.

5.3.2 Wildlife Handling Procedures

All carcasses found will be documented as described in Section 5.4.2.2 and left in place (not handled) or handled in accordance with federal and state permits. In the event that a carcass of a federally or state-listed species or eagle is found, Freeborn will cover the carcass with a container and contact the appropriate authorities. If an injured bird or bat is found, Freeborn will contact the appropriate authorities and/or wildlife rehabilitator.

5.4 Monitoring

5.4.1 Study Design

There are several sources of bias that may impact the results of post-construction monitoring at wind facilities. The wind industry, consultants, and various federal and state agencies have developed field and analytical methodology to correct for these sources of bias. In particular, post-construction monitoring practices account for sources of field-sampling bias, including: (1) variable carcass rates, (2) carcass removal by scavengers, (3) searcher efficiency, and (4) limited search area within nominal full plot area (e.g., road and pad surveys). Freeborn's post-construction carcass monitoring methodology is designed to account for these sources of bias and adapt to preliminary results, such that effectiveness, efficiency, and accuracy of the study are optimized.

Standardized carcass searches will be conducted at Project turbines from March 15 to November 15 of the first full year of Project operations by a qualified consultant. The monitoring study design is meant to be intensive during the first year of monitoring to estimate bird and bat carcass rates, while also capturing important information about the distribution of carcasses around turbines. Collecting a robust data set through this design will provide important baseline information, which can be used to assess the impacts to birds and bats from the Project. Data will be used to determine how search parameters (e.g., number of turbines searched, search interval, necessity/size of cleared plots) can be adjusted if additional monitoring is required. Freeborn will consider a second year of monitoring if the results from the first year suggest a high degree of uncertainty on the level of bird and bat impacts (e.g., results show low searcher efficiency and/or high carcass removal rates that increase the level of uncertainty of actual impact). This decision will be made based on discussions with MNDNR, Iowa DNR, and/or DOC after the final report for the first year of monitoring is complete.

5.4.1.1 Standardized Carcass Searches

Standardized carcass searches will be conducted using two types of surveys:

1) Road-and-pad surveys along access roads and on turbine pads within 60 m (197 ft) of approximately 90% of the turbines[4].
2) Cleared-plot surveys at approximately 10% of the turbines, or at least 10 turbines, along transects within cleared plots measuring 120 x 120-m (394 x 394-ft). These plots will be cleared of all vision-obstructing vegetation.

Surveying the roads and turbine pads generally ensures the highest probability of detection, with the added benefit of obviating crop clearing. Although these searches cover only a portion of the potential carcass deposition area underneath turbines, analytical methods for correcting carcass detection for unsearched area have progressed considerably (Hull and Muir 2010, Huso and Dalthorp 2014). Accurate and relatively precise estimates can be achieved by surveying easily searched areas with a high probability of detection, and using analytical methods to adjust for unsearched area (Huso and Dalthorp 2014). Furthermore, a larger sample of roads and pads (or in this case, the entire facility) can be surveyed for a fixed unit of effort. A larger survey or full census provides additional information about spatial patterns within the facility and evaluation of landscape level variables that might affect carcass rate trends (e.g. distance to water features, relative composition of land cover within a fixed distance). The 60-m (197-ft) road-and-pad search radius should facilitate an efficient road-and-pad survey design, which minimizes the number of bat carcasses that go undetected due to falling (or being moved) outside of the plot radius.

Data collected through cleared-plot surveys will enable the development of a site-specific area correction to adjust estimated carcass rates calculated from carcasses found during road-and-pad searches. The 120 x 120-m (394 x 394-ft) area of cleared plots is expected to capture at least 89% of bat carcasses, based on carcass location data from eight post-construction carcass studies in the Midwest (Barton I and II, BSGF, Elm Creek, Fowler I, II, III [2011], Fowler I, II, III [2012], Grand Ridge I, Moraine II, and Winnebago). Studies used to inform the bat distribution analysis were chosen based on availability of public bat carcass location data. Furthermore, models of bird-fall distributions suggest at least 80% of small-bird carcasses, and 50% of large raptor carcasses may fall within 120 x 120-m (394 x 394-ft) cleared plots (Hull and Muir 2010).

5.4.1.2 Search Intervals

The WEG recommend that “carcass search intervals should be adequate to answer applicable questions at an appropriate level of precision to make general conclusions about the project” (USFWS 2012). The WEG (USFWS 2012) further recommend that carcass search intervals should be adequate for the study’s target species. A weekly search interval is recommended for low risk sites in the MNDNR Protocol (Mixon et al. 2014).

[4] The radius of the largest circle that fits inside a 120-m (394 x 394 ft) square is 60 m (197 ft). Therefore, 100-m (328-ft) radius road-and-pad plots cover more than the greatest extent of a 120-m (394 x 394 ft) cleared plot (out to about 85 m [279 ft] at the corners).

The turbine search schedule and order will be randomized so each turbine's search plot will be sampled at differing periods during the day. If more or less intensive monitoring is deemed necessary following initial data collection (carcass searches and carcass removal trials), the search intervals will be modified, accordingly.

Given the information presented above, road-and-pad searches and cleared-plot searches will be conducted weekly during spring, fall, and summer (March 15-November 15) to estimate all-bird and all-bat carcass rates during the period of highest use. Search intervals will be adjusted if carcass removal data suggest faster removal times during some seasons after the initial data collection.

5.4.2 Field Methods

5.4.2.1 Carcass Search Protocol

During road-and-pad searches, a searcher will walk along the road and around the turbine pad, focusing search efforts for carcasses only on roads and pads. For cleared-plot searches, searchers will walk transects placed 6 m (20 ft) apart within the plot and scan the area on both sides of each transect out to 3 m (10 ft) for carcasses. Searchers will walk at a rate of approximately 45–60 meters per minute (m/min; 2 miles per hour [mph]).

5.4.2.2 Data Collection and Processing

All standardized carcass searches will be conducted by a biologist experienced in conducting carcass searches, including proper assessment and reporting of carcasses. Searchers will be familiar with and able to accurately identify bird and bat species likely to be found at the Project. Any unknown birds and bats or suspected northern long-eared bats discovered during carcass searches will be picked up by an appropriate authority and sent to a qualified expert for positive identification.

For all carcasses found during standardized carcass searches, data recorded will include:

1) Date and time.
2) Initial species identification.
3) Sex, age, and reproductive condition (when identifiable).
4) Global positioning system location.
5) Distance and bearing to turbine.
6) Substrate/ground cover conditions.
7) Condition (intact, scavenged).
8) Any notes on presumed cause of death.
9) Wind speeds and direction and general weather conditions for nights preceding search.

At least one digital picture of each detected carcass will be taken. Bird and bat carcasses will be marked with spray paint and their location will be flagged with a short pin flag so searchers are aware the carcass has already been counted. Carcasses will either be left in place or collected in accordance with federal and state permits (Section 5.3).

Bird and bat carcasses found in non-search areas will be coded as "incidental finds" and otherwise documented in a similar fashion to those found during standard searches. The O&M personnel will be informed of the timing of standardized searches and, in the event that O&M personnel find a carcass or injured animal, they will report it (Section 5.5). Any carcasses found by O&M personnel also will be considered incidental finds. Incidental finds by O&M personnel within search areas will be included in survey summary totals and incorporated in the carcass rate estimates under the assumption that the carcass would have been found during the next search. Incidental finds by O&M personnel in non-search areas will be included in survey summary totals, but will not be included in the carcass rate estimates.

5.4.3 Bias Trials

5.4.3.1 Searcher Efficiency Trials

The objective of the searcher efficiency trials is to estimate the percentage of carcasses that are found by searchers. Searcher efficiency trials will be conducted in the same areas carcass searches occur. Searcher efficiency trials will begin when carcass searches begin. Personnel conducting carcass searches will not know when trials are conducted or the location of the carcasses.

Trials will be conducted to cover all seasons. Searcher efficiency rates will be estimated for each search type (e.g., turbine road and pad, tilled ground and cleared crops), size of carcass (large bird, small bird, and bat), and season (spring, summer, and fall). Estimates of searcher efficiency rates will be used to adjust the total number of carcasses found to account for those expected to be missed by searchers.

To estimate searcher efficiency rates during the road-and-pad and cleared-plot surveys, approximately 15 carcasses of small birds and 10 carcasses of large birds will be placed in search areas during each search season (i.e., spring, summer, and fall), for a total of 75 carcasses. Bird carcasses used for searcher efficiency trials may consist of non-native/non-protected or commercially available species; examples include house sparrows (*Passer domesticus*) and juvenile coturnix quail (*Coturnix coturnix*) representing likely small birds, and rock pigeons (*Columba livia*), mallards (*Anas platyrhynchos*), pheasants (*Phasianus colchicus*), and adult coturnix quail representing large birds. Additional species may be utilized if they are more readily available than examples provided above. To measure detection bias for bats, up to 15 surrogate brown/black mice will be used during each of spring, summer, and fall, for a total of 45 "bat" searcher efficiency trials.

All carcasses will be placed at locations within areas being searched prior to the carcass search, but on the same day. Carcasses will be dropped from shoulder height and allowed to land in a random posture. Each trial carcass will be discreetly marked with a black zip-tie around the leg for birds or around the upper arm for bats (front leg for bat surrogates) prior to dropping so that it can be identified as a study carcass after it is found. The number and location of the detection carcasses found during the carcass search will be recorded. The number of carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses.

5.4.3.2 Carcass Removal Trials

The objective of carcass removal trials is to estimate the likelihood a carcass is available to be found as a function of the number of days it has been on the ground. Carcass removal includes removal by predation/scavenging or removal by other means, such as being plowed into a field. Carcass removal trials will be conducted approximately monthly to adequately cover all seasons and crop cover conditions. Estimates of carcass removal rates will be used to adjust the total number of carcasses found for those removed from the search area, correcting for removal bias.

Carcass removal trials will begin when carcass search studies begin. Trials will be placed on representative habitat within the facility, but at a great enough distance from turbines to avoid increasing risk to eagles and scavenging raptors, and avoid carcass swamping at searched turbines. To estimate carcass removal rates during the road-and-pad and cleared-plot surveys, approximately 15 carcasses of small birds and 10 of large birds will be placed along access roads within the facility, but outside of the search areas during each search season (i.e., spring, summer, and fall), for a total of 75 bird trial carcasses. Bird carcasses will consist of species similar to searcher efficiency trial specimens. In addition to birds, up to 10 carcass removal trials for bats will be performed during the spring, summer, and fall seasons, for a total of up to 30 trials. As for the searcher efficiency trials, bat carcass removal trials will be conducted using brown/black mice carcasses as a surrogate for bats.

As for the searcher efficiency trials, carcasses will be dropped from shoulder height and allowed to land in a random posture. Each trial carcass will be discreetly marked with a black zip-tie around the leg for birds or around the upper arm for bats (front leg for bat surrogates) prior to dropping so that it can be identified as a study carcass if it is found by other searchers or wind facility personnel.

Personnel conducting carcass searches will monitor the trial birds over a 30-day period according to the following schedule, as possible. Carcasses will be checked every day for the first four days, then on days 7, day 10, day 14, day 20, and day 30. This schedule may vary depending on weather and coordination with the other survey work. Experimental carcasses will be left at the location until the end of the carcass removal trial. At the end of the 30-day period, any evidence of the carcasses that remain will be removed from the search plot.

5.5 Incidental Monitoring

An incidental reporting process will be developed for operations personnel ensuring they can document bird or bat casualties during routine maintenance work and at other times they are within the Project area. Freeborn will provide operations personnel with materials (e.g., posters) describing the incidental reporting process and reporting resources. Incidentally found wildlife will be documented for the life of the Project to identify wildlife concerns, should they arise.

5.6 Statistical Methods for Estimating Carcass Rates

Carcass rate estimation is a complex task due to a number of variables present in every study. Animal fatalities occur at an unknown rate, carcasses persist for variable amounts of time, and carcass detection is variable, based on carcass characteristics and ground cover. Fortunately, methods have been developed to account for these auxiliary variables in the estimation of carcass rates.

Estimates of facility-related carcass rates are based on:

1) Observed number of carcasses found during standardized searches during the monitoring year for which the cause of death is either unknown or is potentially facility-related.
2) Non-removal rates expressed as the estimated average probability a carcass is expected to remain in the search area and be available for detection by the searchers during scavenger removal trials.
3) Searcher efficiency expressed as the proportion of planted carcasses found by searchers during searcher efficiency trials.
4) Search area adjustment based on the plot size and carcass density.

Carcass rate estimates will be provided for the following groups, as appropriate, based on the results of the standardized carcass searches: (1) all birds, (2) small birds, (3) large birds, (4) raptors, (5) eagles, and (6) bats. The total number of carcasses found during standardized road-and-pad and cleared-plot searches will be tallied for each of the groups listed above. For each group, carcass rate estimates will be calculated by adjusting for carcass removal rates, searcher efficiency rates, and (when appropriate) the proportion of carcasses expected to fall on roads and pads. In general, bias-adjusted carcass rate estimates are calculated via an equation of the form (Huso 2010, Korner-Nievergelt et. al 2011):

$$F = \frac{C}{r * p * A}$$

where F is the adjusted carcass rate estimate, C is the number of carcasses detected, r is the probability a carcass is available to be found, p is the probability a carcass is detected, and A is density-weighted area correction for road and pad plots ($A = 1$ for cleared plots).

There are several carcass rate estimators that can be used for post-construction monitoring studies at wind energy facilities (e.g., Shoenfeld 2004, Huso 2010, Korner-Nievergelt et. al 2011). Some estimators are more appropriate under particular field conditions (e.g., removal time, search interval, detection probability) due to inherent biases in all estimators. The Huso (2010) estimator was demonstrated to be relatively robust under a wide range of field condition. Therefore, the Huso estimator will be used to estimate carcass rates for the Project; however, if a more appropriate carcass rate estimator is available at the time of analysis, and its implementation is agreed upon by all parties involved, then it may be implemented in lieu of the Huso estimator.

The estimates and 90% confidence intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances, and confidence intervals for complicated test statistics. A total of 1,000 bootstrap replicates will be used. The lower 5th and upper 95th percentiles of the 1,000 bootstrap estimates will provide estimates of the lower limit and upper limit of an approximate 90% confidence interval on all estimates.

To account for unsearched area, a carcass density-weighted proportion of area approach is used to adjust carcass rate estimates found in searched areas (Huso and Dalthorp 2014). Separate estimates are calculated for birds and bats. A density-weighted approach assigns more weight to areas nearer the turbine (where carcass density is higher), and less weight to areas farther from the turbine (where carcass density is low). The result is an estimate of the proportion of carcasses expected to land within searched and unsearched areas around a turbine. Data collected from searched areas at the Project will be used to derive density models for birds and bats. If carcass counts are low, the carcass density distribution will be estimated using a Bayesian approach (Gelman et al. 2013), and publicly available prior data on bird and bat distances from turbines in the U.S. will be used in conjunction with the Project's data.

5.7 Data Analysis and Reporting

5.7.1 Quality Assurance and Quality Control

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

5.7.2 Data Compilation and Storage

A database will be developed to store, organize, and retrieve survey data. Data will be keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. All data forms, field notebooks, and electronic data files will be retained for reference.

5.7.3 Data Analysis

Analysis of data collected during the post-construction monitoring study will include spring, summer, and fall season carcass rate estimates for bats and spring, summer, and fall carcass rate estimates of birds. Data analysis will be performed to assess carcass estimates by turbine location. Data also may be analyzed to determine the influence of factors such as date and location on bird and bat carcass rates.

A variety of statistical tests may be applied to the data to analyze the patterns of estimated carcass rates in relationship to species/genera/taxa, season, and location. Data will be analyzed using

appropriate statistical procedures. Tests will be selected based on the parameter(s) under analysis, the ability of the data to meet test assumptions, and the suitability of tests for different forms of data. While statistical tests will not be used to correlate carcasses with weather variables, Freeborn will qualitatively evaluate carcass events with regards to notable weather events.

5.7.4 Reporting

Freeborn will prepare an internal annual carcass monitoring report following the completion of post-construction monitoring. The report will include carcass rate estimates and data summaries. Estimated carcass rates will be expressed both in terms of carcasses/turbine/year and carcasses/megawatt/year, as recommended by the WEG (USFWS 2012). This approach will facilitate comparison with other studies. The reports will include data analyses, including overall carcass rate estimates and a discussion of monitoring results and their implications.

If federal and state collection permits are obtained, Freeborn will report carcasses in accordance with the permit requirements. Freeborn will report any federally listed species or eagle carcasses found to the USFWS within one business day after species' identification confirmation.

6 ADAPTIVE MANAGEMENT

6.1 Adaptive Management Goals

The goals of the adaptive management plan are to enable the incorporation of results from the post-construction monitoring, O&M incidental reporting, industry research, and new regulatory developments into the Project's bird and bat avoidance and minimization strategy. Certain trigger events and potential subsequent changes to the avoidance and minimization strategy have been defined as a part of the adaptive management plan to guide the adaptive management process. If the avoidance and minimization measures are not producing the desired results, adjustments will be made, as necessary, to reduce impacts to birds and bats.

6.2 Adaptive Management Triggers and Responses

Adaptive management measures for the Project will be triggered by the following events, which are further defined below:

- Greater-than-expected bird or bat carcass rates (Section 3.4)
- Mass casualty event (five or more carcasses documented at the Project in a five-day period)
- Discovery of a federally listed species carcass or eagle carcass
- Discovery of a new and/or active eagle nest

Freeborn understands that unanticipated events beyond these adaptive management triggers may arise, and Freeborn will report and coordinate with the USFWS and MNDNR or Iowa DNR as necessary and appropriate to address any unanticipated issues. If appropriate, Freeborn will conduct additional specific, targeted monitoring to determine if adaptive management measures are necessary and/or effective.

6.2.1 Greater-than-predicted Bird or Bat Carcass Rates or Mass Casualty Event

Avian and bat carcass rates at the Project are expected to be within the range or lower than those reported for similar facilities in southern Minnesota and northern Iowa. The adaptive management triggers, based on the maximum bird and bat carcass rates from wind facilities in the region or a mass casualty event, will be structured to indicate whether the initial risk characterization was accurate and identify whether certain factors have changed from the pre-construction conditions. Consequently, these triggers will communicate when risk re-evaluation from Project operation may be necessary.

If carcass rates are greater than the expected range (Section 3.4) and are likely to exceed certain thresholds by species, or a mass casualty event is documented, Freeborn will meet and confer with the USFWS, MNDNR, Iowa DNR, and/or DOC, as appropriate. If a particular cause can be identified, Freeborn will develop specific mitigation measures in consultation with appropriate agencies to address the occurrence. Examples of potential adaptive management responses may include:

- Remove/modify the source of bird attraction
- Implement turbine operational protocols designed to reduce bird or bat carcass discoveries and target the particular issue identified during monitoring
- Implement technological solutions if new techniques or technology become available that are cost-effective and feasible to implement

6.2.2 Discovery of a Federally Listed Species' Carcass or Eagle Carcass

If a federally listed species' carcass or eagle carcass is found at the Project, Freeborn will take the following actions:

- Identify and secure the carcass at the place of its discovery in the field until USFWS Office of Law Enforcement (OLE) personnel can be reached and provide further instruction for carcass storage or pickup
- Notify the USFWS OLE within one business day of the discovery and positive species identification confirmation
- Notify the MNDNR and/or Iowa DNR in accordance with any state collection permits obtained
- Work with the USFWS to evaluate available data related to the carcass discovery and, as appropriate, identify and implement avoidance or minimization measures to reduce the risk of future fatalities; such measures may include adjusting the operational protocol at specific turbines during specific weather conditions or seasonal periods, followed by a year of carcass monitoring to assess whether the avoidance or minimization measures are sufficient
- Assess the need to obtain take authorization under the ESA or BGEPA in light of the new information

6.2.3 Discovery of a New and/or Active Eagle Nest

Freeborn will notify the USFWS if a new and/or active bald eagle nest is identified within 800 m (2,625 ft) of an operating turbine. If appropriate, Freeborn may elect to monitor eagle activity in and around the eagle nest. In coordination with USFWS, Freeborn may implement operational measures, such as turbine curtailment, to reduce collision risk to eagles. Additionally, after the nesting season, Freeborn will consider seeking a permit to remove the eagle nest in coordination with the USFWS and MNDNR or Iowa DNR.

7 KEY RESOURCES

Resource	Phone Number
Black Hawk County Rehab Tammy Lea Wood Box 172/106 Hampton Street Rudd, IA 50471	641-220-1957
Black Hawk Wildlife Refuge Connie Devries 501 18th Ave Charles City, IA 50616	614-220-1129
Wildlife Rehabilitation Jim Mason 900 Main Street Janesville, IA 50647	319-987-8232
U.S. Fish and Wildlife Service, Minnesota Twin Cities Field Office	952-252-0092
U.S. Fish and Wildlife Service, Iowa Rock Island Field Office	309-757-5800
Minnesota Department of Natural Resources	651-296-6157
Iowa Department of Natural Resources	515-725-8200
Freeborn Wind Farm Operations & Maintenance	TBD

8 LITERATURE CITED

8.1 Laws, Acts, and Regulations

16 United States Code (USC) §§ 1531-1599. 1973. Title 16 - Conservation; Chapter 35 - Endangered Species; Sections (§§) 1531-1599. Endanged Species Act. 16 USC 1531-1599. P.L. 93-205, 84 Stat. 884 (codified as amended).

16 United States Code (USC) §§ 668 - 668d. 1940. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter Ii - Protection of Bald and Golden Eagles; Sections (§§) 668-668d - Bald and Golden Eagles. 16 USC 668-668d. (June 8, 1940, Chapter [Ch.] 278, § 1,54 Statute [Stat.] 250; Public Law [Pub. L.] 86–70, Section [§] 14, June 25, 1959, 73 Stat. 143; Pub. L. 87–884, October 24, 1962, 76 Stat. 1246; Pub. L. 92–535, § 1,October 23, 1972, 86 Stat. 1064).

16 United States Code (USC) 703-711. 1973. Title 16 - Conservation; Chapter 7 - Protection of Migratory Game and Insectivorous Birds; Subchapter Ii - Migratory Bird Treaty; Sections (§§) 703-711. 16 Usc 703-711. Available online at: http://www.gpo.gov/fdsys/pkg/USCODE-2010-title16/pdf/USCODE-2010-title16-chap7-subchapII.pdf

33 Code of Federal Regulations (CFR) 323. 1999. Title 33 - Navigation and Navigable Waters; Part 323 - Water Pollution Control; Waterways.

50 Code of Federal Regulations (CFR) § 10.12. 2010. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§)10.12. Definitions. 50 CFR 10.12. [38 Federal Register (FR) 22015, Augugust 15, 1973, as amended at 42 FR 32377, June 24, 1977; 42 FR 59358, November 16, 1977; 45 FR 56673, August 25, 1980; 50 FR 52889, December 26, 1985; 72 FR 48445, August 23, 2007].

50 Code of Federal Regulations (CFR) § 10.13. 1973. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§)10.13. List of Migratory Birds. 50 CFR 10.13; 38 Federal Register (FR) 22015, August 15, 1973, as amended 50 FR 52889, December 26, 1985.

50 Code of Federal Regulations (CFR) 22.26. 2009. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.26 - Permits for Eagle Take That Is Associated with, but Not the Purpose of, an Activity. 50 CFR 22.26. [74 Federal Register (FR) 46877, September 11, 2009, as amended at 79 FR 73725, December 9, 2013].

50 Code of Federal Regulations (CFR) 22.27. 2009. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.26 - Removal of Eagle Nests. 50 CFR 22.26. [74 FR 46877, September 11, 2009; 79 FR 46877 October 1, 2012.

50 Code of Federal Regulations (CFR) 22.3. 1974. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart a - Introduction; Section (§) 22.3 - Definitions. 50 CFR 22.3. [39 Federal Register (FR) 1183, January 4, 1974, as amended at 48 FR 57300, December 29, 1983; 64 FR 50472, September 17, 1999; 72 FR 31139, June 5, 2007; 74 FR 46876, September 11, 2009].

77 Federal Register (FR) 58: 17496-17498. 2012. United States Fish and Wildlife Service, Department of the Interior. Fisheries and Habitat Conservation and Migratory Birds Programs; Final Land-Based Wind Energy Guidelines. March 26, 2012.

80 Federal Register (FR) 63: 17974-18033. 2015. 50 Cfr 17. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(D) Rule. Final rule, and interim rule with request for comments. Department of the Interior Fish and Wildlife Service. 80 FR 63: 17974-18033. April 2, 2015. Available online at: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf

81 Federal Register (FR) 9: 1900-1922. 2016. 50 Cfr 17. Endangered and Threatened Wildlife and Plants; 4(D) Rule for the Northern Long-Eared Bat. Final rule. Department of the Interior Fish and Wildlife Service. 81 FR 9: 1900-1922. January 14, 2016. Available online at: http://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/FRnlebFinal4dRule14Jan2016.pdf

8.2 Literature

Auch, R. F. 2014. Western Corn Belt Plains Ecoregion Summary. U.S. Geological Survey (USGS) Land Cover Trends Project. USGS Center for Earth Resources Observation and Science, Sioux Falls, South Dakota. Available online at: http://landcovertrends.usgs.gov/gp/eco47Report.html#_ftn1

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, California.

Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC, Washington D.C.

Bat Conservation International (BCI). 2015. Bat Species: Us Bats. BCI website. BCI, Inc., Austin, Texas. Range GIS data from 2009. Homepage: http://www.batcon.org; Species profiles available online at: http://batcon.org/index.php/all-about-bats/species-profiles.html

BHE Environmental, Inc. (BHE). 2010. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2010.

Chodachek, K., C. Derby, D. Bruns Stockrahm, P. Rabie, K. Adachi, and T. Thorn. 2014. Bat Fatality Rates and Effects of Changes in Operational Cut-in Speeds at Commercial Wind Farms in Southern Minnesota - Year 1: July 9 - October 31, 2013. Prepared for Minnesota Department of Commerce, St. Paul, Minnesota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota, and Minnesota State University Moorhead, Moorhead, Minnesota. May 23, 2014. Available online at: http://mn.gov/commerce/energyfacilities/documents/MNDOC,%20Bat%20Fatality%20Study%20Year%201,%205.23.14.pdf

Chodachek, K., C. Derby, M. Sonnenberg, and T. Thorn. 2012. Post-Construction Fatality Surveys for the Pioneer Prairie Wind Farm I Llc Phase Ii, Mitchell County, Iowa: April 4, 2011 – March 31, 2012. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 27, 2012.

Cryan, P. M. 2008. Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines. Journal of Wildlife Management 72(3): 845-849. doi: 10.2193/2007-371.

Cryan, P. M. and A. C. Brown. 2007. Migration of Bats Past a Remote Island Offers Clues toward the Problem of Bat Fatalities at Wind Turbines. Biological Conservation 139: 1-11. doi:10.1016/j.biocon.2007.05.019.

Derby, C., K. Chodachek, and K. Bay. 2010a. Post-Construction Bat and Bird Fatality Study Crystal Lake Ii Wind Energy Center, Hancock and Winnebago Counties, Iowa. Final Report: April 2009- October 2009. Prepared for NextEra Energy Resources, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 2, 2010.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010b. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010c. Post-Construction Fatality Surveys for the Moraine Ii Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010d. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009 - February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011. Post-Construction Fatality Surveys for the Barton I and Ii Wind Project: Iri. March 2010 - February 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: September 28, 2011.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012. Post-Construction Fatality Surveys for the Elm Creek Ii Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.

Elliott-Smith, E. and S. M. Haig. 2004. Piping Plover (*Charadrius Melodus*). A. Poole, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. http://bna.birds.cornell.edu/bna/species/002; doi: 10.2173/bna.2

Erickson, W. P., G. D. Johnson, D. P. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared for Bonneville Power Administration, Portland, Oregon by WEST, Inc., Cheyenne, Wyoming. December 2002. http://www.bpa.gov/Power/pgc/wind/Avian_and_Bat_Study_12-2002.pdf

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka, and R. E. Good. 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Bird Collision Mortality in the United States. National Wind Coordinating Collaborative (NWCC) Publication and Resource Document. Prepared for the NWCC by WEST, Inc., Cheyenne, Wyoming. August 2001.

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

ESRI. 2016. World Imagery and Aerial Photos. ArcGIS Resource Center. ESRI, producers of ArcGIS software. Redlands, California.

Federal Aviation Administration (FAA). 2000. Obstruction Marking and Lighting. AC 70/7460-1K. Available online at http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/b993dcdfc37fcdc486257251005c4e21

Federal Aviation Administration (FAA). 2007. Obstruction Marking and Lighting. Advisory Circular. AC 70/7460-1K. US Department of Transportation, FAA. Effective February 1, 2007. Available online at: http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2070%207460-1K.pdf

Fernley, J., S. Lowther, and P. Whitfield. 2006. A Review of Goose Collisions at Operating Wind Farms and Estimation of the Goose Avoidance Rate. Unpublished report. West Coast Energy, Hyder Consulting and Natural Research.

Foster, R. W. and A. Kurta. 1999. Roosting Ecology of the Northern Bat (*Myotis septentrionalis*) and Comparisons with the Endangered Indiana Bat (*Myotis sodalis*). Journal of Mammalogy 80: 659-672.

Gelman, A., J. B. Carlin, H. S. Stern, D. B. Dunson, A. Vehtari, and D. B. Rubin. 2013. Bayesian Data Analysis. CRC Press, London.

Goetzman, K. 2014. Our Golden Eagles. Minnesota Conservation Volunteer January-February 2014: 8-21.

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Henderson, L. E. and H. G. Broders. 2008. Movements and Resource Selection of the Northern Long-Eared Myotis (*Myotis septentrionalis*) in a Forest-Agriculture Landscape. Journal of Mammalogy 89: 952-963.

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online from: http://www.mrlc.gov/nlcd2011.php

Howe, R. W., W. Evans, and A. T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.

Hull, C. and S. Muir. 2010. Search Area for Monitoring Bird and Bat Carcasses at Wind Farms Using a Monte-Carlo Model. Australian Journal of Environmental Management 17:77-87.

Huso, M. 2010. An Estimator of Wildlife Fatality from Observed Carcasses. Environmetrics 22(3): 318–329. doi: 10.1002/env.1052.

Huso, M. M. P. and D. Dalthorp. 2014. Accounting for Unsearched Areas in Estimating Wind Turbine-Caused Fatality. Journal of Wildlife Management 78(2): 347-358. doi: 10.1002/jwmg.663.

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. M.S. Thesis. Iowa State University, Ames, Iowa.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000. Final Report: Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. http://www.west-inc.com

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2003. Mortality of Bats at a Large-Scale Wind Power Development at Buffalo Ridge, Minnesota. The American Midland Naturalist 150: 332-342.

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Kerlinger, P., R. Curry, A. Hasch, and J. Guarnaccia. 2007. Migratory Bird and Bat Monitoring Study at the Crescent Ridge Wind Power Project, Bureau County, Illinois: September 2005 - August 2006. Final draft prepared for Orrick Herrington and Sutcliffe, LLP. May 2007.

Kochert, M. N., K. Steenhof, C. L. Mcintyre, and E. H. Craig. 2002. Golden Eagle (*Aquila Chrysaetos*). A. Poole, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/684; doi: 10.2173/bna.684

Korner-Nievergelt, F., P. Korner-Nievergelt, O. Behr, I. Niermann, R. Brinkmann, and B. Hellriegel. 2011. A New Method to Determine Bird and Bat Fatality at Wind Energy Turbines from Carcass Searches. Wildlife Biology 17: 350-363.

Kunz, T. H., E. B. Arnett, B. M. Cooper, W. P. Erickson, R. P. Larkin, T. Mabee, M. L. Morrison, M. D. Strickland, and J. M. Szewczak. 2007a. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management 71(8): 2449-2486. Available online at: http://www.batsandwind.org/pdf/Assessing%20Impacts%20of%20wind-energy%20development%20on%20bats%20and%20birds.pdf

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007b. Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. Frontiers in Ecology and the Environment 5(6): 315-324. Available online at: https://www.bu.edu/cecb/files/2009/12/kunzbats-wind07.pdf

Liguori, J. 2005. Hawks from Every Angle: How to Identify Raptors in Flight. Princeton University Press, Princeton, New Jersey.

Manly, B. F. J. 1997. Randomization, Bootstrap, and Monte Carlo Methods in Biology. second Edition. Chapman and Hall, London.

Mattson, T., K. Chodachek, S. Hamilton, and S. Agudelo. 2015. Raptor Nest Survey Results for the Rock Creek Wind Project, Atchison and Nodaway Counties, Missouri. Final Report: July 27, 2015. . Prepared for Rock Creek Wind Project, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota.

Minnesota Department of Natural Resources (MNDNR). 2011. Minnesota Department of Natural Resources Guidance for Commercial Wind Energy Projects. October 1, 2011. Available online at: http://files.dnr.state.mn.us/publications/ewr/dnr_wind_energy_project_guidance_2011.pdf

Minnesota Department of Natural Resources (MNDNR). 2015a. Areas of Biodiversity Significance in Minnesota. MBS Site Biodiversity Significance Ranks, Minnesota Biological Survey (MBS). MNDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html

Minnesota Department of Natural Resources (MNDNR). 2015b. Waterfowl refuges and sanctuaries. Accessed February 2015. Information available online at: http://www.dnr.state.mn.us/wildlife/shallowlakes/refuges.html

Minnesota Department of Natural Resources (MNDNR). 2016a. Recreation Compass. Accessed September 2016. Information available online at: http://www.dnr.state.mn.us/maps/compass.html

Minnesota Department of Natural Resources (MNDNR). 2016b. First new bat species discovered in Minnesota in more than a century. MNDNR News Release (August 1). Available online at: http://news.dnr.state.mn.us/2016/08/01/first-new-bat-species-discovered-in-minnesota-in-more-than-a-century/

Mixon, K. L., J. Schrenzel, D. Pile, R. Davis, R. Doneen, L. Joyal, N. Kestner, M. Doperalski, and J. Schladweiler. 2014. Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota. Minnesota Department of Natural Resources. New Ulm, Minnesota. 41 pp.

National Audubon Society (Audubon). 2014. The Important Bird Areas. Updated June 2014. IBAs by state available online at: http://www.audubon.org/bird/iba

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects. National Academies Press. Washington, D.C. www.nap.edu

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Ornithological Council, The. 2007. Critical Literature Review: Impact of Wind Energy and Related Human Activities on Grassland and Shrub-Steppe Birds. Prepared for the National Wind Consulting Council. Literature Review by S. Mabey and E. Paul. October 2007.

Pardieck, K. L., D. J. Z. Jr., and M.-A. R. Hudson. 2014. North American Breeding Bird Survey Dataset 1966 - 2013. Version 2013.0. US Geological Survey [USGS] Patuxent Wildlife Research Center. Laurel, Maryland. Raw data retrieval available online at: www.pwrc.usgs.gov/BBS/RawData/

Pedersen, M. B. and E. Poulsen. 1991. Impact of a 90m/2mw Wind Turbine on Birds - Avian Responses to the Implementation of the Tjaereborg Wind Turbine at the Danish Wadden Sea. Dansek Vildundersogelser 47: 1-44. Miljoministeriet & Danmarks Miljoundersogelser.

Pompei, V. D. and F. J. Cuthbert. 2004. Spring and Fall Distribution of Piping Plovers in North America: Implications for Migration Stopover Conservation. Unpublished report submitted to US Army Corps of Engineers.

Preston, C. R. 1990. Distribution of Raptor Foraging in Relation to Prey Biomass and Habitat Structure. Condor 92: 107-112.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.

Rosenzweig, M. L. 1989. Habitat Selection, Community Organization, and Small Mammal Studies. Pp. 5-21. *In*: D. W. Morris, Z. Abramsky, B. J. Fox, and M. R. Willig, eds. Patterns in the Structure of Mammalian Communities. Texas Tech University Press, Lubbock, Texas.

Shaffer, J. A. and D. H. Johnson. 2008. Displacement Effects of Wind Developments on Grassland Birds in the Northern Great Plains. Presented at the Wind Wildlife Research Meeting VII, Milwaukee, Wisconsin. Wind Wildlife Research Meeting VII Plenary. October 28-29, 2008.

Shaffer, J. A., D. H. Johnson, and D. A. Buhl. 2012. Avoidance of Wind Generators by Breeding Grassland Birds. Poster presented at the 5th North American Ornithological Conference, August 14 - 18, Vancouver, Canada.

Shaw, S. and C.G. Fredine. 1956. Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife. Washington D.C. Department of the Interior, Fish and Wildlife Service, Office of the River Basin Studies. Circular 39.

Shoenfeld, P. 2004. Suggestions Regarding Avian Mortality Extrapolation. Technical memo provided to FPL Energy. West Virginia Highlands Conservancy, HC70, Box 553, Davis, West Virginia, 26260. Available online at: https://www.nationalwind.org/wp-content/uploads/2013/05/Shoenfeld-2004-Suggestions-Regarding-Avian-Mortality-Extrapolation.pdf

Simon, S. and T. Mattson. 2016a. Site Characterization Study Report for the Freeborn Wind Energy Project, Freeborn County, Minnesota. Final Report. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 32 pages.

Simon, S. and T. Mattson. 2016b. Eagle Nest Survey for the Freeborn Wind Project, Freeborn County, Minnesota. Final Report: March 29 – 31, 2016. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 6 pages.

Simon, S. and T. Mattson. 2016c. Avian Studies for the Freeborn Wind Energy Project, Freeborn County, Minnesota. Final Report: January 2015 – March 2016. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 44 pages + appendices.

Simon, S. and T. Mattson. 2016d. Bat Acoustic Study for the Freeborn Wind Energy Project, Freeborn County, Minnesota. Final Report: April 14 – November 14, 2015. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 24 pages.

Simon, S. and T. Mattson. 2016e. Native Prairie Evaluation, Freeborn Wind Energy Project, Freeborn County, Minnesota. Final Report: September 2015. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. August 26, 2016. 6 pages + appendix.

Simon, S. and T. Mattson. 2016f. Preliminary Water Resource Evaluation, Freeborn Wind Energy Project, Freeborn County, Minnesota. April 9, 2015. Prepared for Freeborn Wind Energy LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. August 26, 2016. 9 pages.

Simon, S., R. Duncan, and T. Mattson. 2017a. Site Characterization Study Report, Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota, and Worth County, Iowa. Final Report. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 46 pages.

Simon, S., R. Duncan, and T. Mattson. 2017b. Native Prairie Evaluation, Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota, and Worth County, Iowa. Final Report. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 10 pages + appendix.

Simon, S., R. Duncan, and T. Mattson. 2017c. Water Resource Evaluation, Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota, and Worth County, Iowa. Final Report. Prepared for Freeborn Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 9 pages.

Spaans, A., L. van der Bergh, S. Dirksen, and J. van der Winden. 1998. Windturbines En Volgles: Hoe Hiermee Om Te Gaan? (Wind Turbines and Birds: Can They Co-Exist?). De Levende Naturr 99(3): 115-121.

Sullivan, B.L., C.L. Wood, M.J. Iliff, R.E. Bonney, D. Fink, and S. Kelling. 2009. eBird: a citizen-based bird observation network in the biological sciences. Biological Conservation 142:2282-2292.

U.S. Department of Agriculture (USDA). 2014. Imagery Programs - National Agriculture Imagery Program (Naip). USDA - Farm Service Agency (FSA). Aerial Photography Field Office (APFO), Salt Lake City, Utah. Last updated September 2014. Information available online at: http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

U.S. Environmental Protection Agency (USEPA). 2014. National Pollutant Discharge Elimination System (Npdes). Last updated July 21, 2014. Information online at: http://water.epa.gov/polwaste/npdes/

U.S. Fish and Wildlife Service (USFWS). 2011. Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects. Revised October 26, 2011. Available online at: http://www.fws.gov/midwest/endangered/mammals/inba/pdf/inbaS7and10WindGuidanceFinal26Oct2011.pdf

U.S. Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online at: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

U.S. Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online at: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

U.S. Fish and Wildlife Service (USFWS). 2014. Northern Long-Eared Bat Interim Conference and Planning Guidance. USFWS Regions 2, 3, 4, 5, and 6. January 6, 2014. Available online at: http://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf

U.S. Fish and Wildlife Service (USFWS). 2015a. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(D) Rule; Final Rule and Interim Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. 80 Federal Register (FR) 63: 17974-18033. April 2, 2015. Available online at: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf

U.S. Fish and Wildlife Service (USFWS). 2015b. Initial Project Scoping: Ipac - Information, Planning, and Conservation System. IPaC, Environmental Conservation Online System (ECOS), USFWS. Last updated March 2015. USFWS Endangered Species Program homepage: http://www.fws.gov/endangered/; Environmental Conservation Online System (ECOS): http://ecos.fws.gov/ecos/indexPublic.do; IPaC: http://ecos.fws.gov/ipac/; IPaC Initial Poject Scoping: http://ecos.fws.gov/ipac/wizard/chooseLocation!prepare.action;jsessionid=C7EFBBD36C261B68BA38B5CD30A7584C

U.S. Fish and Wildlife Service (USFWS). 2015c. Piping Plover (*Charadrius Melodus*). USFWS Environmental Conservation Online System (ECOS) Species Profile. Accessed February 2015. ECOS available at: http://ecos.fws.gov/ecos/indexPublic.do; Piping plover species profile available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B079

U.S. Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (Nlcd 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Information available online at: http://www.mrlc.gov/nlcd2011.php; Legend information available at: http://www.mrlc.gov/nlcd11_leg.php

U.S. Geological Survey (USGS). 2013. Migration of Birds: Routes of Migration. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Accessed February 2015. Available online at: http://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rtcref/ch2.3/2014-12-19_USGS2013_MigrationofBirds.pdf

U.S. Geological Survey (USGS). 2016. National Hydrography Dataset (Nhd). USGS NHD Extracts: North Dakota. Last accessed February 2016. Information available online at: http://nhd.usgs.gov/; State data available online at: ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/

U.S. Geological Survey (USGS). 2016. Version 10.22. ArcGIS Rest Services Directory. Streaming data. The National Map, USGS. Last updated September 2016. Data from: https://basemap.nationalmap.gov/arcgis/rest/services

Winkelman, E. 1990. Impact of the Wind Park near Urk, Netherlands, on Birds: Bird Collision Victims and Disturbance of Wintering Fowl. International Ornithological Congress 20: 402-403.

8.3 Studies Used to Estimate Midwest Bat Distance Distribution

Barton I and II

Western EcoSystems Technology, Inc. (WEST). 2011. Post-Construction Fatality Surveys for the Barton Chapel Wind Project: Iberdrola Renewables. Version: July 2011. Iberdrola Renewables, Portland, Oregon.

BSGF

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Elm Creek

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Fowler I, II, III (2011)

Good, R. E., A. Merrill, S. Simon, K. Murray, and K. Bay. 2012. Bat Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana: April 1 - October 31, 2011. Prepared for the Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 31, 2012.

Fowler I, II, III (2012)

Good, R. E., M. Sonnenburg, and S. Simon. 2013. Bat Evaluation Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana: August 1 - October 15, 2012. Prepared for the Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 31, 2013.

Grand Ridge I

Derby, C., J. Ritzert, and K. Bay. 2010. Bird and Bat Fatality Study, Grand Ridge Wind Resource Area, Lasalle County, Illinois. January 2009 - January 2010. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. July 13, 2010. Revised January 2011.

Moraine II

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010. Post-Construction Fatality Surveys for the Moraine II Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Winnebago

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.