

## **Appendix G – Tier 1/Tier 2 Studies**

**Site Characterization Study**  
**Freeborn Wind Energy Project Expansion Area**  
**Freeborn County, Minnesota and Worth County, Iowa**

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**Final Report**



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## 1 INTRODUCTION

Freeborn Wind Energy, LLC (Freeborn) is considering the development of the Freeborn Wind Energy Project (Project) and Expansion Area (Project Expansion Area) in Freeborn County, Minnesota and Worth County, Iowa (Figure 1). To support development of the Project Expansion Area, Freeborn requested Western EcoSystems Technology, Inc. (WEST) conduct a biological site characterization study of the Project Expansion Area in accordance with Tiers 1 and 2 preliminary site evaluation and site characterization recommendations set forth in the United States (U.S.) Fish and Wildlife Service's (USFWS) *Land-based Wind Energy Guidelines* (USFWS 2012). The objectives and purpose of this report are to identify and characterize biological resources present within and surrounding the Project Expansion Area, addressing the Tier 1 and Tier 2 questions outlined in the WEG (USFWS 2012). Additionally, this report outlines the process followed and summarizes potential species of interest, sensitive ecological environments, and bird species common to the region.

Freeborn expanded the Project area for potential siting of wind energy facilities to include additional areas in Minnesota and Iowa. A similar site characterization study was conducted for the original Project area in Freeborn County, Minnesota, and was summarized in a previous report (Simon and Mattson 2016).

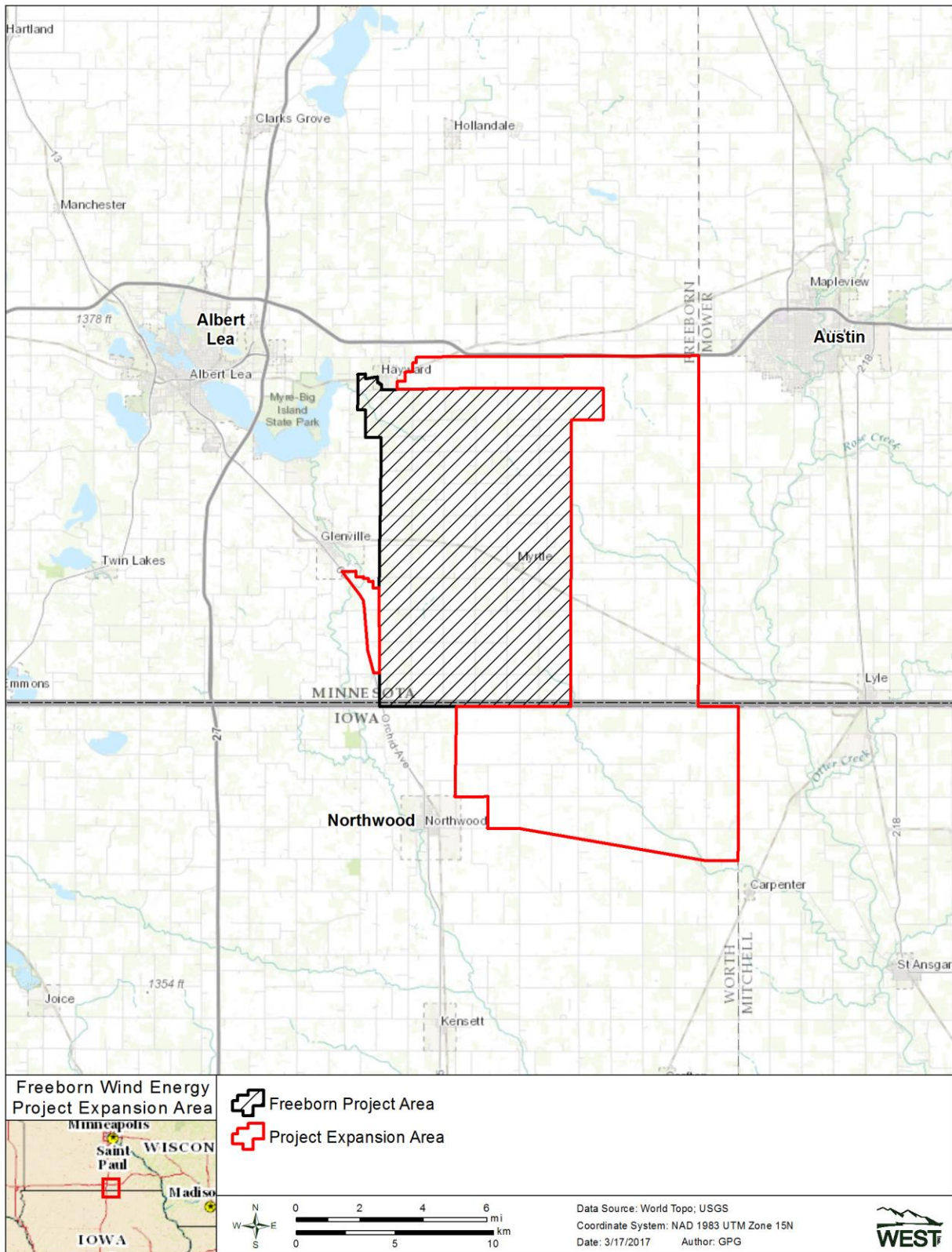


Figure 1. Location of the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.

## 2 STUDY AREA

The Project Expansion Area encompasses 22,482 hectares (ha; 55,553 acres [ac]) in Freeborn County, Minnesota and Worth County, Iowa (Figure 1). The Project Expansion Area in Minnesota is generally located between the cities of Albert Lea and Austin; the Project Expansion Area in Iowa is located east of the city of Northwood. The original Project area is also shown on Figure 1 for reference.

The Project Expansion Area is located in the Eastern Iowa and Minnesota Drift Plains Level IV Ecoregion, within the Western Corn Belt Plains Level III Ecoregion (U.S. Environmental Protection Agency [USEPA] 2016), which covers much of Iowa and portions of southern Minnesota and eastern Nebraska. The Western Corn Belt Plains Ecoregion is composed of glaciated till plains and undulating loess plains. Much of the region was originally dominated by tallgrass prairie, riparian forest, oak-prairie savannas, and woody and herbaceous wetlands. Today, most of the area has been cleared for agricultural production and the predominant land cover type is cultivated crops (e.g., corn [*Zea mays*], soybeans [*Glycine max*]; see Section 4.1, *Land Cover*).

Many smaller streams in the Project Expansion Area have been tilled, ditched, and tied into existing drainage systems, resulting in a reduction in wetland and aquatic habitats in this ecoregion (USEPA 2016). Several streams are present in and adjacent to the Project Expansion Area, including Orchard Creek, Woodbury Creek, and Mud Lake Creek in the eastern Project Expansion Area, Deer Creek in the southern Project Expansion Area, and a small segment of the Shell Rock River in the western Project Expansion Area (see Section 4.2, *Wetlands and Waterbodies*).

The topography in the region is nearly flat to gently rolling. As shown on Figure 2, the elevations range from 337 to 412 meters (m; 1,106 to 1,352 feet [ft]) above mean sea level, with the highest elevations in the eastern section of the Project Expansion Area.

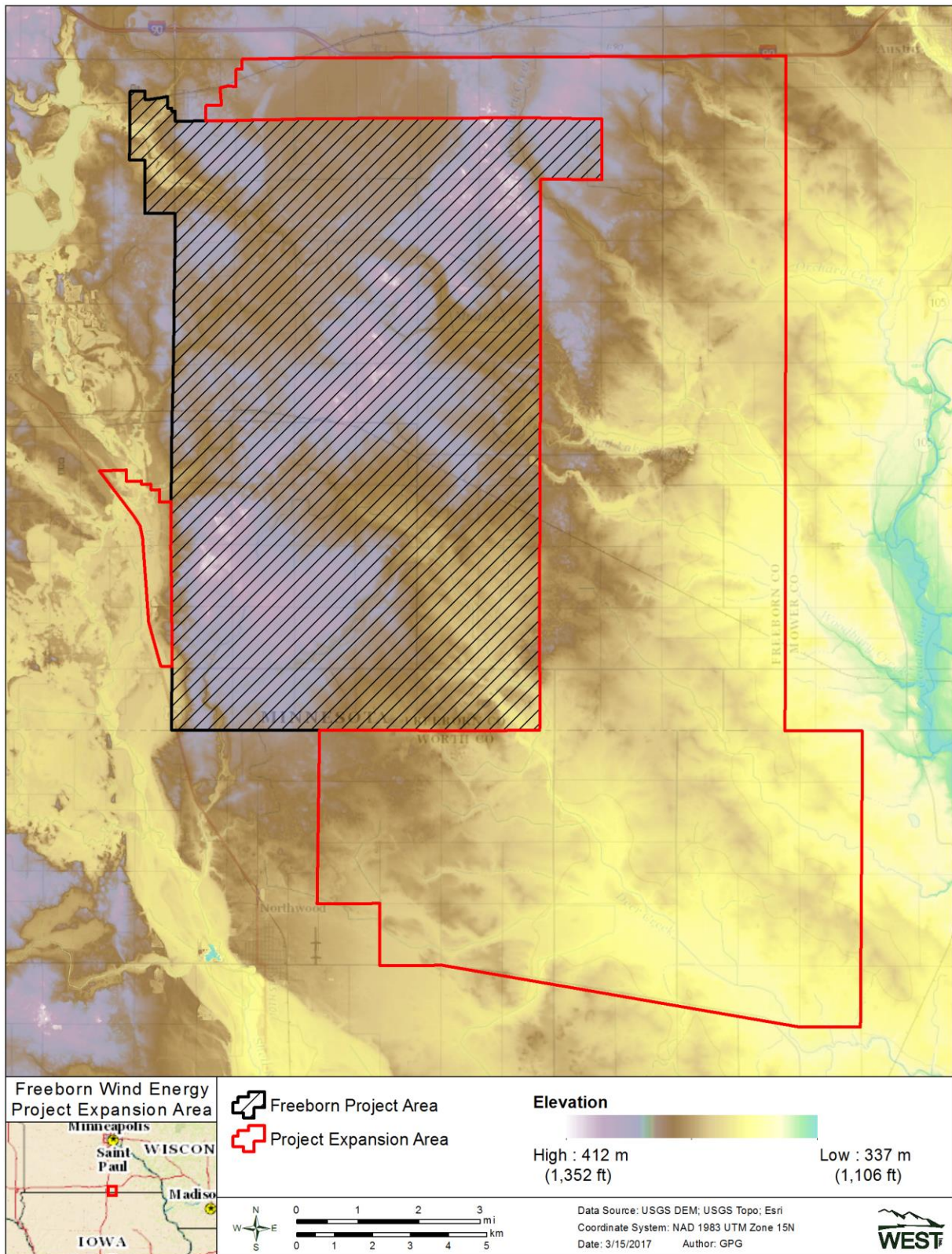


Figure 2. Digital elevation map of the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.

### 3 METHODS

#### 3.1 Preliminary Site Evaluation

A preliminary site evaluation of existing biological data was completed for the Project Expansion Area. Several sources of publicly available data were reviewed, including the following:

- 2011 U.S. Geological Survey (USGS) National Land Cover Database (NLCD; USGS NLCD 2011, Homer et al. 2015)
- U.S. Department of Agriculture (USDA) Natural Resource Conservation Service Soil Survey (NRCS; USDA NRCS 2016)
- The National Map (USGS 2016a)
- *Spring and Fall Distribution of Piping Plovers in North America: Implications for Migration Stopover Conservation* (Pompei and Cuthbert 2004)
- Mississippi Flyway and Central Flyway (Flyways.us 2016)
- *Lives of North American Birds* (Kaufman 1996)
- *Bats of the United States* (Harvey et al. 1999), and *Bats of the United States and Canada* (Harvey et al. 2011)
- USFWS National Wetlands Inventory (NWI) Data Mapper (USFWS NWI 2016)
- Species accounts from The Birds of North America Online (BNA), Cornell Laboratory of Ornithology (BNA 2016)
- USFWS Environmental Conservation Online System (ECOS) species profiles (USFWS 2016a)
- USFWS Iowa: County Distribution of Federally Threatened, Endangered, Proposed, and Candidate Species. Endangered Species, USFWS, Midwest Region (USFWS 2016b)
- USFWS Minnesota: County Distribution of Federally Threatened, Endangered, Proposed, and Candidate Species. Endangered Species, USFWS, Midwest Region (USFWS 2016c)
- USFWS *Recovery Plan for the Great Lakes Piping Plover (Charadrius melodus)* (USFWS 2003)

- Piping plover general information and life history from BNA, Cornell Laboratory of Ornithology (Elliott-Smith and Haig 2004)
- Iowa Department of Natural Resources (Iowa DNR) Natural Heritage Inventory (Iowa DNR 2016a)
- Iowa DNR Threatened and Endangered Species (Iowa DNR 2016b)
- Minnesota Department of Natural Resources (MNDNR) Threatened and Endangered Species (MNDNR 2016a)
- Bald eagle (*Haliaeetus leucocephalus*) general information and life history (Buehler 2000)
- Golden eagle (*Aquila chrysaetos*) general information and life history (Kochert et al. 2002, Goetzman 2014)
- eBird, An online database of bird distribution and abundance (eBird 2016)
- The National Audubon Society (Audubon) Important Bird Areas (IBA; National Audubon Society 2016)
- USGS Breeding Bird Survey (BBS; USGS 2001, 2016b; Pardieck et al. 2016)
- USFWS Birds of Conservation Concern (USFWS 2008)
- Bat Conservation International (BCI) species profiles (BCI 2016)
- *The Sibley Field Guide to Birds of Eastern North America* (Sibley 2003)

Data requests for Natural Heritage Information System (NHIS) records were submitted to the MNDNR and the Iowa DNR, to which the agencies responded in January 2017. These requests were made to assess the potential occurrence of federally listed and state-listed species in Freeborn and Worth counties and to evaluate their potential use of the Project Expansion Area based on habitat associations.

### 3.2 Site Reconnaissance

A site reconnaissance from public roads in the Project Expansion Area was conducted by a biologist on November 29 – 30, 2016, to investigate biological resources identified in the preliminary site evaluation and to investigate the potential presence of other biological resources in the Project Expansion Area. Specifically, potential habitat for any federally listed and state-listed species identified during the preliminary review was evaluated during the site reconnaissance.

During the site reconnaissance, the biologist recorded all wildlife species observed and documented any habitats, land features, and land use practices that would infer the potential for concentrated eagle, other bird, or bat use in the Project Expansion Area. Habitat layers delineated in the preliminary site evaluation identified potential habitats for federally or state-listed species. These habitats were subsequently confirmed or eliminated during the site reconnaissance by manually mapping habitat boundaries on aerial photographs from publicly accessible locations. A more detailed desktop evaluation and field evaluation were conducted for water resources and native prairie habitat within the Project Expansion Area; results of both efforts are presented under a separate cover.

## 4 LAND USE

### 4.1 Land Cover

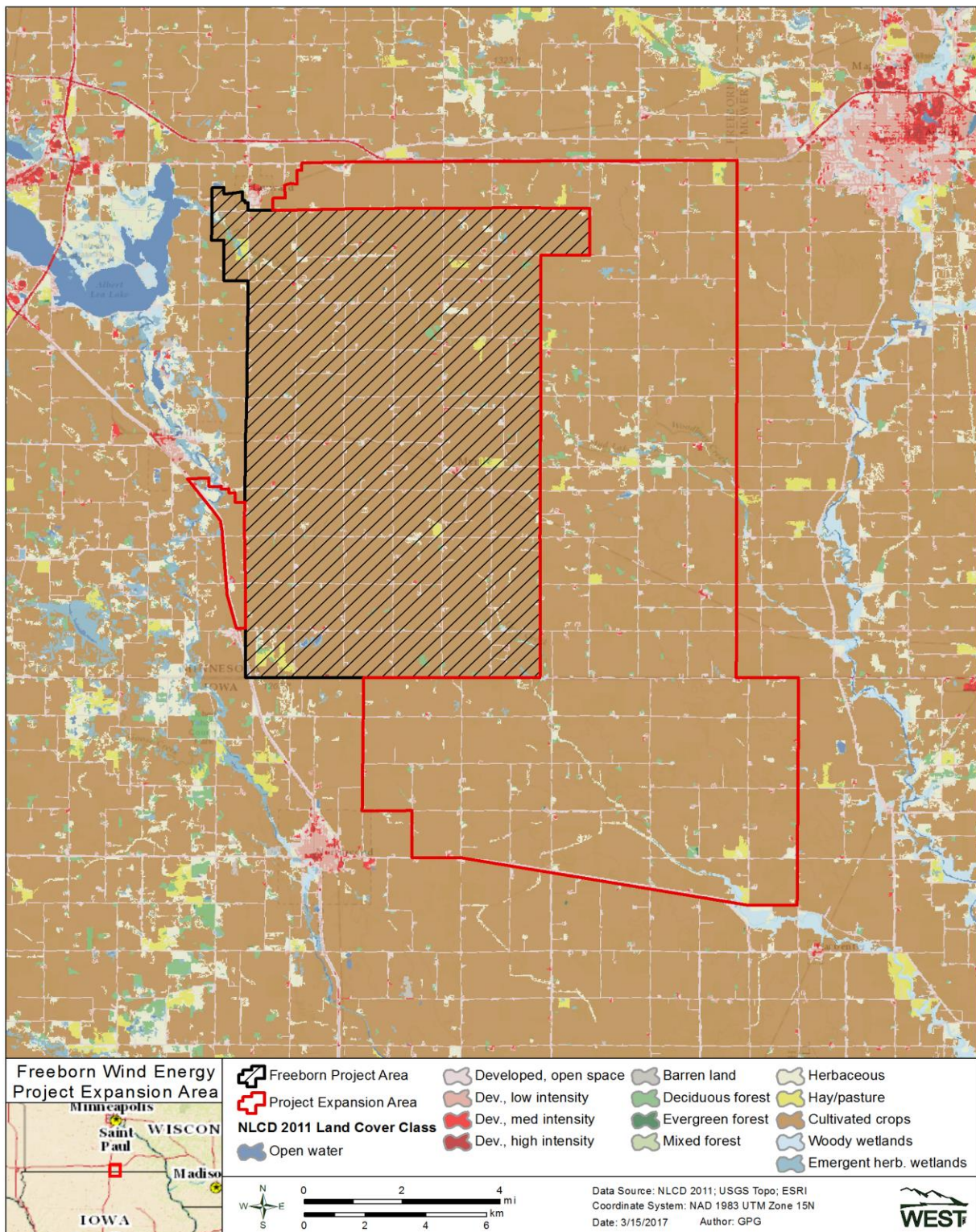
According to the 2011 NLCD (USGS NLCD 2011, Homer et al. 2015), the majority (90%) of the Project Expansion Area consists of cultivated croplands (Table 1 and Figure 3). Corn and soybean are the primary crops. The next most common cover type by area (approximately 6%) is developed open space, which includes primarily farmsteads and roads. Herbaceous and deciduous forest land cover types compose approximately 2% and 1% of the Project Expansion Area, respectively. The remaining land cover types each comprise less than 1% of the Project Expansion Area.

**Table 1. 2011 Land cover types present within the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa, based on the National Land Cover Database and site reconnaissance.**

Cover Type	Hectares	Acres	Percent (%)
Cultivated Crops	20,176	49,855	90
Developed, Open Space	1,230	3,041	6
Herbaceous	431	1,066	2
Deciduous Forest	227	561	1
Hay/Pasture	142	352	<1
Developed, Low Intensity	100	248	<1
Emergent Herbaceous Wetlands	86	212	<1
Woody Wetlands	46	113	<1
Developed, Medium Intensity	28	70	<1
Open Water	8	20	<1
Evergreen Forest	3	6	<1
Developed, High Intensity	2	6	<1
Barren Land	1	3	<1
Mixed Forest	0	0	0
<b>Total<sup>1</sup></b>	<b>22,482</b>	<b>55,553</b>	<b>100</b>

Source: USGS NLCD 2011, Homer et al. 2015

<sup>1</sup> Sums of values may not add to total value shown, due to rounding



**Figure 3. Land cover types within and adjacent to the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa, based on the National Land Cover Database and site reconnaissance.**

## 4.2 Wetlands and Riparian Areas

The 2016 NWI data (USFWS NWI 2016) indicate approximately 127 ha (312 ac) of wetlands occur in the Project Expansion Area. The predominant wetland type shown by the NWI data is freshwater emergent wetland (Table 2 and Figure 4). Data mapped from the 2011 NLCD show 140 ha (345 ac) of wetlands in the Project Expansion area, including 86 ha (212 ac) of emergent herbaceous wetlands, 46 ha (113 ac) of woody wetlands, and 8 ha (20 ac) of open water (Table 1 and Figure 3). Results of the field evaluation of the Project Expansion Area wetlands are in preparation (Simon et al. in prep).

Several streams and rivers are located within the Project Expansion Area (Figure 4). Orchard Creek, Woodbury Creek, Mud Lake Creek, and Shell Rock River are located within the expansion areas in Minnesota. Deer Creek is located in the expansion area in Iowa.

Although wetlands and other waters of the U.S. occur in the Project Expansion Area, they occupy a small percentage of the total Project area (less than 1%), with the majority confined to riparian zones, particularly along Mud Lake Creek in the eastern expansion area and along the Shell Rock River in the western expansion area. There are also farmed wetlands in croplands throughout the Project Expansion Area that tend to be saturated or show standing water during the wet season, but often are farmed once they dry out.

**Table 2. Wetland types present within the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa, based on the U.S. Fish and Wildlife Service National Wetlands Inventory data.**

Wetland Type	Hectares	Acres	Percent (%)
Freshwater Emergent Wetland	105	260	83
Riverine	11	28	9
Freshwater Forested/Shrub Wetland	8	19	6
Freshwater Pond	3	7	2
Lake	0	0	0
<b>Total</b>	<b>127</b>	<b>314</b>	<b>100</b>

Source: USFWS NWI 2016

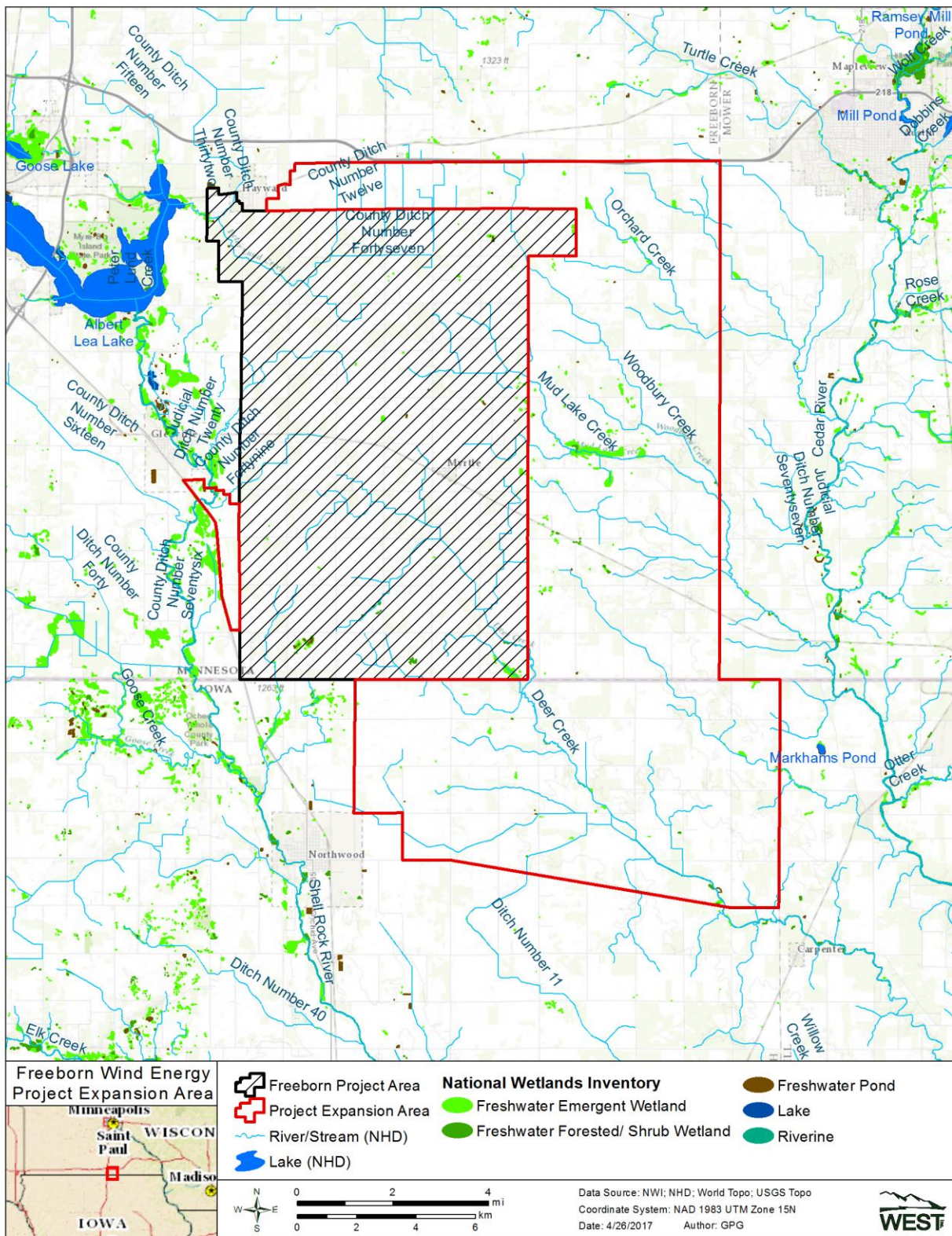


Figure 4. National Wetlands Inventory wetlands within and adjacent to the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.

From the preliminary wetlands and water review, wetlands identified by the NWI data primarily are located adjacent to or within the riparian zone of waterbodies (e.g., Mud Lake Creek, Deer Creek) connected to other water resources (e.g., Shell Rock River, Cedar River). The Minnesota Wetland Conservation Act (WCA 1991) regulates all wetlands in the state, including isolated wetlands that may not be considered jurisdictional by the United States Army Corps of Engineers (USACE; Environmental Laboratory 1987). The Minnesota WCA (1991) oversees projects in and near wetlands and other waterbodies. Minnesota Statutes Section 84.415, administered through Minnesota Administrative Rules Chapter 6135, regulates placement of utilities over, under, or across public waters, including potential fill placement and access roads.

The State of Iowa defines waters of the state as any “body or accumulation of water, surface or underground, natural or artificial, public or private, which are contained within, flow through or border upon the state or any portion thereof” (Iowa Code [IA Code] Section [§] 455B.171). Further, the State of Iowa defines wetlands as “an area of two or more acres in a natural condition that is mostly under water or waterlogged during the spring growing season and is characterized by vegetation of hydric soils” (IA Code § 456B.1). Protected wetlands in Iowa are designated according to the types defined by the U.S. Department of the Interior in *Wetlands of the United States* (USFWS 1971).

### **4.3 Federally and State-managed Lands**

#### **4.3.1 Federally Managed Lands**

There are no federally managed lands located within the Project Expansion Area; however, three federally managed Waterfowl Protection Areas (WPA) are located in the vicinity of the Project area (Figure 5). In Minnesota, Goose Lake WPA is located 7.8 km (4.9 mi) west of the eastern expansion area and Turtle Creek WPA is located 4.8 km (3.0 mi) north of the eastern expansion area. In Iowa, the Elk Creek Marsh WPA is located 12 km (7.5 mi) southwest of the southern expansion area. The WPAs have been set aside for the preservation of wetlands and grasslands considered critical to waterfowl and other wildlife.

#### **4.3.2 State-managed Lands**

The MNDNR manages Scientific and Natural Areas (SNA; Figure 6) and Wildlife Management Areas (WMA; Figure 5) in Minnesota (MNDNR 2016b). These areas of conservation significance are generally considered important for conserving native species, natural communities, and ecological systems of the state. There are no SNA or WMA located within the Project Expansion Area; however, there are several of these state-managed lands located in the vicinity of the Project Expansion Area.

The nearest SNA to the Project Expansion Area is the Wild Indigo Prairie SNA (Figure 6). This SNA is a native prairie remnant (MNDNR 2016c), which is located approximately 9.7 km (6.0 mi) northeast of the eastern expansion area along a railroad right-of-way. The Iron Horse Prairie SNA is located about 28 km (17 mi) northeast of the eastern expansion area. This SNA is a native prairie remnant located in an abandoned railroad right-of-way (MNDNR 2016d).

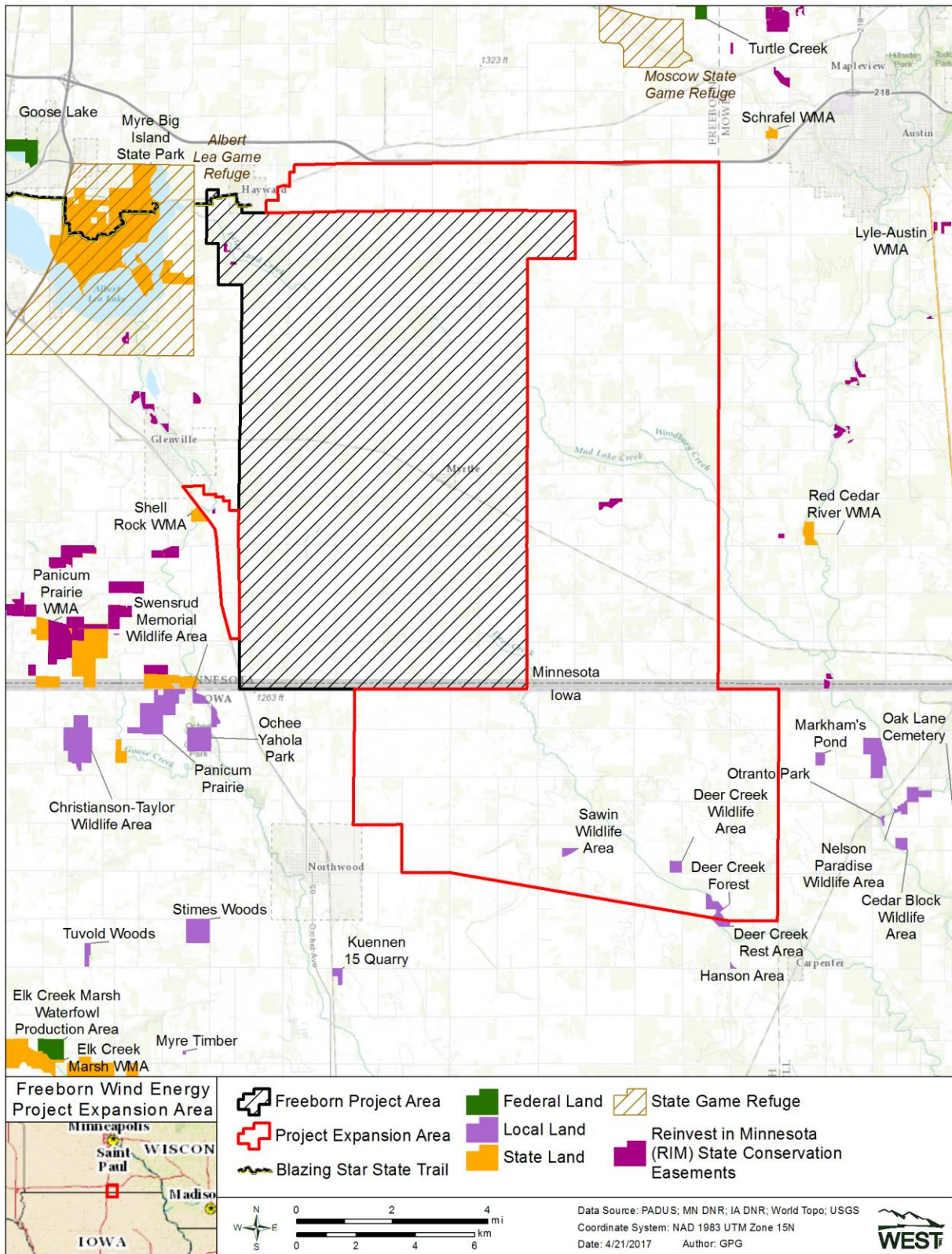
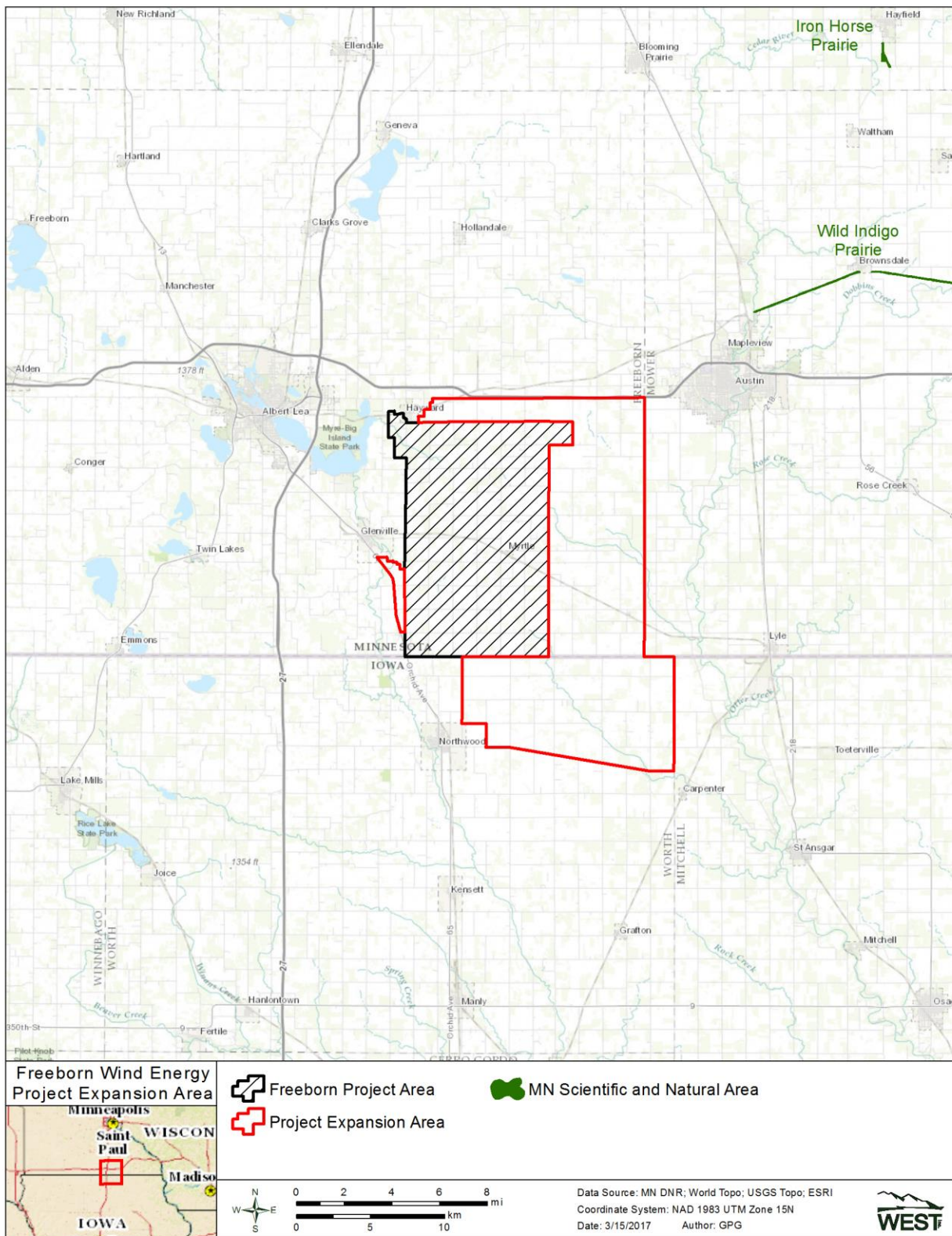


Figure 5. Location of protected, conserved, and recreation lands in and near the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.



**Figure 6. Location of Minnesota Scientific and Natural Areas in relation to the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.**

There are four MNDNR-managed WMAs located in proximity to the Project Expansion Area (Figure 5; MNDNR 2016e), including:

- Schrafel WMA - located about 1.8 km (1.1 mi) northeast of the eastern expansion area
- Red Cedar River WMA - located about 5.3 km (3.3 mi) east of the eastern expansion area
- Panicum Prairie WMA - located about 1.8 km (1.1 mi) southwest of the western expansion area
- Shell Rock WMA - located just across Highway 65 from the western expansion area

The WMAs are primarily managed for hunting, fishing, and other recreational opportunities. Prominent habitats in these WMAs include prairie and wetland communities and there is potential for these areas to support sensitive species (MNDNR 2016e).

There are two Reinvest in Minnesota (RIM) conservation easement parcels located within the Project Expansion Area, one in the eastern area and one in the western area (Figure 5). Several other RIM parcels are located in the vicinity of the Project Expansion Area, particularly to the west. The RIM program takes environmentally sensitive lands out of agricultural production and implements conservation practices to improve water quality in adjacent streams and to enhance fish and wildlife habitat (Minnesota Board of Water and Soil Resources 2016).

A state park and a game refuge also occur in the vicinity of the Project Expansion Area in Minnesota. Myre-Big Island State Park is located about 3.7 km (2.3 mi) west of the eastern expansion area; it is adjacent to Albert Lea Lake (Figure 5). This area is recognized for bald eagle use throughout the year (see eBird 2016). In addition, the Blazing Star State Trail exists within Myre-Big Island State Park and is proposed for expansion to the east, traveling adjacent to the railroad through Hayward to Austin (MNDNR 2015a), which could place some of the trail through portions of the eastern expansion area.

The Albert Lea Game Refuge is located in and around Myre-Big Island State Park, which is about 1.8 km (1.0 mi) west of the northwest corner of the eastern expansion area. The Moscow State Game Refuge is located approximately 3.4 km (2.1 mi) north of the eastern expansion area (Figure 5). Hunting and trapping is allowed on public parcels in these game refuges, including small game (e.g., squirrels, rabbits, turkeys [*Melagris gallopavo*]) and deer (*Odocoileus virginianus*), by firearms and archery (Minnesota Administrative Rules 6230.0400). However, the primary purpose of these game refuges is to provide protection to waterfowl; therefore, no waterfowl hunting is permitted within the refuges.

No state-managed land is located within the Iowa portion of the Project Expansion Area; however, there are several State of Iowa lands located in the vicinity of the southern expansion area (Figure 5). There are also several county-managed lands located within and near this expansion area. Three small WMA managed by the Worth County Conservation Board are located within the Project Expansion Area (Figure 5; Worth County 2016). These areas consist of the Sawin Wildlife Area, Deer Creek Wildlife Area, and Deer Creek Forest Wildlife Area.

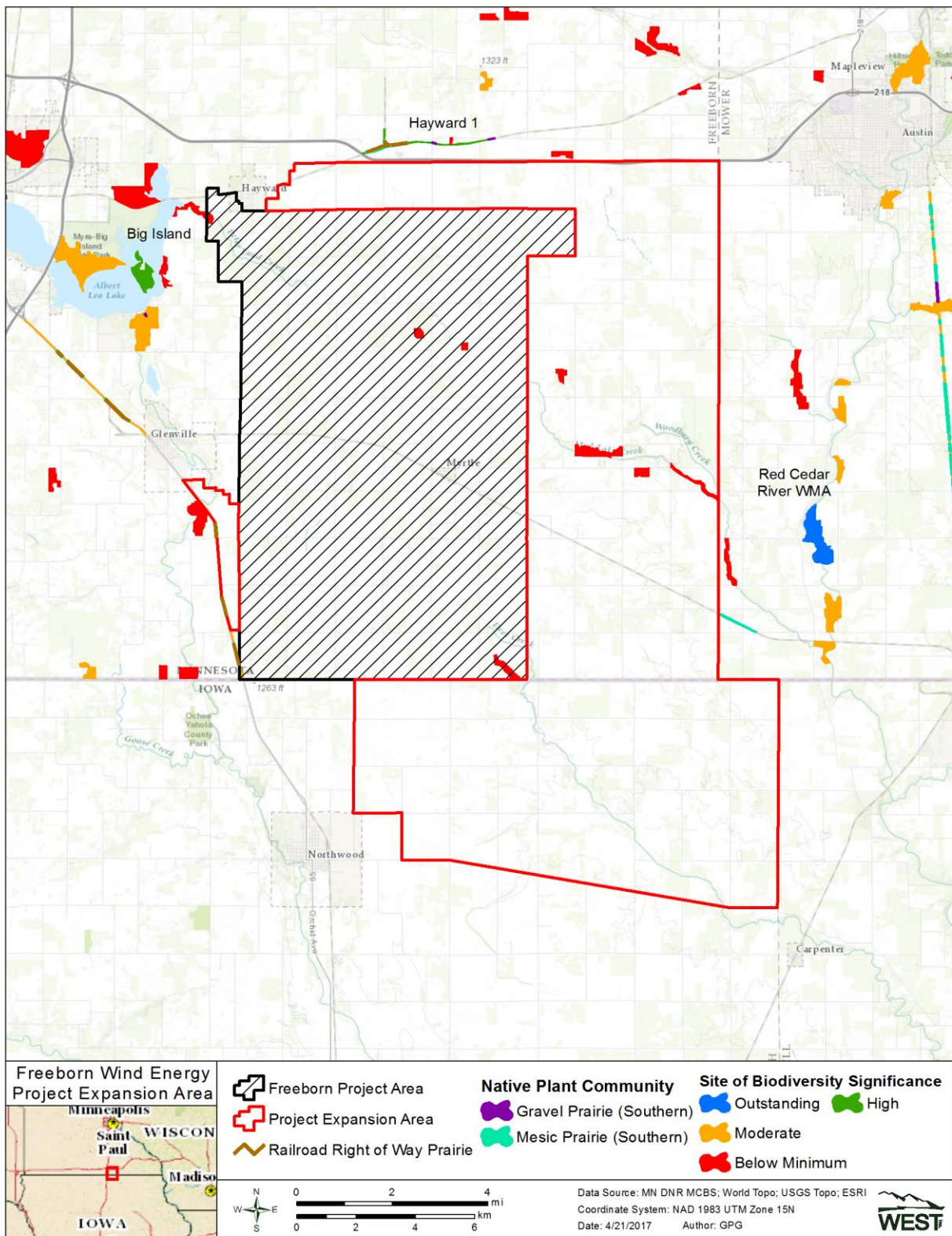
The largest wildlife/natural area in the vicinity of the expansion area is the Panicum Prairie WMA, which is located about 5.3 km (3.3 mi) west of the southern expansion area on the border of Iowa and Minnesota (Figure 5). This WMA is located in both states, with the Iowa portion managed by the Worth County Conservation Board, and the Minnesota portion managed by the MNDNR.

#### 4.4 Sites of Biodiversity Significance and Native Plant Communities

The Minnesota County Biological Survey (MCBS) is an ongoing effort initiated in 1987 by the MNDNR to systematically survey, county-by-county, the State's natural habitats. The MCBS has mapped areas of biodiversity significance throughout the state and assigned rank categories based on the presence of rare species, the conservatism of native plant communities within these areas (i.e., plant species less tolerant of disturbed areas with a high degree of fidelity to a narrow range of pristine habitats), and the relation of these areas to the surrounding landscape of the site (MNDNR 2016f).

A few areas located along or near Mud Lake Creek in the eastern expansion area have been classified as sites of biodiversity significance (Figure 7). These sites are ranked as “below minimum” (i.e., no rare plant species are likely to occur within these areas). However, the relation of these areas to surrounding landscapes and features (e.g., riparian corridors) could provide potential habitat for rare plant species and corridors for wildlife. Although these “below minimum” sites provide lower value and function compared to more pristine native habitats, there is the potential for higher species diversity and enhanced wildlife habitat in these MCBS-mapped areas. The nearest “outstanding” site of biodiversity significance is associated with the Red Cedar WMA, which is located about 5.3 km (3.3 mi) east of the eastern expansion area.

According to MCBS mapping, two small native prairies occur along the railroad tracks on the western Project Expansion Area boundary (Figure 7; MNDNR 2016f). The MNDNR has classified these native plant communities as southern mesic prairie. The vegetation is typically dominated by tall prairie grasses, such as big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*), with sparse patches of native forb species (MNDNR 2009a). There are also some native prairies located along railroad tracks just north and east of the eastern expansion area (Figure 7). Portions of these prairies have been classified as either southern mesic or southern gravel. The gravel prairies have droughty soils and are typically dominated by grasses such as little bluestem (*Schizachyrium scoparium*; MNDNR 2009b).



**Figure 7. Sites of biodiversity significance and native plant communities in and near the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.**

## 5 FEDERALLY AND STATE-PROTECTED SPECIES

Table 3 summarizes the federally and state-listed wildlife species and federally listed plant species identified as potentially occurring in the Project Expansion Area, based on historical distributions and habitat associations. State-listed plant species are addressed separately in Section 5.2.4.

**Table 3. Federally and state-listed wildlife species and federally listed plant species with known or potential for occurrence in the Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota and Worth County, Iowa.**

Species	Status	Suitable Habitat	Potential to Occur in Project Expansion Area
<b>Mammals</b>			
Northern long-eared bat ( <i>Myotis septentrionalis</i> )	FT	Forest interior and riparian areas (Lausen 2009). Typically avoids open habitats (Owen et al. 2003). Hibernates in caves, mines, and sometimes buildings. Summer roosts singly or in colonies underneath tree bark or in tree cavities (USFWS 2014).	Its summer range overlaps this area in Minnesota and Iowa. Potential to roost during the summer along forested riparian corridors in the Project Expansion Area is moderate, including along Woodbury Creek, Mud Lake Creek, Deer Creek, and Shell Rock River. Also may occupy larger contiguous forest patches that occur adjacent to and outside the Project Expansion Area.
Southern red-backed vole <i>Clethrionomys gapperi</i>	SE	Prefers old growth, boreal forest in northcentral Iowa with understory consisting of fallen logs (Iowa DNR 2016d).	Unlikely to occur year-round given the lack of habitat in the Iowa portion of the Project Expansion Area. Documented in Worth County.
<b>Birds</b>			
Piping plover <i>Charadrius melodus</i>	FE <sup>1</sup> FT <sup>2</sup> SE	Stopover habitats include shorelines of reservoirs, industrial ponds, natural lakes, rivers, wetlands with open waterbody components and fish hatcheries (Elliott-Smith and Haig 2004).	Unlikely migrant during spring and fall from Great Lakes or northern Great Plains populations. Potential to use stopover habitat along Mud Lake Creek, Woodbury Creek, and Shell Rock River is low, based on limited amount of suitable stopover habitat (about 1% of the total Project Expansion Area; USFWS NWI 2016). Project Expansion Area is out of range for summer breeding and wintering.

**Table 3. (continued) Federally and state-listed wildlife species and federally listed plant species with known or potential for occurrence in the Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota and Worth County, Iowa.**

Species	Status	Suitable Habitat	Potential to Occur in Project Expansion Area
Henslow's sparrow <i>Ammodramus henslowii</i>	SE	Breeding habitat includes large, flat, overgrown, moist fields, with scattered low shrubs or saplings, some standing dead vegetation from the previous season, and a deep litter layer. Also found in native warm-season grass fields, pastures, and weedy or un-mowed hayfields (Herkert et al. 2002).	Possible spring or fall migrant through Project Expansion Area. Potential summer nesting habitat in pastures and weedy or un-mowed hayfields. Known occurrence documented in Steele County, which borders Freeborn County.
Baird's sparrow <i>Ammodramus bairdii</i>	SE	Prefers shortgrass prairie with scattered low bushes and matted vegetation (Green et al. 2002).	Possible spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat and habitat fragmentation.
Sprague's pipit <i>Anthus spragueii</i>	SE	Prefers dry, open grasslands. Most common in areas of intermediate grass height and thickness, and moderate litter depth (Davis et al. 2014).	Possible spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat and habitat fragmentation.
Burrowing owl <i>Athene cunicularia</i>	SE	Breeds in open treeless areas in grasslands, steppes, and deserts (Poulin et al. 2011).	Possible spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat and habitat fragmentation.
Northern harrier <i>Circus cyaneus</i>	SE	Breeding habitat includes open wetlands, wet pastures, marshes, dry upland prairies, and late successional grasslands. Prefers large areas of undisturbed grassland habitat (Smith et al. 2011).	Potential spring and fall migrant and potential year-round resident. Potential to forage within grasslands, pastures, and wetlands in Project Expansion Area is high. Potential to nest in upland grasslands and wetlands. Known to occur in Project Expansion Area as documented during avian use surveys.

**Table 3. (continued) Federally and state-listed wildlife species and federally listed plant species with known or potential for occurrence in the Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota and Worth County, Iowa.**

Species	Status	Suitable Habitat	Potential to Occur in Project Expansion Area
Chestnut-collared longspur <i>Calcarius ornatus</i>	SE	Breeds in relatively shortgrass areas. Prefers native grasslands (Bleho et al. 2015).	Possible spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat and habitat fragmentation.
Loggerhead shrike <i>Lanius ludovicianus</i>	SE	Prefers open country, pastures with fencerows, and mowed roadsides (Yosef 1996).	Potential summer nesting habitat in pastures with fencerows. Possible spring and fall migrant through the Project Expansion Area. Documented occurrence in Freeborn County.
Horned grebe <i>Podiceps auritus</i>	SE	Nests in shallow ponds and wetlands with moderate emergent vegetation (Stedman 2000).	Potential spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall is low, based on low percentage of suitable habitat. Out of range for summer breeding
King rail <i>Rallus elegans</i>	SE	Occurs in freshwater marshes, marsh-shrub wetlands, and sedge and cattail ( <i>Typhus</i> spp.) wetlands (Pickens and Meanley 2015).	Possible spring and fall migrant through Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat.
Common tern <i>Sterna hirundo</i>	ST	Nests on islands and inland beaches with sand/cobble substrate with sparse to moderate vegetation (Nisbet 2002).	Possible spring and fall migrant through the Project Expansion Area. Potential of occurrence during spring and fall migration is low, based on low percentage of suitable habitat.
Wilson's phalarope <i>Phalaropus tricolor</i>	ST	Prefers wetlands; nests in marshes or upland buffers in varying densities of vegetative cover (Colwell and Jehl 1994).	Possible spring and fall migrant through the Project Expansion Area. Potential occurrence during spring and fall migration is low, based on low percentage of suitable habitat.
<b>Amphibians and Reptiles</b>			
Northern cricket frog <i>Acris blanchardi</i>	SE	Prefers small rivers and streams, fringe wetlands along riparian zones, littoral zones of lakes, and floodplain forests (Hammerson et al. 2004).	Potential is low to moderate within habitat present along fringe wetlands of riparian zones. Known occurrence documented in Mower County, which borders Freeborn County.

**Table 3. (continued) Federally and state-listed wildlife species and federally listed plant species with known or potential for occurrence in the Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota and Worth County, Iowa.**

Species	Status	Suitable Habitat	Potential to Occur in Project Expansion Area
Blanding's turtle <i>Emydoidea blandingii</i>	ST	Occurs in upland and lowland prairies, small streams, floodplains, and wet meadows with adjacent sandy uplands (IDNR 2016e).	Potential to utilize small streams, floodplains, and wetlands in the Project Expansion Area is low to moderate, based species' distribution and suitable habitat.
Wood turtle <i>Glyptemys insculpta</i>	ST	Largely aquatic and prefers fast moving rivers and streams of varying size, floodplains, and wet meadows. Upland and lowland prairie (Iowa DNR 2016f).	Potential to occur is low, based on limited habitat present. Known occurrence documented in Mower County, which borders Freeborn County.
<b>Insects</b>			
Baltimore checkerspot <i>Euphydryas phaeton</i>	ST	Occurs in wet meadows, bogs, and marshes (Butterflies and Moths of North America 2016).	Potential to occur in Project Expansion Area is low, based on limited amount of suitable habitats.
Silvery blue <i>Glaucopsyche lygdamus</i>	ST	Occurs in upland areas including prairies, meadows, road rights-of-way, and bushy fields (Butterflies and Moths of North America 2016).	Potential to occur in Project Expansion Area is low, based on limited amount of suitable habitats.
<b>Plants</b>			
Western prairie fringed orchid <i>Platanthera praeclara</i>	FT	Occurs in mesic tallgrass prairies, in wetlands, and along roadside ditches (USFWS 2016f).	Potential to occur in Project Expansion Area is low, based on limited amount of suitable habitats.
Prairie bush clover <i>Lespedeza leptostachya</i>	FT	Occurs in dry to mesic prairies with gravelly soil (USFWS 2016g).	Potential to occur in Project Expansion Area is low, based on limited amount of suitable habitats

Source: Status information and occurrence information from MNDNR 2013

FE= federally endangered species; FT = federally threatened species; SE = state-endangered; ST = state-threatened

<sup>1</sup> Great Lakes population<sup>2</sup> Northern Great Plains population

## 5.1 Federally Listed Species

No species listed as endangered under the Endangered Species Act (ESA 1973) are identified as of known occurrence in Freeborn or Worth counties (USFWS 2016c, 2016d). However, the northern long-eared bat (*Myotis septentrionalis*), listed as threatened under the ESA, has been documented in these counties (USFWS 2016c, 2016d). In addition, there are two federally threatened plant species — prairie bush clover (*Lespedeza leptostachya*) and western prairie fringed orchid (*Platanthera praeclara*) — with known occurrences in Worth County, Iowa (USFWS 2016d). In its January 2017 response to our inquiry about records of species of concern in the vicinity of the Project Expansion Area, MNDNR reported a 1939 record of

western prairie fringed orchid in Freeborn County. The Iowa DNR did not identify any federally listed species in the Iowa portion of the Project Expansion Area.

There is some potential for ESA-listed populations of the piping plover to occur in the Project Expansion Area. Although the piping plover is not documented as occurring within Freeborn or Worth counties, birds from the federally endangered Great Lakes population or birds from the federally threatened northern Great Plains population (USFWS 2016e) may move through the Project Expansion Area during migration.

#### *5.1.1 Northern Long-eared Bat*

The northern long-eared bat is widely distributed throughout Minnesota and Iowa (Harvey et al. 2011) and was commonly encountered in summer mist-net surveys throughout much of the Midwest prior to the documentation of white nose syndrome (USFWS 2013; 78 Federal Register 191:61046). Northern long-eared bats hibernate in caves, mines, and sometimes buildings. One of the largest concentrations of wintering northern long-eared bats in Minnesota is at Mystery Cave, located approximately 58 km (36 mi) east of the Project Expansion Area (MNDNR 2015b).

The northern long-eared bat is a forest-dependent species, generally relying on forest features for both foraging and roosting during the summer months (USFWS 2013). Specifically, northern long-eared bats appear to be a forest interior species that require adequate canopy closure for both roosting and foraging habitat (Lausen 2009). Additionally, riparian areas are considered important resource areas for many species of bats because they support higher concentrations of insect prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999).

Wing morphology of the northern long-eared bat makes them ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Abundance of northern long-eared bat prey items, particularly beetles and moths, are typically higher in more closed forest stands than in openings, which is in line with studies that have found northern long-eared bats tend to avoid open habitats (Owen et al. 2003). While this species is associated with forest habitats, it also occurs in agricultural settings where forest habitats have been highly fragmented. In these areas, northern long-eared bats rely on woodlots and forested riparian corridors for both roosting and foraging.

During the summer, northern long-eared bats roost individually or in colonies underneath exfoliated bark and in cavities or crevices of live trees and snags (USFWS 2013). Males and non-reproductive females also may roost in cooler environments such as caves and mines. This bat tends to be opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. Northern long-eared bats also have been found, rarely, roosting in structures (e.g., barns and sheds), and therefore may not always be associated with tree roosts.

During the summer months, the northern long-eared bat is unlikely to cross over large open lands (i.e., land lacking suitable habitat) to search for foraging and roosting habitats, but rather is more likely to use tree-lined linear features as travel corridors to and from roosting and foraging habitats (USFWS 2014). These tree-lined corridors may be important for bats as navigational aids in agricultural landscapes, as protection from predators and wind, and may act to concentrate insect prey (Verboom and Huitema 1997).

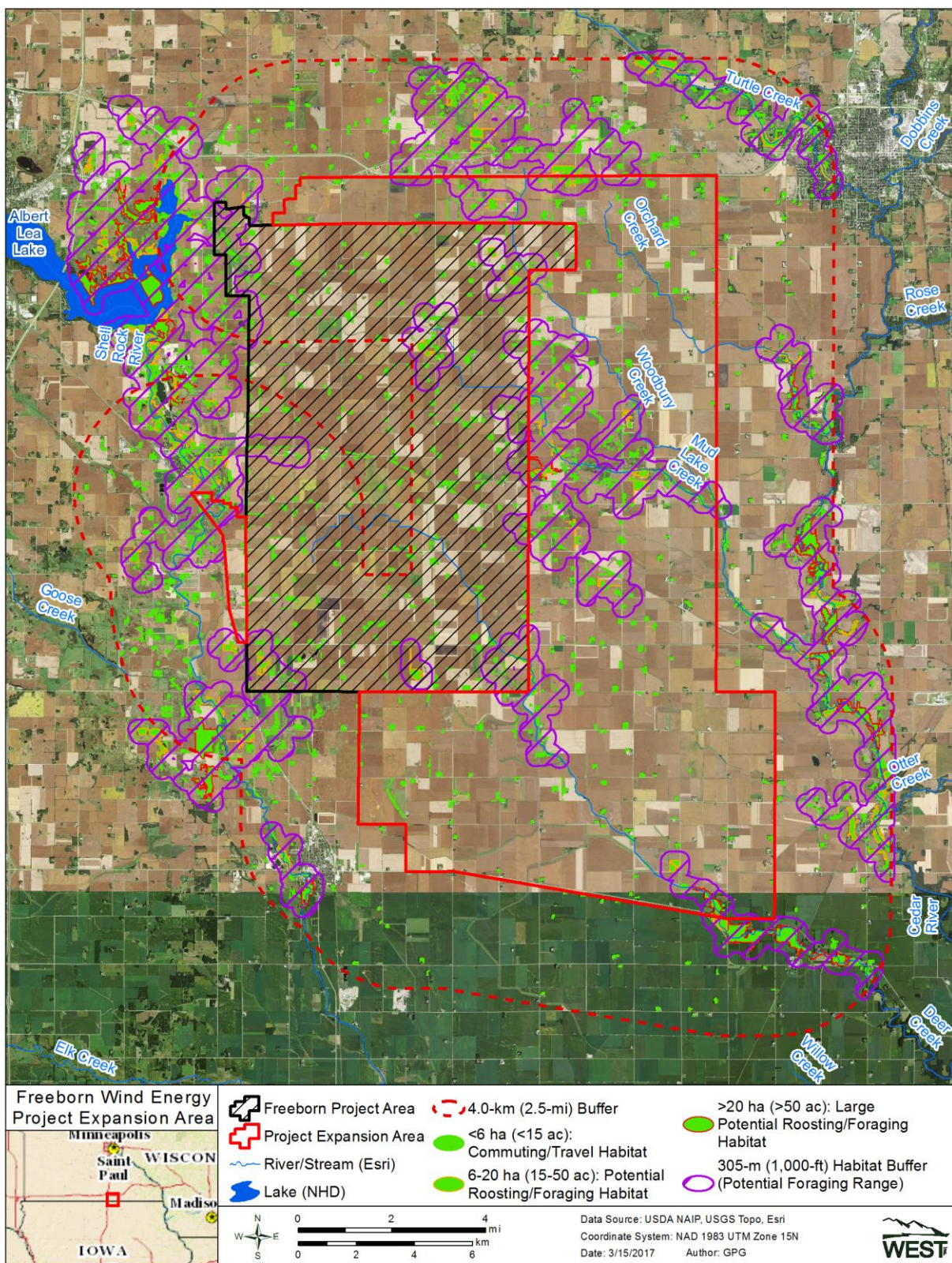
The northern long-eared bat is particularly associated with intact forested habitats. Henderson and Broders (2008) found northern long-eared bats did not travel more than 78 m (255 ft) from the edge of intact forest structure. A study of nine female northern long-eared bats using an intensively managed forest in West Virginia found this species foraging in areas with forest patch sizes between 46 and 65 ha (114 and 161 ac; Owen et al. 2003); however, studies in landscapes dominated by agricultural activities found northern long-eared bats may use woodlots and riparian zones with as little as 6 to 20 ha (15 to 49 ac) of forest cover (Foster and Kurta 1999, Henderson and Broders 2008).

Northern long-eared bats typically migrate between summer habitat and winter hibernacula between mid-August and mid-October in the fall and between mid-March and mid-May in the spring. They are considered a short-distance migrant (64-80 km [40-50 mi]), although their known migratory distances can vary between 8-270 km (5-168 mi; USFWS 2014). Suitable fall swarming and spring staging habitats consist of a variety of forested/wooded habitats where bats roost, forage, and travel, most typically within 8 km (5 mi) of a hibernaculum (USFWS 2014).

Based on review of public datasets, available resources, and the site reconnaissance visit, northern long-eared bats are not expected to occur in the Project Expansion Area during late fall or winter, since there is no evidence of potential hibernacula (e.g., caves or mines) within this area, and the closest known hibernaculum is located 58 km (36 mi) from the Project Expansion Area.

Based on 2011 NLCD forest land cover types mapped in the Project Expansion Area, there are approximately 276 ha (680 ac) of forest habitat in the Project Expansion Area (Figure 8). Following Foster and Kurta (1999) and Henderson and Broders (2008), forest patches were sorted by size into the following groups and labeled relative to potential use by northern long-eared bats: less than 6 ha (15 ac) commuting/travel habitat; 6-20 ha (15-50 ac) small roosting/foraging habitat; and more than 20 ha (50 ac) medium-large roosting/foraging habitat. A minimum patch size of 6 ha (15 ac) was used to identify potential roosting habitat, and the proximity of that area to other suitable roosting habitat defined the value of that patch for potential summer northern long-eared bat use.

Telemetry data on foraging activity and observations of northern long-eared bats indicate isolated trees may provide suitable summer roosting habitat, if they occur within 305 m (1,000 ft) of other suitable wooded roosting habitat (e.g., suitable roost trees, woodlot, wooded fencerow) (USFWS 2011, 2016c). Isolated trees or commuting/travel habitat located greater than 305 m



**Figure 8. Potentially suitable northern long-eared bat summer habitat (areas within the purple buffers) in and near the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.**

(1,000 ft) from the next nearest suitable summer roosting habitat may be used during spring and fall migration only. In Figure 8, the purple polygons defined as habitat buffer depict potential suitable summer roosting habitat, encompassing forest patches of varying sizes, with each forest patch, regardless of size, within 305 m (1,000 ft) of adjacent forest patches, and collectively providing suitable summer roosting habitat. Commuting/travel habitat, delineated outside the purple polygons (i.e., not within 305 m [1,000 ft] of another forest patch) depict small forest patches that may be used by northern long-eared bats only during migration.

To determine the location of potential northern long-eared bat summer habitat, all polygons representing forested habitats were buffered by 152 m (500 ft) and borders between adjacent polygons were removed to group any habitat patches within 305 m (1,000 ft) of each other. The area encompassing all forested habitats within 305 m (1,000 ft) of another forested patch was then filtered of small isolated patches by selecting only those connected habitats containing forested patches at least 6 ha (15 ac) in size. The resulting forested habitat patches were then buffered by 305 m (1,000 ft) to represent the potential summer foraging area for northern long-eared bat within the Project Expansion Area (shown as forested areas within the purple 305-m [1,000-ft] buffer; Figure 8).

Most of the Project Expansion Area does not contain suitable summer habitat for the northern long-eared bat, since most forested patches are relatively small in size and isolated from one another. Some of the woodlots and forested riparian corridors within the Project Expansion Area may provide suitable summer habitat for northern long-eared bats, particularly those forested patches connected with larger contiguous forest tracts within 305 m (1,000 ft) of forested habitat near Mud Lake Creek in the Project Expansion Area (Figure 8).

#### 5.1.2 *Piping Plover – Interior Subspecies*

Piping plovers nest in three primary locations in North America: (1) the shorelines of the Great Lakes; (2) the shorelines of rivers and lakes in the northern Great Plains; and (3) along the Atlantic Coast (USFWS 2003). After the breeding season, this species migrates to their wintering grounds on the Atlantic and Gulf Coasts from southern North Carolina to Mexico and into the West Indies and Bahamas (Haig 1992). Based on this species' migratory movement patterns, there is a potential for birds from the northern Great Plains and the Great Lakes piping plover populations to migrate through the Project Expansion Area and/or utilize regional wetlands and waterbodies for stopover habitat.

Plovers begin migration from the Great Lakes region in mid-July through early September, with females usually departing first (USFWS 2003). Migration from their wintering grounds begins in mid-February, with peak migration occurring in March. Males and females typically migrate separately, but arrive in unison on the breeding grounds (USFWS 2003). Pompei and Cuthbert (2004), in a review of potential stopover habitat use by the Great Lakes population of piping plovers, documented more than 3,400 fall and spring stopover records at 1,196 sites in the inland U.S. Stopover habitats included shorelines of reservoirs, industrial ponds, natural lakes, and rivers usually where sand or mixed sand and mud substrates were present.

Data from these sightings indicate piping plovers do not concentrate in large numbers at inland stopover sites and appear to stop opportunistically, with site use varying from year-to-year, 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). In most cases, reports of birds at inland sites were single individuals (Pompei and Cuthbert 2004). Spring migration patterns of piping plovers are similar to those during the fall migration period.

During the breeding season, piping plovers have been documented flying low over water and adjacent land at approximately 10 m (33 ft) above sea level. Specific migration flight height for piping plovers is not well documented.

Although there is potential for piping plovers to opportunistically utilize various wetland and waterbody features in the Project Expansion Area, depending on annual hydroperiods (i.e., percentage of time a wetland is inundated), suitable piping plover habitat within the Project Expansion Area is limited. Based on the assessment of water resources in the Project Expansion Area and habitats observed and recorded during the site reconnaissance, open water areas associated with wetland complexes were documented in the Project Expansion Area along Mud Lake Creek. Considering the large open waterbodies and shorelines along nearby Albert Lea Lake and other lakes further west and north of the Project Expansion Area (e.g., Geneva, Fountain, Pickerel, Upper Twin, and Lower Twin lakes), these regional features are most likely to attract piping plovers during migration.

### 5.1.3 Federally Listed Plants

No federally listed plant species have been documented in Freeborn County; however, two federally listed plant species have been recorded in Worth County. These two threatened species are prairie bush clover and western prairie fringed orchid. The prairie bush clover is typically found in dry to mesic prairies with gravelly soil, and the western prairie fringed orchid prefers wet prairies and sedge meadows, and has also been documented along roadside ditches. There is no critical habitat designated for either species (USFWS 2016c, 2016f, 2016g). Due to the limited amount of native prairie in the Project Expansion Area, these species are unlikely to occur in the Project Expansion Area.

## 5.2 State-listed Species

### 5.2.1 State-listed Birds, Mammals, Amphibians, and Reptiles

The MDNR lists 11 bird, two mammal, one amphibian, and four reptile species as threatened or endangered statewide. The Iowa DNR lists nine bird, six mammal, four amphibian, and 15 reptile species as threatened or endangered statewide. Of the 18 Minnesota state-listed species, 11 bird, one amphibian, and two reptile species may occur in the vicinity of the Project Expansion Area; and of the 34 Iowa DNR state-listed species, one additional mammal species may occur in the vicinity of the Project Expansion Area. Table 3 lists the 15 state-listed species with the potential to occur in or near the Project Expansion Area, based on suitable habitat descriptions for each species. Only two species have been documented with known occurrence

in Freeborn County: Blanding's turtle (*Emydoidea blandingii*; state-threatened) and loggerhead shrike (*Lanius ludovicianus*; state-endangered; MNDNR 2013). The MNDNR did not identify any known occurrences of state-listed birds, mammals, amphibians, or reptiles in the Project Expansion Area.

There is potential for state-listed birds to migrate through the Project Expansion Area during spring and fall or utilize the Project Expansion Area for stopover habitat, but summer nesting potential is limited for most state-listed bird species due to limited nesting habitat and/or the Project Expansion Area being located outside of their breeding ranges. No winter use of the Project Expansion Area by state-listed bird species is anticipated, since their wintering grounds do not occur in the Project Expansion Area.

The potential for state-listed reptiles and amphibians to occur in the Project Expansion Area is low, given limited suitable habitat in the Project Expansion Area and the location of the Project Expansion Area relative to the species' distributions (Table 3).

#### 5.2.2 State-listed Mollusk and Fish Species

Several species of state-threatened and state-endangered mollusk and fish species are listed throughout Minnesota (MNDNR 2013). The MNDNR did not identify any known records for threatened or endangered mollusk or fish species in the Project Expansion Area. While some streams are present within the Project Expansion area, they do not have suitable habitat for any state-listed mollusk or fish species, which generally prefer larger river systems with rocky substrates. There are no state-listed mollusks listed for Worth County, but the Iowa DNR has documented one state-threatened fish species (pearl dace [*Margariscus margarita*]). However, the Iowa DNR did not identify any known records for threatened or endangered mollusk or fish species in the Project Expansion Area.

The pearl dace prefers clear, cool water streams with a sinuous channel and well-vegetated undercut banks (Cunningham 2006). The one stream located within the Project Expansion Area (i.e., Deer Creek) is a warm water stream that has been extensively ditched and likely does not provide suitable habitat for pearl dace.

#### 5.2.3 State-listed Insects

The Iowa DNR has documented two state-listed threatened butterfly species in Worth County (Iowa DNR 2016a), but none have been recorded in the Project Expansion Area. These species are baltimore checkerspot (*Euphydryas phaeton*) and silvery blue (*Glaucopsyche lygdamus*). The baltimore checkerspot prefers wet areas such as wet meadows, bogs, and marshes while the silvery blue prefers open, upland areas such as prairies, meadows, road rights-of-way, and brushy fields (Butterflies and Moths of North America 2016). Due to limited wetland and grassland areas within the Iowa portion of the Project Expansion Area, there is a relatively low potential for these state-listed butterfly species to occur in the Project Expansion Area.

#### 5.2.4 State-listed Plant Species

The majority of state-listed plant species are native prairie-dependent or aquatic species. There are three state-threatened plant species with documented occurrence in Freeborn County: Sullivant's milkweed (*Asclepias sullivantii*), tuberous Indian-plantain (*Arnoglossum plantagineum*), and valerian (*Valeriana edulis* var. *ciliata*). The MNDNR identified known occurrences of the three species listed above as occurring in or near the Project Expansion Area.

Native prairie habitat was documented in two small areas along the railroad tracks on the western Project boundary as well as along two railroad tracks immediately adjacent to the Project Expansion Area (MNDNR 2016b; Figure 7); the remainder of the Project Expansion Area is largely lacking native prairie habitats and wetland communities are relatively sparsely distributed in the Project Expansion Area (Figure 4). The potential for state-listed plants to occur in the Project Expansion Area is low given the limited amount of potentially suitable habitat. However, a few railroads within the Project Expansion Area may contain native prairie remnants within their rights-of-way that could provide suitable habitat for these state-threatened plant species. Additionally, some records of state-listed plants have been associated with road ditches.

There are several state-listed threatened and endangered plants species documented to occur in Worth County, Iowa, including: bog willow (*Salix pedicellaris*; state-threatened), buckbean (*Menyanthes trifoliata*; state-threatened), rush aster (*Aster junciformis*; state-threatened), shining willow (*Salix lucida*; state-threatened), yellow monkey flower (*Mimulus glabratus*; state-threatened), leafy northern green orchid (*Platanthera hyperborean*; state-threatened), meadow spikemoss (*Selaginella eclipse*; state-endangered). All of these state-listed plants prefer wet areas such as swamps, fens, bogs, and wet meadows. The Iowa DNR did not identify any known occurrences of these state-listed plant species in the Project Expansion Area.

### 5.3 Eagles

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act (1940) and the Migratory Bird Treat Act (1918). Both species are discussed relative to the potential to occur in and near the Project Expansion Area.

#### 5.3.1 Bald Eagle

As stated in Section 4.3, *Federally and State-managed Lands*, bald eagles are known to occur in and near the Myre-Big Island State Park and along Albert Lea Lake (see eBird 2016). The park is located approximately 3.7 km (2.3 mi) west of the eastern expansion area and the lake is located about 2.9 km (1.8 mi) west of the eastern expansion area (Figure 6). The Shell Rock River also traverses a small portion of the Project Expansion Area to the west of the original Project area.

Bald eagles may potentially occur in the Project Expansion Area during the winter, migration, and breeding/nesting seasons. Bald eagles typically nest in forested areas or mature trees adjacent (within 2.0 km [1.2 mi]) of waterbodies large enough to provide foraging opportunities

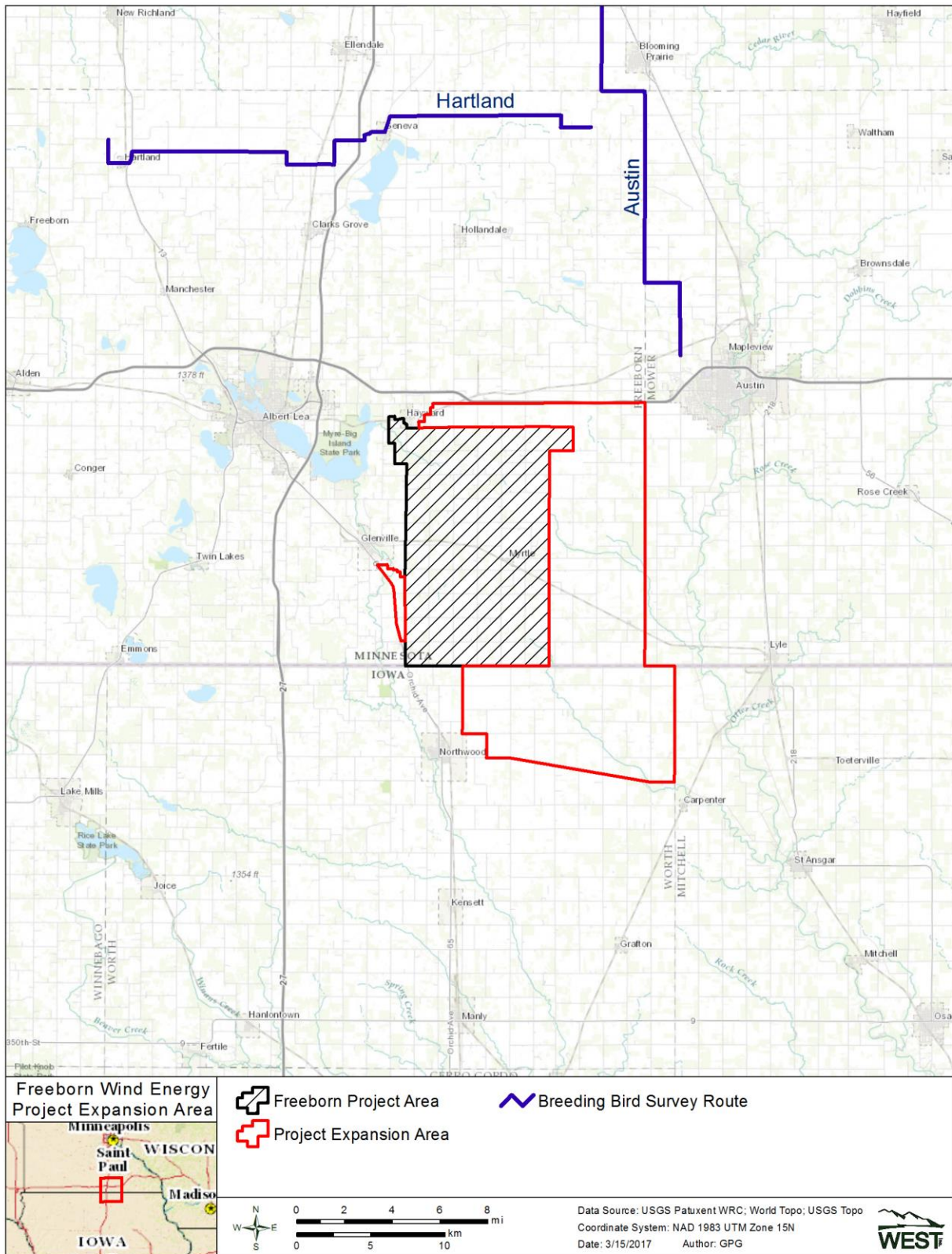
(Buehler 2000). An aeration system installed in Albert Lea Lake may enhance the potential for open water and thin ice during a portion of the winter, which would attract foraging bald eagles during the winter months. There also is potential to forage along moving waters of Shell Rock River during the winter. Tributaries to the Shell Rock River may provide more limited foraging opportunities in spring, summer, and fall, but likely freeze during the winter. Tributaries to the Cedar River, which is located approximately 2.9 km (1.8 mi) east of the Project Expansion Area, also may provide limited foraging habitat within the Project area. These tributaries include Deer Creek, Orchard Creek, Woodbury Creek, and Mud Lake Creek.

The U.S. Geological Survey (USGS) Breeding Bird Survey (BBS) includes bald eagle breeding records for both the Hartland (19.3 km [12 mi] north of the Project Expansion Area) and Austin BBS (3.2 km [2.0 mi] northeast of the Project Expansion Area) survey routes (Pardieck et al. 2016). These are the two closest BBS routes to the Project Expansion Area (Figure 9) and are discussed in Section 6.1.4, *US Geological Society Breed Bird Survey*.

### 5.3.2 Golden Eagle

Golden eagles commonly breed in the western United States. (Kochert et al. 2002). A small population (approximately 130 golden eagles) winter from November through March in the bluff country of southeastern Minnesota, northeastern Iowa, western Wisconsin, and northern Illinois (Goetzman 2014) and individual birds may migrate through the region (Kochert et al. 2002). However, golden eagle use within the Project Expansion Area would likely be limited to rare occurrences during migration or winter (Goetzman 2014). No non-breeding/migrant observations of golden eagles have been documented along the Austin or Hartland BBS routes (Pardieck et al. 2016) or have been incidentally recorded in Freeborn or Worth counties on the eBird system (eBird 2016).

Golden eagles commonly forage in open habitats (Kochert et al. 2002). Suitable foraging habitats within the Project Expansion Area for individual migrant or wintering eagles would primarily encompass the hay/pasture (142 ha [352 ac]) and herbaceous (i.e., grasslands; 431 ha [1,066 ac]) land cover types (Table 1), which in total only comprises about 2.6% of the Project Expansion Area. Although incidental occurrences of golden eagles are possible within the Project Expansion Area, the amount of suitable golden eagle foraging habitat is low; the likelihood of migrating or wintering birds moving through the area is low, based on historical occurrences; and the golden eagle does not breed in this region of the U.S. These elements all would limit the potential use of the Project Expansion Area by golden eagles.



**Figure 9. Breeding Bird Survey routes closest to the Freeborn Wind Energy Project Expansion Area in Freeborn County, Minnesota and Worth County, Iowa.**

## 6 GENERAL WILDLIFE

### 6.1 Bats

Seven bat species occur in Minnesota, all of which have ranges that overlap the Project Expansion Area, and 11 bat species occur in Iowa, seven of which have ranges that overlap the Project Expansion Area (Harvey et al. 1999, Bat Conservation International [BCI] 2016). The seven bat species with potential to occur in the Project Expansion Area are listed in Table 4. These species could potentially occur in the Project Expansion Area during all seasons except winter when they are hibernating or have migrated south. The eastern red bat (*Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*) are considered tree bats; however all seven of the bat species listed in Table 4 will roost in trees during summer. More detailed information on the northern long-eared bat is provided in Section 5.1.1, Northern Long-eared Bat.

**Table 4. Bat species with known or potential occurrence in or near the Freeborn Wind Energy Project Expansion Area, Freeborn County, Minnesota and Worth County, Iowa.**

Common Name	Scientific Name
Eastern red bat	<i>Lasiurus borealis</i>
Little brown bat	<i>Myotis lucifugus</i>
Northern long-eared bat <sup>1</sup>	<i>Myotis septentrionalis</i>
Tri-colored bat	<i>Perimyotis subflavus</i>
Big brown bat	<i>Eptesicus fuscus</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Hoary bat	<i>Lasiurus cinereus</i>

Source: USFWS 2016h (federally threatened species; USFWS 2013)

Based on 2011 NLCD forest land cover types in the Project Expansion Area, the Project Expansion Area has approximately 276 ha (680 ac; approximately 1% of the Project Expansion Area) of woodland habitat for tree-roosting bats, with the majority of habitat located along the semi-forested corridors of the Shell Rock River and Mud Lake Creek (Figure 8). Also, the presence of wetlands, ponds, and cultivated cropland may attract bats for foraging and drinking opportunities.

### 6.2 Birds

#### 6.2.1 Bird Migration

The Project Expansion Area is located within the Mississippi Flyway (Flyways.us 2016), which is used by migrating waterfowl, waterbirds, shorebirds, songbirds, and raptors. Of these bird types, waterfowl have the greatest potential to migrate through the Project Expansion Area: waterfowl migration corridors that follow a broad front through Minnesota and Iowa are used by as many as three million dabbling ducks (USGS 2013). Based on USFWS NWI data, there are about 127 ha (312 ac) of potential wetlands and open water areas in the Project Expansion Area, and there is potential for migrating waterfowl to use these areas, as well as flooded agricultural fields, as stopover habitats. There also is potential for waterfowl to forage on waste grain in cultivated fields (approximately 90% of the Project Expansion Area) during migration (Drilling et

al. 2002). Additionally, Albert Lea Lake, located west of the Project Expansion Area, and the emergent wetlands associated with this waterbody, have the potential to increase waterfowl use in the Project Expansion Area.

### 6.2.2 Important Bird Areas

The National Audubon Society (Audubon) has identified Important Bird Areas (IBA), described by Audubon as providing essential habitat for one or more bird species (National Audubon Society 2016). The closest registered IBA in Minnesota is the Blufflands-Root River IBA, located about 52 km (32 mi) east of the Project Expansion Area. The Blufflands-Root River IBA is located in Houston, Olmsted, Winona, and Fillmore counties, and encompasses 197,970 ha (489,194 ac) of floodplain forest and upland deciduous forest.

Elk Creek Marsh, located in Worth County, Iowa, about 17.0 km (10.6 mi) southwest of the Project Expansion Area, is the closest state IBA. This 1,178-ha (2,911-ac) IBA is within the Elk Creek Marsh WMA and is comprised of a mix of wetlands, woodlands, grasslands, and riparian habitats. It contains a bald eagle nest, great blue heron (*Ardea herodias*) rookery, and about 70 bird species during the nesting season (Iowa Audubon 2016).

### 6.2.3 U.S. Fish and Wildlife Service Birds of Conservation Concern

The USFWS lists 39 species as birds of conservation concern (BCC) within the Eastern Tallgrass Prairie Bird Conservation Region (BCR) where the Project Expansion Area is located (USFWS 2008). These species have been identified as vulnerable to population declines in the area by the USFWS (2002).

Based on these species' ranges and potential habitats within the Project Expansion Area, 30 of the 39 BCC species listed may occur within the Project Expansion Area, primarily to utilize stopover habitat during spring and fall migration, although some nesting during the breeding season and some wintering may occur for some species. Although some of these species may use habitats in the Project area during migration or nesting (e.g., wetlands, ponds with associated mudflats, forested areas, herbaceous areas), the majority of the Project Expansion Area encompasses agricultural lands (90%), so use by these BCC species would likely be limited to the scattered native habitats in and near the Project Expansion Area. Migrating BCC particularly may be attracted to the Shell Rock River and Albert Lea Lake. These BCC are discussed further in Section 6.2.4, *US Geological Society Breed Bird Survey*, for the two BBS routes located in the Project Expansion Area region. A few of these species include grassland birds, which may utilize stopover habitat in the Project Expansion Area during migration; however, the majority of the Project Expansion Area is agricultural land and grassland habitat is limited.

### 6.2.4 U.S. Geological Survey Breeding Bird Survey

The two closest USGS BBS routes to the Project Expansion Area include the Hartland Route, running east/west, located about 19 km (12 mi) north of the Project Expansion Area, and the Austin Route, running north/south 4 km (2.5 mi) northeast of the Project Expansion Area (Figure 9; Pardieck et al. 2016). The BBS routes are each 39.4 km (24.5 mi) long and consist of 50 3-

minute counts along the length of each route (USGS 2001). Information gathered from the BBS provides an indication of what species may occur in the Project Expansion Area.

A total of 114 bird species have been documented along the Hartland Route, including six diurnal raptor and owl species (bald eagle, American kestrel [*Falco sparverius*], red-tailed hawk [*Buteo jamaicensis*], Cooper's hawk [*Accipiter cooperii*], northern harrier [*Circus cyaneus*]), and great horned owl [*Bubo virginianus*]). Ten waterfowl species have been documented along this route from 1967 to 2013, with the most abundant species being mallard (*Anas platyrhynchos*; Pardieck et al. 2016). The most common passerine (songbird) species recorded were the European starling (*Sturnus vulgaris*), 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*). One state-listed endangered species (loggerhead shrike; MNDNR 2013) and 10 species designated by the USFWS as BCC within the Eastern Tallgrass Prairie BCR (USFWS 2008) also have been documented along the Hartland Route: dickcissel (*Spiza americana*), field sparrow (*Spizella pusilla*), grasshopper sparrow (*Ammodramus savannarum*), red-headed woodpecker (*Melanerpes erythrocephalus*), American bittern (*Botaurus lentiginosus*), pied-billed grebe (*Podilymbus podiceps*), black-crowned night heron (*Nycticorax nycticorax*), black-billed cuckoo (*Coccyzus erythrophthalmus*), upland sandpiper (*Bartramia longicauda*), and loggerhead shrike.

A total of 102 bird species have been documented along the Austin Route, including the same six diurnal raptor and owl species (bald eagle, American kestrel, red-tailed hawk, Cooper's hawk, northern harrier, and great horned owl). Seven waterfowl species have been documented along this route from 1993 to 2013, with the most abundant species also mallard (Pardieck et al. 2016). The most common songbird species recorded were European starling, common grackle, red-winged blackbird, house sparrow, American robin, horned lark, and song sparrow. The state-listed endangered loggerhead shrike (MNDNR 2013) also has been documented, and seven species designated by the USFWS as BCC within the Eastern Tallgrass Prairie BCR (USFWS 2008) have been observed: dickcissel, grasshopper sparrow, red-headed woodpecker, pied-billed grebe, black-billed cuckoo, upland sandpiper, and loggerhead shrike.

#### 6.2.5 Raptors

Breeding raptors could nest in a variety of habitats in and near the Project Expansion Area. Tree and cavity nesters could occupy small woodlots and shelterbelts surrounding area farm buildings and residences; the 2011 NLCD forest land cover types that likely includes these habitat features (e.g., deciduous forest, woody wetlands, and evergreen forest) compose about 1% (276 ha [680 ac]; Table 1) of the Project Expansion Area. Raptor nesting also could occur (predominantly in trees) along riparian corridors, ephemeral stream, wetlands, and herbaceous areas (grasslands) in the Project Expansion Area. Nesting in the agricultural and developed areas would be limited to manmade structures, such as power poles, windmills, and other infrastructure.

During migration, raptors could rest and forage in the Project Expansion Area, depending on habitats, weather, and prey availability. The Project Expansion Area is located on flat to gently rolling agricultural fields that generally lack defined topographical ridges or other defined features typically used by migrating raptors (Figure 1 and Figure 2). However, given raptor species are more likely to travel along north-south orientated large water bodies during migration (Liguori 2005), the Shell Rock River and Cedar River, their tributaries, and Albert Lea Lake may be attractive to migrating raptors.

Raptor foraging is influenced by habitat types and prey availability. Small- and medium-sized mammals comprise the primary prey base for many raptors species, although small- and medium-sized birds and insects also make up the diet for many species. Rodents may be most concentrated along field edges, roads, and railroads (Rosenzweig 1989; Preston 1990). Songbirds and insects likely occur in most of the Project Expansion Area. However, given the limited amount of grassland and pasture habitat (where these prey species are likely to be most concentrated) in the Project Expansion Area compared to the surrounding areas, it is unlikely that concentrations of songbirds or insects would attract many foraging raptors in the Project Expansion Area. Waterfowl and waterbirds, also potential prey for eagles and other large raptors, would mostly likely be attracted to the perennial and ephemeral water sources in and near the Project Expansion Area, particularly Albert Lea Lake, Shell Rock River, and wetland complexes along Mud Lake Creek, as well as grain fields.

## 7 REFERENCES

### 7.1 Literature

- Bat Conservation International, Inc. (BCI). 2015. BCI Species Profiles. BCI, Inc., Austin, Texas. Accessed December 2015. Homepage: <http://www.batcon.org>; Range map data from 2003-2015.
- Bat Conservation International (BCI). 2016. Bat Species: US Bats. BCI, Inc., Austin, Texas. Accessed October 2016. Homepage: <http://www.batcon.org>; Species profiles available online at: <http://www.batcon.org/resources/media-education/species-profiles>, species ranges from 2003-2016 data.
- Birds of North America (BNA). 2016. The Birds of North America Online. Cornell Lab of Ornithology and the American Ornithologists' Union. Accessed June and July 2016. BNA homepage at: <http://bna.birds.cornell.edu/bna>
- Bleho, B., K. Ellison, D. P. Hill, and L. K. Gould. 2015. Chestnut-Collared Longspur (*Calcarius ornatus*). P. G. Rodewald, 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/288>; doi: 10.2173/bna.288
- Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). 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/506>
- Butterflies and Moths of North America. 2016. Accessed December 2016. Available online at: <http://www.butterfliesandmoths.org>
- Colwell, M. A. and J. R. Jehl. 1994. Wilson's Phalarope (*Phalaropus tricolor*). P. G. Rodewald, 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/wilpha>; doi: 10.2173/bna.83
- Cunningham, G. R. 2006. Pearl Dace (*Margariscus margarita*): A Technical Conservation Assessment. US Department of Agriculture (USDA) Forest Service, Rocky Mountain Region. Available online at: [https://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb5206789.pdf](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206789.pdf)
- Davis, S. K., M. B. Robbins, and B. C. Dale. 2014. Sprague's Pipit (*Anthus spragueii*). P. G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from the Birds of North America Online: <https://birdsna.org/Species-Account/bna/species/sprpip>; doi: 10.2173/bna.439
- Dierschke, V. and J.-P. Daniels. 2003. Zur Flughöhe Ziehender See-, Küsten- Und Greifvögel Im Seegebiet Um Helgoland. [Flight Altitude of Migrating Seabirds, Coastal Birds and Raptors in the Southeastern North Sea.]. Corax 19(Sonderheft 2): 35-41.
- Drilling, N., R. D. Titman, and F. McKinney. 2002. Mallard (*Anas platyrhynchos*). P.G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from the Birds of North America: <https://birdsna.org/Species-Account/bna/species/mallar>; doi:10.2173/bna.658
- DOI: 10.2173/bna.658eBird. 2016. eBird: An Online Database of Bird Distribution and Abundance. eBird, Cornell Lab of Ornithology, Ithaca, New York. Accessed January 2016. Available online at: <http://ebird.org/content/ebird/>

- 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
- ESRI. 2016. World Imagery and Aerial Photos. ArcGIS Resource Center. ESRI, producers of ArcGIS software. Redlands, California.
- Flyways.us. 2016. Mississippi Flyway and Central Flyway. A collaborative effort of waterfowl managers across the continent. US Fish and Wildlife Service (USFWS). Accessed August 2016. Information available at: <http://flyways.us/flyways/info>
- 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.
- Goetzman, K. 2014. Our Golden Eagles. Minnesota Conservation Volunteer January-February 2014: 8-21.
- Green, M. T., P. E. Lowther, S. L. Jones, S. K. Davis, and B. C. Dale. 2002. Baird's Sparrow (*Ammodramus bairdii*). P. G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from the Birds of North America Online: <https://birdsna.org/Species-Account/bna/species/baispa>; doi: 10.2173/bna.638
- Grindal, S. D., J. L. Morissette, and R. M. Brigham. 1999. Concentration of Bat Activity in Riparian Habitats over an Elevational Gradient. Canadian Journal of Zoology 77(6): 972-977. doi: 10.1139/z99-062.
- Haig, S. M. 1992. Piping Plover (*Charadrius melodus*). A. Poole, ed. The Birds of North America Online. Cornell Laboratory of Ornithology. Ithaca, New York. Retrieved from The Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/002>; doi: 10.2173/bna.2
- Hammerson G., G. Santos-Barrera, and D. Church. 2004. *Acris crepitans*. The IUCN Red List of Threatened Species 2004: e.T55286A11272584. <http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T55286A11272584.en>.
- Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and US Fish and Wildlife Service, Arkansas.
- Harvey, M. J., J. S. Altenbach, and T. L. Best. 2011. Bats of the United States and Canada. The Johns Hopkins University Press, Baltimore, Maryland.
- 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.
- Herkert, J. R., P. D. Vickery, and D. E. Kroodsma. 2002. Henslow's Sparrow (*Ammodramus henslowii*). P. G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from The Birds of North America Online: <https://birdsna.org/Species-Account/bna/species/henspa>; doi: 10.2173/bna.672
- 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>

- Iowa Audubon Society (Iowa Audubon). 2016. IBA Site Information – Elk Creek Marsh. Accessed December 2016. Available online at: <http://www.iowaaudubon.org/iba/>
- Iowa Department of Natural Resources (Iowa DNR). 2016a. Query Interactive Mapping. Natural Areas Inventory, IDNR. Accessed October 2016. Species-specific information and occurrence from: <https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx>
- Iowa Department of Natural Resources (Iowa DNR). 2016b. Iowa's Threatened and Endangered Species Program. Accessed February 2016. Information available online at: <http://www.iowadnr.gov/Conservation/Threatened-Endangered>
- Iowa Department of Natural Resources (Iowa DNR). 2016c. Flood Plain Management: Flood Plain Development Permits. Accessed November 2016. Information available online at: <http://www.iowadnr.gov/Environmental-Protection/Land-Quality/Flood-Plain-Management/Flood-Plain-Dev-Permits>
- Iowa Department of Natural Resources (Iowa DNR). 2016d. Southern Red-Backed Vole. State-Wide Data for a Tracked Species, Natural Areas Inventory. Accessed October 2016. Species data: <https://programs.iowadnr.gov/naturalareasinventory/pages/RepSpeciesByCounty.aspx?elementID=522&type=County>; Species profile: <https://programs.iowadnr.gov/naturalareasinventory/images/elements/522.pdf>
- Iowa Department of Natural Resources (Iowa DNR). 2016e. Blanding's Turtle. State-Wide Data for a Tracked Species, Natural Areas Inventory. Accessed October 2016. Species data: <https://programs.iowadnr.gov/naturalareasinventory/pages/RepSpeciesByCounty.aspx?elementID=561&type=County>; Species profile: <https://programs.iowadnr.gov/naturalareasinventory/images/elements/561.pdf>
- Iowa Department of Natural Resources (Iowa DNR). 2016f. Wood Turtle. State-Wide Data for a Tracked Species, Natural Areas Inventory. Accessed October 2016. Species data: <https://programs.iowadnr.gov/naturalareasinventory/pages/RepSpeciesByCounty.aspx?elementID=560&type=County>; Species profile: <https://programs.iowadnr.gov/naturalareasinventory/images/elements/560.pdf>
- Kaufman, K. 1996. Lives of North American Birds. Houghton Mifflin Company, Boston.
- 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
- Lausen, C. 2009. Status of the Northern Myotis (*Myotis septentrionalis*) in Alberta. Alberta Wildlife Status Report No. 3: (Update 2009).
- Liguori, J. 2005. Hawks from Every Angle: How to Identify Raptors in Flight. Princeton University Press, Princeton, New Jersey.
- Minnesota Board of Water and Soil Resources. 2016. RIM Reserve Fact Sheet. St. Paul, Minnesota. Accessed December 2016. Information available online at: <http://www.bwsr.state.mn.us/easements/rim/factsheet.html>
- Minnesota Department of Natural Resources (MNDNR). 2009a. Southern Mesic Prairie. UPs23, Upland Prairie System: Southern Floristic Region. Minnesota County Biological Survey (MCBS), MDNR, St. Paul, Minnesota. Available online from: [http://files.dnr.state.mn.us/natural\\_resources/npc/upland\\_prairie/ups23.pdf](http://files.dnr.state.mn.us/natural_resources/npc/upland_prairie/ups23.pdf)

- Minnesota Department of Natural Resources (MNDNR). 2009b. Southern Dry Prairie. UPs13, Upland Prairie System: Southern Floristic Region. Minnesota County Biological Survey (MCBS), MDNR, St. Paul, Minnesota. [http://files.dnr.state.mn.us/natural\\_resources/npc/upland\\_prairie/ups13.pdf](http://files.dnr.state.mn.us/natural_resources/npc/upland_prairie/ups13.pdf)
- Minnesota Department of Natural Resources (MNDNR). 2013. Minnesota's List of Endangered, Threatened, and Special Concern Species. Effective August 19, 2013. Available online at: [http://files.dnr.state.mn.us/natural\\_resources/ets/endlist.pdf](http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf)
- Minnesota Department of Natural Resources (MNDNR). 2015a. Blazing Star State Trail. State Trails. MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: [http://www.dnr.state.mn.us/state\\_trails/blazingstar/index.html](http://www.dnr.state.mn.us/state_trails/blazingstar/index.html)
- Minnesota Department of Natural Resources (MNDNR). 2015b. Northern Long-Eared Bat (*Myotis septentrionalis*). Rare Species Guide, Minnesota's Endangered, Threatened, and Special Concern Species, MNDNR, St. Paul, Minnesota. Accessed February 2015. Available online at: <http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC01150#>
- Minnesota Department of Natural Resources (MNDNR). 2016a. Rare Species Guide. Minnesota's List of Endangered, Threatened, and Special Concern Species. Accessed December 2016. Available online at: <http://www.dnr.state.mn.us/rsg/index.html>
- Minnesota Department of Natural Resources (MNDNR). 2016b. Areas of Biodiversity Significance in Minnesota. MBS Site Biodiversity Significance Ranks, Minnesota Biological Survey (MBS). MDNR, St. Paul, Minnesota. Accessed December 2016. Information available online at: [http://www.dnr.state.mn.us/eco/mcbs/biodiversity\\_guidelines.html](http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)
- Minnesota Department of Natural Resources (MNDNR). 2016c. Wild Indigo SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed December 2016. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01051>
- Minnesota Department of Natural Resources (MNDNR). 2016d. Iron Horse Prairie SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed December 2016. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01018>
- Minnesota Department of Natural Resources (MNDNR). 2016e. More About Wildlife Management Areas. MDNR, St. Paul, Minnesota. Accessed December 2016. Information available online at: <http://www.dnr.state.mn.us/wmas/description.html>
- Minnesota Department of Natural Resources (MNDNR). 2016f. Minnesota Biological Survey Native Plant Community and Rare Species County Maps. MDNR, St. Paul, Minnesota. Accessed December 2016. Information and data downloads available online at: <http://www.dnr.state.mn.us/eco/mcbs/maps.html>
- Minnesota Department of Natural Resources (MNDNR). 2016g. First New Bat Species Discovered in Minnesota in More Than a Century. MNDNR News Release (August 1). <http://news.dnr.state.mn.us/2016/08/01/first-new-bat-species-discovered-in-minnesota-in-more-than-a-century/>
- National Audubon Society (Audubon). 2016. The Important Bird Areas. Data accessed November 2016. IBAs by state available online at: <http://www.audubon.org/bird/iba>
- Nisbet, I. C. 2002. Common Tern (*Sterna hirundo*). P. G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from The Birds of North America Online: <https://birdsna.org/Species-Account/bna/species/comter>; doi: 10.2173/bna.618

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

Owen, S. F., M. A. Menzel, W. M. Ford, B. R. Chapman, K. V. Miller, J. W. Edwards, and P. B. Wood. 2003. Home-Range Size and Habitat Used by the Northern Myotis (*Myotis septentrionalis*). American Midland Naturalist 150(2): 352-359.

Pardieck, K. L., D. J. Ziolkowski, Jr., M. A. R. Hudson, and K. Campbell. 2016. North American Breeding Bird Survey Dataset 1966 - 2015, Version 2015.1. US Geological Survey, Patuxent Wildlife Research Center. Information available online at: [www.pwrc.usgs.gov/BBS/RawData/](http://www.pwrc.usgs.gov/BBS/RawData/)

Pickens, B. A. and B. Meanley. 2015. King Rail (*Rallus elegans*). P. G. Rodewald, 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/kinrai4>; doi: 10.2173/bna.3

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.

Poulin, R., L. D. Todd, E. A. Haug, B. A. Millsap, and M. S. Martell. 2011. Burrowing Owl (*Athene cunicularia*). 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/061>; doi: 10.2173/bna.61

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

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.

Sibley, D. A. 2003. The Sibley Field Guide to Birds of Eastern North America. Knopf Publishing, New York.

Simon, S. and T. Mattson. 2016. Site Characterization Study 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 pp.

Smith, K. G., S. R. Wittenberg, R. B. Macwhirter, and K. L. Bildstein. 2011. Northern Harrier (*Circus cyaneus*). 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/210>

Stedman, S. J. 2000. Horned Grebe (*Podiceps auritus*). P. G. Rodewald, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from The Birds of North America Online: <https://birdsna.org/Species-Account/bna/species/horgre>; doi: 10.2173/bna.505

U.S. Army Corps of Engineers (USACOE). 1987. 1987 Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1. Final report prepared by Environmental Laboratory. January 1987. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. Available online at: <https://www.cpe.rutgers.edu/Wetlands/1987-Army-Corps-Wetlands-Delineation-Manual.pdf>

- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2016. SSURGO Soils Data. Soil Survey Geographic (SSURGO) Database, USDA Soil Survey Staff, NRCS. SSURGO Database for Freeborn County, Minnesota, and Worth County, Iowa. Web Soil Survey and other information available online at: <http://websoilsurvey.nrcs.usda.gov/>
- U.S. Department of Agriculture (USDA). 2016. Imagery Programs - National Agriculture Imagery Program (NAIP). USDA - Farm Service Agency (FSA). Aerial Photography Field Office (APFO), Salt Lake City, Utah. Data accessed May 2016. Information available online at: <http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index>
- U.S. Environmental Protection Agency (USEPA). 2016. Ecoregion Download Files by State - Region 7: Iowa. Ecoregions of the United States, Ecosystems Research, USEPA. Last updated March 22, 2016. Information and maps available online at: <https://www.epa.gov/ecoresearch/ecoregion-download-files-state-region-7#pane-13>
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2016. NWI Data Mapper. Updated October 13, 2016. Fort Snelling, Minnesota. Wetlands Mapper: <http://www.fws.gov/wetlands/Data/Mapper.html>
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2014. Seamless Wetlands Data by State: Minnesota. USFWS NWI Data Mapper. USFWS NWI, Fort Snelling, Minnesota. Updated November 2014. Geodatabase and Shapefile data available online at: <http://www.fws.gov/wetlands/data/State-Downloads.html>
- U.S. Fish and Wildlife Service (USFWS). 1971. Wetlands of the United States: Their Extent and Value to Waterfowl and Other Wildlife. Circular 39. S. P. Shaw and C. G. Fredine, Office of River Basin Studies, USFWS. Available online at: <https://www.fws.gov/wetlands/documents/Wetlands-of-the-United-States-Their-Extent-and-Their-Value-to-Waterfowl-and-Other-Wildlife.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2002. Migratory Bird Mortality: Many Human-Caused Threats Afflict Our Bird Populations. USFWS Division of Migratory Bird Management, Arlington, Virginia. January 2002.
- U.S. Fish and Wildlife Service (USFWS). 2003. Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*). Region 3 USFWS, Ft. Snelling, Minnesota. 141 pp.
- U.S. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management. Arlington, Virginia. Available online at: <https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2011. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Threatened or Endangered. 76 Federal Register (FR) 125, 38095-38106, 50 Code of Federal Regulations (CFR) 17. June 29, 2011.
- U.S. Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. [http://www.fws.gov/cno/pdf/Energy/2012\\_Wind\\_Energy\\_Guidelines\\_final.pdf](http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf)
- U.S. Fish and Wildlife Service (USFWS). 2013. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species. Docket No. FWS-R5-ES-2011-0024. 78 Federal Register (FR) 191: 61046-61080. October 2, 2013.

- 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). 2016a. Species Profiles. USFWS Environmental Conservation Online System (ECOS) Species Profiles. Accessed October 2016. ECOS species profiles available online from: <http://ecos.fws.gov/ecp/>
- U.S. Fish and Wildlife Service (USFWS). 2016b. Iowa: County Distribution of Federally Threatened, Endangered, Proposed, and Candidate Species. Endangered Species, USFWS, Midwest Region. October 2016. Available online at: [https://www.fws.gov/midwest/endangered/lists/iowa\\_cty.html](https://www.fws.gov/midwest/endangered/lists/iowa_cty.html)
- U.S. Fish and Wildlife Service (USFWS). 2016c. Endangered Species in Minnesota. County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. Information available at: <https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html>
- U.S. Fish and Wildlife Service (USFWS). 2016d. Iowa: County Distribution of Federally Threatened, Endangered, Proposed and Candidate Species. Accessed October 2016. Information available online at: [https://www.fws.gov/midwest/endangered/lists/iowa\\_spp.html](https://www.fws.gov/midwest/endangered/lists/iowa_spp.html)
- U.S. Fish and Wildlife Service (USFWS). 2016e. Piping Plover (*Charadrius melodus*). USFWS Environmental Conservation Online System (ECOS) Species Profile. Accessed November 2016. ECOS available at: <http://ecos.fws.gov/ecos/indexPublic.do>; Species profile available online at: <http://ecos.fws.gov/ecp0/profile/speciesProfile?scode=B079>
- U.S. Fish and Wildlife Service (USFWS). 2016f. Western Prairie Finged Orchid (*Platanthera praeclara*). USFWS Environmental Conservation Online System (ECOS) Species Profile. Accessed November 2016. ECOS available at: <http://ecos.fws.gov/ecos/indexPublic.do>; Species profile available online at: <http://ecos.fws.gov/ecp0/profile/speciesProfile?scode=Q2YD>
- U.S. Fish and Wildlife Service (USFWS). 2016g. Species Profile: Prairie Bush-Clover (*Lespedeza leptostachya*). Last updated: December 2016. USFWS Environmental Conservation Online System (ECOS) Species Profile. Accessed November 2016. ECOS available at: <http://ecos.fws.gov/ecos/indexPublic.do>; Species profile available at: <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=Q2CB>
- U.S. Fish and Wildlife Service (USFWS). 2016h. Threatened and Endangered Species Profiles. Accessed December 2016. Available online at: <https://www.fws.gov/endangered>
- U.S. Geological Survey (USGS) Digital Elevation Model (DEM). 2016. Digital Elevation Model (DEM) Imagery.
- U.S. Geological Survey (USGS) Gap Analysis Program (GAP). 2016. Protected Areas Database of the United States (PAD-US). Version 1.4 Combined Feature Class. May 2016. Available online at: <http://gapanalysis.usgs.gov/padus/data/download/>
- U.S. Geological Survey (USGS) National Hydrography Dataset (NHD). 2016. USGS NHD Extracts: Iowa and Minnesota. Last accessed October 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). 2001. North American BBS Methodology Training. Accessed October 2016. USGS Breeding Bird Surveys (BBS), Patuxent Wildlife Research Center. Laurel, Maryland. Methodology Training available online at: <http://www.pwrc.usgs.gov/BBS/participate/training/>; Description and Methods available online at: <http://www.pwrc.usgs.gov/BBS/participate/training/1.html>

- U.S. Geological Survey (USGS). 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\\_leq.php](http://www.mrlc.gov/nlcd11_leq.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](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). 2016a. ArcGIS Rest Services Directory. Streaming data. The National Map, USGS. Last updated September 2016. Data from: <https://basemap.nationalmap.gov/arcgis/rest/services>
- U.S. Geological Survey (USGS). 2016b. Information on Routes. North American Breeding Bird Survey, Patuxent Wildlife Research Center, USGS. Accessed August 2016. Online at: <https://www.pwrc.usgs.gov/BBS/RouteMap/Map.cfm#>
- Verboom, B. and H. Huitema. 1997. The Importance to Linear Landscape Elements for the Pipistrelle, *Pipistrellus pipistrellus*, and the Serotine Bat, *Eptesicus Serotinus*. Landscape Ecology 12: 117-125.
- Worth County. 2016. Worth County Conservation Board. Accessed December 2016. Available online at: <http://www.worthcounty.org/default.aspx>
- Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). 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/231>; doi: 10.2173/bna.231

## 7.2 Laws, Acts, and Regulations

- 33 United States Code (USC) § 401 et. seq. 1899. Rivers and Harbors Act. 33 USC 401 et seq.
- 78 Federal Register (FR) 191: 61046-61080. 2013. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species. Proposed Rule; 12-Month Finding. Department of the Interior Fish and Wildlife Service. 78 FR 61046. October 2, 2013. Available online at: <https://www.gpo.gov/fdsys/pkg/FR-2013-10-02/pdf/2013-23753.pdf>
- Bald and Golden Eagle Protection Act. 1940. 16 United States Code (USC) § 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, Section (§) 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. As amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.
- Clean Water Act. 1972. Section 404. 33 U.S.C. §§ 1251-1387. Pub. L. 92-500, Oct. 18, 1972. 86 Stat. 816-903. Available online at: [http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/cwa\\_sec404doc.pdf](http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/cwa_sec404doc.pdf)
- Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 et seq.]; 50 Code of Federal Regulations (CFR) 402.

- Iowa Code (IA Code) § 455B.171. Chapter 455b - Jurisdiction of Department of Natural Resources; Section (§) 455b.171-Definitions. IA Code 455B.171. [C66, 71, § 455B.2; C73, 75, 77, 79, 81, § 455B.30; 82 Acts, ch 1050, § 1, 2, ch 1199, § 6, 7, 8, 96] <https://coolice.legis.iowa.gov/Cool-ICE/default.asp?category=billinfo&service=iowaCode&input=455B.171>
- Iowa Code (IA Code) § 456B.1. Chapter 456b - Special Provisions - Natural Resources Department; Section (§) 456b.1 - Definitions. IA Code 456B.1. [86 Acts, ch 1245, § 1846; C87, § 108.1; 90 Acts, ch 1199, § 1; C93, § 456B.1]. Information available online at: [http://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=456B.1](http://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=456B#456B.1)
- Iowa Code (IA Code) § 456B.13. Chapter 456b - Special Provisions - Natural Resources Department; Section (§) 456b.13-Protections of Wetlands. IA Code 456B.13. [http://coolice.legis.iowa.gov/Cool-ICE/default.asp?category=billinfo&service=iowaCode&ga=83&input=456B.13](http://coolice.legis.iowa.gov/Cool-ICE/default.asp?category=billinfo&service=iowaCode&ga=83&input=456B#456B.13)
- Iowa Code (IA Code) 456B. Chapter 456b - Natural Resources Department. <http://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=456B>
- Migratory Bird Treaty Act. 1918. 16 United States Code (USC) §§ 703-712. July 13, 1918.
- Minnesota Administrative Rules 6230.0400. Minnesota Administrative Rules; Department of Natural Resources; Chapter 6230 - Wildlife Management; Part 6230.0400 - Special Provisions for State Game Refuges. Available online at: <https://www.revisor.leg.state.mn.us/rules/?id=6230.0400>
- Minnesota Administrative Rules Chapter 6135. Minnesota Administrative Rules; Department of Natural Resources; Chapter 6135 - Utility Crossings. Available online at: <https://www.revisor.mn.gov/rules/?id=6135&view=chapter>
- Minnesota Statutes Section 84.415. 2016. 2016 Minnesota Statutes; Natural Resources; Chapter 84 - Department of Natural Resources; Section 84.415 - Utility Licenses, Permits. Available online at: <https://www.revisor.leg.state.mn.us/statutes/?id=84.415>
- Minnesota Wetland Conservation Act (WCA). 1991. Laws 1991, Chapter 354. As amended by Laws 1993, Chapter 175; Laws 1994, Chapter 627; Laws 1996, Chapter 462; Laws 2000, Chapter 382; Laws 2001, Chapter 146; Laws 2002, Chapter 220; Laws 2003, Chapter 128; Laws 2004, Chapters 221 and 255; Laws 2007, Chapters 57 and 131; and Laws 2008, Chapter 368.
- Minnesota Statutes Section 103G.005. 2016. 2016 Minnesota Statutes; Water; Chapter 103g - Waters of the State; Section 103g.005 - Definitions. Available online at: <https://www.revisor.leg.state.mn.us/statutes/?id=103G.005>
- Minnesota Statutes Section 103G.201. 2016. 2016 Minnesota Statutes; Water; Chapter 103g - Waters of the State; Section 103g.201 - Public Waters Inventory. Available online at: <https://www.revisor.leg.state.mn.us/statutes/?id=103G.201>

**Site Characterization Study  
for the Freeborn Wind Energy Project  
Freeborn County, Minnesota**

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**Final Report**



**Prepared for:**

**Freeborn Wind Energy LLC**

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## 1 INTRODUCTION

Freeborn Wind Energy LLC (Freeborn) is considering the development of the Freeborn Wind Energy Project (Project) in Freeborn County, Minnesota (Figure 1). To support development of the Project, Freeborn requested Western EcoSystems Technology, Inc. (WEST) prepare this biological site characterization study report. The purpose of this report is to describe biological resources present within and surrounding the proposed Project area in accordance with a Tier 2 site characterization set forth in the U.S. Fish and Wildlife Service's (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012).

## 2 STUDY AREA

The proposed Project area encompasses 16,120 hectares (ha; 39,834 acres [ac]) in Freeborn County, Minnesota (Figure 1). The Project occurs in the Western Corn Belt Plains Ecoregion (U.S. Environmental Protection Agency [USEPA] 2013), characterized by glaciated till plains and undulating loess plains. Much of the region was originally dominated by tallgrass prairie, riparian forest, oak-prairie savannas, and woody and herbaceous wetlands. Today, most of the area has been cleared for farms producing corn, soybeans, and livestock (USEPA 2013).

Many smaller streams in this ecoregion have been tilled, ditched, and tied into existing drainage systems, resulting in a reduction in wetland and aquatic habitats (USEPA 2013). A few streams are present in and adjacent to the Project 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 the Shell Rock River and its tributaries in the west (Figure 1). The elevation in the Project area ranges from approximately 343 – 422 meters (m; 1,125 – 1,385 feet [ft]; Figure 2). Topography in the Project area is generally flat with some gently rolling hills (Figure 2).

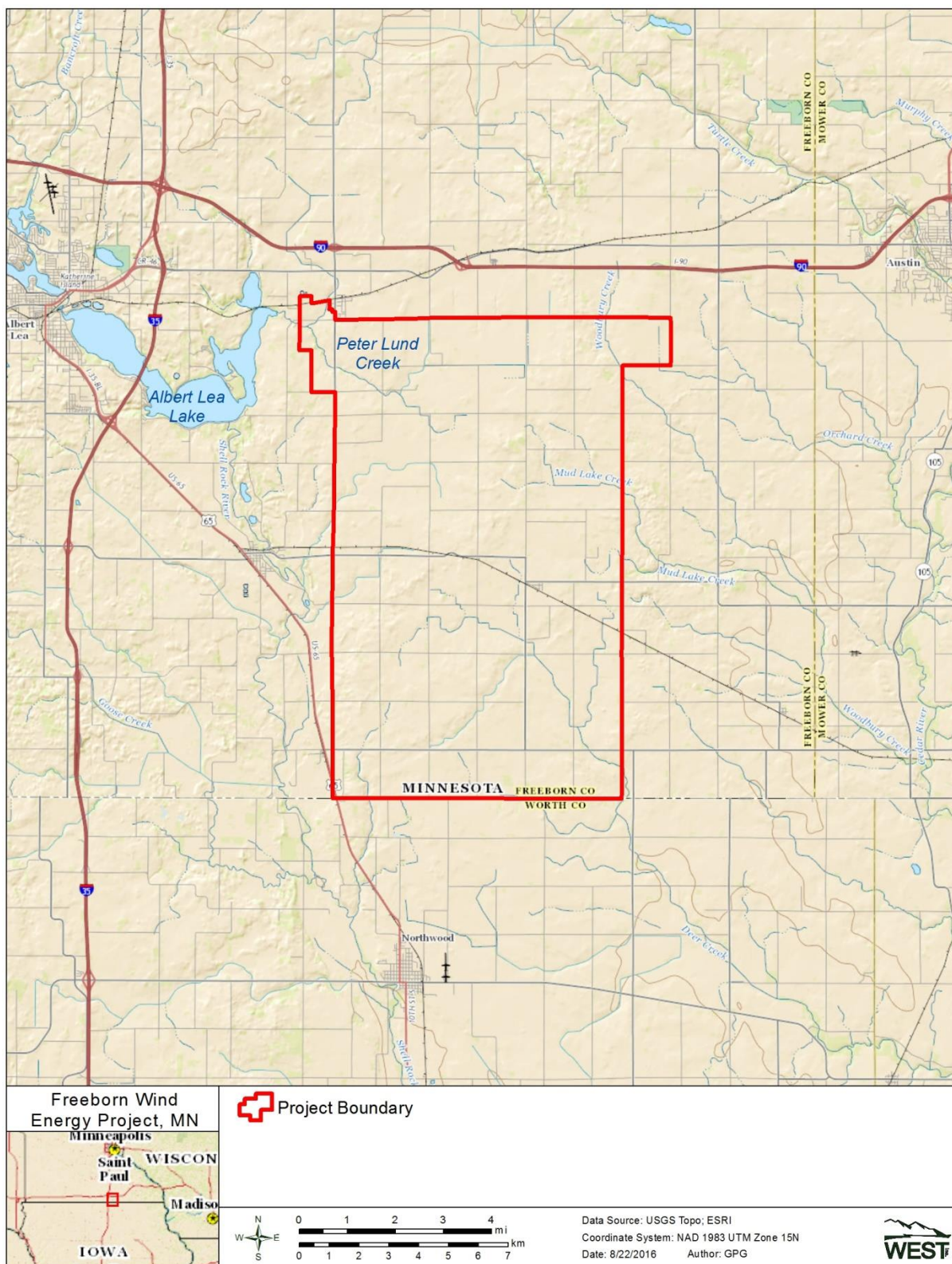


Figure 1. Location of the Freeborn Wind Energy Project in Freeborn County, Minnesota.

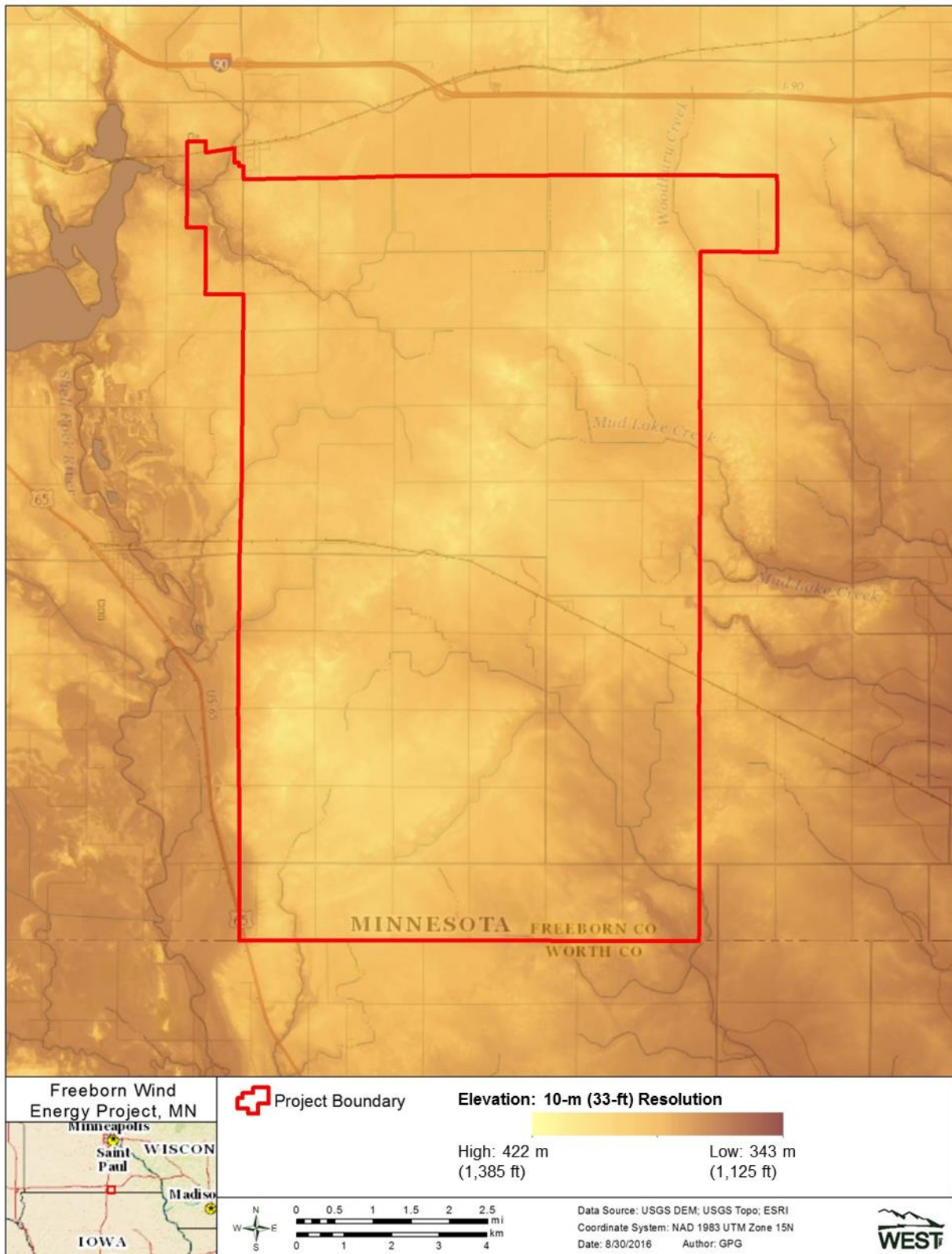


Figure 2. Digital elevation map of the Freeborn Wind Energy Project in Freeborn County, Minnesota.

### 3 METHODS

Biological resources within the Project area were evaluated through a comprehensive desktop review of existing data. Several sources of available data were used including published technical literature, field guides, and public datasets. A data request to the Minnesota Department of Natural Resources (MNDNR), including a request for Minnesota Natural Heritage Information System (NHIS) records for the Project area, was submitted on February 17, 2015. Correspondence from MNDNR (March 18 and 26, 2015, Environmental Assessment Review and NHIS, respectively) is provided in this document. Additionally, a site reconnaissance was conducted by a biologist in the Project area on March 9, 2015 to assess biological resources from public roads throughout the extent of the Project area. Prior to the site visit, biological resources data were reviewed for the Project area, including federally listed and state-listed species with potential to occur in Freeborn County, to evaluate the potential use of the Project area by these species based on habitat associations. Potential habitat for listed species was confirmed during the site visit and documented on aerial photographs.

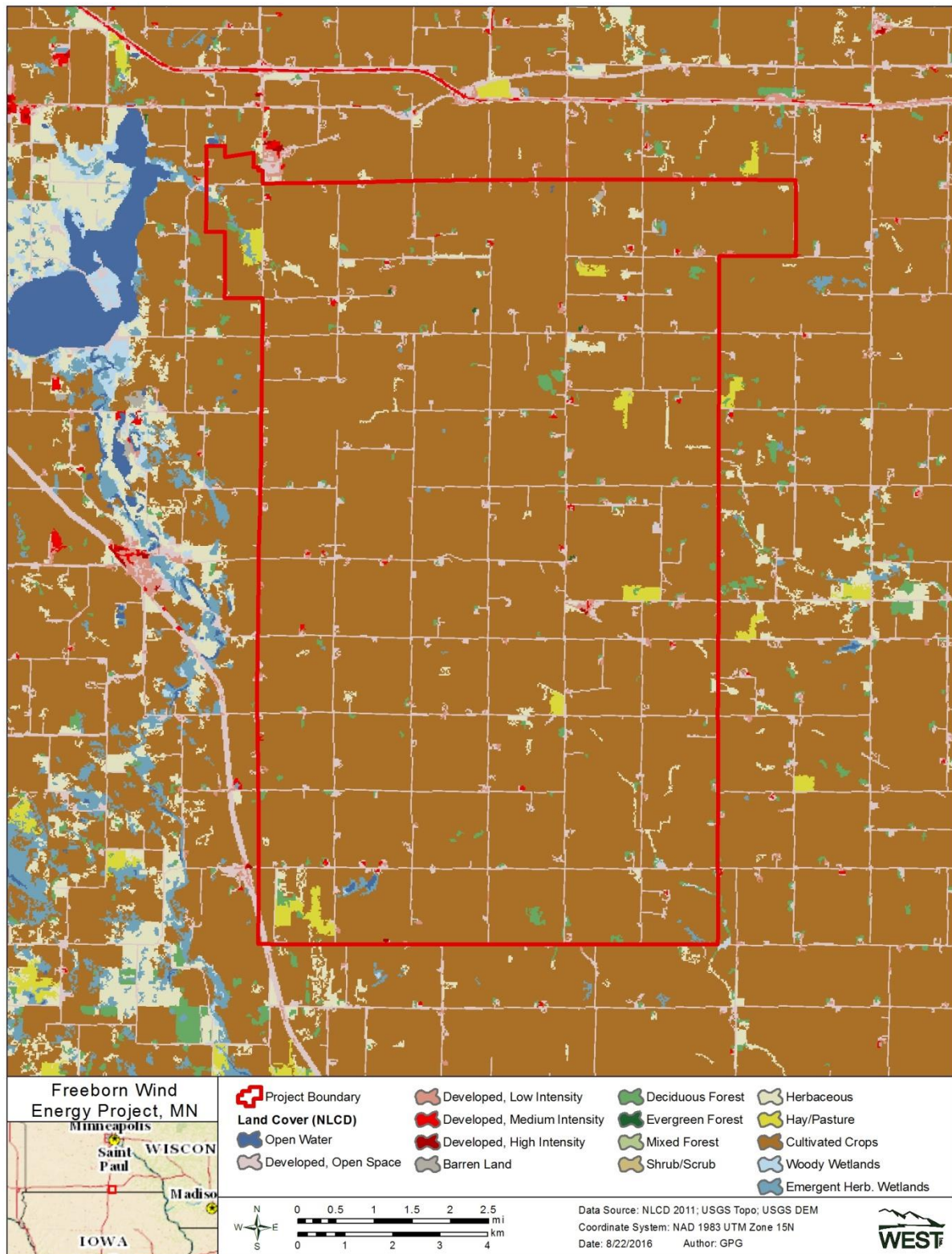
### 4 HABITATS

#### 4.1 Land Cover

According to the 2011 National Land Cover Database (NLCD; Homer et al. 2015), the majority (96.9%) of the Project area consists of cultivated croplands (i.e., agriculture) and developed areas (Table 1 and Figure 3). Corn (*Zea mays*) and soybean (*Glycine max*) are the most common crops. Herbaceous land cover comprises 1.0% of the Project area. Hay/pasture and deciduous forest land cover types each comprise less than 1.0% of the Project area. The remaining land cover types all comprise less than 0.1% of the Project area.

**Table 1. 2011 National Land Cover Database land cover types within the Freeborn Wind Energy Project area.**

Cover Type	Hectares	Acres	Percent (%)
Cultivated Crops	14,701.6	36,328.5	91.0
Developed, Open Space	849.8	2,100.0	5.3
Herbaceous	162.0	400.4	1.0
Hay/Pasture	133.2	329.1	0.8
Deciduous Forest	131.1	324.0	0.8
Developed, Low Intensity	56.3	139.1	0.4
Emergent Herbaceous Wetlands	40.0	98.9	0.3
Developed, Medium Intensity	21.5	53.1	0.1
Open Water	6.5	16.0	<0.1
Woody Wetlands	7.9	19.6	<0.1
Barren Land	5.3	13.1	<0.1
Evergreen Forest	2.9	7.1	<0.1
Developed, High Intensity	2.0	4.9	<0.1
Mixed Forest	0.0	0.0	0.0
Shrub/Scrub	0.0	0.0	0.0
<b>Total</b>	<b>16,120.2</b>	<b>39,833.8</b>	<b>100.0</b>



**Figure 3. National Land Cover Database land cover types within and adjacent to the Freeborn Wind Energy Project area in Freeborn County, Minnesota.**

## 4.2 Wetlands and Riparian Areas

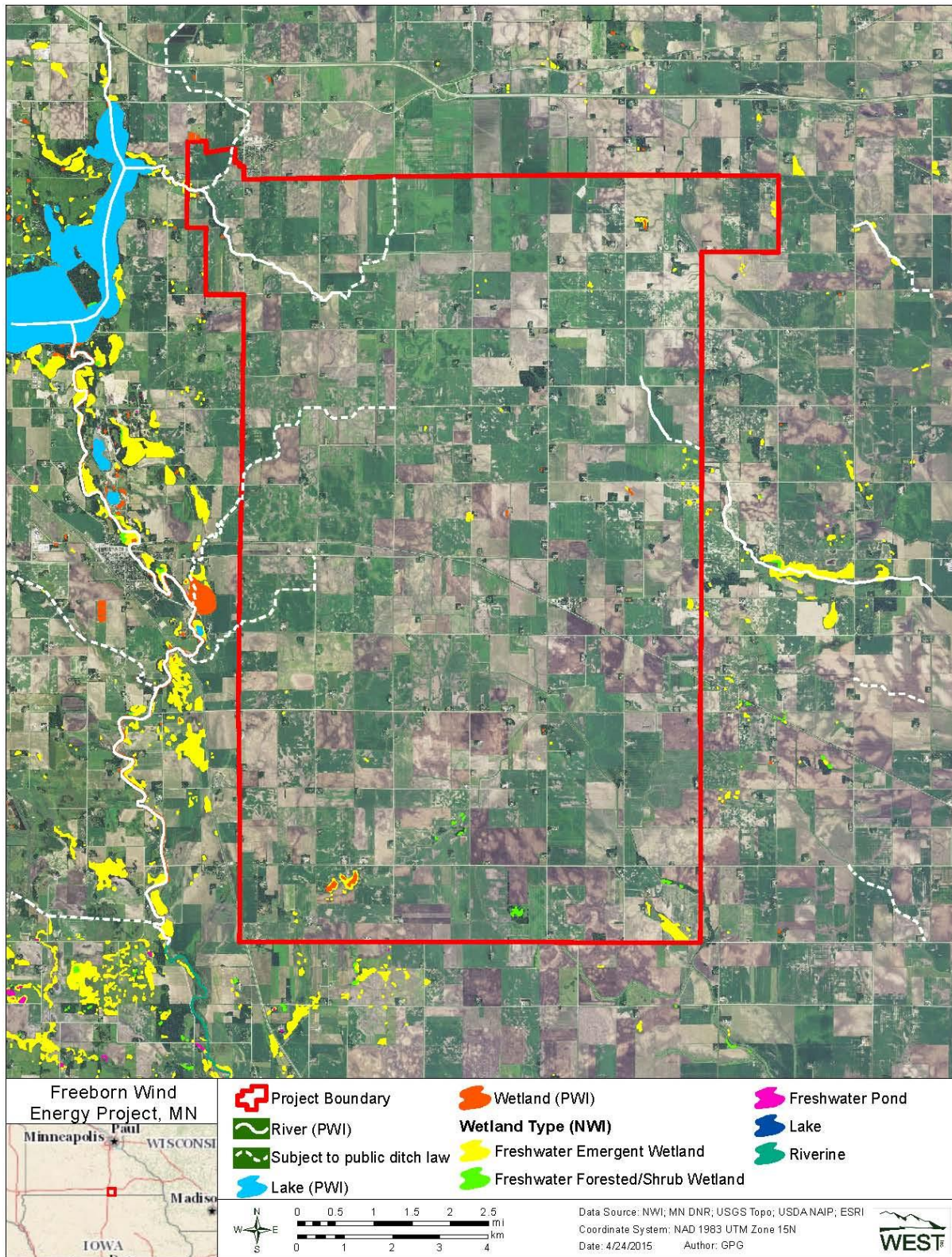
National Wetlands Inventory (NWI) data (USFWS NWI 2014) show 76.6 ha (189.3 ac; less than 0.5%) within the Project area are wetlands, including the following wetland types: freshwater emergent wetland (64.9 ha [160.3 ac]), freshwater pond (6.4 ha [15.8 ac]), and freshwater forested/shrub wetland (5.3 ha [13.2 ac]; Table 2; Figure 4). Data mapped from the 2011 NLCD show 47.9 ha (118.5 ac) of wetlands in the Project area, including 40.0 ha (98.9 ac) of emergent herbaceous wetlands and 7.9 ha (19.6 ac) of woody wetlands, as well as 6.5 ha (16.0 ac) of open water (Table 1 and Figure 3).

**Table 2. Wetland types based on the U.S. Fish and Wildlife Service National Wetlands Inventory present within the Freeborn Wind Energy Project area in Freeborn County, Minnesota..**

Wetland Type	Hectares	Acres	Percent (%)
Freshwater Emergent Wetland	64.9	160.4	84.7
Freshwater Pond	6.4	15.8	8.3
Freshwater Forested/Shrub Wetland	5.3	13.1	7.0
<b>Total</b>	<b>76.6</b>	<b>189.3</b>	<b>100.0</b>

Although wetlands and other Waters of the U.S. occur in the Project area, they occupy a small percentage of the area, with the majority restricted to riparian zones, particularly along Peter Lund Creek in the northwest corner of the Project area and Deer Creek in the southwest corner of the Project area, as observed during the site reconnaissance conducted March 9, 2015. There is potential for depressions within croplands to be saturated or to pond water during the wet season, which was observed during the March 9, 2015 site reconnaissance. Formal wetland delineations have not been completed; however, from the desktop review, many of the wetlands identified by the NWI occur adjacent to or are within the riparian zone of waterbodies that have a significant nexus with traditional navigable waters, and, therefore, would likely be considered jurisdictional by the U.S. Army Corps of Engineers (USACOE; see Environmental Laboratory 1987).

Additionally, the Minnesota Wetland Conservation Act (WCA 1991) regulates impacts to all wetlands in the state, including isolated wetlands that may not be jurisdictional under the Clean Water Act (CWA 1972). If the Project were to impact wetlands and the impacts exceeded the de minimus or exemption thresholds of the WCA, a wetland replacement/mitigation plan would likely be required.



**Figure 4. National Wetland Inventory wetland types and Minnesota Public Waters Inventory within and adjacent to the Freeborn Wind Energy Project area in Freeborn County, Minnesota.**

Public waters are all waterbasins and watercourses that meet the criteria set forth in Minnesota Statutes, Section 103G.005, that are identified on Public Water Inventory (PWI) maps authorized by Minnesota Statutes, Section 103G.201; the MNDNR has regulatory jurisdiction over these waters. Public Waters Inventory wetlands are located within the southern portion of the Project area (Figure 4); the nearest PWI lake is Albert Lea Lake, located less than 1.6 kilometers (km; 1 mile [mi]) from the northwest corner of the Project area. Mud Lake Creek (located in the eastern portion of the Project area) and Peter Lund Creek (located in the northwest corner of the Project area) are PWI streams; the Shell Rock River located approximately 1.6 km (1 mi) to the west of the Project also is a PWI river.

Minnesota law (Minnesota Statutes Section 84.415, administered through Minnesota Administrative Rules Chapter 6135) requires a license be obtained from the MNDNR Division of Lands and Minerals for the crossing of any utility over, under, or across any public waters; permits also are required for potential fill placement or other impacts that may affect the banks of watercourses, such as an access road crossing. Several of the major tributaries in the Project area are mapped on the PWI inventory as dashed lines, indicating they are subject to public ditch law and the MNDNR may not have jurisdiction.

#### 4.3 State-Managed Lands

The MNDNR manages Scientific and Natural Areas and Wildlife Management Areas (WMA) in Minnesota (MNDNR 2015a; Figure 5). These areas of conservation significance are generally considered important for conserving the native species, communities, and ecological systems of the state.

The Osmundson Prairie Scientific and Natural Area is located approximately 40.2 km (25 mi) west of the Project and is comprised of remnant mesic prairie dominated by Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardi*), and grama grasses (*Bouteloua* spp.; MNDNR 2015b). Wild Indigo Prairie Scientific and Natural Area, a native prairie remnant (MNDNR 2015c), is located approximately 14.5 km (9 mi) northeast of the Project area along a railroad verge. Iron Horse Scientific and Natural Area, comprised of mesic prairie, is located approximately 32.2 km (20 mi) northeast of the Project (MNDNR 2015d). Hythecker Prairie Scientific and Natural Area is located approximately 40.2 km (25 mi) northeast of the Project area and contains rare plant species such as valerian (*Valeriana edulis* var. *ciliata*) and rattlesnake master (*Eryngium yuccifolium*; MNDNR 2015e; Figure 5).

In addition to the four Scientific and Natural Areas listed above, there are several managed parcels administered by the MNDNR in proximity to the Project area. Myre-Big Island State Park is the closest at 1.6 km (1 mi) northwest of the Project; it is adjacent to Albert Lea Lake (Figure 6). This area is recognized for bald eagle (*Haliaeetus leucocephalus*) use throughout the year (see [www.ebird.org](http://www.ebird.org)). The Blazing Star State Trail exists within Myre-Big Island State Park and is proposed for expansion to the east, traveling adjacent to the railroad through Hayward to Austin (MNDNR 2015f), which would place a small portion of the trail through the far northwest corner of the Project area.

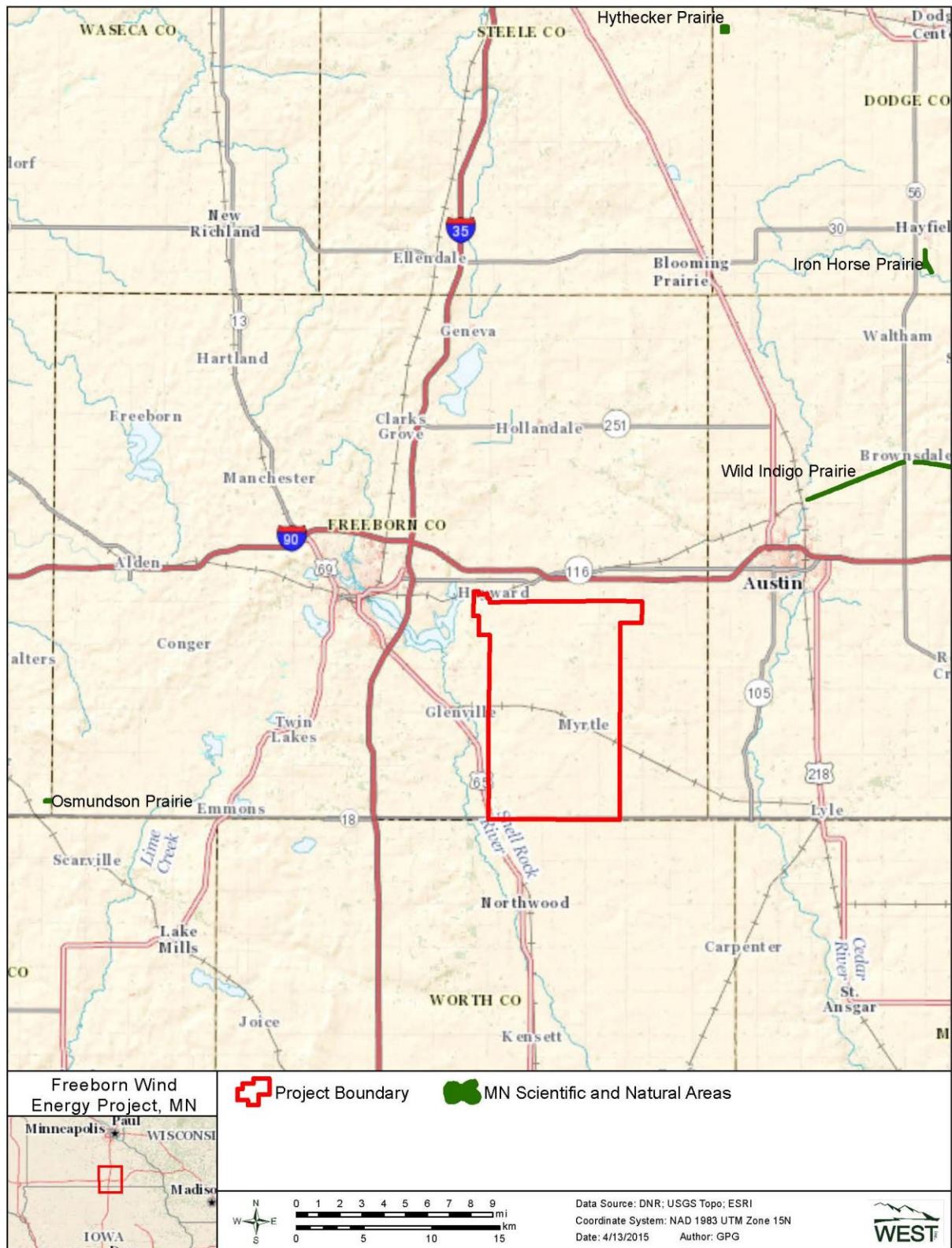


Figure 5. Location of Minnesota Scientific and Natural Areas in relation to the Freeborn Wind Energy Project area in Freeborn County, Minnesota.

A total of five state-managed WMA land complexes, consisting of 10 land parcels in proximity to the Project area and ranging from 2 – 13 km (1 – 8 mi) from the Project area, as well as several state-managed Reinvest in Minnesota (RIM) conservation easement parcels, ranging from 1.6 – 11.3 km (1 – 7 mi) from the Project area (MNDNR 2015a). Prominent habitats in these WMAs include prairie and wetland communities and there is some potential for these areas to support sensitive species (MNDNR 2016a, Figure 6). One parcel is managed by the Iowa Department of Natural Resources (IDNR; a portion of the Panicum Prairie WMA complex) located immediately southwest of the Project in Worth County, Iowa (IDNR 2015). Additionally, 11 county parks are administered by local agencies (shown as Local Land in Figure 6).

The Albert Lea Game Refuge is located in and around Myre-Big Island State Park, less than 0.8 km (0.5 mi) from the northwest corner of the Project area; the Moscow State Game Refuge is located approximately 8 km (5 mi) northeast of the Project (Figure 6). Hunting and trapping is allowed on public parcels in these game refuges, including small game, deer (*Odocoileus virginianus*), and bear (*Ursus americana*) by firearms and archery (Minnesota Administrative Rules 6230.0400). However, the primary purpose of these game refuges is to provide protection to waterfowl; therefore, no waterfowl hunting is permitted within the refuge. The game refuges may be open or closed at the discretion of the MNDNR commissioner.

#### **4.4 Federally Managed Lands**

Two federally administered Waterfowl Protection Areas (WPA) are located approximately 9.7 km (6 mi) from the Project area. Goose Lake WPA is located 6.4 km (4 mi) northwest of the Project area and Turtle Creek WPA is located 9.7 km (6 mi) northeast of the Project (Figure 6).

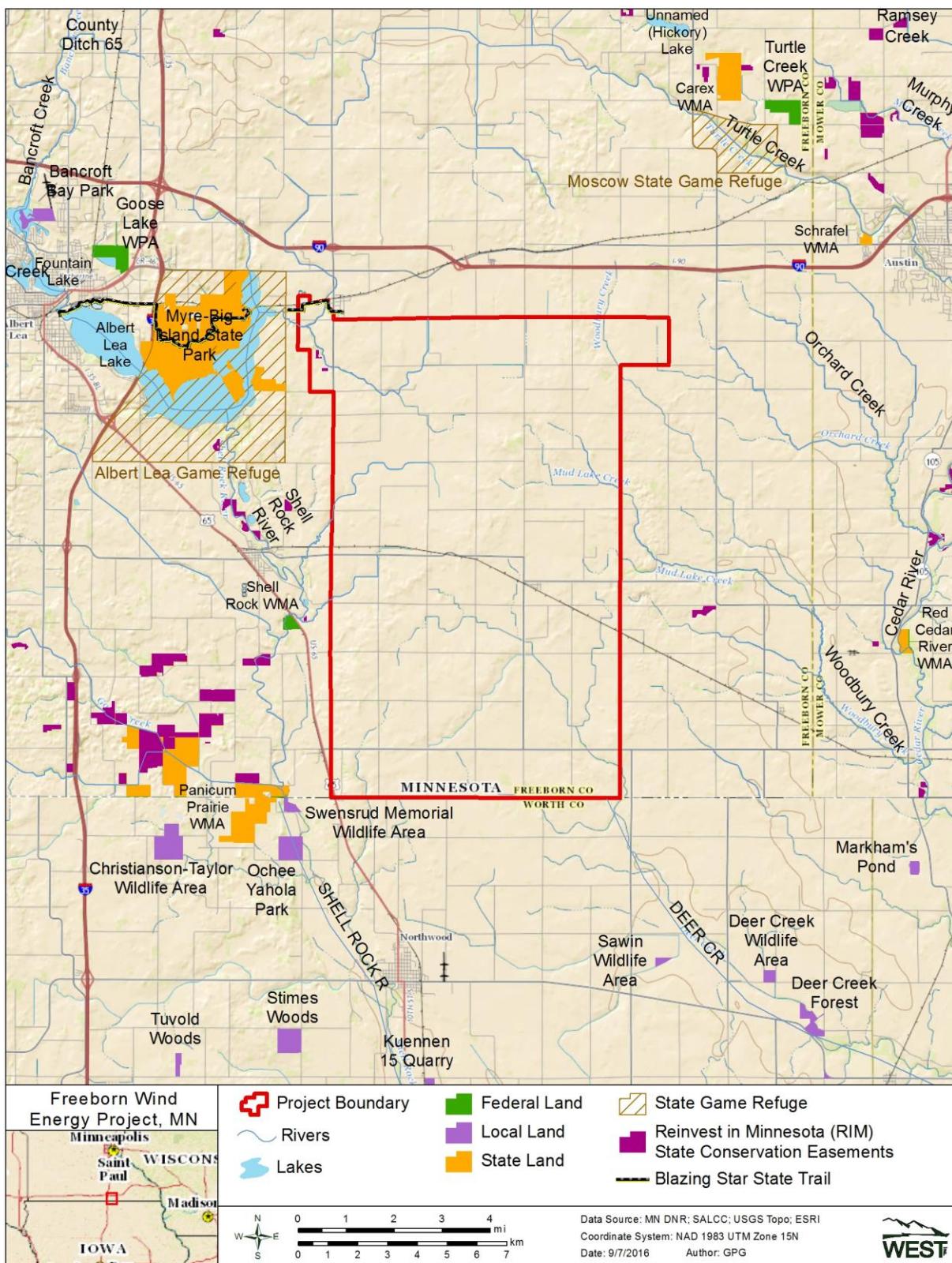


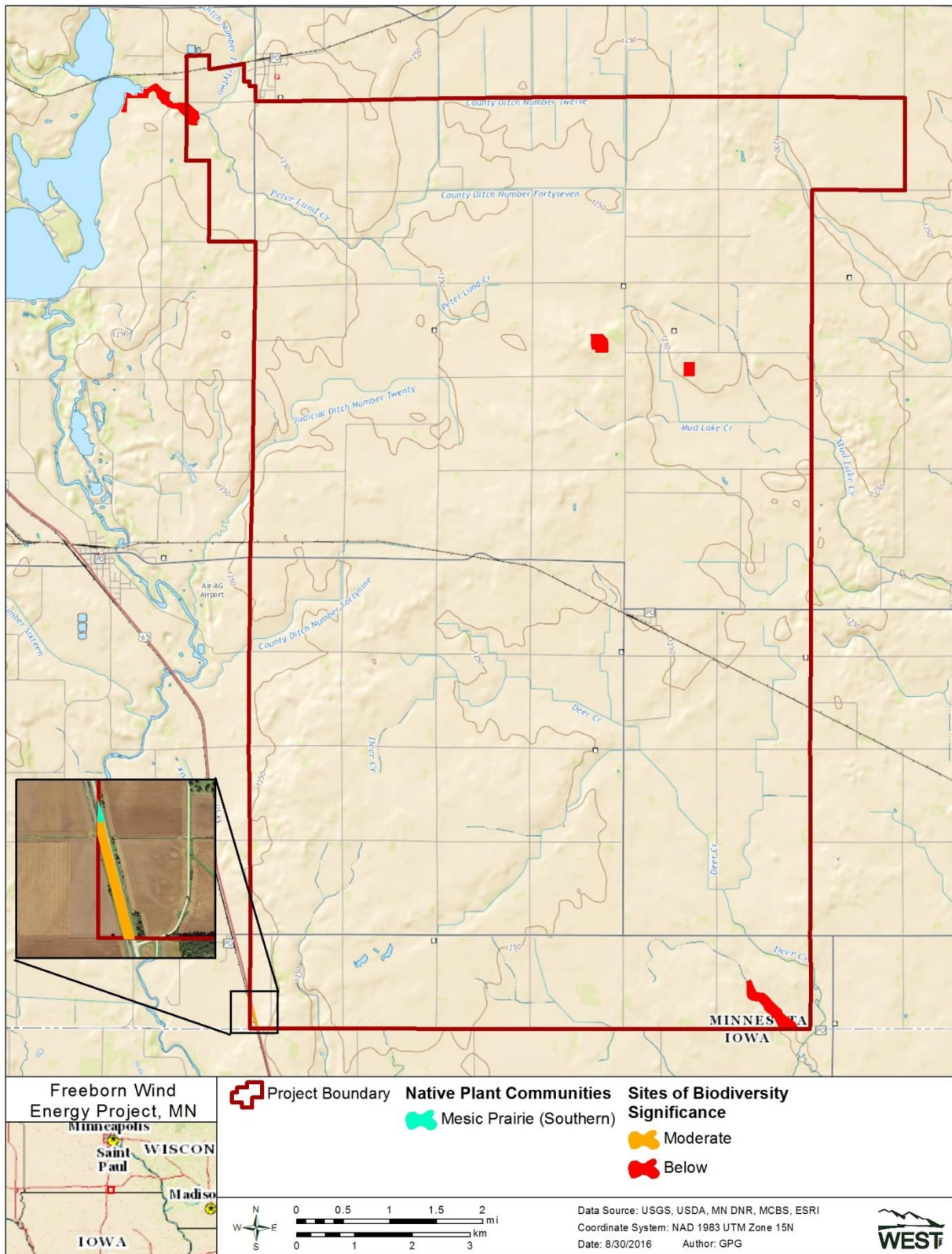
Figure 6. Protected lands in relation to the Freeborn Wind Energy Project area in Freeborn County, Minnesota.

#### **4.5 Sites of Biodiversity Significance and Native Plant Communities**

The Minnesota Biological Survey (MBS) is an ongoing effort initiated in 1987 by the MNDNR to systematically survey, county-by-county, the state's natural habitats. MBS has mapped areas of biodiversity significance throughout the state and assigned rank categories based on the presence of rare species, the conservatism of native plant communities within these areas (i.e., plant species less tolerant of disturbed areas with a high degree of fidelity to a narrow range of pristine habitats), and the relation of these areas to the surrounding landscape of the site (MNDNR 2015a).

A few sites have been evaluated for biodiversity significance in the Project area that are ranked as “below,” (i.e., no rare plant species are likely to occur within these areas), but the relation of these areas to surrounding landscapes and features (e.g., riparian corridors) could provide potential habitat corridors for rare plant species (Figure 7). Although these sites provide lower value and function compared to more pristine native habitats, there is the potential for native habitat restoration or enhancement in these MBS-mapped areas.

According to MBS mapping, one small native plant community occurs in the Project area, a mesic prairie that exists along a railroad verge near the southwest Project boundary (Figure 7). A continuation along this railroad edge in the far southwest corner of the Project area is mapped as a small site of biodiversity significance ranked as “moderate,” (i.e., rare plant species are present, but the community has been degraded). The surrounding landscape could support potential recovery of rare plant species.



**Figure 7. Sites of biodiversity significance and native plant communities in and near the Freeborn Wind Energy Project area in Freeborn County, Minnesota.**

## 5 FEDERALLY AND STATE-PROTECTED SPECIES

### 5.1 Federally Listed Species

No species listed as endangered under the Endangered Species Act (ESA, 1973) are identified for Freeborn County, Minnesota (USFWS 2015a). The northern long-eared bat (*Myotis septentrionalis*; USFWS 2015a), listed as threatened under the ESA (USFWS 2015b) may potentially occur in the county. Additionally, there is some potential for ESA-listed populations of the piping plover (*Charadrius melodus*) to occur in the Project area. Although the piping plover is not documented as occurring within Freeborn County, birds from the federally endangered Great Lakes population or birds from the federally threatened northern Great Plains population (USFWS 2015c) may move through the Project area during migration.

#### 5.1.1 Northern Long-Eared Bat

The northern long-eared bat is widely distributed throughout Minnesota (Harvey et al. 2011) and is commonly encountered in summer mist-net surveys throughout much of the Midwest (USFWS 2013; 78 Federal Register [FR] 61046). Northern long-eared bats hibernate in caves, mines, and sometimes buildings. One of the largest concentrations of wintering northern long-eared bats in Minnesota is at Mystery Cave, located approximately 64 km (40 mi) east of the Project (MNDNR 2015g).

The northern long-eared bat is a forest-dependent species, generally relying on forest features for both foraging and roosting during the summer months (USFWS 2007, 2013). Specifically, northern long-eared bats appear to be a forest interior species that require adequate canopy closure for both roosting and foraging habitat (Lausen 2009). Additionally, riparian areas are considered important resource areas for many species of bats because they support higher concentrations of prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999).

Wing morphology of the northern long-eared bat makes them ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Abundance of northern long-eared bat prey items, particularly beetles and moths, are typically higher in more closed forest stands than in openings, which is in line with studies that have found northern long-eared bats tend to avoid open habitats (Owen et al. 2003). While this species is associated with forest habitats, it also occurs in agricultural settings where forest habitats have been highly fragmented. In these areas, northern long-eared bats rely on woodlots and forested riparian corridors for both roosting and foraging.

During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (USFWS 2007, 2013). Males and non-reproductive females also may roost in cooler places (e.g., caves and mines). This bat tends to be opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. Northern long-eared bats also have been found, rarely, roosting in structures (e.g., barns and sheds), and therefore may not always be associated with tree roosts.

During the summer months, the northern long-eared bat is unlikely to cross over large open lands (i.e., land lacking suitable habitat) to search for foraging and roosting habitats, but rather is more likely to use tree-lined linear features as travel corridors to and from roosting and foraging habitats (USFWS 2014). These tree-lined corridors may be important for bats as navigational aids in agricultural landscapes, as protection from predators and wind, and may act to concentrate insect prey (Verboom and Huitema 1997).

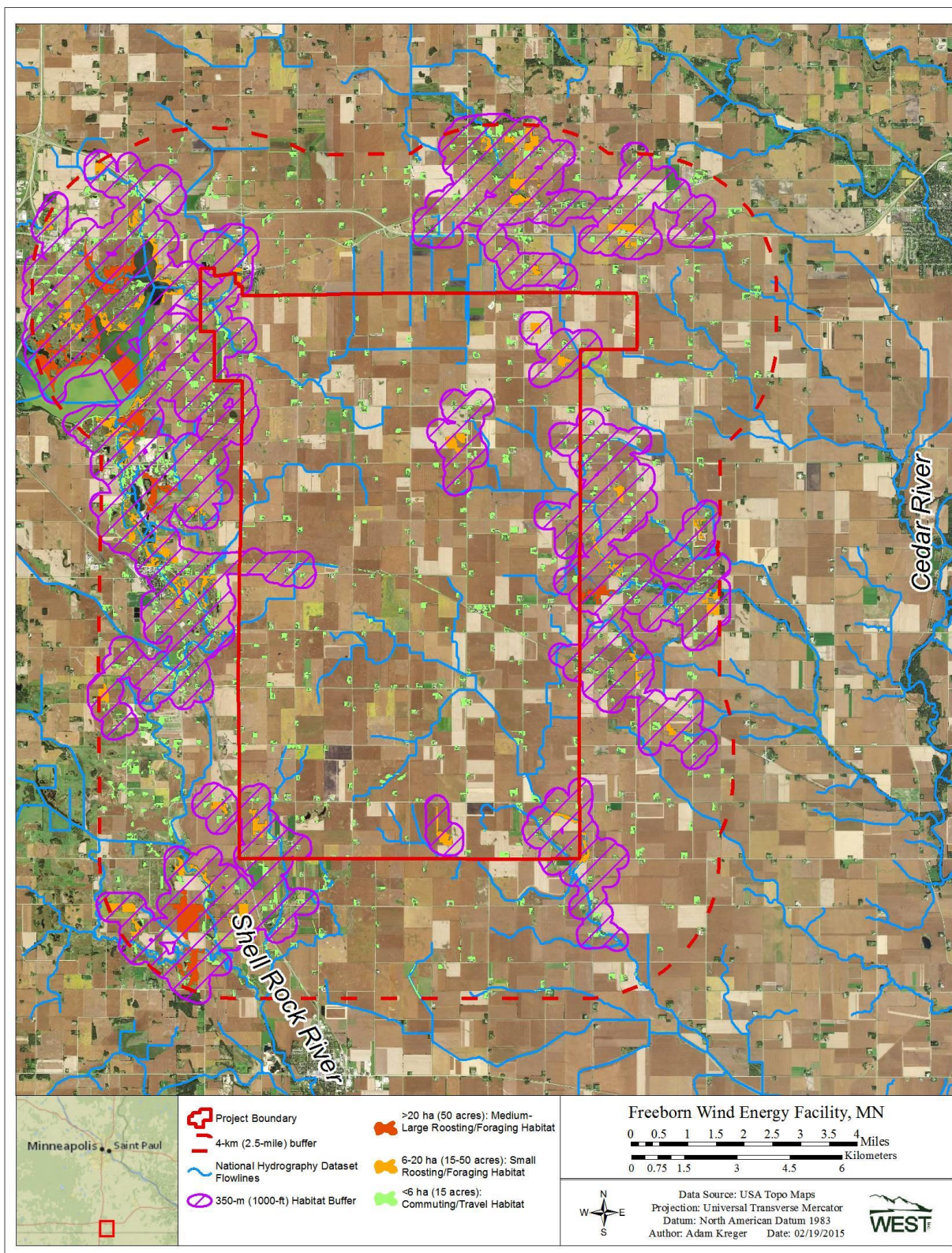
The northern long-eared bat is particularly associated with intact forested habitats. Henderson and Broders (2008) found northern long-eared bats did not travel more than 78 m (255 ft) from the edge of intact forest structure. A study of nine female northern long-eared bats using an intensively managed forest in West Virginia found this species foraging in areas with forest patch sizes between 46 and 65 ha (114 and 161 ac; Owen et al. 2003); however, studies in landscapes dominated by agricultural activities found northern long-eared bats may use woodlots and riparian zones with as little as 6 to 20 ha (15 to 49 ac) of forest cover (Foster and Kurta 1999, Henderson and Broders 2008,).

Northern long-eared bats typically migrate between summer habitat and winter hibernacula between mid-August and mid-October in the fall and between mid-March and mid-May in the spring. They are considered a short-distance migrant (64 – 80 km [40 – 50 mi]), although their known migratory distances can vary between 8 – 270 km (5 – 168 mi; USFWS 2014). Suitable fall swarming and spring staging habitats consist of a variety of forested/wooded habitats where bats roost, forage, and travel, most typically within 8 km (5 mi) of a hibernaculum (USFWS 2014).

Based on review of public datasets, available resources, and the March 9, 2015 site reconnaissance visit, northern long-eared bats are not expected to occur in the Project area during late fall or winter, since there is no evidence of potential hibernacula (e.g., caves or mines) within the Project area, and the closest known hibernaculum is located 64.4 km (40 mi) from the Project area.

Based on 2011 NLCD forest land cover types mapped in the Project area and additional forested areas mapped from digitizing forest habitat from aerial images, there are approximately 438 ha (1,082 ac; 2.7%) of forest habitat in the Project area (Figure 8). Forest patches were sorted by size into the following groups and labeled relative to potential use by northern long-eared bats: <6 ha (<15 ac) commuting/travel habitat; 6-20 ha (15-50 ac) small roosting/foraging habitat; and >20 ha (>50 ac) medium-large roosting/foraging habitat. A minimum patch size of 6 ha (15 ac) was used to identify potential roosting habitat, and the proximity of that area to other suitable roosting habitat defined the value of that patch for potential summer northern long-eared bat use.

Telemetry data on foraging activity and observations of northern long-eared bats indicate isolated trees may provide suitable summer roosting habitat, if they occur within 305 m (1,000 ft) of other suitable wooded roosting habitat (e.g., suitable roost trees, woodlot, wooded fencerow) (USFWS 2011, 2016). Isolated trees or commuting/travel habitat located greater than 305 m



**Figure 8. Potentially suitable northern long-eared bat summer habitat (areas within the purple buffers) in and near the Freeborn Wind Energy Project area in Freeborn County, Minnesota.**

(1,000 ft) from the next nearest suitable summer roosting habitat may be used during spring and fall migration only. The purple polygons defined as habitat buffer and shown in Figure 8 depict potential suitable summer roosting habitat, encompassing forest patches of varying sizes, with each forest patch, regardless of size, within 305 m (1,000 ft) of adjacent forest patches, and collectively provide suitable summer roosting habitat. Commuting/travel habitat, delineated outside the purple polygons (i.e., not within 305 m [1,000 ft] of another forest patch) depict small forest patches that may be used by northern long-eared bats only during migration.

To determine the location of potential northern long-eared bat summer habitat, all polygons representing forested habitats were buffered by 152 m (500 ft) and borders between adjacent polygons were removed to group any habitat patches within 305 m (1,000 ft) of each other. The area encompassing all forested habitats within 305 m (1,000 ft) of each other was then filtered of small isolated patches by selecting only those connected habitats containing forested patches at least 6 ha (15 ac) in size. The resulting forested habitat patches were then buffered by 305 m (1,000 ft) to represent the potential summer foraging area for northern long-eared bat within the Project area (shown as forested areas within the purple 305-m [1,000-ft] buffer; Figure 8).

The majority of the Project area does not contain suitable summer habitat for the northern long-eared bat, since most forested patches are relatively small in size and isolated from one another. A few woodlots and forested riparian corridors within the Project area may provide suitable summer habitat for northern long-eared bats, particularly those forested patches connected with larger contiguous forest tracts within 305 m (1,000 ft) of forested habitat adjacent to Albert Lea Lake and the Shell Rock River. However, suitable summer foraging, roosting, and commuting habitats for this bat species are mostly limited to the periphery of the Project area and are connected to larger contiguous forested tracts located outside of the Project area (e.g., forested habitat along the Shell Rock River to the west and the Cedar River to the east) (Figure 8).

#### 5.1.2 *Piping Plover – Interior Subspecies*

Piping plovers nest in three primary locations in North America: (1) the shorelines of the Great Lakes, (2) the shorelines of rivers and lakes in the northern Great Plains, and (3) along the Atlantic Coast (USFWS 2003). After the breeding season, this species migrates to their wintering grounds on the Atlantic and Gulf Coasts from southern North Carolina to Mexico and into the West Indies and Bahamas (Haig 1992). Based on this species' migratory movement patterns, there is a potential for birds from the northern Great Plains and the Great Lakes piping plover populations to migrate through the Project area and/or utilize regional wetlands and waterbodies for stopover habitat.

Plovers begin migration from the Great Lakes region in mid-July through early September, with females usually departing first (USFWS 2003). Migration from their wintering grounds begins in mid-February, with peak migration occurring in March. Males and females typically migrate separately, but arrive in unison on the breeding grounds (USFWS 2003). Pompei and Cuthbert (2004), in a review of potential stopover habitat use by the Great Lakes population of piping plovers, documented more than 3,400 fall and spring stopover records at 1,196 sites in the

inland U.S.. Stopover habitats included shorelines of reservoirs, industrial ponds, natural lakes, and rivers usually where sand or mixed sand and mud substrates were present.

Data from these sightings indicate piping plovers do not concentrate in large numbers at inland stopover sites and appear to stop opportunistically, with site use varying from year-to-year, 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). In most cases, reports of birds at inland sites were single individuals (Pompei and Cuthbert 2004). Spring migration patterns of piping plovers are similar to those during the fall migration period.

During the breeding season, piping plovers have been documented flying low over water and adjacent land at approximately 10 m (33 ft) above sea level. Specific migration flight height for piping plovers is not well documented; however, shorebird migration studies have recorded heights of approximately 50 m (164 ft) above sea level (Dierschke and Daniels 2003).

Although there is potential for piping plovers to opportunistically utilize various wetland and waterbody features in the Project area, depending on annual hydroperiods (i.e., percentage of time a wetland is inundated), more suitable piping plover habitat includes wetlands associated with open water (pond) components for stopover habitat. Based on the preliminary desktop assessment of water resources in the Project area and habitats observed and recorded during the March 9, 2015 site reconnaissance, ponds with associated wetland complexes were documented in the southwest and northeast corners of the Project area. Potential stopover habitat also was observed during the site reconnaissance along Peter Lund Creek and the adjacent wetlands along portions of this riparian corridor in the northwest portion of the Project area. Considering the large open water body and shoreline along Albert Lea Lake and the associated wetland complex with open water body components immediately west of the Project area, these regional features are the most likely to attract plovers during migration.

### 5.1.3 Federally Listed Plants

No federally listed plant species have been documented in Freeborn County, Minnesota.

## 5.2 State-Listed Species

### 5.2.1 State-Listed Birds, Mammals, Amphibians, and Reptiles

The MNDNR lists 11 bird, two mammal, one amphibian, and four reptile species as threatened or endangered statewide. Of these 18 state-listed species, 11 bird, one amphibian, and two reptile species may occur in the vicinity of the Project area. Table 3 lists the 14 state-listed species with the potential to occur in or near the Project area, based on suitable habitat descriptions for each species. Only two species have been documented with known occurrence in Freeborn County: Blanding's turtle (*Emydoidea blandingii*; state threatened) and loggerhead shrike (*Lanius ludovicianus*; state endangered; MNDNR 2013; Table 3).

**Table 3. State-listed threatened and endangered species with known or potential for occurrence in the Freeborn County, Minnesota.**

Species	State Status	Suitable Habitat	Potential for Occurrence in the Project Area
<b>Birds</b>			
<p>pipin plover <i>Charadrius melodus</i></p>	SE	Nests on sandy beaches, lakeshores, and dunes. Stopover habitats include shorelines of reservoirs, industrial ponds, natural lakes, and rivers, usually where sand or mixed sand and mud substrates are present, and wetlands with open waterbody components.	Possible migrant for Great Lakes or northern Great Plains population during spring and fall; potential stopover habitat present at wetlands and waterbodies. Out of range for summer breeding and wintering potential.
<p>Henslow's sparrow <i>Ammodramus henslowii</i></p>	SE	Nests in large, flat, overgrown, moist fields, with scattered low shrubs or saplings, some standing dead vegetation from the previous season, and a deep litter layer. Also found in native warm-season grass fields, pastures, and weedy or un-mowed hayfields.	Possible spring or fall migrant and potential summer nesting habitat in pastures, and weedy or un-mowed hayfields. Known occurrence documented in Steele County, which borders Freeborn County.
<p>Baird's sparrow <i>Ammodramus bairdii</i></p>	SE	Prefers shortgrass prairie with scattered low bushes and matted vegetation.	Possible migrant; potential low occurrence during spring and fall migration, based on low percentage of suitable habitat and habitat fragmentation.
<p>Sprague's pipit <i>Anthus spragueii</i></p>	SE	Prefers dry, open grasslands. Most common in areas of intermediate grass height and thickness, and moderate litter depth.	Possible migrant; potential low occurrence during spring and fall migration, based on low percentage of suitable habitat and habitat fragmentation.
<p>burrowing owl <i>Athene cunicularia</i></p>	SE	Breeds in open treeless areas in grasslands, steppes, and deserts.	Possible migrant; potential low occurrence during spring and fall migration, based on low percentage of suitable habitat and habitat fragmentation.

**Table 3. State-listed threatened and endangered species with known or potential for occurrence in the Freeborn County, Minnesota.**

Species	State Status	Suitable Habitat	Potential for Occurrence in the Project Area
chestnut-collared longspur <i>Calcarius ornatus</i>	SE	Breeds in relatively shortgrass areas. Prefers native grasslands.	Possible migrant; potential low occurrence during spring and fall migration, based on low percentage of suitable habitat and habitat fragmentation.
loggerhead shrike <i>Lanius ludovicianus</i>	SE	Prefers open country, pastures with fencerows, and mowed roadsides.	Potential summer nesting habitat in pastures with fencerows; possible spring and fall migrant. Documented occurrence in Freeborn County.
horned grebe <i>Podiceps auritus</i>	SE	Nests in shallow ponds and wetlands with moderate emergent vegetation.	Potential migrant; potential occurrence during spring and fall. Out of range for summer breeding.
king rail <i>Rallus elegans</i>	SE	Prefers freshwater marshes, marsh-shrub wetlands, and sedge and cattail wetlands.	Possible migrant; potential occurrence during spring and fall migration.
common tern <i>Sterna hirundo</i>	ST	Nests on islands and inland beaches with sand/cobble substrate with sparse to moderate vegetation.	Possible migrant; potential low occurrence during spring and fall migration, based on low percentage of suitable habitat.
Wilson's phalarope <i>Phalaropus tricolor</i>	ST	Prefers wetlands; nests in marshes or upland buffers in varying densities of vegetative cover.	Possible migrant; potential occurrence during spring and fall migration.
<b>Amphibians and Reptiles</b>			
northern cricket frog <i>Acris blanchardi</i>	SE	Prefers small rivers and streams, fringe wetlands along riparian zones, littoral zones of lakes, and floodplain forests.	Potential is low; limited habitat present within fringe wetlands of riparian zones. Known occurrence documented in Mower County, which borders Freeborn County.
Blanding's turtle <i>Emydoidea blandingii</i>	ST	Prefers upland and lowland prairie, small streams, floodplains, and wet meadows with adjacent sandy uplands.	Potential is low; limited habitat present. Documented occurrence in Freeborn County.

**Table 3. State-listed threatened and endangered species with known or potential for occurrence in the Freeborn County, Minnesota.**

Species	State Status	Suitable Habitat	Potential for Occurrence in the Project Area
wood turtle <i>Glyptemys insculpta</i>	ST	Largely aquatic and prefers fast moving rivers and streams of varying size, floodplains, and wet meadows. Upland and lowland prairie.	Potential is low; limited habitat present. Known occurrence documented in Mower County, which borders Freeborn County.

SE = state endangered; ST = state threatened (MNDNR 2013)

Correspondence from the MNDNR Environmental Assessment Review and the NHIS indicated no records for state-listed threatened or endangered species are known to occur within the Project area (K. Mixon, personal communication, March 18, 2015; L. Joyal, personal communication, March 26, 2015). There is potential for state-listed birds to migrate through the Project area during spring and fall or utilize the Project area for stopover habitat, but summer nesting potential is limited for most state-listed bird species due to limited nesting habitat and/or the Project area being located outside of their breeding ranges. No winter use of the Project area by state-listed bird species is anticipated, since their wintering grounds do not occur in the Project area.

The potential for state-listed reptiles and amphibians to occur in the Project area is low, given limited suitable habitat for them in the Project area and the location of the Project relative to their distributions (Table 3).

### 5.2.2 State-Listed Mollusk and Fish Species

Several species of state-threatened and state-endangered mollusk and fish species are listed throughout Minnesota (MNDNR 2013). However, correspondence from MNDNR Environmental Assessment Review and NHIS (K. Mixon, personal communication, March 18, 2015; L. Joyal, personal communication, March 26, 2015) indicated no known records for threatened or endangered mollusk or fish species in the Project area. While some streams are present within the Project area, they do not have suitable habitat for any state-listed mollusk or fish species, which generally prefer larger river systems with rocky substrates.

### 5.2.3 State-Listed Plant Species

The majority of state-listed plant species are native prairie-dependent or aquatic species. There are three state threatened plant species with documented occurrence in Freeborn County, including Sullivant's milkweed (*Asclepias sullivantii*), tuberous Indian-plantain (*Arnoglossum plantagineum*), and valerian (*Valeriana edulis* var. *ciliata*). Native prairie habitat was documented in a very small area in the southwest corner of the Project area (MNDNR 2015a) (Figure 3); the remainder of the Project area is largely lacking native prairie habitats and wetland communities are relatively sparsely distributed in the Project area (Figure 4). The potential for state-listed plants to occur in the Project area is low given the low amount of potentially suitable habitat. However, a few railroads within the Project area may contain native

prairie remnants within their rights-of-way. Additionally, some records of state-listed plants have been associated with road ditches.

### 5.3 Eagles

#### 5.3.1 Bald Eagle

As stated in Section 4.3, bald eagles are known to occur in and near the Myre-Big Island State Park and along Albert Lea Lake (see [www.ebird.org](http://www.ebird.org)), located approximately 1.6 km (1 mi) northwest of the Project (Figure 6). The Project area also is located immediately east of the Shell Rock River.

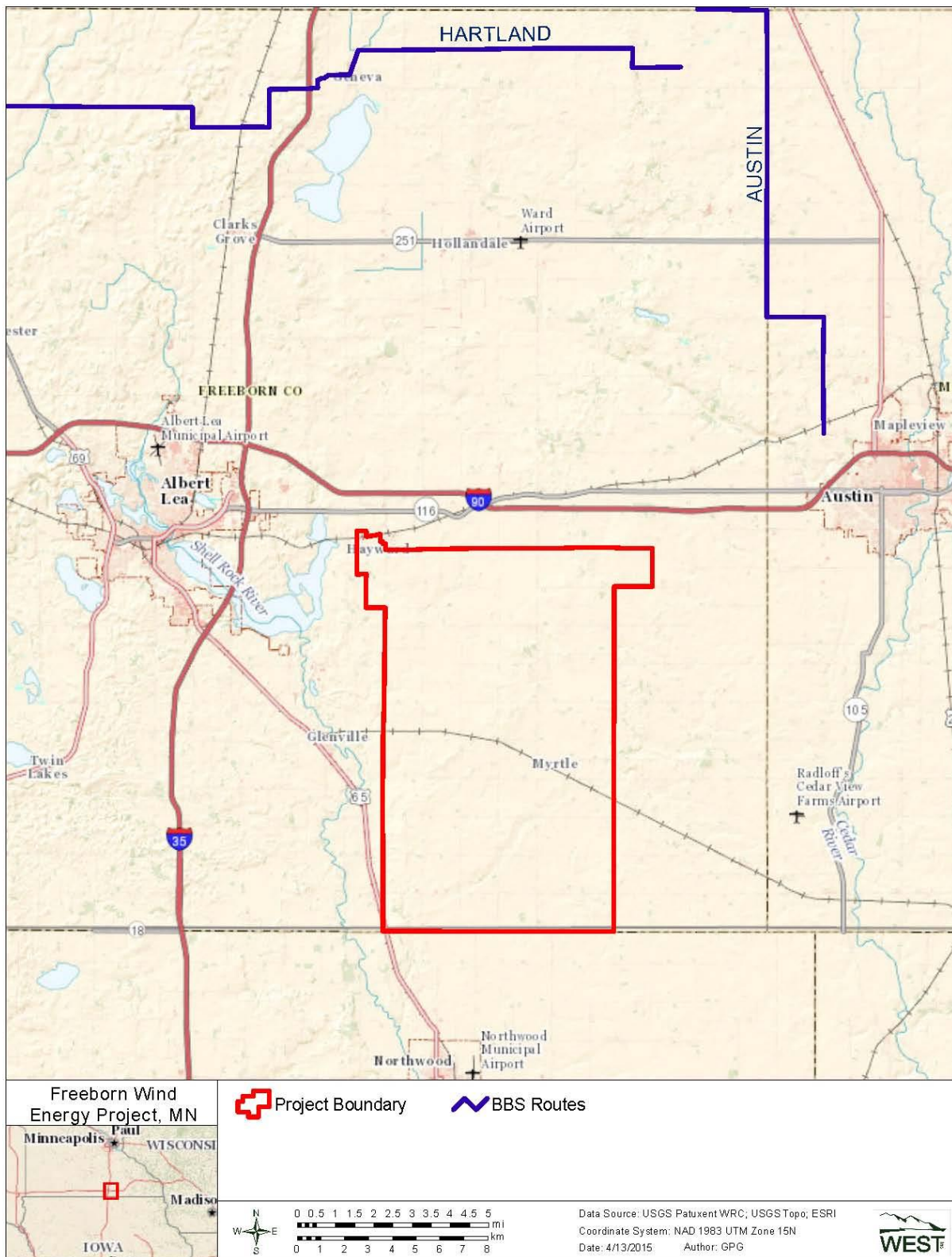
Bald eagles may potentially occur in the Project area during the winter, migration, and breeding/nesting seasons. Bald eagles typically nest in forested areas or mature trees adjacent (within 1.9 km [1.2 mi]) of waterbodies large enough to provide foraging opportunities (Buehler 2000). An aeration system installed in Albert Lea Lake may enhance the potential for open water and thin ice during a portion of the winter, which would attract foraging bald eagles during the winter months. There also is potential to forage along moving waters of Shell Rock River during the winter. Tributaries to the Shell Rock River may provide more limited foraging opportunities in spring, summer, and fall, but likely freeze during the winter. Tributaries to the Cedar River, which is located approximately 16.1 km (10 mi) east of the Project area, also may provide limited foraging habitat within the Project area. These tributaries include Deer Creek, Woodbury Creek, and Mud Lake Creek.

The U.S. Geological Survey (USGS) Breeding Bird Survey (BBS) includes bald eagle breeding records for both the Hartland (approximately 24.1 km [15 mi] north of the Project) and Austin (approximately 11.3 km [7 mi] north of the Project) BBS survey routes (Pardieck et al. 2014). These are the two closest BBS routes to the Project area (Figure 9).

#### 5.3.2 Golden Eagle

Golden eagles (*Aquila chrysaetos*) do not breed in Minnesota, but they migrate through or winter in the southern part of the state (Kochert et al. 2002). A small population (approximately 130 golden eagles) winter from November – March in the bluff country of southeastern Minnesota, western Wisconsin, northern Illinois, and northeastern Iowa (Goetzman 2014). Winter habitat in the Midwest includes reservoirs and wildlife refuges, which provide foraging opportunities; golden eagles also may utilize riparian corridors associated with wetland complexes east of the Mississippi River (Kochert et al. 2002).

Golden eagles' prey items, including fox, squirrels, wild turkeys (Goetzman 2014), rabbits, and other small and medium-sized prey, may use limestone bluffs, farmlands, and forestland in the southeastern corner of Minnesota. No non-breeding/migrant observations of golden eagles have been documented along the Austin or Hartland BBS routes (Pardieck et al. 2014) or have been incidentally recorded in Freeborn County on the eBird system (see eBird 2015). Therefore, golden eagle use within the Project area is likely low, primarily based on historic winter and migration movements, habitat use, and known occurrences within the state.



**Figure 9. Breeding Bird Survey (BBS) routes closest to the Freeborn Wind Energy Project area in Freeborn County, Minnesota.**

## 6 GENERAL WILDLIFE

### 6.1 Birds

#### 6.1.1 Bird Migration

The Project area is located within the Mississippi Flyway, which is used by migrating waterfowl, waterbirds, shorebirds, songbirds, and raptors. Of these bird types, waterfowl have the greatest potential to migrate through the Project area: waterfowl migration corridors that follow a broad front through Minnesota are used by as many as three million dabbling ducks (USGS 2013a). Based on USFWS NWI data, the Project area only contains 76.6 ha (189.3 ac) of NWI-mapped wetlands and open water, and there is potential for migrating waterfowl to use these areas, as well as flooded agricultural fields, as stopover habitats. Additionally, the Shell Rock River, Albert Lea Lake, and the emergent wetlands associated with these waterbodies located west of the Project, have the potential to increase waterfowl use in the Project area.

#### 6.1.2 Important Bird Areas

The National Audubon Society (Audubon) has identified Important Bird Areas (IBA), described by Audubon as providing essential habitat for one or more bird species (Audubon 2014). The closest registered IBA to the Project area is the Blufflands-Root River IBA, located 64.4 km (40 mi) east of the Project. The Blufflands-Root River IBA is located in Houston, Olmsted, Winona, and Fillmore counties and encompasses 197,970 ha (489,194 ac) of floodplain forest and upland deciduous forest.

#### 6.1.3 U.S. Fish and Wildlife Service Birds of Conservation Concern

The USFWS lists 39 species as birds of conservation concern (BCC) within the Eastern Tallgrass Prairie Bird Conservation Region (BCR) where the Project is located (USFWS 2008). These species have been identified as vulnerable to population declines in the area by the USFWS (2002). Although some of these species may use habitats in the Project area during migration or nesting (e.g., wetlands, ponds with associated mudflats, forested areas), the majority of the Project area encompasses agricultural lands, so use by these BCC species would likely be limited to the scattered native habitats in and near the Project area. Migrating BCC particularly may be attracted to the Shell Rock River and Albert Lea Lake located west of the Project. BCC are discussed further in Section 6.1.4 for the two BBS routes located in the Project region. A few of these species include grassland birds, which may utilize stopover habitat in the Project during migration; however the majority of the Project area is agricultural land and grassland habitat is limited.

#### 6.1.4 U.S. Geological Survey Breeding Bird Survey

The two closest USGS BBS routes to the Project area include the Hartland Route, running east/west, located 24.1 km (15 mi) north of the Project, and the Austin Route, running north/south 11.3 km (7.0 mi) northeast of the Project (Figure 9; Pardieck et al. 2014). The BBS routes are each 39.4 km (24.5 mi) long and consist of 50 3-minute counts along the length of each route (USGS 2001). Information gathered from the BBS provides an indication of what species may occur in the Project area.

A total of 114 bird species have been documented along the Hartland Route, including six raptor species (bald eagle, American kestrel [*Falco sparverius*], red-tailed hawk [*Buteo jamaicensis*], Cooper's hawk [*Accipiter cooperii*], northern harrier [*Circus cyaneus*]), and great horned owl [*Bubo virginianus*]). Ten waterfowl species have been documented along this route from 1967 to 2013, with the most abundant species being mallards (*Anas platyrhynchos*; Pardieck et al. 2014). The most common passerine (songbird) species recorded were the European starling (*Sturnus vulgaris*), 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*). One state-listed endangered species (loggerhead shrike) and 10 species designated by the USFWS as BCC within the Eastern Tallgrass Prairie BCR (USFWS 2008) also have been documented along the Hartland Route. These BCC species include the dickcissel (*Spiza americana*), field sparrow (*Spizella pusilla*), grasshopper sparrow (*Ammodramus savannarum*), red-headed woodpecker (*Melanerpes erythrocephalus*), American bittern (*Botaurus lentiginosus*), pied-billed grebe (*Podilymbus podiceps*), black-crowned night heron (*Nycticorax nycticorax*), black-billed cuckoo (*Coccyzus erythrophthalmus*), upland sandpiper (*Bartramia longicauda*), and loggerhead shrike; (USFWS 2008, MNDNR 2013).

A total of 102 bird species have been documented along the Austin Route, including the same six raptor species (bald eagle, American kestrel, red-tailed hawk, Cooper's hawk, northern harrier, and great horned owl). Seven waterfowl species have been documented along this route from 1993 to 2013, with the most abundant species also mallards (Pardieck et al. 2014). The most common songbird species recorded were European starling, common grackle, red-winged blackbird, house sparrow, American robin, horned lark, and song sparrow. The state-listed endangered loggerhead shrike also has been documented, and seven species designated by the USFWS as BCC within the Eastern Tallgrass Prairie BCR (USFWS 2008) have been observed: the dickcissel, grasshopper sparrow, red-headed woodpecker, pied-billed grebe, black-billed cuckoo, upland sandpiper, and loggerhead shrike (USFWS 2008, MNDNR 2013).

#### 6.1.5 Raptors

Breeding raptors could nest in a variety of habitats in and near the Project area. Tree and cavity nesters could occupy small woodlots and shelterbelts surrounding area farm buildings and residences; the 2011 NLCD deciduous forest land cover type that likely includes these habitat features comprises 0.8% (131 ha [324 ac]) of the Project area, or 2.7% (437.9 ha [1,082 ac]) of the Project area based on the site reconnaissance conducted March 9, 2015 and related digitizing of aerial images. Raptor nesting also could occur (predominantly in trees) along riparian corridors, ephemeral drainages, wetlands, and upland prairies in the Project area. Nesting in the agricultural and developed areas would be limited to manmade structures, such as power poles, windmills, and other infrastructure. Based on the low acreage of suitable habitat, it is unlikely the Project area supports high densities of nesting raptors.

During migration, raptors could rest and forage in the Project area, depending on habitats, weather, and prey availability. Several factors influence the migratory patterns of raptors, the

most significant of which is geography (Liguori 2005). Two geographical features are primarily used by raptors during migration: ridgelines and the shorelines of large bodies of water (Liguori 2005). Updrafts formed as wind hits ridges and thermals created over land, not water, make for energy-efficient travel for raptors over long distances (Liguori 2005). It is for this reason that raptors tend to follow prominent ridges with defined edges during migration. The Project area is located on flat to gently rolling agricultural fields that generally lack defined topographical ridges or other defined features typically used by migrating raptors (Figure 1 and Figure 2). However, given raptor species are more likely to travel along north-south orientated large water bodies during migration (Liguori 2005), the Shell Rock River and Cedar River, their tributaries, and Albert Lea Lake may be attractive to migrating raptors.

Raptor foraging is influenced by habitat types and prey availability. Small- and medium-sized mammals comprise the primary prey base for many raptors species, although small- and medium-sized birds and insects also make up the diet for many species. Rodents may be most concentrated along field edges, roads, and railroads (Preston 1990, Rosenzweig 1989). Songbirds and insects likely occur in most of the Project area. However, given the limited amount of grassland and pasture habitat (where these prey are likely to be most concentrated) in the Project area compared to the surrounding areas, it is unlikely that concentrations of songbirds or insects would attract foraging raptors in Project area. Waterfowl and waterbirds, also potential prey for eagles and other large raptors, would mostly likely be attracted to the perennial and ephemeral water sources in and near the Project area, particularly Albert Lea Lake, the Shell Rock River, Cedar River, wetland complexes, and grain fields.

## 6.2 Bats

Seven<sup>1</sup> bat species occur in Minnesota, all of which have ranges that overlap the Project area (Table 4; Harvey et al. 1999, Bat Conservation International [BCI] 2015) and have the potential to use the Project area during the spring, summer, and fall. Based on the desktop habitat assessment, the Project area has approximately 438 ha (1,082 ac; 2.7%) of woodland habitat for tree-roosting bats, with the majority of habitat located on the periphery of the Project area along semi-forested corridors of the Shell Rock River (e.g., Peter Lund Creek) and Cedar River (e.g., Woodbury Creek) and their tributaries. Also, the presence of wetlands, ponds, and cultivated cropland may attract bats for foraging and drinking opportunities.

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<sup>1</sup> 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 were an isolated individual or if this species has expanded its range into Minnesota.

**Table 4. Potential bat species within the Freeborn Wind Energy Project area.**

Common Name	Scientific Name
eastern red bat	<i>Lasiurus borealis</i>
little brown bat	<i>Myotis lucifugus</i>
northern long-eared bat <sup>1</sup>	<i>Myotis septentrionalis</i>
tri-colored bat	<i>Perimyotis subflavus</i>
big brown bat	<i>Eptesicus fuscus</i>
silver-haired bat	<i>Lasionycteris noctivagans</i>
hoary bat	<i>Lasiurus cinereus</i>

<sup>1</sup> federally threatened species (USFWS 2015b)

## 7 REFERENCES

### 7.1 Literature

- Audubon Society (National Audubon Society [Audubon]). 2014. The Important Bird Areas. IBAs by state available online at: <http://www.audubon.org/bird/iba>
- Bat Conservation International (BCI). 2015. BCI Species Profiles. BCI, Inc., Austin, Texas. Accessed February 2015. Homepage: <http://www.batcon.org>; Range map data from 2003-2015.
- Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). 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/506>
- Dierschke, V. and J.-P. Daniels. 2003. Zur Flughöhe Ziehender See-, Küsten- und Greifvögel im Seegebiet um Helgoland. [Flight Altitude of Migrating Seabirds, Coastal Birds and Raptors in the Southeastern North Sea.]. Corax 19(Sonderheft 2): 35-41.
- eBird. 2015. Golden Eagle Sightings in Minnesota. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Golden eagle sightings in Minnesota. Accessed February 2015. Information available online at: <http://ebird.org>
- 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
- Environmental Laboratory. 1987. 1987 Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1. Final report prepared by Environmental Laboratory. January 1987. U.S. Army Corps of Engineers (USACOE), Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi, Vicksburg, Mississippi. Available online at: <http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf>
- 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.
- Fry, J. A., G. Xian, S. Jin, J. A. Dewits, H. J., L. Yang, C. A. Barnes, N. D. Herold, and J. D. Wickham. 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States. Photogrammetric Engineering and Remote Sensing 77(9): 859-864. [http://www.mrlc.gov/nlcd06\\_data.php](http://www.mrlc.gov/nlcd06_data.php)

- Goetzman, K. 2014. Our Golden Eagles. Minnesota Conservation Volunteer January-February 2014: 8-21.
- Grindal, S. D., J. L. Morissette, and R. M. Brigham. 1999. Concentration of Bat Activity in Riparian Habitats over an Elevational Gradient. Canadian Journal of Zoology 77(6): 972-977. doi: 10.1139/z99-062.
- Haig, S. M. 1992. Piping Plover (*Charadrius melodus*). A. Poole, ed. The Birds of North America Online. Cornell Laboratory of Ornithology, Ithaca, New York. Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/002>; doi: 10.2173/bna.2
- Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service, Arkansas.
- Harvey, M. J., J. S. Altenbach, and T. L. Best. 2011. Bats of the United States and Canada. The Johns Hopkins University Press, Baltimore, Maryland.
- 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>
- 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
- Lausen, C. 2009. Status of the Northern Myotis (*Myotis septentrionalis*) in Alberta.
- Liguori, J. 2005. Hawks from Every Angle: How to Identify Raptors in Flight. Princeton University Press, Princeton, New Jersey.
- Minnesota Department of Natural Resources (MNDNR). 2013. Minnesota's List of Endangered, Threatened, and Special Concern Species. Effective August 19, 2013. Available online at: [http://files.dnr.state.mn.us/natural\\_resources/ets/endlist.pdf](http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf)
- Minnesota Department of Natural Resources (MNDNR). 2015a. Areas of Biodiversity Significance in Minnesota. MBS Site Biodiversity Significance Ranks, Minnesota Biological Survey (MBS). MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: [http://www.dnr.state.mn.us/eco/mcbs/biodiversity\\_guidelines.html](http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)
- Minnesota Department of Natural Resources (MNDNR). 2015b. Osmundson Prairie SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01031>
- Minnesota Department of Natural Resources (MNDNR). 2015c. Wild Indigo SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01051>

- Minnesota Department of Natural Resources (MNDNR). 2015d. Iron Horse SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01018>
- Minnesota Department of Natural Resources (MNDNR). 2015e. Hythecker Prairies SNA. Minnesota Scientific and Natural Areas (SNAs). MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01038>
- Minnesota Department of Natural Resources (MNDNR). 2015f. Blazing Star State Trail. State Trails. MDNR, St. Paul, Minnesota. Accessed February 2015. Information available online at: [http://www.dnr.state.mn.us/state\\_trails/blazingstar/index.html](http://www.dnr.state.mn.us/state_trails/blazingstar/index.html)
- Minnesota Department of Natural Resources (MNDNR). 2015g. Northern Long-Eared Bat (*Myotis septentrionalis*). Rare Species Guide, Minnesota's Endangered, Threatened, and Special Concern Species, MNDNR, St. Paul, Minnesota. Accessed February 2015. Available online at: <http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC01150#>
- Minnesota Department of Natural Resources (MNDNR). 2016a. Minnesota's Wildlife Managements Areas. Available online at: <http://www.dnr.state.mn.us/wmas/index.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/>
- Owen, S. F., M. A. Menzel, W. M. Ford, B. R. Chapman, K. V. Miller, J. W. Edwards, and P. B. Wood. 2003. Home-Range Size and Habitat Used by the Northern Myotis (*Myotis septentrionalis*). American Midland Naturalist 150: 352-359.
- Pardieck, K. L., D. J. Z. Jr., and M.-A. R. Hudson. 2014. North American Breeding Bird Survey Dataset 1966 - 2013. Version 2013.0. U.S. Geological Survey [USGS] Patuxent Wildlife Research Center, Laurel, Maryland. Raw data retrieval and other information available online at: [www.pwrc.usgs.gov/BBS/RawData/](http://www.pwrc.usgs.gov/BBS/RawData/)
- 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 U.S. Army Corps of Engineers.
- Preston, C. R. 1990. Distribution of raptor foraging in relation to prey biomass and habitat structure. The Condor 92:107-112
- Rosenzweig, M. L. 1989. Habitat selection, community organization, and small mammal studies. Pp. 5-21 in Patterns in the structure of mammalian communities (D.W. Morris, Z. Abramsky, B.J. Fox, and M.R. Willig, eds.). Texas Tech University Press, Lubbock, TX.
- U.S. Fish and Wildlife Service (USFWS). 2002. Migratory Bird Mortality: Many Human-Caused Threats Afflict Our Bird Populations. USFWS Division of Migratory Bird Management, Arlington, Virginia. January 2002.
- U.S. Fish and Wildlife Service (USFWS). 2003. Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*). Region 3 USFWS, Ft. Snelling, Minnesota. 141 pp.
- U.S. Fish and Wildlife Service (USFWS). 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Department of Interior, Fish and Wildlife Service, Region 3. USFWS, Fort Snelling, Minnesota. 260 pp. Available online at: [http://ecos.fws.gov/docs/recovery\\_plan/070416.pdf](http://ecos.fws.gov/docs/recovery_plan/070416.pdf)

- U.S. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management, Arlington, Virginia. Available online at: <http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf>
- U.S. Fish and Wildlife Service (USFWS). 2011. Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (Revised: 26 October 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](http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf)
- U.S. Fish and Wildlife Service (USFWS). 2013. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species. Docket No. FWS-R5-ES-2011-0024. 78 Federal Register (FR) 191: 61046-61080. October 2, 2013.
- 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 Species in Minnesota: County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. Midwest Region, USFWS. Accessed February 2015. Available online at: <https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html>
- U.S. Fish and Wildlife Service (USFWS). 2015b. U.S. Fish and Wildlife Service Protects Northern Long-Eared Bat as Threatened under Endangered Species Act. Also Issues Interim Special Rule that Tailors Protections to Eliminate Unnecessary Restrictions and Provide Regulatory Flexibility for Landowners. April 1, 2015. USFWS Newsroom, Available online at: <http://www.fws.gov/midwest/news/778.html>
- 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. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2014. Seamless Wetlands Data by State: Minnesota. USFWS NWI Data Mapper. USFWS NWI, Fort Snelling, Minnesota. Updated November 2014. Geodatabase and Shapefile data available online at: <http://www.fws.gov/wetlands/data/State-Downloads.html>
- U.S. Fish and Wildlife Service (USFWS). 2016. 2016 Range-Wide Indiana Bat Summer Survey Guidelines. April 11, 2016. Available online at: <https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2016IndianaBatSummerSurveyGuidelines11April2016.pdf>
- U.S. Geological Survey (USGS). 2001. North American BBS Methodology Training. Accessed 2010. USGS Breeding Bird Surveys (BBS), Patuxent Wildlife Research Center, Laurel, Maryland. Methodology Training available online at: <http://www.pwrc.usgs.gov/BBS/participate/training/>; Description and Methods available online at: <http://www.pwrc.usgs.gov/BBS/participate/training/1.html>

- U.S. Geological Survey (USGS). 2013a. 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/rcref/ch2.3/2014-12-19\\_USGS2013\\_MigrationofBirds.pdf](http://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rcref/ch2.3/2014-12-19_USGS2013_MigrationofBirds.pdf)
- U.S. Geological Survey (USGS) National Land Cover Data (NLCD). 2006. Land Use/Land Cover, USGS NLCD 2001 Data. USGS Headquarters, USGS National Center, Reston, Virginia. Information available online at: <http://www.mrlc.gov/nlcd2006.php>
- Verboom, B. and H. Huitema. 1997. The Importance to Linear Landscape Elements for the Pipistrelle, *Pipistrellus pipistrellus*, and the Serotine Bat, *Eptesicus serotinus*. Landscape Ecology 12: 117-125.

## 7.2 Laws, Acts, and Regulations

- 78 Federal Register (FR) 191: 61046-61080. 2013. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species. Department of the Interior Fish and Wildlife Service. Proposed Rule; 12-Month Finding. 78 FR 191: 61046-61080. October 2, 2013.
- Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 U.S. Code (USC) § 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, Section (§) 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. As amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.
- Clean Water Act (CWA). 1972. Clean Water Act. 33 U.S. Code (USC) § 1251-1387, 1251 et seq., 2000. October 18, 1972.
- Endangered Species Act (ESA). 1973. 16 U.S. Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 et seq.]; 50 Code of Federal Regulations (CFR) 402.
- Migratory Bird Treaty Act (MBTA). 1918. 16 U.S. Code (USC) §§ 703-712. July 13, 1918.
- Minnesota Administrative Rules 6230.0400. Minnesota Administrative Rules; Department of Natural Resources; Chapter 6230 - Wildlife Management; Part 6230.0400 - Special Provisions for State Game Refuges. Available online at: <https://www.revisor.leg.state.mn.us/rules/?id=6230.0400>
- Minnesota Administrative Rules Chapter 6135. Minnesota Administrative Rules; Department of Natural Resources; Chapter 6135 - Utility Crossings. Available online at: <https://www.revisor.mn.gov/rules/?id=6135&view=chapter>
- Minnesota Statutes Section 84.415. 2015. 2015 Minnesota Statutes; Natural Resources; Chapter 84 - Department of Natural Resources; Section 84.415 - Utility Licenses, Permits. Available online at: <https://www.revisor.leg.state.mn.us/statutes/?id=84.415>
- Minnesota Statutes Section 103G.005. 2015. 2015 Minnesota Statutes; Water; Chapter 103G - Waters of the State; Section 103G.005 - Definitions. Available online at: <https://www.revisor.leg.state.mn.us/statutes/?id=103G.005>

Minnesota Wetland Conservation Act (WCA). 1991. Laws 1991, Chapter 354. As amended by Laws 1993, Chapter 175; Laws 1994, Chapter 627; Laws 1996, Chapter 462; Laws 2000, Chapter 382; Laws 2001, Chapter 146; Laws 2002, Chapter 220; Laws 2003, Chapter 128; Laws 2004, Chapters 221 and 255; Laws 2007, Chapters 57 and 131; and Laws 2008, Chapter 368.