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## **Stage 1 Initial Site Assessment of Eagle Use/Risk Aurora Wind Energy Project Williams County, North Dakota**

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### **INTRODUCTION**

Aurora Wind, LLC (Aurora Wind) is considering the development of the Aurora Wind Energy Project (Project) in Williams County, North Dakota (Figure 1). Aurora Wind requested that Western Ecosystems Technology, Inc. (WEST) develop an initial site assessment for eagles, which determines the relative importance of the Project (defined as the project boundary as currently determined by Aurora Wind and portrayed in figures below) to resident breeding and non-breeding eagles and migrant and wintering eagles. This report is intended to meet the requirements of a Stage 1 Initial Site Assessment as described in the US Fish and Wildlife Service's (USFWS) *Eagle Conservation Plan Guidance: Module 1 – Land-Based Wind Energy, Version 2* (ECPG; USFWS 2013).

The principal objective of this Stage 1 Assessment for the Project is to assess whether the Project is within areas known to or likely to be used by eagles, and if it is, to determine the expected extent and type of eagle use of the Project.

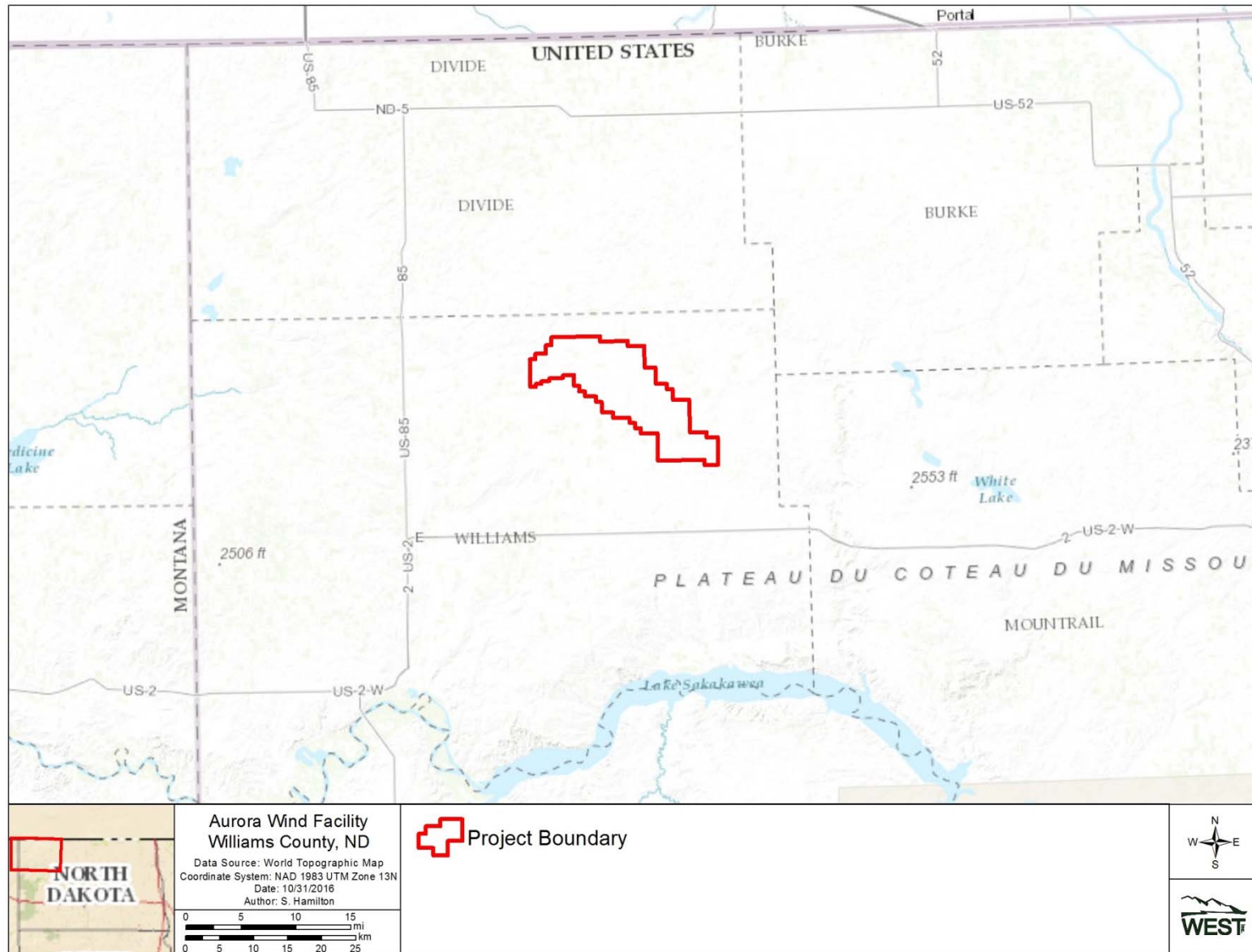


Figure 1. Location of the Aurora Wind Facility in Williams County, North Dakota.

## **Study Area**

The Project encompasses approximately 54,316 acres (ac; 21,981 hectares [ha]) in Williams County, North Dakota (Figure 1). The Project falls within the Northwestern Glaciated Plains Level III Ecoregion and the Glaciated Dark Brown Prairie Level IV Ecoregion and the Missouri Coteau Slope Level IV Ecoregion (USEPA 2010). Much of the Northern Glaciated Plains region, which stretches from Saskatoon, Canada in the north, along the Missouri River through the Dakotas, and south to northern Nebraska, was originally characterized by fescue grasslands, tall and short-grass prairie, trembling aspen (*Populus tremuloides*), oak groves, mixed tall shrubs, and seasonal wetlands, but is now primarily farmland (Griffith 2010). The Northern Glaciated Plains region is a productive agricultural area with a variety of crops including spring wheat, flax (*Linum usitatissimum*), rye (*Secale cereal*), barley (*Hordeum vulgare*), oats (*Avena sativa*), corn (*Zea mays*), soybeans (*Glycine max*), and sunflowers (*Helianthus*; Griffith 2010). The majority of the land use/land cover within the Project is cultivated crops, herbaceous grassland, developed open space, and emergent herbaceous wetlands (US Geological Service [USGS] National Land Cover Database [NLCD] 2011). Though most of the Project is composed of cultivated cropland, there is some open water (<1%), shrub/scrub (<1%), woody wetlands (<1%), deciduous forest (<1%), and low intensity developed areas (<1%). Medium intensity developed areas and mixed forest are also present within the Project. Tom Berg Lake is within the Project (Figure 4), and several larger lakes are within two miles (mi; 3.2 kilometers [km]) of the Project. The topography of the Project is gently rolling hills (Figure 2) with the elevation ranging from approximately 669 – 755 meters (m; 2,195 – 2,477 feet [ft]; Figure 3).

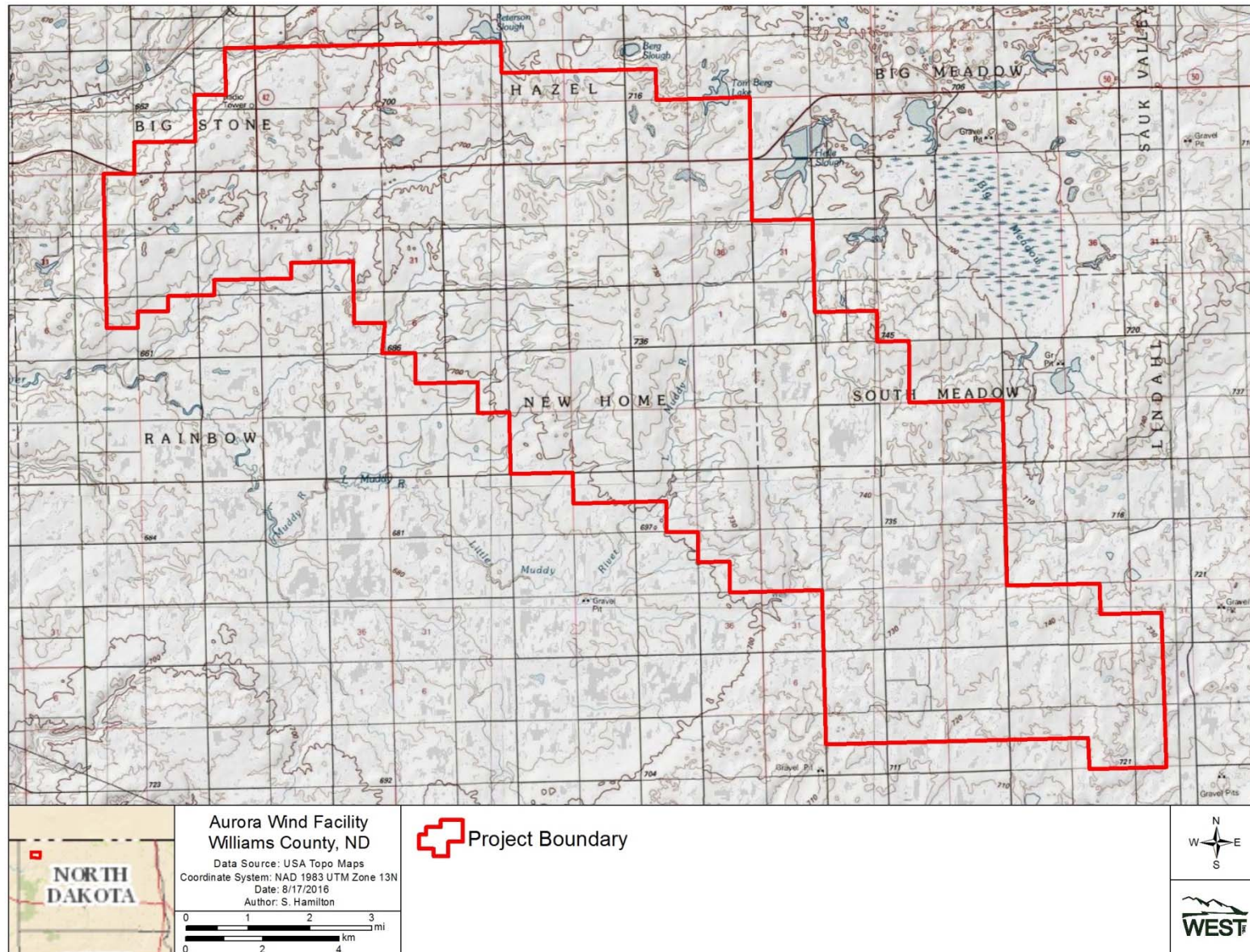


Figure 2. Topographic map of the Aurora Wind Facility.

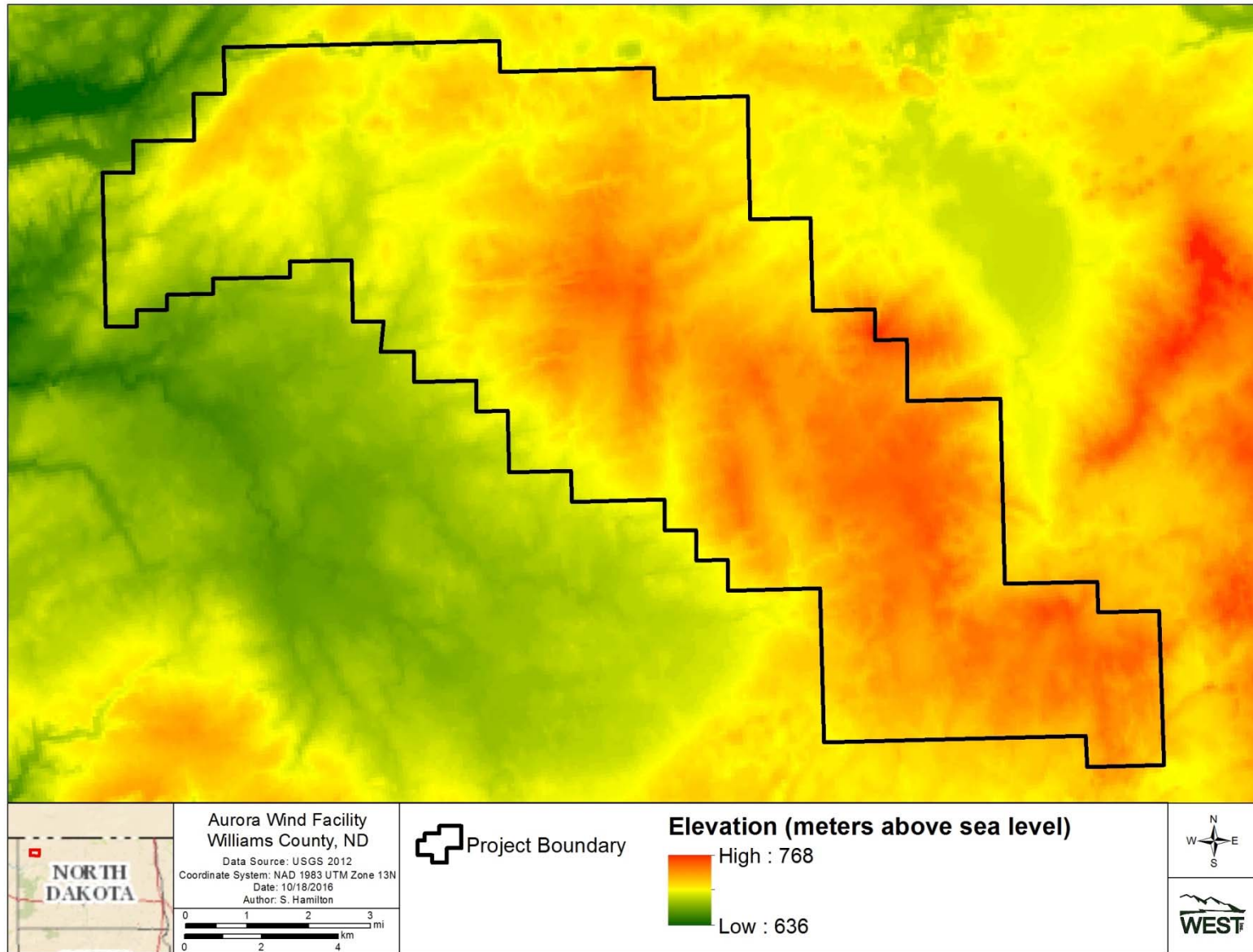


Figure 3. Elevation at Aurora Wind Facility (USGS 2012).

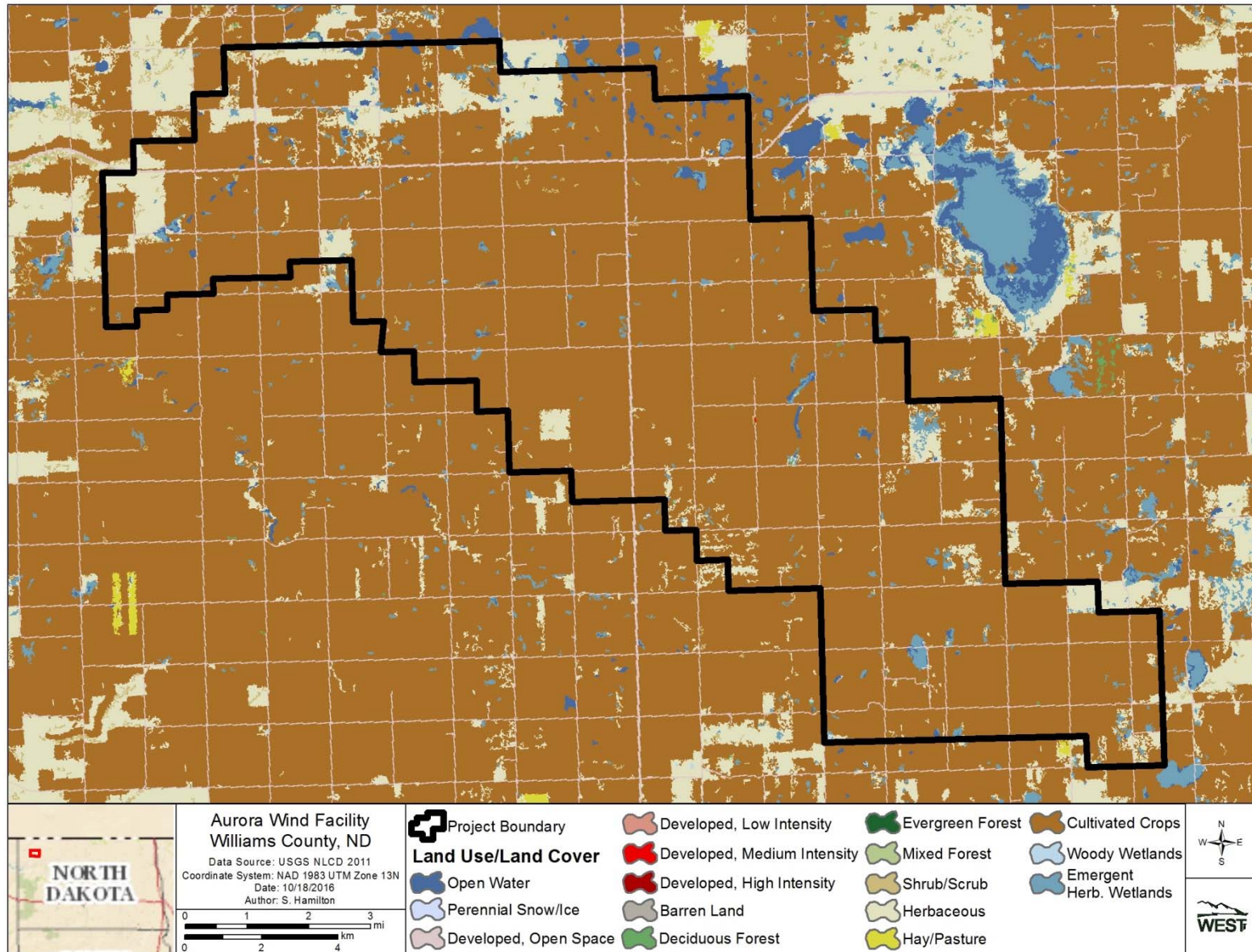


Figure 4. Land use/land cover in the Aurora Wind Facility (USGS NLCD 2011).

## **METHODS**

This Stage 1 Assessment describes existing information from publicly available literature, databases, and other sources to evaluate the appropriateness of the Project for development as it relates to potential risk to eagles. Several sources of available data were used to identify biological resources within the Project. These sources included publicly available reports, publications, geographic information system (GIS) maps, agency reports, species experts, and online databases. Per the ECPG (USFWS 2013), areas of focus for this Stage 1 Assessment include:

- recent or historical nesting and seasonal occurrence data for eagles at the prospective area;
- migration or other regular movement by eagles through the area or surrounding landscape;
- seasonal concentration areas, such as a communal roost site in a mature riparian woodland, or waterfowl concentration serving as a major forage base; and
- physical features of the landscape, especially topography, that may attract or concentrate eagles.

## **PROJECT SITE CHARACTERISTICS**

### **Land Use/Land Cover**

Approximately 87% of the Project is cultivated crop. Herbaceous grasslands compose about 7% of the Project, and may contain some native grassland (USGS GAP 2014). Developed open space makes up approximately 4% of the Project. Emergent herbaceous wetlands cover about (2%) of the Project, while open water makes up nearly 1% of the Project (Table 1, Figure 4).

**Table 1. Land use/cover types present within the Aurora Wind Facility (USGS NLCD 2011).**

<b>Land Use/Cover</b>	<b>Acres</b>	<b>Percent Composition</b>
Cultivated Crop	47,105.8	86.7
Herbaceous	3,555.7	6.5
Developed, Open Space	2,034.0	3.7
Emergent Herbaceous Wetlands	844.9	1.6
Open Water	488.8	<1
Shrub/Scrub	211.5	<1
Woody Wetlands	33.7	<1
Deciduous Forest	19.7	<1
Developed, Low Intensity	19.7	<1
Developed, Medium Intensity	1.1	<1
Mixed Forest	1.1	<1
<b>Total</b>	<b>54,316.1</b>	<b>100</b>

## **Wetlands**

Based on National Wetland Inventory (NWI) polygon data (USFWS NWI 2014), there are approximately 1,401.5 ac (567.1 ha) of wetlands found in the Project (Table 2, Figure 5). Freshwater emergent wetlands account for 1,281.5 acres (518.6 ha); followed by lakes that make up 59.8 ac (21.0 ha; Table 2). There is one named river, the Little Muddy River, that flows west from within the Project.

**Table 2. National Wetland Inventory polygon types present within the Aurora Wind Facility (USFWS NWI 2014).**

<b>Wetland Type</b>	<b>Acres</b>	<b>Percent Composition</b>
Freshwater Emergent Wetland	1,281.5	91.4
Lake	59.8	4.3
Freshwater Pond	51.6	3.7
Freshwater Forested/Shrub Wetland	4.9	0.3
Other	3.7	0.3
<b>Total</b>	<b>1,401.5</b>	<b>100</b>

## **Protected Areas**

A review of the Protected Areas Database (PADUS 2012) from USGS shows that there are seven parcels of North Dakota State protected areas within the Project (Figure 6). Within 10 mi of the Project, there are four federally protected Waterfowl Production Areas (WPA) and three state protected areas with a total of 55 parcels dispersed throughout the 10 mi area. All protected areas within 10 mi of the Project have a total area of approximately 19,499 ac (7,891 ha). Protected areas within 10 miles of the Project are largely composed of herbaceous grassland, emergent herbaceous wetlands, and open water that may provide suitable foraging opportunities for eagles (USGS NLCD 2011).

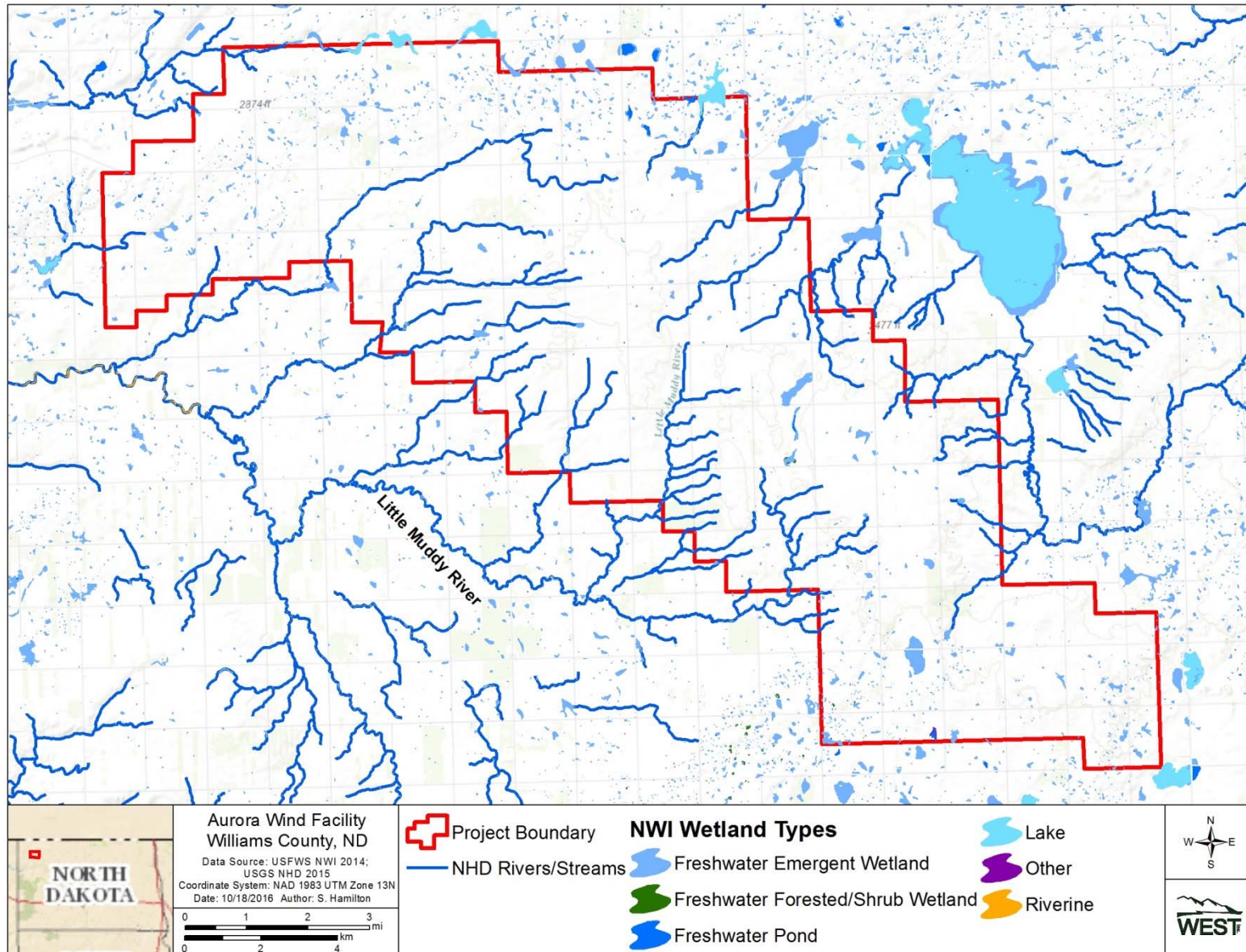


Figure 5. Wetlands, rivers, and streams in the Aurora Wind Facility (USFWS NWI 2014, USGS 2015).

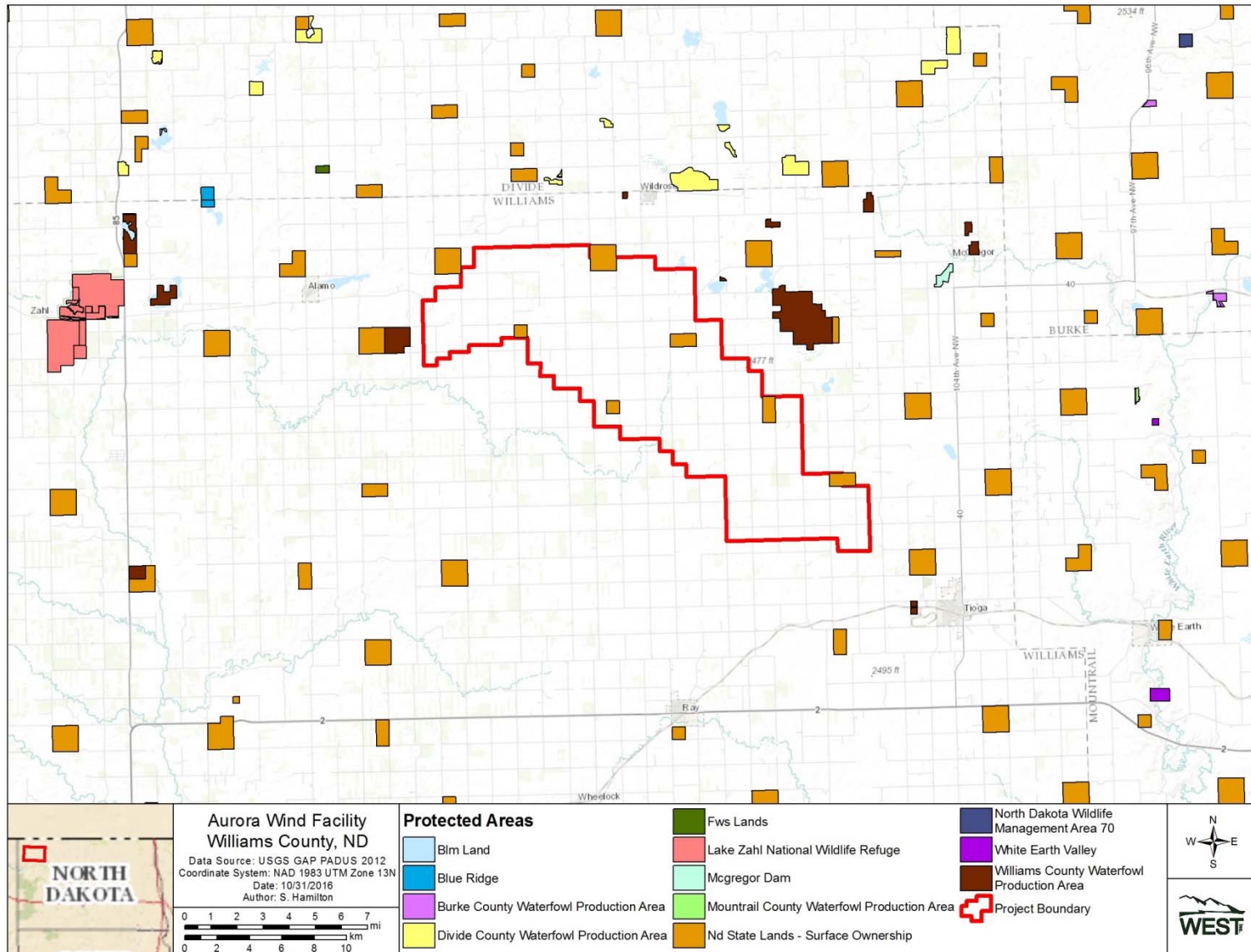


Figure 6. Protected Areas near the Aurora Wind Facility (PADUS 2012).

## **Important Bird Areas**

The National Audubon Society (Audubon) has identified Important Bird Areas (IBAs) that provide essential habitat for one or more bird species (Audubon 2015). There are no IBAs within the Project. The closest IBA to the Project is Lostwood National Wildlife Refuge (NWR), a Globally Important Bird Area located approximately 23 miles (mi, 37.0 kilometers [km]) east of the Project in Burke and Mountrail Counties. This Globally Important Bird Area encompasses 63,992.2 ac (25,896.7 ha) and contains mixed-grass prairie, wetland, and open water habitat that is used by a variety of bird species, particularly breeding waterfowl and shorebirds (USFWS 2016a). The next closest IBA, Medicine Lake NWR, is a Globally Important Bird area that is located approximately 37.0 mi (59.5 km) west of the Project. This IBA encompasses 33,491 ac (13,553.3 ha) in Sheridan and Roosevelt Counties, Montana. Like Lostwood NWR, Medicine Lake NWR contains open water, native prairie, and marsh that provide migratory and breeding habitat for a number of avian species (USFWS 2016b).

## **EAGLE OCCURRENCE IN THE PROJECT**

### **Golden Eagle**

Golden eagles (*Aquila chrysaetos*) are typically considered more susceptible to wind turbine collision than bald eagles (*Haliaeetus leucocephalus*), as evidenced by higher mortality rates throughout their range (Allison 2012). While the North Dakota Game and Fish Department (NDGFD) classify the golden eagle as “uncommon” throughout North Dakota (NDGFD 2012), this species is reported more frequently in the western half of the state as western North Dakota is within the breeding range of the golden eagle (Figure 7). There is one eBird observation of a golden eagle within the Project in 2015, and there are multiple golden eagle observations recorded around the Project (eBird 2016e; Figure 7). It should be noted that eBird data is a citizen-science database and is composed of reported observations collected without a systematic sampling structure. These data should be interpreted with caution as observation locations are often skewed toward birding hotspots and accessible areas. However, these data are useful for the investigation of broad spatial and temporal trends. Given the Project is located largely outside of the breeding range of the species, this report focuses largely on bald eagles (see below sections).

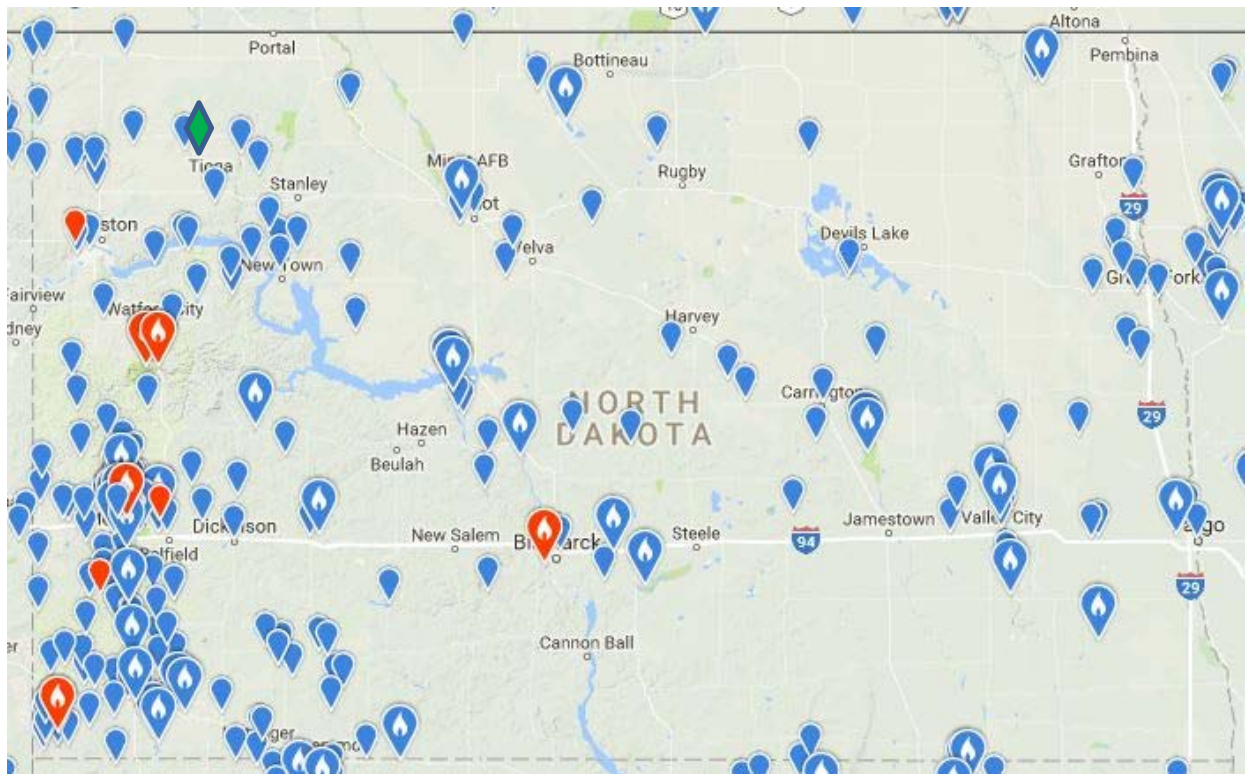


Figure 7. eBird data of golden eagle occurrences observed during all seasons in North Dakota (eBird 2016e). The green diamond represents the approximate location of Aurora Wind Facility. Blue markers indicate golden eagle observations from 1900-2016 and red markers indicate observations less than 30 days old (data from August 18, 2016). Each blue marker can represent one golden eagle observation or multiple golden eagle observations in the same location.

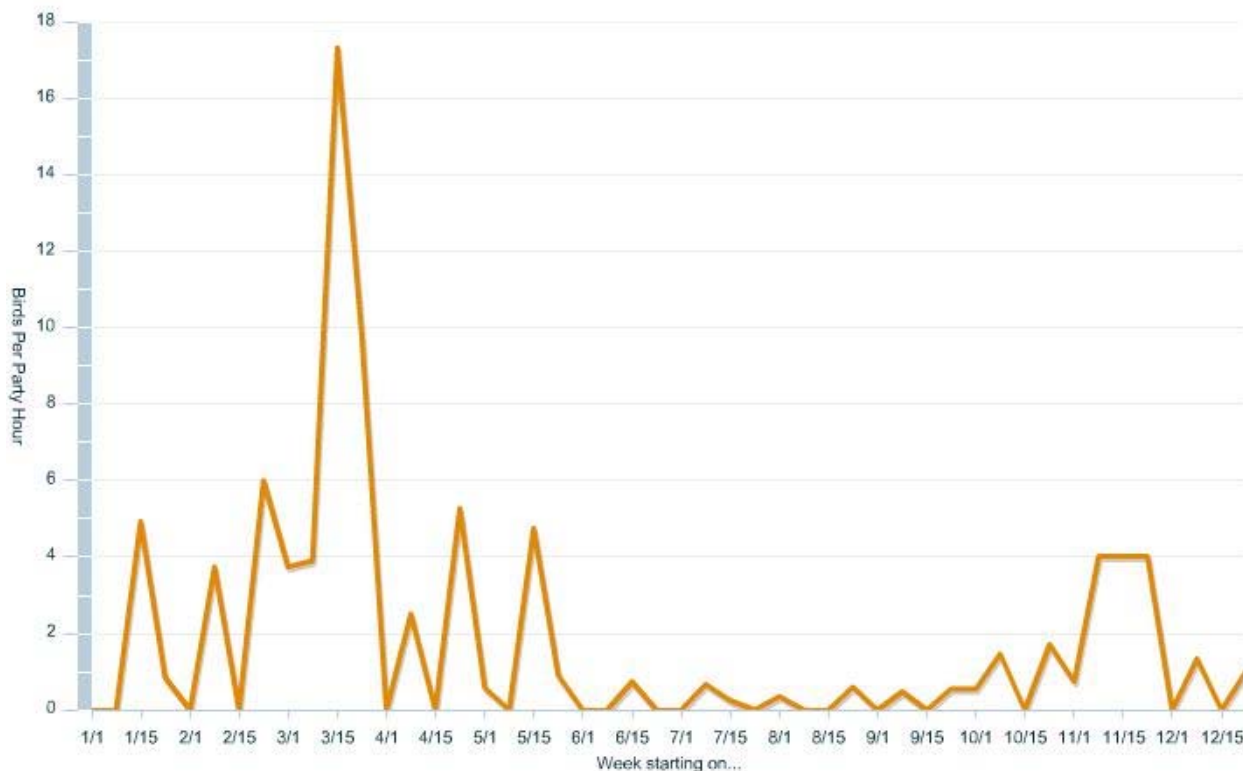
### Bald Eagle

In the 1800s, bald eagles were common breeders along North Dakota's major rivers and lakes, such as the Missouri River, Red River, and Devils Lake (Johnson 2010). By the 19<sup>th</sup> century, however, a significant decline in their numbers occurred due to environmental contaminants and loss of habitat (USFWS 2015). This drop in numbers led to the enactment of the Bald and Golden Eagle Protection Act (BGEPA) in 1940 (BGEPA 1940). In 1978, the bald eagle was listed as an endangered species (Johnson 2010). Nationwide conservation efforts led to the recovery of bald eagles, and the bald eagle was removed from the federal list of endangered and threatened wildlife and plants in 2007 (USFWS 2007b, Johnson 2010).

Bald eagles prefer nesting, roosting, and foraging in areas with mature trees near permanent water bodies in undisturbed areas with abundant prey resources, such as fish and waterfowl (Swenson et al. 1986; Mojica et al. 2008). Though North Dakota has experienced a large increase in the number of nesting bald eagles over the past four decades, challenges and threats to bald eagles remain. Threats to bald eagles include loss or alteration of nesting and roosting habitat, exposure to poisons and environmental contaminants (e.g., lead, pesticides, pollution), electrocution and collision with power lines, and collision with wind turbines (Kochert and Steenhof 2002). Potential impacts to bald eagles from wind energy development and

operations include collision with wind turbines and associated transmission lines, as well as disturbance of nests, roosting sites, and foraging areas.

A review of all years (1900 – 2016) of bald eagle year-round data in the eBird database for a 5-county region (Williams County and the surrounding North Dakota counties [Burke, Divide, McKenzie, and Mountrail Counties]) indicates a strong seasonal trend, with eagle occurrence peaking in March with some smaller peaks in observations occurring in January, mid-April to mid-May, and November (Figures 8), essentially the migration and winter periods. Bald eagle observations within Williams County peak in March with a few additional increases in observations occurring between January-April and again in November (Figure 9). The bald eagle observations from this region are primarily concentrated along the Missouri River and in Lostwood NWR, approximately 17.8-mi (28.6 km) south and 23-mi (37.0 km) west of the Project, respectively. Bald eagle sightings are dispersed throughout the landscape in lower densities in this region of North Dakota, typically where suitable habitat exists (Figure 10).



**Figure 8. eBird data of bald eagles observed per hour of observation within the 5-county region in North Dakota where Aurora Wind Facility is located (Williams County and the surrounding North Dakota counties Burke, Divide, McKenzie, and Mountrail Counties; eBird 2016b). Birds per hour is the average number of bald eagles seen per hour spent birding within a specified date range and region. Dates range from January 1, 1900, to August 19, 2016.**

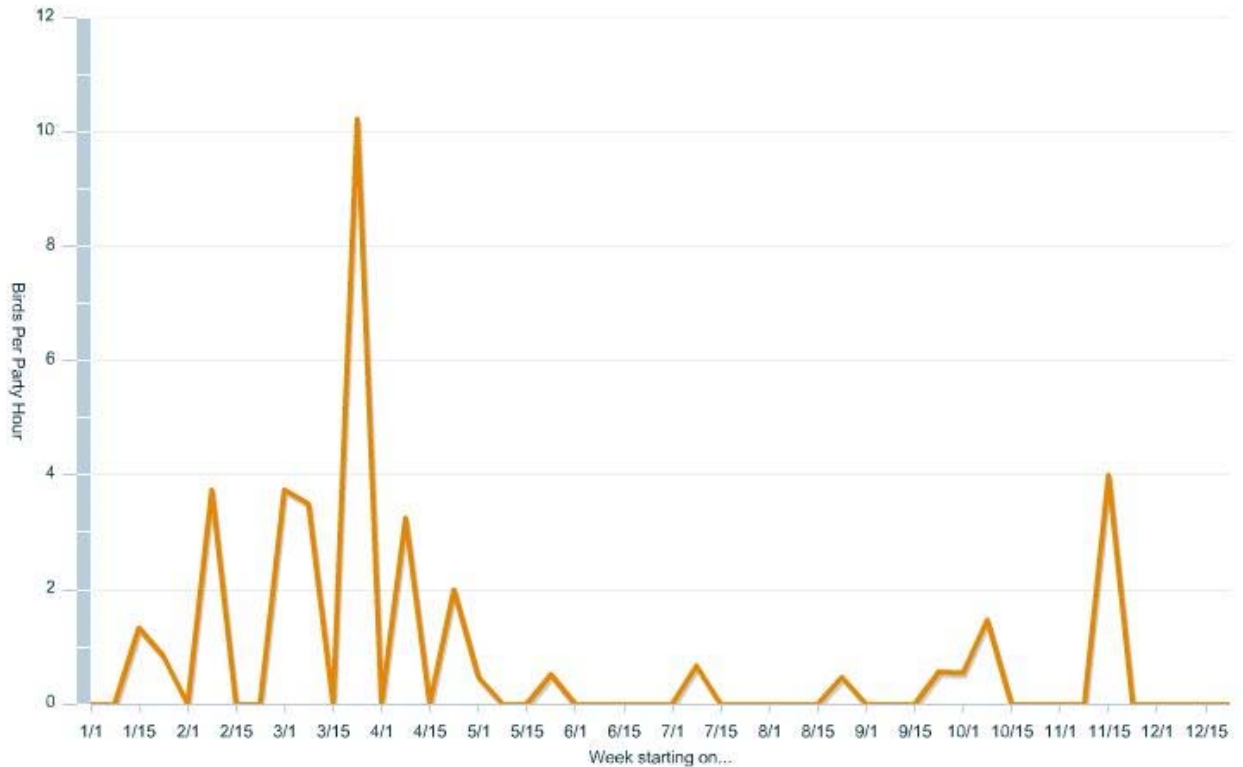
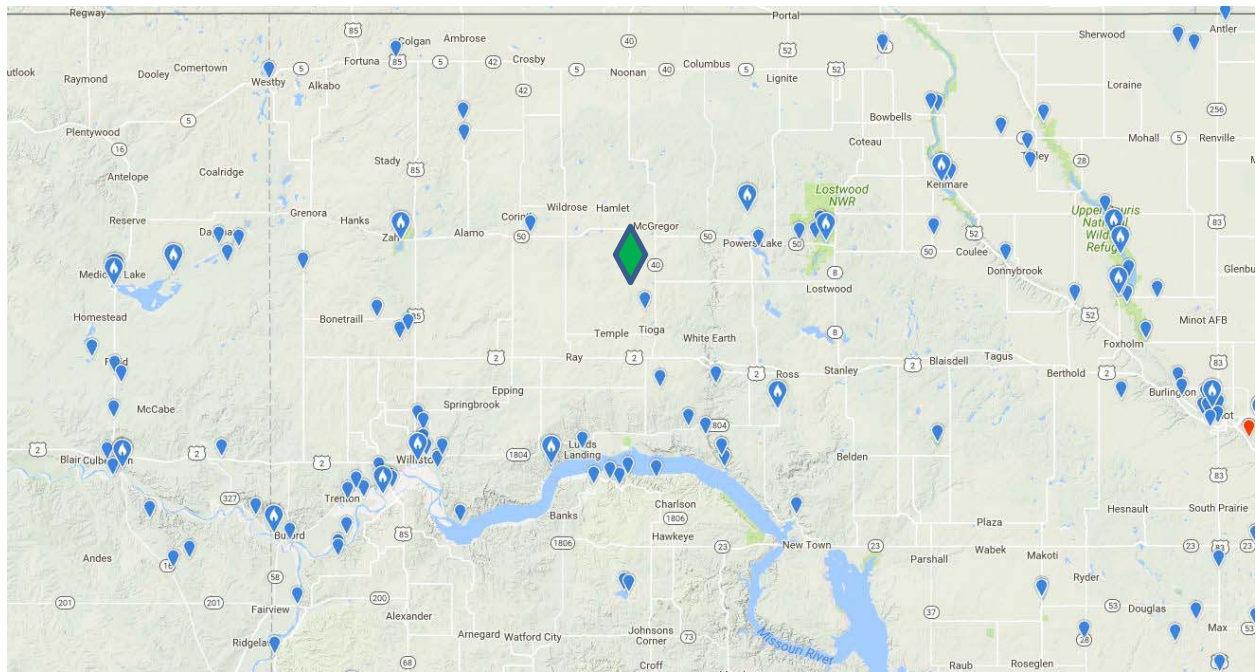


Figure 9. eBird data of bald eagles observed per hour of observation in Williams County, North Dakota (eBird 2016d). Birds per hour is the average number of bald eagles seen per hour spent birding within a specified date range and region. Dates range from January 1, 1900, to August 19, 2016.



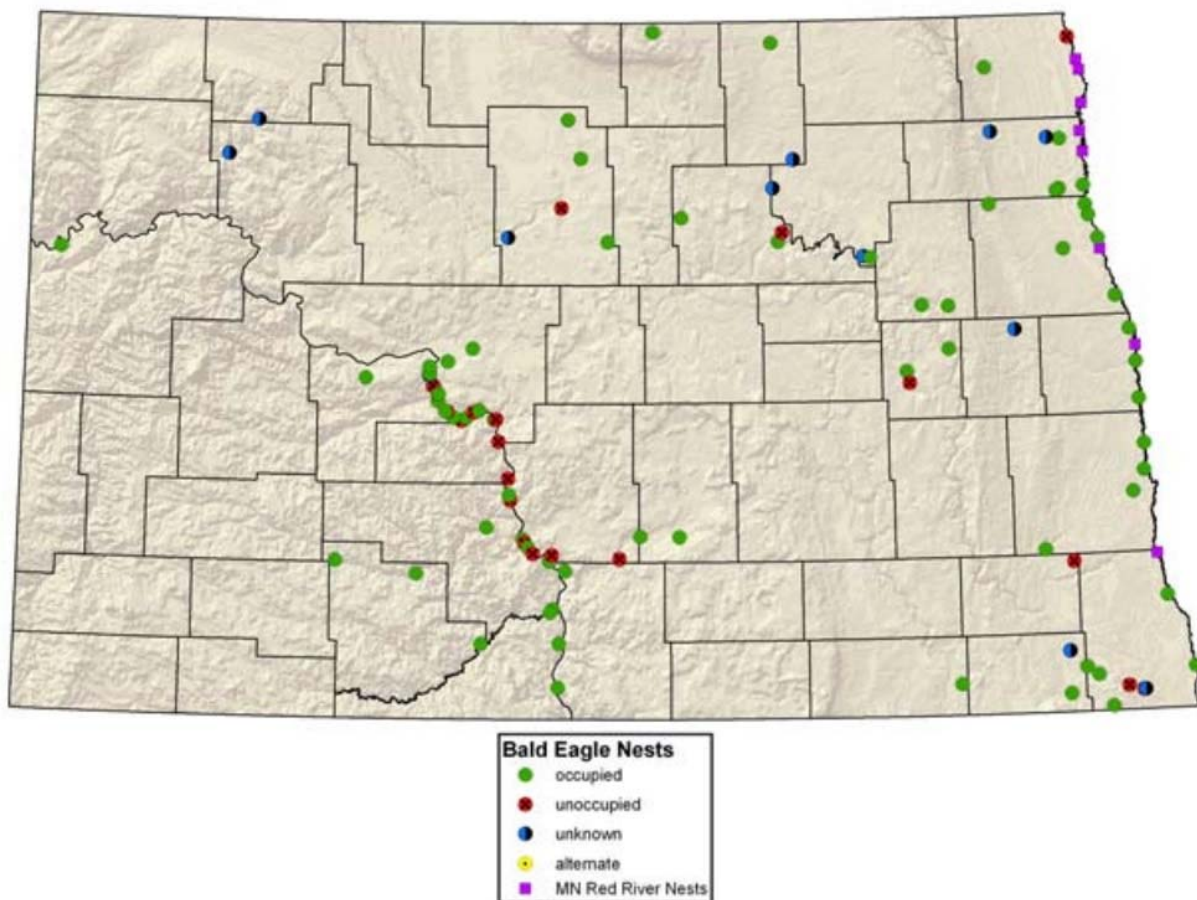
**Figure 10. eBird data of bald eagle observations within the region where Aurora Wind Facility is located (eBird 2016a). Observation data are from all months. The green diamond indicates the approximate location of Aurora Wind Facility. Blue markers indicate all year- round observations from 1900-2016 that are more than 30 days old. Red markers indicate data from the last 30 days (data from August 19, 2016). Each blue marker can represent one bald eagle observation or multiple bald eagle observations in the same location.**

*Resident Breeding and Non-Breeding Eagles*

During the breeding season, bald eagles typically breed in forested areas adjacent to large bodies of water. They usually nest in large mature deciduous or coniferous trees in forest tracts that have relatively open canopies or foliage-height diversity that allow for access to nest trees (Anthony and Isaacs 1989, Buehler 2000, Wood et al. 1989). The distance from nest to water varies depending on the population, and occasionally, distance to water appears to be less important than the presence of quality foraging areas (defined by diversity, abundance, and availability of prey [MacDonald and Austin-Smith 1989]), and absence of human disturbance (McGarigal et al. 1991). Perch trees encompass a wider range of tree species and sizes than nest or roost-trees as bald eagles use both coniferous and deciduous trees for perching (Buehler 2000; Stalmaster 1987).

In 2009, the NDGFD reported 66 pairs of bald eagles nesting in 29 counties in the state (Johnson 2010). Johnson (2010) reported two potential bald eagle nests in northwestern Mountrail County and south central Burke County, within approximately 25.0 mi (40.2 km) of the Project (Figure 11). Nesting bald eagle numbers are increasing, as the NDGFD estimated 140 active bald eagle nests in North Dakota in 2015 (Kessler 2015). An increase in migrating bald eagles has also been observed throughout the state as bald eagles migrate through grassland areas in the fall and spring (Kessler 2015). The NDGFD reports that there are no known bald or golden eagle nests within 10-miles of the Project (NDGFD pers. comm.). It should be noted that the NDGFD eagle nests database contains nests reported by the public and nests found during the NDGFD raptor surveys (NDGFD pers. comm.). The NDGFD does not implement a state-wide eagle nest survey using a systematic sampling structure. Therefore, eagle nests may be within 10 miles of the Project, but have yet to be reported to the NDGFD.

Nesting eagles could also pass through the Project or forage within the Project. While the Project land use and land cover is primarily cultivated crops, the herbaceous grassland areas that exist within the Project are likely to provide habitat for eagles (USGS NLCD 2011). Also within and near the Project, there are some large wetland complexes and open water with nearby trees that provide suitable foraging habitat for bald eagles. If bald eagles are found within or near the Project, they will likely be near these lakes. However, there is no reason to believe that the Project landscape is more attractive to eagles than habitat outside of the Project (e.g., more attractive habitat is likely found along the Missouri River, Williams County WPA to the east, and Medicine Lake to the west).



**Figure 11. Spatial distribution of bald eagle nests in North Dakota in 2009 (Johnson 2010).**

### *Breeding Bird Surveys*

One USGS Breeding Bird Survey (BBS) route, the Wild Rose BBS route, runs through the Project. The next closest route is the Powers Lake Route, located approximately 15.5 mi (24.9 km) east of the Project. Routes are typically 24.5 mi (39.4 km) long and consist of 50 3-minute counts along the length of the route (USGS 2014). Information gathered from the survey provides information about what species may occur in the Project, either transiently or during the breeding season.

Between 2012 and 2015, 86 species were observed along the Wild Rose BBS route, including three raptor species: red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and Swainson's hawk (*Buteo swainsoni*; Pardieck et al. 2016). No bald or golden eagles were observed along the Wild Rose BBS routes during these years (Pardieck et al. 2016). Between 2012 and 2015, 81 species were observed along the Powers Lake BBS route, including three raptor species: red-tailed hawk, northern harrier, and Cooper's hawk (*Accipiter cooperii*; Pardieck et al. 2016). Two owl species, great horned owl (*Bubo virginianus*) and short-eared owl (*Asio flammeus*), were also observed along the Powers Lake BBS route (Pardieck et al. 2016). No bald or golden eagles were observed along the Powers Lake BBS routes during these years (Pardieck et al. 2016).

### *Wintering Eagles*

Bald eagles may congregate in communal roosts in winter to conserve energy, exploit protective microclimates, and reduce foraging costs (USFWS 2010). Roost sites are typically in mature trees where eagles are sheltered from the wind and inclement weather (USFWS 2007a). Buehler et al. (1991) found that winter communal roosts were more often located close to water sources and away from human development than at random sites. Perching habitat during the winter is similar to other times of the year and is characterized by tall trees located adjacent to foraging areas (Buehler et al. 1992; Chandler et al. 1995).

Bald eagles prefer to forage on fish, so they are often attracted to aquatic habitats (DeLong 1990). However, they are opportunistic foragers and may rely heavily on carrion of fish, birds, and mammals as a primary food source during the winter months (Buehler 2000; Mersmann 1989). Bald eagles also forage at waterfowl concentration areas during the winter where mortality due to hunting provides a reliable supply of waterfowl carcasses for scavenging (Griffin et al. 1982).

Bald eagles are present during the winter in North Dakota, especially near rivers and reservoirs (Kessler 2015). In 2015, bald eagles were reported during 17 of the 20 Christmas Bird Counts that took place throughout the state of North Dakota, with 142 bald eagles observed statewide (Audubon 2016). The Project does not contain significant habitat features that would be attractive to wintering eagles (i.e., open water sources). However, if waterfowl are present during open water periods in late fall and early spring, the herbaceous areas and open water/wetland complexes within the Project and the WPAs or Wildlife Management Areas adjacent to the Project could attract eagles (All About Birds 2015). Bald eagles may occur within the Project during the winter; however, larger bodies of water that are free of ice longer, such as the lake and freshwater emergent wetlands within Williams County WPA to the east and Medicine Lake to the west, are expected to provide better winter habitat. The Project also contains herbaceous areas where carrion (e.g., deer carcasses, road kill) or small game may be present and could be an attractant for bald eagles.

### *Bald Eagle Migration or Other Regular Movement*

Bald eagle migration is not as regular as other migratory birds, as movements are often opportunistic, somewhat unpredictable, and widely dispersed in time (Buehler 2000). Bald eagle migration patterns depend primarily on the age of the bird (immature or adult), location of the breeding site, breeding site climate, and food availability (Buehler 2000). Bald eagles typically do not migrate in kettles or flocks, but concentrations of migrants may occur at communal feeding and roost sites during migration (Buehler 2000). Migration occurs during the day, when thermals provide opportunities to soar with limited energetic expense.

Fall migration peaks from mid-October to early December in North Dakota (Johnson 2009). Bald eagles often migrate along major river systems in search of food (Buehler et al. 1991). In the spring, bald eagles may return to their breeding grounds as soon as the weather improves and

food is available, again often using major river valleys as migration corridors. The spring migratory period peaks from mid-March to mid-April in North Dakota (Johnson 2009).

Little information is available regarding the characteristics of stopover habitat used during migration. It is likely that the suitability of stopover habitat is most related to food availability rather than vegetative composition or structural characteristics. Stopover sites are usually areas with consistent fish-kills, concentrations of fish and waterfowl, or the presence of large mammals as carrion (McClelland et al. 1996). Roosts that most commonly see repeated use as stopover sites consist of clumps of mature deciduous trees in riparian areas protected from human disturbance and close to foraging opportunities. Locations within the Project that may serve as stopover sites for eagles are limited to small wooded patches and lakes with opportunities for foraging. Grasslands and other areas within the Project may attract migrating bald eagles if carrion or small game is present. Therefore, it is possible that eagles will migrate through the Project. However, it is more likely that bald eagles will migrate through areas with more water and trees (e.g., Missouri River corridor) during the migratory period.

### **Seasonal Eagle Concentration Areas**

The Project does not contain habitat or landscape features that would appear to lead to significant seasonal concentrations of bald or golden eagles. Most of the Project consists of cultivated cropland with some grassland and wetland habitat. There are a few wetland complexes within the Project that eagles could use during winter, migration, or during the breeding season. Ephemeral foraging opportunities in the form of carrion and road kill may temporarily attract eagles, especially during the winter.

### **Physical Landscape Features**

Physical features of the landscape that may attract or concentrate eagles are limited within the Project. The general topography across the Project is gently rolling hills. It is likely that bald or golden eagles will migrate through the Project in a broad-front fashion as there are no prominent north-south ridges or valleys that would funnel migrants through the Project (HawkMountain 2016; Liguori 2005; Figures 2 and 3). The available trees and open water/wetland complexes may provide some stopover habitat for migrating eagles, but concentrated use is not expected within the Project since these features are limited within the Project.

## **CONCLUSIONS**

The ECPG (USFWS 2013) suggests specific questions that should be considered to help place a prospective project site into an appropriate risk category. These questions are answered below based on the information compiled during the Stage 1 Initial Site Assessment.

1. *Does existing or historical information indicate that eagles or eagle habitat may be present within the geographic region under development consideration?*

Eagles have not been observed within the Project. There are no known bald or golden eagle nests within the Project or within 10 miles per communication with NDGFD. Bald eagle habitat

exists within the Project as there are open water/wetland complexes (<3%) and forest coverage (<1%; USGS NLCD 2011).

2. *Within a prospective project site, are there areas of habitat known to be or potentially valuable to eagles that would be destroyed or degraded due to the project?*

Overall the Project lacks significant eagle habitat. There is some potentially eagle habitat in the Project area, such as wetland complexes, open water, and herbaceous grasslands. Impacts to these areas should be minimized.

3. *Are there important eagle use areas or migration concentration sites documented or thought to occur in the project area?*

To date, no important eagle use areas or migration concentration sites have been documented or are thought to occur within the Project. The important bald eagle use areas and migration concentration sites are located approximately 17.8 mi (28.6 km) south of the Project along the Missouri River. No bald or golden eagle nests are known within the Project.

4. *Does existing or historical information indicate that habitat supporting abundant prey for eagles may be present within the geographic region under development consideration?*

Abundant prey for eagles is not expected to be present within the Project, but may be found in the larger geographic region. Some foraging opportunities may be present in the form of waterfowl, small game, and road-killed deer and other carrion within the Project.

5. *For a given prospective site, is there potential for significant adverse impacts to eagles based on answers to above questions and considering the design of the proposed project?*

Bald and golden eagles have the potential to occur in the Project during all seasons, but will likely occur in low numbers. Generally, bald eagles do not move broadly across the landscape during the nesting season. As such, the potential risk of bald and golden eagles interacting with wind turbines at this site could be greater during the migratory season; however, no migration concentration sites have been documented or are thought to occur within the Project. Based on available information, it is not likely that eagle populations will be significantly adversely impacted by development of the proposed Project.

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