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Stage 1 Initial Site Assessment of Eagle Use/Risk Lindahl Wind Project, Williams County, North Dakota

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INTRODUCTION

Lindahl Wind Project, LLC, is considering the development of a proposed wind energy facility in Williams County, North Dakota (Figure 1), known as the Lindahl Wind Project (LWP). The project developer has asked Western Ecosystems Technology, Inc. (WEST) to develop an initial site assessment for eagles, which determines the relative importance of the project area to resident breeding and non-breeding eagles and migrant and wintering eagles. This initial site assessment 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 Initial Site Assessment for the LWP is to assess whether the LWP is within areas known or likely to be used by eagles, and if so, to determine the expected extent and type of eagle use of the site.

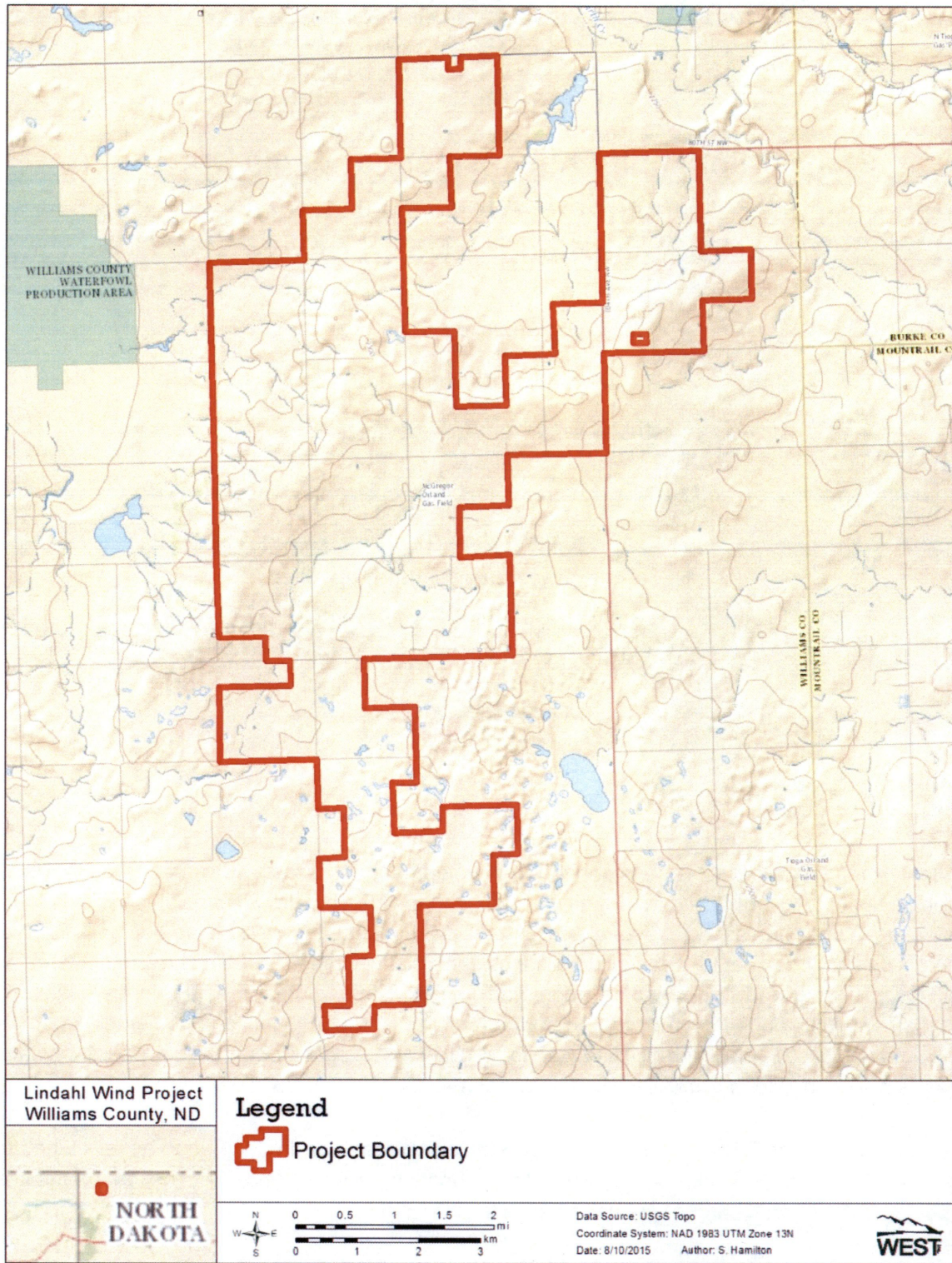


Figure 1. Location of the Lindahl Wind Project in Williams County, North Dakota.

Study Area

The LWP study area encompasses about 13,000 acres (52.32 square kilometers [km²]) in Williams County, North Dakota (Figure 1). The LWP falls within the Northwestern Glaciated Plains Level III Ecoregion, which stretches through northeast Montana, and western North and South Dakota, and the Missouri Coteau Slope Level IV Ecoregion (USEPA 2013). Much of the Northwestern Glaciated Plains region was originally dominated by spear grass, wheat grass, and blue grama grass prairie, riparian forest, sagebrush, and in some areas, a high concentration of semi-permanent and seasonal wetlands (Griffith 2010). Today, this region is used for cattle grazing and some agricultural land, primarily grain crops (Griffith 2010). The Missouri Coteau Slope Ecoregion has a simple drainage pattern and less wetland depressions than the Missouri Coteau (Bryce et al. 1996). The majority of the LWP is comprised of cropland and herbaceous grasslands, with some emergent herbaceous wetlands and developed areas (US Geological Service [USGS] National Land Cover Data [NLCD] 2011).

The elevation of the LWP ranges from approximately 684 – 766 meters (m; 2,244 – 2,513 feet [ft]; Figure 3). Topography of the LWP is gently rolling hills (Figure 2). Though most of the LWP is composed of cultivated cropland, there are several relatively large areas of herbaceous grasslands within the project boundary. Emergent herbaceous wetlands are also present throughout the project site, though they are more concentrated in the southern part of the site. There are no large lakes within the LWP; however, there are several large lakes within one mile (1.6 km) of the project boundary that could occasionally be used by foraging eagles (Figure 4).

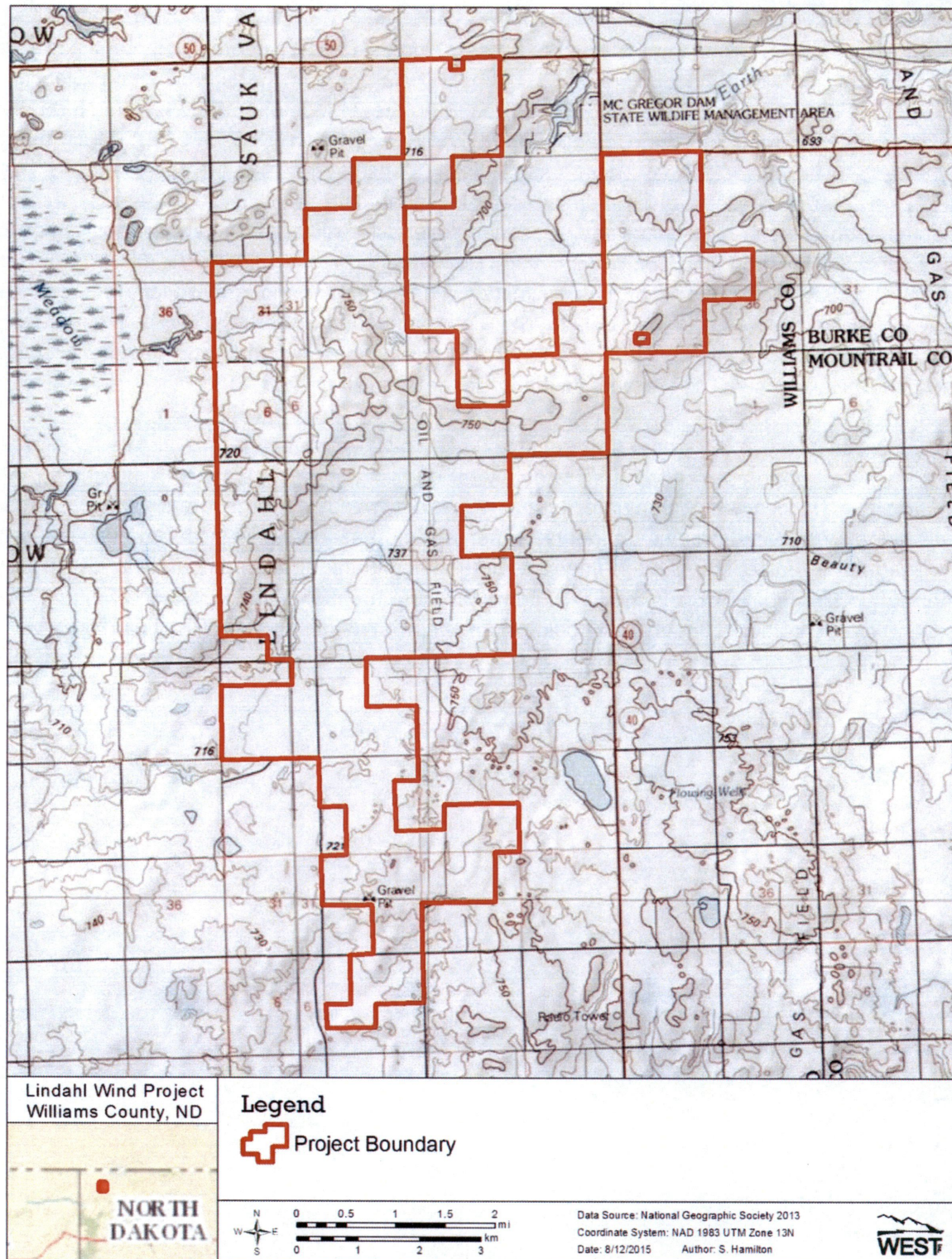


Figure 2. Topographic image of the Lindahl Wind Project.

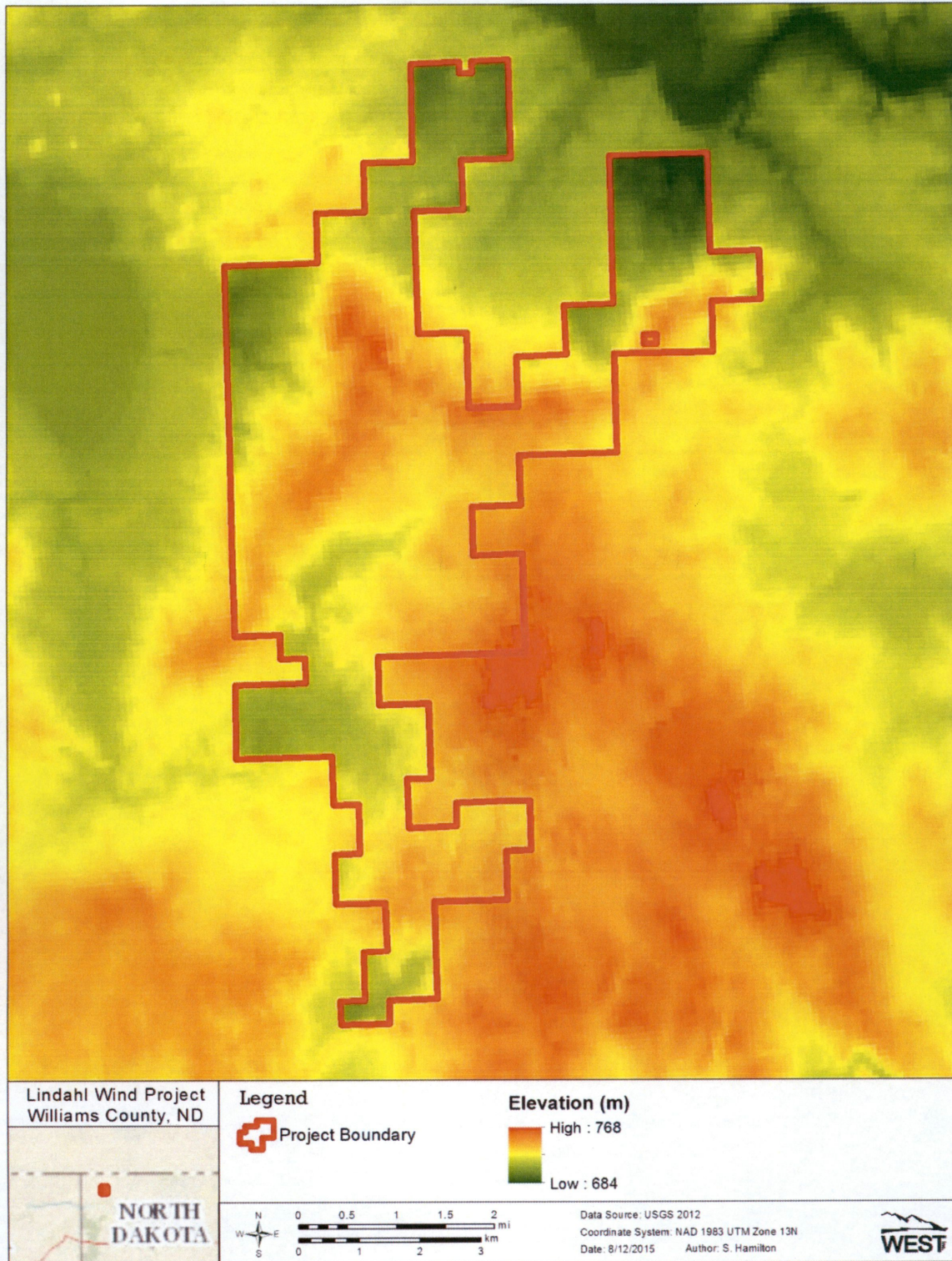


Figure 3. Elevation at the Lindahl Wind Project.

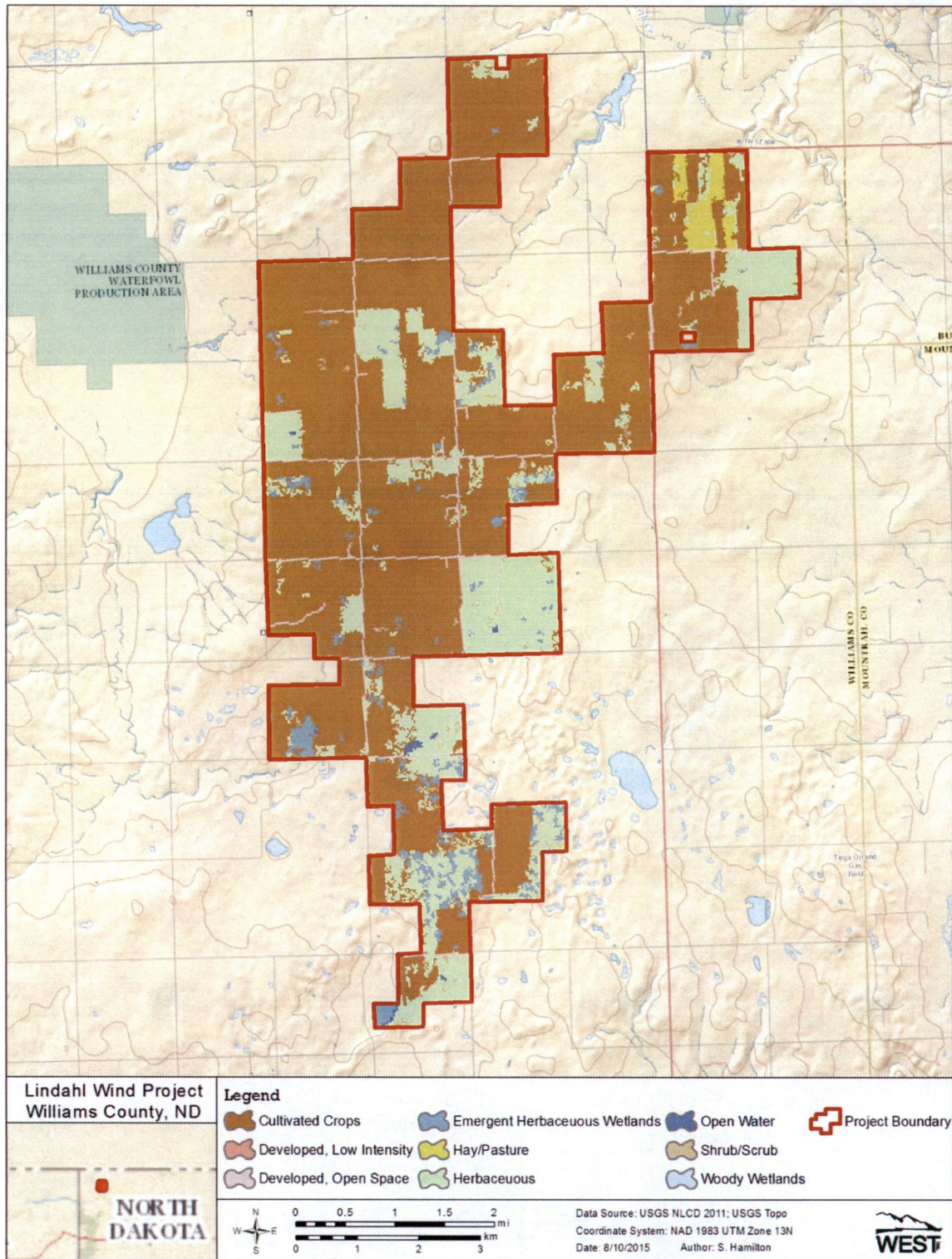


Figure 4. Land cover in the Lindahl Wind Project (USGS NLCD 2011).

METHODS

This Stage 1 Initial Site Assessment describes existing information from publicly available literature, databases, and other sources to evaluate the appropriateness of the LWP for development as it relates to potential risk to eagles. Several sources of available data were used to identify biological resources within the LWP. 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 Initial Site Assessment included:

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

LINDAHL WIND PROJECT SITE CHARACTERISTICS

Land Use/Land Cover

Approximately 70% of the LWP is cultivated crops. Herbaceous grasslands compose approximately 20% of the LWP and emergent herbaceous wetlands make up approximately 3% of the project area. Developed space covers approximately 3% of the LWP, mainly in the form of roads. Hay/pasture accounts for approximately 2% of the LWP. Shrub/scrub, open water, and woody wetlands each compose less than 1% of the project area. (Table 1, Figure 4; USGS NLCD 2011).

Table 1. Land use/cover types present within the Lindahl Wind Project (USGS NLCD 2011).

Land Use/Cover	Project Acres	Percent Composition
Cultivated Crops	9,109.63	70.45
Herbaceous	2,611.78	20.20
Emergent Herbaceous Wetlands	448.03	3.47
Developed, Open Space	442.35	3.42
Hay/Pasture	193.86	1.50
Shrub/Scrub	92.46	0.71
Open Water	23.49	0.18
Woody Wetlands	4.63	0.04
Developed, Low Intensity	3.54	0.03
Total	12,929.77	100

Wetlands

Formal wetland delineations for the LWP have not been fully completed for the final design but are largely complete based on several previous preliminary Project designs. Based on National Wetland Inventory (NWI) polygon data (USFWS NWI 2014), there are approximately 339.62 acres (137.44 hectares [ha]) of wetlands, found in the LWP (Table 2, Figure 5). Freshwater emergent wetlands account for 89% of the wetlands within the LWP, followed by lakes (7%), and freshwater ponds (3.5%). Other wetland types and freshwater forested/shrub wetlands each compose less than 1% of the wetlands within the LWP. There are no named streams within the LWP. The National Hydrography Dataset (NHD) mapped flow-lines within the project area total approximately 19.97 miles (32.14 km) in length, and all of these streams are intermittent streams (USGS NHD 2015a).

Table 2. National Wetland Inventory polygon types present within the Lindahl Wind Project (USFWS NWI 2014).

Wetland Type	Project Acres	Percent Composition
Freshwater Emergent Wetland	303.77	89.44
Lake	22.65	6.67
Freshwater Pond	11.71	3.45
Other	1.08	0.32
Freshwater Forested/Shrub Wetland	0.40	0.12
Total	339.62	100

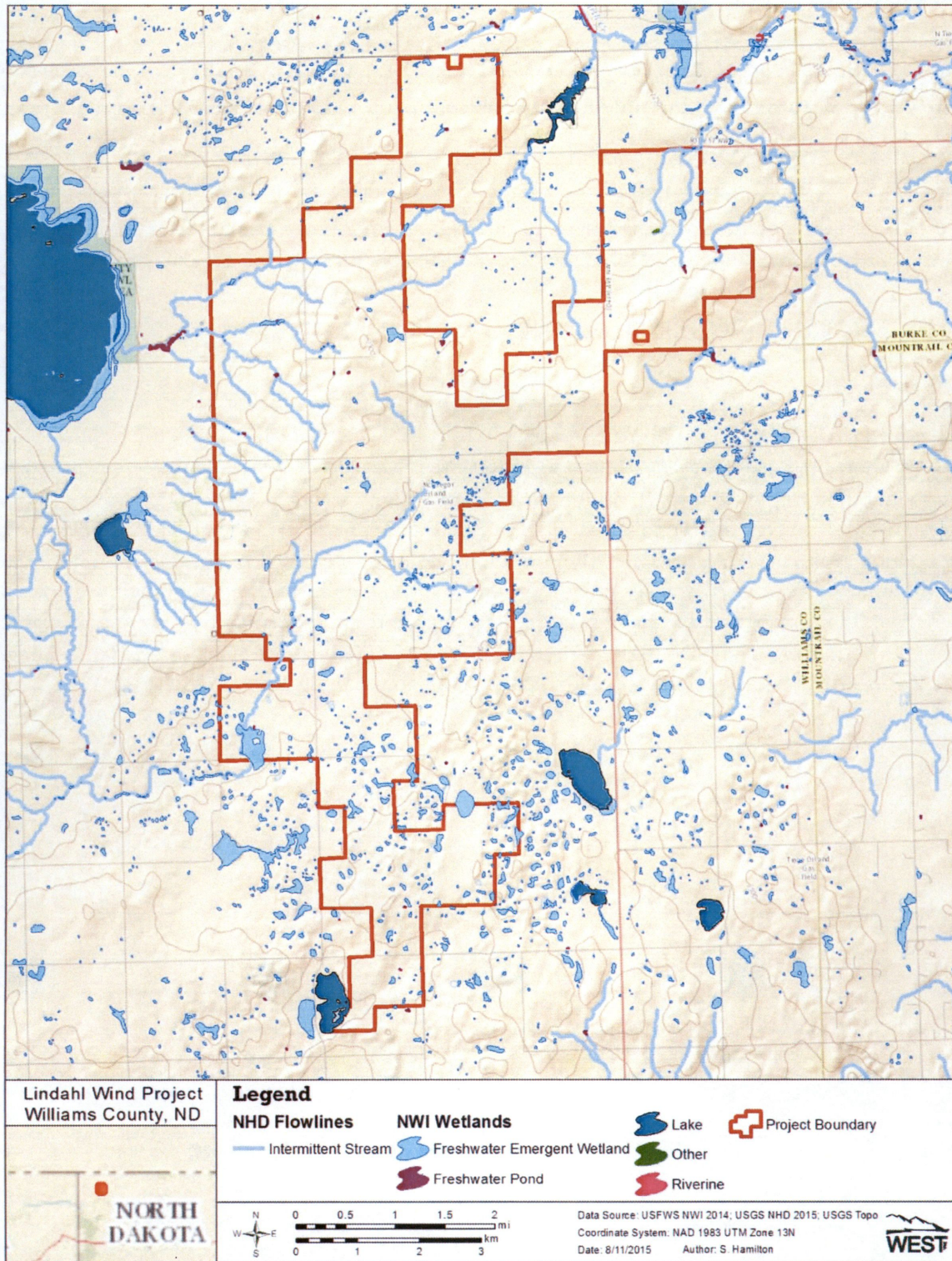


Figure 5. Wetlands and streams in the Lindahl Wind Project (USFWS NWI 2014, USGS NHD 2015a).

Protected Areas

A review of the Protected Areas Database (PAD-US) from the USGS notes that there are no Waterfowl Production Areas (WPAs) or Wildlife Management Areas (WMAs) within the LWP (USGS 2012b). However, there are multiple protected wildlife areas within 10 miles (16 km) that include, but are not limited to, the Fuller WPA, White Earth Valley WMA, Olson WPA, Powers Lake WPA, and Wildrose WPA. All wildlife protected areas within 10 miles of the LWP have a total area of approximately 5,028 acres (2,035 ha). These protected areas within 10 miles of the LWP are largely composed of herbaceous grassland, emergent herbaceous wetlands, open water, and some deciduous forest that may provide suitable foraging opportunities for eagles.

EAGLE OCCURRENCE IN THE LINDAHL WIND 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). Western North Dakota is within the breeding range of the golden eagle. There are reports of golden eagle observations in Williams County and throughout North Dakota (eBird 2015e; Figure 6). The North Dakota Game and Fish Department (NDGFD) classifies golden eagle as “uncommon” throughout North Dakota (NDGFD 2012), although this species has been reported more frequently in the western half of the state (Figure 6). The NDGFD reports that no known golden eagle nests are located within the LWP or within a 10-mile buffer of the LWP (S. Johnson, pers. comm., August 2015).

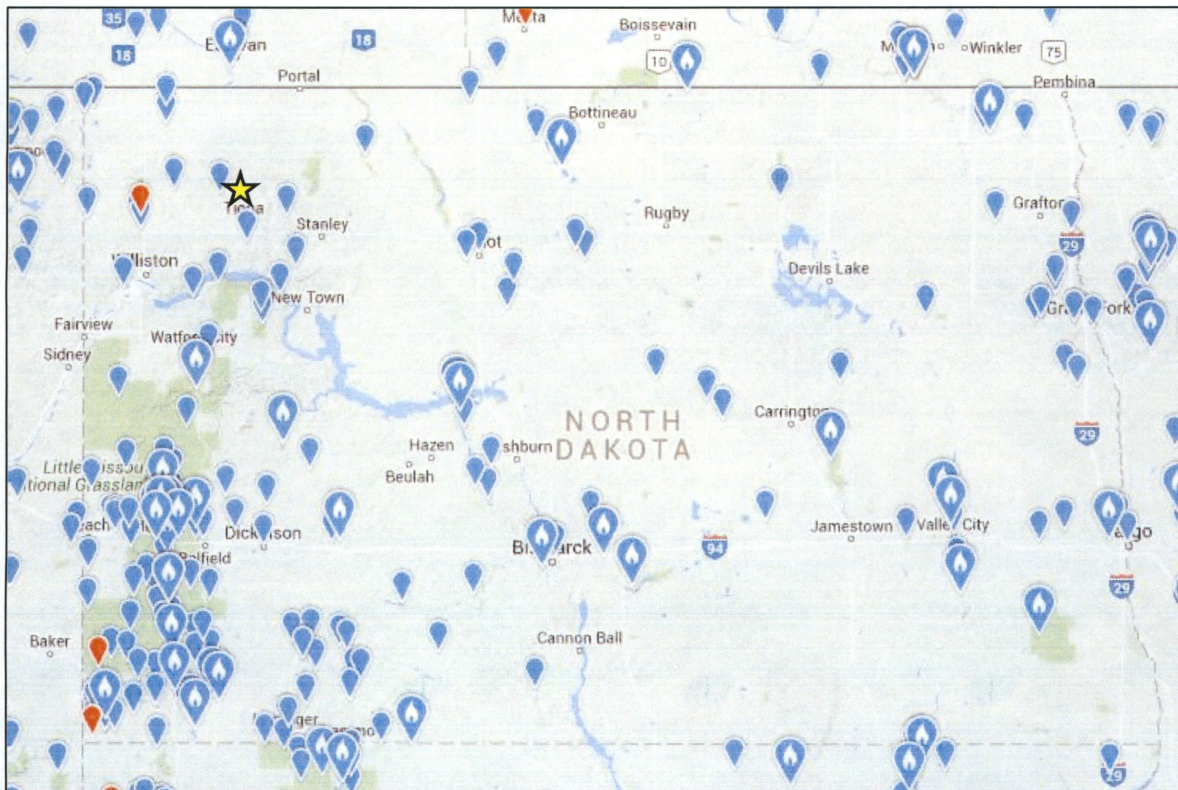


Figure 6. eBird data map of golden eagle occurrences observed during all seasons in North Dakota (eBird 2015e). The yellow star indicates the approximate location of the Lindahl Wind Project. Blue markers indicate all golden eagle observations from 1900-2015, red markers indicate observations less than 30 days old (data from August 12, 2015). Each blue marker can represent one golden eagle observation or multiple golden eagle observations in the same location.

Bald Eagle

In North Dakota, bald eagles historically nested along the Missouri River, Red River, and in the Devils Lake area (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 an increase in the number of nesting bald eagles over the past four decades, challenges and threats to bald eagles remain. Major 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 of bald eagle year-round data in the eBird database (Sullivan et al. 2009) for an 5-county region (Williams County and the four surrounding North Dakota counties [Divide, Burke, Mountrail, and McKenzie Counties]) indicates a fairly strong seasonal trend, with eagle

occurrence peaking from February to June and another peak in late November (Figures 7). Bald eagle observations within Williams County are less frequent from April to June, but the general seasonal trend seen in the 5-county region is also seen in Williams County data (Figure 8). The bald eagle observations from this region are primarily concentrated along the Missouri River, approximately 22 miles (35 km) to the south of the LWP, but are also dispersed throughout the landscape in lower densities (Figure 9). It should be noted that eBird data is a citizen-science database and is comprised 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-temporal trends.

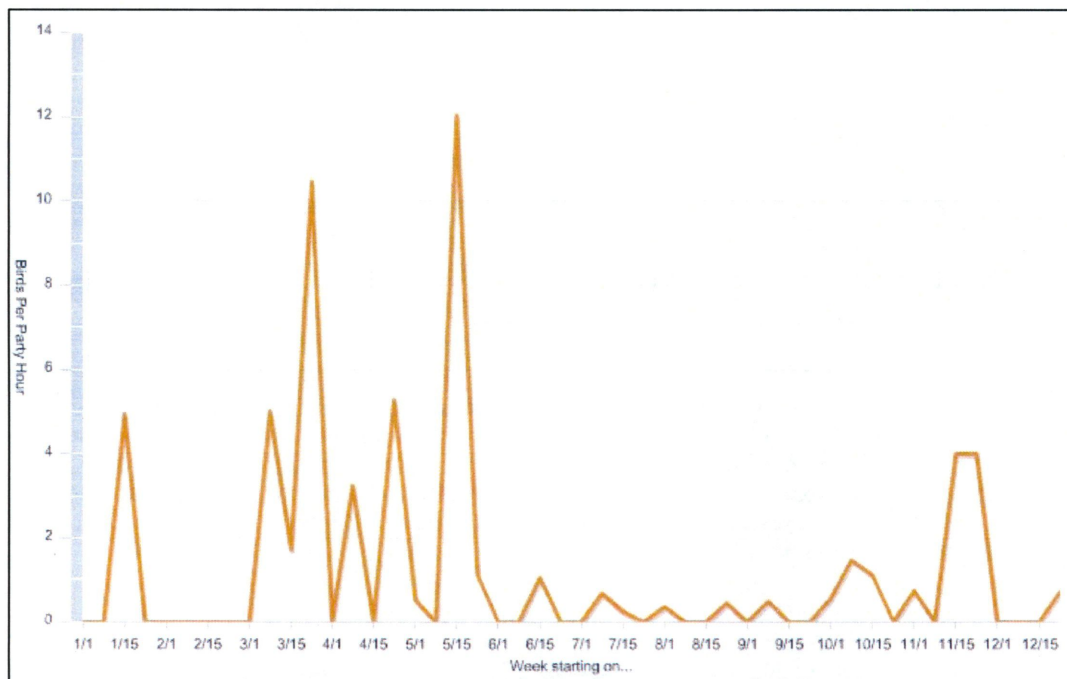


Figure 7. eBird data showing bald eagles per hour within the 5-county region in North Dakota, including Williams County, in which the Lindahl Wind Project is located (eBird 2015b). Birds per hour is the average number of bald eagles seen per hour spent birding within a specified date range and region. Dates range from January 1, 1900, to August 12, 2015.

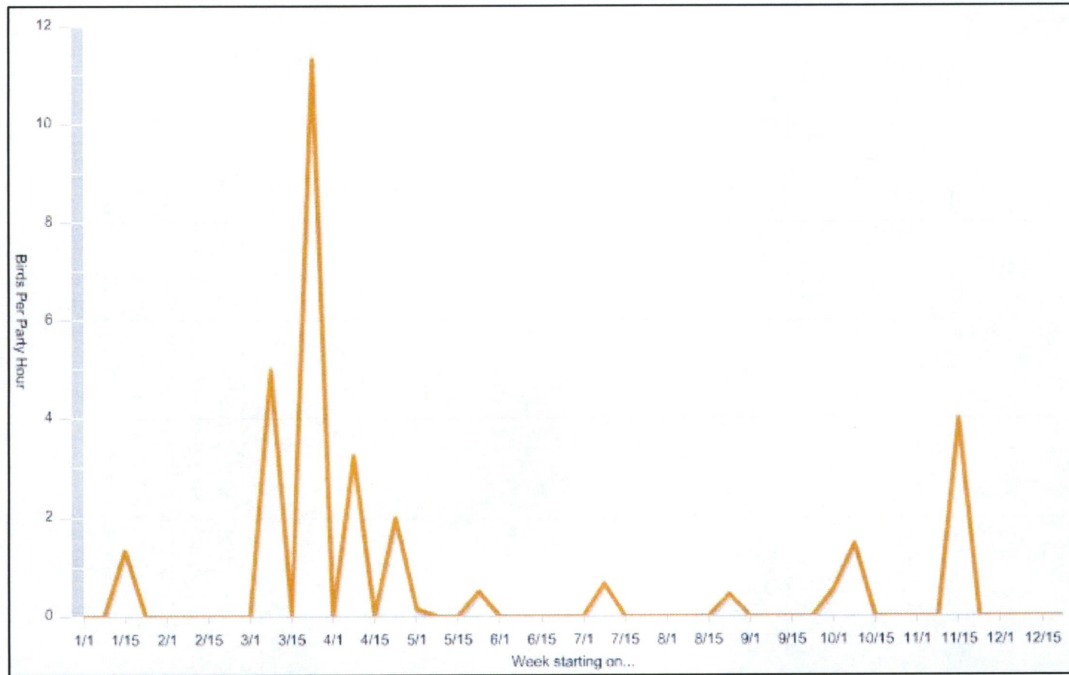


Figure 8. eBird data showing bald eagles per hour in Williams County, North Dakota (eBird 2015d). Birds per hour is the average number of bald eagles seen per hour spent birding within a specified date range and region. Dates range from January 1, 1900, to August 12, 2015.

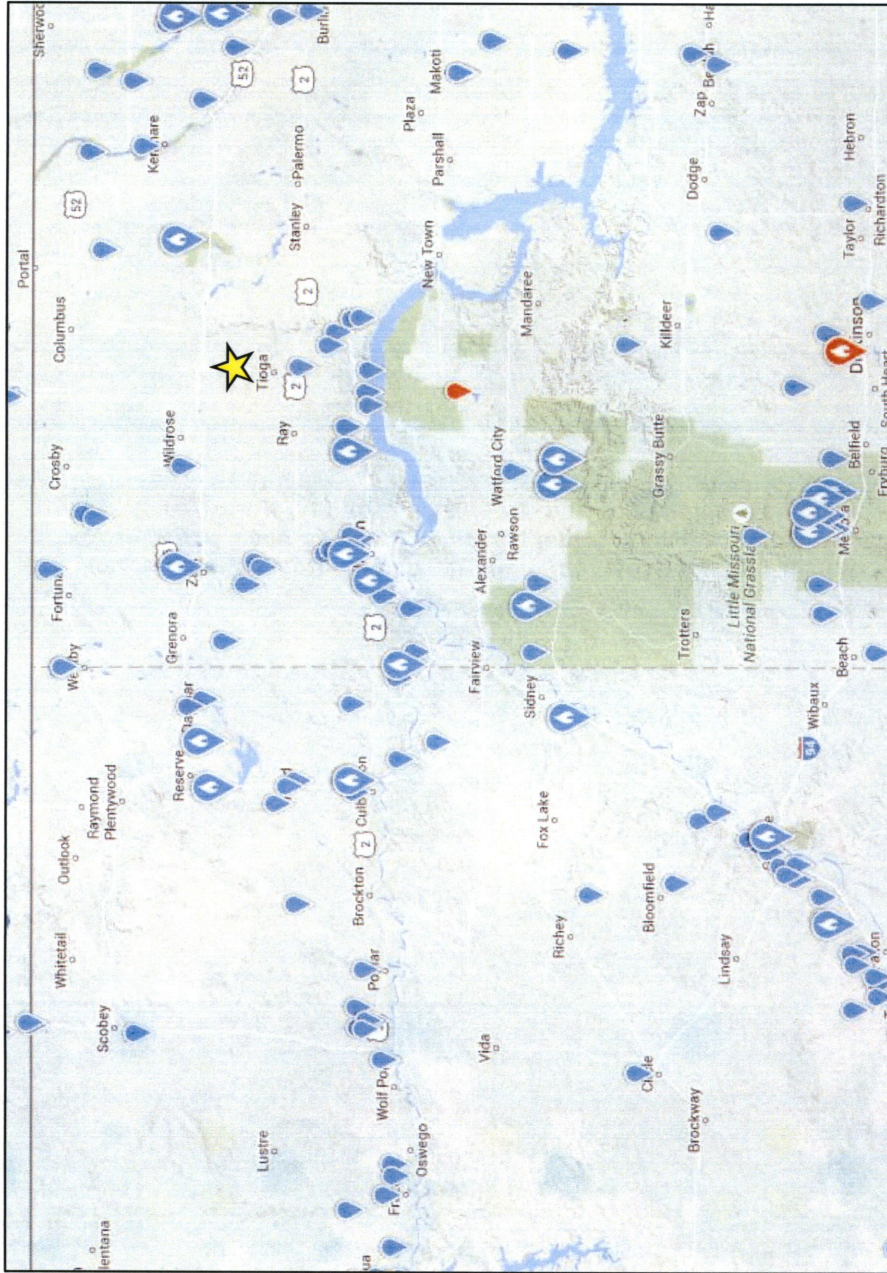


Figure 9. eBird data map of bald eagle observations within the region in which the Lindahl Wind Project is located (eBird 2015a). Observation data are from all months and all years. The yellow star indicates the approximate location of the Lindahl Wind Project. Blue markers indicate all year round observations from 1900-2015 that are more than 30 days old. Red markers indicate data from the last 30 days (data from August 12, 2015). Each blue marker can represent one bald eagle observation or multiple bald eagle observations in the same location.

Resident Breeding and Non-Breeding Eagles

In the 1800s, bald eagles were common breeders along North Dakota's major rivers and lakes, such as the Missouri River, the Red River, and Devils Lake (Johnson 2010). A significant decline in their numbers caused by environmental contaminants and loss of habitat led to the enactment of the Bald Eagle Protection Act in 1940; however, 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).

In 2009, the NDGFD reported 66 pairs of bald eagles nesting in 29 counties in the state (Johnson 2010). Johnson (2010) reported one occupied bald eagle nest in McKenzie County along the Missouri River and two bald eagle nests (it was unknown if these nests were occupied or unoccupied) that appear to be in Mountrail County (Figure 10). Nesting bald eagle numbers are increasing, as the NDGFD estimated 140 active bald eagle nests 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).

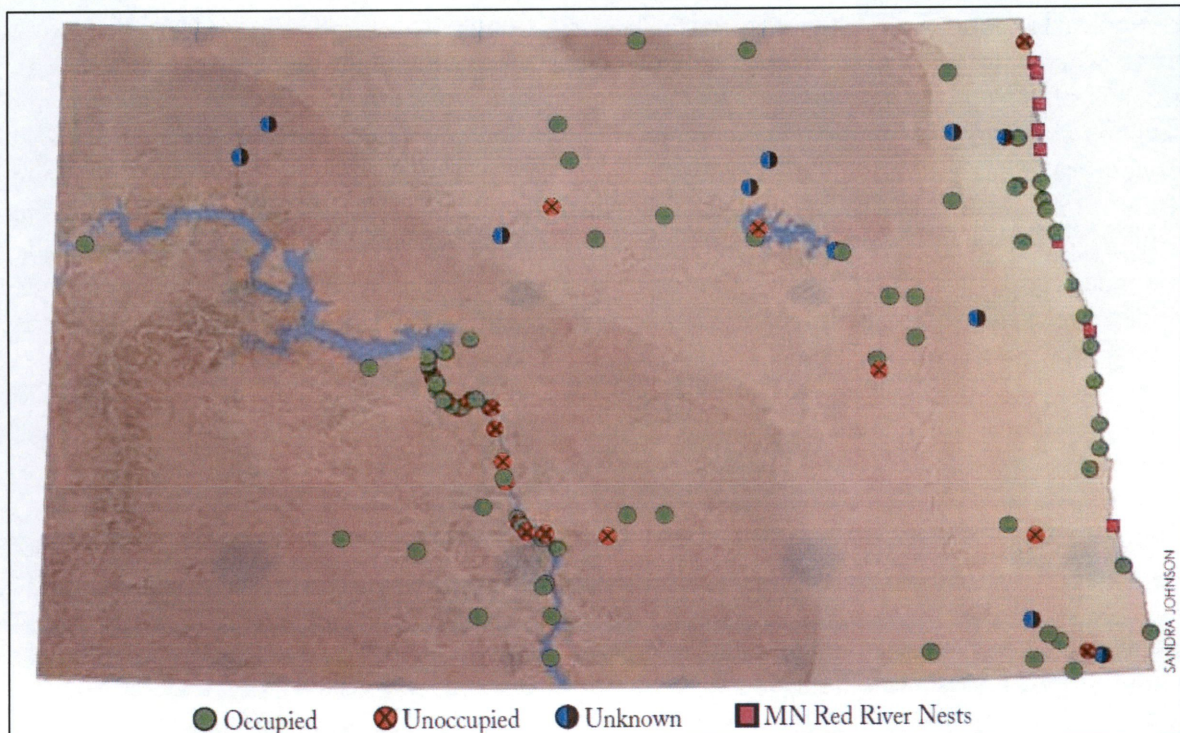


Figure 10. Spatial distribution of bald eagle nests in 2009 (Johnson 2010).

During the breeding season, bald eagles typically breed in forested areas adjacent to large bodies of water, nesting 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 (Buehler 2000, Anthony and Isaacs 1989, Wood et al. 1989). The distance 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). Trees that bald eagles use for perching are variable and include both coniferous and deciduous species, if available (Buehler 2000). Perch trees encompass a wider range of tree species and sizes than nest or roost-trees (Stalmaster 1987).

The LWP land use is primarily cultivated crops and herbaceous grassland, with a small amount of wetlands and open water and no deciduous forest. These land cover types are not likely to provide abundant forage and habitat for bald eagles. If bald eagles are found within the site, they will likely be near wooded and wetland areas. The Fuller Waterfowl Production Area (approximately 0.75 mile [1.2 km] west of the LWP boundary and at least 2.0 miles from the nearest proposed project facility) and the Wildrose Waterfowl Production Area (approximately seven miles [11 km] west of the LWP) are likely to provide better foraging and nesting opportunities for bald eagles.

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 are more often located close to water sources and away from human development than at random sites. Bald eagles are considered opportunistic foragers and food habits vary and depend on prey species available (Mersmann 1989). Bald eagles are often attracted to aquatic habitats and prefer foraging on fish (DeLong 1990). During the winter months, bald eagles may rely heavily on carrion (fish, birds, and mammals) as a primary food source, and may be found feeding on carrion in dry, open uplands during the winter (Buehler 2000). 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). 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 are present during the winter in North Dakota, especially near rivers and reservoirs (Kessler 2015). The annual Garrison Dam Christmas Bird Count reported 62 bald eagles in December 2014 (Kessler 2015). The LWP does not contain significant habitat features that would be attractive to wintering eagles. However, the presence of several waterfowl protection areas in the area could attract eagles if waterfowl are present. Bald eagles are not likely to occur within the LWP during the winter. Large bodies of water, such as along the Missouri River, are expected to provide better winter habitat – particularly in areas of open, ice-free water. The LWP contains patches of grasslands that are used for cattle grazing and the presence of cattle (or smaller livestock) carcasses could also be an attractant for bald eagles.

Bald Eagle Migration or Other Regular Movement

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 eagle migration is not as regular as with other migratory birds, as movements are often opportunistic, somewhat unpredictable, and widely dispersed in time (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). Fall migration occurs during August through January. 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 using major river valleys as migration corridors. The spring migratory period is generally considered to occur from January to March. Migration occurs during the day, when thermals provide opportunities to soar with limited energetic expense.

Eagles may pass through the LWP in a broad-front fashion during migration, especially if there are food sources such as carrion available. 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 proximate to foraging opportunities. Locations within the LWP that may serve as stopover sites for eagles are limited to small wooded patches and corridors near wetlands and ponds with opportunities for foraging. Pasture land may attract bald eagles if carrion or small game is present. Bald eagles are probably more likely to occur within these areas during the migratory period.

Eagle Seasonal Concentration Areas

The LWP does not contain habitat or landscape features that would lead to seasonal concentration of bald or golden eagles. There are no large bodies of water within the LWP and the majority of the area is composed of cultivated cropland and grassland with very little forest or wetlands. Ephemeral foraging opportunities in the form of livestock carcasses and road kill may temporarily attract eagles, especially during the winter.

Eagle Physical Landscape Features

Physical features of the landscape that may attract or concentrate eagles are limited within the LWP. The general topography across the LWP is gently rolling hills throughout. It is likely that bald or golden eagles will migrate through the LWP in a broad-front fashion. The majority of the LWP is lacking prominent north/south ridges or valleys that would funnel migrants through the project area (Liguori 2005; Figures 2 and 3). Trees, shrubs, and open water sources may provide some stopover habitat for migrating eagles, but concentrated use is not expected within the LWP.

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 been observed near the geographic region under development consideration, but the NDGFD reports that no known bald or golden eagle nests are located within the LWP or within 10 miles of the LWP (S. Johnson, pers. comm., August 2015). Very little eagle habitat is present within the LWP as the project area has very few trees. The LWP is less likely than the surrounding areas to support relatively high bald eagle use because the biological resources eagles rely on are more abundant outside of the project area, such as large waterbodies to the west and wooded draws to the east.

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?*

There is limited potentially valuable habitat for eagles within the LWP. Land use is predominantly cultivated crops. Impact to potential eagle habitat will be avoided whenever possible and current development plans would not impact these areas.

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

To date, there are no important eagle use areas and migration concentration sites documented or thought to occur within the study area. The important bald eagle use areas and migration concentration sites are located approximately 22 miles to the south along the Missouri River. It is possible that eagles could use the LWP for foraging as there are waterfowl protection areas within 10 miles of the LWP. No bald or golden eagle nests were found within the LWP and the surrounding 10-mile buffer area.

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 region under consideration for development. Some foraging opportunities may be present in the form of waterfowl and small game within pasturelands. However, better foraging opportunities and more abundant concentrations of suitable prey are likely to be outside the area under consideration for development.

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?

The potential for significant adverse impacts to bald and golden eagles from construction and operation of the LWP is low. Bald and golden eagles have the potential to occur in the LWP during all seasons, but will likely occur in low numbers. Based on the information gathered it is not likely that eagles will be significantly adversely impacted by development of the proposed project.

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