Whooping Crane Habitat Review

Emmons-Logan Wind Energy Center and 230 kV Transmission Line

Emmons and Logan Counties, North Dakota

Final Report

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INTRODUCTION

Emmons-Logan Wind, LLC (Emmons-Logan Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC proposes to develop the Emmons-Logan Wind Energy Center and 230 kV Transmission Line (Project) in Emmons and Logan Counties, North Dakota (Figure 1). Emmons-Logan Wind requested that Western EcoSystems Technology, Inc. (WEST) conduct a desktop review of potential whooping crane (*Grus americana*) habitat resources within the Project and perform a comparative analysis to resources in the surrounding landscape using four adjacent and similarly-sized reference areas.

PROJECT AREA

The analysis was completed based on a Project boundary provided by Emmons-Logan Wind in 2017 encompassing about 75,056 acres (ac; 303.7 square kilometers [km^2]; 117.3 square miles [mi^2]) but is applicable to the current boundary, including both the Wind Energy Center as well as the 230 kV Transmission Line. The Project is located in the south-central North Dakota counties of Emmons and Logan, approximately 8 miles (mi; 13 kilometers [km]) northeast of the City of Linton (Figure 1). The landscape area is generally rolling to flat. Elevations range from 1,917.1 to 2,176.0 feet (ft; 584.3 to 663.2 meters [m]) above sea level. Historically, the landscape was grassland but has since been converted to agricultural use with crop production and livestock grazing the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Natural wetlands are present and scattered throughout the Project and surrounding area. Common agricultural crops include small grains, corn, soybeans, sunflowers, and alfalfa.

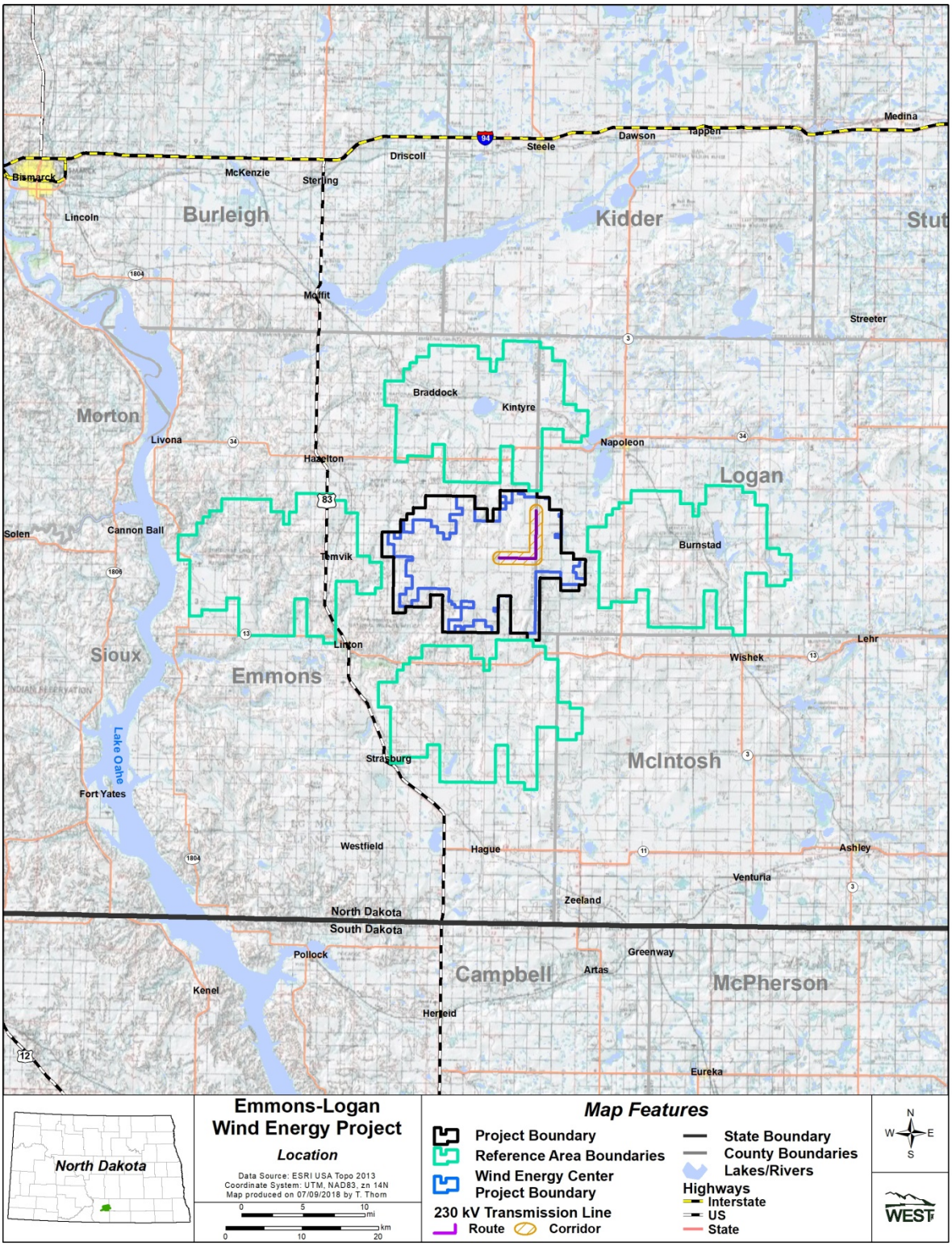

Figure 1. Location of the Emmons-Logan Wind Energy Center, 230 kV Transmission Line, and adjacent reference areas.

METHODS

A desktop review was completed using ArcGIS, ArcMap 10.3.1, National Land Cover Database (NLCD) information, National Wetland Inventory (NWI) data, 2016 National Agricultural Imagery Program (NAIP) aerial imagery, and the Project area as provided by Emmons-Logan Wind in 2017. A site visit was not completed by WEST for this exercise specifically, but WEST has conducted other surveys within the Project area and confirmed that the mapping generally agrees with current conditions.

The whooping crane habitat analysis included a comparison of land cover within the Project and four similarly-sized reference areas (collectively, the "study areas") located adjacent to the Project in the four cardinal directions. A potentially suitable habitat assessment (Watershed Institute 2012) was also used to quantify and compare whooping crane habitat within the study areas. This assessment first screens all wetlands within the study areas for minimum size, visual obstructions, and disturbances. Those wetlands left are then quantified by their size, density of wetlands around them, distance to food, whether they are natural or man-made, and their water regime as a means to quantify suitability. This work was initially done in Kansas and the results were compared to Quivira National Wildlife Refuge, a traditional migratory stopover area. Further, the study areas were reviewed qualitatively using recent habitat suitability modeling from the USFWS (Niemuth et al. 2018).

RESULTS

There are approximately 48,724 ac of grassland/herbaceous and pasture/hay land cover/ land use types within the proposed Project area, or 64.9% of the total area. Croplands make up slightly more than 31% of the Project area while developed lands occupy another 3.3%. The remaining <1% of the Project area is composed of wetlands, trees, and shrubs (Figure 2; Table 1).

Croplands, Grasslands, and Other Habitats

The percentage of cropland varied by less than 10% between the study areas with the east reference area having the lowest at 23.0% and the Project area having the highest at 31.4% (Figure 2; Table 1). All cropland has the potential as foraging areas for whooping cranes but crop type could influence the extent of use of a particular field during any one migration season.

Grassland habitats (including both the grassland/herbaceous and pasture/hay types) also varied between study areas by 10% (Figure 2; Table 1). The percentage of grassland types ranged from 69.6% (east reference area) to 59.6% (north reference area; Table 1). The influence of grassland habitats on migrating whooping crane behavior is unknown; however, short grasslands (i.e. grazed pasture) adjacent to wetlands may provide loafing areas and cranes may utilize grasslands to some degree for foraging.

All other habitat types comprised approximately 3.3% of the Project area which was similar to the percentage of these habitats found in the reference areas (Table 1).

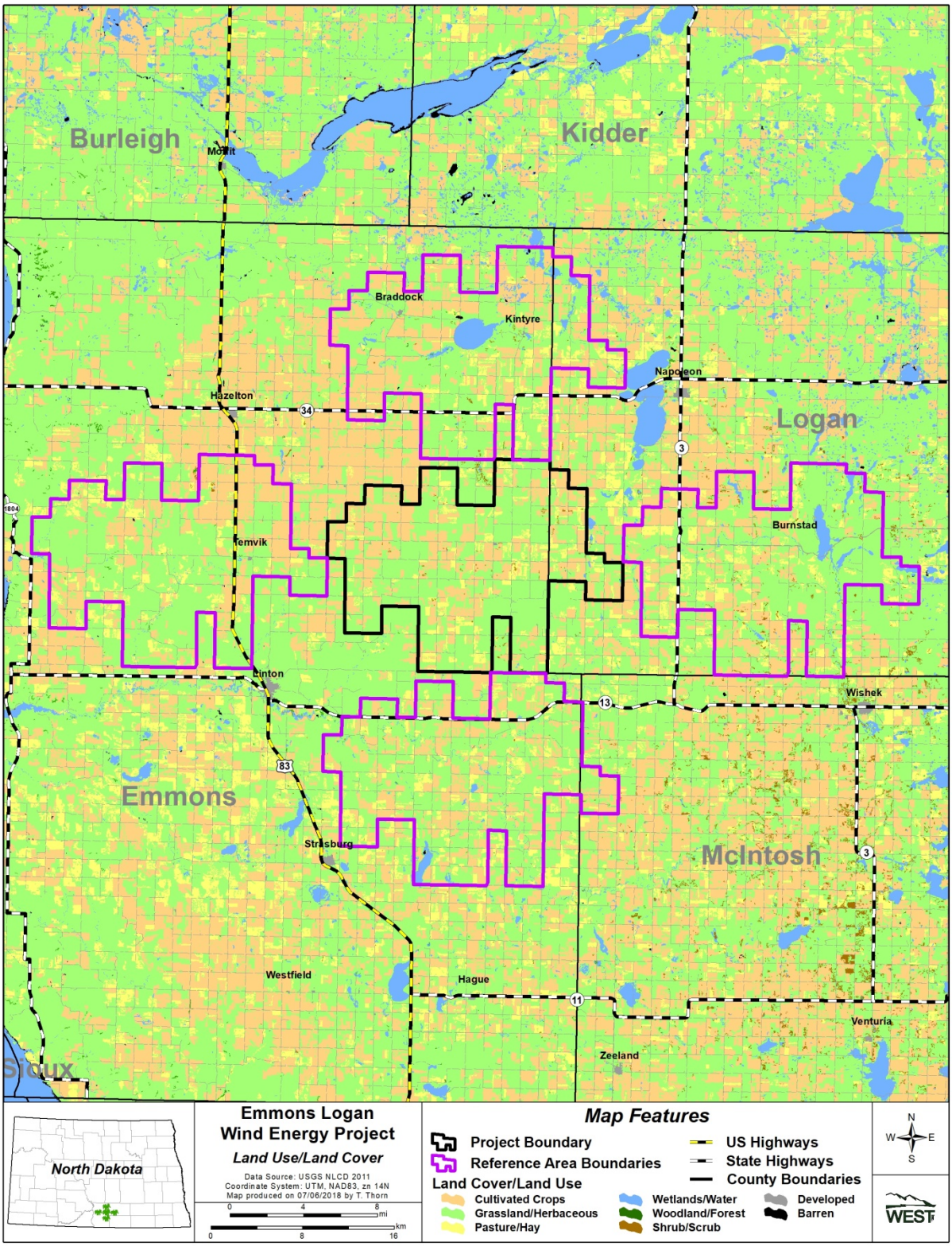

Figure 2. Land Use/Land Cover within and around the Emmons-Logan Wind Project and adjacent reference areas.

Table 1. Land Use/Land Cover within the Emmons-Logan Wind Project and adjacent reference areas.

	Project		North		East		South		West	
Habitat Type	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Cultivated Crops	23,569.0	31.4	24,108.6	32.1	17,242.9	23.0	19,798.4	26.4	21,346.8	28.4
Grassland/Herbaceous	42,426.1	56.5	38,655.3	51.5	44,652.1	59.5	44,057.3	58.7	44,846.4	59.8
Pasture/Hay	6,297.7	8.4	6,049.4	8.1	7,580.5	10.1	7,120.4	9.5	6,233.8	8.3
Developed	2,470.5	3.3	2,381.5	3.2	2,316.7	3.1	2,752.4	3.7	2,361.6	3.1
Water/Wetlands	57.3	<0.1	3,530.4	4.7	2,570.0	3.4	1,231.9	1.6	173.4	0.2
Shrub/Scrub	219.14	0.3	195.2	0.3	667.4	0.9	39.8	0.1	26.6	<0.1
Forests	15.8	<0.1	72.2	<0.1	18.9	<0.1	41.2	0.1	52.5	0.1
Barren			63.0	<0.1	7.1	<0.1	14.2	<0.1	14.5	<0.1

Data Source: National Land Cover Database (Fry et al. 2011) with similar land cover/land use combined.

Wetlands

NWI wetland data was used for this analysis because it represents wetland features to a higher degree than the NLCD. For this portion of the analysis, it is assumed that all wetlands are potential whooping crane roosting areas under one water regime or another (e.g., drought, normal, or flood). The Project area had the least wetland acreage, smallest mean wetland size, narrowest wetland size range, and third fewest wetlands of all study areas (Figure 3; Table 2). The north reference area had the greatest number of wetlands (1,883), largest mean wetland size (4.7 ac), widest wetland size range (<0.1 to 1,713.9 ac), and the highest wetland acreage (8,915.9 ac).

Freshwater emergent wetlands were the dominant wetland type in all study areas. However, approximately 33% of the east and 20% of the north area wetlands were lakes (Figure 3: Table 3).

In general, wetland characteristics were similar (smallest/fewest) for the Project and west reference area while the north and east reference area characteristics were also similar but they had the largest/greatest wetland numbers with lakes being more prevalent.

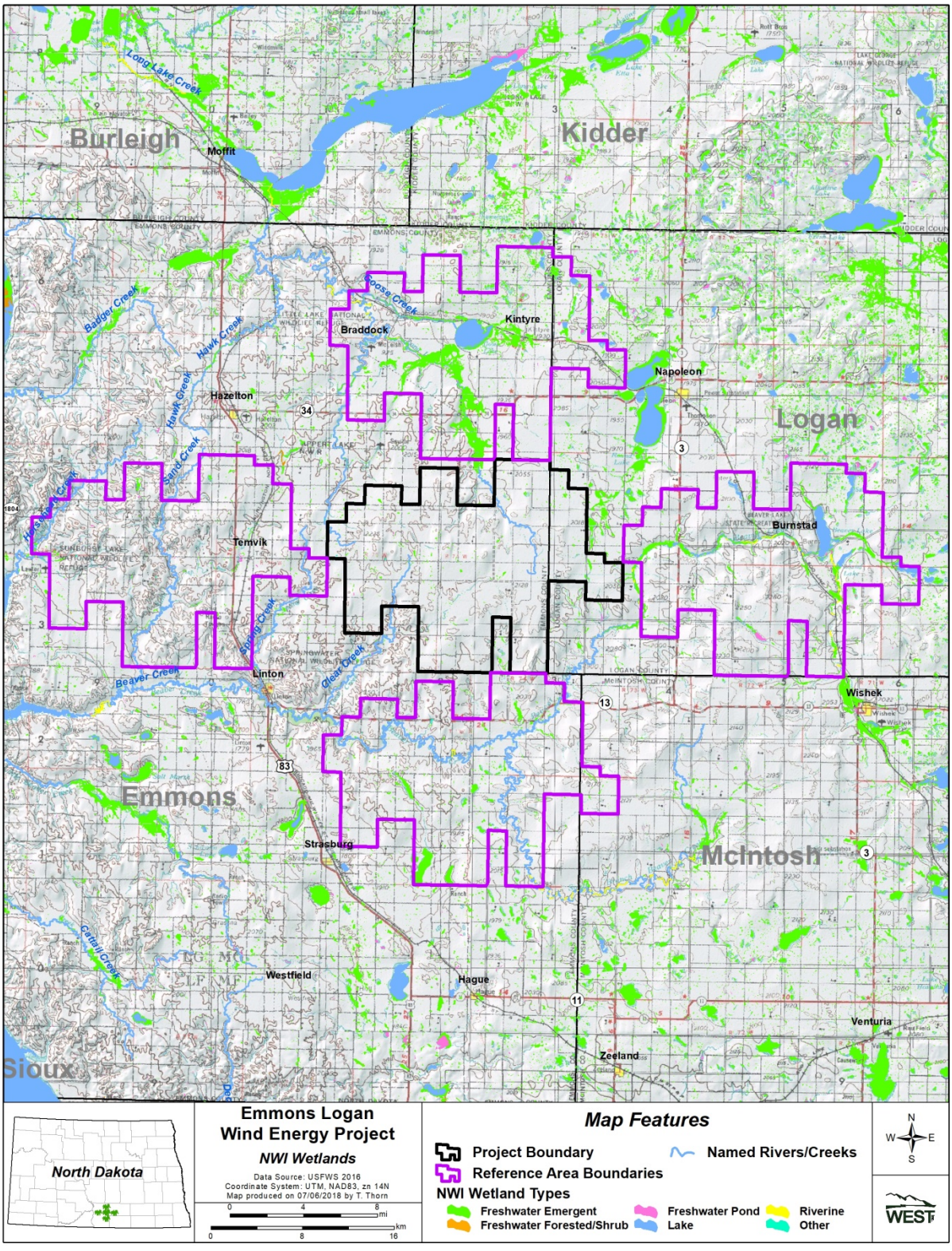

Figure 3. NWI wetlands and rivers/creeks within and around the Emmons-Logan Wind Project and adjacent reference areas.

Table 2. Comparison of the number of wetland basins and mean size within the Emmons-Logan Wind Project and adjacent reference areas.

Area	Basins	Total – acres	Mean Size – acres	Range – acres
Project	975	771.6	0.8	<0.1 – 30.7
North	1,883	8,915.9	4.7	<0.1 – 1,713.9
East	1,223	4,985.4	4.1	<0.1 – 1,130.9
South	967	2,477.2	2.6	<0.1 – 601.8
West	698	777.2	1.1	<0.1 – 58.5

Data Source: NWI 2010 data with wetland parts dissolved.

Table 3. Wetland types within the Emmons-Logan Wind Project and adjacent reference areas.

Wetland Type	Project Acres	%	North Acres	%	East Acres	%	South Acres	%	West Acres	%
Freshwater Emergent	714.1	92.6	7,122.1	79.9	3,059.2	61.4	2,350.5	94.9	625.5	80.5
Freshwater Forested/Shrub	1.7	0.2	7.7	<0.1	0.2	<0.1	6.4	0.3	2.9	0.4
Freshwater Pond	54.7	7.1	138.3	1.6	150.3	3.0	104.6	4.2	141.2	18.1
Lake	-	-	1,617.6	18.1	1,668.1	33.5	-	-	2.3	0.3
Other	1.1	0.1	0.2	<0.1	-	-	2.8	0.1	5.3	0.7
Riverine	-	-	30.1	0.3	107.6	2.1	12.9	0.5	-	-

Data Source: NWI 2010.

Whooping Crane Suitable Habitat Assessment

The habitat assessment model identified 351 wetland basins totaling 450.1 ac within the Project as potential whooping crane roosting habitat (Table 4). The mean suitability score for these wetlands was 10.1 with the scores ranging from seven to 16. Only the west reference area had fewer potential basins (258), less total acres (412.7), and a smaller mean score (9.7) than the Project area. The highest number (559), total acreage (6,178.0), and mean score (11.2) of potential whooping crane wetlands was in the north reference area.

In Kansas, a wetland with a score of 12 or more was considered potentially suitable whooping crane habitat (Watershed Institute 2012). If applied to the Project, 65 (18.5%) of the wetlands scored would have a score greater than 12 and thus be considered potentially suitable habitat. For the reference areas, the percentage of potentially suitable habitat wetlands with a score of 12 or greater was 42.8% in the north, 37.6% in the east, 18.9% in the south, and 12.8% in the west.

Table 4. Comparison of suitable whooping crane habitat within the Emmons-Logan Wind Project and adjacent reference areas.

Area	Basins	Total – acres	Mean Score	Score range
Project	351	450.1	10.1	7 – 16
North	559	6,178.0	11.2	7 – 18
South	381	1,771.5	10.1	7 – 18
East	396	3,098.6	10.8	8 – 18
West	258	412.7	9.7	5 – 16

Data Derived From: Potentially Suitable Habitat Assessment, Watershed Institute 2012.

Whooping Crane Stopover Site Use Intensity

The U.S. Geological Survey (USGS) and its' partners recently determined whooping crane stopover sites and the intensity of use of these areas within the Great Plains using radio telemetry information from 2010 to 2014 of tagged whopping cranes (Pearse et al. 2015). Stopover sites and their use intensity were based on 20 km square grid cells. USGS describes four use intensity cells (Pearse et al. 2015):

1. "Unoccupied" lacks evidence of use,
2. "Low intensity" show evidence of use and low stopover site use intensity,
3. "Core intensity" contains density of stopovers identified as high use intensity and crane days of lower intensity, and
4. "Extended use core" show high use intensity of stopovers and crane days.

The Project falls within core intensity and unoccupied cells, with most of the Project in a low intensity region (Figure 4). The reference areas include a mix of all use types. The north reference area includes more core intensity areas, because Long Lake National Wildlife Refuge is a common stopover for whooping cranes during migration. The west reference area includes extended use core intensity cells due to whooping crane use along the Missouri River. The east and south reference areas only fall within unoccupied and low intensity cells.

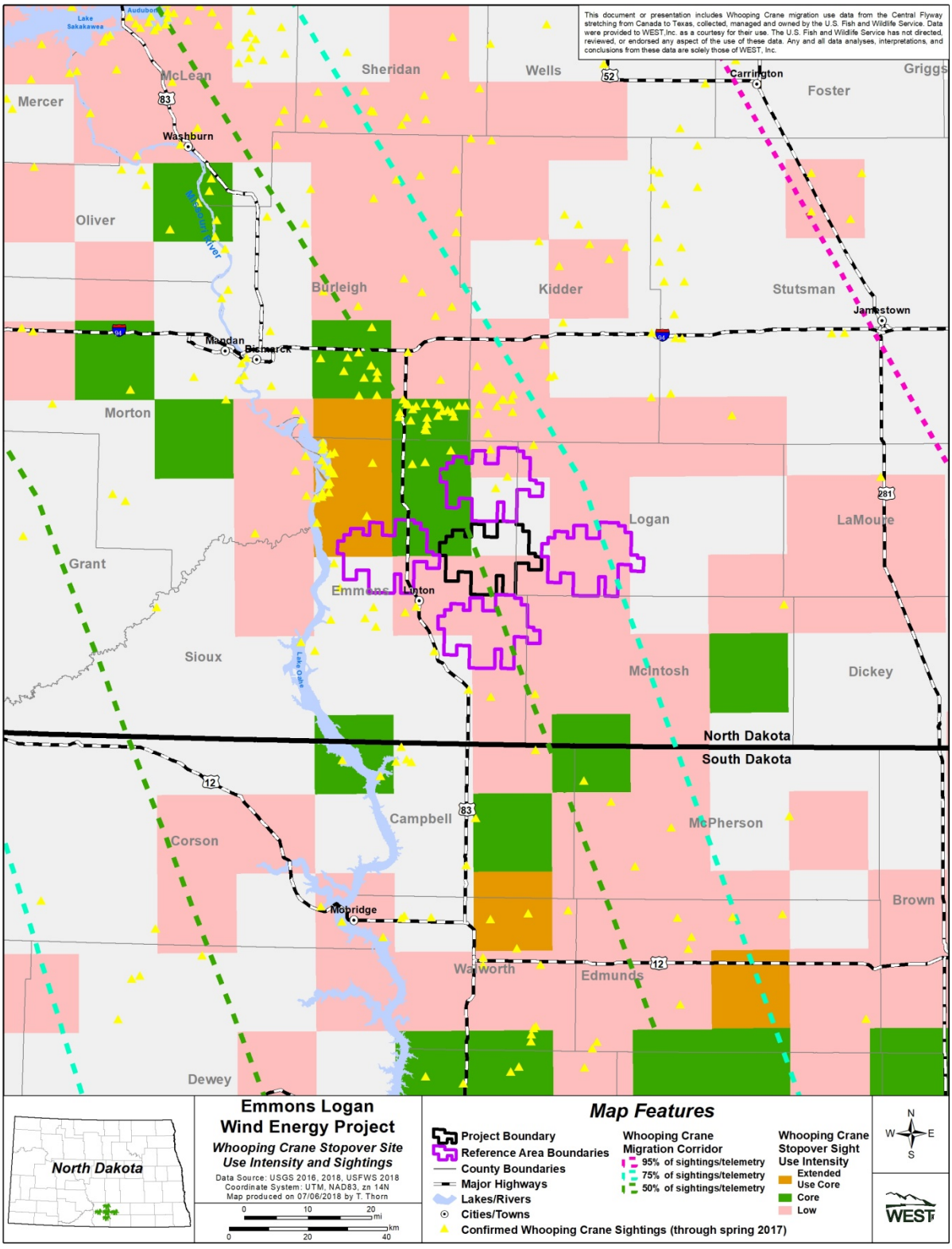

Figure 4. Location of the Emmons-Logan Wind Project, adjacent reference areas, and whooping crane stopover site use intensity and sightings.

USFWS Whooping Crane Habitat Suitability Model

The USFWS Habitat and Population Evaluation Team (HAPET) developed a habitat suitability model based on opportunistically collected whooping crane observation data with landscape level data within a GIS (Niemuth et al. 2018). The landscape data used included NWI wetland information, distance to whooping crane migration centerline, upland cover types, disturbance factors, and other variables. The report and associated spatial data were reviewed to help evaluate potential whooping crane habitat suitability within the Project.

The Project falls within an area of variable potential whooping crane use based on the habitat suitability, from low potential to higher potential, with higher potential in the northwest part of the Project (Figure 5) that contains more agriculture (Figure 2). All four reference areas also contain variable potential use based on the model, with the western and northern areas having a larger percentage of higher use potential than the Project or other reference areas.

Whooping cranes are currently listed as endangered under the Endangered Species Act (32 FR 4001) except where nonessential experimental populations exist (66 FR 33903-33917, 2001 June 26; 62 FR 38932-38939, 1997 July 21; and 58 FR 5647-5658, 1993 January 22). In the US, the whooping crane was listed as threatened with extinction in 1967 and endangered in 1970 – both listings were "grandfathered" into the Endangered Species Act of 1973 (ESA 1973). The 2015 – 2016 winter population within the primary wintering grounds was estimated at 329 birds (291 – 371, 95% confidence interval.). There was another 10 whooping cranes thought to be outside of the primary wintering grounds when systematic surveys were conducted (USFWS 2016a). Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas. During the migration, most birds pass through central North Dakota.

The Project is within the central 75% migration corridor band. The USGS has recently determined whooping crane stopover sites and their intensity of use within the Great Plains from radio telemetry information. This information shows that at least a part of all reference areas lay within an area of low intensity crane use, with the western reference area within a portion of extended core use area. Similarly, the USFWS habitat suitability model shows varying levels of potential use based on habitat suitability. The model largely follows the results of the USGS telemetry data that indicates more actual use to the north and west of the Project. No confirmed whooping crane sightings have been reported within the Project through spring 2016 (USFWS 2016b) but there have been reports of whooping cranes around the Project, mainly to the north and west (Figure 5). Although the majority of the Project falls within a low intensity region and no whooping crane sightings have been reported to the USFWS from within the Project, it is possible that whooping cranes would fly over or through the Project area during migration. Whooping cranes generally migrate at 1,000-6,000 ft (305-1830 m) altitude, well above turbine height (Stehn 2007), and thus for the most part are unlikely to collide with turbines. However, as whooping cranes ascend and descend during takeoff and landing, or migrate during inclement weather, they may fly at lower altitudes, including those corresponding to the rotor swept area (generally less than 200 m). In summary, low altitude flight is generally of short duration in the

mornings and evenings with more time and distance covered at higher elevation during typical migration flight; reducing potential risk to whooping cranes.

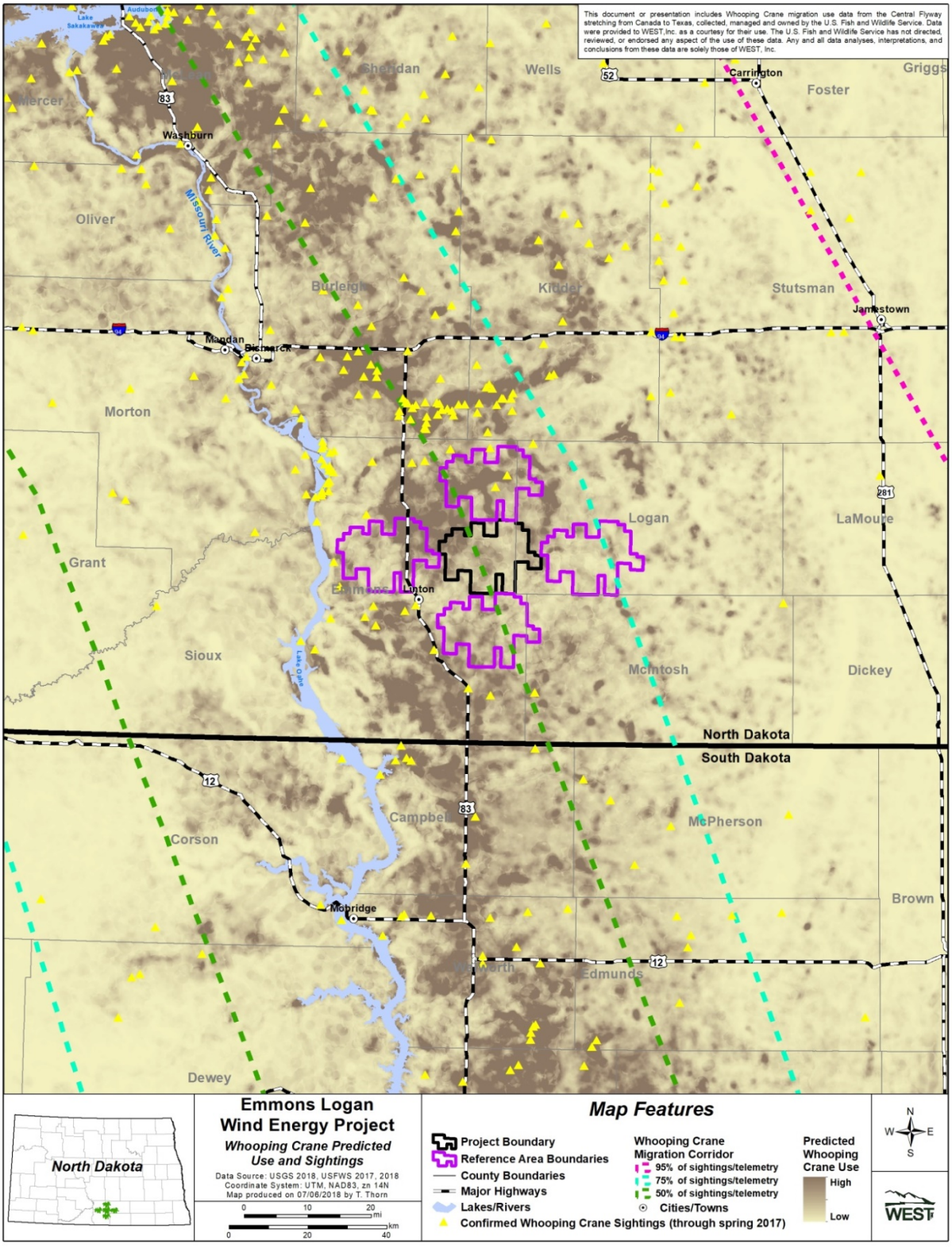

Figure 5. Potential whooping crane use based on the USFWS habitat suitability model for the Emmons-Logan Wind Project and adjacent reference areas.

DISCUSSION

A review of whooping literature reveals no whooping cranes have been reported as being killed or injured by wind turbines. One sandhill crane (*Grus canadensis*) mortality was reported at the Altamont wind energy facility in California (Smallwood and Karas 2009), it is unclear if this was a result of turbine collision or collision with a power line. Two sandhill cranes were also apparently collided with turbines during a study of wintering cranes in Texas (Navarrete and Griffis 2011a). No sandhill cranes or whooping cranes have been found as fatalities at five wind facilities searched daily for crane mortalities during migration in North Dakota and South Dakota for up to three years (Derby et al. 2012). It appears that cranes are not overly susceptible to collision with turbines given that 100,000's sandhill cranes migrate twice annually through the Great Plains and none have been documented as wind turbine collision fatalities in this region during migration.

Although developed for transmission line impacts on whooping crane habitat in Kansas, the Watershed Institute's (2012) potentially suitable habitat assessment for whooping cranes can help to quantify potential whooping crane habitat in and around a proposed wind energy project. This tool indicates that the Project had the second fewest potential whooping crane wetland basins, total acres, and mean score. Only the west reference area had fewer/less potential wetland basin statistics. About 20% of the identified potential whooping crane habitat in the Project had a score 12 or greater. Again, only the west reference area had a lower percentage (12.8) of wetland basins with a score of 12 or more. A score of 12 or higher was considered quality whooping crane (Watershed Institute 2012).

SUMMARY

In analyzing the potential for significant impacts from wind development on whooping crane stopover habitat, Stehn (2007) suggests assessing whether there is "*lots of suitable stopover habitat in the general area … or is the proposed wind farm site the only suitable whooping crane stopover habitat for miles around*". This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the Project to adjacent reference areas. GIS was used to calculate the amount of the various habitats and in the case of wetlands, number of individual basins and their type, in each of the reference areas compared to the proposed Project (Tables 1, 2, and 3). This analysis shows that both roosting (i.e. wetlands) and foraging (i.e. croplands) habitats are available in the Project and alternate areas. In general, potential whooping crane habitat within the Project appears to be most similar to that in the west reference area and less suitable than that found in the north reference area. Based on recent whooping crane telemetry tracking and confirmed sighting data, whooping cranes will likely migrate over or through the Project during some migration period. While there is potential whooping crane habitat within the Project, impacts resulting from Project activities are unlikely given low historic use, low or lack of use based on radio telemetry information, similar or more wetland roosting habitat in adjacent areas, and the lack of recorded whooping crane fatalities at other facilities and scarcity of sandhill crane fatalities across the U.S.

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