Whooping Crane Migration Habitat Assessment

Ruso Wind Project

McHenry and Ward Counties, North Dakota

Final Report

Prepared for:

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INTRODUCTION AND BACKGROUND

Ruso Wind Partners, LLC, a subsidiary of Southern Power Company (Southern) is developing the Ruso Wind Project (Project) in McHenry and Ward counties, North Dakota. Ruso Wind Partners, LLC requested Western EcoSystems Technology, Inc. (WEST) conduct a desktop assessment of potential whooping crane (*Grus americana*) migration habitat resources within the Project and adjacent reference areas.

The whooping crane is the largest North American member of the Gruidae family, a worldwide family that includes 15 species of tall, long-legged wading birds. Whooping cranes occupy marshland habitat in their nesting and wintering areas, and a variety of wetlands, including rivers, streams, marshes, and playas during migratory stopovers (Urbanek and Lewis 2015). The whooping crane is a diurnal migrant, making biannual migrations between nesting in and around Wood Buffalo National Park in northwest Alberta, Canada, and wintering grounds in and around the Aransas National Wildlife Refuge on the Gulf Coast of Texas (US Fish and Wildlife Service [USFWS] 2009). During the 2,500.0-mile (mi; 4,023.4-kilometer [km]) migration, most whooping cranes pass through North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.

Due to habitat loss and hunting pressure, the Aransas-Wood Buffalo population had been reduced to an estimated 15 individuals in 1941 (Harrell and Bidwell 2013). This prompted conservation efforts by wildlife agencies in the US and Canada, including captive breeding efforts and an emergency listing as “threatened with extinction” in the US in 1967 (32 Federal Register [FR] 48: 4001 1967). This listing was grandfathered into the Endangered Species Act, and whooping cranes are currently listed as federally endangered except where nonessential experimental populations exist (62 FR 139: 38932-38939 1997, 66 FR 123: 33903-33917 2001; see USFWS 2012). As a result of joint recovery efforts by Canadian and US agencies, the Aransas-Wood Buffalo wintering population was estimated at 505 whooping cranes in 2018 (95% confidence interval = 439.2–576.6; USFWS 2017, 2018).

Stehn (2007) documented a 200.0-mi (321.9-km) wide migration corridor for whooping cranes based on the historical sightings of whooping cranes from the early 1960’s through 2006. This 200.0-mi wide corridor (100.0 mi [160.9 km] on either side of the centerline) encompasses approximately 94% of the observations and a 100.0-mi wide corridor subset of this encompasses approximately 82.0% of the observations. The USFWS has expressed concern with wind energy developments and other above-ground developments (e.g., transmission lines) that are built anywhere within the 200.0-mile wide corridor, but with more emphasis placed on those projects within the region that encompasses 75% of the observations. This region extends approximately 40.0 mi (64.4 km) to either side of the centerline. The Project is included within this region.

The objective of the whooping crane desktop habitat assessment was to determine if the Project area contained suitable stopover habitat for whooping cranes and how this compared to

reference areas within the vicinity of the Project. The potential impacts to whooping cranes from development of the Project can be assessed based on the results of this assessment.

PROJECT AREA

The Project area is located approximately 5.0 mi (8.0 km) north of the town of Ruso, North Dakota (Figure 1), encompassing approximately 17,571 acres (ac; 7,111 hectares [ha]). The Project topography is flat to rolling, with elevations ranging from 1,777.9 – 2,206.7 feet (ft; 541.9 – 672.6 meters [m]) above sea level (US Geological Survey [USGS] 2019). The Project occurs within the Missouri Coteau and Drift Plains Level IV Ecoregions (US Environmental Protection Agency [USEPA]; USEPA 2017). The Missouri Coteau Level IV Ecoregion is dotted with wetland depressions and is used for tilled agriculture and grazing (Bryce et al. 1996). The Drift Plains Level IV Ecoregion contains many temporary and seasonal wetlands and most of the landscape has been tilled due to its productive soil and relatively level topography (Bryce et al. 1996).

Cultivated crop is the most abundant land cover within the Project area (62.4%), followed by wetlands/water (13.2%), grassland/herbaceous (10.8%), and pasture/hay (9.3%; Table 1, Figure 2; Multi-Resolution Land Characteristics [MRLC] 2019, Yang et al. 2018). Developed (2.6%), woodland/forest (1.7%), and shrub/scrub (0.1%) are scattered throughout the Project area (Figure 2; MRLC 2019, Yang et al. 2018).

Table 1. Land use and land cover types within the Ruso Wind Project in McHenry and Ward Counties, North Dakota, based on Multi-Resolution Land Characteristics (MRLC).

Land Use and Land Cover	Acres	Percent (%) Cover
Cultivated Crops	10,965.6	62.4
Wetlands/Water	2,310.0	13.2
Grassland/Herbaceous	1,892.1	10.8
Pasture/Hay	1,630.4	9.3
Developed	455.4	2.6
Woodland/Forest	300.1	1.7
Shrub/Scrub	15.1	0.1
Barren Land	2.7	<0.1
Total[1]	**17,571.4**	**100**

Sources: MRLC 2019, Yang et al. 2018.

[1.] Sums of values may not add to total value shown, due to rounding

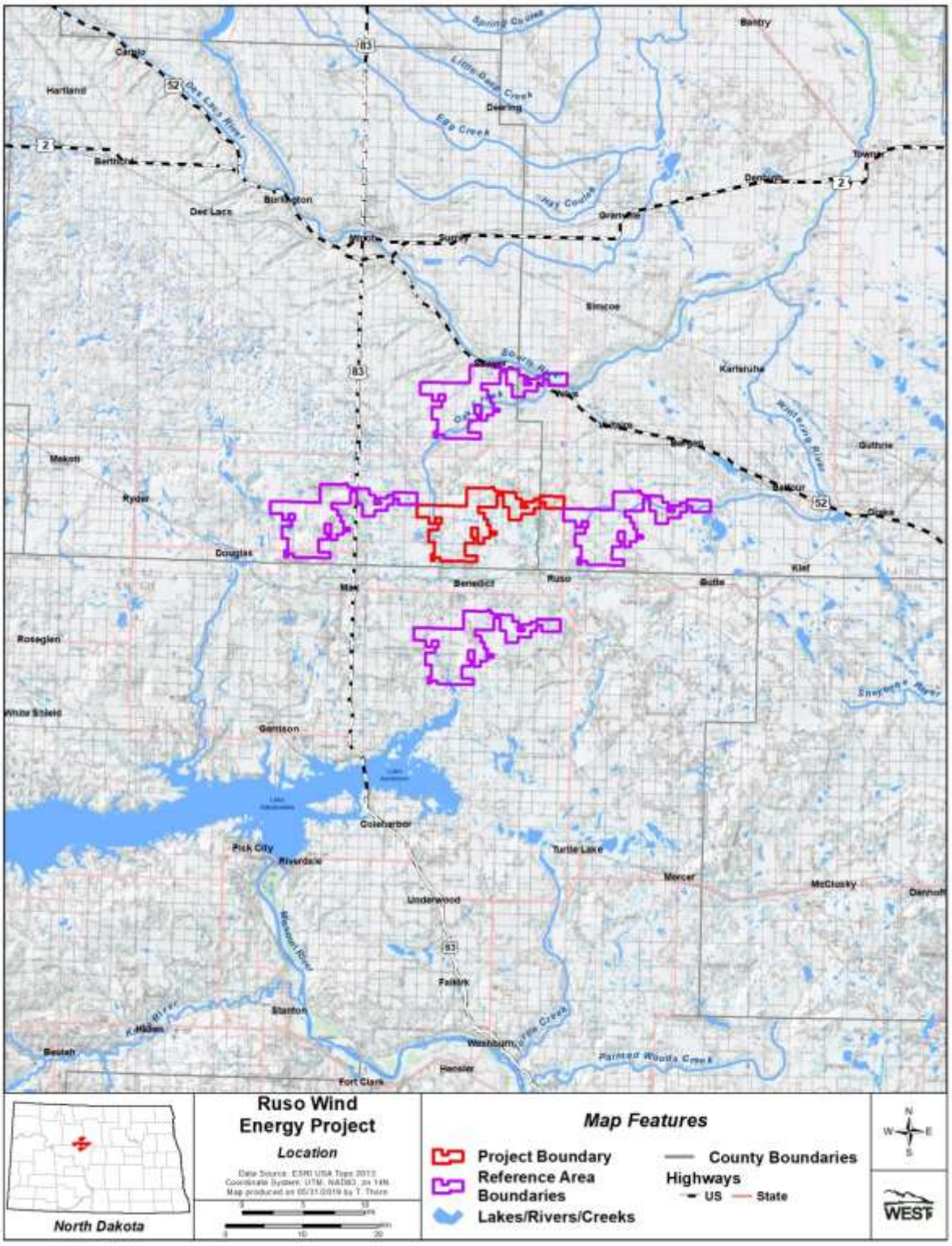

Figure 1. Location of the Ruso Wind Project in McHenry and Ward counties, North Dakota and four reference areas.

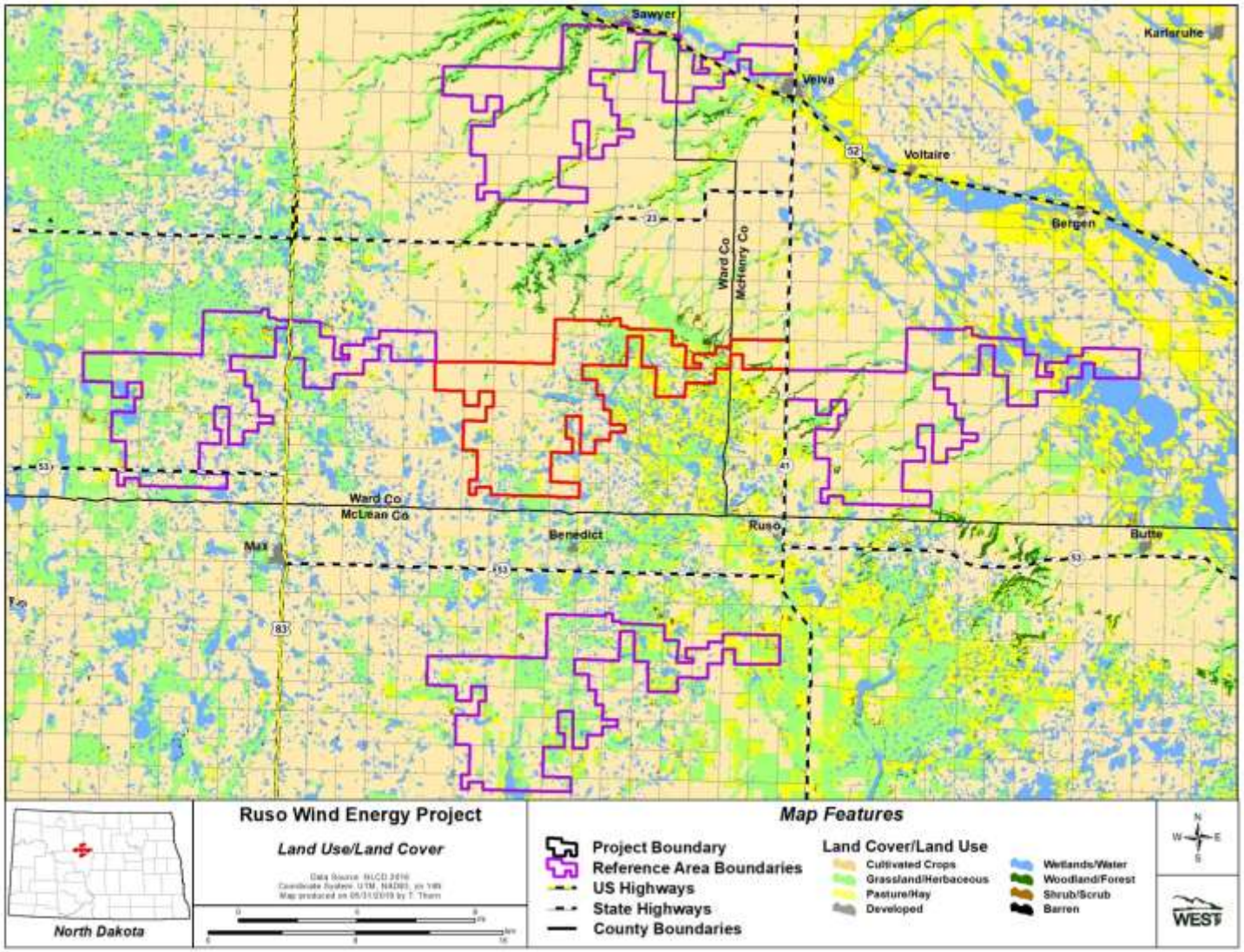

Figure 2. Land use and land cover within and in the vicinity of the Ruso Wind Project in McHenry and Ward counties, North Dakota, and the four reference areas (Sources: Multi-Resolution Land Characteristics 2019, Yang et al. 2018).

METHODS

Habitat Mapping

A desktop review of habitat conditions in the Project area and at nearby reference areas was completed using ArcGIS ArcMap 10.5.1, land cover information from the MRLC (2019; Yang et al. 2018), wetland data from the USFWS National Wetland Inventory (NWI; USFWS NWI 2016), aerial imagery from the National Agricultural Imagery Program (US Department of Agriculture 2017), and the current Project boundary provided by Ruso Wind LLC. NWI wetland data was used in mapping the wetlands because it represents wetland features to a higher degree than the MRLC. Additionally, any mapped wetlands were considered as potential whooping crane roosting areas under one water regime or another (e.g., drought, normal, or flood).

A site visit was not conducted to specifically ground-truth the results of the desktop mapping effort; however, it is confirmed that the mapping generally agrees with current, on-the-ground conditions based on site visits for other wildlife surveys being conducted in the Project area. In addition to mapping habitat attributes within the Project area, conditions at four reference areas of the same dimensions as the Project, located adjacent to the Project area in the four cardinal directions (based on the centroid of the Project boundaries), were mapped using data from the South Dakota specific whooping crane migration corridor and confirmed whooping crane observations through spring 2018 (USFWS 2018).

Habitat Suitability Assessment

Whooping crane selection of migration habitat is influenced by land use and cover, wetland water regime, size, and water depth as well as proximity to food resources and disturbances (Watershed Institute 2012, Niemuth et al. 2018). An assessment of the suitability of whooping crane habitat in the Project area and four reference areas was conducted using methodology developed by the Watershed Institute (Watershed Institute 2012). This methodology involves eliminating wetlands from consideration based on their size, visual obstructions, and disturbances. Wetlands that pass these initial criteria 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. Those wetlands not excluded are then given a score (as a means to quantify suitability); a score of 12 or higher represents potentially suitable whooping crane migratory stopover habitat. Niemuth et al. (2018) created a predictive model and map showing relative probability of whooping crane habitat use during migration through North and South Dakota. WEST used GIS data received from USFWS Service Region 6, The Habitat Population Evaluation Team, Bismarck, North Dakota (created as a result of Niemuth et al. 2018) to compare the Project area and the reference areas.

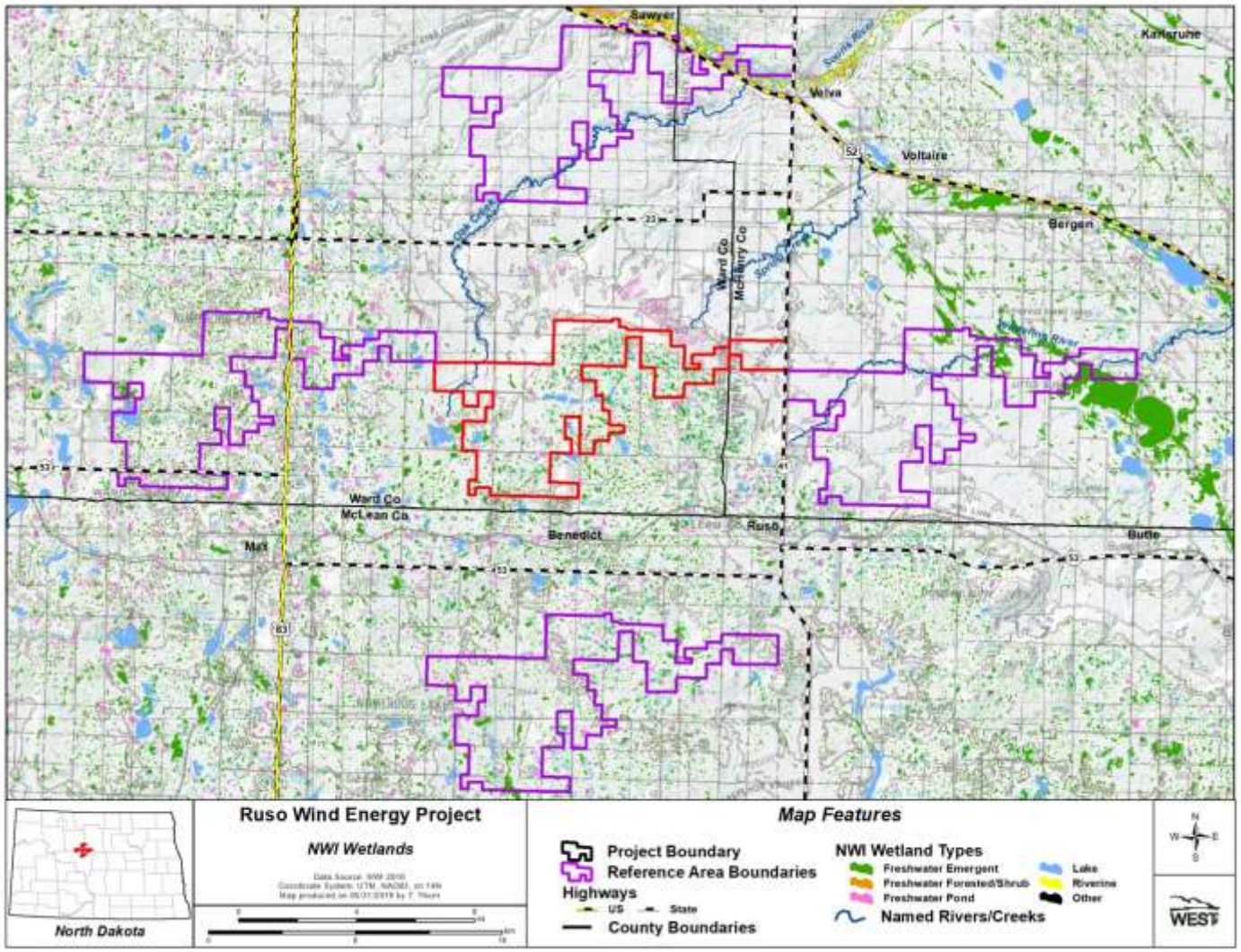

Figure 3. National Wetlands Inventory (NWI) wetlands, rivers, and streams within and in the vicinity of the Ruso Wind Project in McHenry and Ward counties, North Dakota, and the four reference areas (Source: US Fish and Wildlife Service NWI 2016).

RESULTS

Habitat Mapping

Terrestrial Habitats

Approximately 10,966 ac (4,438 ha) of cultivated cropland were mapped, accounting for 62.4% of the total Project area (Table 1). The amount of grassland/herbaceous in the Project area was similar to the east reference area (64.8%); while the north (74.9%) reference area contained slightly higher amounts of cultivated cropland and the south (48.1%) and west (48.9%) reference areas contained slightly lower amounts of cultivated cropland (Table 2). The percentage of grassland/ herbaceous ranged from 8.3% in the east reference area to 29.8% in the west reference area. The Project was lower-range, with 10.8% grassland/herbaceous (Table 2).

Wetlands

The Project contained 1,792.1 ac (725.2 ha) of wetland (USFWS NWI 2016) of which 81.7% were freshwater emergent wetlands (Table 3, Figure 3). Other wetland types included freshwater pond (9.6%) and freshwater forested/shrub wetland (8.7%; Figure 3). The west reference area contained the greatest number of wetlands with 2,267.6 ac (917.7 ha), followed by the Project (1,792.1 ac [725.2 ha]), and the south reference area (1,590.1 ac [643.5 ha]). The east reference area was relatively lower with 978.8 ac (396.1 ha) of wetland. Freshwater emergent wetlands were the dominant wetland type for all reference areas (Table 3).

Table 2. Land use and land cover types, by acreage and percent coverage (%), within and in the vicinity of the Ruso Wind Project in McHenry and Ward counties, North Dakota, and four reference areas, based on the Multi-Resolution Land Characteristics (MRLC).

	Project		East		North		South		West	
Land Use/Cover	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Cultivated Crops	10,965.6	62.4	11,387.9	64.8	13,152.1	74.8	8,445.4	48.1	8,519.3	48.5
Wetlands/Water	2,310.0	13.1	1,798.9	10.2	310.8	1.8	1,969.7	11.2	2,844.8	16.2
Grassland/Herbaceous	1,892.1	10.8	1,457.3	8.3	2,428.2	13.8	5,080.3	28.9	5,231.8	29.8
Pasture/Hay	1,630.3	9.3	2,058.0	11.7	528.6	3.0	1,524.9	8.7	472.4	2.7
Developed	455.4	2.6	570.6	3.2	472.4	2.7	496.2	2.8	385.6	2.2
Woodland/Forest	300.1	1.7	290.8	1.7	663.1	3.8	22.8	0.1	84.2	0.5
Shrub/Scrub	15.1	0.1	7.7	<0.1	16.1	0.1	23.4	0.1	9.1	0.1
Barren Land	2.7	<0.1	0.2	<0.1	0	0	8.7	<0.1	24.1	0.1

Sources: MRLC 2019, Yang et al. 2018.

Table 3. Wetland types, by acreage and percent (%) of total wetlands, within the Ruso Wind Project in McHenry and Ward counties, North Dakota, and four reference areas.

	Project		East		North		South		West	
Wetland Type	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Freshwater Emergent Wetland	1,464.1	81.7	962.2	98.3	289.7	85.8	1,399.0	88.0	1,812.3	79.9
Freshwater Forested/Shrub Wetland	0.2	0.0	3.0	0.3	10.4	3.1	1.8	0.1	4.7	0.2
Freshwater Pond	155.8	8.7	12.0	1.2	11.3	3.4	159.2	10.0	183.2	8.1
Lake	172.1	9.6	0.0	0.0	0.0	0.0	30.1	1.9	267.4	11.8
Other	0.0	0.0	1.6	0.2	0.2	0.1	0.0	0.0	0.0	0.0
Riverine	0.0	0.0	0.0	0.0	26.0	7.7	0.0	0.0	0.0	0.0
Total	**1,792.1**	**100**	**978.8**	**100**	**337.6**	**100**	**1,590.0**	**100**	**2,267.6**	**100**

Source: US Fish and Wildlife Service National Wetland Inventory 2016.

Habitat Suitability Assessment

The habitat assessment identified 580 wetland basins totaling 1,370.7 ac (554.7 ha) within the Project area as potential whooping crane roosting habitat (Table 4). Average basin size was 2.4 ac (1.0 ha). The mean suitability score for these wetlands was 12.8 with the scores ranging from 7–19. Although the west and south reference areas had the highest acreage of wetlands (1,630.9 ac [660.0 ha] in 723 basins and 1,259.3 ac [509.6 ha] in 681 basins, respectively), the average basin size (2.3 ac [0.9 ha] and 1.9 [0.8 ha], respectively), mean suitability score (12.8 and 12.6, respectively); and scores ranges of 7-19 and 8-18, respectively, were similar to the Project (Table 4). The east and north reference areas had the fewest number of basins (123 and 135, respectively), smallest total wetland acreage (695.0 ac [281.3 ha] and 88.9 ac [36.0 ha], respectively) and the lowest mean score (10.5 and 10.2, respectively). In summary, the Project and west reference area had the highest mean suitability score (12.8 each), followed by the south (12.6), east (10.5), and north (10.2) reference areas (Table 4).

In Kansas, a wetland with a score of 12 or more was considered suitable potential whooping crane habitat (Watershed Institute 2012). If applied to the Project, 471 (81.2%) of the potential whooping crane habitat wetlands would be considered as such. For the reference areas, the percentage of potential whooping crane habitat with a score of 12 or greater is 30.1% in the east, 26.7% in the north, 82.5% in the south, and 80.5% in the west.

Table 4. Number of wetland basins and mean size in acres and potential suitable whooping crane migration habitat within the Ruso Wind Project in McHenry and Ward counties, North Dakota, and four reference areas.

Area	Number of Basins	Total Wetland Acres	Mean Basin Size in Acres	Basin Size Range in Acres	Mean Score	Score Range
Project	580	1,370.7	2.4	0.3–130.5	12.8	7–19
East	123	695.0	5.7	0.3–135.8	10.5	8-15
North	135	88.9	0.7	0.3–88.9	10.2	8–14
South	681	1,259.3	1.9	0.3–139.1	12.6	8–18
West	723	1,630.9	2.3	0.3–154.4	12.8	7–19

Data derived from Potentially Suitable Habitat Assessment (Watershed Institute 2012).

Whooping cranes have the potential to occur in the Project and reference areas. The west and south reference areas are the closest to the center of the whooping crane migration corridor (Figure 4). The Project area and west, south, and half of the north reference areas are located within the corridor with 75% of sightings; while the other half of the north reference area and east reference area are located within the corridor with 95% of sightings.

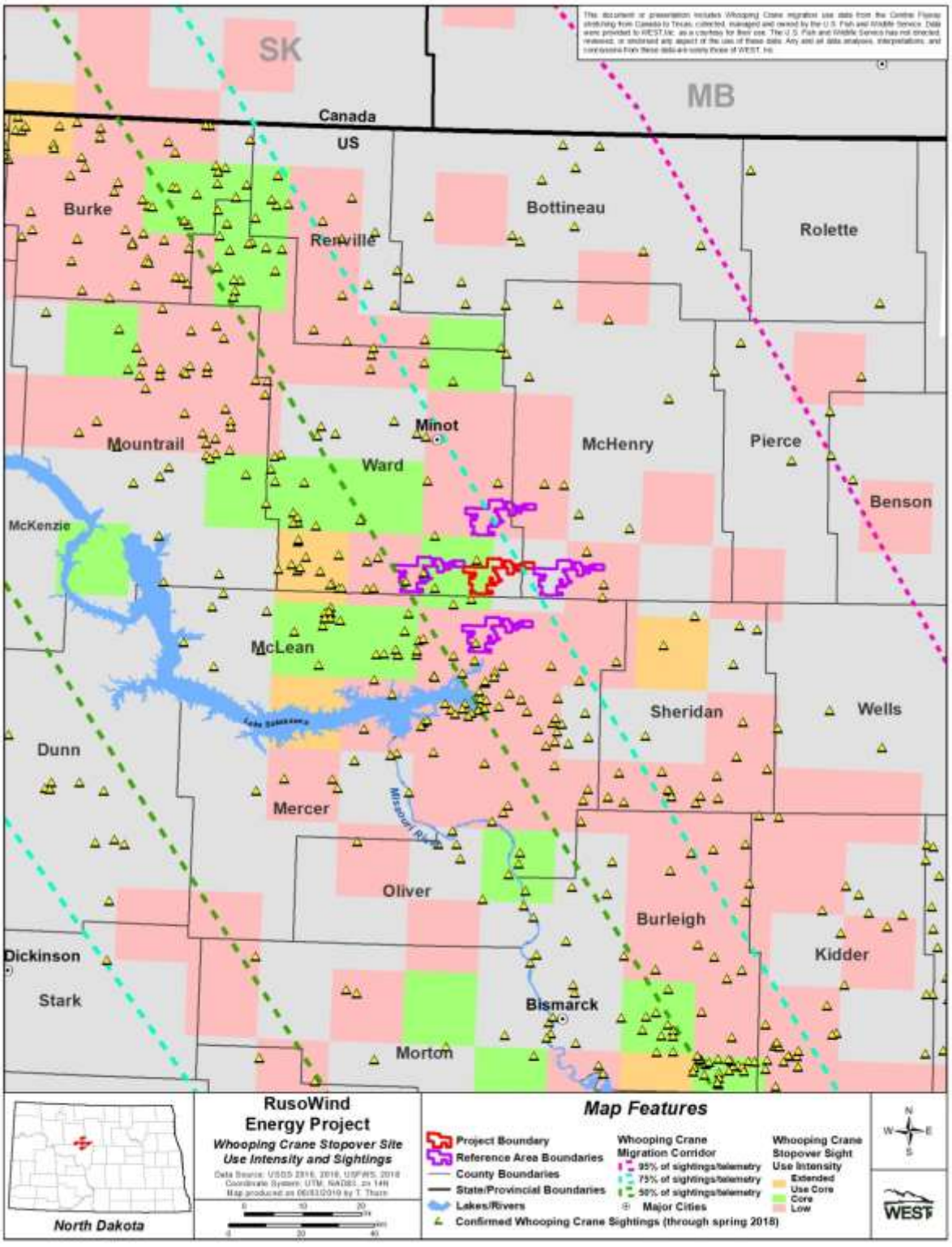

Figure 4. Whooping crane stopover site use intensity and sightings near the Ruso Wind Project in McHenry and Ward counties, North Dakota and four reference areas.

DISCUSSION

Potential whooping crane habitat within the Project area was similar to the reference areas. The Project area and reference areas all had substantial amounts of cultivated cropland with lesser amounts of grassland/herbaceous. Additionally, all areas had wetlands. These results verify that both roosting (i.e., wetlands) and foraging (i.e., croplands and grassland) habitats are available in the Project and reference areas.

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 proposed wind energy projects. According to this model, the range of scores and mean scores of wetlands within the Project area was similar to the four reference areas. Overall, the average score and the majority of the individual wetland scores were within the reference score of 12 developed for quality habitat at the Quivira National Wildlife Refuge. Use of the Watershed Institute's 2012 model as a tool for assessing habitat suitability at Project suggests that whooping cranes may use the Project area for migratory stopovers.

No confirmed whooping crane sightings have been reported within the Project area through spring 2018 (USFW 2017, 2018); however, observations of whooping cranes within the vicinity of the Project have been recorded (Figure 4). As such, it is possible that whooping cranes could fly over or through the Project during migration and use wetland or cropland resources in the Project and vicinity. Whooping cranes generally migrate at 1,000.0-6,000.0 ft (304.5-1,828.8 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 and may fly at altitudes corresponding to the rotor-swept areas of wind turbines. In summary, low altitude flight is generally of short duration in the morning and evenings with more time and distance covered at higher elevation during typical migration flight, reducing potential risk to whooping cranes.

To date, there have been no recorded instances of whooping cranes being killed or injured by wind turbines (National Wind Coordinating Collaborative 2004); however, one sandhill crane (*Antigone canadensis*) was reported killed at the Altamont wind energy facility in California (Smallwood and Karas 2009); it is unclear if this fatality was a result of turbine collision or collision with a power line. Additionally, two sandhill cranes struck turbines during a study of wintering cranes in Texas (Navarrete and Griffis-Kyle 2014). 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). Thus, it appears that cranes are not particularly susceptible to collision with wind turbines given that large numbers of sandhill cranes and lesser numbers of whooping cranes that migrate biannually through the Great Plains region with no documented fatalities as a result of collision with wind turbines during migration.

According to the habitat selection map developed by Niemuth et al. (2018), the west and south reference areas have the greatest probability of providing whooping crane habitat (Figure 5). The Project was located mid-range (Figure 5).

SUMMARY

In summary, there is potential whooping crane habitat within the Project area and the potential for whooping cranes to utilize suitable habitats within the Project while migrating. However, the Project area does not offer higher quality habitat than the reference areas in the vicinity.

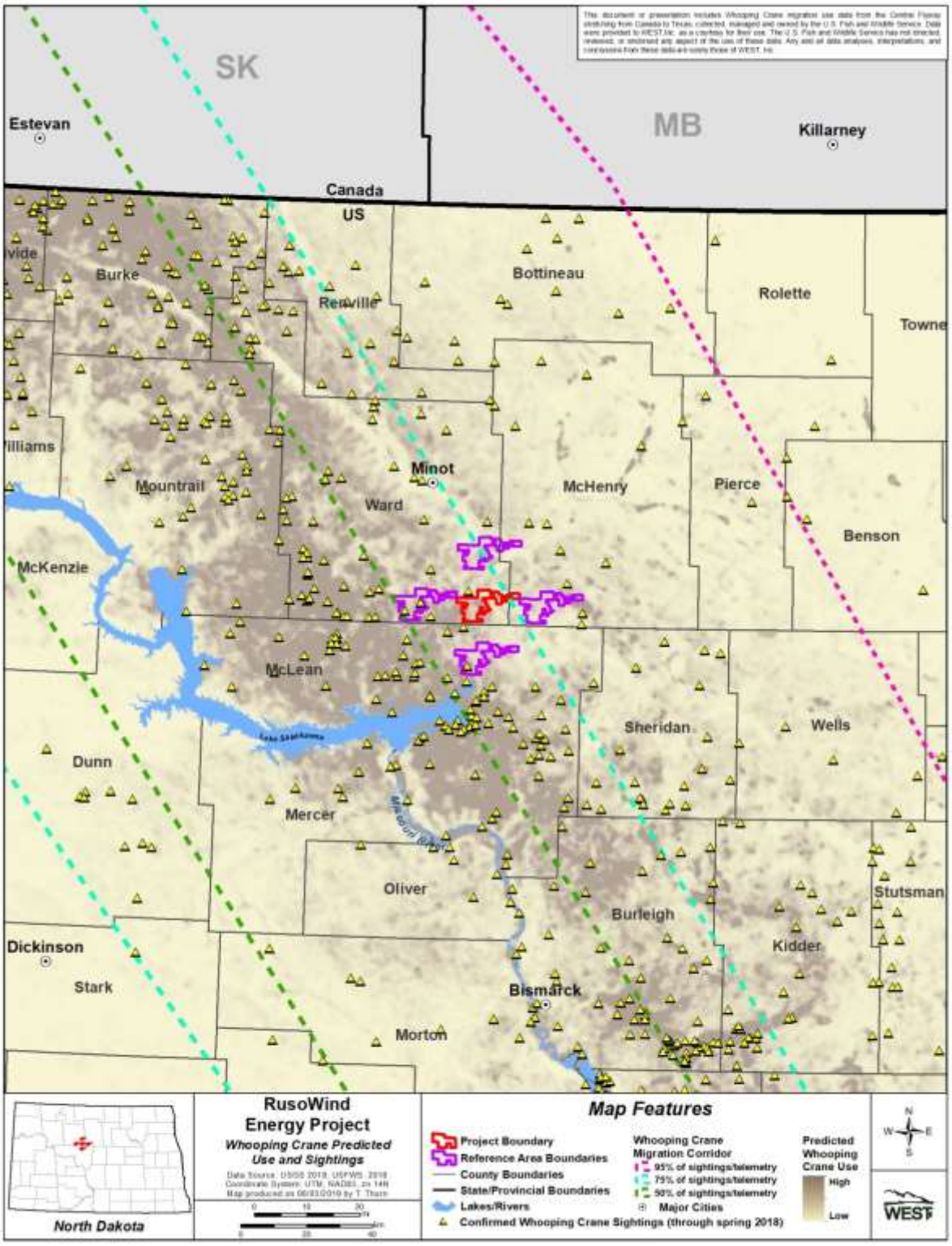

Figure 5. Whooping crane predicted use and sightings near the Ruso Wind Project in McHenry and Ward counties, North Dakota and four reference areas.

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