Whooping Crane Habitat Review
Prevailing Winds Wind Project
Bon Homme and Charles Mix Counties, South Dakota

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August, 2016

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

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INTRODUCTION

The Prevailing Winds Wind Project (PWWP) is proposed for development by Prevailing Winds Wind Project LLC (Prevailing Winds) in Bon Homme and Charles Mix Counties, South Dakota. Prevailing Winds requested that Western EcoSystems Technology, Inc. (WEST) implement a desktop review and analysis of potential whooping crane (*Grus americana*) habitat resources within the PWWP and to compare these resources to areas outside of the project boundary to the north, south, east, and west. The habitat review and analysis evaluates whether or not the proposed PWWP area represents the only unique whooping crane habitat compare to the surrounding landscape. From this analysis all parties can then discuss what impacts there may be to whooping cranes from development of the PWWP.

PROJECT AREA

The PWWP is located in the southeastern South Dakota counties of Bon Homme and Charles Mix, just north of the city of Avon (Figure 1). The PWWP is currently about 37,017 acres (ac; 150 square kilometers [km^2]; 58 square miles [mi^2]). Landscape within the project area is generally flat with some steeper hills. Elevations range from 454.5 to 573.7 meters (m; 1,491.2 to 1,882.3 feet [ft]) above sea level. Historically, the PWWP's landscape was dominated by grasslands but has since been converted largely 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. Wetlands are scattered throughout the PWWP with some being man-made. Common agricultural crops include small grains, corn, soybeans, and alfalfa.

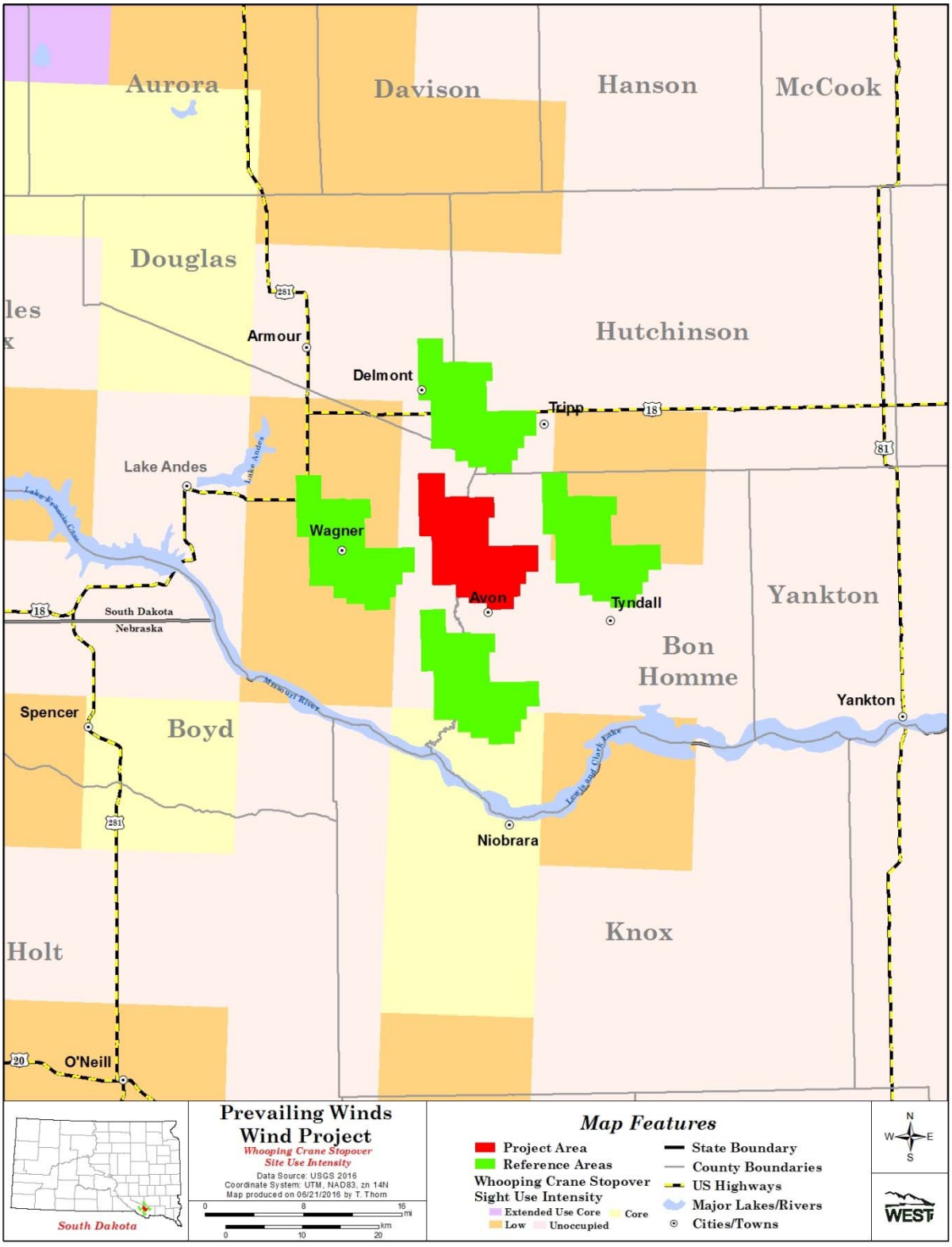

Figure 1. Location of the Prevailing Winds Wind Project, alternate areas, and whooping crane stopover site use intensity.

METHODS

A desktop review was completed using ArcGIS, ArcMap 10.3, land cover information from the National Land Cover Database (NLCD), wetland data from the National Wetland Inventory (NWI), 2014 National Agricultural Imagery Program (NAIP) aerial imagery, and the current project boundary as provided by Prevailing Winds. A site visit was not completed by WEST for this exercise specifically, but WEST has conducted other surveys at the PWWP and confirmed that the mapping generally agrees with current conditions.

The whooping crane habitat analysis included a comparison of land cover within the proposed PWWP boundary and four alternate areas of the same dimensions located adjacent (based on the PWWP's boundary extent) to the PWWP boundary in the four cardinal directions (Figure 1). 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. In Kansas, it was determined that a score of 12 or higher represented potentially suitable whooping crane habitat.

RESULTS

There is almost 17,588 ac of cropland within the proposed project area, or 47.5% of the total area. Pasture/hay lands make up approximately 38% of the project area while grass/herbaceous lands and developed areas occupy another 6.7% and 4.3% respectively. Water, forest, shrub/scrub, and barren habitats comprise the remaining 3.5% of the PWWP (Figure 2; Table 1).

Croplands, Grasslands, and Other Habitats

The percentage of cropland varied between the project area and comparison areas, with the PWWP containing the second lowest (47.5%) and the east comparison area the most (66.4%; Figure 2; Table 1). The south reference area had the least cropland (39.8%) with the north and west areas comprised of 54.1% and 55.4% cropland respectively (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.

Considering grassland/herbaceous and pasture/hay habitats as "grasslands", this habitat type also varied between analyzed areas (Figure 2; Table 1). The south (46.6%) had the most while the east reference area had the least (26.6%). Grassland percentages in the other three areas ranged from 44.2% (PWWP) to 34.8% (Table 1).

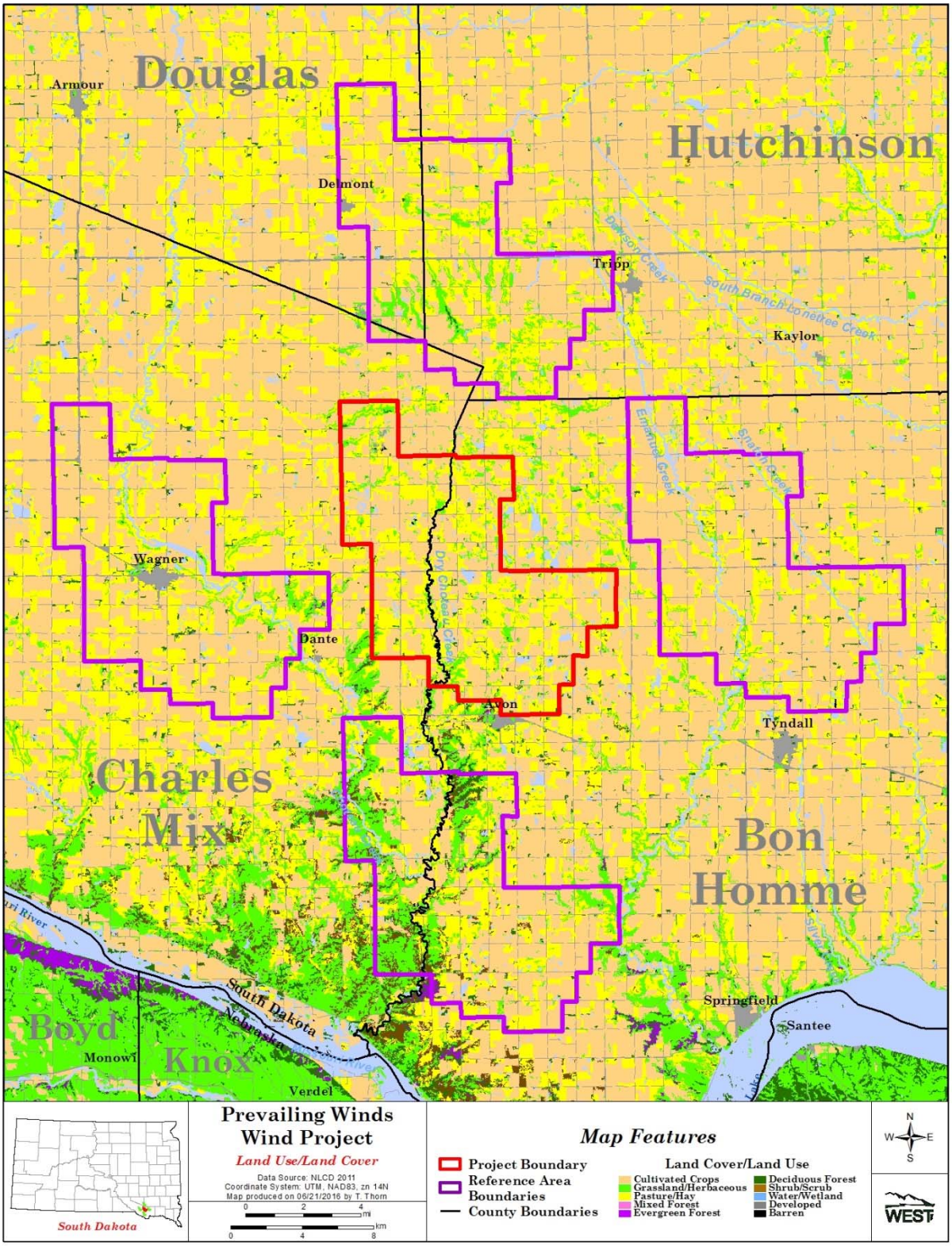

Figure 2. Land Use/Land Cover within and around the Prevailing Winds Wind Project.

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 8.3% of the PWWP's area. This is similar to the north, east, and west reference areas while in the south comparison area, other habitat types occupied 13.6% of the area. Shrub/scrub land made up almost half of the other habitats in this area (Figure 2; Table 1).

Table 1. Land Use/Land Cover within the Prevailing Winds Wind Project and adjacent areas.

	PWWP		North		East		South		West	
Habitat Type	Acres	%	Acres	%	Acres	%	Acres	%	cres	%
Cultivated Crops	17,588.3	47.5	20,033.3	54.1	24,592.7	66.4	14,716.9	39.8	20,507.8	55.4
Grassland/Herbaceous	2,481.9	6.7	2,922.5	7.9	995.0	2.7	7,270.35	19.6	1,398.2	3.8
Pasture/Hay	13,897.5	37.5	11,676.7	31.5	8,853.2	23.9	9,985.0	27.0	1,1482.6	31.0
Developed	1,578.0	4.3	1,894.3	5.1	1,668.2	4.5	1,142.3	3.1	1,998.4	5.4
Water/Wetlands	1,016.5	2.8	327.6	0.9	562.2	1.5	682.0	1.8	1,086.7	2.9
Forests	372.1	1.0	152.5	0.4	307.5	0.8	958.8	2.6	441.8	1.2
Shrub/Scrub	67.5	0.2	9.7	<0.1	22.7	<0.1	2,251.6	6.1	93.3	0.3
Barren	14.7	<0.1			15.1	<0.1	9.7	<0.1	7.8	<0.1

National Land Cover Database - Fry et al. 2011.

Wetlands

NWI wetland data was used for this analysis because it represents wetland features to a higher degree than the NLCD. For this 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 PWWP had similar total acres, mean size and size range of wetland basins as the north and east reference areas (Table 2). Total number of wetland basins ranged from 792 in the PWWP to 924 in the east reference area. The south comparison area had the fewest basins (507) and the lowest total wetland acreage (688 ac). However, mean wetland size and wetland size range was similar to all other areas except the west comparison area (Table 2). The west reference area has by far the highest total wetland acreage (2,268.7 ac). However, almost 41% of the total acreage is made up of wetlands associated with Choteau Creek (Figure 3). This causes the size and acreage range of wetlands within this area to be somewhat misleading

Freshwater emergent (77.5%) made up the highest percentages of wetland types in the PWWP, with freshwater ponds accounting for another 14.7% (Table 3). Wetlands in all the comparison areas were 83% or greater freshwater emergent (Table 3). The west and south reference areas contained riverine wetlands with slightly more the 8% of wetlands in the west and 4% in the south classified as this wetland type (Table 3).

To summarize, the PWWP had similar wetland acreages and types as those for the north and east comparison areas and to a lesser extent the south area. The south reference area had the fewest wetland basins and smallest wetland total acreage but had similar mean wetland size and wetland size range to all other areas except the west. Wetland statistics (highest total wetland acreage, mean wetland size, and basin size range) for the west reference area were misleading due wetlands associated with Choteau Creek which intersects the area from north central to southeast (Figure 3).

Table 2. Comparison of the number of wetland basins and mean size within the Prevailing Winds Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Size - acres	Range - acres
PWWP	792	1,304.9	1.6	<0.1 – 63.4
North	913	1,158.0	1.3	<0.1 – 39.5
East	924	1,149.0	1.2	<0.1 – 34.6
South	507	687.8	1.4	<0.1 – 54.8
West	769	2,268.7	3.0	<0.1 – 919.8

Data Source: NWI data with wetland parts dissolved.

Table 3. Wetland types within the Prevailing Winds Wind Project and adjacent areas.

Wetland Type	PWWP		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Freshwater Emergent	1,011.0	77.5	962.8	83.1	987.9	85.9	610.9	88.8	1959.4	86.4
Freshwater Forested/Shrub	44.3	3.4	20.5	1.8	43.2	3.8	4.4	0.6	15.8	0.7
Freshwater Pond	192.2	14.7	122.6	10.6	95.0	8.3	43.4	6.3	79.4	3.5
Lake	57.4	4.4	52.0	4.5	23.9	2.1			24.7	1.1
Riverine							29.1	4.2	189.4	8.3

Data Source: NWI 2010.

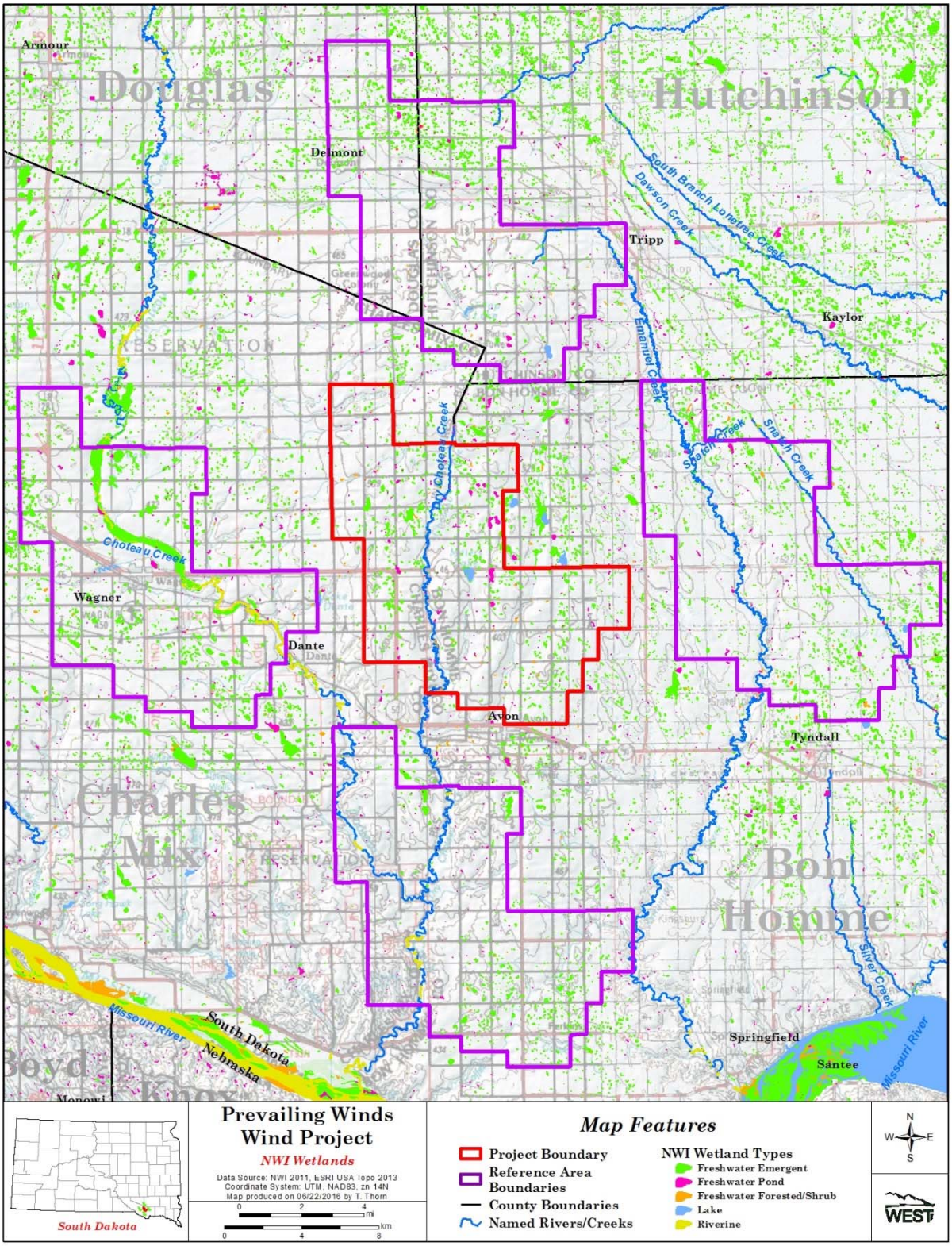

Figure 3. NWI wetlands within and around the Prevailing Winds Wind Project.

Whooping Crane Suitable Habitat Assessment

The habitat assessment model identified 262 wetland basins within the PWWP as potential whooping crane roosting habitat. The mean suitability score for these wetlands was 9.4 with the scores ranging from 6 to 16 (Table 4). This mean suitability score and range was similar to the score and range for three of the four reference areas. The exception being the southern comparison area which had the fewest potential whooping crane roosting wetlands, lowest total potential wetland acreage, lowest mean suitability score and lowest and narrowest score range (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 PWWP, there would be 41 wetlands (15.6% of identified potential whooping crane wetlands) considered as such. The south reference area would have only 13 and the north, east, and west comparison areas would have between 33 and 63 potentially suitable whooping crane wetlands

Table 4. Comparison of suitable whooping crane habitat within the Prevailing Winds Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Score	Score range
PWWP	262	490.1	9.4	6 – 16
North	270	517.2	9.8	6 – 18
South	157	285.9	8.4	5 – 14
East	244	395.6	9.7	6 – 16
West	284	1,239.8	9.8	6 – 17

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

Whooping Crane Stopover Site Use Intensity

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.

The PWWP and the north review area fall within "unoccupied" 20 km cells while the east and west reference areas lie within "low intensity" cells and the south intersects a "core intensity" cell (Figure 1). USGS describes an "unoccupied" cell as "lacking evidence of use", "low intensity" cell shows "evidence of use and low stopover site use intensity", and a "core intensity" site "contains density of stopovers identified as high use intensity and crane days of lower intensity" (Pearse et al. 2015).

DISCUSSION

Whooping cranes are currently listed as endangered under the Endangered Species Act (32 FR 4001, 1967 March 11) 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 (USFWW 2016). 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 South Dakota.

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 whooping crane use directly to the south, east, and west of the project area. Although no whooping crane use was document within the 20 km grid cell the project falls within, at the least, 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 and may fly at altitudes corresponding to the rotor-swept areas. 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.

No whooping cranes have been reported as being killed or injured by wind turbines (NWCC 2004), but one sandhill crane (*Grus canadensis*) 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 struck by turbines during a study of wintering cranes in Texas (Navarrete and Griffis 2011a). 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.

Besides direct mortality, concern has also been raised regarding potential displacement impacts that wind facilities may have on whooping cranes. For example, if whooping cranes avoid wind facilities, the likelihood of impacts with turbines is further decreased but the availability of habitat in the project area may be diminished, causing cranes to have to fly further to find suitable habitat to roost and forage. To date, very little quantitative data is available to help address displacement impacts on whooping cranes or sandhill cranes. A presentation by Navarrete and Griffis (2011b) suggested that the mean density of sandhill cranes wintering in the high plains of Texas increased the further away from studied wind facilities and this distribution was not a

random event. There is an operating wind energy facility just north of the proposed project boundary. What, if any impact this facility has on crane use in and around the surrounding area is unknown.

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 range of scores and average score at the PWWP is similar to three of the four other study areas. The exception being the southern reference area which had fewer potential roost wetlands, with the average score for those basins one less than the other areas. Overall, the average score and the majority of the individual wetland scores were lower than the reference score of 12 developed for quality habitat at the Quivira National Wildlife Refuge.

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 area to surrounding (in the four cardinal directions) areas of the same dimensions, located adjacent (based on the PWWP's boundary extent) to the PWWP boundary. A Geographic Information System (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 areas compared to the proposed PWWP (Tables 1, 2, and 3). This analysis shows that both roosting (i.e. wetlands) and foraging (i.e. croplands) habitats are available in the PWWP and alternate areas. Potential whooping crane habitat within the PWWP appears to be most similar to that in the north, east, and west reference areas and more suitable than that found in the south alternate area. Based on the USGS's recent determination of whooping crane stopover use sites adjacent to the proposed project area, whooping cranes will likely migrate over or through the PWWP during some migration period. There is potential whooping habitat within the PWWP but this habitat is not unique compared to adjacent areas.

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