Appendix C
North Bend Wind Project Field Studies Summary 2016–2020

North Bend Wind Project
Field Studies Summary 2016 – 2020
Hughes and Hyde Counties, South Dakota

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WEST

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INTRODUCTION

North Bend Wind Project, LLC (North Bend) is considering the development of the North Bend Wind Project (Project) in Hughes and Hyde counties, South Dakota. North Bend contracted with Western EcoSystems Technology, Inc. (WEST) to conduct baseline wildlife and habitat studies to evaluate potential impacts of wind energy facility construction and operations on wildlife.

In 2016, baseline wildlife studies were completed within a previous defined wind resources area encompassing 15,822.9 hectares (ha; 39,099.3 acres [ac]) based on a 200-megawatt (MW) project. In 2017, this wind resource area was expanded to encompass 44,573.0 ha (110,142.3 ac) based on up to three separate 250 MW phases. This expanded wind resource area was the largest of the proposed boundaries. North Bend recently refined the area for the Project, which is primarily located along the western portion of the previously surveyed wind resource area and encompasses approximately 18,817.0 ha (46,498.0 ac; Figure 1, Table 1).

Baseline wildlife studies within the Project area were designed to address the questions posed under Tier 3 of the US Fish and Wildlife Service (USFWS) *Final Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and Stage 2 of the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013). Studies conducted within the Project area from 2016 to 2020 include avian use surveys, raptor and eagle nest surveys, prairie grouse lek surveys, general bat acoustic monitoring, northern long-eared bat (NLEB; *Myotis septentrionalis*) summer habitat analysis, whooping crane (*Grus americana*) stopover habitat analysis, and a land cover characterization study.

The studies conducted to date also incorporate WEST's experience working in South Dakota with USFWS Ecological Services, the USFWS Region 6 Ecological Services Field Office, and South Dakota Game, Fish, and Parks (SDGFP). The following provides a summary of studies conducted, in progress, or applicable to the current Project area.

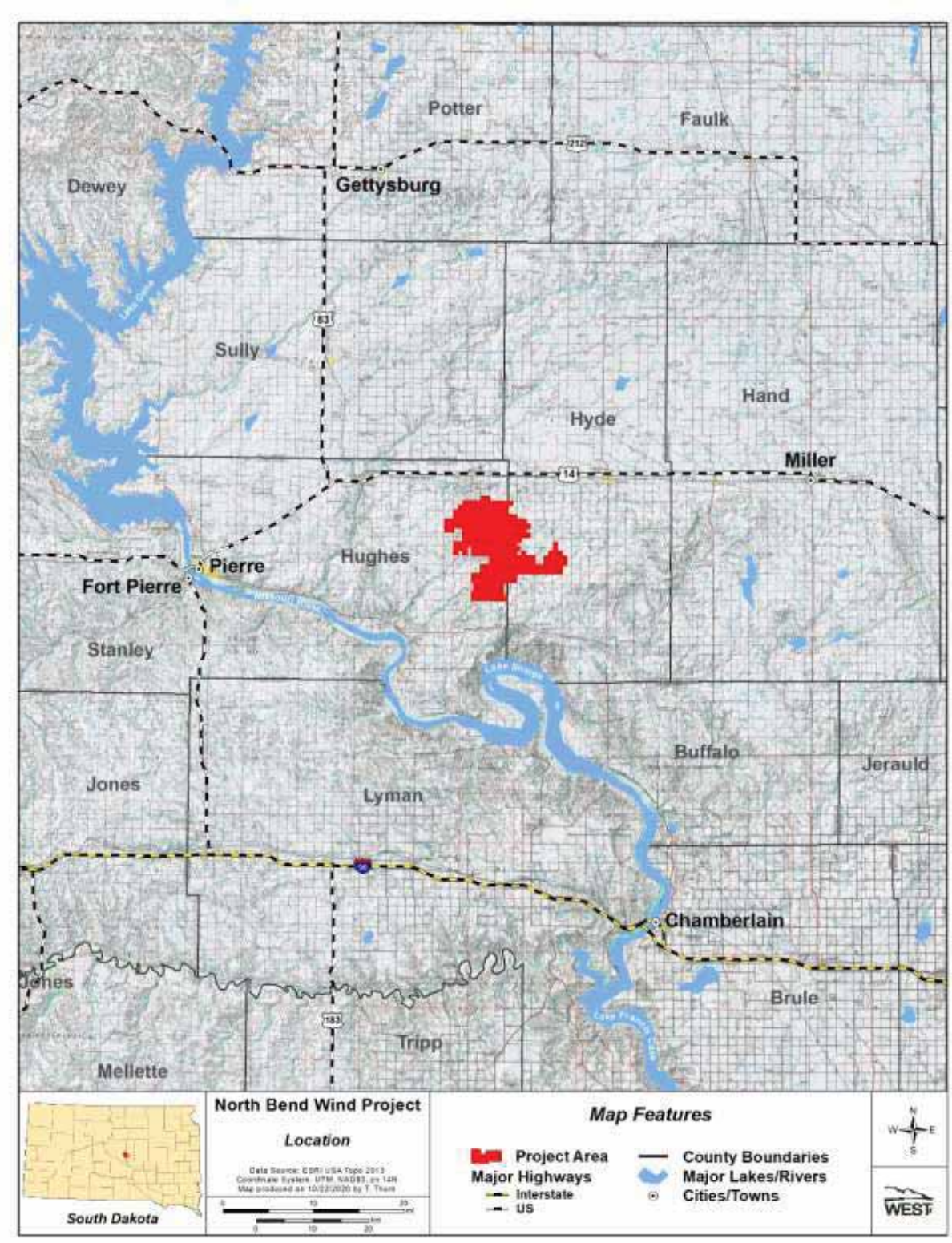

Figure 1. Location of the North Bend Wind Project, Hughes and Hyde counties, South Dakota.

PROJECT AREA DESCRIPTION

The Project area is located in Hughes and Hyde counties, South Dakota, approximately six kilometers (km; four miles [mi]) south of Harrold, South Dakota. This area is within the Northwestern Great Plains Level III Ecoregions (US Environmental Protection Agency [USEPA] 2017). The Northwestern Glaciated Plains ecoregion has significant surface irregularity and dense concentrations of wetlands. In contrast, this area along the Southern Missouri Coteau exhibits a topography of gentle, rolling hills rather than steep hummocks, with fewer areas of high wetland density, and more stream erosion (USEPA 2017) much of which has been converted to cultivated crops. The river breaks landform is also common near riparian areas and consists of uplands with broken terraces that descend to the Missouri River and its major tributaries. This rough and broken river break topography, with its wooded draws and uncultivated areas, provides habitat for wildlife.

The topography within the Project area consists of rolling hills, with elevations ranging from 540–630 meters (m; 1,772–2,067 feet [ft]) above mean sea level (US Geological Survey [USGS] Digital Elevation Model 2017). Land ownership within the Project area is primarily private with a few scattered State Resource Management Areas (USGS Protected Areas Database of the US 2019) one of which fall within the Project area (Figure 2). Chapelle Creek and South Chapelle Creek are the named creeks within the Project area (Figure 2; USGS National Hydrography Dataset 2019). Wetlands are dispersed throughout the Project area, but most are located in the northeastern portion of the Project area (Figure 2; National Wetlands Inventory [NWI] 2019). The majority of wetlands are herbaceous wetlands, followed by open water (i.e., freshwater pond, and lakes; Table 1).

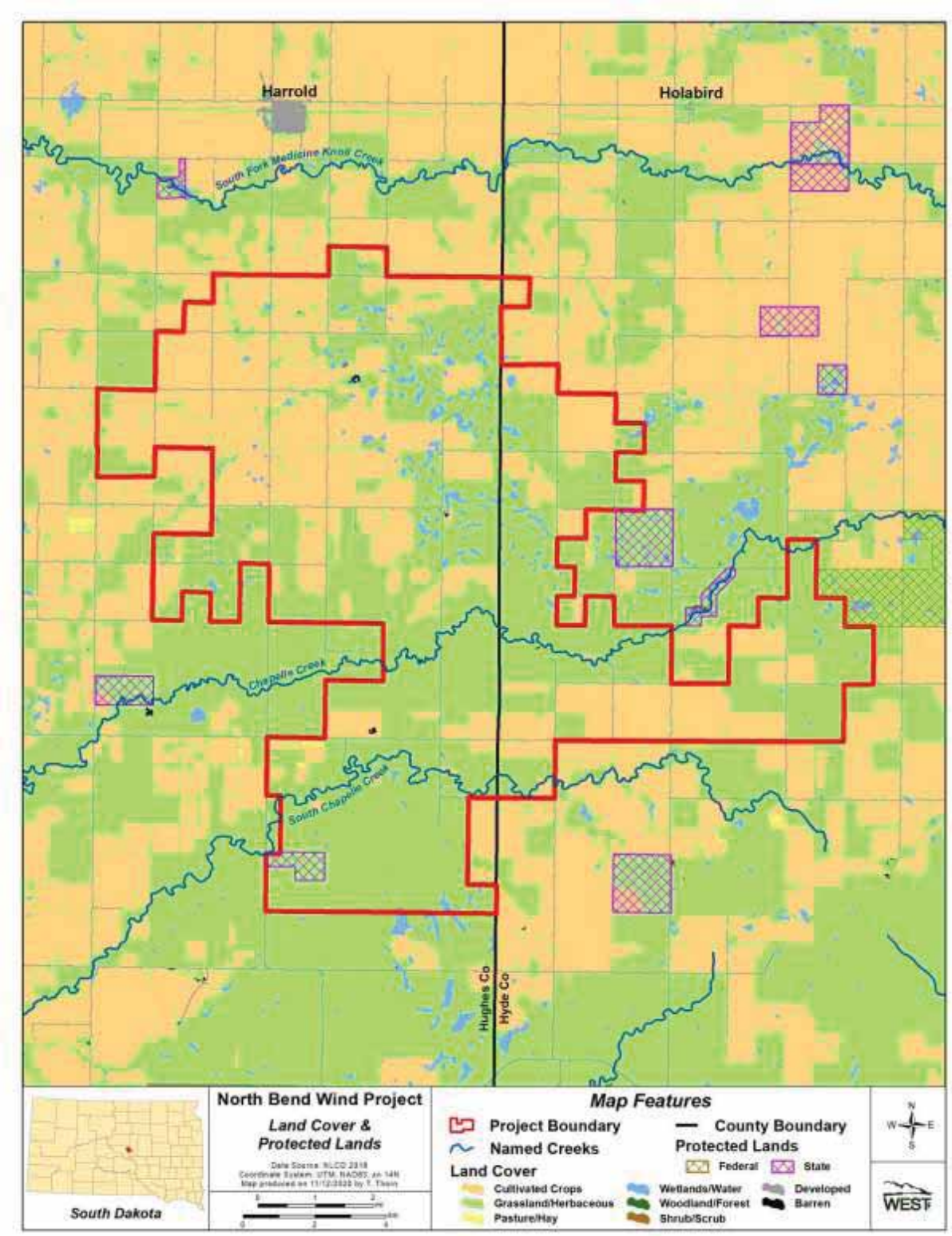

Figure 2. Land cover types and protected lands within the current North Bend Wind Project boundary located in Hughes and Hyde counties, South Dakota.

Land Cover

Land cover types were digitized using ArcGIS (version 10.4) within the current Project area. Using US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP [USDA 2019]) aerial imagery in combination with 2011 South Dakota Land Cover Patterns (National Land Cover Database (NLCD; 2016), USDA National Agricultural Statistics Service (NASS) National Cropland Layer (USDA NASS 2018) cropland classification, and field inspections, all lands within the current Project area were digitized and assigned one of seven cover types (Table 1). NWI data were used to represent water for the purpose of mapping within the current Project area. Water features visible on the aerial imagery, but not located in the NWI data tables, were digitized as "Wetland/Water" on the map (Figure 2).

The dominant land cover type within the current Project area is herbaceous, representing 60.0% of the land cover (11,295.8 ha [27,912.5 ac]) followed by cultivated crops (6,732.9 ha [16,637.4 ac]; 35.8%; Table 1, Figure 2). Additional land cover types included developed (381.9 ha [943.7 ac]; 2.0%) followed by herbaceous wetlands (367.2 ha [907.4 ac]; 2.0%). All remaining land cover types in the Project area were less than 0.1% (Table 1).

Table 1. Land cover, coverage, and percent (%) composition within the North Bend Wind Project, Hughes and Hyde counties, South Dakota.

Land Cover	Coverage (Hectares)	% Composition
Herbaceous	11,295.8	60.0
Cultivated crops	6,732.9	35.8
Developed	381.9	2.0
Herbaceous wetlands	367.3	2.0
Open water	17.6	<0.1
Hay/Pasture	13.0	<0.1
Barren land	8.6	<0.1
Total	**18,817.1**	**100**

Source: National Land Cover Database (2016).

AVIAN USE SURVEYS

Avian point-count surveys are the most widely used methodology for pre-construction avian use characterization and turbine siting considerations (e.g., USFWS Tier 3 studies [USFWS 2012]) because of their effectiveness and efficiency for characterizing the use of selected sites by a broad spectrum of diurnally active birds (Ralph et al. 1993, Strickland et al. 2011). The objective of the fixed-point avian use surveys was to estimate the seasonal and spatial use of the Project area by birds over the four-year period surveys were conducted. Project boundaries changed over time, and therefore altered avian use survey locations. Unless otherwise noted, surveys were conducted once a month for 70 minutes (min) each. Small bird species were recorded during the first 10 min of the survey period, and then only large bird species were recorded for the next 60 min. The initial 10-min surveys allowed for comparison of small use with the majority of wind projects in the region. The 60-min surveys encompassing large birds were consistent with the

ECPG and used to obtain a stronger dataset with which to evaluate large bird use, particularly for eagles.

Survey plots were selected to survey representative habitats and topography of the Project area, while meeting ECPG spatial sampling recommendations. The ECPG recommended at least 30% coverage of areas within 1.0 km (0.6 mi) of turbine locations or within the minimum convex polygon (MCP) of the complete turbine array (USFWS 2013) should be surveyed. As location of turbines were unknown at the time of sampling, survey coverage included at least 30% of the Project area. Large birds observed within an 800-m (2,625-ft) plot and small birds within a 100-m (328-ft) plot were used for quantitative analysis and other comparative metrics. During surveys, locations of diurnal raptors, other large birds, and species of concern observed during surveys were recorded on field maps by unique observation numbers. Flight paths and perch locations were digitized using ArcGIS 10.4. Additionally, for all eagle observations, data were collected following ECPG methodology (USFWS 2013).

The Project area has shifted numerous times during development (Figure 3) due to various logistic constraints. As such, avian use information from 2016 to 2019 is synthesized to provide a high level overview of the methods and results as limited sampling points overlap the most recent and constricted Project area. The conclusion of this section provides interim survey results of ongoing avian use efforts focused on the MCP of the current turbine array as described in the ECPG.

Fixed-point Survey Efforts (2016 – 2017)

The following provides a summary of the avian use survey effort conducted April 18, 2016 – March 28, 2017 within the current Project area (Figure 3). Surveys covered approximately 34% of the 2016 Project area (Figure 3). During this effort, surveys were conducted for 60 min at each survey point location with all birds recorded for the first 20 min and only large birds recorded for the following 40 min. While this methodology differs from later surveys, results from these previous efforts can provide general information on species composition and diversity within the current Project area. Sixty hours (hr) of surveys were completed at five point count locations. This effort resulted in 41 unique species being observed during surveys, regardless of bird size, with horned lark (*Eremophila alpestris*; 387 observations, 9 groups), Canada goose (*Branta canadensis*; 201, 5), and Franklin's gull (*Leucophaeus pipixcan*; 95, 1), being the most commonly observed species. Northern harrier (*Circus hudsonius*; 4, 4), bald eagle (*Haliaeetus leucocephalus*; 1, 1) and merlin (*Falco columbarius*; 1, 1) were the only identified diurnal raptors during surveys. No golden eagles (*Aquila chrystaetos*) were documented during survey effort. No state- or federal-listed species were observed during surveys.

Fixed-point Survey Efforts (2018 – 2019)

The following provides a summary of avian use survey effort conducted January 23, 2018 – January 14, 2019 within the current Project area (Figure 3). There were 27 survey locations resulting in 324 fixed-point surveys completed for each large and small bird surveys. This effort resulted in 60 unique large bird species being observed. The most commonly recorded large bird species were snow goose (*Anser caerulescens*; 19,515 observations, 19 groups), Canada goose (6,007, 31), and greater white-fronted goose (*A. albifrons*; 4,870, 14). Nine diurnal raptor species

were documented during surveys with northern harrier (17, 17) as the most frequently recorded species. For small birds, western meadowlark (*Sturnella neglecta*; 197, 102) was the most regularly observed species, followed by red-winged blackbird (*Agelaius phoeniceus*; 91, 25), and brown-headed cowbird (*Molothrus ater*; 90, 31). Six golden eagles and four bald eagles were documented during survey efforts. No state- or federal-listed species were observed while conducting surveys.

Fixed-point Survey Efforts (2019 – 2020)

Surveys were conducted from April 5, 2019 – March 31, 2020 at 19 survey points (Figure 3). There were 212 fixed-point surveys completed for each large and small bird survey. Sixty unique species were recorded during surveys including 38 unique large bird and 22 unique small bird species. The most common large bird species were sandhill crane (*Antigone Canadensis*; 2,950 observations, 15 groups), Canada goose (674, 26), and mallard (*Anas platyrhynchos*; 175, 45). The most abundance raptors identified within the Project area were red-tailed hawk (*Buteo jamaicensis*; 48, 30) followed by northern harrier (16, 15). Red-winged blackbird (714, 84), brown-headed cowbird (274, 58), and western meadowlark (251, 145) were the most frequently recorded small bird species. One bald eagle was observed during fixed-point surveys. No other eagle, state-, or federal-listed species were observed while conducting surveys within the Project area during the 2019 – 2020 survey year.

Fixed-point Survey Efforts (2020 – 2021): Ongoing

For the purposes of this interim summary, only surveys beginning April 2020 through July 2020 are included. These data have gone through initial quality assurance/quality control, but have not been finalized; therefore, summary results are preliminary. Avian use surveys were conducted at 23 survey points, which were developed using a minimum convex polygon of the most recently proposed turbine layout following recommendations in the ECPG (USFWS 2013; Figure 3). There were 76 fixed-point surveys completed for large and small birds each. Fifty-eight unique species were recorded during surveys, including 30 unique large bird and 28 unique small bird species. For large birds, the most common species recorded included Canada goose (466 observations, 20 groups), mourning dove (*Zenaida macroura*; 72, 43) and killdeer (*Charadrius vociferous*; 38, 38). Six diurnal raptor species were identified within the Project area, with northern harrier (24, 24) and red-tailed hawk (17, 17) being the most abundant. For small bird species, western meadowlark (163, 163), brown-headed cowbird (101, 22), and grasshopper sparrow (*Ammodramus savannarum*; 55, 55) were the most common. No eagle, state-, or federal-listed species have been observed while conducting surveys within the Project area during this effort.

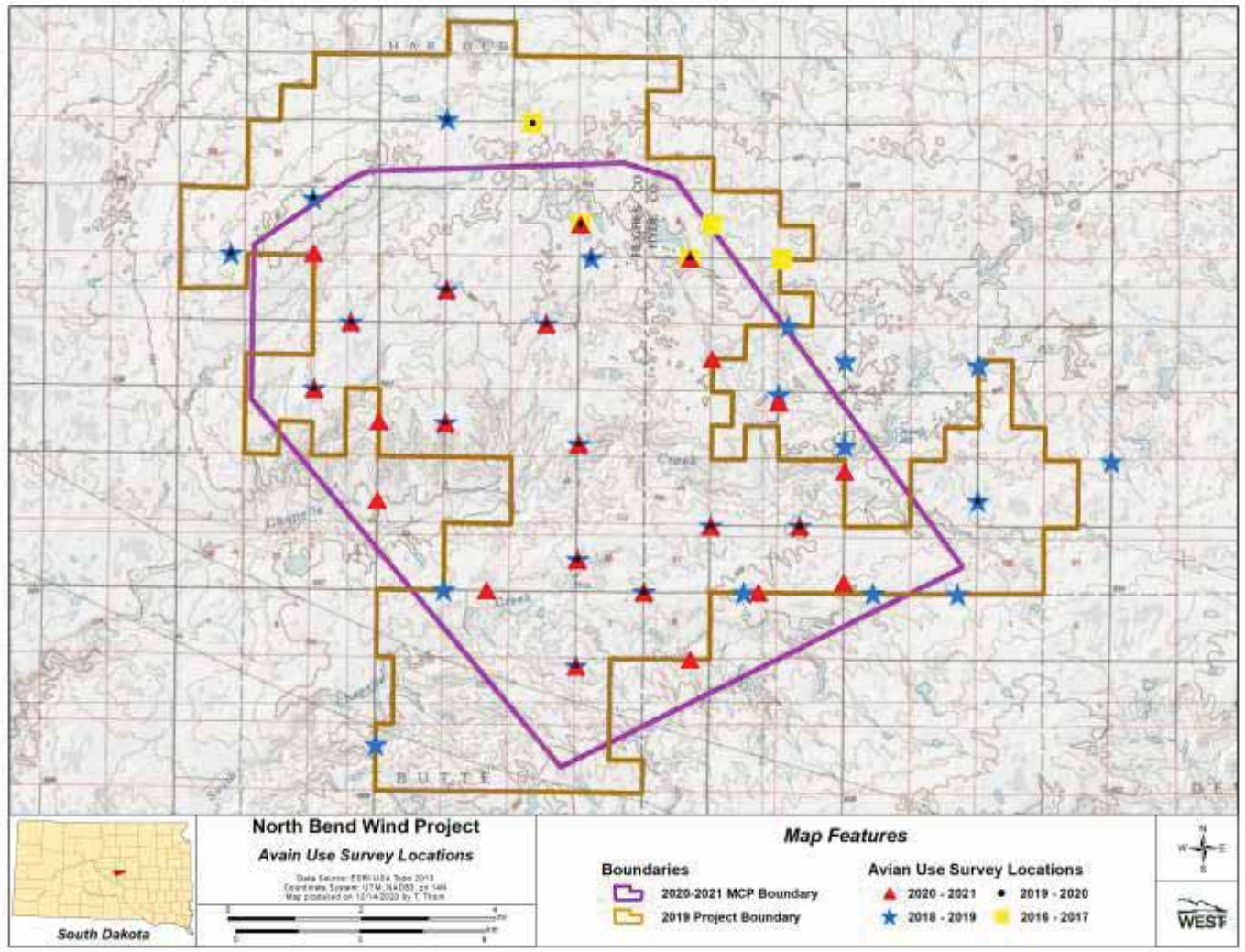

Figure 3. Location of fixed-point avian use survey stations completed in from 2016-2020 throughout the North Bend Wind Project boundary located in Hughes and Hyde counties, South Dakota. The 2020-2021 MCP Boundary (purple outline) encapsulates the most recent proposed turbine layout.

RAPTOR NEST SURVEYS

Raptor nest surveys were conducted in the spring of 2016, 2018, 2019, and 2020. The objectives of the nest surveys were to gather information on eagle nest locations and other raptor species nesting in the area, which may be subject to disturbance or displacement effects from wind facility construction and operation. Surveys were conducted within the Project area and a 1.0-mi buffer for all raptors. Due to various guidance from USFWS over the past several years, additional eagle nest survey efforts have included various buffers from 16.1-km (10-mi; USFWS 2013), 6.4-km (4-mi; USFWS 2020b) and 3.2-km (2-mi; USFWS 2020c). For the purposes of this section, the current 2-mi buffer was used to summarize the results of these efforts. Prior to the surveys, topographic and aerial maps were evaluated to determine where raptor and eagle nesting habitat is likely to occur (e.g., riparian habitat along creeks, open lakes with large trees) so these areas could be targeted during the aerial surveys. A biologist conducted the surveys in a helicopter operated by a pilot experienced in conducting low-altitude wildlife surveys. Surveys were generally conducted on days with good visibility and no precipitation. The locations of all raptor nests and survey paths were recorded using a hand-held onboard Global Positioning System (GPS) receiver.

For all raptor and eagle nest structures detected, the biologist recorded nest location coordinates with the GPS receiver, species present (if any), condition of the nest, presence of eggs or young (if present and visible), and the substrate of the nest (e.g., tree, power pole, rock outcrop). The status of each nest was determined as either: Occupied – an adult in incubating position, eggs, nestlings or fledglings, a newly constructed or refurbished stick nest and/or the presence of one or more adults on or immediately adjacent to the nest structure(s), or Unoccupied – a nest with no evidence of recent use, or attendance by adult raptors. Efforts were made to minimize disturbance to nesting raptors, livestock, or occupied dwellings to the greatest extent possible. Photographs were taken of possible eagle nests.

2016 Surveys

Aerial surveys were conducted from March 28 – April 1, 2016, to search for eagle and raptor nests. During the 2016 aerial survey, three raptor nests were documented within the Project area (Figure 4; Table 2). Two nests were occupied by red-tailed hawks, while one nest was inactive. No eagle or potential eagle nests were located within the Project area and 2-mi buffer.

Table 2. Location of raptor nest sites observed during 2016 surveys located in the current North Bend Wind Project and surrounding 3.2-kilometer (2.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species[1]	2016 Status
1	442383	4922347	RTHA	Occupied
2	444594	4919242	UNRA	Unoccupied
16	444423	4925361	RTHA	Occupied

1. RTHA = red-tailed hawk, UNRA = unknown raptor.

ID = Identification.

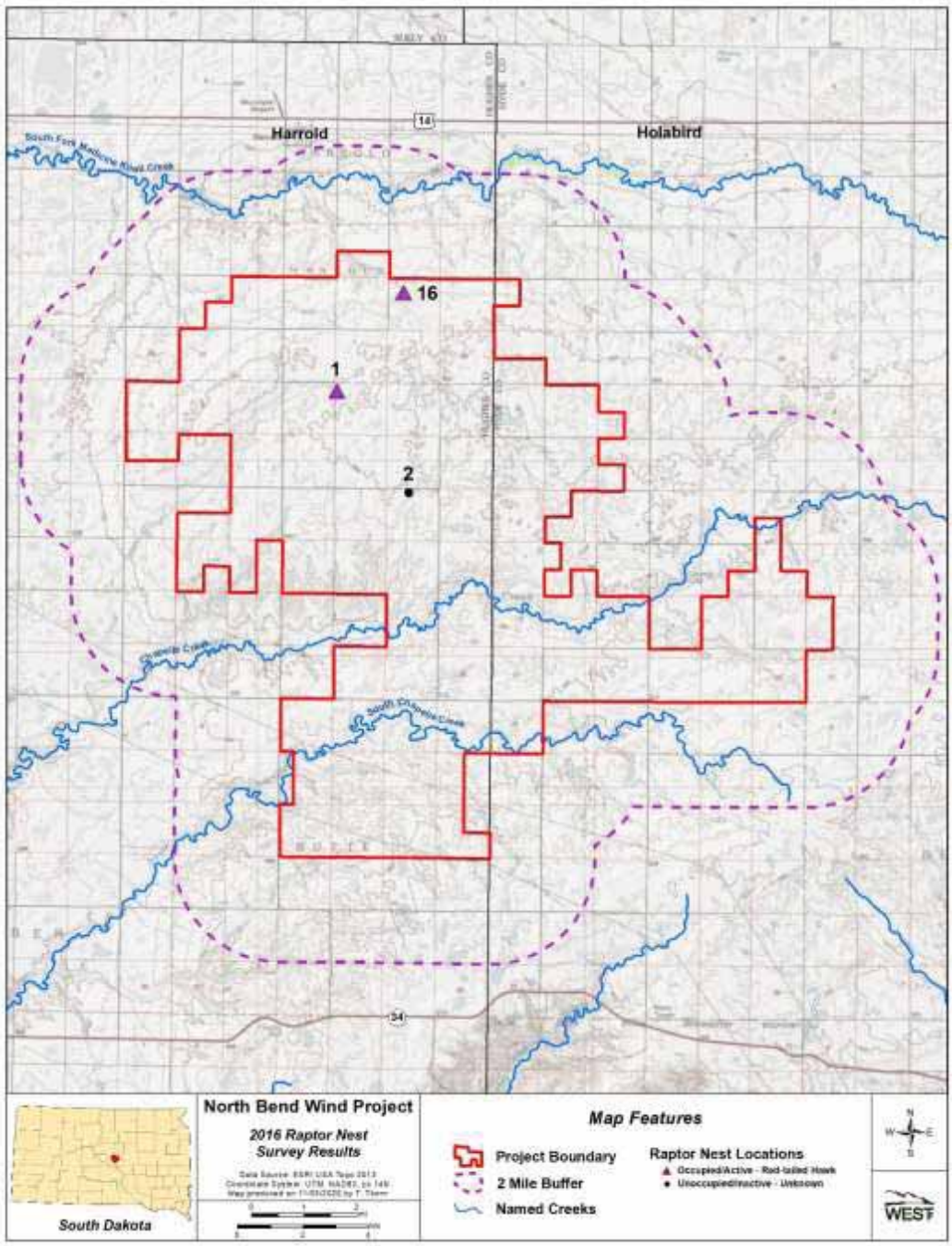

Figure 4. Location of raptor nests identified during surveys in 2016 for the North Bend Wind Project and 3.2-kilometer (km; 2.0-mile [mi]) buffer in Hughes and Hyde counties, South Dakota.

2018 Surveys

An aerial survey for raptor nests was completed for the Project from March 9 – 14, 2018, with follow-up ground surveys conducted in conjunction with other work in May 2018. During these surveys, 21 raptor nests were identified (Figure 5). All three of the previously documented nests from 2016 were re-visited; one was confirmed occupied with a great-horned owl (*Bubo virginianus*) and two could not be relocated. No potential eagle nests were identified within the Project area or 2-mi buffer. Fourteen of the 21 nests were classified as unoccupied nests of unknown raptor. The remaining occupied nests included five great-horned owls, one Swainson's hawk (*Buteo swainsoni*), and one red-tailed hawk (Table 3).

Table 3. Location of raptor nest sites observed during 2018 surveys located in the current North Bend Wind Project and surrounding 3.2-kilometer (2.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species[1]	2018 Status
1	442383	4922347	GHOW	Occupied
2	444594	4919242	DNL	n/a
17[2]	444423	4925361	DNL	n/a
18	444179	4925747	DNL	n/a
19	447561	4925661	UNRA	Unoccupied
30	448709	4915493	GHOW	Occupied
31	455958	4919088	UNRA	Unoccupied
32	455650	4919108	UNRA	Unoccupied
40	440000	4910135	UNRA	Unoccupied
41	440926	4910634	UNRA	Unoccupied
46	451315	4923410	UNRA	Unoccupied
47	450147	4927430	UNRA	Unoccupied
48	450012	4916820	UNRA	Unoccupied
53	452476	4916512	UNRA	Unoccupied
56	459961	4913766	UNRA	Unoccupied
57	459364	4911417	GHOW	Occupied
58	445523	4914147	UNRA	Unoccupied
59	435866	4923410	UNRA	Unoccupied
60	437402	4918910	UNRA	Unoccupied
61	438491	4919700	GHOW	Occupied
62	443789	4915766	UNRA	Unoccupied
63	446691	4925852	GHOW	Occupied
69	448861	4910473	RTHA	Occupied
70	443433	4906458	SWHA	Occupied

[1] DNL = did not locate, GHOW = great horned owl, UNRA = unknown raptor, RTHA = red-tailed hawk, SWHA = Swainson's hawk.

[2] Originally labeled Nest ID 16 in 2016 survey efforts.

ID = Identification.

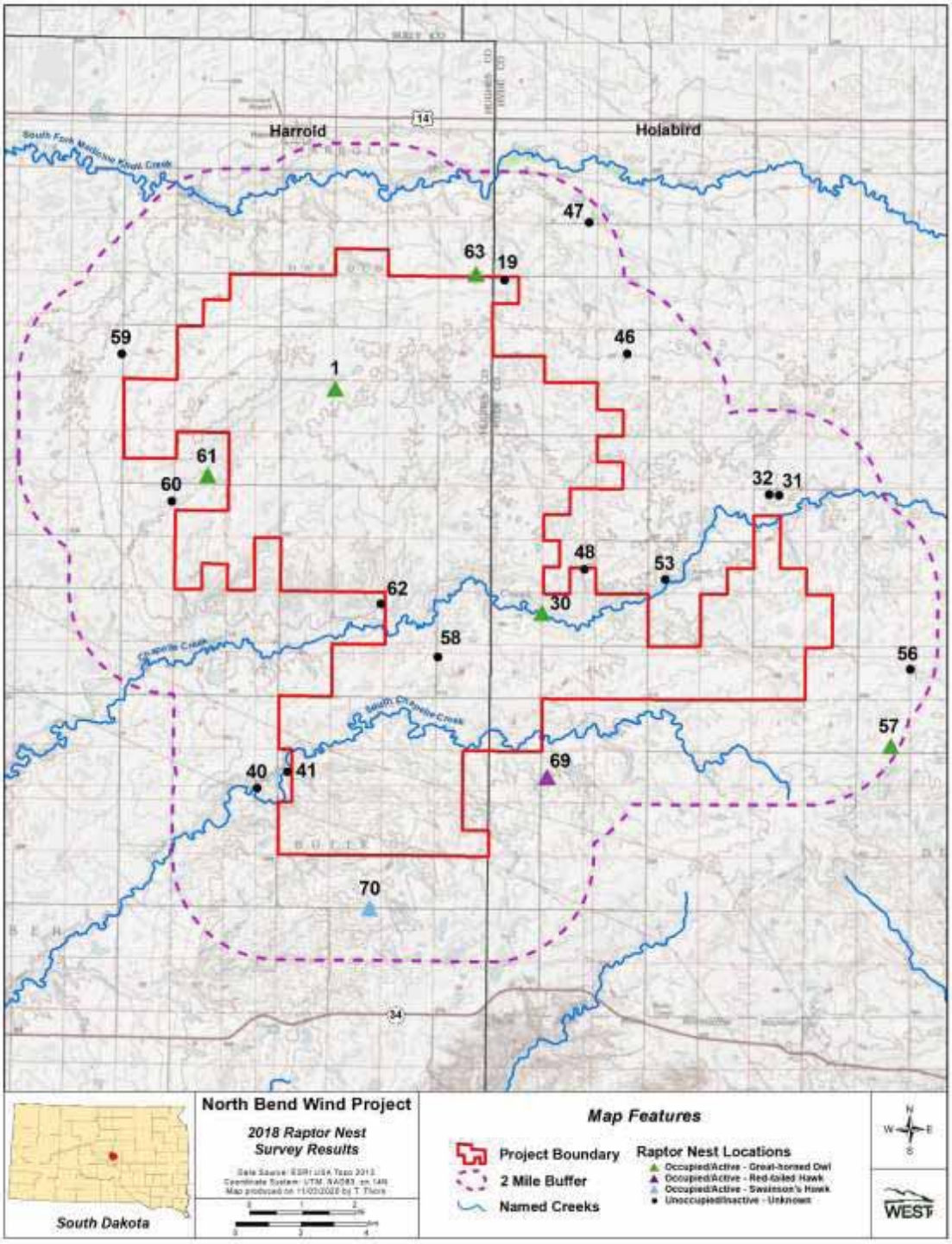

Figure 5. Location of raptor nests identified during surveys in 2018 for the North Bend Wind Project and 3.2-kilometer (km; 2.0-mile [mi]) buffer in Hughes and Hyde counties, South Dakota.

2019 Surveys

Two aerial surveys for the Project were conducted on March 26 and April 16 – 17, 2019. Twenty-two nests were documented during surveys (Figure 6) and 13 previously identified nests were either not present or excluded from surveys due to safety considerations (Figure 6; No Fly Areas). Twelve nests were determined to be occupied with adults in the nest, perched in the same tree, or eggs in the nest. Ten nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG (Figure 6; Table 4). Of occupied nests, five were occupied by great horned owl, one by ferruginous hawk (*Buteo regalis*), four by red-tailed hawk, and two by unidentified raptors (eggs were present in the nest or adults were not identified; Table 4). No eagle or potential eagle nests were identified within the Project area or 2-mi buffer.

Table 4. Location of raptor nest sites observed during 2019 surveys located in the current North Bend Wind Project and surrounding 3.2-kilometer (2.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Nest ID	Northing	Easting	Species	2019 Status
2	444594	4919242	DNL	n/a
17	444423	4925361	DNL	n/a
18	447561	4925661	DNL	n/a
19	444179	4925747	DNL	n/a
30	448709	4915493	UNRA	Occupied
31	455958	4919088	UNRA	Unoccupied
32	455650	4919108	UNRA	Unoccupied
39	440000	4910135	UNRA	Unoccupied
40	440926	4910634	DNL	n/a
46	451315	4923410	UNRA	Unoccupied
47	450147	4927430	GHOW	Occupied
48	450012	4916820	DNL	n/a
56	459961	4913766	DNL	n/a
58	445523	4914147	UNRA	Unoccupied
59	435866	4923410	DNL	n/a
60	437402	4918910	UNRA	Unoccupied
61	438491	4919700	GHOW	Occupied
62	443789	4915766	RTHA	Occupied
63	446691	4925852	DNL	n/a
70	443433	4906458	UNRA	Unoccupied
73	437079	4918884	UNRA	Unoccupied
75	447665	4925512	RTHA	Occupied
86	447117	4911890	RTHA	Occupied
87	442263	4909846	FEHA	Occupied
88	439662	4910051	RTHA	Occupied
89	440967	4914462	GHOW	Occupied
90	439921	4917768	UNRA	Occupied
91	439620	4917741	GHOW	Occupied
92	456143	4916029	GHOW	Occupied
94	437892	4926281	UNRA	Unoccupied
95	435635	4920750	UNRA	Unoccupied

[1.] DNL = did not locate, UNRA = unknown raptor, GHOW = great horned owl, RTHA = red-tailed hawk, FEHA = ferruginous hawk.

ID = Identification.

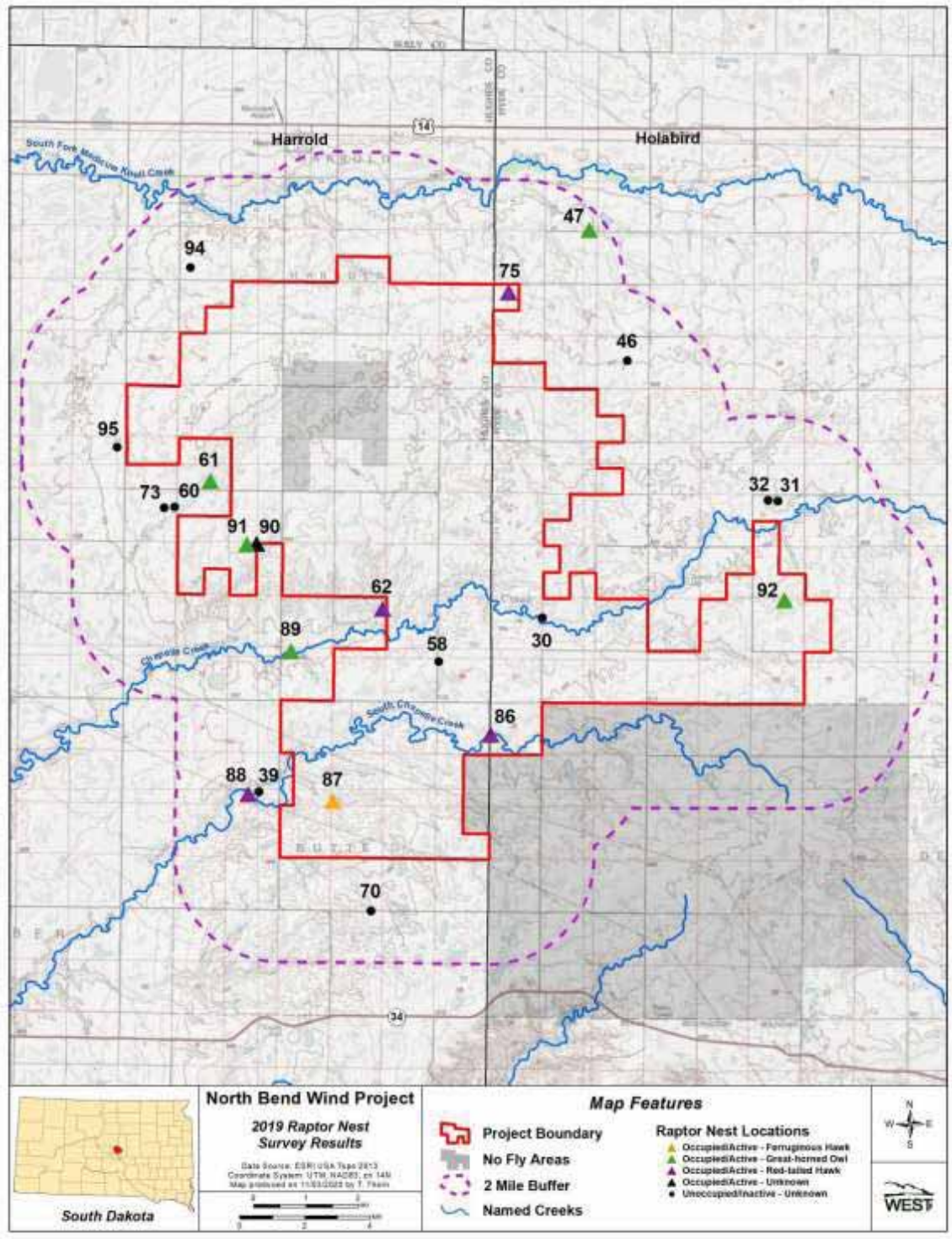

Figure 6. Location of raptor nests identified during surveys in 2019 for the North Bend Wind Project and 3.2-kilometer (km; 2.0-mile [mi]) buffer in Hughes and Hyde counties, South Dakota. Shaded "No Fly Areas" included lands not surveyed in 2019.

2020 Surveys

Three surveys for the Project area were conducted on March 2 – 3, March 12 and 20, and April 20, 2020. Thirty-seven nests were documented during surveys. Twenty nests were previously identified within the Project and associated 2-mi buffer, and four previously identified nests were either not present or excluded from surveys due to safety considerations. Twenty-one nests were determined to be occupied. Of these eight were occupied by red-tailed hawks, six by great horned owls, and two by ferruginous hawks. One occupied nests could not be identified to species (i.e., unknown raptor). Of special interest, two nest locations were used by two different species (Table 5, Figure 7). Nest ID 62 and 90 were first occupied by great horned owls and then by red-tailed hawks. A final nest (Nest ID 108) was a raptor stick nest with a Canada goose occupying the nest. Sixteen nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG (Figure 7). No eagle or potential eagle nests were identified within the Project area or 2-mi buffer. Table 5 presents a cumulative summary of survey results in 2016, 2018, 2019, and 2020 for occupied nests within the Project area and 2-mi buffer.

Table 5. Yearly summary of all potential raptor nests[1] identified during survey efforts for the North Bend Wind Project, Hughes and Hyde counties, South Dakota[2].

Nest ID	Northing	Easting	2016 Status	2018 Status	2019 Status	2020 Status
1	442383	4922347	RTHA	GHOW	n/a[3]	n/a
2	444594	4919242	UNRA	DNL	DNL	n/a
16[4]	444423	4925361	RTHA	DNL	DNL	n/a
18	444179	4925747		DNL	DNL	
19	447561	4925661		UNRA	DNL	
30	448709	4915493		GHOW	UNRA	RTHA
31	455958	4919088		UNRA[2]	UNRA	RTHA
32	455650	4919108		UNRA	UNRA	UNRA
39	440000	4910135			UNRA	DNL
40	440926	4910634		UNRA	DNL	
41	440926	4910634		UNRA		
46	451315	4923410		UNRA	UNRA	UNRA
47	450147	4927430		UNRA	GHOW	
48	450012	4916820		UNRA	DNL	
53	452476	4916512		UNRA		RTHA
54	452741	4916572				GHOW
56	459961	4913766		UNRA	DNL	
57	459364	4911417		GHOW	n/a	
58	445523	4914147		UNRA	UNRA	UNRA
59	435866	4923410		UNRA	DNL	n/a
60	437402	4918910		UNRA	UNRA	UNRA
61	438491	4919700		GHOW	GHOW	UNRA
62	443789	4915766		UNRA	DNL	GHOW
62	443789	4915766			RTHA	RTHA
63	446691	4925852		GHOW	DNL	
69	448861	4910473		RTHA	n/a	
70	443433	4906458		SWHA	UNRA	
73	437079	4918884			UNRA	UNRA
75	447665	4925512			RTHA	GHOW
86	447117	4911890			RTHA	RTHA
87	442263	4909846			FEHA	DNL

Table 5. Yearly summary of all potential raptor nests[1] identified during survey efforts for the North Bend Wind Project, Hughes and Hyde counties, South Dakota[2].

Nest ID	Northing	Easting	2016 Status	2018 Status	2019 Status	2020 Status
88	439662	4910051			RTHA	RTHA
89	440967	4914462			GHOW	GHOW
90	439921	4917768			UNRA	GHOW
90	439921	4917768			UNRA	RTHA
91	439620	4917741			GHOW	UNRA
92	456143	4916029			GHOW	RTHA
94	437892	4926281			UNRA	UNRA
95	435635	4920750			UNRA	UNRA
100	452654	4916585				UNRA
101	450680	4917677				GHOW
102	437420	4918824				UNRA
103	440497	4921656				RTHA
104	440905	4910925				UNRA
105	440940	4910629				FEHA
106	447119	4920622				GHOW
107	444593	4919229				UNRA
108[5]	452741	4916580				CAGO
109	443810	4915783				UNRA
110	448289	4920613				UNRA
111	447491	4926950				UNRA
112	439048	4909605				GHOW
113	450014	4916821				RTHA
114	441881	4911305				UNRA
115	443356	4906471				FEHA
116	454972	4914450				UNRA

1. UNRA = unknown raptor, GHOW = great horned owl, RTHA = red-tailed hawk, SWHA = Swainson's hawk, FEHA = ferruginous hawk, CAGO = Canada goose.

2. Occupied nest sites in a given year are denoted by species code of the individuals that nested there.

3. n/a denotes nests no longer available (e.g., due to being in a new No Fly Zone or falling out of a tree due to winds)

4. Nest ID 16 was changed to Nest ID 17 for 2018, 2019, and 2020.

5 Raptor stick nest identified with a nesting Canada goose.

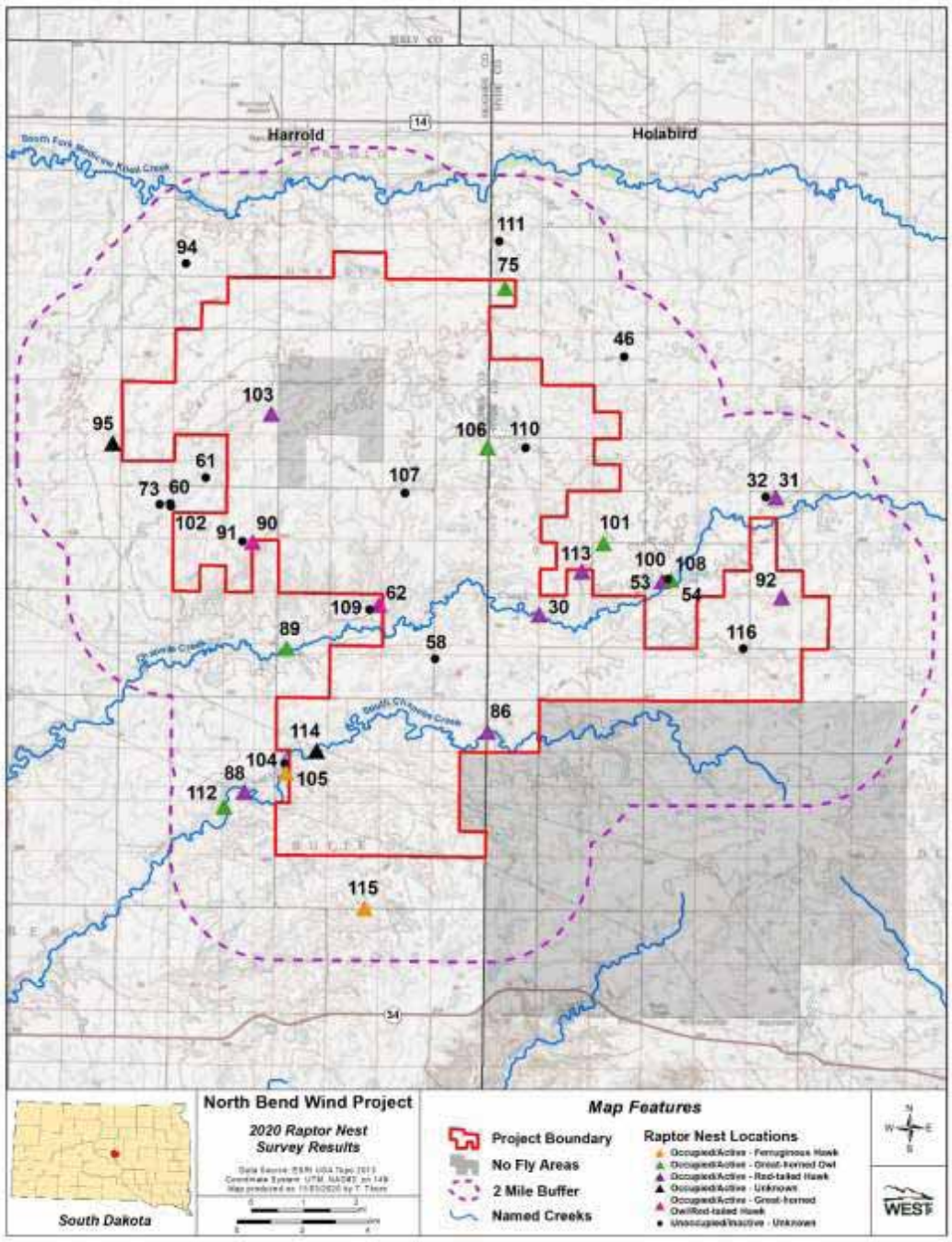

Figure 7. Location of raptor nests identified during surveys in 2020 for the North Bend Wind Project and 3.2-kilometer (km; 2.0-mile [mi]) buffer in Hughes and Hyde counties, South Dakota. Shaded "No Fly Area" included lands not surveyed in 2020.

PRAIRIE GROUSE LEK SURVEYS

The Project area occurs within the occupied range of the greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus*; combined as "prairie grouse"). Greater prairie-chickens are listed as a species of greatest conservation need in South Dakota, but both species are considered upland game birds and are hunted in South Dakota (SDGFP 2014). WEST conducted surveys to document prairie grouse leks during the breeding season within the Project area. The objective of the prairie grouse lek surveys was to identify potential leks and determine status of each to help inform Project siting decisions. These surveys were conducted in 2016, 2018, 2019, and 2020 and followed Project changes as described above in "Avian Use Surveys" for their respective years (Figure 3).

Surveys were conducted three times from late March to the end of the first week of May each year and included their respective Project areas and 1.6-km (1.0-mi) buffer. Surveys began approximately 30 min prior to sunrise until 90–120 min after sunrise. To the extent possible, all surveys were conducted on relatively calm mornings (winds less than 24–32 km [15–20 mi] per hr) and on days with no precipitation. Surveys were conducted to document the presence and the number of male and female birds attending leks. Because both sharp-tailed grouse and greater prairie-chickens are found within the area, identification of species during the survey was recorded, when possible. Information collected during all surveys included date, time, temperature, cloud cover, precipitation, and observer(s).

The SDGFP defines a lek as "a traditional display area where two or more male sage-grouse have attended in two or more of the previous five years" (Connelly et al. 2003). "Active leks" are locations where two or more birds have been observed or heard in courtship behavior during more than one survey period. "Potential leks" are locations where birds have been observed or heard engaging in courtship behavior during only one survey period, where birds were observed in more than one survey period but not in courtship behavior, or where number of birds could not be confirmed (e.g., heard at least one bird). If no birds were seen or heard in any of the three surveys, the lek was classified as inactive for the season. Results include a cumulative summary of all survey efforts across years as it relates to the current Project area and 1-mi buffer (Figure 8).

Aerial Surveys

Aerial surveys were conducted in 2016 and 2018 with a Cessna 172. Surveys included north/south transects across the Project area and 1-mi buffer spaced approximately 0.40 km (0.25 mi) apart at an altitude of approximately 30–45 m (100–150 ft) above ground level. An onboard GPS unit was used to keep the plane on transect, document lek locations, and record daily flight paths. Biologists recorded the number of birds on the lek and whether occupied by greater prairie-chicken or sharp-tailed grouse. The following characteristics were used to distinguish between these species from the air: a square-tail shape and dark, blocky body for greater prairie-chickens versus a pointed-tail shape with white under tail coverts and lighter body color for sharp-tailed grouse.

Ground Surveys

Ground visits were conducted in 2019 and 2020 by traveling publically accessible roads (or roads where permission was previously obtained) throughout the Project area and 1-mi buffer. During ground visits, the following information was recorded and included lek ID, location, species, type of detection (auditory or visual), number of males (if possible), and number of females (if possible). If a new lek was identified during this effort it was documented with the same information and identified using a new unique lek ID.

Twenty prairie grouse leks were identified during a combination of aerial surveys and ground lek visits during the 2016, 2018, 2019, and 2020 breeding season within the Project area and 1-mi buffer (Figure 8). Four lek locations were active in 2016, seven in 2018, three in 2019, and eight in 2020 (Table 6). Of these active and potential leks, one was a sharp-tailed grouse lek and nineteen were greater prairie-chicken leks (Table 6).

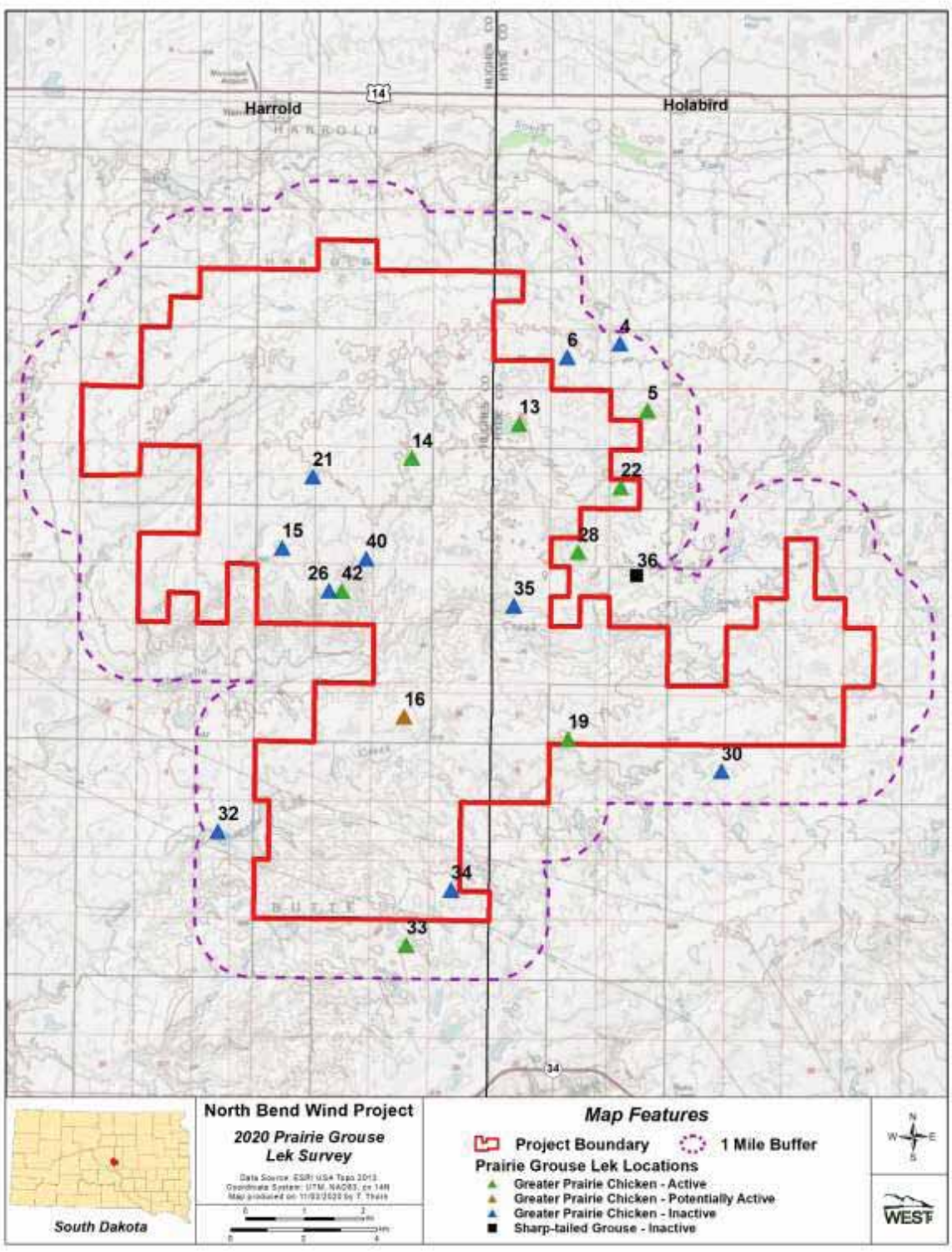

Figure 8. Location and 2020 status of potential prairie grouse leks identified during surveys within the North Bend Wind Project and 1.6-kilometer (1.0-mile) buffer from the 2016, 2018, 2019, and 2020 breeding seasons, Hughes and Hyde counties, South Dakota.

Table 6. Location and maximum number of prairie grouse observed at potential leks during surveys for the current North Bend Wind Project and 1.6-kilometer (1.0-mile) buffer, Hughes and Hyde counties, South Dakota.

Lek ID	Northing	Easting	Species	2016 Status	2018 Status	2019 Status	2020 Status	Grouse # (2020)
4	450633	4923799	GRPC	active	active	active	Inactive	0
5	451387	4921969	GRPC	active	inactive	active	Active-Auditory Only	at least 2
6	449195	4923428	GRPC	active	inactive	inactive	Inactive	0
13	447884	4921599	GRPC	NA	active	active	Active	5
14	444949	4920674	GRPC	NA	active	active	Active-Auditory Only	at least 3
15	441411	4918223	GRPC	NA	active	inactive	Inactive	0
16	444744	4913615	GRPC	NA	active	active-auditory only	Potentially Active	at least 1
19	449214	4913008	GRPC	NA	active	active	Active	4
21	442248	4920168	GRPC	NA	active	inactive	Inactive	0
22	450661	4919869	GRPC	NA	active	inactive	Active-Auditory Only	at least 2
26	442688	4917054	GRPC	NA	active	inactive	Inactive	0
28	449496	4918102	GRPC	NA	active	inactive	Active	5
30	453409	4912128	GRPC	NA	active	inactive	Inactive	0
32	439651	4910488	GRPC	NA	active	inactive	Inactive	0
33	444800	4907382	GRPC	NA	active	active	Active-Auditory Only	unknown
34	446025	4908887	GRPC	NA	active	inactive	Inactive	0
35	447735	4916644	GRPC	NA	active	inactive	Inactive	0
36	451106	4917464	STGR	NA	active	active	Inactive	0
40	443708	4917928	GRPC	NA	active	inactive	Inactive	0
42	443038	4917050	GRPC	NA	NA	active	Active-Auditory Only	at least 3

ID = identification; GRPC = greater prairie-chicken; STGR = sharp-tailed grouse.

BAT ACOUSTIC SURVEYS

WEST conducted acoustic monitoring studies to estimate levels of bat activity within the Project area from May 26 through October 21, 2016 and April 25 – October 25, 2018 at three locations (two cropland [representative of the Project area] and one bat feature). The bat feature included proximity with water features, trees, hedge rows, and other bat-associated habitats. AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific™, Columbia, Missouri) were placed 1.5 m (5.0 ft) above the ground, to minimize insect noise were used during the study. Studies of bat activity followed the recommendations of the WEG (USFWS 2012) and Kunz et al. (2007), detectors were programmed to turn on approximately 30 min before sunset and turn off approximately 30 min after sunrise each night. The study was divided into two primary seasons (summer and fall). WEST defined the fall migration period FMP as a standard for comparison with activity from other wind energy facilities. During the FMP (July 30 – October 14), bats begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (WEST 2019).

For each survey location, bat passes were sorted into two groups based on their call's minimum frequency. High-frequency (HF) bats, such as eastern red bats (*Lasiurus borealis*) and *Myotis* species (such as northern long-eared bat [NLEB; *M. septentrionalis*]) have minimum frequencies greater than 30 kilohertz (kHz). Low-frequency (LF) bats, such as big brown bats (*Eptesicus fuscus*), silver-haired bats (*Lasionycteris noctivagans*), and hoary bats (*L. cinereus*), typically emit echolocation calls with minimum frequencies below 30 kHz.

Summarized Results

Summarized results of these efforts included three general trends. First overall bat activity varied by season with lower activity recorded in the summer and higher activity in the fall. Secondly, at all stations and frequencies, bat passes peaked during the first half of September. Finally, the bat feature recorded more bat passes/detector night than in the cropland as was expected. However, there was little variation in overall activity between seasons in croplands.

There was some variation between years in the composition of HF and LF activity. In 2016, there were more HF bat passes recorded while in 2018 more LF bat passes were recorded (Table 7). Generally, there was less activity in 2018 than in 2016.

Table 7. Results of bat activity surveys conducted at stations within the North Bend Wind Project area, Hughes and Hyde counties, South Dakota, from May 26 – October 21, 2016, and April 25 – October 25, 2018. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).

Year	Station	Type	# of HF Bat Passes	# of LF Bat Passes	Total Bat Passes	Detector-Nights	Bat Passes/Night[1]
2016	West	representative	49	53	102	61	1.67 ± 0.44
	East	bat feature	128	95	223	95	2.35 ± 0.37
Total			**177**	**148**	**325**	**156**	**---**

Table 7. Results of bat activity surveys conducted at stations within the North Bend Wind Project area, Hughes and Hyde counties, South Dakota, from May 26 – October 21, 2016, and April 25 – October 25, 2018. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).

Year	Station	Type	# of HF Bat Passes	# of LF Bat Passes	Total Bat Passes	Detector-Nights	Bat Passes/Night[1]
2018	West	representative	5	12	17	151	0.11 ± 0.04
	East	bat feature	54	79	133	127	1.05 ± 0.20
Total			**59**	**91**	**150**	**278**	**---**

[1]± bootstrapped standard error.

---Total not given due to differences in how stations were selected and their objectives.

Use of bat activity to predict post-construction mortality is difficult to relate and lacks any direct relationship based on pre-construction survey efforts (Solick et al. 2020). Furthermore, there is some evidence that activity increases from pre-construction to post-construction. Acoustic surveys can provide some level of species composition including the presence of HF bats within the Project area and possible presence of listed species such as NLEB. Though the study was not designed to survey specifically for NLEB, the presence of HF bats along with a habitat assessment for the species (see below) may help inform siting decisions for the Project.

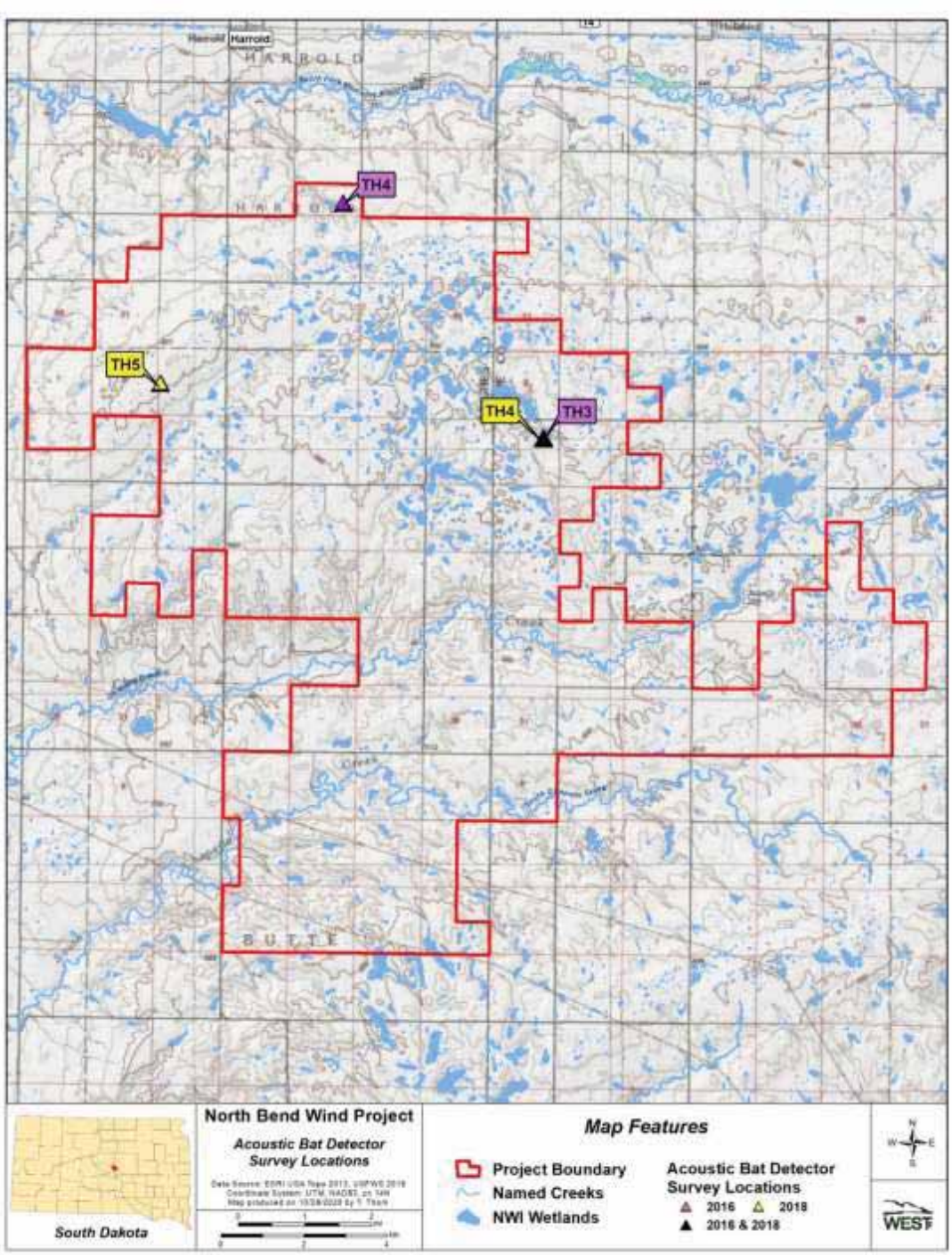

Figure 9. Location of AnaBat detectors deployed during 2016 and 2018 within the North Bend Wind Project boundary in Hughes and Hyde counties, South Dakota.

NORTHERN LONG-EARED BAT HABITAT ASSESSMENT

The NLEB is listed as a federally threatened species. The range of the NLEB is considered to be across all of South Dakota, including Hughes and Hyde counties. A desktop assessment of the presence of potentially suitable habitat for the NLEB was conducted across the Project area in 2017 and updated in 2020 using the USFWS *2020 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2020a; Figure 8). Suitable habitat for this species consists of forested areas where bats might roost, forage, and commute between roosting and foraging sites. NLEB primarily forage or travel in forest habitat and are typically constrained to forest features (Boyles et al. 2009). Therefore, habitat suitability was evaluated based primarily on the presence of forested areas that NLEB might use for roosting and foraging.

WEST conducted a desktop assessment of potentially suitable NLEB habitat by reviewing the NLCD within a 4.0-km (2.5-mi) buffer of the Project area, and delineating potential suitable habitat types (i.e., deciduous forest, evergreen forest, mixed forest, and woody wetlands) using ArcGIS (version 10.4). The habitat delineations were then cross-checked and edited based on the most recent publicly available aerial imagery from the USDA NAIP for the Project area. The overall habitat layer was edited to remove areas that had been cleared of trees and to refine habitat boundaries. Narrow commuting corridors not captured by the NLCD were also added based on the aerial imagery.

Once the desktop assessment was completed, a habitat analysis was conducted to assess connectivity of suitable foraging habitats (i.e., woodlots, forested riparian corridors, and natural vegetation communities adjacent to these habitats), roosting habitats, and commuting habitats (i.e., shelterbelts/tree-lines, wooded hedgerows) as suggested in the USFWS Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (USFWS 2011). The guidance suggests assessing the potential presence of Indiana bats (*Myotis sodalis*) and NLEB within a Project based on availability of travel/commuting corridors within the Project's boundary, and connectivity to foraging or roosting habitat within a 4.0-km buffer of the Project. The minimum size for suitable foraging/roosting habitat is not well understood, but lower estimates are approximately eight ha (20 ac; Broders et al. 2006). We used a minimum patch size of four ha (10 ac) to assign potential roosting habitat. Trees up to 305 m (1,000 ft) from the next nearest suitable roost tree, woodlot, or wooded fencerow were considered suitable habitat (USFWS 2011). The 305-m distance is based on observations of NLEB behavior indicating isolated trees might only be suitable as habitat when they are less than 305 m from other forested/wooded habitats (USFWS 2020a). Based on this informed guidance, it is reasonable to conclude NLEB are unlikely to occur within the Project area, beyond patches separated by more than 305 m from the nearest connected suitable habitat (USFWS 2011, 2020a Figure 10).

Forested patches were sorted by size into the following groups: less than four ha (small forest patches), four to 20 ha (10–50 ac; potential NLEB roost/foraging habitat), and greater than 20 ha (large potential roost/foraging habitat). All polygons representing forested habitats were buffered by 152 m (500 ft) and dissolved to group any habitat patches within 305 m of each other. This

buffer, representing all forested habitats within 305 m of each other, was then purged of small isolated patches by selecting only those connected habitats containing forested patches at least four ha in size. This selection of habitat patches was then buffered by 305 m to represent the potential foraging area for NLEB resulting in nine patches covering 1,198.3 total ha (2,961.0 total ac) within the Project area and 4.0-km buffer (Figure 10). Patch sizes range from 96.2 ha (237.8 ac) to 2,016.4 ha (534.7 ac).

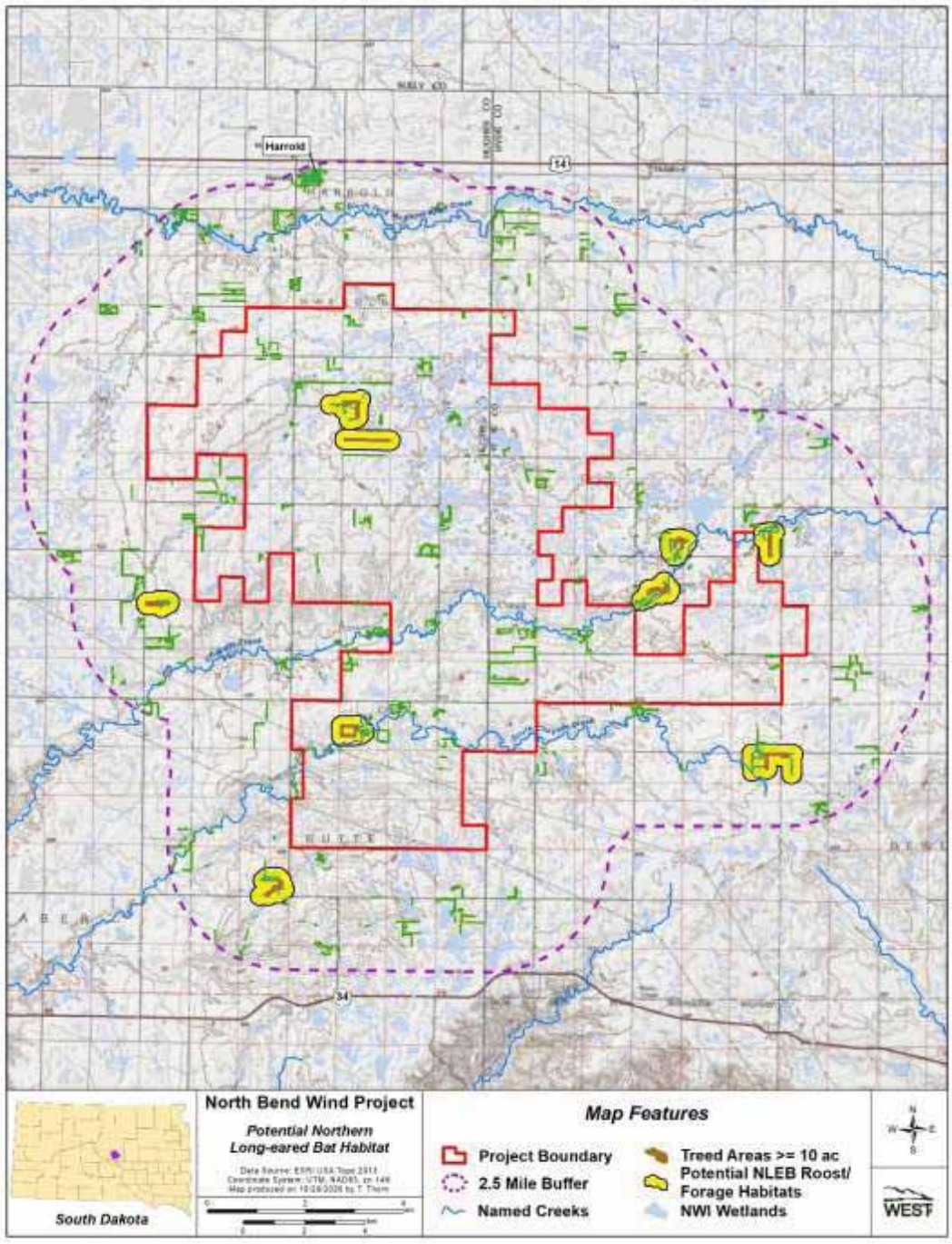

Figure 10. Northern long-eared bat habitat assessment of the North Bend Wind Project and 4.0-kilometer (2.5-mile) buffer, Hughes and Hyde counties, South Dakota.

WHOOPING CRANE STOPOVER HABITAT

Whooping crane use of habitat along their migration corridor has been poorly understood and resulted in numerous approaches to identify those habitats. Niemuth et al. (2018) developed a predictive model specific for North and South Dakota to help identify areas that may be used by whooping crane during migration. They used whooping crane sightings, landscape data, and statistical models to provide a better insight into habitat use within the Dakotas. Figure 9 displays the results of this model along with whooping crane sightings in the region through fall of 2019, and telemetry data from 2009 through 2018. The entire Project area is contained within the 50th percentile of all sightings along the migration corridor (Niemuth et al. 2018, Pearse et al. 2018).

Based on this predictive model, potential stopover habitat varies across the Project area. The south and southwestern portion of the Project area has lower potential habitat quality, while the northcentral portion of the Project area potentially contains relatively high quality (Figure 11). There have been two confirmed whooping cranes within the Project area, one from telemetry data in the extreme northern portion of the Project area and one confirmed sighting along the western portion of the Project area (Figure 11). Though whooping cranes have been documented within the Project area and a 16.1-km (10-mi) buffer, most telemetry and sighting data indicated whooping crane are infrequently using the habitat within 16.1 km of the Project area. Although there is potential migratory stopover habitat within and around the Project area based on the Niemuth et al. (2018) model, only 16 whooping cranes have been confirmed within 16.1 km of the Project. In comparison, it appears that more confirmed habitat use has been to the northeast, east, and south of the Project (Figure 11).

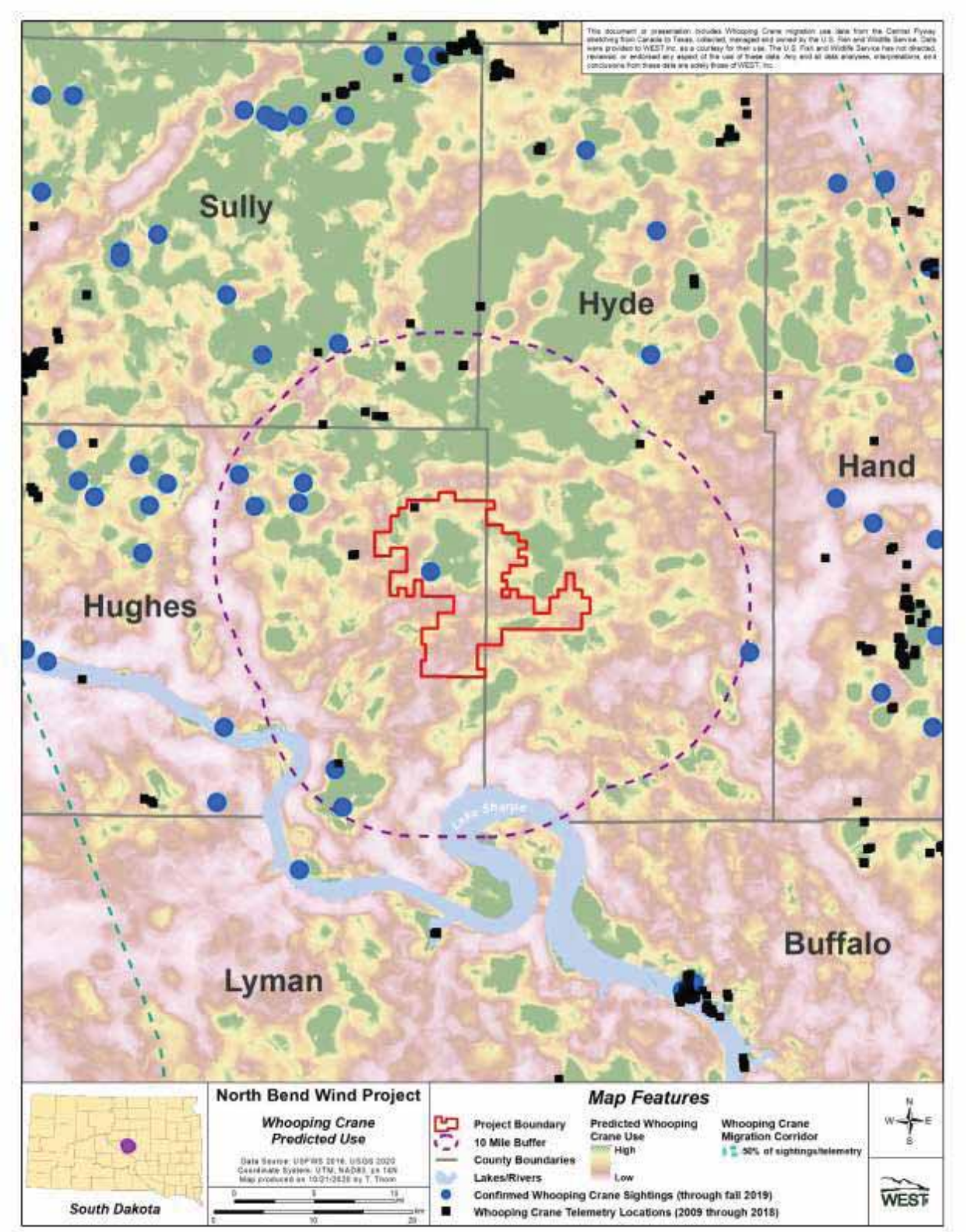

Figure 11. Map of wetlands scored using the predictive habitat use model (Niemuth et al. 2018) for the current North Bend Wind Project boundary and surrounding area in Hughes, Hyde, and Sully counties, South Dakota.

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